Edited by
John Laing Roberts · Shyam Nath
Satya Paul · Yeti Nisha Madhoo

Shaping the Future of Small Islands

Roadmap for Sustainable Development

palgrave
macmillan

Shaping the Future of Small Islands

John Laing Roberts • Shyam Nath
Satya Paul • Yeti Nisha Madhoo
Editors

Shaping the Future of Small Islands

Roadmap for Sustainable Development

palgrave
macmillan

Editors
John Laing Roberts
Indian Ocean Commission
Ebène, Mauritius

Satya Paul
ANU College of Arts and Social Sciences
Australian National University
Canberra, ACT, Australia

Shyam Nath
Amrita Center for Economics & Governance
Amrita Vishwa Vidyapeetham University
Kollam, Kerala, India

Yeti Nisha Madhoo
Amrita Center for Economics & Governance
Amrita Vishwa Vidyapeetham University
Kollam, Kerala, India

ISBN 978-981-15-4882-6 ISBN 978-981-15-4883-3 (eBook)
https://doi.org/10.1007/978-981-15-4883-3

This Palgrave Macmillan imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Foreword

Small island developing states (SIDS) are not in the spotlight of development studies, even though the social and economic development constraints that these countries face are among the most difficult in the world. These are sovereign small island states, isolated geographically, which fall largely in middle-income categories. Nevertheless, they are often without a strong physical or institutional infrastructure, and most are vulnerable to external economic fluctuations and natural disasters as well as disease burdens. This book of original essays goes a long way towards providing a better understanding of these challenges and the policy answers that are now in play in these countries.

The major impediments to development in small islands have to do with their isolation and their vulnerability. International climate meetings have remained ineffective on global environmental issues that have severe consequences for the very existence of these small island states. Matters are made worse because the development of their economic base—often sea-fishing, international tourism and plantations—poses formidable challenges and is often at odds with their environmental management efforts. Arguably, the biggest challenge of all is on the near-term horizon. SIDS are on track to become the early sufferers from global warming and sea level rise, and already are confronting a steady increase in the frequency and severity of natural disasters, including cyclones and floods.

The chapters in this book take on some specific problems of individual small island countries and link them back to the basic theme of vulnerability to environmental degradation and to weakening economies. These include the mounting threat of climate change, heatwaves, overcutting of natural forests, and the stress on the population that comes from attempting to overcome such issues through policy experiments. The solutions offered in these essays vary from tailoring the traditional approaches to better fit the case of SIDS (e.g., establishing better resilience measures and better merging natural resource policy and economic development policy) to avoiding over-tourism and embracing "blue and circular economies" which focuses on reusing all waste.

This set of 21 original essays offers a new look at how small island economies might balance their economic and environmental goals in a context of extreme vulnerability. Not surprisingly the chapter authors are drawn from several disciplines including economists, government practitioners, ocean governance commissions, and environmentalists. The book is a sequel to the volume *Saving Small Island Developing States: Environmental and Natural Resource Challenges* edited by Shyam Nath, John Laing Roberts and Yeti Nisha Madhoo (2010), published by Commonwealth Secretariat, UK.

Roy W. Bahl Jr

Dean and Regents Professor of Economics,
Emeritus, Andrew Young School of Policy Studies,
Georgia State University, Atlanta, GA, USA
Professor Extraordinaire, University of Pretoria,
Pretoria, South Africa

Acknowledgements

I would like to take this opportunity to record our sincere thanks to everyone who contributed to the development of this edited volume over several phases. During my visit to Mauritius in 2013 to attend a workshop on youth and sustainable development organised by Indian Ocean Commission (IOC), Raj Mohabeer, Chargé de mission of IOC, shared this idea with me and John Laing Roberts. Discussions with John Laing Roberts who has long-time expertise with SIDS while working with Commonwealth Secretariat, London, and IOC in Mauritius went a long way in getting ahead the idea of a sequel of an earlier volume with an interesting new title. This idea however remained latent until a team of economists headed by Simon Feeney of RMIT University, Australia, visited Amrita University to forge a collaboration in mainstream economics and supported this idea. Our efforts got fresh stimulus when Satya Paul from the Western Sydney University and the University of the South Pacific, Fiji (now with Australian National University), joined the stream with his new ideas.

At this stage in 2017, a tremendous ray of support from the Chancellor of Amrita University, Mata Amritanandamayi Devi, World Renowned Spiritual Saint, speeded up the momentum and encouraged the idea through the creation of Amrita Center for Economics & Governance. Migration of Yeti Nisha Madhoo from the University of Mauritius to India to join the Center with her expertise on the economics and ecology of islands provided further impetus to this endeavour.

Subsequently, we contacted the experts working in the contemporary issues of small islands. We are thankful to the experts not only for accepting our invitations but also for writing chapters well on time despite their hectic schedules. In this process, our task was facilitated with the great help of Augustin K Fosu of United Nations University, Helsinki, Finland, Oliver Morrissey of Nottingham University, UK, and Larry D Schroeder of Syracuse University, USA.

We also place our thanks to Raj Mohabeer and IOC Headquarter in Mauritius for initiating and supporting the idea of a roadmap for sustainable development of small islands.

Finally, we acknowledge the support of Palgrave, particularly Sandeep Kaur and Arun Prasath for processing and monitoring the publication of this volume.

Coordinating Editor Shyam Nath
Amrita Center for Economics & Governance,
Amrita Vishwa Vidyapeetham University,
Kollam, India

Contents

Part I Economic and Development Concerns 1

1 **Transition from Economic Progress to Sustainable Development: Missing Links** 3
Shyam Nath and John Laing Roberts

2 **Macroeconomic Trends, Vulnerability, and Resilience Capability in Small Island Developing States** 21
Satya Paul

3 **Development Strategies for the Vulnerable Small Island Developing States** 37
Augustin Kwasi Fosu and Dede Woade Gafa

4 **Trade Policy and Innovation Governance: An Analysis of Trade Challenges in the Pacific and Caribbean Economies** 71
Keith Nurse and Jeanelle Clarke

5 **Tourism and Sustainable Growth in Small (Island) Economies** 93
Harvey W. Armstrong and Robert Read

Part II Social Dimensions 109

6 **Democracy and Social Empowerment in Small Island Jurisdictions** 111
Peter E. Buker and Mark Lapping

7 **Social Capital and Subjective Wellbeing in Small States** 125
Sefa Awaworyi Churchill, Yeti Nisha Madhoo, and Shyam Nath

8 **The Quality of Life: An Analysis of Inter-island Disparity and Emerging Issues** 139
Satya Paul

9 **Disease, Environment and Health Policy Response** 155
Brijesh C. Purohit

Part III Climate Change and Natural Resources 183

10 **Climate Change, Sea Level Dynamics, and Mitigation** 185
Shyam Nath and Yeti Nisha Madhoo

11 **Institutional and Policy Analysis: Water Security and Disaster Management in Small Island Developing States** 205
Chloe Wale, Nidhi Nagabhatla, and Duminda Perera

12 **Potential Restoration Approaches for Heavily Logged Tropical Forests in Solomon Islands** 219
Eric Katovai, Dawnie D. Katovai, and William F. Laurance

13 **Climate Change and Heatwaves** 233
John Laing Roberts

Part IV Environmental Governance and Challenges 249

14 Promoting the Blue Economy: The Challenge 251
Raj Mohabeer and John Laing Roberts

15 Assessing the Progress of Environmental Governance in Small Island Economies 269
John Laing Roberts

16 Overseas Development Assistance and Climate Resilience: A Case Study of Tonga 283
Partha Gangopadhyay and Khushbu Rai

17 Overtourism, Environmental Degradation and Governance in Small Islands with Special Reference to Malta 301
Lino Briguglio and Marie Avellino

Part V Global Environment and Sustainable Development 323

18 International Climate Diplomacy, Collective Action and SIDS 325
Larry D. Schroeder and Shyam Nath

19 International Development Goals and Small Island Developing States 339
Simon Feeny, Alberto Posso, and Sefa Awaworyi Churchill

20 Saving Small Islands: Does Institutional Quality Matter? 361
Yeti Nisha Madhoo

21 The Connectivity Challenge in the Western Indian Ocean 387
Raj Mohabeer

22 Overview, Emerging Issues and a Roadmap for SIDS 405
John Laing Roberts, Shyam Nath, Satya Paul, and
Yeti Nisha Madhoo

Index 417

Notes on Contributors

Harvey W. Armstrong is Professor Emeritus (formerly Professor of Economic Geography) at the University of Sheffield and Fellow of the UK Academy of Social Sciences. He has previously worked at the University of Loughborough and the University of Lancaster, and has held visiting appointments at the University of British Columbia, and the University of West Virginia (Regional Research Institute). His principal research interests are in regional policy (including EU regional policy), and the analysis of small states and island economies. He has undertaken extensive advisory and consultancy work within the UK and internationally, as well as with evaluation projects for DG Regional Policy.

Marie Avellino is the Director of the Institute for Tourism, Travel and Culture at the University of Malta, which offers programmes ranging from Undergraduate to PhD level. Her research interests include social anthropology, cultural heritage research, tourism and cultural identities, intercultural competencies for management, and visitor experience management. Her EU-Funded Projects experience in Project Management includes the 2018–2021 Erasmus+ Key Action 2 Strategic Partnerships "Boosting blue Entrepreneurs" competences towards an environmental care ecosystem"(BLUESPROUT) and the 2019–2021 Skills for promotion, valorisation, exploitation, mediation, and interpretation of European Cultural Heritage (EUHeritage).

Lino Briguglio is a professor and the Director of the Islands and Small States Institute of the University of Malta. His main research interests include economies of small states, island tourism, and economic governance. He is known internationally for his seminal work on the "Vulnerability Index", which was published in *World Development* in 1995, which led to a worldwide interest and to many quantitative studies on economic vulnerability. He has also pioneered work on the measurement of economic resilience, in a paper published in *Oxford Development Studies* in 2009. He has acted as a consultant to various international organisations on studies and reports relating to small states.

Peter E. Buker is Chair of General Studies at Yorkville University in Canada. He was educated at Queen's University, Kingston, Ontario, Canada (MA in Economics and PhD in Political Studies) and St Andrews University, Scotland (MA). His research interests are in the areas of political economy and democracy, and small-scale jurisdictions. He is a research associate of the Institute of Island Studies, the University of Prince Edward Island, Canada, where he lives.

Sefa Awaworyi Churchill is an associate professor and principal research fellow with the School of Economics, Finance & Marketing at RMIT University, Australia. He holds a PhD in Economics from Monash University. His inter-disciplinary research focuses on development economics, addictive behaviour, ethnic diversity, wellbeing, and other issues related to sociology, health and economics. He has experience working on consultancy projects for various policy agencies and international development organisations.

Jeanelle Clarke is an international trade policy specialist working as Associate Economic Affairs Officer at the UNCTAD in Geneva, Switzerland, where she works on economic diversification in small and developing states with a specific focus on the creative economy. Ms Clarke holds a Bachelor's degree in Political Science and Law, and a master's in International Trade Policy from the University of the West Indies. She has worked for national governments and international organisations in the Caribbean and internationally, including the World Trade Organisation.

Simon Feeny is a professor at RMIT University, Australia. He has 20 years' experience as a development economist. Feeny has been awarded more than US$1.5 million in funding and has undertaken work for the Australian government's Department of Foreign Affairs and Trade, the United Nations, the South Pacific Forum Secretariat, the

Association of Southeast Asian Nations (ASEAN) Secretariat, Oxfam Australia, World Vision International, the Fred Hollows Foundation, Plan International and the Centre for Poverty Analysis in Sri Lanka. Feeny has more than 80 academic publications and has produced over 25 reports for industries. He is an associate editor of the *Journal of International Development*.

Augustin Kwasi Fosu is a professor in the University of Ghana, an extraordinary professor in the University of Pretoria, and a research associate (CSAE) in the University of Oxford. His recent positions include Deputy Director, United Nations University-WIDER, Helsinki; Senior Policy Advisor/Chief Economist, UNECA, Addis Ababa; and Director of Research, AERC, Nairobi. He holds a PhD in Economics from Northwestern University, USA. Fosu is Editor-in-Chief of *Journal of African Trade* (Elsevier/Atlantis), Co-Managing Editor of *Journal of African Economies* (Oxford), and has served on the editorial boards of numerous other journals including *Journal of Development Studies*, *Oxford Development Studies*, *World Bank Economic Review*, and *World Development*. He has published extensively in referred journals.

Dede Woade Gafa is a PhD candidate in the UNU-WIDER/University of Ghana collaborative PhD programme in Development Economics. She holds a Master of Philosophy (MPhil) degree in Economics from the University of Ghana, Legon, Ghana. Her research interests focus on inequality of opportunity and poverty.

Partha Gangopadhyay is Associate Professor of Economics at the School of Business, Western Sydney University. His recent positions include chair professorships in Germany and Fiji and visiting professorships in the USA, Canada, India. He also holds the position of Joint-Executive Director at the Gandhi Centre at ABBS, Bangalore, India.

Dawnie D. Katovai is a PhD candidate at the University of the South Pacific in Suva, Fiji, where she is studying the impact of land-use change on ecological connectivity across coastal forests in the Solomon Islands.

Eric Katovai is a senior lecturer at James Cook University, Fiji. One of Katovai's research initiatives examines possible ways of rehabilitating heavily logged forests in the Solomon Islands.

Mark Lapping is the Distinguished University Professor Emeritus at the University of Southern Maine, Portland, Maine (USA), where he taught classes in public policy, community development and planning, and democracy. He founded the School of Rural Planning & Development at the University of Guelph, Ontario (Canada), as well as the Bloustein School of Planning and Public Policy at Rutgers University, New Jersey (USA). He is a research associate in the Institute of Island Studies at the University of Prince Edward Island, Canada, and lives in Maine (USA).

William F. Laurance is a distinguished research professor at James Cook University in Cairns, Australia, and an Australian Laureate and Prince Bernhard Chair in International Nature Conservation at Utrecht University, Netherlands.

Yeti Nisha Madhoo is a professor at the Center for Economics & Governance, Amrita Vishwa Vidyapeetham University (India). She holds a PhD degree in Economics from the University of Mauritius and conducted post-doctoral research in Development Economics at the University of California, Berkeley (USA), under Fulbright Scholarship. Madhoo was attached to National University of Singapore, the University of Alberta (Canada), and the University of East Anglia (UK). She co-edited the book, *Saving Small Island Developing States* (2010), and worked as consultant to African Economic Research Consortium (AERC, Kenya), United Nations Research Institute for Social Development (UNRISD, Geneva, Switzerland), and Commonwealth Secretariat (UK).

Raj Mohabeer holds the position of Officer-in-Charge of Economic Affairs with the portfolio of economic cooperation, trade, regional integration and infrastructure and maritime security at the Indian Ocean Commission General Secretariat since 2000. Prior to this period, he worked as an Economist at the Ministry of Economic Planning and Development of Mauritius. Mohabeer has extensive knowledge of the Western Indian Ocean region and has contributed to the advancement of regional integration by working closely with neighbouring regional organisations in a varied number of areas such as regional integration, promotion of trade, economic cooperation and maritime security, improvement of natural resources and sustainable development. He has also been working with the Pacific and Caribbean region for the promotion of SIDS issues.

Nidhi Nagabhatla is an adjunct professor at McMaster University, Canada, and programme officer with the United Nations University

Institute for Water, Environment and Health (UNU-INWEH). With over 20 years of experience as systems science specialist and geospatial analyst, she has led, coordinated, and implemented transdisciplinary projects and worked with multi-disciplinary research teams in various geographical regions (Asia, African, West Europe, and North America). She has been associated with multiple international organisations leading sustainable development projects and programmes (International Water Management Institute (IWMI), World Fish Centre International Union for Conservation of Nature (IUCN), and United Nations University (UNU)) and capacity development initiatives and published widely over 150 reports, peer-reviewed paper, and policy and web articles.

Shyam Nath is Director of Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University (Coimbatore, India), and earlier, he was Professor of Economics at University of Mauritius, Le Reduit, Mauritius. He holds PhD in Economics from University of Rajasthan, India, and PDF in Metropolitan Finance from the Maxwell School, Syracuse University (New York, USA). He has more than 40 years of teaching and research experience at university level in India and abroad and 20 years of active participation in consultancy and research for national and regional governments and international agencies (UNDP, United Nations Capital Development Fund (UNCDF), the World Bank, United Nations University/World Institute for Development Economics Research (UNU/WIDER), United States Agency for International Development (USAID), United Nations Research Institute for Social Development (UNRISD), Economic Commission for Africa (ECA), African Economic Research Consortium (AERC), Commonwealth Secretariat).

Keith Nurse is the Principal of the Sir Arthur Lewis Community College in St Lucia. He has formerly served as the World Trade Organisation Chair at the University of the West Indies and has worked recently as Senior Economist and Advisor on Structural Policies and Innovation at the OECD Development Centre in Paris. He serves on the executive bureau of the UN Committee for Development Policy and as a member of Hemispheric Programme Advisory Committee of the Inter-American Institute for Cooperation in Agriculture.

Satya Paul is Honorary Professor at Australian National University. His recent positions include Professor of Economics at the University of Western Sydney and Professor and Head of School of Economics at the

University of the South Pacific. He also taught at other prestigious universities in Australia, New Zealand, India, Canada, and China. He also served as a Consultant to Indian Planning Commission, National Institute of Public Finance and Policy, Delhi, ILO, and UNFPA. Paul has published extensively in refereed journals. His area of research includes income distribution, poverty, growth, well-being, relative deprivation, unemployment, and measurement of efficiency.

Duminda Perera is a water resource professional with over 15 years' experience in research related to water-related disasters. He is a civil engineering graduate of the United Nations University Institute for Water, Environment and Health, Canada, and McMaster University, Canada, and University of Ottawa, Canada, and Sri Lanka and holds master's and doctoral degrees in Urban and Environmental Engineering from the Kyushu University, Japan. His research covers numerical modelling for flood hazards, flood forecasting, basin-scale climate change impact assessments, disaster risk reduction, and capacity development. Before UNU-INWEH, he worked as research specialist at UNESCO International Centre for Water Hazard and Risk Management (ICHARM), Japan. He is affiliated with McMaster and the Ottawa University, Canada.

Alberto Posso is Professor of Economics, RMIT University, Australia. Posso holds a PhD in Economics from the Australian National University with specialisations in labour economics, economic development, and applied econometrics. His research focuses on development issues in East Asia, Latin America, and the Pacific. Posso has over 40 peer-reviewed publications, including papers in *World Development*, *The Journal of Development Studies,* and *The Review of Development Economics.* Posso has also authored reports for governments and international organisations, including Oxfam, Plan International, the United Nations, and the Fred Hollows Foundation.

Brijesh C. Purohit is a professor at the Madras School of Economics, Chennai, India. After completing his PhD in Economics from the Institute for Social and Economic Change, Bangalore, India, he accumulated nearly 25 years of professional experience, including teaching, training, research, and consultancy. He has served at various reputed institutions in India and was also a South Asian Visiting scholar at Queen Elizabeth House, the University of Oxford, UK. He has published a number of books and articles in reputed national and international journals.

Khushbu Rai is an early-career academic. Her research focuses on the developmental aspects of island states in the Pacific and the Caribbean. She is at present a Doctoral Candidate in Climate Studies at the University of the South Pacific, Fiji.

Robert Read is Senior Lecturer in International Economics at the Lancaster University Management School UK. He is a leading international authority on the growth performance of small economies and has published numerous articles in leading academic journals, book chapters, and reports (much of it in collaboration with Prof. Harvey Armstrong). Read has been a consultant for many leading international organisations, including the European Commission, the UK Department for International Development (DfID), the UK Foreign Office, the Dutch Foreign Ministry, the Commonwealth Secretariat, the World Bank and its Foreign Investment Advisory Service (FIAS), and the World Trade Organization (WTO).

John Laing Roberts is a consultant on sustainable development with the Indian Ocean Commission and the Commonwealth Secretariat, with master's and PhD degrees from the University of Birmingham, in health economics. During 1962–1989 he worked in the National Health Service (NHS), becoming a Regional Administrator in 1981. After the NHS, he became adviser to the WHO, the World Bank, the EU and the African Development Bank, while teaching at post graduate level in Birmingham, Bristol, Cardiff, Manchester, and Mauritius. He contributed to the UNEP Development Outlook series and was co-editor of the Commonwealth Secretariat, 2010, Saving SIDS book. He lives in Mauritius.

Larry D. Schroeder is Professor Emeritus of Public Administration and International Affairs at the Maxwell School of Citizenship and Public Affairs, Syracuse University in Syracuse, New York. His research interests focus on local public finance, intergovernmental fiscal relations, and financial management, particularly in developing and transition economies. Schroeder has authored and co-authored a large number of articles and several books on these subjects and has participated in policy research projects in numerous countries, especially in South and South-East Asia but also in Africa and Eastern Europe.

Chloe Wale is a joint scholar from McMaster University and United Nations University Institute for Water, Environment and Health. She has worked for a municipal water department of the city for two years. Given her passion in environment and health in the developing world, as well as water research and climate change, she has been closely involved in science communication activities and created a collaborative project with the Hamilton Paramedics. She wrote a systematic review and also contributed significantly to research and policy outputs of UNU-INWEH related to SIDS. Her extracurricular activities include volunteering with Let's Talk Science, where she attends schools and leads classes in performing science experiments.

List of Figures

Fig. 1.1	Evolution of Global Population and Global Carbon Dioxide Emissions. (Source: World Climate Report (2008), Population data are from the U.S. Census Bureau and CO_2 emissions data are from the Carbon Dioxide Information Analysis Center (CDIAC))	11
Fig. 1.2	Mixed Empirical Evidence on Environmental Kuznets Curve. (Source: Adapted from Panayotou 2000)	12
Fig. 2.1	GDP growth rates of SIDS	24
Fig. 2.2	Vulnerability index values	30
Fig. 3.1	Economic vulnerability index (EVI), SIDS NON-LDCs versus SIDS LDCs (1990–2013). (Source: Data on EVI are obtained from Feindouno and Goujon (2016), online at http://www.ferdi.fr/en/indicator/retrospective-economic-vulnerability-index. Notes: EVI is obtained by taking the arithmetic mean of two components, namely exposure index and shock index. The former is based on five components: population size (25%), remoteness from world markets (25%), exports concentration (12.5%), share of agriculture, forestry, and fishery in GDP (12.5%), and the share of population living in low-elevated coastal zone (25%). And the shock index is computed using three components: the victims of natural disasters (25%), the instability in agricultural production (25%), and the instability in exports of goods and services (50%))	39
Fig. 3.2	Economic growth: SIDS LDCs versus SIDS NON-LDCs, 1983–2016. (Source of data: World Development Indicators (WDI), World Bank (2018a). Notes: In the computation of	

the average growth rate for SIDS LDCs, the graduation of Cape Verde (2007), Maldives (2011), and Samoa (2014) were taken into account, such that at every point in time the list of LDCs is consistent with the UN classification for that year (see, https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-graduation.html)) 40
Fig. 4.1 Loss of output and fiscal revenue, 2007–2011 (% GDP). (Source: Mercer-Blackman and Melgarejo 2013) 72
Fig. 4.2 GDP composition by sector for select SIDS in 2011. (Source: World Bank, World Development Indicators 2011) 74
Fig. 4.3 Trade to GDP ratios: The Caribbean and select small states. (Source: UNDP 2018) 76
Fig. 4.4 Trends in exports of intermediate goods 2006–2016. (Source: WTO 2018) 79
Fig. 4.5 Trends in imports of intermediate goods in Caribbean countries. (Source: WTO 2018) 80
Fig. 4.6 Trends in CARIFORUM's exports to the top importing markets, 2006–2013 (US$ billion). (Source: ITC 2013) 81
Fig. 4.7 CARIFORUM's exports to top EU markets, pre- and post-EPA periods compared, 2006–2013 (US$ billion). (Source: ITC 2013) 82
Fig. 4.8 The Pacific's top four exported commodities, 2005–2014 (US$ billion). (Source: UNCOMTRADE 2015) 83
Fig. 9.1 Population of SIDS across continents (in thousands). (Source: Estimated) 157
Fig. 9.2 Percentage across continents of SIDS population. (Source: Estimated) 157
Fig. 9.3 Per capita income of SIDS (in US$). (Source: Estimated) 158
Fig. 10.1 Contributors global sea level rise (1993–2018). (Taken from: https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level (Accessed Dec 2019)) 191
Fig. 11.1 Distribution of SIDS in the global geographical landscape. (Source: Adopted from Gheuens et al. 2019) 206
Fig. 11.2 Chronological timeline between 1997 and 2019 outlining water security and climate change challenges faced and addressed by SIDS 208
Fig. 12.1 Log export volume for the Solomon Islands between 1997 and 2017. The economy of the Solomon Islands has been heavily reliant on log export, resulting in a steep increase in logging activities in the country, with harvest quadrupling beyond the sustainable yield 220

Fig. 12.2 A highly logged forest landscape (**a**) and a large forest tract deforested for temporary log storage (**b**) in Solomon Islands 221
Fig. 12.3 Ecological restoration approaches widely used in tropical landscapes. An integrated approach whereby several techniques implemented concurrently can potentially aid success in heavily logged forests 224
Fig. 14.1 Waste per capita per day and gross (GNI National Income) per capita (IOC Region). (Source: World Bank Database 2019) 253
Fig. 14.2 GNI and CO_2 emissions (IOC Region). (Source: World Bank database 2019) 254
Fig. 15.1 Ecological footprints and Human Development Index. (Sources: Global Footprint Network 2019; UNDP 2019) 273
Fig. 16.1 Donors of climate finance and sector allocation to Tonga (million US$, 2010–2014). (Source: Atteridge and Canales 2017—OECD DAC CRS database) 291
Fig. 16.2 Vulnerability index for Tonga, 1976–2015. Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data) 292
Fig. 16.3 Time profile of overseas development assistance (ODA) to Tonga. Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data) 293
Fig. 16.4 Oil price (OILP) dynamics overtime. Note: Year = 1, Year 39 = 2015. (Source: Created by the authors from publicly available data) 294
Fig. 16.5 Annual change in global temperature (CGT). Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data) 294
Fig. 17.1 Inbound tourism. (Source: Malta Tourism Authority [2018]. *Tourism in Malta—Facts and Figs. 2017*) 310
Fig. 17.2 Seasonal tourism, 2017. (Source: Malta Tourism Authority 2018) 310
Fig. 20.1a Environmental Health and Economic Indicators—Linear Fit Line. (*Source*: Computed) 376
Fig. 20.1b Environmental Health and Economic Indicators—Quadratic Fit Line. (*Source*: Computed) 377
Fig. 20.2a Ecosystem Vitality and Economic Indicators—Linear Fit Line. (*Source*: Computed) 379
Fig. 20.2b Ecosystem Vitality and Economic Indicators—Quadratic Fit Line. (*Source*: Computed) 380

List of Tables

Table 2.1	Macroeconomic trends	23
Table 2.2	Estimates of human development index (HDI) and poverty rates for SIDS and regions based on latest available years	25
Table 2.3	Country-wise and year-wise estimates of vulnerability indices for SIDS	28
Table 2.4	Overall and region-wise average estimates of vulnerability indices	30
Table 2.5	Indicators of institutional quality, 2018	32
Table 2.6	Geographical Classification of SIDS	35
Table 3.1	Development outcomes in SIDS: GNI Per capita and human development indicators, by country—latest year available	41
Table 3.2	Development outcomes in SIDS by quintiles: GNI per capita and human development indicators, by country	45
Table 3.3	Ease of doing business in SIDS, 2017	52
Table 3.4	Institutional quality in SIDS, 2016	56
Table 3.5	State of institutional quality in SIDS, by quintiles	59
Table 3.6	List of SIDS	66
Table 4.1	Annual GDP growth rates, 2008–2017, for several Caribbean countries	73
Table 4.2	Proportion of goods and services in exports, 2013 vs. 2016	74
Table 4.3	Composition of merchandise exports, 2013	75
Table 4.4	Export performance of major services, 2000–2013 (US$ billion)	75
Table 4.5	Merchandise trade in US$ million (2017)	76
Table 4.6	Exports of intermediate goods 2006–2016 in US$ millions	77
Table 4.7	Imports of intermediate goods 2006–2016 in US$ millions	78
Table 4.8	Exports of selected services 2017	80

Table 4.9	Select examples of trade agreements signed by the Caribbean	81
Table 4.10	Select examples of trade agreements signed by the Pacific	84
Table 4.11	Key niche products from the Pacific regions with export potential	84
Table 4.12	Government expenditure as a proportion of GDP, selected Caribbean countries, 2017	88
Table 5.1	Economic reliance on tourism in small economies	97
Table 7.1	Social capital and wellbeing	130
Table 7.2	Social capital and wellbeing (Singapore)	132
Table 7.3	Social capital and wellbeing (Trinidad and Tobago)	133
Table 8.1	Geographical classification of SIDS	142
Table 8.2	Borda ranking of quality of life	146
Table 8.3	Pearson rank correlations	147
Table 9.1	Urbanization, life expectancy and mortality in SIDS	159
Table 9.2	Immunization coverage among one-year-olds (%) for diphtheria, hepatitis, polio and nationally recommended age for measles and incidence of malaria in SIDS	161
Table 9.3	Pattern of non-communicable diseases in SIDS	164
Table 9.4	Environment and climate indicators in small island states	166
Table 9.5	Correlations	168
Table 9.6	Spearman correlation	168
Table 9.7	Regression results for SIDS with healthy life years expected as dependent variable on per capita GDP and carbon emission	169
Table 9.8	Regression results for SIDS using healthy life years expected using urbanization and carbon emission	169
Table 9.9	Global environmental risk factors for children: correlated health concerns and risk levels in SIDS Countries in the Eastern Caribbean	171
Table 9.10	National policies and activities undertaken SIDS in the Eastern Caribbean to promote children's education on the environment	172
Table 9.11	National policies catering for the care and protection of children and their relevance in circumstances of natural disasters in SIDS in Eastern Caribbean	174
Table 9.12	National disaster plans catering for children, mothers and families in the partner countries of the UNICEF Office for Barbados and the Eastern Caribbean	176
Table 9.13	Some aspects of healthcare expenditure and manpower in Pacific Island nations	179
Table 9.14	Classification of SIDS	180
Table 10.1	Income classification of SIDS	187
Table 10.2	Sources of carbon dioxide	189

Table 10.3	Historical and top 15 current emissions of carbon dioxide from fossil fuel combustion and cement production	190
Table 10.4	New source generation costs when compared to existing coal generation	196
Table 14.1	Examples of Eco-Action from the IOC December 2019 Eco. Actions Forum	256
Table 14.2	The Dilemmas of Development in a Divided Region: Indian Ocean and East Atlantic SIDS	264
Table 15.1	Ecological footprint in selected island states	274
Table A.1	The weights in the vulnerability index of Tonga (VIT)	296
Table A.2	Autoregressive distributed lag (ARDL) results (Eq. 16.2): Vulnerability Index of Tonga (VIT) vis-à-vis Variables of Interest	298
Table 19.1	Regressions results	347
Table 20.1	Environmental performance of SIDS versus non-SIDS (2014)	367
Table 20.2	Selected socio-economic and institutional quality characteristics of SIDS vs. non-SIDS (2014)	369
Table 20.3	Correlations between environmental performance, international environmental treaties and institutional quality measures: SIDS versus non-SIDS (year 2014)	374
Table 21.1	Logistics Performance Index 2019	393

List of Boxes

Box 1.1	Nobel Prize in Economic Sciences and Sustainable Development	5
Box 1.2	Evolution of Developmental Thoughts and Economic Models	8
Box 1.3	Sustainable Development	10
Box 1.4	Governing Common Pool Resources	13
Box 1.5	Environmental Policy Tools	15
Box 10.1	SIDS Survival vs. Sea Level Rise	192
Box 10.2	Mitigation and Adaptation Strategies	193
Box 18.1	Club Goods	330

PART I

Economic and Development Concerns

CHAPTER 1

Transition from Economic Progress to Sustainable Development: Missing Links

Shyam Nath and John Laing Roberts

1.1 Introduction

The world has witnessed the transformation of the major powers from agrarian societies to industrial giants and an emergence of a new international economic order which puts emphasis on the philosophy of development. The early and celebrated economic models are unable to forecast that the growth rates of output are not sustainable if the quality of environment declines. These economic models posit that production basically comes from different combinations of labour and capital that are embodied in technology. Capital has been the subject of the main focus in several forms such as physical capital (machinery), financial capital (savings) and human capital (investment in education and health). Thus, according to the conventional models, if the labour and capital are organized efficiently,

S. Nath (✉)
Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, India
e-mail: shyamnath@am.amrita.edu

J. L. Roberts
Indian Ocean Commission, Ebène, Mauritius
e-mail: john.laing@hotmail.com

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_1

growth will take place, ceteris paribus. Production will enter markets, the adjustment process in marketplace will clear all the imbalances and economies will continue to grow. The new growth theory adds a new impetus to growth modelling by emphasizing the role of new ideas, innovations, policies, governance and institutions in addition to the traditional factors of production. The proponents of new growth theory further explain that technology is not only exogenously available, but it can also evolve over time by 'learning and doing'.

Interestingly, there is no mention of natural capital (environment) in this literature. In recent decades, however, the trajectory of CO_2 (carbon dioxide) emissions over a long period of time portrays the limitations of such economic models for not capturing carbon growth or other ecological externalities of production. Such sustained neglect evidently carries the threat of destabilizing both economic growth and the essential ecological balance of the planet. The traditional version of the established dominant social paradigm laying more emphasis on growth and redistribution has been challenged by the new environmental paradigm. The latter acknowledges the interdependence of development and the environment and seeks to redress the adverse ecological externalities of production, by investment in protective, preventive and mitigating measures, which value natural resources and include them explicitly in the system of social national accounts. This is a major shift in the economic thinking.

Whilst growth of GDP (Gross Domestic Product) necessitates the use of environmental and natural resources along with other inputs, the concern here is what happens to the environment when economic growth takes place. As GDP is produced, the planet, as part of the eco-balance system, uses photosynthesis (the process for converting carbon dioxide into oxygen, using sunlight) to produce an environmental (invisible) output, which is one of the inputs in the further production process, and therefore its quality is important. If GDP growth degrades the environment and there are no remedial measures, this will adversely affect both the GDP growth rate and the process of photosynthesis now and for future generations. In other words, the GDP growth rate can be sustained only when the policy of protecting the quality of environment is in place. Ecological vitality is a necessary condition for economic growth.

Environmental and natural resource analysis has evolved as a major component of the emerging public policy debate because of growing concern about sustainable development. In recent years, the Nobel Prize Committee in Economic Sciences recognized the challenges of natural

Box 1.1 Nobel Prize in Economic Sciences and Sustainable Development

The Nobel Foundation (2018) acknowledges the contributions of Paul Romer and William Nordhaus using these words.

Paul Romer of Stanford University "demonstrates how knowledge can function as a driver of long-term economic growth. When annual economic growth of a few per cent accumulates over decades, it transforms people's lives. Previous macroeconomic research had emphasised technological innovation as the primary driver of economic growth but had not modelled how economic decisions and market conditions determine the creation of new technologies. Paul Romer solved this problem by demonstrating how economic forces govern the willingness of firms to produce new ideas and innovations."

William Nordhaus of Yale University worked on various environmental issues and his "findings deal with interactions between society and nature. Nordhaus decided to work on this topic in the 1970s, as scientists had become increasingly worried about the combustion of fossil fuel resulting in a warmer climate. In the mid-1990s, he became the first person to create an *integrated assessment model*, i.e. a quantitative model that describes the global interplay between the economy and the climate. His model integrates theories and empirical results from physics, chemistry, and economics. Nordhaus' model is now widely spread and is used to simulate how the economy and the climate co-evolve. It is used to examine the consequences of climate policy interventions, for example carbon taxes."

Source: Taken from Nobel Foundation (2018).

resources in 2018 through awards to two economists who integrated economic and environmental analysis for addressing some of our time's most basic and pressing questions about how we create long-term sustainable economic growth (see Box 1.1).

The objective of this introductory chapter is to examine the workings of economic models propounded by early schools of economic science and philosophy along with later developments in the context of policy and institutions. Then, the analysis shifts to the issue of sustainable development, which sets limits to economic growth in terms of the environmental carrying capacity of the economic system in a country.

The chapter is organized as follows. Section 1.2 describes how economic models work and how they have evolved over time. The contents of new growth theory are presented, namely innovation, ideas, policy and institutions. This section raises the issue of missing environmental resources in economic models and asks whether changes in economic growth rates can simply be attributable to conventional factors of production and markets, and government policy. Section 1.3 discusses the factors underlying the missing environment resource as a factor of production and the limitations of the conventional environmental instruments to alleviate environmental degradation and borderless pollution. Intergovernmental cooperation and environmental scientific knowledge then assume special significance. Section 1.4 presents a simple framework for sustainable development strategy for small island developing states (SIDS) using defensive restoration expenditure as an argument. Section 1.5 contains concluding remarks on sustainable development and its importance for SIDS.

1.2 Evolution of Economic Models with Extensions

An economic model is a simplified description of reality, designed to yield hypotheses about economic behaviour that can be tested. It is heavily guided by the perception and value judgements of the modeller. Broadly speaking, economic models aim to explain how economies work and how economic agents interact. Economic agents, namely individuals, households, business and industry and government engage in activities that produce goods and services for self-consumption as well as for exchange in the domestic and international markets. Conventional theory holds that these agents are guided by utility maximization, profit maximization and social welfare or vote maximization respectively.

There is a growing recognition among economists that vote maximization and self-seeking behaviour of politicians dominate the political agenda and the economic growth agenda becomes a tool for achieving the former. The political imperialist appropriation of land for colonies in European economies in the seventeenth to nineteenth centuries was the ruthless imposition of the colonial frontier expansion policy. One effect was substantial degradation and loss of untouched natural habitat of land and sea (Bass and Dalai-Clayton 1995; Crosby 2004), despite the rise of a conservation movement (Ross 2017). The degradation of small states and islands continued with European style farming, sugar cane planting after forest clearance, and the exploitation of natural resources such as natural hard wood in rain forests, latex for rubber, copper, phosphate, oil and aviation fuel. In the case of Mauritius, for example, the rich indigenous ebony forests were plundered for the European furniture trade and finally eradicated; the giant tortoise was hunted to extinction for the decoration of ornamental hairbrushes and mirrors; and the demise of the Dodo has become a metaphor for the eclipse of pristine sustainable ecology (Cheke and Hume 2008).

Economic models are nevertheless tools to achieve growth objectives through organization of production of goods and services and its distribution across socioeconomic groups and periods whether or not they entail social and environmental depredations. These products and services are accounted for in GDP of a nation, which is generally used as an indicator of standard of living in per capita terms; the depredations are not included in this form of economic arithmetic. A summary of these economic models is presented in Box 1.2.

In the early days, free trade and competition were the rules of the day. The discussion of developmental issues became prominent with the publication of *The General Theory of Employment, Interest and Money* by John Maynard Keynes in 1936 when the capitalist United States witnessed a severe economic depression during 1929–33. The supremacy of the market-guided economic system was challenged and governmental intervention was called for to revitalize sluggish private investment by pump-priming public expenditures to create purchasing power and raise the effective demand. On the other hand, communism, as an anti-thesis of capitalism, advanced social or public ownership of property and resources, and independence from foreign capital and goods.

Gradually, the analysis of poverty, which had become a principal concern in social policy, both at home and abroad, culminated into the emergence of development economics in 1950s as a separate branch of economics with its main focus on growth issues of developing countries. The economics profession entered in a big way in the game of developing economic models to describe problems of under-development and prescribe solutions. The whole array of assumptions and postulations played important roles in discovering the major determinants of economic

Box 1.2 Evolution of Developmental Thoughts and Economic Models
Early views:

Capitalism: free trade, private property and competition (Smith 1776)

Communism: social or public ownership of property and independence of foreign capital and goods (Marx, Das Kapital published 1867)

Classical theories:

The linear-stages-of-growth models: savings and investments (Rostow 1960; Harrod 1948; Domar 1947)

Structural-change models:

Transferring resources from low- to high-productivity activities (from traditional/agricultural to modern industrial sector) (Lewis 1954; Chenery 1960)

Neoclassical counter-revolution models:

Liberalization, stabilization, privatization, minimum government, consumer perceptions of value

New growth theory: (Romer 1986)

Knowledge or innovation and institutions, public policy

Theory of coordination failure:

Underdevelopment as a coordination failure among complementary activities

Government intervention to move the economy to a preferred equilibrium

Sustainable development model: (Pearce and Turner 1990)

Source: Adapted with modifications from Dang and Sui Pheng (2015), p. 23.

growth. Initial models described transition from a primitive society to the mass consumption and mass production stage (Rostow 1960) but the importance of savings and investment was neatly developed by Harrod and Domar in the late 1940s. Later Lewis (1954) and Chenery (1960) developed inter-sectoral and structural models to show the productivity potentials of different sectors and movement of economic resources to higher-productivity areas with different growth impacts. What is essential in this evolution of the theory is that the roles of markets and governments were no longer the main arguments.

The formalization of economic models started with neo-classical counter revolution where supremacy of markets is re-enforced, and they are governed by "invisible hand" with built-in-adjustment capability. Labour and capital are the principal factors of production with full international mobility (capital and technology are internationally available). With no technical change (it is exogenously given), capital accumulation is the main driver of growth. Both labour and capital are subject to diminishing returns as they are gradually added to the production process. The production function is subject to constant returns to scale, that is, doubling of inputs would double the output.

The proponents of the new growth theory (also known as endogenous growth theory) have challenged the major prediction of the neoclassical growth model that countries will converge in growth rates and disparities in incomes would narrow down. The new growth theorists relax the neoclassical assumptions of exogenously given technical change and declining marginal productivity of capital. In their models, technical change is endogenously determined, that is, it can occur within the system. Rich countries with greater stock of capital would benefit from positive externalities through technical change. Moreover, marginal productivity of capital may not decline. These would result in increasing returns to scale in production. Based on this, they predict that high-income nations would not face decline in growth rates. Hence the gap between developed and developing countries would diverge. Moreover, the international adoption of technology benefitting economically backward nations as expected in the neo-classical framework is far from reality. The new growth theory emphasizes that investment in human capital, innovation, ideas, learning by doing, institutions and public policies are vital in explaining long-run economic growth across countries.

Later developments in growth modelling cut across issues such as coordination failure in policies and governance, lack of complementary policies and resources, and sustainable development. There is no standard sustainable development model in which environmental inputs are major arguments as determinants of growth. There are episodes of alternative environmental management strategies to alleviate pollution and resource degradation. Excessive degradation of natural resources raises issues of intergenerational equity and limits to present exploitation. Both sustainable development and intergenerational equity can be met if we conduct

Box 1.3 Sustainable Development

Sustainable development is defined by the UN Bruntland Commission 1987 in *Our Common Future* (Oxford University Press) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This concept avoids the false conflict between human progress and environmental loss, and is sometimes referred to as ecological modernization. In economic terms, the concept of a sustainable economy is one where physical capital, labour, natural resource endowments and technology lead to constant or increasing economic opportunities now and in the future, so that potential human welfare does not decline. This approach allows allocative and technical efficiency to exist with sustainable development. In terms of the sustained availability of natural resources, there are two views in environmental economics. One view depends on the concept of "strong sustainability," which requires any used natural resource to be replaced over time. The other depends on the concept of "weak sustainability," which accepts substitution through new technical transformation of any non-renewable natural resource. Thus, if the same level of energy production from oil can be achieved through wind power, that is, other things being equal, an acceptable substitute under the concept of weak sustainability but not under that of strong sustainability, since the former oil resources have been depleted and cannot be replaced.

ourselves in the present such that "we leave to the future the option or the capacity to be as well off as we are" (Solow 1992) and raise the photosynthetic product of the planet to support further production (see Box 1.3 for concepts of sustainable development).

1.3 Missing Environment Resource as a Factor of Production

In this section, an attempt is made to examine the factors underlying the explicit absence of environmental assets and resources in economic models. The simplest way to defend the neglect of environment by model

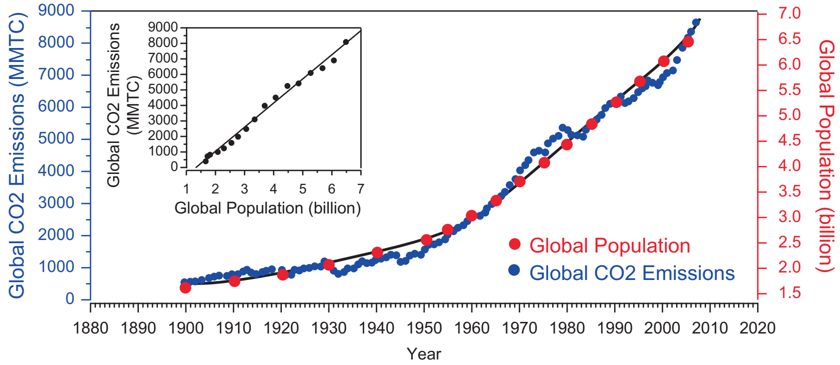


Fig. 1.1 Evolution of Global Population and Global Carbon Dioxide Emissions. (Source: World Climate Report (2008), Population data are from the U.S. Census Bureau and CO_2 emissions data are from the Carbon Dioxide Information Analysis Center (CDIAC))

builders will be to take shelter in the Environmental Kuznets Curve (EKC). That is, economic growth will take care of environmental degradation and pollution. In the initial stages of development, there will be more pollution but as development reaches a level, the proactive policy response to environmental quality will decrease pollution (an inverted U shape relationship between per capita income and pollution). However, growth is not a panacea for all environmental evils as CO_2 emissions have not abated and seem to be attributed to population growth capturing human behaviour (Fig. 1.1). Moreover, many pollutants have shown a rising trend despite income growth (Fig. 1.2).

The other issue however is: Should we wait for growth to occur for cleaner environment? There is an evident contradiction. It has been explained earlier that growth rates may not be sustained if environmental quality continues to degrade, which would reflect in declining photosynthetic product of the planet. So, for growth to happen, the precondition is that environmental quality is preserved. The pertinent question however is how to know the hidden environmental costs and benefits in economic models? In data-based empirical models, total factor productivity (known as Slow Residuals after isolating the contribution of factors such as labour

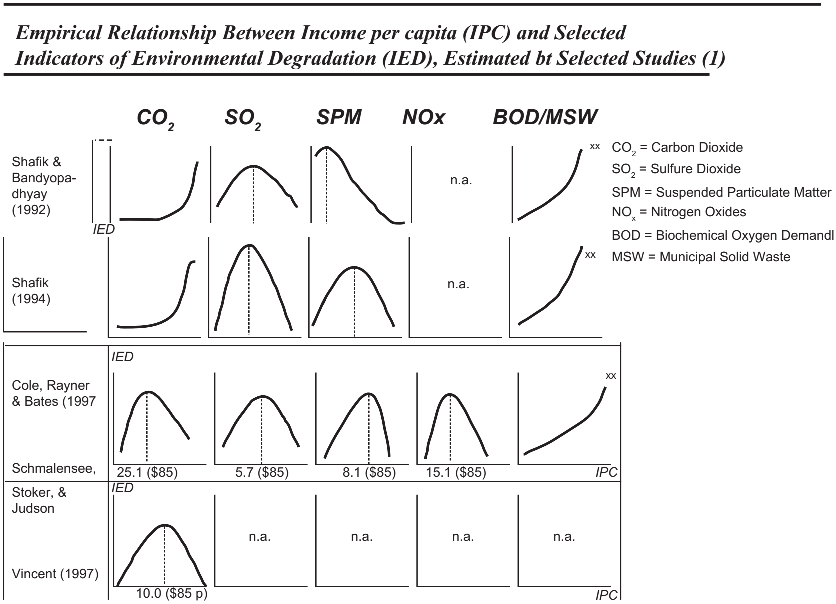


Fig. 1.2 Mixed Empirical Evidence on Environmental Kuznets Curve. (Source: Adapted from Panayotou 2000)

and capital) is expected to capture the contribution of missing factors including environmental resources (See Box 1.4).

Environmentalists argue that GDP growth overstates the true improvement in economic welfare, because it fails to capture the degradation of environmental resources and the negative spillover externalities associated with rapid GDP growth (Gore 1992; Repetto et al. 1996). What is lacking in this argument however is that the contribution of the photosynthetic product of the planet and other positive externalities emanating from the natural capital are not considered.

It is important to note that physically invisible environmental resources such as climate and atmosphere cannot be ignored in the production process. Nordhaus (1993) found that climate (captured by latitude and average temperature) does appear to impact economic performance but its effects may be swamped by other factors. He reports that "income per square kilometer vary from a low of about $31 in China to high of about

Box 1.4 Governing Common Pool Resources
Elinor Ostrom, a political scientist, won the Nobel in Economics in 2009 for her achievement in effectively answering popular theories about the "Tragedy of the Commons," which has been interpreted to mean that private property is the only means of protecting finite resources from ruin or depletion. She has documented in many places around the world how communities devise ways to govern the commons to assure the survival for their needs and future generations. Conventional solutions typically involve either centralized governmental regulation or privatization of the resource. But, according to Ostrom, there is a third approach to resolving the problem of the commons: the design of durable cooperative institutions that are organized and governed by the resource users themselves. A classic example of this was her field research in a Swiss village where farmers tend private plots for crops but share a communal meadow to graze their cows. While this would appear a perfect model to prove the tragedy-of-the-commons theory, Ostrom discovered that in reality there were no problems with overgrazing. That is because of a common agreement among villagers that one is allowed to graze more cows on the meadow than they can care for over the winter—a rule that dates back to 1517. Ostrom has documented similar effective examples of "governing the commons" in her research in Kenya, Guatemala, Nepal, Turkey, and Los Angeles.

Source: Taken from Walljasper (2011)

$36,000 in Hong Kong, and from $37 in Indonesia to $62,000 in Japan." Thus, latitude explains "less than 1 percent of the variance in income per capita and per area." *This would imply that average temperature emerges as a dominant factor in productivity outcomes (emphasis added)*. According to computations by Gallup et al. (1999), average GDP per capita in tropical countries in 1995 was $3326 as against $9027 for non-tropical countries. Mailer (1997) concludes that input environmental resources are more important for the poor than for the rich. The relationship between mangroves and fisheries is quite instructive. Fishers are quite aware that the destruction of mangrove forests means the destruction of their fisheries, which is the major employment generator for them.

There are several important reasons why environment has been ignored in economic models and are worth exploring. Firstly, economic models excessively depend on market efficiency in fixing correct prices. In other words, markets will solve all problems (Fullerton and Stavins 1998). When the monetary value of an environmental resource is to be ascertained, economists will use available market prices. In the absence of market transactions, it is difficult to determine the non-market value of an environmental resource. In this event, hypothetical markets can be created to generate such information on benefits and costs thereby facilitating economic decisions regarding the feasibility of environmental projects. In many cases information is obtained from other locations and also from other country locations, which may not yield desired outcomes.

Secondly, policy intervention using command and control, tax-subsidy and emission trading rights has limited success due to the global nature of externalities (see Box 1.5). When polluters are spread at large (global scale), a simple application of the polluters-pay principle would not be feasible. Thirdly, valuation of some environmental resources is a difficult task, for example, value of rivers, trees and animals like the elephant. Where property rights are not well defined as in the case of common pool resources, the tragedy of the commons in the form of over-exploitation of resources is the outcome (Hardin 1968). Community management of common pool resources, as suggested by Ostrom (1990), may be hampered due to profit-maximizing lobbies and lax governmental machinery.

Finally, climate and environmental changes may originate from activities other than economic activities and population pressure. Planetary changes in the form of physical and chemical processes are alternative sources, which fall beyond the domain of economic analysis. Given the fact that environmental management is a complex issue, the explicit separation of economic and natural scientists, for instance, has caused lack of natural progression of the understanding of the interface among land, sea, climate and humans. Global environmental governance would necessitate international cooperation and agreements. In the absence of consensus among the nations to shoulder the responsibility of climate change and global warming, Nordhaus' (2015) suggestion to create climate clubs consisting of like-minded nations to reduce CO_2 emissions may hold some

Box 1.5 Environmental Policy Tools

Market instruments—By establishing property rights, these instruments enable the use of the legal system.

Economic instruments—Also known as incentive mechanisms. Examples include taxes, subsidies on abatement technology, pollution permit-trading systems and transferable quotas, deposit-refund systems, for example, on bottles and packaging and performance bonds such as afforestation bonds. Examples of environmental taxes, also known as green taxes, include petroleum taxes, selective production and input taxes, and tax on international travel based on carbon footprints.

Command-and-control—Standards and quotas, prohibition of inputs, processes, or products.

Liability rules—Precedence from previous cases creates expectations about penalties for future transgressors.

Education, information and communication—to polluters, investors and consumers.

Support for R&D—To promote cost-cutting and environment-friendly technologies.

Generators of renewable energy (wind, solar etc.)—Receive a renewable energy credit for each megawatt of electricity generated from renewable energy sources. This is an important component of CDM (Clean Development Mechanism).

Encouragement of voluntary participation or cooperation—At the local, state, or global level depending upon the dimension of the environmental or natural resource issue.

promise. This issue is further discussed by Larry D Schroeder and Shyam Nath in this volume.

1.4 Emerging Issues in Sustainable Development of SIDS

Sustainable development of SIDS would entail both local and international initiatives. They are far off from the world business centres and many of them are dependent on the oversees development assistance. Some important points need consideration.

Firstly, the ocean covers more than two-thirds of our planet, and small island developing states are scattered somewhere in the middle of it. While the whole planet is under stress due to population growth and growth in production and consumption to attain higher standards of living, many small islands are already seeing the limits of their environmental carrying capacity. Their environmental priorities concern their immediate coastal areas, where the balance between population and resources is critical for the future. Moreover, construction, motorization and consumerism tend to aggravate the problem. Global warming and climate-related changes have added new dimensions to environmental governance. Small island countries are more exposed to these environmental challenges arising not only from within their boundaries, but also from the activities of other countries. Eventually, many small islands will be impacted by what would happen within their land boundary (environmental degradation), within the ocean (sea level rise) and beyond (pollution elsewhere). With the sea level rising, the survival of many small islands is threatened for which these islands are not responsible.

Secondly, the impact of environmental degradation is severe in island economies as their major economic activities are environment intensive. Tourism and marine resources are such examples.

An economic growth model for the sustainable development of SIDS would thus need to incorporate the following:

(i) Environmental quality control mechanism for tourism development and marine resource management;
(ii) Improvement in management and use of natural resources;
(iii) International cooperation through international agreements for global climate governance to safeguard SIDS from coastal erosion;
(iv) Valuation of existing environmental capital and its role in production, and the cost-effectiveness of intervention to protect it and prevent critical loss.

Besides the above considerations, the following points may be of immediate concern.

- Boosting local food production and building local and regional consumption circuits;
- Strengthening the resilience of communities through adaptation strategies in the face of natural disasters and emerging climate-related challenges;

- At the island level, there is need to create an environmental budgetary head. Most environmental proposals, including the system of integrated environmental and economic accounts, suggest that environmental degradation should be measured by obtaining estimates of restoration costs rather than by attempting to quantify and put a monetary value on damage (Harrison 1993; Feather et al. 1995).
- What is important to note is that both preventive and restoration expenditures should be made mandatory on the lines of mandatory corporate social responsibility in some countries such as Mauritius and India. The environmental budgets should be run on the model of performance budgeting purely in terms of feasible projects.

1.5 Concluding Remarks

Economic models are constructed based on theory, stylized facts and close observations of data. The neglect of environmental factors in the established economic models can be attributed to some legitimate constraints. The relationship between environmental degradation and economic growth is well recognized as is evidenced in the major paradigm shift in thinking. Technical and analytical advances are necessary to separate and measure the environmental impacts of production.

In the context of SIDS, it is vital that sustainable development models incorporate strategies for tourism development, natural resource management and marine governance. International cooperation and agreements may be additional arguments in such models as part of global environmental governance.

Given the fact that environmental externalities have no national boundaries, tackling global externalities would necessitate international and intergovernmental cooperation. The latter is also expected to ensure the application of international best practice technologies and knowhow in environmental governance. Moreover, the success of global environmental management would depend on how effective the international climate agreements are. The creation of climate clubs to regulate CO_2 emissions suggested by Nordhaus (2015) may hold some promise.

SIDS can be both the settings for the observatories of the resilience of natural resources and the laboratory for experiments, which will be low cost because of the economies of investment in small-scale trials and the isolation of SIDS will inhibit the intrusion of other variable factors on the results. This might be termed as a new economic approach to analyse small island sustainability, which can further help policy planning in non-SIDS.

Acknowledgement Grateful thanks are due to Dr Y N Madhoo (Amrita Vishwa Vidyapeetham University) for valuable comments on an earlier draft of the chapter.

References

Bass, S., & Dalal-Clayton, B. (1995). *Small Island States and Sustainable Development: Strategic Issues and Experience*. Environmental Planning Group, International Institute for Environment and Development, London, UK. Available at: https://pubs.iied.org/pdfs/7755IIED.pdf. Accessed 4 Jan 20.

Cheke, A. S., & Hume, J. P. 2008. *Lost Land of the Dodo: An Ecological History of Mauritius, Réunion and Rodrigues*. London: Christopher Helm.

Chenery, H. B. (1960). Patterns of Industrial Growth. *American Economic Review, 50*(4), 624–654.

Crosby, A. W. (2004). *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*. Cambridge: Cambridge University Press.

Dang, G., & Sui Pheng, L. (2015). Infrastructure Investments in Developing Economies. *Springer Science Business Media Singapore, 10*, 978–981.

Domar, E. D. (1947). Expansion and Employment. *American Economic Review, 37*(1), 34–55.

Feather, T. D., Russell, C. S., Harrington, K. W., & Capan, D. T. (1995). *Review of Monetary and Nonmonetary Valuation of Environmental Investments* (IWR Report No. 95-R-2). Alexandria: Army Corps of Engineers.

Fullerton, D., & Stavins, R. (1998). How Economists See the Environment. *Nature, 395*(6701), 433–434.

Gallup, J. L., Sachs, J. D., & Mellinger, A. D. (1999). Geography and Economic Development. *International Regional Science Review, 22*(2), 179–232.

Gore, A. (1992). *Earth in the Balance: Ecology and the Human Spirit*. Boston: Houghton Mifflin.

Hardin, G. (1968). The Tragedy of the Commons. *Science, 162*(3859), 1243–1248.

Harrison, K. (1993). Natural Assets and National Accounting. In E. Lutz (Ed.), *Towards Improved Accounting for the Environment*. Washington, DC: World Bank.

Harrod, R. F. (1948). *Towards a Dynamic Economics, Some Recent Developments of Economic Theory and Their Application to Policy*. London: Macmillan.

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *Manchester School, 22*(2), 139–191.

Mailer, K. G. (1997). Environment, Poverty and Economic Growth. In B. Pleskovic & J. E. Stiglitz (Eds.), *Annual World Bank Conference on Development Economics 1996* (pp. 251–270). Washington, DC: The World Bank.

Nobel Foundation. (2018, October 8). Nobel Prize in Economics 2018: Integrating Innovation and Climate with Economic Growth. *ScienceDaily*. Available at:

https://www.sciencedaily.com/releases/2018/10/181008174322.htm. Accessed 12 Dec 2009.

Nordhaus, W. D. (1993). Climate and Economic Development. In L. H. Summers & S. Shah (Eds.), *Proceedings of the World Bank Annual Conference on Development Economics 1992* (pp. 55–376). Washington, DC: World Bank.

Nordhaus, W. D. (2015). Climate Clubs: Free riding in International Climate Policy. *American Economic Review, 105*(4), 1339–1370.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Panayotou, T. (2000). *Economic Growth and the Environment* (CID Paper # 56). Center for International Development, Harvard University.

Pearce, D. W., & Turner, R. K. (1990). *Economics of Natural Resources and the Environment*. New York: Harvester Wheatsheaf.

Repetto, R., Rothman, D., Faeth, P., & Austin, D. (1996). *Has Environmental Protection Really Reduced Productivity Growth? We need Unbiased Measures*. Washington, DC: World Resources Institute.

Romer, P. M. (1986). Increasing Returns and Long-run Growth. *Journal of Political Economy, 94*(5), 1002–1037.

Rostow, W. W. (1960). *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: Cambridge University Press.

Ross, C. (2017). *Ecology and Power in the Age of Empire: Europe and the Transformation of the Tropical World*. Oxford University Press.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*. Oxford: Clarendon Press.

Solow, R. M. (1992). Sustainability: An Economist's Perspective. *National Geographic Research and Exploration, 8*, 10–21.

Walljasper, J. (2011). Elinor Ostrom's 8 Principles for Managing A Commons. *On the Commons*. Available at: https://www.onthecommons.org/magazine/elinor-ostroms-8-principles-managing-commmons. Accessed 5 Oct 2019.

CHAPTER 2

Macroeconomic Trends, Vulnerability, and Resilience Capability in Small Island Developing States

Satya Paul

2.1 Introduction

Small Island Developing States (SIDS) are a distinct group of 38 UN member States and 20 non-UN members faced with unique social, economic, and environmental challenges that hinder their development progress. These countries are spread over three geographical regions: (i) the Caribbean, (ii) the Pacific and (iii) the Atlantic Indian Ocean, Mediterranean and South China Sea (AIMS). The Caribbean region has 16 UN member and 13 non-UN member States, the Pacific has 13 UN member and seven non-UN States, whereas AIMS has only nine UN member States. These countries are listed in Appendix Table 2.6. Each of these regions has regional bodies for the purpose of regional cooperation. These are the Caribbean Community (CARICOM), the Pacific Islands Forum (PIF) and the Indian Ocean Commission (IOC). In 2014, the combined

S. Paul (✉)
ANU College of Arts and Social Sciences, Australian National University, Canberra, ACT, Australia
e-mail: satya.paul@anu.edu.au

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_2

population of SIDS was estimated to be 66 million, which represents nearly 1 per cent of the world's population (United Nations 2014).

SIDS face similar constraints to their sustainable development. These constraints are location away from the world business centres, small domestic markets, low private investment, a narrow resource base, high costs of energy, infrastructure, transportation and communication, vulnerability to natural disasters and climate shocks, and weak resilience.

In view of these constraints, the First United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 (known as the Earth Summit) recognised SIDS as a special case for sustainable development. The world community met again after two years in Barbados and advocated specific actions and strategies empowering SIDS to achieve the goals of sustainable development. The result of this meeting is known as the Barbados Programme of Action.

In 2005, world leaders gathered in Mauritius, and addressed the gap in the implementation of the Barbados Programme of Action and suggested a strategy (called as Mauritius Strategy) to enhance the effectiveness of the programme. In 2014, the world community met in Pia, Samoa, for the Third International Conference on Small Island Developing States to forge a new pathway for achieving sustainable development. This new pathway, known as 'SAMOA Pathway', recognised the adverse impacts of climate change and sea-level rise on island economies, and suggested a framework of actions covering strategy for climate and disaster resilience development, management of chemicals and hazardous wastes, and guidelines for food security. The readers can find details of these programmes and conferences in UN-OHRLLS (2011).

In this chapter, we provide a snapshot of the economies of small islands. Section 2.2 documents and analyses macroeconomic trends in their GDP growth, public debt, and fiscal and trade balances. It also discusses the industries that provide income and employment to people. Section 2.3 discusses the vulnerability of small islands to natural disasters and climatic change. Section 2.4 provides details on resilience finance and other supports from international organisations and donors that help mitigating the effects of natural disasters and climate change. To see the things in perspective, our discussion is extended to broader issues of interest in Sect. 2.5. Section 2.6 provides conclusions.

2.2 Macroeconomic Trends and Other Economic Features

We begin with a discussion of how SIDS have performed in terms of macro variables during 2009–2018. The growth rates of real GDP presented in Table 2.1 are not only low (less than 3 per cent) but also show yearly fluctuations without any trend. These growth rates are the lowest in the Caribbean region and the highest in AIMS. In the Pacific region, the growth rates are slightly higher than the overall average growth rates for SIDS (Fig. 2.1). The per capita GDP, which is a traditional measure of the standard of living, has grown from 0.5 per cent in 2009–13 to 1.9 per cent in 2018, thus showing on average a growth rate of 1.5 per cent. Inflation rate has remained generally low during this period.

Current account balance as a percentage of GDP is negative. Imports are much higher than exports for all the years. Thus, these countries are

Table 2.1 Macroeconomic trends

Macroeconomic variables	*Average for 2009–13*[a]	*2014*[a]	*2015*[a]	*2016*[a]	*2017*[b]	*2018*[b]	*Average for 2014–18*
Real GDP growth	1.8	2.9	2.6	2.9	2.98	2.93	2.8
Real GDP per capita growth	0.5	1.1	1.4	1.4	1.5	1.9	1.5
Inflation, CPI per cent change	4	2.1	1.4	2.6	2.6	2.8	2.3
General government net lending/borrowing, in per cent of fiscal year GDP	−1.7	0.2	−2.1	−4.1	−3.3	−2.7	−2.4
Current account balance, in per cent of GDP	−10.6	−9	−7.8	−9.7	−9.6	−9	−9.0
Public debt, in per cent of GDP	56.7	58.5	60.9	63.5	63.6	63.1	61.9
Import of goods and services, in per cent of GDP	64.7	64.3	63.9	62.6	61.6	60.6	62.6
Export of goods and services, in per cent of GDP	40.8	40.9	39.4	39.1	39.6	39.8	39.7
Region-wise real GDP growth							
Caribbean	0.4	2.5	1.3	2	2.3	2.6	2.2
Pacific	2.6	2.9	3.3	3.3	3.3	3.7	3.3
AIMS	3.2	3.8	3.2	3.4	3.6	3.8	3.5

[a]For these years data are obtained from World Bank (2016, Table 2.1 on p. 13)
[b]Author's calculation based on data from World Bank (2019). Available online

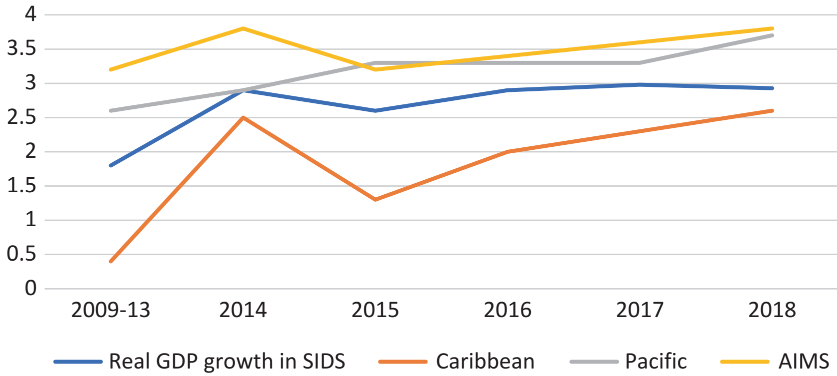


Fig. 2.1 GDP growth rates of SIDS

vulnerable to trade imbalances due to the lack of diversification, over-dependence on exports of primary goods and susceptibility to damages from natural disasters. Public debt as a percentage of GDP is very high and shows an increasing trend. Frequent natural disasters are partially responsible for an increase in debt levels. Natural disasters affect economic activities, reducing revenue and exports and increasing fiscal and external deficits. The disaster preparedness and expenses of post-disaster reconstruction add significant fiscal pressure and hinder the well-being of people. In the SIDS as a whole, about 16 per cent of population is in absolute poverty. The highest poverty (19 per cent) is observed in AIMS and the lowest in the Caribbean (14.9 per cent). The human development index (HDI) for 2015 (latest year for which data are available) is 0.69 and it varies across regions. HDI is the lowest (0.64) for the Pacific region and the highest (0.73) for the Caribbean region (Table 2.2).

For income and employment, SIDS depend heavily on three key industries/sectors, namely, fisheries, tourism, and agriculture. These sectors provide employment up to 40 per cent of the labour force. As pointed out in UN-OHRLLS (2015), the fisheries industry contributes up to 10 per cent of total GDP in the Pacific region. The tuna caught in the waters of the Pacific Ocean, generate a total of close to US$ 3 billion in revenues. Fisheries and related activities are a major source of employment to people in the Caribbean SIDS. More specifically, fisheries and aquaculture provide employment to about 64,000 people, and fishing-related activities such as processing, retail, boat construction, and net repair provide

Table 2.2 Estimates of human development index (HDI) and poverty rates for SIDS and regions based on latest available years

	HDI	*Poverty rates (head count ratio) (per cent) Based on poverty line of US$ 1.9 a day*
ALL SIDS	0.69	16.3
Caribbean	0.73	14.88
Pacific	0.64	15.4
AIMS	0.67	19.13

Source: Authors calculations based on data presented in Fosu and Gafa, in Chap. 3 of this volume

Note that the HDI estimates are based on data for 2015 but poverty rates relate to different years – the latest year is 2015. For this reason, the average poverty rates presented here should be interpreted with caution

employment to about 200,000 people in the Caribbean region. Major fish-producing countries in the region are Guyana, Suriname, the Bahamas, and Trinidad and Tobago (UN-OHRLLS 2015).

Agriculture is the mainstay for survival in many SIDS. Its contribution to GDP varies across countries. In some least-developed SIDS such as Cape Verde, Kiribati, Papua New Guinea, Solomon Islands and Vanuatu, agriculture contributes about 23 per cent of GDP compared to 7 per cent in other SIDS (OECD 2018, p. 29). In resource-rich economies, oil, natural gas, gold, nickel and bauxite contribute significantly to their GDPs. For example, in Timor-Leste, oil and natural gas account for about 80 per cent of GDP and 90 per cent of government revenue (IMF 2016). In other resource-rich economies such as Papua New Guinea, Guyana, Suriname, Solomon Islands and Guinea-Bissau, natural resource rents contribute 10–40 per cent of their GDP (OECD 2018, p. 32).

Tourism is an important source of income for people particularly in the Caribbean and Pacific regions. In the Caribbean region, about 12 per cent of the labour force (approximately 2 million people) work in the tourism sector generating about 14 per cent of GDP per annum, see UN-OHRLLS (2015). In the Pacific region, tourism contributes about 11.9 per cent of GDP. The contribution of tourism varies across the islands. In the Palau and Cook Islands, tourism contributes about 67.1 per cent and 50 per cent of GDP, respectively. In the resource-rich economies of the Solomon Islands and Papua New Guinea, tourism's contributions are low, at 1.7 per cent and 0.1 per cent of GDP respectively (Harrison and Prasad 2013).

2.3 Vulnerability

SIDS are vulnerable due to their high susceptibility to natural hazards, smallness in size, narrow resource base, and climate changes. The climate change causes the sea level to rise, threatening the existence of low-lying countries such as Kiribati, Maldives, and Tuvalu (Nurse and Sem 2000). The sea level rise also threatens the costal-concentrated agriculture, small business and tourism infrastructure (UNFCCC 2007; Storlazzi et al. 2015).

Since many of the SIDS are located in regions with a high density of tropical cyclones, they are acutely vulnerable to the increasing impacts of natural disasters. More than 335 major natural disasters have occurred in SIDS since 2000, resulting in an estimated US$ 22.7 billion in direct damages. Some countries such as Grenada, Vanuatu, Niue and Tonga, are known to be the most disaster-prone countries in the world. For further details, see OECD and World Bank (2016, p. 13).

In small islands, the economic losses (as a percentage of GDP) due to climate change are estimated to be much higher than the global average of 0.5 per cent in 2010. For instance, the average annual loss as a percentage of GDP is about 6.5 per cent in Vanuatu, 4 per cent in Tonga, 2.5 per cent in Fiji, and 10 per cent in Caribbean countries (see UN-OHRLLS 2015).

SIDS are also vulnerable to global trade imbalances due to lack of diversification, over-dependence on exports of primary goods and susceptibility to damage from natural disasters.

2.3.1 *Indices of Vulnerability*

In the previous section, we discussed economic losses to SIDS due to their vulnerability to natural disasters and climate shocks. We now turn to the measurement of vulnerability. Vulnerability is a multidimensional concept. A multidimensional (composite) index is required to compare the levels of vulnerability across countries. This index should help international organisations and donors in allocating resilience finance to island countries according to the levels of their vulnerability.

In the recent past, several attempts have been made to construct vulnerability indices. The important amongst the attempts are those due to Guillaumont (2009), Burck et al. (2009), Briguglio (1995, 2014), Angeon and Bates (2015), Beroya-Eitner (2016), and Scandurra et al. (2018). Using a comprehensive dataset including 32 variables, Scandurra et al. (2018) have constructed year-wise composite vulnerable indices for 33

SIDS for the period from 2009 to 2014. These indices cover four main dimensions, namely, social, economic, remoteness and environmental. The values of the vulnerable index lie between 0 (not vulnerable) and 1 (most vulnerable). All other values of the index lying between 0 and 1 reveal different degrees of vulnerability.

The country-level indices of vulnerability obtained from Scandurra et al. (2018) are presented in Table 2.3. In Table 2.4 we present region-specific indices. It may be noted that in 2005, Kiribati turned out to be the most vulnerable island with an index value of 0.599, followed by Papua New Guinea (0.545), Vanuatu (0.538), the Solomon Islands (0.542), and Haiti (0.521). Singapore turned out to be the least vulnerable with an index value of 0.142.

The ranking of vulnerability in 2014 is somewhat different from that in 2005. The most vulnerable country is again Kiribati with an index value of 0.618 and the least vulnerable is Barbados with an index value of 0.132. Over the years, the vulnerability levels of St Kitts and Nevis, Kiribati, Singapore, Sao Tome and Principe, and Seychelles have increased and those of other SIDS have marginally declined.

On the whole, the Pacific islands are found to be the most vulnerable and the Caribbean the least vulnerable during the entire period. The vulnerability of AIMS is close to the overall average for SIDS (see Fig. 2.2).

2.4 Resilience and Financial Support

The SIDS have little resilience to bear the losses and restore their livelihood, houses and key industries. With limited domestic revenue sources, SIDS governments often need to divert scarce public resources from essential social and development investments to address disaster-related needs. They also look for concessional financial support from international agencies, development partners, and donors. Considering their economic vulnerability, bilateral donors, and multilateral institutions such as the World Bank, the Asian Development Bank, the Adaptation Fund (AF), the Climate Investment Funds (CIF) and the Green Climate Fund (GCF) provide financial support for resilience building. Many bilateral donors also extend Official Development Assistance (ODA) to SIDS.

Over the 2011–14 period, major multinational institutions have provided US$ 910 million in concessional support to SIDS for climate and disaster resilience, or an average of US$ 228 million per year. The bulk of this funding (39 per cent) came from the World Bank (US$ 88 million per

Table 2.3 Country-wise and year-wise estimates of vulnerability indices for SIDS

S. No	*Region Code*	*Country*	*2005*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*Ranking 2005*	*Ranking 2014*
1	1	Aruba	0.289	0.220	0.219	0.220	0.212	0.200	0.202	7	3
2	1	Antigua and Barbuda	0.309	0.288	0.267	0.262	0.258	0.272	0.281	9	9
3	1	Bahamas	0.347	0.330	0.315	0.303	0.296	0.309	0.317	14	14
4	1	Belize	0.367	0.366	0.380	0.370	0.336	0.322	0.335	18	19
5	1	Barbados	0.135	0.109	0.112	0.144	0.135	0.113	0.132	2	1
6	1	Cuba	0.309	0.387	0.297	0.292	0.277	0.274	0.286	10	10
7	1	Dominica	0.314	0.302	0.286	0.296	0.292	0.29	0.302	11	12
8	1	Dominican Rep.	0.357	0.346	0.364	0.355	0.307	0.308	0.332	15	18
9	1	Grenada	0.253	0.242	0.254	0.265	0.255	0.250	0.259	4	6
10	1	Guyana	0.368	0.348	0.341	0.348	0.339	0.326	0.328	19	17
11	1	Haiti	0.521	0.469	0.505	0.523	0.477	0.482	0.515	29	30
12	1	Jamaica	0.364	0.312	0.319	0.329	0.313	0.313	0.323	17	15
13	1	St Kitts and Nevis	0.256	0.243	0.232	0.256	0.252	0.261	0.294	6	11
14	1	St. Lucia	0.290	0.264	0.248	0.278	0.261	0.259	0.271	8	7
15	1	Surinam	0.357	0.327	0.329	0.329	0.318	0.322	0.326	16	16
16	1	Trinidad and Tobago	0.207	0.207	0.204	0.209	0.213	0.211	0.220	3	4
17	1	St. Vincent and Grenadines	0.320	0.301	0.301	0.320	0.297	0.288	0.310	12	13
18	2	Fiji	0.407	0.383	0.373	0.382	0.358	0.358	0.380	23	21
19	2	Kiribati	0.599	0.595	0.585	0.606	0.582	0.600	0.618	33	33
20	2	Paua New Guinea	0.545	0.529	0.515	0.518	0.522	0.529	0.531	32	31
21	2	Solomon Islands	0.542	0.522	0.518	0.540	0.513	0.519	0.545	31	32
22	2	Tonga	0.369	0.369	0.365	0.361	0.336	0.324	0.341	20	20
23	2	Vanuatu	0.538	0.490	0.472	0.484	0.452	0.466	0.476	30	27
24	2	Samoa	0.458	0.448	0.436	0.428	0.411	0.407	0.417	25	25
25	3	Bahrain	0.396	0.340	0.337	0.299	0.283	0.281	0.276	21	8
26	3	Comoros	0.401	0.403	0.415	0.434	0.382	0.402	0.404	22	24

27	3	Cabo Verde	0.434	0.405	0.388	0.397	0.374	0.386	0.400	24	23
28	3	Guinea-Bissau	0.504	0.509	0.493	0.502	0.476	0.481	0.497	28	29
29	3	Maldives	0.469	0.393	0.410	0.431	0.426	0.437	0.443	26	26
30	3	Mauritius	0.254	0.237	0.220	0.223	0.229	0.217	0.235	5	5
31	3	Singapore	0.091	0.089	0.081	0.133	0.167	0.141	0.142	1	2
32	3	Sao Tome and Principe	0.474	0.466	0.446	0.452	0.462	0.471	0.492	27	28
33	3	Seychelles	0.335	0.337	0.356	0.275	0.366	0.394	0.398	13	22

Source: Adapted from the Appendix in Scandurra et al. (2018)

Note: Code 1 refers to Caribbean, code 2 to Pacific and code 3 refers to AIMS

Table 2.4 Overall and region-wise average estimates of vulnerability indices

	2005	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
All SIDS	0.369	0.351	0.345	0.350	0.339	0.340	0.352
Caribbean countries	0.315	0.298	0.293	0.300	0.285	0.282	0.296
Pacific countries	0.494	0.477	0.466	0.474	0.453	0.458	0.473
AIMS countries	0.373	0.353	0.350	0.359	0.352	0.357	0.365

Source: Author's calculation based on Table 2.3

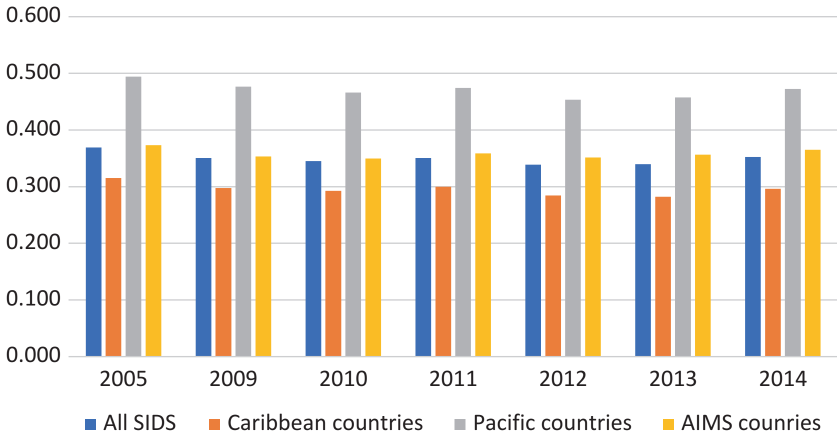


Fig. 2.2 Vulnerability index values

year), the Global Environment Facility (US$ 46 million per year), the ADB (US$ 36 million per year) and the Climate Investment Funds (US$ 29 million per year). Additional resources for resilience to SIDS are provided by other international organisations. European Union institutions provided about US$ 100 million a year, UNDP US$ 1.4 million per year, FAO, WHO and UNICEF provided all under US$ 250,000 per year for resilience building.

Many other countries also provide resilience/development finance to SIDS. These countries are China, Malaysia, India, Indonesia, Morocco, Russia, Taiwan, the Gulf States, the United Arab Emirates and Venezuela (Dornan and Brant 2014).

The extent of climate and disaster resilience finance provided by development partners varies across regions. During 2011–14, Pacific SIDS received 47 per cent (US$ 370 million per year) of all funding, Caribbean SIDS received 37 per cent (US$ 291 million per year) and AIMS SIDS 16 per cent (US$ 122 million per year, see OECD and World Bank (2016)). Thus, the Pacific region being the most vulnerable got the highest share of resilience finance.

The Pacific region is heavily dependent on regional development partners—Australia, Japan and New Zealand—as well as on the Asian Development Fund and the World Bank for resilience finance. The major finance providers to the Caribbean SIDS are France, the World Bank, the European Union, Norway, and the CIF. Similarly, major finance providers to the AIMS SIDS are Japan, France, the United States, the Global Environment Facility, and the Adaptation Fund (OECD and World Bank 2016).

Policy support for disaster prevention and preparedness is provided by UNESCO (2014). More specifically, this organisation provides advice on the development of early-warning systems, disaster risk reduction strategies, and climate adaptation.

2.5 Discussion

Located away from the world business centres, unpredictable environmental vulnerability and climate change add to their massive governance challenges to small islands. To enhance resilience capability and achieve the goals of sustainable development, these countries should make concerted efforts to increase opportunities for income and employment generation, develop physical infrastructure and strengthen their institutions. Infrastructure is vital for growth and private-sector productivity. The soundness of institutions is important at least for three reasons. First, foreign investors look at the quality of institutions in the country before making any decision to invest. Second, the high-quality institutions enable their citizens to achieve their goals and discourage brain drain. Third, good institutions enhance the trustworthiness and credibility of a country. The multilateral and bilateral development partners prefer to provide more resilience finance to those countries that have high-quality institutions.

World Bank and The Fraser Institute publish data on several dimensions of the quality of institutions. In Table 2.5, we present a summary of

Table 2.5 Indicators of institutional quality, 2018

		Region-wise SIDS			*Developed SIDS*	*Developed Non-SIDS*		
Indicator	*All SIDS*	*Caribbean*	*Pacific*	*AIMS*	*Singapore*	*Australia*	*France*	*United States*
Control of Corruption	0.05	0.16	−0.10	0.08	2.17	1.81	1.32	1.32
Government Effectiveness	−0.22	−0.13	−0.48	−0.02	2.23	1.60	1.48	1.58
Political Stability and Absence of Violence	0.48	0.28	0.60	0.30	1.51	0.98	0.11	0.48
Regulatory Quality	−0.26	−0.15	−0.55	−0.05	2.13	1.93	1.17	1.58
Rule of Law	−0.03	−0.01	−0.09	0.01	1.84	1.72	1.44	1.45
Voice and Accountability	0.36	0.42	0.62	−0.12	−0.06	1.43	1.18	1.04

Source: Author's calculations based on data published by World Bank (2019) six key indicators of the quality of institutions, using country-level data for 2018 for SIDS and a few developed non-SIDS. These statistics are obtained from World Bank (2019). The indicators are control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability. The values of each indicator range between −2.5 and 2.5, with the higher values reflecting higher quality of institutions.

Control of corruption captures perceptions of corrupt practices, such as the exercise of public power for private gain. Government effectiveness is a composite index focusing on inputs like quality of the bureaucracy and independence of the civil service from political pressures, required for the government to produce and implement good policies and deliver public goods. Political stability and absence of violence measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Regulatory quality includes market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of burdens imposed by excessive regulation. The rule of law captures the extent to which a society is successful in protecting the socio-economic and property rights of citizens. Voice and accountability index captures the extent to which citizens of a country are able to participate in the selection of government.

In comparison to the developed nations such as Australia, France, and the United States, the quality of institutions in terms of all the six indicators is very poor in SIDS. The Pacific SIDS have the lowest values for all the indicators except political stability and voice and accountability where they have performed better than the Caribbean and AIMS SIDS. The quality of institutions in Singapore is very high in all the dimensions except voice and accountability, where it performs poorly perhaps due to the nature of government controls (Table 2.5). Governments in less developed island countries may like to learn from Singapore in formulating their pro-growth strategies. Singapore stresses on private-public partnership in infrastructure, education and training, and encourages foreign direct investment.

2.6 Conclusion

This chapter begins with a documentation of macroeconomic trends in GDP growth, debt, and fiscal and trade balances in SIDS. This is followed by a detailed discussion of their vulnerability to natural disasters and climatic change. Estimates of a composite index of vulnerability are used to see the difference in vulnerability across countries. Finally, the avenues of international concessional finance and other supports to build the resilience capability of these economies are discussed.

The SIDS depend heavily for income and employment on three key industries/sectors, namely, fisheries, tourism and agriculture. These sectors provide employment to up to 40 per cent of the labour force. SIDS are vulnerable to natural disasters, smallness in size, narrow resource base and climate changes. Given their meagre resources, most of the SIDS have weak economic resilience. The very existence of the low-lying nations, such as Kiribati, the Maldives, the Marshall Islands, and Tuvalu, is threatened by climate change-induced sea-level rise. Urgent international attention is required to protect these economies against the damaging effects of sea rise.

The composite vulnerability indices reveal that Kiribati, Papua New Guinea, Haiti, the Solomon Islands, and Guinea-Bissau are the top five most vulnerable islands. Barbados, Singapore, Aruba, Trinidad and Tobago, and Mauritius are the five least vulnerable islands. On the whole, Pacific small States are observed as the most vulnerable and the Caribbean States least vulnerable.

The SIDS have little resilience to bear the losses and restore their livelihood, houses and industries due to limited resources. While the international organisations, development partners, and other donors offer financial support to help mitigate the effects of natural disasters and climate change, much more support is needed in terms of advice, planning and forecasting the events.

As compare to developed nations, the quality of institutions in small islands is poor. The prevalence of low-quality institutions reduces trust and credit worthiness thereby discouraging foreign direct investment. Good institutions are vital for sustainable growth and well-being of people. Any attempt to improve the quality of institutions in small islands is not likely to go unrewarded.

Appendix

Table 2.6 Geographical Classification of SIDS

Caribbean (29)
UN members (16): Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago
Non-UN members (13): Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, Curacao, Guadeloupe, Martinique, Montserrat, Puerto Rico, Sint Maarten, Turks and Caicos, U.S. Virgin Islands
Pacific (20)
UN members (13): Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Liste, Tonga, Tuvalu, Vanuatu
Non-UN members (7): American Samoa, Commonwealth of Northern Marianas, Cook Islands, French Polynesia, Guam, New Caledonia, Niue
AIMS (9)
UN members (9): Bahrain, Cape Verde, Comoros, Guinea- Bissau, Maldives, Mauritius, Sao Tome and Principe, Seychelles, Singapore

Note: Within parentheses are number of countries

References

Angeon, V., & Bates, S. (2015). Reviewing Composite Vulnerability and Resilience Indexes: A Sustainable Approach and Application. *World Development, 72*, 140–162.

Beroya-Eitner, M. A. (2016). Ecological Vulnerability Indicators. *Ecological Indicators, 60*, 329–334.

Briguglio, L. (1995). Small Island Developing States and Their Economic Vulnerabilities. *World Development, 23*(9), 1615–1632.

Briguglio, L. (2014). A Vulnerability and Resilience Framework for Small States. In D. Bynoe Lewis (Ed.), *Building the Resilience of Small States: A Revised Framework*. London Commonwealth Secretariat. https://doi.org/10.14217/9781848599185-5-en

Burck, J., Bals, C., & Ackermann, S. (2009). *The Climate Change Performance Index*. Germanwatch: Bonn.

Dornan, M., & Brant, P. (2014). Chinese Assistance in the Pacific: Agency, Effectiveness and the Role of Pacific Island Governments. *Asia and the Pacific Policy Studies, 1*, 349–363.

Guillaumont, P. (2009). An Economic Vulnerability Index: Its Design and Use for International Development Policy. *Oxford Development Studies, 37*(3), 193–228.

Harrison, D., & Prasad, B. C. (2013). The Contribution of Tourism to the Development of Fiji and Other Pacific Island Countries. In C. Tisdell (Ed.), *Handbook of Tourism Economics: Analysis* (New Applications and Case Studies) (pp. 741–762). World Scientific: Hackensack.

IMF. (2016). In H. Khor, R. Kronenberg, & P. Tumbarello (Eds.),. Published Spring 2016 *Resilience and Growth in the Small States of the Pacific*. Washington, DC: International Monetary Fund Publications.

Nurse, L. A., & Sem, G. (2000). Small Island States. In J. J. McCarthy, O. F. Canziani, N. A. Leary, D. J. Dokken, & K. S. White (Eds.), *Climate Change 2001: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Third Assessment Report* (pp. 843–875). Cambridge: Cambridge University Press.

OECD. (2018). *Making Development Co-operation Work for Small Island Developing Countries*. Paris: OECD Publishing.

OECD and World Bank. (2016). *Climate and Disaster Resilience Financing in Small Island Developing States*. New York: OECD/World Bank.

Scandurra, G., Romano, A. A., Ronghi, M., & Carfora, A. (2018). On the Vulnerability of Small Island Developing States: A Dynamic Analysis. *Ecological Indicators, 84*, 382–392.

Storlazzi, C. D., Elias, E. P. L., & Berkowitz, P. (2015). Many Atolls may be Uninhabitable Within Decades due to Climate Change. *Nature Scientific Reports, 5*(14546), 1–9.

UNESCO. (2014). *Islands of the Future – Building Resilience in a Changing World*. Paris: UNESCO.

UNFCCC. (2007). *Climate Change: Impacts, Vulnerability and Adaptation in Developing Countries*. Bonn: Climate Change Secretariat: United Nations Framework Convention on Climate Change.

United Nations. (2014). *Population and Development in SIDS 2014*. New York: United Nations Department of Economic and Social Affairs, Population Division.

UN-OHRLLS. (2011). *Small Island Developing States – Small Islands Big(ger) Stakes*. New York: United Nations Office of the High Representative for Least developed Countries and Small Island Developing States.

UN-OHRLLS. (2015). *Small Island Developing States in Numbers: Climate Change Edition 2015*. New York: United Nations Office of the High Representative for Least developed Countries and Small Island Developing States.

World Bank. (2016, September 8). *World Bank Group Engagement with Small States: Taking Stock*. World Bank Operational Policy and Country Services.

World Bank. (2019). *Worldwide Governance Indicators*. Available at: http://info.worldbank.org/governance/wgi/#home

CHAPTER 3

Development Strategies for the Vulnerable Small Island Developing States

Augustin Kwasi Fosu and Dede Woade Gafa

3.1 Introduction

The recognition of Small Island Developing States (SIDS)[1] as a group of islands with peculiar characteristics and challenges by the United Nations in the early 1990s highlights the importance of taking into account the group's distinct needs in global development policy discourses. Despite the considerable progress of most of these islands on growth and socio-economic development, the sustainability of the progress is threatened by their inherent economic and environmental vulnerabilities that are linked to their insularity, small size, and remoteness (UN-OHRLLS 2008). SIDS are often identified by a number of characteristics such as the following: narrow resource base; small domestic markets and heavy dependence on

A. K. Fosu (✉)
University of Ghana, Accra, Ghana

University of Pretoria, Pretoria, South Africa

University of Oxford, Oxford, UK
e-mail: afosu@isser.edu.gh

D. W. Gafa
University of Ghana, Accra, Ghana

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_3

few external and remote markets; high costs for energy, infrastructure, transportation, communication, and servicing; long distances from export markets and import resources; low and irregular international traffic volumes; little resilience to natural disasters; growing populations; high volatility of economic growth; limited opportunities for the private sector and a proportionately large reliance of their economies on their public sector; and fragile natural environments (ibid.).

Notwithstanding these similarities, there is substantial diversity among SIDS. For example, they differ with respect to geographical location (e.g., the extent of isolation and climatic conditions), their population size (Tuvalu has a population of almost 11,000, while that of Haiti is about 11,000,000), their resource endowment (Papua New Guinea, Timor-Leste, and Trinidad and Tobago, for example, are resource-rich countries[2]), the extent of ethnic diversity (Samoa, Solomon Island, and Tonga have quite homogenous societies compared to Singapore, Mauritius, and Seychelles).

Moreover, while certain states are high-income countries with significant levels of human development, others rank among the poorest countries globally. Indeed, the composition of the independent SIDS in terms of income groups is as follows: (a) 7 high-income countries—*Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Vincent, Seychelles, Singapore*, and *Trinidad and Tobago*; (b) 18 are upper-middle-income countries—*Belize, Dominica, Dominican Republic, Fiji, Grenada, Guyana, Jamaica, Maldives, Marshall Islands, Mauritius, Nauru, Palau, Saint Vincent and the Grenadines, Suriname, Saint Lucia, Samoa, Tonga*, and *Tuvalu*; (c) 8 are lower-middle-income countries—*Cape Verde, Kiribati, Micronesia, Papua New Guinea, Sao Tome and Principe, Solomon Islands, Timor-Leste*, and *Vanuatu*; and (d) 3 are low-income countries—*Comoros, Guinea-Bissau*, and *Haiti*.[3] Furthermore, about 15% of independent SIDS are classified as least developed countries (LDCs).[4] These countries are: *Comoros, Guinea-Bissau, Haiti, Kiribati, Sao Tome and Principe, Solomon Islands, Timor-Leste, Tuvalu*, and *Vanuatu*.

LDCs are characterized by higher structural economic vulnerabilities compared to non-LDCs. An illustration of this point is provided in Fig. 3.1, which presents data on the economic vulnerability index (EVI). EVI reflects the structural exposure to shocks as well as the level of environmental and trade shocks that countries face in a given year. The index ranges from 0 to 100; the higher the index, the greater is the level of economic vulnerability. As observed in Fig. 3.1, the level of vulnerability in

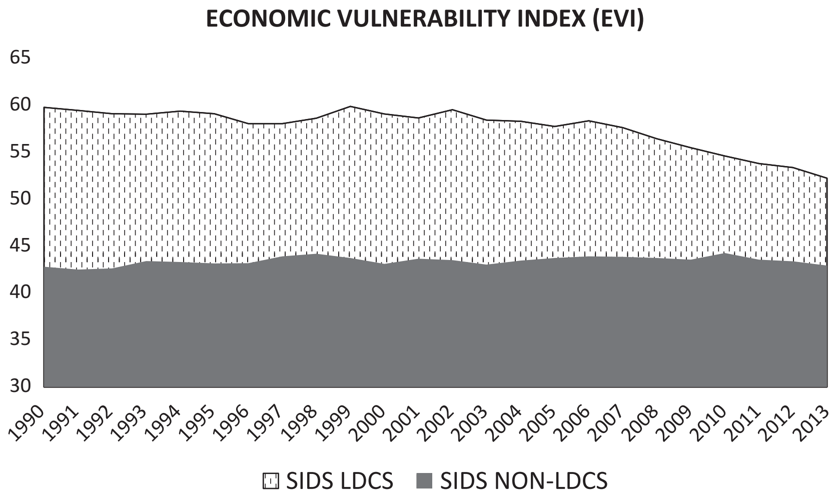


Fig. 3.1 Economic vulnerability index (EVI), SIDS NON-LDCs versus SIDS LDCs (1990–2013). (Source: Data on EVI are obtained from Feindouno and Goujon (2016), online at http://www.ferdi.fr/en/indicator/retrospective-economic-vulnerability-index. Notes: EVI is obtained by taking the arithmetic mean of two components, namely exposure index and shock index. The former is based on five components: population size (25%), remoteness from world markets (25%), exports concentration (12.5%), share of agriculture, forestry, and fishery in GDP (12.5%), and the share of population living in low-elevated coastal zone (25%). And the shock index is computed using three components: the victims of natural disasters (25%), the instability in agricultural production (25%), and the instability in exports of goods and services (50%))

SIDS LDCs has, on average, been about 14 points higher than SIDS non-LDCs. Nevertheless, the gap between the two groups has been narrowing since 2006, mainly due to the reduction in EVI for SIDS LDCs. Furthermore, Fig. 3.2 compares the average annual growth rate of per capita GDP of SIDS LDCs to that of SIDS non-LDCs over the period early-1980s to the present, and shows that, on average, growth of per capita GDP is lower and more volatile in SIDS LDCs compared with SIDS non-LDCs.

Considerable differences also exist across SIDS with respect to their development outcomes. To provide a picture of such heterogeneity, Table 3.1 presents the latest estimates of per capita GNI, human

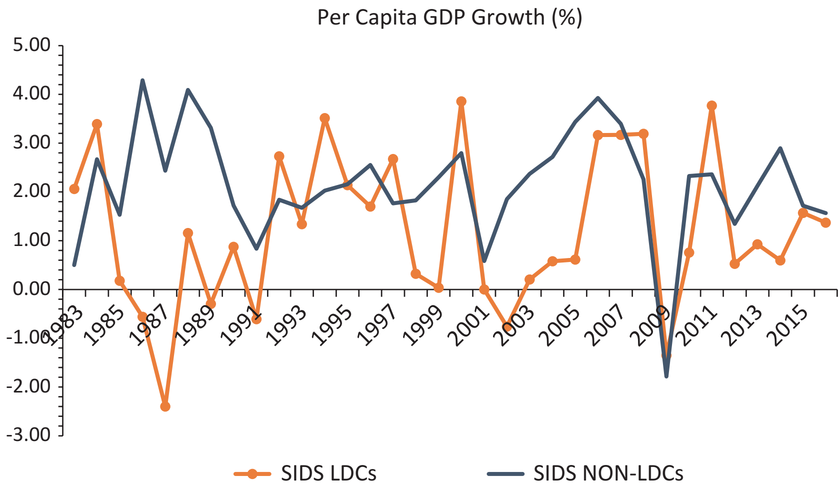


Fig. 3.2 Economic growth: SIDS LDCs versus SIDS NON-LDCs, 1983–2016. (Source of data: World Development Indicators (WDI), World Bank (2018a). Notes: In the computation of the average growth rate for SIDS LDCs, the graduation of Cape Verde (2007), Maldives (2011), and Samoa (2014) were taken into account, such that at every point in time the list of LDCs is consistent with the UN classification for that year (see, https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-graduation.html))

development index (HDI), access to improved water source, under-five mortality rate, life expectancy, primary school enrolment, and headcount poverty rate for each country. Moreover, adopting the methodology in Fosu (2017), the data reported in Table 3.1 are ranked by quintile in Table 3.2, with the highest quintile rank (fifth) representing the worst performer and the lowest quintile rank (first) assigned to the best performer on a given indicator. As shown in Table 3.1, on average SIDS LDCs have lower levels of development compared to SIDS non-LDCs.

On per capita GNI, HDI, and all the development indicators, Singapore topped all SIDS. The country's per capita income is more than twice that of Trinidad and Tobago, which has the second highest income in the group, and about 55 times that of Guinea Bissau and Comoros. Singapore ranks fifth globally on HDI, its entire population has access to potable water, and under-five mortality rate is at 3 deaths per 1000 live births. The classification by quintile rank based on HDI is as follows:

Table 3.1 Development outcomes in SIDS: GNI Per capita and human development indicators, by country—latest year available

Country	*GNI per capita, PPP (constant 2011 international $)*[a]	*Human Development Index (HDI)*[b]	*Improved water source (% of population with access)*[c]	*Mortality rate, under-five (per 1000 live births)*[b]	*Life expectancy at birth, total (years)*[d]	*School enrolment, primary (% net)*[e]	*Poverty headcount (%, poverty line of US$1.9 a day), latest year*[f]
SIDS LDCs							
Comoros	1435.06	0.50	90.10	73.30	63.46	79.46	17.67
Guinea-Bissau	1430.69	0.42	79.30	88.10	56.95	68.23	67.08
Haiti	1663.19	0.49	57.70	67.00	63.01	n/a	24.90
Kiribati	2344.33	0.59	66.90	54.30	66.05	95.21	12.87
Sao Tome and Principe	2704.89	0.57	97.10	33.80	66.42	94.91	32.28
Solomon Islands	1493.84	0.51	80.80	25.80	70.48	70.55	25.14
Timor-Leste	3940.60	0.61	71.90	49.70	68.58	95.59	43.47
Tuvalu	4745.65	n/a	97.70	25.30	n/a	84.40	3.26
Vanuatu	2893.45	0.60	94.50	27.60	71.98	85.81	13.14
SIDS NON-LDCs							
Antigua and Barbuda	17962.28	0.79	97.90	8.50	76.08	87.05	n/a
Bahamas	20007.09	0.79	98.40	10.60	75.37	97.52	n/a
Barbados	15411.32	0.79	99.70	12.30	75.64	91.02	n/a
Belize	7606.77	0.71	99.50	14.90	70.31	96.14	13.92
Cape Verde	5754.27	0.65	91.70	21.40	72.44	97.12	8.07

(*continued*)

Table 3.1 (continued)

Country	*GNI per capita, PPP (constant 2011 international $)*[a]	*Human Development Index (HDI)*[b]	*Improved water source (% of population with access)*[c]	*Mortality rate, under-five (per 1000 live births)*[b]	*Life expectancy at birth, total (years)*[d]	*School enrolment, primary (% net)*[e]	*Poverty headcount (%, poverty line of US$1.9 a day), latest year*[f]
Cuba	n/a	0.77	94.90	5.50	79.54	92.15	n/a
Dominica	9921.90	0.73	94.40	34.00	n/a	92.95	n/a
Dominican Republic	13405.46	0.72	84.70	30.70	73.70	86.89	1.94
Fiji	7262.47	0.74	95.70	22.00	70.22	97.64	1.46
Grenada	10762.96	0.75	96.60	16.00	73.50	95.73	n/a
Guyana	6108.73	0.64	98.30	32.40	66.54	68.23	14.00
Jamaica	7831.63	0.73	93.80	15.30	75.81	92.45	1.70
Maldives	14084.57	0.70	98.60	8.50	77.12	94.80	7.26
Marshall Islands	4279.86	n/a	94.60	35.40	n/a	77.33	n/a
Mauritius	19470.84	0.78	99.90	13.70	74.35	96.15	0.53
Micronesia	3517.92	0.64	89.00	33.30	69.05	84.00	15.26
Nauru	8161.66	n/a	96.50	34.60	n/a	86.43	n/a
Palau	13566.65	0.79	95.30	15.90	n/a	80.01	n/a
Papua New Guinea	3058.32	0.52	40.00	54.30	65.39	86.01	38.03
Samoa	5461.54	0.70	99.00	17.30	74.84	95.95	0.62
Seychelles	20991.06	0.78	95.70	14.30	73.23	94.90	1.06
Singapore	78929.23	0.92	100.00	2.80	82.60	n/a	n/a
St Kitts and Nevis	20954.16	0.77	98.30	9.30	n/a	78.35	n/a
St Lucia	11945.18	0.74	96.30	13.30	75.28	93.04	35.83

St Vincent and the Grenadines	9682.69	0.72	95.10	16.60	73.06	93.93	n/a
Suriname	14005.56	0.72	94.80	20.00	71.29	93.31	23.38
Tonga	5246.36	0.72	99.60	16.40	72.84	88.23	1.11
Trinidad and Tobago	30649.24	0.78	95.10	18.50	70.59	95.24	3.41
SIDS							
Mean	11352.54	0.69	91.06	26.83	71.47	88.76	16.30
Median	7719.20	0.72	95.30	20.00	72.44	92.45	13.14
Max	78929.23 (Singapore)	0.92 (Singapore)	100.00 (Singapore)	88.10 (Guinea Bissau)	82.60 (Singapore)	97.64 (Fiji)	67.08 (Guinea Bissau)
Min	1430.69 (Guinea Bissau)	0.42 (Guinea Bissau)	40.00 (Papua New Guinea)	2.80 (Singapore)	56.95 (Guinea Bissau)	68.23 (Guinea Bissau)	0.53 (Mauritius)
SIDS LDCs							
Mean	2516.85	0.54	81.78	49.43	65.87	84.27	26.65
Median	2344.33	0.54	80.80	49.70	66.23	85.11	24.90
Max	4745.65 (Tuvalu)	0.61 (Timor-Leste)	97.70 (Tuvalu)	88.10 (Guinea-Bissau)	71.98 (Vanuatu)	95.59 (Timor-Leste)	67.08 (Guinea-Bissau)
Min	1430.69 (Guinea-Bissau)	0.42 (Guinea-Bissau)	57.70 (Haiti)	25.30 (Tuvalu)	56.95 (Guinea-Bissau)	68.23 (Guinea-Bissau)	3.26 (Tuvalu)
SIDS NON-LDCs							
Mean	14297.77	0.73	94.05	19.56	73.43	90.10	10.47

(*continued*)

Table 3.1 (continued)

Country	*GNI per capita, PPP (constant 2011 international $)*[a]	*Human Development Index (HDI)*[b]	*Improved water source (% of population with access)*[c]	*Mortality rate, under-five (per 1000 live births)*[b]	*Life expectancy at birth, total (years)*[d]	*School enrolment, primary (% net)*[e]	*Poverty headcount (%, poverty line of US$1.9 a day), latest year*[f]
Median	10762.96	0.73	96.00	16.20	73.50	92.95	5.34
Max	78929.23 (Singapore)	0.92 (Singapore)	100.00 (Singapore)	54.30 (Papua New Guinea)	82.60 (Singapore)	97.64 (Fiji)	38.03 (Papua New Guinea)
Min	3058.32 (Papua New Guinea)	0.52 (Papua New Guinea)	40.00 (Papua New Guinea)	2.80 (Singapore)	65.39 (Papua New Guinea)	68.23 (Guyana)	0.53 (Mauritius)

Source: Data on GNI per capita, assess to improved water source, under-five mortality rate, life expectancy at birth, poverty headcount ratio (US 1.90 a day) are from the World Bank, World Development Indicators (2018, online), World Bank (2018a). Human development index (HDI) is from UNDP (2018)

Notes: The categorization of SIDS LDCs is based on the UN LDCs list as at June 2017. The data is reported for the latest year available, between 2000 and present

[a]The latest year is 2016 for Bahamas, Dominican Republic, Guinea Bissau, Haiti, Jamaica, Mauritius, Palau, and Singapore; 2013 for Cape Verde, 2014 for Comoros, and 2011 for the other SIDS

[b]The latest year is 2015 for all the countries

[c]The latest year is 2007 for Dominica, 2011 for Palau, and 2015 for the other SIDS

[d]The latest year is 2015 for all countries

[e]The latest year is: 2004 for Jamaica; 2007 for St Lucia; 2009 for Dominica; 2010 for Bahamas, Guinea Bissau, and Trinidad and Tobago; 2012 for Guyana and Papua New Guinea; 2014 for Barbados, Comoros, Nauru, Tonga; 2016 for Maldives and Palau; and 2015 for the other countries

[f]The latest year is as follows: 1992 for Trinidad and Tobago; 1995 for St Lucia; 1998 for Guyana; 1999 for Belize and Suriname; 2002 for Maldives; 2004 for Jamaica; 2006 for Kiribati; 2007 for Cape Verde and Timor-Leste; 2009 for Papua New Guinea and Tonga; 2010 for Guinea Bissau, Sao Tome, Tuvalu, and Vanuatu; 2012 for Haiti and Mauritius; 2013 for Comoros, Fiji, Micronesia, Seychelles, and Solomon Islands; and 2015 for Dominican Republic

Table 3.2 Development outcomes in SIDS by quintiles: GNI per capita and human development indicators, by country

Country	*GNI per capita, PPP (constant 2011 international $)*	*Human Development Index (HDI)*	*Improved water source (% of population with access)*	*Mortality rate, under-five (per 1000 live births)*	*Life expectancy at birth, total (years)*	*School enrolment, primary (% net)*	*Poverty headcount (%, poverty line of US$1.9 a day)*
SIDS LDCs							
Comoros	5	5	4	5	5	5	4
Guinea-Bissau	5	5	5	5	5	5	5
Haiti	5	5	5	5	5	n/a	4
Kiribati	5	5	5	5	5	2	3
Sao Tome and Principe	5	5	2	4	5	2	5
Solomon Islands	5	5	5	4	4	5	4
Timor-Leste	4	4	5	5	4	2	5
Tuvalu	4	n/a	2	3	n/a	4	2
Vanuatu	5	4	4	4	3	4	3
SIDS NON-LDCs							
Antigua and Barbuda	1	1	2	1	1	4	n/a
Bahamas	1	1	1	1	2	1	n/a
Barbados	2	1	1	1	1	3	n/a
Belize	3	3	1	2	4	1	3
Cape Verde	4	4	4	3	3	1	3
Cuba	n/a	2	3	1	1	3	n/a
Dominica	3	3	4	4	n/a	3	n/a
Dominican Republic	2	3	5	4	2	4	2

(*continued*)

Table 3.2 (continued)

Country	*GNI per capita, PPP (constant 2011 international $)*	*Human Development Index (HDI)*	*Improved water source (% of population with access)*	*Mortality rate, under-five (per 1000 live births)*	*Life expectancy at birth, total (years)*	*School enrolment, primary (% net)*	*Poverty headcount (%, poverty line of US$1.9 a day)*
Fiji	3	2	3	3	4	1	1
Grenada	2	2	2	2	2	1	n/a
Guyana	3	4	2	4	5	5	3
Jamaica	3	2	4	2	1	3	2
Maldives	2	4	1	1	1	2	2
Marshall Islands	4	n/a	4	5	n/a	5	n/a
Mauritius	1	1	1	2	2	1	1
Micronesia	4	4	5	4	4	4	4
Nauru	3	n/a	2	5	n/a	4	n/a
Palau	2	1	3	2	n/a	5	n/a
Papua New Guinea	5	5	5	5	5	4	5
Samoa	4	4	1	3	2	1	1
Seychelles	1	1	3	2	3	2	1
Singapore	1	1	1	1	1	n/a	n/a
St Kitts and Nevis	1	2	2	1	n/a	5	n/a
St Lucia	2	2	3	1	2	3	5
St Vincent and the Grenadines	3	3	3	3	3	2	n/a
Suriname	2	3	4	3	3	3	4
Tonga	4	3	1	2	3	3	1
Trinidad and Tobago	1	2	3	3	4	2	2

Source: The ranking is based on the data provided in Table 3.1

Notes: See notes under Table 3.1 for details on each indicator. For all the variables, a rank of 1 means 'best performer' and 5 is 'worst performer'

- *First Quintile*: Antigua and Barbuda, Bahamas, Barbados, Mauritius, Palau, Seychelles, and Singapore
- *Second Quintile*: Cuba, Fiji, Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia, Trinidad, and Tobago.
- *Median Quintile*: Dominica, Dominican Republic, Saint Vincent and the Grenadines, Suriname, Tonga.
- *Fourth Quintile*: Cape Verde, Guyana, Micronesia, Samoa, Timor-Leste, Tonga, Vanuatu.
- *Fifth Quintile*: Comoros, Guinea-Bissau, Haiti, Kiribati, Papua New Guinea, Sao Tome and Principe, Solomon Islands.

Overall, countries with relatively high incomes also attained high levels of human development, including access to potable water, infant mortality, life expectancy, education, and poverty. However, Trinidad and Tobago ranks poorly (fourth quintile) among SIDS in terms of life expectancy, while Antigua and Barbuda, and St Kitts and Nevis fall below the SIDS mean with respect to primary school enrolment.

All SIDS LDCs rank in the bottom quintiles on HDI and most of the other indicators. Comoros, Guinea-Bissau, Haiti, and Solomon Islands in particular belong to the lowest quintiles on all seven development indicators. For instance, Guinea-Bissau has the lowest level of HDI, life expectancy, and school enrolment at the primary level as well as the highest poverty rate (67%) in SIDS. Among SIDS LDCs, Tuvalu has the highest level of income and ranks relatively well on access to potable water, infant mortality, and poverty. Moreover, access to potable water not only in Tuvalu but also in Sao Tome is comparable to that of Antigua and Barbuda and better than Trinidad and Tobago. There are also non-LDCs like Cape Verde, Guyana, Micronesia, Samoa, Papua New Guinea, and Tonga that exhibit relatively low levels of human development. Particularly, Micronesia and Papua New Guinea rank at the bottom quintile on all indicators.

Furthermore, amidst all the challenges faced by SIDS as a result of their unfavourable initial conditions (insularity, geographical location, small population size, and remoteness), some of these islands have experienced considerable economic growth over the years and achieved a level of development that defies a number of economic predictions. Mauritius and Singapore are two interesting examples in that respect. These SIDS are often cited as examples for other developing countries, on the basis of policies that led them on the path of development against all odds (Subramanian and Roy 2001; Frankel 2014; Subramanian 2013).

Given the uniqueness of each state, a 'one-coat-fit-all' type of strategy might be ineffective in building the resilience and economic development in vulnerable SIDS. Nevertheless, these countries may learn from the success stories from their SIDS counterparts, and presumably others, in adopting well-suited development policies to address their needs. The model of development pursued by Singapore and Mauritius and some of their development strategies may provide lessons for SIDS, especially SIDS LDCs, in the formulation of country-specific policies for socio-economic gains as well as resilience to external fluctuations. Thus, the present chapter draws on key similarities in the development strategies of Mauritius and Singapore, two successful SIDS economies, to provide lessons for relatively vulnerable SIDS. The aim is not to propose a 'one-coat-fit-all' policy for vulnerable SIDS, but rather to give useful insights and examples of successful strategies that have been pursued elsewhere.

The rest of the chapter examines key features of the development strategies, based on selected themes discussed in Fosu (2013a, b). Following this introduction, Sect. 3.2 discusses trade openness and diversification strategies, while Sect. 3.3 focuses on the role of foreign direct investment. Sections 3.4 and 3.5 examine the importance of capabilities and private–public partnership, respectively. Section 3.6 provides policy recommendations and conclusions.

3.2 Trade Openness and Export Diversification

Since the 1980s, scholars and international organizations have largely advocated for outward-oriented rather than inward-looking economic policies for industrialization and development. The overall scepticism about the possible benefits of protectionism and the resulting shift in economic policies from inward-looking to outward-oriented strategies emerged from the failure of import-substitution (IS) policies in many developing countries, including a number of SIDS. Instead of boosting domestic production and industrialization, these IS policies led to the collapse of export sectors, substantial macroeconomic imbalances, and the deterioration of economic growth. Nevertheless, protectionist policies, in the form of import restrictions, underlined the early stages of development in a number of East Asian economic successes. These countries however managed to substantially minimize the negative impact of such policies on exports in order to derive substantial positive outcomes with regards to industrialization and growth (Fosu 2013a).

The benefits of openness for growth, competitiveness, and development have been increasingly emphasized in economic discourses.[5] Trade openness offers an opportunity for commerce and investment. It deepens countries' access to the global market, both for imports and exports, with significant implications for balance of trade, domestic prices and production, efficiency, and competitiveness. Openness also leads to specialization based on comparative advantage (Armstrong and Read 1998) and is important in fostering foreign direct investment inflows that may result in substantial transfer of technology and innovations for productivity gains (Briguglio 1995).

Furthermore, openness to trade improves countries' resilience to domestic shocks, especially environment-related shocks. However, the higher the level of openness, the greater is the exposure to shocks from the global market. This vulnerability is even more profound in economies that have a small export base and are heavily dependent on imports, in which case economic diversification may represent a buffer against swings in international prices or exports demand (Haddad et al. 2013).

Historical evidence shows that many economic success stories have entailed export-led growth strategies, but at different degrees of openness. Singapore, for instance, has a history of high economic integration into the world market. Trade restrictions in the form of tariffs are almost non-existent and are largely applicable for safety reasons, related to health and environment (World Trade Organization 2000). Since the late 1960s, at a time where policies in most developing countries were inward-looking, Singapore adopted an outward-oriented approach, by positioning itself as a city of trade, that is, the middleman in the region, with global trading partners. Thus, the country was able to industrialize significantly based on its free-trade strategy and also as a result of substantial foreign direct investment inflows (Ravi 2015). Owing to its unique geographical location, Singapore has become over the years a city of trade starting from the service sectors in the 1980s and later expanding to the manufacturing sector. Its trade to GDP ratio has been consistently above 300% since the late 1980s (World Bank 2018a). Furthermore, Singapore has greatly diversified its economy since the 1970s, from low-skill manufacturing to trading and financial services, and then to high-technology industries.

Similar to Singapore, but to a lesser extent, Mauritius has followed the path of diversification and its economy has evolved from a low-productivity agriculture, mainly based on the sugar sector, to manufacturing industries, and the country is now developing its service sector, especially financial and IT sectors (Frankel 2014). With respect to its trade strategy, Mauritius is however substantially different from Singapore. Rodrik (1999), Subramanian and Roy (2001), and Subramanian (2013) argue that trade policy in Mauritius has not been liberal, but rather restrictive, with government interventions. The country's trade strategy included the use of substantial trade restrictions on imports, especially from the beginning of the industrialization process until trade liberalization in the late-1990s under the structural adjustment programme. However, unlike in many developing countries, the negative consequences of protectionist policies on the export sectors have been avoided owing to the success of its Export Processing Zone (EPZ) policy that partially dampened the negative impact of its heterodox import policies on exports. The EPZ Act, adopted in 1970, mainly includes the removal of all duties on inputs, tax incentives or indirect subsidies to exporting firms as well as measures that ensured labour market flexibility within the zone. Hence, similar to Vietnam and other Asian successes, Mauritius pursued what can be seen as partial and strategic openness which entails the use of import restrictions to nurture local industries, while minimizing the negative impact of such protectionist import policies on exports, in order to derive substantial positive outcomes with regards to industrialization and growth.

SIDS are generally open economies, with high trade-to-GDP ratios. The countries' reliance on external trade can be explained by factors such as the small size of their domestic market, the presence of diseconomies of scale, and their narrow resource base that make the cost of autarky and import-substitution relatively high compared to bigger states (Armstrong and Read 1998). Furthermore, smallness and limited resource base may themselves constitute a barrier to export diversification and expansion of domestic activities (Armstrong and Read 1998). Hence, minimizing vulnerability requires the implementation of appropriate openness and export strategies to harness the benefits of trade and simultaneously strengthen resilience, which is crucial for long-term growth in SIDS, particularly in LDCs.

Nevertheless, the success of trade strategies rests significantly on existing institutional environments, and on other complementary policies (Fosu 2013a). For instance, although Haiti has a long history of free-trade policies, it failed to experience sufficient growth and development. Thus, the effectiveness of openness strategies on growth depends substantially on accompanying monetary, fiscal and exchange rate policies, investment policies, and physical as well as institutional capabilities (Frankel and Romer 1999; Baldwin 2004; Srinivasan and Bhagwati 2001).

3.3 Foreign Direct Investment

Foreign direct investment (FDI) is important for improvements in productivity, employment, competitiveness, and growth (Borensztein et al. 1998; Hansen and Rand 2006). In addition to increasing capital formation, there is a transfer of skills and technology from the rest of the world to the host countries that leads to an increase in total factor productivity through positive spillover effects. Furthermore, FDI may represent a route to domestic economic diversification in developing countries, particularly in SIDS.

Many researchers argue that in order to attract and gain sufficient benefits from FDI, the host economies must create the necessary incentives and enhance its absorptive capacity, in terms of human capital, financial development, and physical infrastructure, macroeconomic stability, trade openness, and institutions (Borensztein et al. 1998; Iamsiraroj and Ulubaşoğlu 2015). In the context of SIDS, a number of factors have been identified as important in determining countries' attractiveness to FDI. These factors are geographical location, especially proximity to large and developed markets, trade openness, and income level (Read 2008).

Additionally, barriers to business entry, excessive bureaucracy, and rigid regulation may hinder the attractiveness of SIDS to FDI. For instance, in the case of Solomon Islands, World Bank (2010) emphasizes that unfriendly business environment, high cost of utilities, and investors' perception of risks are factors that discourage investment in the tourism sector in spite of its potential for economic growth. To provide more insights into the conduciveness of the regulatory environment for business entry and operation across SIDS, Table 3.3 provides the ease of doing business (EDB) index for all SIDS with quintile ranks (first quintile the best) as well as the countries rank at the global level.

Singapore is the most business-friendly economy among SIDS and the second most business-friendly economy worldwide. Singapore is followed by Mauritius, which is ranked 25th out of 190 countries. Other countries with relatively conducive regulatory environment are Jamaica, Samoa, Tonga, Vanuatu, Seychelles, and Saint Lucia (first quintile). Globally, these countries rank 70, 87, 90, 95, and 91, respectively. With the exception of Vanuatu, all SIDS LDCs perform poorly on EDB. Haiti has the lowest

Table 3.3 Ease of doing business in SIDS, 2017

Country	*Ease of doing business indicator—distance to frontier score (0=lowest performance to 100=frontier)*	*Quintile rank (distance to frontier score)*	*Ease of doing business index (1 to 190, 1=most business-friendly regulations)—rank global*
SIDS LDCs			
Comoros	48.05	5	158
Guinea-Bissau	41.22	5	176
Haiti	38.23	5	181
Kiribati	49.05	4	157
Sao Tome and Príncipe	44.45	5	169
Solomon Islands	58.14	3	116
Timor-Leste	40.69	5	178
Tuvalu	n/a	n/a	n/a
Vanuatu	63.06	1	90
SIDS NON-LDCs			
Antigua and Barbuda	58.65	2	107
Bahamas	56.65	3	119
Barbados	55.29	4	132
Belize	57.08	3	121
Cape Verde	55.82	3	127
Cuba	n/a	n/a	n/a
Dominica	60.62	2	98
Dominican Republic	58.41	2	99
Fiji	60.7	2	101
Grenada	53.05	4	142
Guyana	55.89	3	126
Jamaica	66.7	1	70
Maldives	53.78	4	136
Marshall Islands	51.42	4	149
Mauritius	75.45	1	25
Micronesia	48.98	5	155
Nauru	n/a	n/a	n/a
Palau	55.12	4	130
Papua New Guinea	58.87	2	109
Samoa	61.83	1	87
Seychelles	60.4	2	95
Singapore	84.53	1	2

(*continued*)

Table 3.3 (continued)

Country	*Ease of doing business indicator—distance to frontier score (0=lowest performance to 100=frontier)*	*Quintile rank (distance to frontier score)*	*Ease of doing business index (1 to 190, 1=most business-friendly regulations)—rank global*
St Kitts and Nevis	54.34	4	134
St Lucia	62.87	1	91
St Vincent and the Grenadines	55.71	3	129
Suriname	46.76	5	165
Tonga	62.93	1	89
Trinidad and Tobago	60.87	2	102

Source: The data on the distance to frontier score is obtained from the World Bank Doing Business project (http://www.doingbusiness.org/, World Bank 2018a)

Notes: The ease of doing business index ranks from 1 to 190 (where 1 is the best rank and 190 the lowest) and is the simple average of each country's percentile rankings on the 10 components indicators (Starting a Business, Dealing with Construction Permits, Getting Electricity, Registering Property, Getting Credit, Protecting Minority Investors, Paying Taxes, Trading across Borders, Enforcing Contracts, Resolving Insolvency). The quintile ranks are computed using the distance to frontier score provided in the second column of the table

EDB score among SIDS and ranks 181 out of 190 countries. Considerable barriers exist in Comoros, Guinea-Bissau, Haiti, Micronesia, Sao Tome and Principe, Suriname, and Timor-Leste (fifth quintile), Kiribati (fourth quintile), and Solomon Islands (third quintile). Hence, improving the business environment in these countries may potentially encourage FDI, with implications for economic diversification.

FDI has been crucial to Singapore's development (Huff 1995; Abshire 2011). Right after independence, the country pursued considerable reforms as well as investment liberalization programmes in order to attract foreign capital. Since 1961, the Economic Development Board of Singapore has encouraged and facilitated the entry of multinational companies and individual investors and entrepreneurship into various sectors, especially services and manufacturing. A number of the policies implemented were aimed at providing the necessary incentives, including educated labour force, adequate physical infrastructures in the form of factory spaces, warehouses and parks for businesses, easy access to finance, tax incentives (exemptions and low tax rates), and legal support (World Bank 2008; Teck-Wong and Tan 1993). Between 1960 and early-1990s, Singapore's investment ratio has more than doubled (Huff 1995). Comparing Singapore to the other Asian tigers, that is, South Korea, Hong Kong, and Taiwan, Huff (1995) noted that the impact of the investment by multinational on capital accumulation and growth was greatest in Singapore.

Similarly, the Mauritius government has provided a conducive environment for both domestic and foreign direct investment, especially in the clothing and textiles industries, and promoted manufacturing exports. Through its EPZs, the country offers tax incentives, productive labour, and business-friendly institutional systems (Subramanian 2013).

3.4 Institutional Capabilities and Social Cohesion

The importance of good institutions in fostering a country's development has been extensively documented over recent years. New institutional economics emphasizes the importance of economic institutions in the form of property rights, rule of law, control of corruption, as well as political institutions, that is, democracy and constraints on executives, for efficiency gains, long-term growth, and development. These institutions contribute to an effective and efficient allocation of resources, promote transparency in public administration and good governance, foster a business-friendly environment for domestic and foreign companies, support industrialization, and reduce the risk of political instabilities and conflicts that significantly disrupt growth and development (Acemoglu et al. 2001, 2005). In a cross-country study, Rodrik et al. (2004) argue that institutions are much more important for development than trade and geographical location. More importantly, institutions play an important role in vulnerable economies, by strengthening a nation's resilience against both internal and external shocks (Rodrik 1999). In small islands that are faced with recurrent shocks in particular, coping with these shocks and building a resilient economy may require good governance to ensure stability.

SIDS are quite diverse with respect to their political systems. Some SIDS are republics (Comoros, Kiribati, Mauritius, Singapore, Samoa, Suriname, Timor-Leste, Vanuatu, etc.), while others are commonwealth (Antigua and Barbuda, Bahamas, Barbados, Belize, Grenada, Jamaica, Papua New Guinea, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Solomon Islands, and Tuvalu), kingdom (Tonga), or communistic (Cuba). While this heterogeneity implies different political institutions, there is little evidence at the global level supporting the hypothesis that political systems per se—that is, democracy or autocracy, for example—significantly explains a country's economic growth (Brunetti 1997; Minier 1998; Doucouliagos and Ulubaşoğlu 2008; Fosu 2008). What is rather evident is the relatively better economic performance of countries where the rules of the political game ensure checks and balances by putting constraints on executives and enforcement mechanisms are well developed and political stability is sustained (Acemoglu et al. 2005).

The ability to adapt to world fluctuations and changes has been crucial in Singapore and Mauritius. For instance, in Mauritius, good institutions were important for good governance that led to macroeconomic stability, supported the successful implementation of the EPZ policy, and encouraged investment in export sectors (Subramanian 2013). Furthermore, as a result of high institutional quality which translates into effective policymaking and implementation, Mauritius has shown growing resilience to external shocks, owing to effective policy responses and adaptation strategies (Frankel 2014).

To shed some light on the state of institutional quality (IQ) in SIDS, Table 3.4 presents recent data on the quality of institutions as measured by the World Bank indicators, namely control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability. These measures are perception scores that are computed for all countries globally. They range from −2.5 to +2.5, with −2.5 assigned to the country with the lowest level of IQ, +2.5 the highest, and zero value as the global mean. The data is then ranked by quintiles and reported in Table 3.5.

Mauritius, Barbados, Dominica, Samoa and Saint Vincent, and the Grenadines rank in the top quintiles on all IQ measures. Singapore is also known for its strong institutions, and as such the country is the best performer on all the institutions variables, except on voice and accountability. Despite the country's economic success, there are concerns expressed by the international community on a number of restrictions on civil and press liberties.

SIDS LDCs performed poorly relative to SIDS non-LDCs IQ measures. Comoros, Guinea-Bissau, Haiti, Sao Tome and Principe, Solomon Islands, and Timor-Leste rank in the bottom quintiles on most IQ indicators. Other LDCs like Kiribati enjoy relatively high control of corruption and accountability, while Tuvalu ranks in the top quintiles on political

Table 3.4 Institutional quality in SIDS, 2016

Country	*Control of corruption*	*Government effectiveness*	*Political stability and absence of violence/terrorism*	*Regulatory quality*	*Rule of law*	*Voice and accountability*
SIDS, LDCs						
Comoros	−0.64	−1.54	−0.02	−1.05	−1.13	−0.18
Guinea-Bissau	−1.56	−1.64	−0.50	−1.24	−1.49	−0.70
Haiti	−1.35	−2.06	−0.67	−1.24	−1.00	−0.73
Kiribati	0.25	−0.45	0.87	−0.84	0.21	1.03
Sao Tome and Principe	−0.06	−0.68	0.23	−0.81	−0.69	0.45
Solomon Islands	−0.34	−0.99	0.51	−0.96	−0.34	0.49
Timor-Leste	−0.51	−1.03	−0.08	−0.98	−1.20	0.24
Tuvalu	0.03	−0.93	1.40	−0.59	0.46	1.09
Vanuatu	−0.10	−0.88	0.51	−0.29	0.32	0.69
SIDS, NON-LDCs						
Antigua and Barbuda	0.69	0.27	1.01	0.34	0.51	0.65
Bahamas	1.13	0.72	0.90	0.26	0.23	0.94
Barbados	1.24	1.08	0.96	0.48	0.78	1.10
Belize	−0.24	−0.68	0.06	−0.51	−0.86	0.67
Cape Verde	0.88	0.10	0.88	−0.30	0.35	1.02
Cuba	0.05	−0.13	0.62	−1.34	−0.41	−1.63
Dominica	0.63	0.05	1.13	0.20	0.61	0.99
Dominican Republic	−0.78	−0.25	0.29	−0.07	−0.29	0.19
Fiji	0.13	−0.26	0.83	−0.38	−0.29	−0.03
Grenada	0.57	−0.18	1.01	0.08	0.57	0.86
Guyana	−0.32	−0.30	−0.03	−0.42	−0.31	0.30

Jamaica	−0.16	0.41	0.24		0.16	−0.25	0.69
Maldives	−0.67	−0.33	0.41		−0.46	−0.41	−0.74
Marshall Islands	−0.06	−1.56	0.93		−0.98	−0.10	1.20
Mauritius	0.32	0.96	1.05		1.03	0.80	0.86
Micronesia	0.65	−0.35	1.05		−0.97	−0.06	1.16
Nauru	−0.47	−0.69	0.55		−0.38	−0.80	0.52
Palau	−0.47	−0.41	0.93		−0.18	0.32	1.23
Papua New Guinea	−0.92	−0.73	−0.50		−0.56	−0.75	0.19
Samoa	0.28	0.54	1.19		−0.10	0.76	0.76
Seychelles	0.79	0.36	0.72		−0.26	0.13	0.16
Singapore	2.07	2.21	1.53		2.18	1.83	−0.28
St Kitts and Nevis	0.52	0.14	0.62		0.37	0.51	1.07
St Lucia	0.63	0.01	0.86		0.29	0.51	1.09
St Vincent and the Grenadines	0.68	0.21	1.01		0.28	0.41	1.04
Suriname	−0.32	−0.34	0.27		−0.63	−0.12	0.46
Tonga	−0.44	−0.29	0.91		−0.41	0.24	0.67
Trinidad and Tobago	−0.26	0.22	0.28		0.09	−0.16	0.60
SIDS							
Mean	0.05	−0.25	0.59		−0.27	−0.03	0.49
Median	−0.06	−0.29	0.72		−0.38	−0.06	0.67
Max	2.07	2.21	1.53		2.18	1.83	1.23

(*continued*)

Table 3.4 (continued)

Country	*Control of corruption*	*Government effectiveness*	*Political stability and absence of violence/ terrorism*	*Regulatory quality*	*Rule of law*	*Voice and accountability*
	(Singapore)	(Singapore)	(Singapore)	(Singapore)	(Singapore)	(Palau)
Min	−1.56	−2.06	−0.67	−1.34	−1.49	−1.63
	(Guinea Bissau)	(Haiti)	(Haiti)	(Cuba)	(Guinea Bissau)	(Cuba)
SIDS LDCs						
Mean	−0.48	−1.13	0.25	−0.89	−0.54	0.27
Median	−0.34	−0.99	0.23	−0.96	−0.69	0.45
Max	0.25	−0.45	1.40	−0.29	0.46	1.09
	(Kiribati)	(Kiribati)	(Tuvalu)	(Vanuatu)	(Tuvalu)	(Tuvalu)
Min	−1.56	−2.06	−0.67	−1.24	−1.49	−0.73
	(Guinea Bissau)	(Haiti)	(Haiti)	(Guinea B & Haiti)	(Guinea Bissau)	(Haiti)
SIDS NON-LDCs						
Mean	0.22	0.03	0.70	−0.08	0.13	0.56
Median	0.21	−0.06	0.87	−0.14	0.18	0.68
Max	2.07	2.21	1.53	2.18	1.83	1.23
	(Singapore)	(Singapore)	(Singapore)	(Singapore)	(Singapore)	(Palau)
Min	−0.92	−1.56	−0.50	−1.34	−0.86	−1.63
	(Papua New Guinea)	(Marshall Islands)	(Papua New Guinea)	(Cuba)	(Belize)	(Cuba)

Sources: The data is obtained from the World Governance Indicators (WGI), World Bank (2018b)

Notes: For all the variables, the data range approximately from −2.5 to 2.5, where −2.5 is the lowest and 2.5 is the highest score

Table 3.5 State of institutional quality in SIDS, by quintiles

Country	*Control of corruption*	*Government effectiveness*	*Political stability and absence of violence/terrorism*	*Regulatory quality*	*Rule of law*	*Voice and accountability*
SIDS LDCs						
Comoros	5	5	5	5	5	5
Guinea-Bissau	5	5	5	5	5	5
Haiti	5	5	5	5	5	5
Kiribati	2	4	3	4	3	2
Sao Tome and Principe	3	4	5	4	5	4
Solomon Islands	4	5	4	5	4	4
Timor-Leste	5	5	5	5	5	4
Tuvalu	3	5	1	4	2	1
Vanuatu	3	5	4	3	2	3
SIDS NON-LDCs						
Antigua and Barbuda	1	1	2	1	1	3
Bahamas	1	1	2	1	3	2
Barbados	1	1	2	1	1	1
Belize	4	4	5	4	5	3
Cape Verde	1	2	2	3	2	2
Cuba	3	2	3	5	4	5
Dominica	2	2	1	2	1	2
Dominican Republic	5	3	4	2	4	4
Fiji	3	3	3	3	4	5
Grenada	2	3	2	2	1	2
Guyana	4	3	5	3	4	4
Jamaica	3	1	4	2	4	3
Maldives	5	3	4	4	4	5
Marshall Islands	3	5	2	5	3	1
Mauritius	2	1	1	1	1	2
Micronesia	1	3	1	5	3	1
Nauru	5	4	3	3	5	3
Palau	5	4	2	2	2	1
Papua New Guinea	5	4	5	4	5	4

(*continued*)

Table 3.5 (continued)

Country	*Control of corruption*	*Government effectiveness*	*Political stability and absence of violence/ terrorism*	*Regulatory quality*	*Rule of law*	*Voice and accountability*
Samoa	2	1	1	2	1	2
Seychelles	1	1	3	3	3	5
Singapore	1	1	1	1	1	5
St Kitts and Nevis	2	2	3	1	2	1
St Lucia	2	2	3	1	1	1
St Vincent and the Grenadines	1	2	2	1	2	1
Suriname	4	3	4	4	3	4
Tonga	4	3	2	3	2	3
Trinidad and Tobago	4	2	4	2	3	3

Source and notes: The classification is done based on the data provided in Table 3.4. The first quintile represents the best performance and the fifth quintile the worst performance

stability as well as on voice and accountability among SIDS but performs poorly on government effectiveness and regulatory quality. Some non-LDCs also exhibit weak institutions. These countries include Belize, Maldives, and Papua New Guinea. Building institutional capacity is crucial for growth and development, particularly in LDCs.

Literature on SIDS generally suggests that smallness offers opportunities for a sense of togetherness and solidarity among citizens that potentially favours social cohesion and contributes to a pursuit of equity. Furthermore, social capital may lead to effective distribution of public goods as well as domestic revenue mobilization, by building a culture of trust and informal institutions that complement formal institutions for collective socio-economic gains (North 1990; Casson et al. 2010; Fafchamps 2004). Yet, a higher risk of polarization and inequities may exist, especially in countries with diverse ethnic groups. These inequities could ensue from biases in the allocation of public goods by the state, since smallness may cause higher proximity between the state and the citizens, thereby creating very little separation between the state and the rest of society, which can hamper the rule of law and limit control of corruption. These are likely to create tensions and instability with adverse consequences for growth.

Both Singapore and Mauritius have, however, been able to maintain social cohesion despite their ethno-linguistic heterogeneity. In the case of Mauritius, Subramanian (2013) maintains that diversity and ethnic fragmentation rather played a significant role in the development of strong institutions that explain to a large extent the country's achievement. He argues that FDI and trade were facilitated through social networks that existed between Mauritius's diverse ethnic groups and the rest of the world.

In the case of Singapore, government endeavored to build social cohesion and a sense of citizenship since the country's independence in 1965 (UNDP 2014). The implementation of educational policies to promote common values, and foster a shared national identity, helped the state in preserving a harmonious multi-religious, multi-racial, multi-ethnic, and multi-lingual society (Tan and Tan 2014). Furthermore, the principle of meritocracy, which remained grounded in the Singaporean society, has been a key ingredient for maintaining low level of corruption, and fostering economic development in Singapore (UNDP 2014).

3.5 Physical and Human Capabilities

Human capital and infrastructural development are important for economic development (Fosu 2013b). Specially, ensuring and improving the quality of education, healthcare and sanitation, transportation and communication systems, and access to reliable electricity supply are essential for attracting FDI, boost productivity, and facilitate industrialization in developing countries.

In SIDS, adequate and reliable physical infrastructure may limit the negative consequences of remoteness on investment and trade by lowering freight and transaction costs, thereby reducing the cost of doing business, and boosting exports and competitiveness of domestic industries (Brun et al. 2005). Additionally, the effectiveness of public service delivery, especially on archipelagos such as Comoros, Kiribati, Maldives, Solomon Islands, Tuvalu, Vanuatu, and Samoa as well as post-conflict SIDS like Timor-Leste, considerably depends on the state of existing transport infrastructures. Hence, poor infrastructure may lead to spatial inequities and hamper economic development. Likewise, human capital is essential throughout the process of industrialization, for investment, effective transfer of technology as well as technological updating and upgrading.

An educated and skilled labour force is important to maintain a competitive environment and attract foreign investment.

Education has been a major priority of the Singaporean government for long-term economic gains in terms of growth and improvements in well-being. The country has been successful in linking and adapting its training and education policies to the skill demands of industries. In terms of human capital development, Singapore through its educational system has strived to give its population the necessary and up-to-date skills and knowledge to meet the demands of foreign investors, with a particular emphasis on quality education from the basic to technical and tertiary education, while investing massively in infrastructure development to reduce communication and transportation cost. With respect to physical infrastructure, Huff (1995, pg. 746) writes: "Infrastructure provided under government auspices was the most modern and efficient possible, including port, airport, telecommunications, roads, and a mass rapid transit system. The effect was to provide a subsidy for business in Singapore, which reduced expenses both in operating within the Republic and in reaching world markets, so-called 'distance costs' (Helleiner 1973)." In the case of Mauritius, Zafar (2011) emphasizes that the level of physical infrastructure development as well as the availability of skilled labour force have contributed tremendously to export expansion, growth, and success of the EPZ policy.

Nevertheless, the existence of scale diseconomies and fixed-cost indivisibility makes the cost of provision of public infrastructure and social services relatively high in SIDS. Thus, infrastructural development in these countries may be constrained by high per unit cost and may require governments' effective partnership with the private sector in financing and maintenance. Furthermore, migration of labour has long been a characteristic of small states (Armstrong and Read 1998). Many SIDS have increasingly benefited from the inflows of both skilled and unskilled labour from less developed neighbouring countries to compensate for the shortage of domestic labour, while the outflow of labour generates remittances. However, skilled out-migration may also result in a reduction in labour supply with adverse effects on growth, particularly in countries with deficient educational systems and limited training capacity (Read 2004). For example, according to International Labour Organization (2018), the emigration of educated workforce aggravated the shortage of skilled labour in Timor-Leste. Thus, appropriate policies are needed to maintain adequate labour supply for domestic production.

3.6 Private–Public Sector Partnership

Finding the right balance between a strict interventionist society and a pure market-based economy has been key in almost all successful economies (Fosu 2013a, b). Economists have often encouraged governments to allow the market to operate and limit interventions to situations of market failures with the aim of minimizing the risk of government failure. However, the recent growth successes in East Asia, in particular, has significantly altered economic thinking such that researchers now preconize an appropriate combination of market and state to promote growth and development (Stiglitz 2016). Indeed, globally, 'development success' critically depended on optimal public–private sector participation (Fosu 2013a, b).

In addition to building state capacity and strong institutions, in the form of effective legal systems, property rights enforcement, limited corruption and stability, government may acquire information on the type of incentives needed to boost investors' trust and reduce risks and barriers to doing business. Hence, effective private–public relations in which government implements appropriate policies to ensure a conducive environment for the private sector to thrive is important for higher efficiency in the allocation of resources and growth. Furthermore, strong government and private sector partnerships in investment and capital mobilization for technological development and infrastructure projects may be crucial for improvements in domestic infrastructures in SIDS.

Singapore is a good example of a state where market and government partnership has tremendously contributed to increasing competitiveness and efficiency, placing the country among the topmost competitive countries globally. The country has been successful in pursuing a capitalist model under government effective planning, by creating a system in which public–private cooperation works effectively. From infrastructure development, education, and technical training, to housing and healthcare systems, Singapore has strategically guided industrialization through market-driven interventions and the provision of appropriate incentives and support for private investment. In addition, the Singaporean government has allowed the market to operate in the provision of public services such as education, healthcare services, housing programmes, and social security (Thomas 2001). Until the wind of privatization in the mid-1980s, there had been a great involvement of government in key targeted sectors that had potential for economic growth and employment such as manufacturing and trade (Huff 1995). Indeed, the Singaporean government has invested in a number of state-initiated profit-oriented enterprises that functioned efficiently and were highly competitive. These companies were then handed over to private investors or owned jointly with the private sector, mainly foreign corporations.

Mauritius, similarly, has long recognized that the private sector can only thrive in a conducive economic and political environment. Government in Mauritius has not only focused on building strong institutions, but has also strived to reduce potential bottlenecks to investment as well as ensure an adequate supply of skilled workforce by encouraging research, innovation, and the development of adequate skills to meet the demands of investors. Thus, Mauritius's success story is to a large extent linked to an excellent state-business partnership.

3.7 Policy Recommendations and Conclusion

Like many other SIDS, Mauritius and Singapore faced harsh initial conditions at independence. However, in recent years, both countries are cited as examples of development success. As part of their development strategies, the two countries pursued reasonably sound trade policies, foreign direct investment promotion, good institutional reforms, complementary human capital development, and infrastructure development, as well as excellent government and private sector relations. Given the substantial differences that exist across countries, replicating the exact policies that were successful in Mauritius and Singapore may not be appropriate. However, vulnerable SIDS, especially LDCs, may emulate particularly these two countries in shaping domestic policies to tackle institutional deficiencies, build capabilities and resilience, and promote exports, foreign direct investment, and industrialization.

The Barbados Programme of Action adopted in 1994 and the Mauritius Strategy for Implementation of the Programme of Action for the Sustainable Development of SIDS in 2005, as well as the Samoa Pathway in 2014, emphasized the importance of international cooperation and partnership for sustainable development in SIDS. The need for better economic integration among SIDS, and with the rest of the world, has often been highlighted. Gaining access to larger exports markets, not only in advanced economies but also in other developing countries, offers SIDS opportunities for market expansion, foreign direct investment in export sectors, diversification, and economic advancement (Armstrong and Read 1998).

Regional, multilateral, and bilateral trade agreements represent key aspects of global partnership. Thus, the important role of external partnership agreement and development assistance cannot be dismissed. Partnership with more advanced economies as well as south-south partnerships are also needed to strengthen institutions, enhance human capital and infrastructural development in vulnerable SIDS LDCs. Support from development partners in training, transfer of skills, capacity building, and technical support might provide the necessary boost to limit these key aspects of their vulnerabilities. Capacity building in the area of public administration, management of public funds, and domestic revenue mobilization is also of particular importance for effective public service delivery in education, healthcare, and other social services.

Greater integration of SIDS in the global market also means greater vulnerability to global crises and policy changes of their major trading partners (Armstrong and Read 1998). It is therefore essential to build resilience, as sustainability would depend on how well the country is able to adapt and adjust to external shocks and the changing global environment. Taking the example of Mauritius, which has substantially benefited from special arrangements with more advanced economies, Subramanian (2013) observed that the success of the EPZ policy and the export sector in Mauritius was also partly due to preferential and favourable trade agreements under the sugar protocol in 1975 with the European Commission and the Multi-Fibre Agreement (MFA) with Europe and the US. In recent years, however, these preferential trade agreements have been phased out, threatening growth and employment in Mauritius. Nevertheless, the 2000 African Growth and Opportunity Act (AGOA) with preferential access to the US market holds opportunities for cushioning the negative impacts of the dismantling of MFA. Other non-African SIDS may well benefit from such arrangements as well, at least in the short run, as these countries strengthen their capabilities to be able to better compete in the global arena.

It is also essential that current trade policies take into account the changing international trade environment as well as the GATT/WTO rules. The possibilities of using quantitative trade restrictions to boost domestic production are currently very limited. Also coupled with trade shocks are the environmental shocks that have been a growing challenge of the recent years. Climate change, global warming, and sea-level rise continue to threaten the islands' fragile ecosystems and biodiversity, their economy, and the very existence of some SIDS (UN-OHRLLS 2011). Adequate actions to address these pressing issues need to be taken not only at the national level but also through international cooperation, in order to achieve better mitigation and adaptation measures (UN-OHRLLS 2011).

Appendix

Table 3.6 List of SIDS

No	*Country*	*No*	*Country*
UN MEMBERS, SIDS LDCS (11)		29	Papua New Guinea
1	Comoros	30	Saint Kitts and Nevis
2	Guinea-Bissau	31	Saint Lucia
3	Maldives	32	Saint Vincent and the Grenadines
4	Sao Tome and Principe	33	Seychelles
5	Haiti	34	Singapore
6	Kiribati	35	Suriname
7	Samoa	36	Tonga
8	Solomon Islands	37	Trinidad and Tobago
9	Timor-Leste	*SIDS NON-UN MEMBERS (20)*	
10	Tuvalu	38	American Samoa
11	Vanuatu	39	Anguilla
UN MEMBERS, SIDS NON-LDCS (26)		40	Aruba
12	Antigua and Barbuda	41	Bermuda
13	Bahamas	42	British Virgin Islands
14	Barbados	43	Cayman Islands
15	Belize	44	Commonwealth of Northern Marianas
16	Cape Verde	45	Cook Islands
17	Cuba	46	Curacao
18	Dominica	47	French Polynesia
19	Dominican Republic	48	Guadeloupe
20	Fiji	49	Guam
21	Grenada	50	Martinique
22	Guyana	51	Montserrat
23	Jamaica	52	New Caledonia
24	Marshall Islands	53	Niue
25	Mauritius	54	Puerto Rico
26	Micronesia (Federated States of)	55	Saint Maarten
27	Nauru	56	Turks and Caicos Islands
28	Palau	57	US Virgin Islands

Notes

1. A total of 57 states are categorized as SIDS according to the UN classification. Out of these 57 states, 37 are independent states and UN members, while 20 are dependencies and thus non-UN members or associate members of regional commissions. The list of countries is provided in Appendix Table 3.6. Three countries on the list however are not islands but are included mainly because they possess the key characteristics of the group. These countries are Belize, Guyana, and Suriname. In the present study, we focus on the 37 independent states.
2. Papua New Guinea exports gold, copper, oil, and natural gas. Timor-Leste and Trinidad and Tobago are producers of oil and gas.
3. This classification is based on the World Bank categorization of countries by income using the 2016 per capita GNI data (Atlas method and PPP); see World Bank (2016). No data is available for Cuba.
4. See Appendix Table 3.6.
5. The findings of many cross-country studies suggest that openness has a positive effect on growth (Edwards 1993; Sachs et al. 1995; Dollar and Kraay 2004; Wacziarg and Welch 2008), though their results have been challenged in the light of possible measurement and methodological issues and the lack of strong theoretical foundation (Rodriguez and Rodrik 2000; Srinivasan and Bhagwati 2001; Rodríguez 2007).

References

Abshire, J. (2011). *The History of Singapore*. Santa Barbara: Greenwood.

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *American Economic Review, 91*(5), 1369–1401.

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a Fundamental Cause of Long-Run Growth. *Handbook of Economic Growth, 1*, 385–472.

Armstrong, H. W., & Read, R. (1998). Trade and Growth in Small States: The Impact of Global Trade Liberalisation. *The World Economy, 21*(4), 563–585.

Baldwin, R. E. (2004). Openness and Growth: What's the Empirical Relationship? In R. E. Baldwin & L. A. Winters (Eds.), *Challenges to Globalization: Analyzing the Economics* (pp. 499–526). Chicago: University of Chicago Press.

Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics, 45*(1), 115–135.

Briguglio, L. (1995). Small Island Developing States and Their Economic Vulnerabilities. *World Development*, *23*(9), 1615–1632.

Brun, J.-F., Carrère, C., Guillaumont, P., & De Melo, J. (2005). Has Distance Died? Evidence from a Panel Gravity Model. *The World Bank Economic Review, 19*(1), 99–120.
Brunetti, A. (1997). Political Variables in Cross-Country Growth Analysis. *Journal of Economic Surveys, 11*(2), 163–190.
Casson, M. C., Della Giusta, M., & Kambhampati, U. S. (2010). Formal and Informal Institutions and Development. *World Development, 38*(2), 137–141.
Dollar, D., & Kraay, A. (2004). Trade, Growth, and Poverty. *The Economic Journal, 114*(493), F22–F49.
Doucouliagos, H., & Ulubaşoğlu, M. A. (2008). Democracy and Economic Growth: A Meta-Analysis. *American Journal of Political Science, 52*(1), 61–83.
Edwards, S. (1993). Openness, Trade Liberalization, and Growth in Developing Countries. *Journal of Economic Literature, 31*(3), 1358–1393.
Fafchamps, M. (2004). *Social Capital and Development* (Department of Economics Discussion Paper No. 214). University of Oxford.
Fosu, A. K. (2008). Democracy and Growth in Africa: Implications of Increasing Electoral Competitiveness. *Economics Letters, 100*(3), 442–444.
Fosu, A. K. (2013a). *Achieving Development Success: Strategies and Lessons from the Developing World*. Oxford: Oxford University Press.
Fosu, A. K. (2013b). *Development Success: Historical Accounts from More Advanced Countries*. Oxford: Oxford University Press.
Fosu, A. K. (2017). Growth, Inequality, and Poverty Reduction in Developing Countries: Recent Global Evidence. *Research in Economics, 71*(2), 306–336.
Frankel, J. (2014). Mauritius: African Success Story. In S. Edwards, S. Johnson, & D. N. Weil (Eds.), *African Successes, Volume IV: Sustainable Growth* (pp. 295–342). Chicago: University of Chicago Press.
Frankel, J. A., & Romer, D. H. (1999). Does Trade Cause Growth? *American Economic Review, 89*(3), 379–399.
Haddad, M., Lim, J. J., Pancaro, C., & Saborowski, C. (2013). Trade Openness Reduces Growth Volatility When Countries Are Well Diversified. *Canadian Journal of Economics, 46*(2), 765–790.
Hansen, H., & Rand, J. (2006). On the Causal Links Between FDI and Growth in Developing Countries. *World Economy, 29*(1), 21–41.
Huff, W. G. (1995). What Is the Singapore Model of Economic Development? *Cambridge Journal of Economics, 19*(6), 735–759.
Iamsiraroj, S., & Ulubaşoğlu, M. A. (2015). Foreign Direct Investment and Economic Growth: A Real Relationship or Wishful Thinking? *Economic Modelling, 51*, 200–213.
International Labour Organization. (2018). *Skills and Employability in Indonesia and Timor-Leste*. Available at: http://www.ilo.org/jakarta/areasofwork/skills-and-employability/lang–en/index.htm

Minier, J. A. (1998). Democracy and Growth: Alternative Approaches. *Journal of Economic Growth, 3*(3), 241–266.
North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.
Ravi, M. (2015). *An Economic History of Singapore – 1965–2065*. Paper presented at Singapore Economic Review Conference 2015.
Read, R. (2004). The Implications of Increasing Globalization and Regionalism for the Economic Growth of Small Island States. *World Development, 32*(2), 365–378.
Read, R. (2008). Foreign Direct Investment in Small Island Developing States. *Journal of International Development, 20*(4), 502–525.
Rodríguez, F. (2007). Openness and Growth: What Have We Learned? In J. A. Ocampo, K. S. Jomo, & R. Vos (Eds.), *Growth Divergences: Explaining Differences in Economic Performance* (pp. 172–203). New York: Zed Books.
Rodriguez, F., & Rodrik, D. (2000). Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence. In B. Bemanke & K. Rogoff (Eds.), *NBER Macroeconomics Annual*. Cambridge: MIT Press.
Rodrik, D. (1999). *The New Global Economy and Developing Countries: Making Openness Work*. Washington, DC: Overseas Development Council.
Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. *Journal of Economic Growth, 9*(2), 131–165.
Sachs, J. D., Warner, A., Åslund, A., & Fischer, S. (1995). Economic Reform and the Process of Global Integration. *Brookings Papers on Economic Activity, 1995*(1), 1–118.
Srinivasan, T. N., & Bhagwati, J. (2001). Outward-orientation and Development: Are Revisionists Right? In D. Lal & R. Snape (Eds.), *Trade, Development and Political Economy: Essays in Honour of Anne O. Krueger* (pp. 3–26). London: Palgrave Macmillan.
Stiglitz, J. E. (2016). *The State, the Market, and Development* (WIDER Working Paper 2016/1). Helsinki: UNU-WIDER.
Subramanian, A. (2013). The Mauritian Success Story and Its Lessons. In A. K. Fosu (Ed.), *Achieving Development Success: Strategies and Lessons from the Developing World* (pp. 204–231). Oxford: Oxford University Press.
Subramanian, M. A., & Roy, M. D. (2001). *Who Can Explain the Mauritian Miracle: Meade, Romer, Sachs, or Rodrik*. Washington, DC: International Monetary Fund.
Tan, C., & Tan, C. S. (2014). Fostering Social Cohesion and Cultural Sustainability: Character and Citizenship Education in Singapore. *Diaspora, Indigenous, and Minority Education, 8*(4), 191–206.
Teck-Wong, S., & Tan, C. S. (1993). *The Lessons of East Asia: Singapore Public Policy and Economic Development*. Washington, DC: World Bank.

Thomas, J. (2001). *Using Markets to Govern Better in Singapore* (Faculty Research Working Papers Series RWP02-010). John F. Kennedy School of Government, Harvard University.

UNDP. (2014). *Small, So Simple? Complexity in Small Island Developing States.* UNDP Global Centre for Public Service Excellence. Available at: https://www.undp.org/content/dam/undp/library/capacity-development/English/Singapore%20Centre/GPCSE_Complexity%20in%20Small%20Island.pdf

UN-OHRLLS. (2008). *About Small Islands Developing States.* Available at: http://unohrlls.org/about-sids/

UN-OHRLLS. (2011). *Small Islands Developing States: Small Islands Big(ger) Stakes.* Available at: http://unohrlls.org/custom-content/uploads/2013/08/SIDS-Small-Islands-Bigger-Stakes.pdf

Wacziarg, R., & Welch, K. H. (2008). Trade Liberalization and Growth: New Evidence. *The World Bank Economic Review, 22*(2), 187–231.

World Bank. (2008). *Singapore Local Economic Development: The Case of the Economic Development Board (EDB)*. Washington, DC: World Bank.

World Bank. (2010). *Solomon Islands Growth Prospects Constraints and Policy Priorities.* Washington, DC: World Bank.

World Bank. (2016). *New Country Classifications by Income Level.* Available at: https://blogs.worldbank.org/opendata/new-country-classifications-2016

World Bank. (2018a). *World Development Indicators.* Available at: http://worldbank.org/

World Bank. (2018b). *World Governance Indicators.* Available at: http://worldbank.org/

World Trade Organization. (2000). *Singapore: March 2000.* Available at: https://www.wto.org

Zafar, A. (2011). Mauritius: An Economic Success Story. In P. Chuhan-Pole & M. Angwafo (Eds.), *Yes Africa Can: Success Stories from a Dynamic Continent* (pp. 91–106). Washington, DC: World Bank.

CHAPTER 4

Trade Policy and Innovation Governance: An Analysis of Trade Challenges in the Pacific and Caribbean Economies

Keith Nurse and Jeanelle Clarke

4.1 Introduction

Small island developing states (SIDS) have common economic and trade challenges and are faced with weak infrastructure, transportation and trade logistics, and slow-moving public administration and governance structures. From a trade standpoint, these countries are impacted by trade policy approaches that engender commodity and low value-added traps. As such, the issue of how SIDS can enhance productive capacity, export diversification, and global competitiveness by moving up global value chains and employing trade policy and innovative governance mechanisms needs to be studied. In this regard, this chapter examines the experience of the Pacific and Caribbean regions in terms of integration into the contemporary global political economy and the extent of the challenges and opportunities. There are growing concerns that the regions' trade and

K. Nurse (✉)
Sir Arthur Lewis Community College, Castries, Saint Lucia

J. Clarke
UNCTAD, Geneva, Switzerland

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_4

economic performance are eroding in multiple spheres at a rapid rate. Urgent attention and action are required to address, if not reverse, the current trajectories and the expected outcomes. Trade performance is at the top of the list of concerns for the regions given their high dependence on trade and the significant developmental impact trade has on the wider economy and society.

This chapter aims to examine the growth and trade performance of the Caribbean and Pacific regions and evaluates the trade policy framework and its scope for economic transformation.

4.2 Trade and Development in Perspective

The last global economic downturn together with the intersecting problems of global finance, climate change, and the food and energy crises had a very significant impact on SIDS in terms of export losses and increased indebtedness. For example, the Caribbean region experienced a major dip in economic performance. For the period from 2007 to 2011, most countries in the region experienced a significant drop in output and loss of fiscal revenues (Fig. 4.1). The countries that experienced the lowest degree of impact

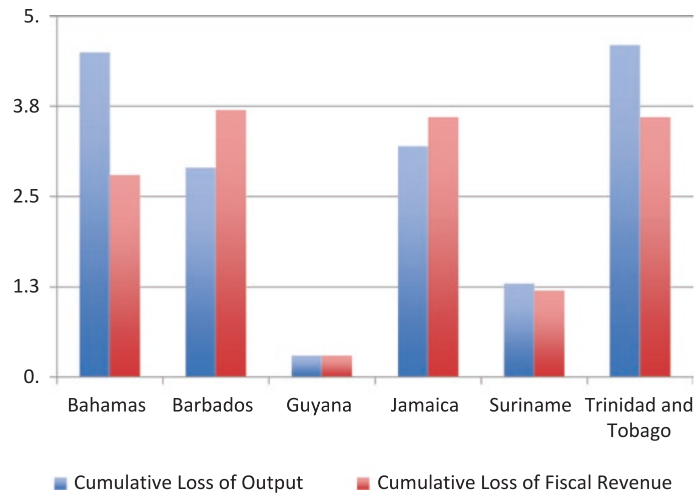


Fig. 4.1 Loss of output and fiscal revenue, 2007–2011 (% GDP). (Source: Mercer-Blackman and Melgarejo 2013)

were Guyana and Suriname, the two main commodity exporters of the region, which were buoyed by increased demand for raw materials from China, Brazil, and other large exporting economies. The biggest impacts were seen on tourism-exporting economies such as Barbados, The Bahamas and Jamaica. Trinidad and Tobago, a hydrocarbon exporter, was affected by the slowdown in its main export markets in North America and Europe, as was the case for the tourism-dependent economies. The growth rates of GDP observed for the period from 2008 to 2017 provide a gloomy picture: for the vast majority of countries, the growth rates were either very low or negative until 2013 and thereafter positive and fluctuating, showing no sign of a rising trend (Table 4.1).

The Caribbean and Pacific economies have some similarity in some respects and differ in others. For example, both the economies are heavily dependent on agriculture. Agriculture contributes about 68% of GDP in the Pacific region and 58% in the Caribbean region. The contribution of the services sector to GDP is 14% in the Pacific region as against only 3% in the Caribbean region (Fig. 4.2). In terms of trade, there is increased concentration in goods exports. For the Caribbean, goods exports were heavily weighted towards fuel exports, likely due to the significant exports

Table 4.1 Annual GDP growth rates, 2008–2017, for several Caribbean countries

Country	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Antigua and Barbuda	0	−12.1	−7.2	−2.1	3.5	−0.1	4.7	4.0	5.6	3.0
Bahamas, The	−2.3	−4.2	1.5	0.6	3.1	−0.4	−0.1	1.0	−1.7	1.4
Barbados	0.1	−4	0.3	0.7	0.3	0.0	0.0	0.9	2.0	1
Belize	3.2	0.7	3.4	2.2	2.9	0.9	3.7	3.4	−0.6	1.4
Dominica	7.1	−1.2	0.7	−0.2	−1.1	−0.6	4.4	−2.6	2.5	−9.5
Dominican Republic	3.2	0.9	8.3	3.1	2.7	4.9	7.6	7.0	6.6	4.6
Grenada	0.9	−6.6	−0.5	0.8	−1.2	2.4	7.3	6.4	3.7	5.1
Guyana	2	3.6	4.1	5.2	5.3	5.0	3.8	3.2	3.3	2.9
Jamaica	−0.8	−4.3	−1.5	1.7	−0.6	0.5	0.7	0.9	1.4	1
Haiti	0.8	3.1	−5.5	5.5	2.9	4.2	2.8	1.2	1.5	1.2
St Vincent and the Grenadines	1.6	−2.1	−3.4	−0.4	1.3	1.8	1.2	1.3	2.0	0.9
St Lucia	5.3	−1.1	0.2	3.5	−0.6	−1.3	3.6	−0.9	3.4	3.8
St Kitts and Nevis	6.5	−3.4	−1.5	1.8	−0.7	5.5	6.1	2.1	2.3	1.2
Suriname	4.1	3.0	5.2	5.9	2.7	2.9	0.3	−3.4	−5.6	1.7
Trinidad and Tobago	3.4	−4.4	3.3	−0.3	1.3	1.0	−0.2	1.5	−6.0	−2.3

Source: World Bank (2019), World Development Indicators 2019

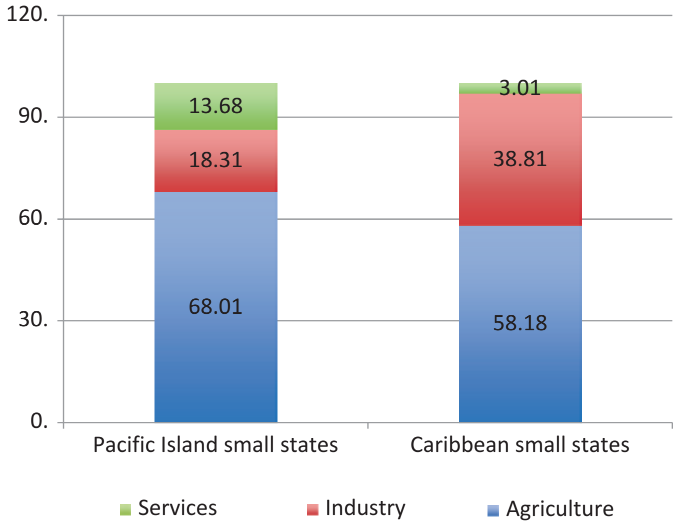


Fig. 4.2 GDP composition by sector for select SIDS in 2011. (Source: World Bank, World Development Indicators 2011)

Table 4.2 Proportion of goods and services in exports, 2013 vs. 2016

Region	*Goods*		*Services*	
	2013 (%)	*2016 (%)*	*2013 (%)*	*2016 (%)*
Caribbean (excluding Trinidad and Tobago)	40	59	60	41
Pacific Islands	76	83	24	17

Source: Commonwealth Secretariat (2015); Commonwealth Secretariat (2018) (excluding Guyana and Trinidad and Tobago)

from Trinidad and Tobago. In contrast, the Pacific region's goods exports were dominated by primary goods at 76% (Fig. 4.2, Tables 4.2 and 4.3). Trade in the services sector in the Caribbean and Pacific regions is heavily skewed towards travel and tourism, with this sector accounting for approximately 80% of service exports for the former and 46% for the latter in 2013. Other business services declined marginally over the period from 2000 to 2013 for the Pacific, while it rose slightly in the Caribbean. Transport declined in the Caribbean, whereas it more than doubled in the Pacific (Table 4.4).

Table 4.3 Composition of merchandise exports, 2013

Region	*Fuels (%)*	*Manufacturing (%)*	*Primary (%)*
Caribbean	49	31	20
Pacific Islands	16	6	78

Source: Commonwealth Secretariat (2015)

Table 4.4 Export performance of major services, 2000–2013 (US$ billion)

	Caribbean		*Pacific*	
	2000	*2013*	*2000*	*2013*
Other business services	0.45	0.52	0.33	0.31
Transport	0.75	0.56	0.17	0.40
Travel	5.04	6.67	0.31	0.79

Source: Commonwealth Secretariat (2015)

4.3 Trade Performance of Caribbean Economies

Trade is often considered the lifeblood of small economies such as those in the Caribbean, as exemplified by the high level of economic openness and high trade to GDP ratios (Fig. 4.3). There are several countries that have trade to GDP ratios in excess of 100%, such as Belize, Dominica, and St Kitts and Nevis, and all the other Caribbean economies are above 60%. This is a characteristic feature of small states and is also evident in Costa Rica, Mauritius, and Seychelles. The trade to GDP ratios illustrates exposure but do not identify specific risks.

Caribbean States are largely net importers of merchandise goods. This is often attributed to factors such as limited natural resources, lack of economies of scale, and lack of diversification of exports. In the Caribbean, only two countries are net exporters of merchandise goods—Trinidad and Tobago, and Suriname (Table 4.5). Caribbean economies have narrowly focused on the production of a few categories of products, that is, those in the agriculture, manufacturing, fuels, and ores and metals sectors. From this viewpoint, over the last two to three decades, the Caribbean has experienced limited levels of diversification, demonstrated by the narrow range of low-value-added, low-technology goods and services exports (Nurse and Greene 2013).

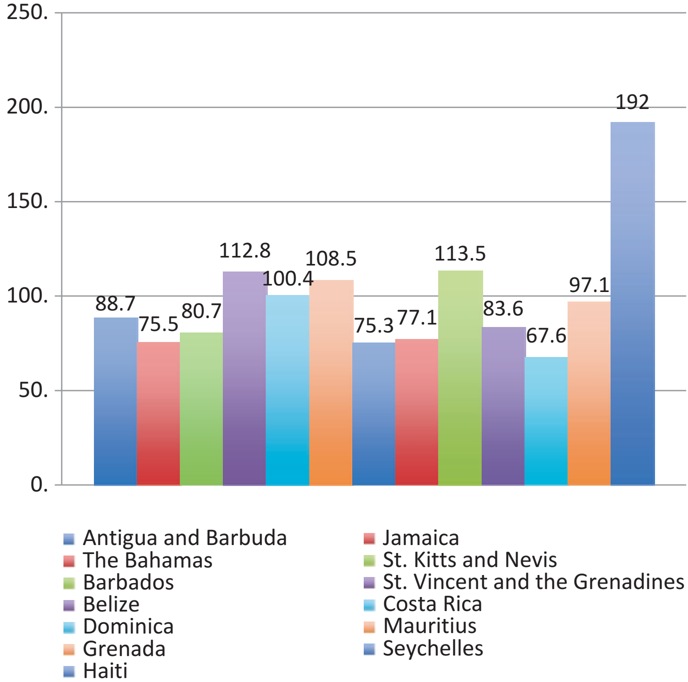


Fig. 4.3 Trade to GDP ratios: The Caribbean and select small states. (Source: UNDP 2018)

Table 4.5 Merchandise trade in US$ million (2017)

Country	*Exports*	*Imports*	*Net*
Antigua and Barbuda	35	620	−585
Bahamas	605	2890	−2285
Barbados	440	1695	−1255
Belize	404	907	−503
Dominica	21	215	−194
Dominican Republic	10,300	18,050	−7750
Grenada	25	295	−270
Guyana	1490	1630	−140
Haiti	980	3552	−2572
Jamaica	1295	5670	−4375
Saint Kitts and Nevis	50	300	−250
Saint Lucia	115	660	−545
Saint Vincent and the Grenadines	40	305	−265
Suriname	2100	1260	840
Trinidad and Tobago	7000	5900	1100

Source: WTO (2018)

With decreased barriers to trade and logistical innovation, production can take place within global value chains. As a result, intermediate inputs occupy a substantial space in world trade. Investment in industrial facilities and value addition represent a significant trade opportunity for the transformation of imported materials and inputs. Within the Caribbean, earnings from the export of intermediate goods vary widely. The largest exporters of intermediate goods include the Dominican Republic, Guyana, and Trinidad and Tobago. The largest importers of intermediate goods include Dominican Republic, Trinidad and Tobago, and Jamaica (Tables 4.6, 4.7 and Figs. 4.4, 4.5). Exports of services are largely from transport, travel, and other services (Table 4.8).

The Caribbean region is signatory to at least seven partial-scope agreements and one comprehensive trade arrangement with the European Union (EU) (Table 4.9). The CARIFORUM–EU Economic Partnership Agreement (EPA) is the first regional group within the African, Caribbean, and Pacific Group of States (ACP) to secure a comprehensive agreement

Table 4.6 Exports of intermediate goods 2006–2016 in US$ millions

Country	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
Antigua and Barbuda	12	10	88	10	7	6	8	7	7	8	6
Bahamas	239	310	345	317	287	312	312	351	336	198	233
Barbados	117	110	114	97	89	89	84	95	96	92	97
Belize	59	51	43	45	42	63	84	94	92	101	84
Dominica	8	9	10	7	10	32	12	33	26	19	23
Dominican Republic	2130	3159	2440	1591	1909	2856	3041	4137	4650	3707	3935
Grenada	9	9	14	22	12	17	21	20	13	19	10
Guyana	428	655	648	623	710	964	1127	1111	989	963	1231
Jamaica	1491	1645	1743	834	752	945	1032	926	822	807	685
Saint Kitts and Nevis	30	26	41	32	26	38	29	25	26	31	28
Saint Lucia	15	12	27	28	31	31	18	36	40	52	36
Saint Vincent and the Grenadines	13	16	20	22	22	26	27	37	30	26	21
Suriname	1064	1163	1326	46	51	114	89	81	94	1297	100
Trinidad and Tobago	2817	3965	4893	1630	3664	5979	4787	5811	5565	4683	3331

Source: WTO (2018)

Table 4.7 Imports of intermediate goods 2006–2016 in US$ millions

Country	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
Antigua and Barbuda	160	184	196	136	101	84	95	97	116	112	129
Bahamas	951	962	933	831	809	941	1101	1054	1165	924	805
Barbados	522	534	575	452	439	497	475	484	483	477	468
Belize	163	173	234	204	207	212	238	255	315	341	327
Dominica	66	74	91	80	83	119	74	101	110	92	77
Dominican Republic	4498	5637	6609	5174	6207	8038	7192	7177	7436	7626	7557
Grenada	114	121	121	96	74	86	79	86	91	90	72
Guyana	310	381	442	387	454	511	588	590	556	575	684
Jamaica	1764	2089	2433	1723	1689	2048	1995	1852	1651	1625	1488
Saint Kitts and Nevis	102	106	124	111	102	102	96	105	112	111	89
Saint Lucia	193	144	159	186	183	191	181	176	166	177	186
Saint Vincent and the Grenadines	101	123	134	123	116	114	122	141	174	125	84
Suriname	382	447	572	605	538	629	679	905	672	643	489
Trinidad and Tobago	2237	2881	3440	2292	2094	2478	2814	2864	2981	2887	2251

Source: WTO (2018)

with the EU. The agreement is comprehensive in its scope covering goods, services, investment, and other trade-related issues such as innovation, intellectual property and cultural cooperation (Nurse et al. 2008). The EPA ensures duty-free, quota-free access for CARIFORUM (CARICOM plus the Dominican Republic)[1] goods in EU markets. In the services sector, the EPA provides market access for Caribbean firms and professionals across the four modes of supply and in critical sectors such as communications, construction, distribution, environmental purposes, financial purposes, transport, tourism and entertainment.

The EPA redefines trade and development cooperation between the EU and CARIFORUM countries, moving away from a preferential trade arrangement towards a reciprocal trade agreement that aligns with WTO rules. The impact of the EPA on Caribbean development is expected to be significant, bringing new opportunities for business, investment, and exports, and new challenges for key sectors and regional firms owing to further trade liberalisation.

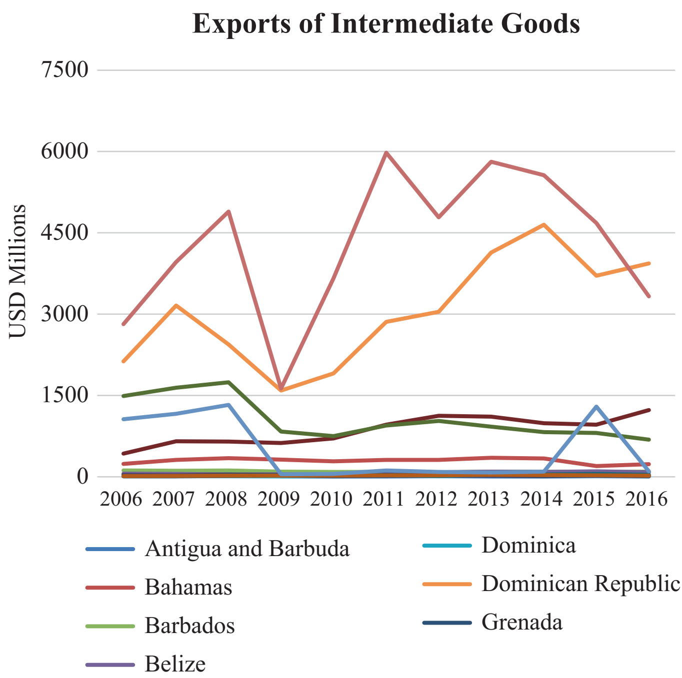


Fig. 4.4 Trends in exports of intermediate goods 2006–2016. (Source: WTO 2018)

Between 2006 and 2013, CARICOM and the Dominican Republic experienced a volatile shift in exports to their top importers. The pattern observed across all import markets peaked in 2008 followed by a dramatic decline thereafter, with a steady rise from the trough in 2010 (Fig. 4.6). For EU imports, there was a double dip and then a recovery in 2011–12. By 2013, EU imports had not surpassed the peak of 2008 (Fig. 4.7).

The Caribbean's experience of the EPA shows that these agreements provide only the platform for market access. The direct role of the EPA on CARIFORUM's export trends to date has been hard to pinpoint owing to limited monitoring of the agreement's implementation. Reducing the proportion of total exports made up of primary goods and basic services is an important indicator of diversification. However, the signing of trade

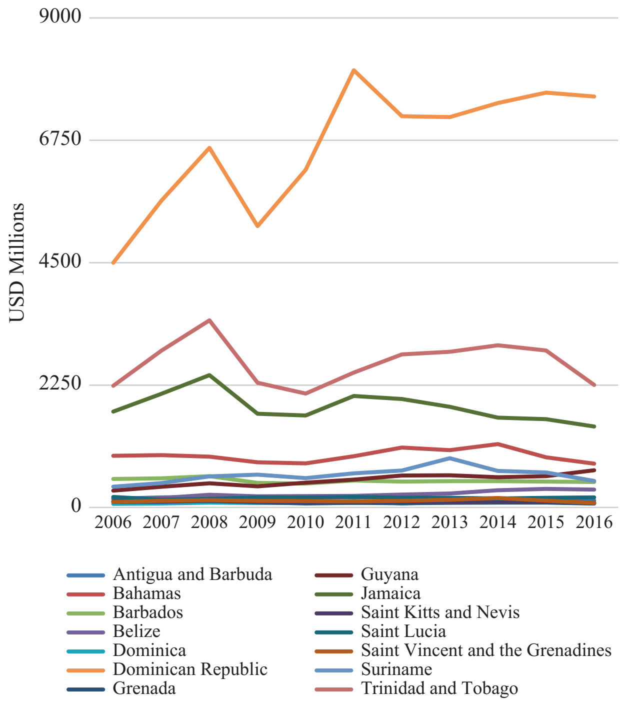


Fig. 4.5 Trends in imports of intermediate goods in Caribbean countries. (Source: WTO 2018)

Table 4.8 Exports of selected services 2017

Services sector	*US$ millions*
Transport	860
Travel	11,750
Other services	2150

Source: UNCTADStat

deals, such as those outlined in Table 4.3 alone has not proven to be enough to diversify exports, trade, and foreign direct investment. The Caribbean region's trade performance before and after the signing of the 2008 EPA illustrates this point.

Table 4.9 Select examples of trade agreements signed by the Caribbean

Trade agreement	*Type of agreement*	*Trade and development opportunities*
2008, Economic Partnership Agreement (EPA with the EU)	Comprehensive Regional Trade Agreement (RTA)	Preferential market access Trade facilitation Development cooperation (European Development Fund, United Kingdom and German donor resources)
CARICOM and Caribbean Single Market and Economy (CSME)	Regional Trade Agreement (RTA)	Market access, rules of origin, free movement of skilled persons
2000, Caribbean Basin Initiative (CBI with the United States)	Bilateral	Market access, rules of origin
1994, CARICOM Columbia Free Trade Agreement (FTA)	Bilateral	Market access, rules of origin
1992, CARICOM Venezuela Free Trade Agreement (FTA)	Bilateral	Market access, rules of origin
2001, CARICOM Dominican Republic Free Trade Agreement (FTA)	Bilateral	Market access, rules of origin, investment promotion
2003, CARICOM Costa Rica Free Trade Agreement (FTA)	Bilateral	Market access
2013, Trinidad and Tobago and Panama Partial Scope Trade Agreement	Bilateral, Partial Scope Agreement	Market access, rules of origin

Sources: Belize Trade and Investment Zone 2015 (Source: http://www.belize.org/tiz/caricom-bi-lateral-agreements)

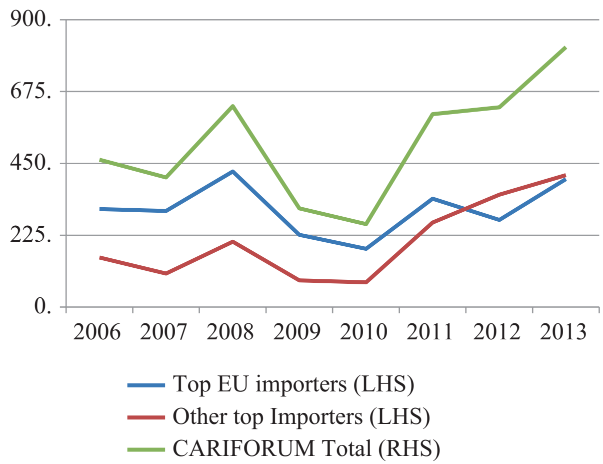
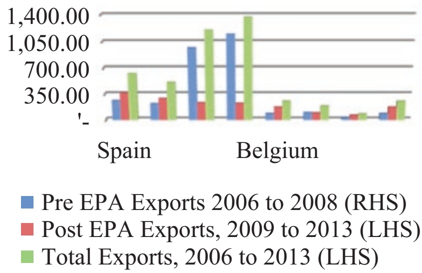


Fig. 4.6 Trends in CARIFORUM's exports to the top importing markets, 2006–2013 (US$ billion). (Source: ITC 2013)

Fig. 4.7 CARIFORUM's exports to top EU markets, pre- and post-EPA periods compared, 2006–2013 (US$ billion). (Source: ITC 2013)



4.4 Trade Performance of Pacific Economies

Exports of the Pacific economies are largely focused on goods. Mineral-based exports remain the backbone of the Pacific Island exports. The top-four mineral-based commodity exports are (1) minerals fuels, oils and distillation products; (2) pearls, precious stones, metals, coins, and so on; (3) ores, slag and ash; and (4) iron and steel (Fig. 4.8). It may also be noted that these commodities exported from the Pacific countries are largely primary-based products at the low end of the value chain.

The Pacific is signatory to at least eight bilateral and multilateral trade agreements, one of which includes an interim EPA with the EU (Table 4.10). The experiences of SIDS in the Caribbean and Pacific regions suggest that trade policy needs to move from just negotiations and market access to trade facilitation and market-entry programmes. The focus should thus be on targeted industrial and technological upgrading through emerging and strategic export sectors. Table 4.11 outlines a range of niche products from the Pacific regions that have export potential. What is proposed is an industrial upgrading strategy based on natural resources, where the local and regional producers are able to ensure that some level of intellectual property value is captured, and the Pacific's share of global value added is deepened. This is in contrast to the traditional export- and resource-based industrialisation approach in which the Pacific operates at the base of the global value chain.

An example of a niche goods trade that has the potential for increased domestic and regional value added is kava, which comes from the Pacific region and has been used as a traditional beverage by Pacific islanders since ancient times.[2] Kava exports have been facilitated by migration from Fiji, Tonga, and Vanuatu. For example, Fiji, the key producing country, currently exports kava to Australia, the United States, New Zealand, Kiribati,

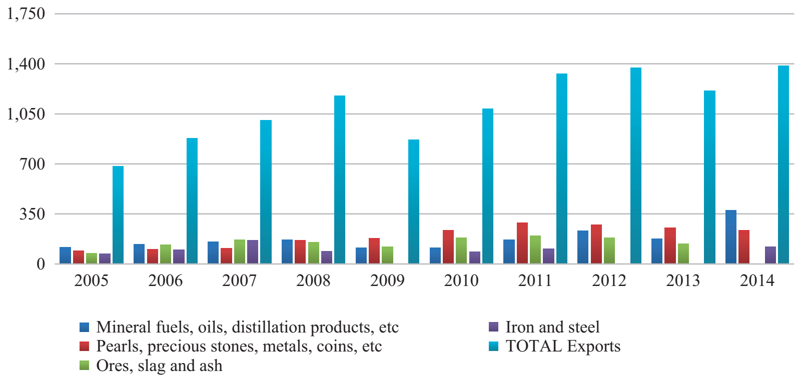


Fig. 4.8 The Pacific's top four exported commodities, 2005–2014 (US$ billion). (Source: UNCOMTRADE 2015)

and the United Kingdom, generating earnings between US$7 million and US$8 million annually (Fiji Government 2013). Kava is also exported to Kiribati and Tuvalu from Fiji. Originally targeted at the Pacific islander diasporas, kava has expanded into the mainstream markets in Australia and New Zealand. For example, the Australian company Taki Mai makes bottled kava drinks, which are popular with the Fijian community and Australian young people as an alternative to alcohol. Australian overseas aid has funded kava production in Fiji as a health supplement and a bottled beverage for export. Taki Mai has been able to benefit from Australian international aid funds to further develop production in Fiji. The value of kava is such that it costs approximately A$30 per kilogram in the Pacific countries but can sell for about A$1000 per kilogram in Australia. This suggests that there is significant scope for Pacific islander producers to move up the value chain and expand their share of margins in the trade.

The example of kava illustrates the key points highlighted in the following quote from the Pacific Island Forum[3]: In general, export creation requires that countries prioritise investments towards their productive capacity for trade. Access to new markets is necessary, but it is not sufficient to ensure export-led growth. Pacific island economies want to develop and diversify their exports, both in terms of products and services, and markets. To truly harness open markets, integrate into global value chains, and seize new (or niche) opportunities, firms and citizens will need to overcome information barriers, distance and high trading costs.

Table 4.10 Select examples of trade agreements signed by the Pacific

Trade agreement	*Type of agreement*	*Trade and development opportunities*
2001, Pacific Island Countries Trade Agreement (PICTA)	Preferential Trade Agreement	Phased market access, temporary movement of persons
1981, South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA)	Preferential Trade Agreement	Market Access, Economic and Technical Cooperation
2002, PACER Plus framework agreement for the gradual integration of the Forum Island Countries	Preferential Trade Agreement	Movement towards a free trade area then customs union
1994, The Melanesian Spearhead Group Trade Agreement (MSG)	Reciprocal Trade Agreement	Market access, rules of origin
1976, Australia-Papua New Guinea Trade and Commercial Relations Agreement (PATCRA)	Partial Scope Agreement	Market access
2007, Interim EPA with the European Union – Pacific group, Fiji and Papua New Guinea	Preferential Trade Agreement	Market access for goods only, technical cooperation for import standards, cooperation on customs and trade facilitation, and improvement on rules of origin for processed fisheries products from the Pacific
1989, The Asia Pacific Economic Cooperation (APEC) forum	Cooperation Forum	Voluntary non-discriminatory liberalisation on a most-favoured nation basis—trade and investment liberalisation; business facilitation; and economic and technical cooperation
1971, The Pacific Islands Forum (PIF)	Preferential Trade Agreement	Economic cooperation, regional cooperation and integration

Table 4.11 Key niche products from the Pacific regions with export potential

Region	*Key niche products*
Melanesia (Vanuatu, Solomon Islands, Fiji, Papua New Guinea)	High-value plantation timber, fairtrade sugar, bottled water, virgin coconut oil, coconut products (cosmetics, furniture, etc.) fresh tuna (sashimi), 'single source' cocoa and coffee, kava, fresh fruit and vegetables, indigenous nuts, fresh flowers, preserved spices, organic beef, pearls
Polynesia (Samoa, Tonga, Tuvalu, Cook Islands, Niue)	Virgin coconut oil, cosmetics, black pearls, noni juice, dried organic fruits, spices, 'single source' cocoa and coffee, kava, fresh fruits and vegetables (particularly squash), indigenous nuts, fresh fish, vanilla
Micronesia (Kiribati, Marshall Islands, Nauru, Palau)	Virgin coconut oil, coconut products, import substitution

Source: Morgan (2013)

4.5 Strategic Areas for Trade and Innovation Governance

Improving overall productive capacity is an important step for SIDS to enhance their participation in international trade in goods and services. Trade expansion is closely linked to the issue of private sector development. SIDS face a serious challenge in enhancing their competitiveness owing to high transaction costs in moving goods across borders, along with various other trade barriers that mitigate their market access opportunities (ITC 2014). In this regard, trade facilitation can be utilised as a tool for boosting the productivity, competitiveness, and innovation of small and medium-sized enterprises and diversification of their export portfolio.

A few countries in the Caribbean region have been pursuing technological change and implementing foresighted and national innovation studies, intellectual property audits, cluster initiatives, and innovation start-ups. While these efforts have been welcome, the evidence suggests that more resources and focus are required to enhance innovation performance. Sustained growth, development, and global competitiveness are increasingly reliant on productivity gains generated through innovation. Attaining such outcomes requires much more than just increased investment or the up-skilling of the workforce—strategic and systemic approaches are required, aimed at:

– Promoting innovation-driven enterprises
– Diasporic entrepreneurship and engagement
– Strategic government procurement
– Aid for trade/innovation

4.5.1 Promoting Innovation-Driven Enterprises

The issue of small size has not often been adequately addressed in the literature on industrial upgrading. Small states face several distinct challenges in this area, such as small markets and weak demand for innovation-driven enterprises from potential research and development users. This is the result of a variety of factors: local firms often consider research and development to be too expensive, it may be more convenient to rely on imported technologies, and innovation may be viewed as something beyond their capabilities. In this regard, small states generally lack the financial and human resources required to actively pursue innovation, making technical assistance or foreign direct investment key to technological upgrading. At the same time, the greater the investment in domestic research and development, the greater the potential for absorbing and utilising external research and innovation. This suggests that small states need to be proactive in terms of promoting innovation-driven enterprises and increasing investment in research and development, both at the firm level and in government.

Two mechanisms which can help address some of the challenges associated with diseconomies of scale include cluster development and value-chain integration. These mechanisms can be effective options to provide small firms with an opportunity to compete in international markets and capitalise market access opportunities. For example, it has been observed that, 'for small firms in less developed countries, participation in value chains is a means of obtaining information on the needs of global markets and of gaining access to those markets' (Pietrobelli and Rabellotti 2006). However, participation in clusters and global value chains are no panacea. It is argued that, at the same time that global production is being fragmented and made accessible to a wider range of producers, some of the production segments are becoming more commodified owing to 'low barriers to entry, global oversupply and declining terms of trade' (Amighini 2006). This illustrates the importance of moving up global value chains or facilitating industrial upgrading to capture higher levels of value addition.

In the efforts to shift small economies from low-value-added and low-technology commodity traps, it is increasingly being recognised that foreign direct investment and the participation of large domestic firms have not been sufficient. In this regard, a more dynamic and proactive policy agenda is required. The promotion of innovation-driven enterprises is viewed not as a replacement but as a complement to foreign firms and large local corporations because innovation-driven enterprises have the capacity to 'retain high technology capabilities in the country and to lure back the scientific, technological and entrepreneurial diasporas' (Pérez 2010). In effect, institutional arrangements are proposed to facilitate the growth of start-up companies.

As most of the literature on innovation focuses on the issues of larger developing economies, its emphasis has been on the manufacturing and agro-processing sectors, as opposed to services sectors (e.g. tourism, financial services, creative industries) and intellectual property sectors (e.g. copyright, traditional knowledge, geographical indications). The services and intellectual property sectors predominate in small developing states and have significant growth potential in the emerging knowledge-driven global economy. It is therefore recommended that greater emphasis be placed on new forms of innovation in the service and intellectual property sectors.

Another area in which there is significant potential for innovation is the sectors that are major users of foreign exchange and in which the region has a high level of exposure, for example, the energy, food, and health sectors. Given the trajectory of the global economy and its impact on small states in terms of climate change, energy, and food price rises and the increasing financial and social cost of chronic non-communicable diseases, there is a clear need to reduce the region's exposure in these areas. These sectors should be viewed as major opportunities for restructuring the region's economies and moving them towards more sustainable and green development pathways.

4.5.2 Diaspora Engagement and Entrepreneurship

Small states are in the unenviable position of having the highest brain drain rates, with sizable proportions (approximately 70–90 percent) of the tertiary-educated population migrating. The weak absorptive capacity of the home economies has been the key driver of this process of emigration. This loss of talent and entrepreneurship can be potentially addressed through return migration, diaspora investment, and entrepreneurship schemes. Diasporic entrepreneurs can help expand trade and create markets for nostalgic and cultural exports. The diaspora engagement and networks can also help reduce informational asymmetries and operate as co-creators and institutional influencers.

The Pacific and Caribbean regions are good candidates to employ diasporic engagement as a mechanism to deepen and widen trade. Both regions have some of the highest remittance/GDP rates in the world along with some of the highest emigration and brain drain rates. In relative terms, there are significant potential growth opportunities, given the size of the diasporic market, if emigration rates, remittances and brain drain rates are used as a proxy. Financial remittances are an important aspect of the transnational relationship, but this is only the tip of the iceberg. Countries also benefit from diasporas by tapping into networks of trade, scientific and professional diasporas.

4.5.3 Strategic Government Procurement

Government consumption accounts for a significant portion of GDP in small economies. In the Caribbean, for example, reported government expenditure accounted for 12–21% of total GDP in 2017, including Saint Vincent and the Grenadines, Guyana, and Belize (Table 4.12). This represents an accessible source of investible funds that small states can mobilise on their own account. As such, this is a key tool to increase innovation in the creation of new products and, especially for existing products in new markets. The idea is that strategic government procurement (SGP) can stimulate markets to a point where innovation is induced naturally or as a result of increased economic activity (Lember et al. 2014). For most Caribbean governments, the procurement process tends to be decentralised with procurement contracts tendered from a variety of government agencies. To foster technological innovation more proactively, a more strategic and policy-oriented use of the current procurement contracts may be beneficial (Shillingford-McKlmon and Gayle-Sinclair 2014). Governments like Barbados and Trinidad and Tobago already have procurement programmes targeted at small and micro enterprises.

4.5.4 Aid for Trade/Innovation

Strategic global cooperation and partnerships can ensure more effective support towards building the resilience of SIDS and can thus allow them to exploit areas in which they have a market advantage. In the Pacific region, besides the bilateral support provided by countries such as the

Table 4.12 Government expenditure as a proportion of GDP, selected Caribbean countries, 2017

Country	*Government expenditure as a proportion of GDP (%)*
Saint Vincent and the Grenadines	21.2
Guyana	16.9
Belize	16.4
Barbados	13.4
Jamaica	13.4
Dominican Republic	12.2

Source: World Bank (2019). World Development Indicators 2019

United States and New Zealand, development organisations such as German International Cooperation (GIZ) have also provided trade and development support. The value of official development assistance has grown in the last decade from US$144 million in 2002 to US$208 million in 2013 (OECD/DAC 2013).

The 2014 'Grant Agreements' within the Pacific region have led to donor cooperation, namely between Germany and the United States, in the areas of climate change adaptation and the environment. These involve a series of climate protection projects covering topics addressing energy efficiency, nature conservation, and adaptation to climate change, all of which contribute to overarching goals for sustainable development. The approach gathers several individual actors on the ground within the overall policy implementation process. This strategy may be expanded to other sectors in which the Pacific countries show a comparative advantage for growth. Through the identification of ongoing projects with trade-related impacts, opportunities for complementary strategic partnerships could be built.

In 2009, the Pacific region in its Aid for Trade Strategy (amended for 2013 to 2017) prioritised its needs along with the corresponding necessary resources. This document outlined target areas in their overall goal for improving trade-related infrastructure and building productive capacity. Specific objectives identified for the region's Aid for Trade agenda included:

- to promote 'trade-related adjustment';
- to improve 'institutional capacity for trade policy and regulations'; and
- to 'effectively address the barriers inhibiting the region's ability to increase its competitiveness, reduce inefficiencies and enhance the beneficial opportunities found in regional economic integration' (ITC 2013).

Aid for innovation should be linked to Aid for Trade, with alignment made between trade and innovation policy agendas. A sector-wide approach by donors would reduce overlap and create further synergies. Furthermore, the creation of regional clusters (i.e. regional public goods) can facilitate sector innovation.

As seen with the CARIFORUM region under their EPA, further resources were allocated under the European Development Fund (EDF). Commitments under the Pacific's interim EPA could be similarly leveraged to support economic growth. To this end, the Pacific's EPA includes a chapter on technical barriers to trade, as well as sanitary and phytosanitary measures, aiming to help exporters meet EU import standards. It also includes a chapter focused on facilitating trade, for example, through more efficient customs procedures and better administration procedures (European Commission 2014). Consequently, the Pacific can strategically pursue trade and development goals by linking ongoing projects that aim to achieve the agreement's objectives with additional resources available under their EPA while facilitating development cooperation.

4.6 Conclusion

The foregoing analysis of trade policy in the Caribbean and Pacific SIDS suggests that passive approaches have had a limited impact on these economies in terms of moving up global value chains and that more dynamic and proactive mechanisms are required to promote economic diversification and global competitiveness. The SIDS regions have negotiated several trade agreements, which have widened their market access. However, penetration into new markets has proven to be elusive or slow at best. The SIDS economies are faced with increasingly undiversified trade and low-growth scenarios. Breaking out of this framework requires bold and dynamic policies. What is proposed in this chapter is a coordinated and synergistic approach to industrial upgrading, which is referred to as innovation governance. This approach focuses on developing a process whereby government, industry, cluster-level private organisations, diasporas and donor agencies collaborate on interventions to enhance innovation, productivity and, ultimately, market penetration.

The analysis calls for a shift in thinking that embraces the notion that even small states can proactively participate in industrial upgrading by facilitating the growth of innovation-driven enterprises, engaging in diasporic trade and entrepreneurship, promoting strategic government procurement and going beyond aid for trade to engender aid for innovation.

Notes

1. CARICOM is a regional grouping of developing archipelagic states. It has 15 full members: Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat (UK), St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Suriname, and Trinidad and Tobago.
2. Kava originally derives from the root of a pepper plant. It has a distinctive taste and causes relaxing or euphoric feelings with symptoms such as numbness in the user's lips and tongue.
3. Source: http://www.tradeforum.org/article/A-strategy-to-support%2D%2Ddevelopment-in-the-Pacific/#sthash.jVM99wSq.dpuf

References

Amighini, A. (2006). Upgrading in International Trade: Methods and Evidence from Selected Sectors in Latin America. In C. Pietrobelli & R. Rabellotti (Eds.), *Upgrading to Compete: Global Value Chains and SMEs in Latin America* (p. 222). Washington, DC: IADB.

Commonwealth Secretariat. (2015). *The Commonwealth in the Unfolding Global Trade Landscape – Commonwealth Trade Review 2015*. http://thecommonwealth.org/commonwealth-unfolding-global-trade-landscape#sthash.ZZO4VbBy.dpuf

Commonwealth Secretariat. (2018). *Strengthening the Commonwealth Advantage: Trade, Technology, Governance – Commonwealth Trade Review 2018*. http://thecommonwealth.org/sites/default/files/inline/Strengthening_the_Commonwealth_9781849291798_UPDF.pdf

European Commission. (2014). *Fact Sheet on the Interim Economic Partnership Agreements, The Pacific: Papua New Guinea and Fiji*. European Commission.

Fiji Government. (2013). *Kava Export to Increase by 18,000 Kilos*. Retrieved May 26, 2015, from http://www.Fiji.Gov.Fj/Media-Center/Press-Releases/KAVA-EXPORT-TO-INCREASE-BY-18,000-KILOS.Aspx

International Trade Centre (ITC). (2013). *Trade Map: Trade Statistics for International Business Development*. Available at: http://www.trademap.org/Index.aspx. Accessed 7 Sep 2015.

International Trade Centre (ITC). (2014). *Input on the Objectives and Substantive Theme of the SIDS Conference*. Available at: http://goo.gl/f11T9F. Accessed 7 Sep 2015.

Lember, V., Kattel, R., & Kalvet, T. (2014). Public Procurement and Innovation: Theory and Practice. In V. Lember, R. Kattel, & T. Kalvet (Eds.), *Public Procurement, Innovation and Policy: International Perspectives* (pp. 13–34). Berlin: Springer.

Mercer-Blackman, V., & Melgarejo, K. (2013). *Spillovers of Global Shocks Over Caribbean Countries: So Large that There is Little Room to Manoeuvre an Impulse Response Analysis*. Washington, DC: IDB.

Morgan, W. (2013). *Growing Island Exports: High Value Crops and the Future of Agriculture in the Pacific*. Crawford School Research Paper No. 05/2013. Available at SSRN: http://ssrn.com/abstract=2371452 or https://doi.org/10.2139/ssrn.2371452

Nurse, K., & Greene, G. (2013). Aid for Trade and Economic Diversification: The Case of Barbados. In M. Jansen, M. S. Jallab, & M. Smeets (Eds.), *Connecting to Global Markets Challenges and Opportunities: Case Studies Presented by WTO Chair-holders* (pp. 159–176). Geneva: World Trade Organization (WTO).

Nurse, K. Francis, A., & Niles, K. (2008). The EPA and Beyond: The Case for Industrial and Innovation Policy. *The Bulletin* (Special Issue on the CARIFORUM-EU Economic Partnership Agreement), 70–104.

OECD/DAC. (2013). *OECD/DAC Aidflows Database*. Available at: http://www.aidflows.org/. Accessed 27 Sep 2015.

Pérez, C. (2010). Technological dynamism and social inclusion in Latin America: A resource-based production development strategy. *CEPAL Review*, 2010 (100): 121–141.

Pietrobelli, C., & Rabellotti, R. (2006). Clusters and Value Chains in Latin America: in Search of an Integrated Approach. In C. Pietrobelli & R. Rabellotti (Eds.), *Upgrading to Compete: Global Value Chains and SMEs in Latin America* (pp. 1–40). Washington, DC: IADB.

Shillingford-McKlmon, S., & Gayle-Sinclair, S. (2014). *CARICOM: Small Market–Big Money: Amalgamating The Procurement Market To Transform Small Size Into An Economic Advantage*. Washington, DC: Inter-American Development Bank.

UNCOMTRADE. (2015). *Trade Database*. http://comtrade.un.org/data/. Accessed 7 Sep 2015.

UNDP. (2018). *Human Development Indices and Indicators 2018 Statistical Update*. http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf

World bank. (2019). *World Development Indicators 2019*. Washington, DC: World Bank.

World Trade Organization (WTO). (2018). *Trade Profiles 2018*. Geneva: WTO.

CHAPTER 5

Tourism and Sustainable Growth in Small (Island) Economies

Harvey W. Armstrong and Robert Read

5.1 Introduction

The precarious economic and environmental situation of many small economies—and small islands in particular—has come to the fore since the 2008 global financial crisis along with the impacts of accelerating climate change. This conjunction represents a critical challenge to their strategies for sustainable growth, given their reliance upon international tourism. This chapter addresses the limited potential growth effects of tourism and its problematic environmental impacts.

H. W. Armstrong (✉)
Department of Geography, University of Sheffield, Sheffield, UK
e-mail: h.armstrong@sheffield.ac.uk

R. Read
Lancaster University Management School, Lancaster, UK
e-mail: r.read@lancaster.ac.uk

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_5

5.2 Constraints on the Growth of Small (Island) Economies

The principal constraints on the growth of small economies have been reviewed extensively in the literature (e.g., Robinson 1960; Jalan 1982; World Development 1980, 1993; Commonwealth Consultative Group 1985; UNCTAD 1988; Armstrong et al. 1998). The general consensus is that small economies, including small islands, face distinct challenges and constraints that greatly limit both their growth and available policy options.

These challenges include scarce natural resources, limited labour supplies and a small domestic economy which limit the attainment of economies of scale and so restrict the array of feasible economic activities, limit competition and render labour-intensive industrialisation inappropriate (Demas 1965; Thomas 1982). High unit costs of output and trade also inhibit R&D, innovation and technical progress (Selwyn 1975; Briguglio 1995). The need for output and export specialisation results in narrow economic structures that constrain diversification, so greatly increasing their exposure to exogenous shocks and balance of payments volatility. Significant asymmetries between the patterns of domestic production and consumption necessarily mean that small economies have highly open trade regimes (Kuznets 1960), lower long-run rates of growth and investment coupled with higher unemployment and external debt (Easterly and Kraay 2000; Guillaumont 2007). Integration with the global economy increases the extent of their market with possibly large potential growth multiplier effects (Ashoff 1989), provided they are internationally competitive. Apart from natural resources, comparative advantage in small economies mostly depends upon activities that are generally scale neutral and intensive in human capital (Bhaduri et al. 1982). The isolation and fragmentation of small remote island groups raise the costs of both internal and external trade. A further challenge is the 'brain drain', notably from Caribbean and Pacific islands, which is substantially greater than for larger countries (Docquier and Schiff 2008) although reversed for more prosperous European small economies (Armstrong and Read 1995).

Small economies also have greater susceptibility to natural hazards and environmental shocks (Briguglio 1995; Briguglio et al. 2006), with the longer term effects of climate change bringing more frequent tropical cyclones and sea surges, rising sea temperatures and increasing oceanic acidification stretching their adaptive capacities (Michel and Pandya 2010).

5.3 Explaining the Growth Performance of Small (Island) Economies

Empirical analyses have yet to find evidence of a significant adverse impact of small size or islandness on their growth (e.g., Armstrong et al. 1998; Armstrong and Read 2001; Read et al. 2012). Openness to trade enhances their domestic competitiveness and comparative advantage together with access to high technology imports. Large stocks of human capital, reflected in high *Human Development Indicators* scores (Briguglio 1995; Read 2018a), enhance their domestic productivity and strengthen their comparative advantage. Small economies in close proximity to relatively prosperous dynamic regions enjoy higher growth than those more distant from major markets (Armstrong et al. 1998; Armstrong and Read 2004). Good governance and institutional quality are also common features (Congdon Fors 2007, 2014; Read 2018a) that ensure the implementation of high quality growth-promoting policies. Many small economies appear to have successfully countervailed their growth challenges, given that they feature disproportionately in the top World Bank income categories (Armstrong et al. 1998; Read 2018a), through a combination of niche growth strategies (Baldacchino and Milne 1999; Armstrong and Read 2002) and openness to trade.

Up until the 2008 global financial crisis, small economies specialising in activities intensive in human capital and natural resources were particularly successful, notably niche off-shore financial services and tourism (Armstrong et al. 1998; Armstrong and Read 2001; Read et al. 2012), although their recovery has since been sluggish (Armstrong and Read 2018, 2020). The impacts of the Covid-19 pandemic in 2020 on many small economies, however, may be even more severe with a particularly adverse impact on international tourism but with beneficial environmental effects. The financial services sector, however, has dubious links with tax evasion and avoidance amid allegations of facilitating large-scale money laundering. Earnings from oil, minerals and fisheries, generate significant rents for some small economies but have limited local employment effects and may trigger 'Dutch' disease.

The expansion of tourism in small economies has been facilitated by the increasing availability of low-cost long haul flights and the popularity of cruises, which have improved the frequency of transport links with even very remote small island economies. Mass tourism is a potentially important component of the *Blue Economy*, depending primarily upon local endowments of sun, sea and sand but it embodies low levels of technology and know-how that require limited labour skills. Nevertheless, the tourism sector is a critically important source of employment in many small economies and this appears to underlie its role as the centrepiece of the growth and development strategies advocated by major international institutions, such as The IMF and World Bank (Hawkins and Mann 2007).

5.4 The Economic Impact of Tourism in Small (Island) Economies

Tourism is of critical importance to many small (island economies) in terms of export earnings and employment although its contribution to GDP and domestic value added is less significant, as is evident from the data presented in Table 5.1. The export and employment data show that tourism contributed more than 50 per cent of export earnings in 19 of these economies and accounted for more than 5 per cent of employment in 23 (more than 10 per cent in eight). The share of export earnings exceeded 75 per cent in nine small island economies; Antigua & Barbuda, The Bahamas, Dominica, Grenada, St Lucia and St Vincent & The Grenadines in the Caribbean along with Macau, The Maldives and Palau. The GDP and productivity data, however, reveal a very different picture; the contribution of tourism to GDP is greater than 10 per cent in just two of the 74 small economies in the table—Macau (13.6) and New Zealand (11.0)—while domestic value added per employee is generally extremely low, the only exceptions being some industrialised and oil economies. A fuller analysis of the growth benefits of tourism in small economies therefore requires deeper evaluation of its contribution to domestic value added through its employment and local multiplier effects.

5.4.1 The Employment Effects of Tourism

Employment is the most visible direct economic impact of tourism in host countries. From the table, island economies have a greater share of their labour force in tourism than other small economies. Foreign investment in the sector is argued to have a greater employment impact than local investment because the former focuses on high quality hotels and resorts with higher employee to guest ratios (Davidson and Sahli 2015). Labour productivity and wages in the sector are also generally higher than in

Table 5.1 Economic reliance on tourism in small economies

	Tourism/	*Tourism/*	*Employment*	*Labour*	*$ Value Added*
	GDP (%)	*Exports (%)*	*('000s)*	*Force (%)*	*per Employee*
	2015–17	*2015–17*	*2016–18*	*2016–18*	*2016–18*
Small Island Economies (40)					
Antigua & Barbuda	0.2	74.9	5.1	–	607
Aruba	0.8	68.9	14.6	–	1418
Bahamas	1.7	76.1	52.7	6.06	3966
Bahrain	1.4	13.5	25.2	2.90	20,010
Barbados	0.6	–	17.4	11.18	1599
Bermuda	0.3	33.2	3.0	–	5831
British Virgin Islands	0.3	–	2.6	–	–
Cabo Verde	0.3	56.7	36.9	14.08	149
Cayman Islands	0.3	–	3.4	–	3230
Comoros	0.0	–	6.4	2.97	52
Curaçao	–	34.9	–	–	–
Cyprus	1.5	20.7	25.8	4.22	13,339
Dominica	0.1	77.9	4.2	–	80
Fiji	0.7	46.6	41.1	11.61	868
French Polynesia	–	66.4	–	–	–
Grenada	0.1	84.0	3.1	–	283
Iceland	2.1	23.0	13.3	6.30	36,601
Jamaica	1.5	57.0	108.9	7.35	1996
Kiribati	0.0	8.3	2.1	–	18
Macau	13.6	89.0	106.0	27.74	64,529
Maldives	1.5	85.7	33.9	13.15	2133
Malta	1.7	8.6	29.7	13.50	7166
Marshall Islands	–	38.4	–	–	–
Mauritius	1.0	34.5	41.2	6.82	3142
New Caledonia	–	13.6	–	–	–
New Zealand	11.0	19.4	211.7	7.89	417,285
Palau	–	85.7	–	–	–
Puerto Rico	2.5	–	19.2	1.70	133,027
Samoa	–	60.5	–	–	–
Sao Tome & Principe	0.15	70.8	6.9	9.77	28
Seychelles	0.4	37.3	11.8	–	480
Sint Maarten	–	73.2	–	–	–
Solomon Islands	0.0	12.4	6.1	2.26	101

(*continued*)

Table 5.1 (continued)

	Tourism/	*Tourism/*	*Employment*	*Labour*	*$ Value Added*
	GDP (%)	*Exports (%)*	*('000s)*	*Force (%)*	*per Employee*
	2015–17	*2015–17*	*2016–18*	*2016–18*	*2016–18*
St Kitts & Nevis	0.1	63.4	1.6	–	372
St Lucia	0.2	81.1	19.6	19.82	201
St Vincent & Grenadines	0.1	75.8	2.5	4.26	160
Timor-Leste	–	60.8	–	–	–
Tonga	0.0	48.4	2.1	5.44	54
Trinidad & Tobago	0.8	7.0	23.8	3.57	7082
Vanuatu	0.1	78.9	11.0	8.97	109
Other Small Economies (34)					
Albania	1.1	51.4	93.2	7.05	1609
Armenia	0.5	28.4	43.5	3.16	1243
Belize	0.3	39.2	20.9	12.04	243
Bosnia & Herzegovina	0.5	12.5	23.2	1.73	3653
Botswana	0.7	8.7	26.0	2.49	4614
Brunei	0.2	2.6	5.3	2.48	5631
Costa Rica	2.9	19.9	104.2	4.49	16,450
Croatia	5.9	37.5	136.6	7.48	24,231
Djibouti	–	5.9	–	–	–
Estonia	1.0	10.5	26.1	3.74	10,073
Eswatini	0.1	0.7	8.6	2.36	719
Gabon	0.2	–	3.7	0.54	6844
Gambia	0.1	46.9	41.0	5.59	32
Georgia	1.3	36.8	134.3	6.63	1527
Guinea-Bissau	–	6.1	–	–	–
Guyana	0.1	5.8	8.4	2.64	396
Kuwait	3.3	1.4	55.5	2.35	72,820
Latvia	1.3	7.2	37.8	3.78	10,516
Lesotho	0.1	3.6	42.8	4.57	88
Lithuania	0.9	4.2	25.2	1.72	16,226
Luxembourg	1.0	3.7	5.9	2.02	111,895
Mauritania	–	1.7	–	–	–
Moldova	0.1	13.1	9.7	0.8	831
Mongolia	0.3	6.3	32.1	2.46	1160
Montenegro	0.5	55.0	14.6	5.63	1757
Namibia	0.4	10.7	23.6	2.57	2132

(*continued*)

Table 5.1 (continued)

	Tourism/ GDP (%)	*Tourism/ Exports (%)*	*Employment ('000s)*	*Labour Force (%)*	*$ Value Added per Employee*
	2015–17	*2015–17*	*2016–18*	*2016–18*	*2016–18*
North Macedonia	0.2	5.4	11.7	1.23	2035
Oman	2.2	7.0	71.3	2.76	22,323
Panama	3.5	24.3	116.3	5.90	18,425
Qatar	5.4	16.3	94.3	4.61	98,166
Slovenia	1.6	7.5	31.1	3.07	25,419
Suriname	0.1	4.3	2.5	1.17	686
Uruguay	2.2	15.0	57.0	3.25	21,310
West Bank & Gaza	–	10.5	–	–	–

Source: World Bank (2019a), *TCdata 360*, https://tcdata360.worldbank.org/indicators/tot.direct/ [accessed, 4 December 2019]; World Bank (2019b), https://databank.worldbank.org/ [accessed 5 December 2019]

Note: Table only includes those countries and territories with populations less than 5 million in 2018 for which data is available

–, data not available

alternative (traditional) activities, notably agriculture (Oxford Economics 2011).

The skill content—and therefore productivity/wage—of tourism sector employment can be calculated by dividing the share of tourism in GDP value by employment in the sector. As mentioned above, labour productivity in tourism is extremely low, especially in many small island economies, owing to its heavy reliance on low-skill employees. Growth in the sector is therefore unlikely to stem the out-migration of skilled workers.

5.4.2 *The Domestic Multiplier (Linkage) Effects of Tourism*

The impact of tourism on host country growth depends upon the generation of direct and indirect multiplier effects through increased demand for local goods and services. Such inter-sectoral linkages, however, are greatly constrained by both the narrowness and shallowness of domestic economic activity in small economies (Read 2005). Tourism is heavily dependent upon imports such that potential domestic value added is often eroded by high levels of 'leakages'. International-standard hotels usually require expertise not locally available and usually rely upon inflows of foreign investment and know-how by global chains which possess extensive booking networks that co-ordinate holiday packages. This leads to further leakages of tourist expenditure as payments for expatriate employees, fees, royalties and profits. The growth multiplier effects of tourism in small economies are therefore often very low with only limited local value added (Archer and Fletcher 1996; Cai et al. 2006; Pratt 2015; Read 2018b), hence its limited contribution to GDP. Leakages are estimated to be 70 to 90 per cent in the Caribbean (Patullo 1996), high in Cabo Verde owing to significant supply constraints on locally sourced food and drink (Mitchell 2008) but less than 50 per cent in The Gambia owing to greater expenditure on locally sourced food, transportation and other purchases (Mitchell and Faal 2008). A growing policy literature is addressing ways to improve the net contribution of tourism to the economies of host countries (Lejàrraga and Walkenhorst 2007, 2010; UNCTAD 2007), by fostering local supply linkages and reducing import dependence.

Tourism may have further beneficial growth effects via knowledge transfers to local employees and there is evidence of extensive training of indigenous managers and high mobility between foreign-owned and local hotels in some developing countries (UNCTAD 2007). There is also evidence of competition effects in the sector. UNCTAD (2007) reports positive efficiency effects of foreign-owned establishments on local hoteliers in Mauritius although local investors are also being 'crowded-out', so reducing domestic participation in the sector (Seetanah and Khadaroo 2009).

5.5 The Social Impacts of Tourism in Small (Island) Economies

The social impacts of tourism relate to its effects on the socio-cultural environments of host countries, including 'internal' shocks and dislocation (Jackson 1986). Tourism growth increases pressure on limited domestic infrastructure and resources, including hospitals, water and power supplies, waste disposal, sewerage and security.

Analyses of the social dimensions of tourism include reviews of the 'carrying capacity' of economies to absorb large numbers of visitors. This approach was formalised as the tourism density ratio (Lindberg 1974), incorporating overnight visitors and other variables relative to the numbers of inhabitants, notably visitors per thousand population per square kilometre (Harrison 1992) and a daily visitor ratio (de Albuquerque and McElroy 1992). The Tourism Penetration Index establishes critical visitor thresholds for a host country using three initially unweighted variables—per capita tourist spend (subsequently given a 50 per cent weighting), average daily tourist density per 1000 population and number of hotel rooms per square kilometre (McElroy and de Albuquerque 1998). One striking finding of this study was that non-sovereign Caribbean economies tended to have much higher penetration ratios than sovereign ones.

McElroy's concept of small island tourism economies (SITEs) describes the expansion of the tourism sector as an explicit development strategy for small economies (McElroy 2006). This approach maps tourism penetration onto the life-cycle of tourism development (Butler 1980) for 36 small island economies. The most successful are argued to be those with socio-economic characteristics associated with high incomes, notably Caribbean islands, while the least successful are larger islands, primarily in the Indian and Pacific Oceans (McElroy 2003). McElroy and Hamma (2010) find that 27 socio-economic and demographic variables have a strong positive correlation with the degree of tourism penetration.

None of these analyses, however, estimate qualitative or quantitative limits to the social carrying capacity thresholds of host countries or consider directly the adverse economic and social impacts of tourism. The principal conclusion of these studies is to advocate tourism expansion, almost regardless of its economic, social and environmental consequences.

5.6 The Environmental Impacts of Tourism in Small (Island) Economies

Increasing awareness of the environmental impacts of tourism and climate change have stimulated the growth of sustainable and eco-tourism as well as influencing policy formulation. The focus of this discussion is the specific impacts of tourism on the environment and the existential threat of climate change on many small islands.

Much of the extensive theoretical, conceptual and empirical literature on the environmental impacts of tourism is devoted to the optimal design, implementation and evaluation of environmentally sustainable policies in host economies. Environmental analyses tend to focus on the impacts of visitor numbers on roads, airports, power supplies, waste disposal etc. since infrastructural provision has tended to expand as tourist numbers have increased, so affecting land-use and the sector's environmental footprint.

Tourism also places stress on the natural environment; many small islands possess critical landscapes, habitats, fragile ecologies and unique bio-diversities. Coral reefs and mangroves are vital defences against coastal erosion and increasingly frequent extreme weather conditions, leading to growing concern about the environmental absorptive capacity of tourism.

Many small tourism-dependent economies have encouraged the growth of sustainable tourism to reduce the sector's environmental and, possibly, social impacts. Community environmental guardianship has given local stakeholders a greater incentive to ensure the long-run benefits and sustainability of tourism and encouraged deeper linkages with local businesses. Eco-tourism is a more rigorous form of sustainable tourism; it is small-scale, low-impact, and socially and environmentally responsible as well as encouraging linkages with local communities via payments for accommodation, food and transport.

Protecting biodiversity hotspots from tourism, however, is a necessary but insufficient condition for conservation although the primary economic and social threats are not being addressed (Gössling 1999). Sustainable and eco-tourism can reduce the adverse social and environmental impacts—there has been a decline in the per capita carbon footprint of tourism but this has been outweighed by underlying growth in the sector (Lenzen et al. 2018). A major challenge for many host economies, and small islands in particular, is that sustainable tourism necessitates a trade-off between greater local growth multiplier effects and lower tourist numbers coupled with reduced employment.

Tourism is responsible for around 5 per cent of global carbon dioxide emissions, some 90 per cent of which is attributable to air travel (UNWTO 2008) and comprises 50 per cent of civil aviation fuel consumption (Gössling 2000). Long-haul aviation is particularly problematic because most emissions occur at high altitude and so have a greater effect on the ozone layer. Full mitigation of long-haul tourism emissions in 2000 would have required afforestation of around 28,800km^2 (Gössling 2000). First Class and Business air travel produce per capita emissions three times those of Economy (Bofinger and Strand 2013) while those of private aircraft are between four and 15 times greater (Beevor 2019). Any credible policy strategy to take into account the full environmental cost of tourism must therefore, by necessity, eliminate long-haul air travel since its carbon footprint is essentially unsustainable (Gössling, et al. 2002).

Up until the 2020 Covid-19 pandemic, cruise ship tourism was the fastest growing tourism market segment. Its economic benefits to host destinations are increased expenditure on local goods and services although the social impacts may not be so positive; Skagway (Alaska) has a resident population of around one thousand but receives upwards of 10,000 daily cruise visitors (Klein 2011). The economic and environmental impacts of cruise ship tourism include discharges of hazardous pollutants and destructive non-native species (Johnson 2002). The 47 ships of *Carnival Corporation*, the world's largest cruise operator, emitted ten times more sulphur dioxide in 2017 than all 260 million cars in Europe (Transport & Environment 2019).

The greatest threat to sustainability, however, is probably the impact of exogenous climatic shocks that result in a switch to non-sustainable behaviour (Casagrandi and Rinaldi 2002). Not only are sustainable policies difficult to achieve in practice but they can, at best, only delay catastrophe. The UN World Tourism Organization suggests blandly that future sustainability depends upon how tourism reacts to climate change (UNWTO 2008).

5.7 Summary and Conclusions

Tourism is a fundamental part of the problem of environmental sustainability rather than a potential solution. Small tourism-dependent economies in particular face a pressing need to undertake a radical reassessment of their growth strategies in the light of climate change and environmental threats. The socio-economic challenge facing small island economies is the critical trade-off between achieving environmental objectives and long-term sustainability against the loss of a major source of domestic employment. The *Blue Economy* may offer possible ways forward by providing new opportunities for diversification that might also reduce economic volatility and so improve the stability of their growth paths. The scale of global environmental problems—declining ocean health, coastal and marine ecosystem degradation and over-fishing—however, means that there is no guarantee that this will be a panacea (Rustomjee 2017). The challenge for these many small economies is to harness the sustainable potential of the *Blue Economy* for growth while not further damaging or, better still, enhancing the environment.

Acknowledgements Grateful thanks are due to Michael Shelly, University of Buffalo, New York, for his insights and to Eilidh Read for data assistance.

References

Archer, B., & Fletcher, J. (1996). The Economic Impact of Tourism in the Seychelles. *Annals of Tourism Research, 23*(1), 32–47.

Armstrong, H. W., & Read, R. (1995). Western European Micro-States and EU Autonomous Regions: The Advantages of Size and Sovereignty. *World Development, 23*(8), 1229–1245.

Armstrong, H. W., & Read, R. (2001). Explaining Differences in the Economic Performance of Micro-States in Africa and Asia. In P. Lawrence & C. Thirtle (Eds.), *Africa & Asia in Comparative Development* (pp. 128–157). Basingstoke: Palgrave.

Armstrong, H. W., & Read, R. (2002). The Importance of Being Unimportant: The Political Economy of Trade and Growth in Small States. In S. M. Murshed (Ed.), *Issues in Positive Political Economy* (pp. 71–88). London: Routledge.

Armstrong, H. W., & Read, R. (2004). Small States and Small Island States: Implications of Size, Location and Isolation for Prosperity. In J. Poot (Ed.), *On the Edge of the Global Economy: Implications of Economic Geography for Small & Medium-Sized Economies at Peripheral Locations* (pp. 191–223). Cheltenham: Edward Elgar.

Armstrong, H. W., & Read, R. (2018). The Impacts of the 2008 Global Financial Crisis on the Economic Performance of Caribbean States. *Canadian Journal of Latin American & Caribbean Studies, 43*(3), 394–416.

Armstrong, H. W., & Read, R. (2020). Size and Sectoral Specialisation: The Asymmetric Impacts of the 2008 Crisis and Its Aftermath. *Journal of International Development, 32.*

Armstrong, H. W., Jouan de Kervenoael, R., Li, X., & Read, R. (1998). A Comparison of the Economic Performance of Different Micro-States and Between Micro-States and Larger Countries. *World Development, 26*(4), 539–556.

Ashoff, G. (1989). *Economic and Industrial Development Options for Small Third World Countries* (Occasional Paper, No. 91). Berlin: German Development Institute.

Baldacchino, G., & Milne, D. (Eds.). (1999). *A Political Economy for Small Islands: The Resourcefulness of Jurisdiction*. Basingstoke: Macmillan.

Beevor, J. (2019). *Jet, Set & Go – Technical Report: UK Business Aviation Market: Potential for Electrification*, Fellow Travellers/Common Wealth (*Mimeo*). https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/Technical+Report.pdf. Accessed 10 Dec 2019.

Bhaduri, A., Mukherji, A., & Sengupta, R. (1982). Problems of Long-Term Growth in Small Economies: A Theoretical Analysis. In B. Jalan (Ed.), *Problems & Policies in Small Economies* (pp. 49–68). Beckenham: Croom Helm, for the Commonwealth Secretariat.

Bofinger, H., & Strand, J. (2013). *Calculating the Carbon Footprint from Different Classes of Air Travel* (World Bank Policy Research Working Paper, No. 6471). Washington, DC: The World Bank.

Briguglio, L. (1995). Small Island Developing States and Their Economic Vulnerabilities. *World Development, 23*(10), 1615–1632.

Briguglio, L., Cordina, G., & Kisanga, E. J. (Eds.). (2006). *Building the Economic Resilience of Small States*. London: Commonwealth Secretariat.

Butler, R. W. (1980). The Concept of a Tourist Area Cycle of Evolution: Implications for Management of Resources. *Canadian Geographer, 24*(1), 5–12.

Cai, J., Leung, P.-S., & Mak, J. (2006). Tourism's Forward and Backward Linkages. *Journal of Travel Research, 45*(1), 36–52.

Casagrandi, R., & Rinaldi, S. (2002). A Theoretical Approach to Tourism Sustainability. *Conservation Ecology, 6*(1), 1–15.

Commonwealth Consultative Group. (1985). *Vulnerability: Small States in the Global Society*. London: Commonwealth Secretariat.

Congdon Fors, H. (2007). *Island Status, Country Size and Institutional Quality of Former Colonies* (Working Papers in Economics, No. 257). Handelshogskolan: Goteborg University.

Congdon Fors, H. (2014). Do Island States Have Better Institutions? *Journal of Comparative Economics, 42*(1), 34–60.

Davidson, L., & Sahli, M. (2015). Foreign Direct Investment in Tourism, Poverty Alleviation and Sustainable Development: A Review of the Gambian Hotel Sector. *Journal of Sustainable Tourism, 23*(2), 167–187.

de Albuquerque, K., & McElroy, J. L. (1992). Caribbean Small-Island Tourism Styles and Sustainable Strategies. *Environmental Management, 16*, 619–632.

Demas, W. G. (1965). *The Economics of Development in Small Countries: With Special Reference to the Caribbean*. Montreal: McGill University Press.

Docquier, F., & Schiff, M. (2008). *Measuring Skilled Emigration Rates: The Case of Small States* (IZA Discussion Paper, No. 3388). Berlin.

Easterly, W., & Kraay, A. (2000). Small States, Small Problems? Income Growth and Volatility in Small States. *World Development, 28*(11), 2013–2027.

Gössling, S. (1999). Ecotourism – A Means to Safeguard Biodiversity and Ecosystem Functions? *Ecological Economics, 29*, 303–320.

Gössling, S. (2000). Sustainable Tourism Development in Developing Countries: Some Aspects of Energy-Use. *Journal of Sustainable Tourism, 8*(5), 410–425.
Gössling, S., Borgström Hansson, C., Hörstmeier, O., & Saggel, S. (2002). Ecological Footprint Analysis as a Tool to Assess Tourism Sustainability. *Ecological Economics, 43*(2-3), 199–211.
Guillaumont, P. (2007). *Assessing the Economic Vulnerability of Small Island Developing States and the Least Developed Countries'* (UNU-WIDER Research Paper, No. 2007/40). Helsinki. Revised Version in *Journal of Development Studies, 46*(5), 828–854, 2010.
Harrison, D. (Ed.). (1992). *Tourism & the Less Developed Countries.* Chichester: Wiley.
Hawkins, D., & Mann, S. (2007). The World Bank's Role in Tourism Development. *Annals of Tourism Research, 34*(2), 348–363.
Jackson, I. (1986). Carrying Capacity in Small Tropical Caribbean Islands. *Industry & Environment, 9*(1), 7–10.
Jalan, B. (Ed.). (1982). *Problems & Policies in Small Economies.* Beckenham: Croom Helm for the Commonwealth Secretariat.
Johnson, D. (2002). Environmentally Sustainable Cruise Tourism: A Reality Check. *Marine Policy, 26*, 261–270.
Klein, R. A. (2011). Responsible Cruise Tourism: Issues of Cruise Tourism and Sustainability. *Journal of Hospitality & Tourism Management, 18*, 107–116.
Kuznets, S. (1960). The Economic Growth of Small States. In E. A. G. Robinson (Ed.), *The Economic Consequences of the Size of Nations* (pp. 14–32). London: Macmillan.
Lejàrraga, I., & Walkenhorst, P. (2007). *Diversification by Deepening Linkages with Tourism*. Washington, DC: World Bank (*Mimeo*).
Lejàrraga, I., & Walkenhorst, P. (2010). On Linkages and Leakages: Measuring the Secondary Effects of Tourism. *Applied Economic Letters, 17*(5), 417–421.
Lenzen, M., Sun, Y., Faturay, F., & Malik, A. (2018). The Carbon Footprint of Global Tourism. *Nature Climate Change*. https://doi.org/10.1038/s41558-018-0141-x.
Lindberg, D. E. (1974). Caribbean Tourism: Social and Racial Tensions. *Cornell Hotel & Restaurant Quarterly, 15*(1), 82–87.
McElroy, J. L. (2003). Tourism Development in Small Islands Across the World. *Geografiska Annaler, Series B, Human Geography, 85*(4), 231–242.
McElroy, J. L. (2006). Small Island Tourist Economies Across the Life Cycle. *Asia Pacific Viewpoint, 47*(1), 61–77.
McElroy, J. L., & de Albuquerque, K. (1998). Tourism Penetration Index in Small Caribbean Islands. *Annals of Tourism Research, 25*(1), 145–168.
McElroy, J. L., & Hamma, P. (2010). SITEs Revisited: Social and Demographic Contours of Small Island Tourist Economies. *Asia Pacific Viewpoint, 51*(1), 36–46.

Michel, D., & Pandya, A. (2010). Introduction. In D. Michel & A. Pandya (Eds.), *Coastal Zones & Climate Change* (pp. ix–xii). New York: The Henry L. Stimson Center.

Mitchell, J. (2008). *Tourist Development in Cape Verde: The Policy Challenge of Coping with Success*. London: ODI.

Mitchell, J., & Faal, J. (2008). *The Gambian Tourist Value Chain and Prospects for Pro-Poor Tourism* (ODI Working Paper, No. 289). London: ODI.

Oxford Economics. (2011). *Methodology for Producing the 2011 WTTC/OE Travel & Tourism Economic Impact Research*. London: Oxford Economics.

Patullo, P. (1996). *Last Resorts: The Cost of Tourism in the Caribbean*. London: Cassell.

Pratt, S. (2015). The Economic Impact of Tourism in SIDS. *Annals of Tourism Research, 52*, 148–160.

Read, R. (2005). FDI and the Creation of Local Linkages in Small States, *World Bank Knowledge Brief*. Sydney: FIAS/The World Bank.

Read, R. (2018a). Small Is Beautiful: Country Size and National Wellbeing in Small Economies. In L. Briguglio (Ed.), *Handbook of Small States* (pp. 386–402). London: Routledge.

Read, R. (2018b). The Determinants and Growth Effects of Foreign Direct Investment in Small Economies. In L. Briguglio (Ed.), *Handbook of Small States* (pp. 287–309). London: Routledge.

Read, R., Armstrong, H. W., & Picarelli, N. (2012). *Binding Growth Constraints in Small Island Economies: Evidence Focusing on the Organisation of Eastern Caribbean States*, Report for the Latin American & Caribbean Section. Washington, DC: World Bank.

Robinson, E. A. G. (Ed.). (1960). *The Economic Consequences of the Size of Nations*. London: Macmillan.

Rustomjee, C. (2017). *Operationalizing the Blue Economy in Small States: Lessons from Early Movers* (Policy Brief No. 117). Waterloo: Centre for International Governance Innovation.

Seetanah, B., & Khadaroo, J. (2009). An Analysis of the Relationship Between Transport Capital and Tourism Development in a Dynamic Framework. *Tourism Economics, 15*(4), 785–802.

Selwyn, P. (1975). Industrial Development in Peripheral Small Countries. In P. Selwyn (Ed.), *Development Policy in Small Countries* (pp. 77–104). Beckenham: Croom Helm.

Thomas, I. (1982). The Industrialisation Experience of Small Economies. In B. Jalan (Ed.), *Problems & Policies in Small Economies* (pp. 103–124). Beckenham: Croom Helm.

Transport & Environment .(2019). *One Corporation to Pollute Them All, Transport & Environment*. https://www.transportenvironment.org/sites/te/files/pub-

lications/One%20Corporation%20to%20Pollute%20Them%20All_English.pdf. Accessed 10 Dec 2019.
UNCTAD. (1988). *Specific Problems of Island Developing Countries*. Geneva: UNCTAD.
UNCTAD. (2007). *FDI in Tourism: The Development Dimension*. Geneva: UNCTAD.
UNWTO. (2008). *Climate Change & Tourism: Responding to Global Challenges*. Madrid: UNWTO.
World Bank. (2019a). *TCdata 360*. https://tcdata360.worldbank.org/indicators/. Accessed 4 Dec 2019.
World Bank. (2019b). https://databank.worldbank.org/. Accessed 5 Dec 2019.
World Development. (1980). The Development Problems of Small Island States, Special Issue, *8*(12), 929–1059.
World Development. (1993). The Special Problems of Small States, Special Issue, *21*(2), 191–318.

PART II

Social Dimensions

CHAPTER 6

Democracy and Social Empowerment in Small Island Jurisdictions

Peter E. Buker and Mark Lapping

6.1 Introduction

This chapter addresses the question of how we can describe the prospects for democracy and for social empowerment in small island jurisdictions in response to a constellation of possible future changes in the physical, social, economic, and political circumstances of these islands. We offer conceptual explanations of what we regard as the primary factors eliciting changes in small island autonomy found in jurisdictional democracy and social empowerment. Our starting point is the dichotomously opposed tendencies in international politics of the processes of integration and fragmentation of jurisdictional powers.

P. E. Buker (✉)
Yorkville University, Fredericton, NB, Canada

University of Prince Edward Island, Charlottetown, PE, Canada

M. Lapping
University of Prince Edward Island, Charlottetown, PE, Canada

University of Southern Maine, Portland, ME, USA
e-mail: mlapping@maine.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_6

We seek to explain the future of democracy and social empowerment first by describing the phenomena of integration and fragmentation in its relevance to small island jurisdictions. We go on to articulate what jurisdictional democracy and social empowerment mean within the specific context of small island vulnerability in their global contexts. The unique attributes of small islands *qua islands* are discussed, differentiating between the civil society-based ideas of social empowerment versus formalized jurisdictional democracy. We discuss the phenomenon of remoteness of small islands and the constraints and opportunities it creates for jurisdictional autonomy. Given we are investigating social and political dimensions for the future of small islands, we include a discussion of what we coin the *new authoritarianism*, a trend in human organization that may very well have profound impacts on small island jurisdictions. This chapter looks at the variable responses to change, including how we might usefully model our predictions with respect to extreme global changes. Finally, by way of addressing the overall intention of this monograph which is to find a roadmap for sustainable development for small island jurisdictions, this chapter offers suggestions as to what *may* happen in the future, and only indirectly answers what will be sustainable.

6.2 Integration and Fragmentation

All small islands are subject to the same two conflicting political processes of *integration* and *fragmentation* that are present for all state-like jurisdictions globally. Small island jurisdictions, however, are also defined by relatively smaller scale and often by geographic remoteness.

Integration is the process or state-of-being whereby the sovereignty of certain policy instruments of a jurisdiction is incorporated with that of other jurisdictions. In the case of small island jurisdictions, this may often be about incorporating with larger non-island states, but can also include integrating organizations with other small islands, such as the Caribbean Community (CARICOM), which involves 28 island jurisdictions. The degree of integration varies in scope from customs unions to complete shared sovereign powers, and tends to evolve (and devolve) similar to the history of the European Union. Integration typically exchanges greater economic opportunity for decreased or shared sovereignty and in many ways reflects the internationalization of capital markets. For small island jurisdictions, their level of integration can vary from the lower integration of an independent sovereign state to the status of a colony or a protectorate.

Fragmentation, on the other hand, is the process and state-of-being where a small island jurisdiction is cut off, either by choice or by fortune, from being a part of other jurisdictions. Fragmentation has the same consequences as decolonization and secession, but can occur for reasons that are not necessarily political, and indeed, fragmentation can be a social and economic phenomenon as well.

Hitherto we have referred only to 'jurisdictions' rather than 'states', for the measure of political autonomy among small islands varies enormously, spanning from actual UN-recognized state status to being almost entirely integrated into the polity of a larger state. This is part of the integration-fragmentation nexus that is crucially important to explaining and describing the level of democratization and social empowerment in small island jurisdictions. From a practical point of view, there are two salient variables that matter: one is the level of decision-making autonomy allowed the island jurisdiction relative to *all* powers, political, social, and economic, and the second is the manner in which the domestic or internal polity of the island itself is conducted—whether it follows democratic principles or is some form of oligarchy.

In general, all other things being equal, political integration, even integration with a democracy, will decrease democracy and social empowerment in a small island jurisdiction, while political fragmentation—that is autonomy—will increase democracy and social empowerment in a small island jurisdiction. This rule-of-thumb, however, is not always obvious. For example, the *institutions* of democratic autonomy may exist in a constitutional sense, with free and fair elections, and with citizens actually making the best decision for their wellbeing, but, the real exercise of choice is so circumscribed by other non-political factors as to be no choice at all. Small island jurisdictions can have—and often do have—all of the mechanisms and practices of *democracy* but are so vulnerable economically or militarily that the choice is functionally a *forced choice*. Whether we still want to define this as 'democracy' depends upon our purpose; in any case, we cannot say that there is *social empowerment*, to use our other key definitional term. Social empowerment is derived from the ability to make autonomous decisions.

6.3 Democracy, Social Empowerment, and Vulnerability

The political structures—including the degree of democracy interpreted in its widest sense of governing authority derived from the citizenry—and the degree of 'social empowerment', interpreted as autonomy of informal policy creation and implementation in the civil society, are in small island jurisdictions more likely to be functionally driven by non-political structures than in larger and non-island jurisdictions. The reasons for this are that the decision-making distance between functional needs and causes, and the political decision makers is shorter; decision-making is more transparent and less subject to obfuscation by large-scale attributes of multiple levels and large numbers of participants because of the small scale. On the whole, the functional imperatives of the limited resource base of most small island jurisdictions create a heightened criticality/vulnerability for all political decisions affecting citizen well-being.

Small island jurisdictions tend to be much more vulnerable economically and socially when we compare them to larger jurisdictions and to non-island small jurisdictions. Larger jurisdictions, by virtue of their larger scale, are by definition more diverse in terms of their natural resource base, their human resource base, and in their human-created capital base. In contrast, small island jurisdictions often rely on a handful of export commodities, or sometimes even solely on a single export commodity with many extreme instances, such as the Marshal Islands' near-100% reliance on coconut oil as their export.

Small island jurisdictions are also far more vulnerable based on their spatial relation to commodity markets compared to small land-based jurisdictions as export and import products must be shipped over greater distances and, in the case of most low-value high-weight commodities, be transferred between water-based transport and land-based transport at both ends of the commodity's movement. The *friction* of movement of export and import goods including administration and management costs is greater. Also, small island jurisdictions typically do not have the scale of shipping to justify large automated ports and handling facilities, unlike the enormous global shipping traffic of large container ships and bulk carriers moving between continents. Indeed, many small island jurisdictions are not geographically blessed with deep-water ports or well-protected ship harbours and are increasingly susceptible to global climate change and coral reef destruction.

Thus, in *functional* terms, many small island jurisdictions are economically vulnerable both in an 'all eggs in one basket' sense and in the friction of product movement sense. This economic vulnerability affects the degree of democracy and the degree of social autonomy a small island jurisdiction can usefully exercise.

Small island export products are vulnerable mostly because of their small economic scale and the lower levels of economic development, which means export products are unprocessed or only partly processed; it is a truism in international commerce that traded goods that are more processed, refined, or complex give more market power to their producers compared to producers of less sophisticated traded products. Primary production has, in the supply-and-demand mechanisms of economics fuelled by scarcity, far less market power than secondary production. And, sophistication occurs with economies to scale—particularly in technology and in business finance—making larger jurisdictions and larger corporate entities more powerful in their command over trade markets.

Power arguably rests in the symmetry or asymmetry of economic interdependence (Keohane and Joseph 1977), and small island jurisdictions are often, in the hierarchy of a production process, asymmetrically interdependent. That is, they are *relatively* less powerful.

When we look at small island jurisdictional trade in terms of *services*, the level of vulnerability is also relatively higher than in non-island jurisdictions and in larger jurisdictions. Many small islands, particularly tropical islands, rely very heavily on tourism as an export and as a key domestic activity (Lapping 2015). Tourism is a highly competitive global industry that is subject to the vagaries and changes in consumer discretionary spending powers and fickle consumer trends as well as to international air carrier and cruise ship industry decisions. Culturally and socially tourism can arguably limit social empowerment and, within certain parameters, it can be pejoratively likened to cultural prostitution. The money tourism brings in may not offset the cultural damage and social *disempowerment* it potentially causes.

6.4 Social Empowerment Versus Democratic Jurisdiction

Above we have explored the concept of political power in small island jurisdictions as being functionally derived from mostly economic power; that is, the scope of political autonomy or dependency is functionally related to the amount of market power a small island wields relative to other jurisdictions. In many ways, political democracy and social empowerment go hand-in-hand in achieving the same self-determining autonomy. However, there are many more dimensions to the concept of social empowerment than just what is circumscribed by either the political structure or by a small island jurisdiction's status among other jurisdictions.

Social empowerment is still about *power*, but that power may be found in the civil society and may involve non-material assets that are not always obvious to outsiders. Barry Buzan notably defined a state as being based upon the physical basis of the state, the institutions of the state, and, perhaps most presciently in terms of small island jurisdictions, the *idea* of the state (Buzan 1983). In terms of small island jurisdictions, the *idea* of the island and of its separateness from other land masses and jurisdictions is fundamentally significant. Small islands typically are constituted by relatively homogeneous cultures and social norms, and in many cases, citizens are genetically related. The boundary of water—even if historically it constituted a superior pathway of communication to the outside world—is still a boundary. It is visual, physical, visceral, and mental—a threshold with no comparable attributes among land-bound jurisdictions. Citizens of small islands arguably have a more defined sense of territory and thus belongingness than non-islanders. How this sense of self in place affects social empowerment is best thought of as a psychological or even a spiritual attribute rather than a material characteristic. The physical watery boundary creates a compare-and-contrast mental phenomenon that both strengthens self-identity and solidifies island citizen unity.

To underpin social empowerment, there first needs to be a social sensibility, and this is found in geographically circumscribed small and sometimes dense populations that typify small island jurisdictions. Shared values enable cooperation, and cooperation is necessary for social empowerment. This pathway to social empowerment is most obvious when we compare small island jurisdictions to non-island or larger jurisdictions; in these latter cases the competition-cooperation scale tips towards competition with a weakened sense of place, a weakened homogeneity of culture, and a greater scope for anonymous zero-sum power relations.

Social empowerment on the level of civil society, therefore, is likely to be very high in small island jurisdictions. The only limitation in terms of power in general then is about the demarcation between civil society, the political realm, and economic power. Still, it is reasonable to expect that strong kinship-type relations and ethnic commonality will result in a high degree of mutuality and reciprocity in all forms of citizen relations.

6.5 Remoteness and Power

One key attribute of small islands is that they are remote; small islands have survived the onslaught of a globalized culture and economy better than differently configured jurisdictions in part because they have been hidden from the view and attention of larger political, cultural, and economic powers. The very unimportance of small island jurisdictions in the varied realms of global competition and domination has, historically, been one of the saving attributes in terms of preserving island culture and independence. Island jurisdictions that are still legal dependencies of old colonial powers are well-known to cost their former colonial masters more than they return in revenue. Tourists flock to small islands precisely because they have preserved something 'different' compared to an increasingly homogenous global cultural landscape. Again, smallness and remoteness have protected these jurisdictions because of their *unimportance* by global state-power standards. And, in many ways, the costs of paying attention to small island jurisdictions on behalf of middle and large global powers has in the past simply been too high to make them worth bothering about.

The future may very well lead to far lower costs of attention, decreased remoteness, and perhaps a renewed interest in integrating small island jurisdictions with larger states *or* with other larger supranational bodies. The fragmentation-integration phenomenon is not only happening in the political realm, but increasingly *all* states are subject to integration in economic and cultural aspects, more so now because technologies have enabled this. While future speculation is just that—speculation—it does seem likely that the inexorable movement towards globalization of capital markets and towards the attendant unifying of cultures will continue.

6.6 The New Authoritarianism

Given we are discussing specifically the future prospects of democracy and social empowerment in small island jurisdictions, we must acknowledge and explain the possible effects that the *new authoritarianism* may have. We are using the term *new authoritarianism* here to describe a constellation of factors—both intended and unintended/structural—that are arguably moving all polities and societies away from democracy, in its most all-embracing sense and towards political, social, and economic systems that do not respect citizen autonomy in decision-making, but, rather, make decisions for citizens. We use the adjective *new* because of the changed locus of power and power instruments used compared to traditional historic structures of authoritarianism. Contemporary scholarship variously also tries to analyse the retreat from democracy using the terms inverted totalitarianism (Wolin 2008), illiberal democracy (Zakaria 1997) and others, to describe a blend of what we would consider a combination of corporatism and technocracy. In the past, authoritarian political structures were overtly created in only the political realm based on either the manipulation of existing laws or a monopoly on physical violence, or both. In the extreme, authoritarian governments became totalitarian as they controlled all aspects of citizens' lives. The difference between then and now is that the instruments of political, social, and economic control are both more powerful and more insidious. The power of control has increased as a consequence of accretion of complex power instruments to fewer and fewer government or capitalist entities, mostly attributable to digitized information and processing technologies.

The system is more insidious because of the sophistication of control exercised over individual thought and over public discourse based again on a technological control. At its most benign we might consider that what democracy had historically existed in the world has been sliding into technocracy that is mostly amoral and without an agenda beyond technological efficiency and material production. In this sense, we could think of new authoritarianism as simply inadvertent and unintended. That being said, footloose global capitalism has historically demonstrated the ability to make or break dependent and vulnerable small island jurisdictions and the indifference of new authoritarian structures may exacerbate these kinds of effects.

Furthermore, however, the very existence of technologically created instruments enabling economic and social authoritarian/totalitarian policies may very well lead to a *led* movement away from democracy and towards other types of governance structures such as dictatorship or theocracy.

6.7 Responses to Change

As technological advances at a geometric rate *à la* Moore's Law, or perhaps as the world approaches the 'all bets are off' point of technological singularity, democratic values and processes may, in reflection, be too slow and unwieldy to deal with accelerating changes and challenges, and governance, by default, will be done as a technocracy. There is also, however, potential for small island jurisdictions to leapfrog large jurisdictions because of the criticality of their vulnerabilities and because of their pliancy attributable to their small size. Democratization—the derivation of political authority from the citizenry—has historically worked well in non-crisis situations where changes in society and the economy occur at a relatively slow rate.

Democracy has, as its unique strength, relatively low costs of voluntary mass citizen compliance to governance and the vigorous potency of enabling diverse and inventive ideas. But democracy's very messiness in terms of obtaining consensus is historically known to be undervalued by those same citizen masses. In a situation where self-help is possible or needed—as in a climate-caused crisis—the underpinnings of social empowerment found in the sense of islandness and the commonality it fosters—may be increased and prove to be a valuable asset. At a certain threshold, however, the vulnerabilities of small island jurisdictions, based on the lack of diversity intrinsic to small jurisdictions with poor physical access to outside resources, may very well overwhelm the small island jurisdiction's population.

There are, indeed, two possible 'future' scenarios for small island jurisdictions. One is that they are very much a canary in the coal mine, and like a canary they are particularly fragile and vulnerable. Any severe stresses, such as climate change or technologies that destroy the protecting insular boundaries, might lead to their demise.

The second scenario is, however, that improvements in technology may productively integrate and diversify small island economies into the global system, allowing them more agility and choice. Even if this is the case, however, it is unlikely that integration will occur without strings attached, and the needed underpinnings for both democracy and for social empowerment—autonomy—will disappear even as the small island's citizens more fully participate at a grander global scale.

Indeed, we can think about political jurisdictional power—and likewise civil society social empowerment—as a pie that is always the same size, but divided differently. Integration will lead to less island-based public policy power but to more influence off-island. Integration may also increase asymmetrical interdependence, with the potential for extortion by bigger, more diversified jurisdictions. Fragmentation will lead to more island-based power, but will open the small, simple economies to damage through neglect or lack of access to needed resources. Similarly, political power and civil society-based social empowerment may be trade-offs: what the political jurisdiction does, society does not, and vice versa. The difference is that the authority of the political jurisdiction relies on democratic mechanisms whereas the working of social empowerment is based on reciprocity, ethnic commonality, and kinship. It is not clear which of these two sources of cooperation is the more powerful.

6.8 Prediction and Extremes

Hypothetical predictions are supported by reasonable and parsimonious Occam's Razor-like explanations. Prediction in terms of the future of small island democracy and social empowerment is easier when the stresses and changes forced upon the small island jurisdiction are themselves predictable. There exist a gamut of extreme stresses and changes about which we can speculate.

Differences in kind rather than just degree are technologically more and more likely; for example, an international crypto-currency will modify state sovereignty in a way that will limit state control and augment the control of large capital. Climate change can potentially cause crises for small island jurisdictions, rendering them utterly dependent on external aid or, destroying them entirely. In these cases social empowerment will likely be a useless resource, as will any autonomy derived from democracy. Today's vulnerability of many small island jurisdictions may increase substantially with global climate changes, leading to water levels rising and more severe storms. The political and cultural resilience of small island populations may be a moot point if the geographical basis sustaining the jurisdiction is damaged or destroyed. 'Power' will transfer to whoever has the will and resources to provide or deny aid.

Lower costs and higher qualities of communications sawill also modify the characteristics of power relations and small island jurisdictional autonomy.

Arguably, some of what we have offered here by way of possible future scenarios is predicated on an all-too-common but fallacious narrative of 'too big to fail'. In our discussion of the forces leading to either fragmentation or integration of a small island polity, we have stated above the basic contention that larger jurisdictions, whether island or mainland, are less prone to failure because of their larger and more diverse land and population base. Thus, it is reasonable to assume that small islands are more vulnerable in almost all analytical categories, as we have argued above. In imagined future scenarios of *extreme* threats, however, 'too big to fail' is incorrect. In the twentieth century, the two world wars, Stalinist Russia's brutality towards its own citizens, the demise of the Soviet Union, the catastrophes of China's famine-inducing 'Great Leap Forward' and inhumane 'Cultural Revolution' were all instances of disastrous loss of life and of very large political entities failing. Unfortunately, in the extreme, size does not protect a polity from what we can properly consider collapse even if the state in name survives.

6.9 Climate Crisis and Citizen Migration

The most widely predicted future crises affecting small island jurisdictions are based on the effects of natural physical calamities—in particular, rising sea levels, tsunamis, and severe weather consequent on climate change. Crises are defined by the fact they affect 'core values', and there can be no more basic core than the physical sustainability of the geographic island themselves. While, globally, small islands vary greatly in their geography, a great number of them have only marginal sustainability in terms of fresh water supply, energy resources, and arable land. Typically, many tropical islands have been formed by coral, and are thus very low-lying and extremely vulnerable to rising sea levels, tsunamis, coral death, and storms. Small islands that have higher geographic reliefs typically are rugged and rocky to the extent that habitable and accessible 'level' land is at a premium; harbours may be non-existent and physical infrastructure precariously sited.

In the extreme cases of a natural event causing crisis, the response in terms of either democracy or social empowerment would be of an 'all bets are off' variety. Democracy and democratic institutions are likely to be unsustainable in a crisis only because the decision-making is too slow and, thereby, ineffective. Similarly, social empowerment functions only when long-term reciprocity is expected; the short timeframe of a physical crisis makes such relationships moot.

The typical response of populations to such major crises is to evacuate if they are able. Non-crisis stressors on the population, such as lack of economic opportunity or fear of foreseeable future crises can be met by citizen migration. In both cases, however, the *ability* to choose to move is highly variable among the citizenry. The history of human migration typically is about the movement of the suffering but able; the very poor, sickly, and families of low status and power are not, typically, the people who migrate. Instead, those citizens who still have some resources—economic, social, and political—are the ones who migrate, albeit often becoming dispossessed of resources because of migrating. And, also typically in the cases of island elites, they will choose to remain on their island as long as they retain most of their relative power and status, while they are also the first to leave—and also the most able to leave—in a catastrophic crisis. What this status-differentiated movement of people means for democracy and social empowerment is that the most egregiously low-status individuals and the most bloated high-status individuals remain, destroying the spirit and fact of social levelling that allows for both democracy and social empowerment. Add in the fact that high-economic-status citizens are often *compradors*, and the relationships among citizens become even more polarized given competing self-interests.

6.10 Future Sustainability

We can surmise, therefore, that many small island jurisdictions have the makings for both strong social empowerment based on island identity and weaker political autonomy given the functional economic bases for power in a structure of integration and fragmentation where outside capital tends to integrate and asymmetrically limit political choices. How are we then to answer the question: what is the future map for the sustainable development of small island jurisdictions—at least from a political and social empowerment point of view?

As a general observation, decision-making quality is best when it is disaggregated following the principle of *subsidiarity*—devolving decisions to the lowest level in a hierarchy whilst maintaining competence—and so the greater the degree of *genuine* democratization and the more highly developed the social empowerment in a small island jurisdiction, the better. The way small island jurisdictions achieve sustainability, or at the very least, plan for sustainability, is probably to be found in the agile autonomous decision-making that is consequent of some combination of island-specific democratic jurisdictional institutions and civil-society-based social empowerment.

6.11 Constructed Sustainability

Hitherto we have addressed the question of small island jurisdiction sustainability in terms of democracy and social empowerment from the perspective of *forced* change, because of either globalism, or technology, or natural phenomena. Many of our speculated scenarios bode poorly for such sustainability. But, what might the situation look like if we addressed our question in terms of *chosen* change?

Already we have many instances—particularly in the Caribbean—where the specialness of islands has attracted citizens for reasons of desirable aesthetics and lifestyles. Sustainability of small islands need not be home grown, but rather, with infusions of capital, technology, and the *ideas* of sustainability, small island jurisdictions can conceivably become democratic paradises with a high degree of social empowerment. That is, small islands can be *constructed* to be sustainable, especially given their small size and their attractiveness as places to live.

We already live in a world where financial capital is geographically disconnected from physical capital; unlike humanity's historical past, built environments now separate where we live from where we create goods. Increasingly in the hierarchy of productive activities, abstract brain-work—manipulating symbols—is proportionately more important than physical production. Because of the increased level of human intellectual and skills development and because of the enabling communication and information processing technologies, contemporary high-productive employment can be, like the capital that finances it, footloose. This makes small island jurisdictions as viable for tertiary productive activities as any other geographic place and allows small island jurisdictions to attract and retain migrant citizens.

Ignoring for the moment the possibilities expressed above that small islands are geographically vulnerable to natural phenomena, we can speculate that all other vulnerabilities can be addressed by active choices and by importing infrastructure and ideas. For example, technological progress in nuclear power or wind turbines can easily address small island energy needs; attendant technologies using these energy sources can desalinate water and provide an information technology infrastructure that allows full participation in the global economy. Other technologies such as hydroponic food production or transportation of people as holograms are examples of the enormous potentialities for small island jurisdictions.

More subtly, the power of crowdsourcing ideas can be enabled using electronic computational infrastructure, and this crowdsourcing can be applied to jurisdictional decision-making in any small island. Arguably, these tools—intentionally used—can enhance democratic structures and decision making, and socially empower citizens in a network far more precise and powerful than mere ethnic/kinship-type face-to-face interactions.

The power and possibilities of capturing cognitive surplus (Shirky 2011) to develop societies, economies, and ultimately human well-being is enormous, and is as easily accessible to small island jurisdictions as it is anywhere on earth. But it needs be a choice, and a choice that involves importing the necessary infrastructure and perhaps people. The archetypal 'island paradise'—one that is sustainable, democratic, and socially empowering—is a genuine possibility.

6.12 Conclusion

In terms of sustainability into the future, small island jurisdictions almost certainly will need to embrace and indeed race against, change. Their best asset as a jurisdiction may be their agility, and in this case the integration-fragmentation question may matter less than the ability to use eclectic policies and actions to address challenges. It is clear that any small jurisdiction must rely either on isolationism or on a disproportionately adept diplomacy with outside jurisdictions, if it is to survive. It seems unlikely that isolation is an option as small-island jurisdictions are universally already dependent upon imports of goods and cultural products to an extent from which there is no going back. What 'sustainable' requires in the future for a small island jurisdiction may be impossible to predict; that being said, fostering agile public policy choices through democratic values and institutions and through social empowerment remains the best option in terms of decision quality and respect for the citizenry.

References

Buzan, B. (1983). *People, States and Fear: The National Security Problem in International Relations*. London: Wheatsheaf Books.

Keohane, R., & Joseph, N. (1977). *Power and Interdependence: World Politics in Transition*. Boston: Little Brown.

Lapping, M. (2015). Geography at Risk. In G. Baldacchino (Ed.), *Archipelago Tourism: Policies and Practices* (pp. xvi–xxiv). Burlington: Ashgate.

Shirky, C. (2011). *Cognitive Surplus: How Technology Makes Consumers into Collaborators*. New York: Penguin Press.

Wolin, S. (2008). *Democracy Incorporated: Managed Democracy and the Specter of Inverted Totalitarianism*. Princeton: Princeton University Press.

Zakaria, F. (1997). The Rise of Illiberal Democracy. *Foreign Affairs, 76*(6), 22–43.

CHAPTER 7

Social Capital and Subjective Wellbeing in Small States

Sefa Awaworyi Churchill, Yeti Nisha Madhoo, and Shyam Nath

7.1 Introduction

Subjective wellbeing has become a benchmark to measure quality of life globally, and thus understanding the determinants of subjective wellbeing has been the focus of a large body of literature in psychology and economics (see Dolan et al. 2008 for a review). The growing importance of subjective wellbeing as a measure of quality of life has peaked interest among policymakers as well, and thus, various measures of subjective wellbeing are being used to monitor progress and evaluate policy (Fujiwara and Campbell 2011; Sachs et al. 2016).

Starting with Easterlin (1974), economists have examined various factors that could influence subjective wellbeing. Using data on self-reported

S. A. Churchill (✉)
RMIT University, Melbourne, VIC, Australia
e-mail: sefa.awaworyichurchill@rmit.edu.au

Y. N. Madhoo • S. Nath
Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, India
e-mail: yetinishamadhoo@am.amrita.edu; shyamnath@am.amrita.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_7

life satisfaction of individuals, Easterlin (1974) established a positive relationship between income and subjective wellbeing. Following this pioneering work, a relatively large body of literature has examined various determinants of wellbeing including social capital (see, e.g., Awaworyi Churchill and Mishra 2017; Hudson 2006; Winkelmann 2009; Zhang and Zhang 2015). However, relatively less is known about the effects of social capital on wellbeing in small states. This chapter attempts to contribute to the literature and policy by examining the association between social capital and subjective wellbeing focusing on two small island developing states (SIDS) namely, Singapore, and Trinidad and Tobago (T&T).

Social capital is considered an important resource derived from social ties and networks (Coleman 1988), and thus several studies have considered measures of social networks as important proxies for social capital. Further, given that trust is an important element that promotes social networks, it has also been widely used in the literature as a measure of social capital. Accordingly, the literature focusing on the impacts of social capital have often used trust and social networks as important measures. Within this literature, it has been argued that social capital is essential in any social setting (Helliwell and Wang 2011), and thus it affects several outcomes including economic performance. Indeed, the conclusion from Arrow's (1972) seminal work sheds light on this. According to Arrow (1972, p. 357), "virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence."

Similarly, social capital is relevant for subjective wellbeing. On the one hand, social capital characterized by social relationships which promote happiness is valuable and enhances individual life satisfaction. Further, strong relationships and networks, built upon trust, have the potential to avert stress and depression, thus promoting wellbeing (Biswas-Diener and Diener 2006). Social support, another important component of social capital, may be a source of good mental health and wellbeing as it can influence how individuals cope with stress (Pinquart and Sörensen 2000). On the other hand, some social networks or relationships may be a strain on individuals' resources and could therefore carry negative consequences including negative effects on wellbeing (Ingersoll-Dayton et al. 1997).

In this chapter, we use data on two small island states to examine the question: what is the impact of social capital measured by trust and social networks on subjective wellbeing? Using data from the World Values

Survey (WVS) on Singapore and T&T, we provide empirical evidence on this relationship, and show that social capital is important to improve quality of life.

The remainder of the chapter is structured as follows. Section 7.2 provides an overview of the data and methods. Section 7.3 presents and discusses the empirical results, while Section 7.4 concludes.

7.2 Data and Methods

The data used is drawn from the fourth, fifth and sixth waves of the World Values Survey (WVS). The WVS is a nationally representative survey that captures changing social values and how they influence various socioeconomic and political outcomes (see www.worldvaluessurvey.org for details). Given data availability issues, we focus on the fourth to sixth waves of the WVS, and on two SIDS, namely Singapore and Trinidad and Tobago (T&T).

To examine the impact of social capital on wellbeing, we estimate the following regression model:

$$SWB_i = \alpha + \gamma_1 SC_i + \sum_n \beta_n \boldsymbol{X}_{n,i} + \varepsilon_i$$

where i indexes the individuals, γ_1 and β_n are the parameters to be estimated, and ε is the random error term. *SWB* is our outcome variable, self-reported subjective wellbeing. The measure of subjective wellbeing adopted is consistent with the existing literature and captures individuals' positive evaluation of their life with regard to satisfaction of life or good feelings (see, e.g., Awaworyi Churchill and Mishra 2017; Pinquart and Sörensen 2000). Specifically, the WVS asks the question: "All things considered, how satisfied are you with your life as a whole these days? 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied" where would you put your satisfaction with your life as a whole?"

SC represents our main explanatory variable, social capital. We capture two dimensions of social capital. The first dimension is trust and the second dimension is social networks. Trust is a commonly used measure of social capital in the existing literature (see, e.g., Awaworyi Churchill et al. 2019a, b; O'Doherty et al. 2017; Oranye et al. 2017; Portela et al. 2013). We measure trust based on the WVS questions on "generalized trust": "generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" Using a dummy variable, we code respondents as trusting if they agreed with the statement that most people could be trusted.

The use of social network as the second measure of social capital is informed by Putnam's (2000, p. 19) definition of social capital, which indicates that, "social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them". Thus, we draw on questions from the WVS that capture the involvement of individuals in various social groups. Our measures of social capital are therefore dummy variables which reflect respondents' involvement in various groups. Specifically, we have five measures of social networks. The first is a dummy variable which is equal to one if the respondent belongs to a religious group (S*ocial Network 1*), while the second is a dummy variable which is equal to one if respondent belongs to a sports group (S*ocial Network 2*). The third, fourth, and fifth are dummy variables that capture respondents who belong to educational groups (*social network 3*), political parties (*social network 4*), and self-help groups (*social network 5*), respectively.

X_n is a set of control variables described earlier consistent with the existing literature, and have been shown to influence an individual's wellbeing (see, e.g., Awaworyi Churchill and Mishra 2017; Biswas-Diener and Diener 2006; Helliwell and Wang 2011). These covariates include age and its quadratic term, income, gender, marital status, unemployment, religion, and other socioeconomic factors.

Description and summary statistics of these variables are reported in Appendix. Focusing on our outcome variable and key explanatory variables, the summary statistics reveal that average wellbeing is slightly higher in Trinidad and Tobago compared to Singapore. However, with regard to the measure of generalized trust, we find that the level of trust is higher in Singapore than in Trinidad and Tobago. Focusing on measures of social networks, we observe higher levels of networks along the lines of religion and self-help groups for Trinidad and Tobago compared to Singapore. However, the opposite is observed with regard to the sports group, educational group, and political party memberships.

Average income is slightly higher in Singapore compared to Trinidad and Tobago. The gender balance is about the same in the sample for both countries, but there are relatively more married people in the Singapore sample, while there are more divorcees in the Trinidad and Tobago sample. Unemployed respondents are higher in Trinidad and Tobago and so is the average age of respondents.

7.3 Empirical Findings

Table 7.1 presents results for the association between social capital and subjective wellbeing. Column 1 presents evidence on the association between trust and wellbeing, while columns 2 to 6 present evidence on the association between various measures of social networks and wellbeing.

Quite robustly, there is evidence of a positive association between all measures of social capital and wellbeing. From column 1, we find that the coefficient on the generalized trust question is 0.108, implying that if respondents were to agree that people can be trusted, their ordered log-odds of being in a higher life satisfaction category would increase by 0.11. Turning to the relevant standardized coefficient, we find that a standard deviation increase in trust is associated with a 0.02 standard deviation increase in wellbeing.

From column 2, we find that belonging to a religious organization contributes to wellbeing with a coefficient of 0.254, implying a 0.25 increase in the ordered log-odds of being in a higher individual life satisfaction, on a scale of 1 to 10, when individuals belong to a religious group. Here, a standard deviation increase in social networks is associated with an increase of 0.06 standard deviations in subjective wellbeing. Similarly, from columns 3 and 4, the coefficients on social networks are 0.305 and 0.342, respectively. These imply a 0.31 and 0.34 higher individual life satisfaction if respondents belong to sports and education groups, respectively. The associated standardized coefficients here are 0.08 and 0.09 for participation in sports and education groups, respectively. Lastly, from columns 5 and 6, the coefficients on the social network variables are 0.392 and 0.452, respectively. These results suggest a 0.39 and 0.45 higher life satisfaction if individuals belong to political parties and self-help groups, respectively. Standardized coefficients associated with participation in political parties and self-help groups are 0.10 and 0.12, respectively.

Based on the results from Table 7.1, we find that although all dimensions of social capital examined have a positive effect on subjective wellbeing, the effect of trust on wellbeing is the weakest. Thus, in the context of the two small states examined in this chapter, the role of social networks in influencing wellbeing is stronger than the role of trust, although both components of social capital play important roles. Focusing further on the individual measures of social capital, results suggest that the effects of participating in self-help groups on wellbeing is stronger than the effects of participating in other groups including religious, sports, education and

Table 7.1 Social capital and wellbeing

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Variables	*Trust*	*Network 1*	*Network 2*	*Network 3*	*Network 4*	*Network 5*
Social capital	0.108*	0.254***	0.305***	0.342***	0.392***	0.452***
	(0.059)	(0.059)	(0.059)	(0.063)	(0.068)	(0.078)
	[0.023]	[0.062]	[0.081]	[0.090]	[0.101]	[0.120]
Income	0.107***	0.111***	0.111***	0.112***	0.116***	0.113***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	[0.118]	[0.122]	[0.122]	[0.123]	[0.127]	[0.124]
Male	−0.083*	−0.079	−0.107**	−0.090*	−0.097*	−0.085*
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
	[−0.022]	[−0.021]	[−0.028]	[−0.024]	[−0.026]	[−0.022]
Married	0.304***	0.306***	0.315***	0.319***	0.302***	0.294***
	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)
	[0.081]	[0.081]	[0.084]	[0.085]	[0.080]	[0.078]
Divorced	−0.040	−0.033	−0.022	−0.018	−0.039	−0.038
	(0.124)	(0.124)	(0.124)	(0.124)	(0.124)	(0.124)
	[−0.006]	[−0.005]	[−0.003]	[−0.003]	[−0.006]	[−0.006]
Unemployed	−0.238**	−0.222**	−0.224**	−0.225**	−0.224**	−0.246**
	(0.110)	(0.110)	(0.109)	(0.109)	(0.110)	(0.111)
	[−0.035]	[−0.033]	[−0.033]	[−0.033]	[−0.033]	[−0.036]
Age	−0.028***	−0.028***	−0.027***	−0.027***	−0.029***	−0.028***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
	[−0.254]	[−0.253]	[−0.250]	[−0.245]	[−0.264]	[−0.254]
Age squared	0.030***	0.030***	0.030***	0.030***	0.032***	0.031***
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
	[0.246]	[0.247]	[0.250]	[0.245]	[0.264]	[0.255]
Dependence	0.255*	0.228*	0.204	0.216	0.205	0.195
	(0.133)	(0.133)	(0.135)	(0.135)	(0.134)	(0.134)
	[0.025]	[0.023]	[0.020]	[0.022]	[0.020]	[0.019]
Food	−0.152	−0.182*	−0.191**	−0.202**	−0.210**	−0.306***
	(0.092)	(0.093)	(0.093)	(0.093)	(0.093)	(0.096)
	[−0.040]	[−0.048]	[−0.050]	[−0.053]	[−0.055]	[−0.081]
Money	−0.228***	−0.236***	−0.257***	−0.263***	−0.266***	−0.307***
	(0.084)	(0.084)	(0.084)	(0.083)	(0.084)	(0.085)
	[−0.059]	[−0.061]	[−0.067]	[−0.068]	[−0.069]	[−0.080]
Unsafe	0.180**	0.129	0.106	0.089	0.083	0.087
	(0.084)	(0.084)	(0.085)	(0.085)	(0.085)	(0.084)
	[0.047]	[0.034]	[0.028]	[0.023]	[0.021]	[0.023]
Religion	0.364***	0.308***	0.350***	0.347***	0.342***	0.342***
	(0.060)	(0.062)	(0.060)	(0.060)	(0.060)	(0.060)
	[0.073]	[0.062]	[0.071]	[0.070]	[0.069]	[0.069]
Singapore	−0.367***	−0.335***	−0.433***	−0.451***	−0.499***	−0.350***
	(0.062)	(0.060)	(0.062)	(0.063)	(0.065)	(0.060)
	[−0.094]	[−0.086]	[−0.111]	[−0.115]	[−0.128]	[−0.090]
Observations	5340	5340	5340	5340	5340	5340

Ordered Logit Regressions; Robust standard errors, adjusted for heteroskedasticity in parentheses
Standardized coefficients in brackets; Dependent variable is wellbeing
*** p<0.01, ** p<0.05, * p<0.1

political groups. Further, the coefficient on the Singapore dummy suggests that wellbeing is relatively lower in Singapore compared to Trinidad and Tobago.

Turning to the effects of the control variables, results suggest that income is positively associated with subjective wellbeing, a finding consistent with the pioneering work of Easterlin (1974). Males tend to report relatively lower levels of wellbeing compared to females while respondents that are married tend to enjoy higher levels of wellbeing. Unemployment is associated with lower levels of wellbeing. Further, the results show that age is negatively associated with wellbeing, but this is not the case with the quadratic term, thus confirming a U-shaped relationship between age and wellbeing. Lack of financial freedom and food security are associated with lower levels of wellbeing while perceiving religion as an important factor in one's life improves wellbeing. The effects of feeling unsafe because of crime and dependence on friends and family are mostly statistically insignificant.

Compared to other control variables, we find that the effects of social capital are relatively weak (in standardized coefficient magnitude) compared to effects of income and age. However, compared to other covariates which are statistically significant including gender, employment status, food, and financial security, the effect of social capital is consistently stronger.

In what follows, we compare the effects of social capital on wellbeing in the two countries. Table 7.2 presents results for Singapore, while Table 7.3 presents results for T&T. From Table 7.2, we find that all dimensions of social capital are positively correlated with subjective wellbeing. However, in the case of T&T, results from Table 7.3 suggest statistically insignificant relationships between all dimensions of social capital except social networks based on self-help groups. In the case of Singapore, with the exception of age, the effects of social capital on wellbeing appear to be the strongest. Given that the average wellbeing in T&T is higher than in Singapore, these results imply that other forces either economic or social play a stronger role in promoting wellbeing in T&T, and results from Table 7.3 confirm this. Specifically, we observe that, with the exception of age, the strongest determinant of wellbeing in T&T is income.

A number of arguments could be advanced for these findings. On various fronts, Singapore is considered more developed than T&T. For instance, the human development index (HDI) ranks Singapore far ahead of T&T in terms of development and this important distinction could

Table 7.2 Social capital and wellbeing (Singapore)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Variables	*Trust*	*Network 1*	*Network 2*	*Network 3*	*Network 4*	*Network 5*
Social capital	0.194***	0.386***	0.475***	0.508***	0.857***	0.876***
	(0.068)	(0.073)	(0.081)	(0.087)	(0.094)	(0.100)
	[0.052]	[0.107]	[0.138]	[0.149]	[0.253]	[0.258]
Income	0.090***	0.095***	0.099***	0.103***	0.112***	0.115***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	[0.112]	[0.118]	[0.122]	[0.128]	[0.139]	[0.143]
Male	−0.116*	−0.114*	−0.133**	−0.112*	−0.130**	−0.115*
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
	[−0.034]	[−0.034]	[−0.039]	[−0.033]	[−0.038]	[−0.034]
Married	0.269***	0.266***	0.286***	0.296***	0.242***	0.259***
	(0.083)	(0.083)	(0.083)	(0.083)	(0.084)	(0.083)
	[0.079]	[0.078]	[0.084]	[0.087]	[0.071]	[0.076]
Divorced	−0.084	−0.054	−0.044	−0.020	−0.062	−0.054
	(0.194)	(0.194)	(0.193)	(0.192)	(0.193)	(0.192)
	[−0.010]	[−0.007]	[−0.005]	[−0.002]	[−0.008]	[−0.007]
Unemployed	−0.215	−0.216	−0.191	−0.209	−0.224	−0.233
	(0.166)	(0.166)	(0.166)	(0.165)	(0.166)	(0.169)
	[−0.028]	[−0.028]	[−0.025]	[−0.027]	[−0.029]	[−0.030]
Age	−0.027***	−0.027***	−0.027***	−0.026***	−0.029***	−0.025***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	[−0.263]	[−0.266]	[−0.265]	[−0.260]	[−0.284]	[−0.251]
Age squared	0.030***	0.031***	0.031***	0.031***	0.035***	0.031***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	[0.257]	[0.258]	[0.263]	[0.260]	[0.293]	[0.260]
Dependence	0.079	0.064	0.020	0.041	0.009	0.020
	(0.145)	(0.145)	(0.147)	(0.148)	(0.148)	(0.147)
	[0.009]	[0.008]	[0.002]	[0.005]	[0.001]	[0.002]
Food	0.180	0.062	0.046	0.016	−0.141	−0.139
	(0.128)	(0.129)	(0.128)	(0.131)	(0.133)	(0.134)
	[0.053]	[0.018]	[0.013]	[0.005]	[−0.041]	[−0.041]
Money	−0.177	−0.204*	−0.258**	−0.258**	−0.298***	−0.337***
	(0.109)	(0.109)	(0.110)	(0.108)	(0.110)	(0.111)
	[−0.052]	[−0.060]	[−0.076]	[−0.075]	[−0.087]	[−0.099]
Unsafe	0.189	0.098	0.058	0.041	−0.036	−0.026
	(0.119)	(0.118)	(0.120)	(0.120)	(0.121)	(0.119)
	[0.056]	[0.029]	[0.017]	[0.012]	[−0.011]	[−0.008]
Religion	0.340***	0.264***	0.318***	0.317***	0.299***	0.295***
	(0.070)	(0.072)	(0.071)	(0.071)	(0.071)	(0.070)
	[0.083]	[0.064]	[0.078]	[0.077]	[0.073]	[0.072]
Observations	3393	3393	3393	3393	3393	3393

Ordered Logit Regressions; Robust standard errors, adjusted for heteroskedasticity in parentheses
Standardized coefficients in brackets; Dependent variable is wellbeing
*** p<0.01, ** p<0.05, * p<0.1

Table 7.3 Social capital and wellbeing (Trinidad and Tobago)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Variables	*Trust*	*Network 1*	*Network 2*	*Network 3*	*Network 4*	*Network 5*
Social capital	−0.046	0.118	0.112	0.146	−0.066	0.315***
	(0.252)	(0.101)	(0.088)	(0.091)	(0.105)	(0.114)
	[−0.004]	[0.023]	[0.025]	[0.031]	[−0.012]	[0.072]
Income	0.134***	0.135***	0.132***	0.129***	0.135***	0.129***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
	[0.126]	[0.126]	[0.123]	[0.121]	[0.127]	[0.121]
Male	−0.086	−0.079	−0.104	−0.093	−0.085	−0.080
	(0.084)	(0.084)	(0.086)	(0.084)	(0.084)	(0.084)
	[−0.020]	[−0.018]	[−0.024]	[−0.022]	[−0.020]	[−0.019]
Married	0.405***	0.406***	0.407***	0.405***	0.407***	0.388***
	(0.095)	(0.095)	(0.095)	(0.095)	(0.095)	(0.096)
	[0.094]	[0.094]	[0.094]	[0.094]	[0.094]	[0.090]
Divorced	0.009	0.009	0.012	0.011	0.009	0.007
	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)	(0.145)
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]
Unemployed	−0.162	−0.153	−0.165	−0.166	−0.160	−0.165
	(0.129)	(0.128)	(0.128)	(0.128)	(0.129)	(0.129)
	[−0.026]	[−0.025]	[−0.027]	[−0.027]	[−0.026]	[−0.027]
Age	−0.032**	−0.031**	−0.031**	−0.031**	−0.031**	−0.032**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
	[−0.258]	[−0.254]	[−0.251]	[−0.251]	[−0.257]	[−0.260]
Age squared	0.037***	0.037***	0.037***	0.037***	0.037***	0.038***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	[0.293]	[0.288]	[0.289]	[0.288]	[0.292]	[0.294]
Dependence	0.231	0.220	0.219	0.229	0.232	0.203
	(0.335)	(0.334)	(0.336)	(0.335)	(0.334)	(0.331)
	[0.017]	[0.016]	[0.016]	[0.017]	[0.017]	[0.015]
Food	−0.089	−0.089	−0.091	−0.093	−0.089	−0.246*
	(0.123)	(0.123)	(0.123)	(0.123)	(0.123)	(0.137)
	[−0.020]	[−0.020]	[−0.020]	[−0.021]	[−0.020]	[−0.055]
Money	−0.358***	−0.354***	−0.351***	−0.352***	−0.361***	−0.398***
	(0.128)	(0.128)	(0.128)	(0.128)	(0.128)	(0.128)
	[−0.077]	[−0.076]	[−0.076]	[−0.076]	[−0.078]	[−0.086]
Unsafe	0.069	0.066	0.063	0.057	0.073	0.004
	(0.116)	(0.116)	(0.115)	(0.115)	(0.115)	(0.115)
	[0.014]	[0.014]	[0.013]	[0.012]	[0.015]	[0.001]
Religion	0.442***	0.411***	0.444***	0.445***	0.439***	0.432***
	(0.142)	(0.144)	(0.141)	(0.141)	(0.141)	(0.141)
	[0.061]	[0.056]	[0.061]	[0.061]	[0.060]	[0.059]
Observations	1947	1947	1947	1947	1947	1947

Ordered Logit Regressions; Robust standard errors, adjusted for heteroskedasticity in parentheses
Standardized coefficients in brackets; Dependent variable is wellbeing
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

explain the reported results. Specifically, focusing on the findings for T&T, individuals with higher income have higher levels of wellbeing than those with higher social capital. This supports the higher importance of economic factors in promoting wellbeing compared to the social factor in the case of developing countries. This finding is consistent with existing literature in the context of developing countries that have found income as a stronger determinant of wellbeing than social factors such as religion and social capital (see, e.g., Awaworyi Churchill et al. 2019a, b; Awaworyi Churchill and Mishra 2017).

On the other hand, the results for Singapore confirm existing findings that in developed countries social factors are stronger determinants of wellbeing than economic factors like income (Easterlin 1995). Thus, as argued by Awaworyi Churchill and Mishra (2017), individuals who have attained the desired level of income (e.g., individuals in developed countries) tend to seek life satisfaction in factors other than income. Thus, from this category of people, satisfaction may be attained from social elements like trust and relationships stemming from social networks.

7.4 Conclusion and Policy

In this chapter, we used data on two small island states to examine the question: what is the impact of social capital measured by trust and social networks on subjective wellbeing? We argue that social capital could work to either enhance or hinder wellbeing. Specifically, good relationships which are built on strong social capital could avert stress, and promote happiness and wellbeing. However, relationships could also strain resources for some parties, thus hindering wellbeing. We have used data from the World Values Survey (WVS) on Singapore and Trinidad and Tobago to examine if social capital works to promote or hinder subjective wellbeing. We find that social capital is important to improve quality of life. However, the effect of social capital is stronger in Singapore as compared to Trinidad and Tobago. We argue that this difference in the effects of social capital across both countries could be because of their economic status. Particularly, our results confirm findings from the literature, which suggests that income is a relatively stronger determinant of wellbeing in poorer countries.

Maslow's (1943) framework suggests a hierarchy of needs, and for relatively richer countries such as Singapore, other factors besides income tend to play an important role in life satisfaction given the level of income already attained. In the case of developing countries such as T&T, higher levels of income are associated with higher life satisfaction given that the desire to attain physiological needs is the primary focus, and thus has priority on an average individual's hierarchy of needs. However, a country such as Singapore, which has attained a higher level of income, moves down to other needs on the hierarchy and thus attains higher wellbeing from social capital.

Our findings, which suggest the importance of different factors in promoting wellbeing, lend support to country-specific policies that take into account the socioeconomic status of countries. In addition to policies that promote social capital, it is equally important to also ensure that policies work to enhance the availability of the basic economic needs of the citizenry, especially in poorer countries.

Appendix: Description and Summary Statistics of Variables

Variable	*Descriptions*	*Overall mean*	*Singapore mean*	*T&T mean*
Wellbeing	All things considered, how satisfied are you with your life as a whole these days? 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied" where would you put your satisfaction with your life as a whole?	7.19	7.08	7.38
Trust	"Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" dummy variable equals 1 if respondent agreed with the statement that most people could be trusted.	0.19	0.28	0.03
SN 1	Dummy variable equals to 1 if respondent belongs to a religious group	0.70	0.67	0.76
SN 2	Dummy variable equals to 1 if respondent belongs to a sports group	0.49	0.58	0.34
SN 3	Dummy variable equals to 1 if respondent belongs to an educational group	0.45	0.54	0.30
SN 4	Dummy variable equals to 1 if respondent belongs to a political party	0.37	0.47	0.19

(*continued*)

(continued)

Variable	*Descriptions*	*Overall mean*	*Singapore mean*	*T&T mean*
SN 5	Dummy variable equals to 1 if respondent belongs to a self-help group	0.51	0.48	0.58
Income	Scale of income	4.91	4.92	4.90
Male	Dummy variable equals to 1 if respondent is male	0.46	0.46	0.45
Married	Dummy variable equals to 1 if respondent is married	0.53	0.56	0.48
Divorced	Dummy variable equals to 1 if respondent is divorced	0.09	0.04	0.18
Unemployed	Dummy variable equals to 1 if respondent is unemployed	0.08	0.05	0.14
Age	Age of respondent	40.19	37.94	44.11
Age squared	Square of age/100	19.14	17.19	22.54
Dependence	Dummy variable equals to 1 if respondent depend on friends, family or relatives as information source	0.96	0.96	0.97
Food	Dummy variable equals to 1 if respondent has in the past gone without food	0.57	0.54	0.63
Money	Dummy variable equals to 1 if respondent has in the past gone without money	0.61	0.56	0.69
Unsafe	Dummy variable equals to 1 if respondent has in the past felt unsafe from crime	0.61	0.55	0.72
Religion	Dummy variable equals to 1 if religion is important to respondent	0.83	0.78	0.90

References

Arrow, K. J. (1972). Gifts and Exchanges. *Philosophy & Public Affairs, 1*(4), 343–362.

Awaworyi Churchill, S., & Mishra, V. (2017). Trust, Social Networks and Subjective Wellbeing in China. *Social Indicators Research, 132*(1), 313–339. https://doi.org/10.1007/s11205-015-1220-2.

Awaworyi Churchill, S., Appau, S., & Farrell, L. (2019a). Religiosity, Income and Wellbeing in Developing Countries. *Empirical Economics, 56*(3), 959–985. https://doi.org/10.1007/s00181-017-1380-9.

Awaworyi Churchill, S., Farrell, L., & Smyth, R. (2019b). Neighbourhood Ethnic Diversity and Mental Health in Australia. *Health Economics, 28*(9), 1075–1087. https://doi.org/10.1002/hec.3928.

Biswas-Diener, R., & Diener, E. (2006). The Subjective Well-Being of the Homeless, and Lessons for Happiness. *Social Indicators Research, 76*(2), 185–205. https://doi.org/10.1007/s11205-005-8671-9.

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology, 94*, S95–S120. https://doi.org/10.1086/228943.

Dolan, P., Peasgood, T., & White, M. (2008). Do We Really Know What Makes Us Happy? A Review of the Economic Literature on the Factors Associated with Subjective Well-Being. *Journal of Economic Psychology, 29*(1), 94–122. https://doi.org/10.1016/j.joep.2007.09.001.

Easterlin, R. A. (1974). Does Economic Growth improve the Human Lot? Some Empirical Evidence. *Nations and Households in Economic Growth, 89*, 89–125.

Easterlin, R. A. (1995). Will Raising the Incomes of All Increase the Happiness of All? *Journal of Economic Behavior & Organization, 27*(1), 35–47.

Fujiwara, D., & Campbell, R. (2011). *Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches: A Discussion of the Current Issues.* London: HM Treasury.

Helliwell, J. F., & Wang, S. (2011). Trust and Well-Being. *Journal of Wellbeing, 1*(1), 42–78.

Hudson, J. (2006). Institutional Trust and Subjective Well-Being across the EU. *Kyklos, 59*(1), 43–62.

Ingersoll-Dayton, B., Morgan, D., & Antonucci, T. (1997). The Effects of Positive and Negative Social Exchanges on Aging Adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 52*(4), S190–S199.

Maslow, A. H. (1943). A theory of human motivation. *Psychological review, 50*(4), 370.

O'Doherty, M. G., French, D., Steptoe, A., & Kee, F. (2017). Social Capital, Deprivation and Self-Rated Health: Does Reporting Heterogeneity play a Role? Results from the English Longitudinal Study of Ageing. *Social Science & Medicine, 179*, 191–200.

Oranye, N. O., Ezeah, P., & Ahmad, N. (2017). Elements of Social Capital and Academic Performance of Undergraduate Students. *Social Indicators Research, 131*(1), 305–319. https://doi.org/10.1007/s11205-016-1249-x.

Pinquart, M., & Sörensen, S. (2000). Influences of Socioeconomic Status, Social Network, and Competence on Subjective Well-Being in Later Life: A Meta-Analysis. *Psychology and Aging, 15*(2), 187–224. https://doi.org/10.1037/0882-7974.15.2.187.

Portela, M., Neira, I., & Salinas-Jiménez, M. d. M. (2013). Social Capital and Subjective Wellbeing in Europe: A New Approach on Social Capital. *Social Indicators Research, 114*(2), 493–511. https://doi.org/10.1007/s11205-012-0158-x.

Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.

Sachs, J., Becchetti, L., & Annett, A. (2016). *World Happiness Report 2016* (Vol. 2). New York: UN Sustainable Development Solutions Network.

Winkelmann, R. (2009). Unemployment, Social Capital, and Subjective Well-being. *Journal of Happiness Studies, 10*(4), 421–430.

Zhang, Z., & Zhang, J. (2015). Social Participation and Subjective Well-Being among Retirees in China. *Social Indicators Research, 123*(1), 143–160.

CHAPTER 8

The Quality of Life: An Analysis of Inter-island Disparity and Emerging Issues

Satya Paul

8.1 Introduction

Small island developing countries (SIDS) are known to be most vulnerable to natural disasters. Natural disasters affect economic activities, reducing revenue and exports and increasing fiscal and external deficits. The per year economic losses due to natural calamities varies between 1 to 9 per cent of their GDP across small island economies (OECD-World Bank 2016). SIDS are also disproportionately vulnerable to the global climate change. The coastal-concentrated agriculture and tourism infrastructure developments face the threat of sea level rise, leaving the domestic economy prone to climate shocks. In SIDS, the losses (percentage of GDP) due to climate change are estimated to be much higher than the global average of 0.5 per cent. For example, average annual loss as a percentage of GDP is about 6.5 per cent in Vanuatu, 4 per cent in Tonga, 2.5 per cent in Fiji and 10 per cent in the Caribbean countries (UN-OHRLLS 2015).

S. Paul (✉)
ANU College of Arts and Social Sciences, Australian National University, Canberra, ACT, Australia
e-mail: satya.paul@anu.edu.au

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_8

The adaptation to climate change and investing in disaster preparedness and meeting the expense of post-disaster reconstruction add significant fiscal pressures and hinder the well-being of people. The objective of this chapter is to see how island countries differ in terms of their quality of life. Two issues are involved in measuring the quality of life. The first issue relates to the choice of comprehensive indicators/attributes of well-being which determine the quality of life. The second issue relates to the aggregation of all available information on the chosen attributes to construct the composite index of quality of life.

Traditionally, per capita GDP is considered as a measure of well-being/quality of life of population. However, it has long been acknowledged that quality of life is a multidimensional phenomenon, and per capita GDP may not be an adequate measure of quality of life. The Human Development Index, proposed by the United Nations in 1990, is the most common alternative to GDP for measuring well-being at the country level. HDI is a composite index encompassing three dimensions, namely, per capita income, education and health. Health is represented by life expectancy at birth. While HDI has been refined and augmented over time (Paul 1996; Hicks 1997; Noorbakhsh 1998; Bilbao-Ubillos 2013), it is not a comprehensive measure of the quality of life.

Some studies have used several socio-economic and physical indicators and political and civil liberties to construct multidimensional (composite) index of the quality of life (e.g. Slottje 1991; Dasgupta and Weale 1992; Paul 1997). The political and civil liberties add significant value to the living of people and thus are considered as important as the socio-economic and physical indicators. In the present study, we also incorporate the indicators of institutional quality in the measurement of quality of life. The indicators of the quality of institutions, such as the rule of law, quality of government and fairness of regulations, affect trust and confidence and the social fabrics, which are conducive to well-being. In addition, by reducing uncertainty and transaction costs, good institutions can promote well-being by preventing theft, violence and economic exploitation and enforcing property rights.

Researchers have followed two broad approaches to measuring the quality of life based on indicators of well-being: (i) the cardinal approach and (ii) the ordinal approach. The cardinal approach defines a multidimensional index of quality of life as the weighted sum of the cardinal magnitudes of well-being indicators. Economic theory does not provide any guidance on the choice of weights to be assigned to indicators. These weights can be chosen arbitrarily (say, equal weights) or they can be derived using statistical techniques such as the method of principal components. By considering 20 attributes of life and using principal component and hedonic weighting techniques, Slottje (1991) compared the quality of life across 126 countries.

The ordinal approach involves the aggregation of rank orders of countries by individual attributes of quality of life. This is similar to the ranking of candidates by voters in the social choice theory. That is, candidates are replaced by countries and voters by indicators/attributes of well-being. This approach has some advantages over the cardinal methods. In the cardinal approach, the weighting system varies depending on the method used and so does the value of the index. As shown in Slottje (ibid), the ranking of the quality of life across countries is very sensitive to the choice of weights used in the cardinal composite index. The data on some physical indicators may be less accurate and may also not be strictly comparable across less developed countries due to differences in their data collection procedures. Therefore, it will be unwise to depend on a methodology which relies on the physical magnitudes of their indicators. The cross-country comparison of the quality of life based on an ordinal measure/aggregator is less likely to be influenced by any errors or biases in the cardinal magnitudes of their achievements. However, the ordinal aggregators mask the range of cardinal differences between ranked subjects, which in some cases may be very small and in others very large. This is both the weakness and the strength of these ordinal aggregators.

In the ordinal approach, the most widely used ranking rule is the Borda rule. This rule is proposed by Borda (1785). The Borda rule is based on the aggregate scores (called Borda scores) that are computed from attribute-specific rank orderings of countries. The rule is simple and straightforward. It allows good performance in one attribute to compensate for a poor performance in another attribute because it is the total Borda scores which matters. Dasgupta and Weale (1992) used this ranking rule to compare the quality of life across 48 poorest countries during the decade of the 1970s. The authors computed the Borda scores from six attributes of well-being, namely, per capita national income, life expectancy at birth, the infant survival rate, the adult literacy rate, and political and civil liberties.

Paul (1997) ranked the quality of life across 109 countries based on Borda scores computed from 11 indicators/attributes of well-being for 1990. Paul (ibid) also used the Copeland rule, which ranks countries by

Table 8.1 Geographical classification of SIDS

Caribbean (15): Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago
Pacific (13): Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Liste, Tonga, Tuvalu, Vanuatu
AIMS (9): Bahrain, Cape Verde, Comoros, Guinea-Bissau, Maldives, Mauritius, Sao Tome and Principe, Seychelles, Singapore

Note: Within parentheses are number of countries

their Copeland scores. These scores are based on the majority criterion in pairwise comparison. The ranking of the quality of life based on Copeland scores is found to be very similar to that based on Borda scores.

In this chapter, we use the Borda rule for ranking the quality of life across 37 out of 38 UN-recognized vulnerable island states using data for 2017. Cuba is excluded from the analysis due to non-availability of data on GDP. Geographically, 15 countries are from the Caribbean region, 13 are from the Pacific and 9 are from Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS). These countries are listed in Table 8.1. The data on 12 attributes of well-being are utilized to compute the aggregate (Borda) scoring of each country. The choice of these attributes is guided by existing well-being studies as well as our own perception and the availability of comparable data.

The rest of this paper is organized as follows. Section 8.2 briefly describes the Borda ranking rule. Section 8.3 discusses the attributes of well-being. Section 8.4 presents the ranking of the quality of life based on Borda scores. Section 8.5 discusses some policy-oriented issues that emerge from our analysis of the quality of life. Section 8.6 provides conclusions.

8.2 The Borda Ranking Rule

The Borda ranking rule is based on the total Borda scores. If n denotes the number of countries and m the number of attributes/indicators of well-being, then the total Borda score of country j is given by

$$B_j = \sum_{k=1}^{m} \left(n - a_j^k \right) \tag{8.1}$$

where a_j^k is the rank order of country j in respect of attribute k. A country performing best is given a rank of 1, the one performing the second best is given a rank of 2 and the one with the worst performance is given a rank of n. The country performing best in respect of attribute k gets a score of $n - 1$, the second performing country gets a score of $n - 2$ and so on until the country with the worst performance gets a score of zero. Summing over all the attributes gives the total Borda scores (B_j) of country j. The country with the highest score ranks first in terms of quality of life, with the second highest score second and so on downwards.

The Borda ranking rule satisfies the following desirable axiomatic properties:

1. *Pareto optimality*: If country i is ranked above country j based on all the attributes, then j should not rank above i.
2. *Anonymity*: The name of the attribute does not matter. If we exchange the names of two attributes, then the ranking should not be affected.
3. *Neutrality*: The name of the country does not matter. More precisely, if the two countries interchange their names, the ranking should not be affected.
4. *Consistency* (Smith 1973; Young 1974; Moulin 1988): If country i is preferred to country j based on each of two blocks of attributes of sizes m_1 and m_2, then country i should also be preferred to j based on the combined block of attributes of size $m = m_1 + m_2$.

It may be noted that Borda does not satisfy the axiom of 'the independence of irrelevant alternatives' proposed in Arrow (1963). Since the number of countries are fixed in our study, this axiom does not bite.

8.3 Attributes of Quality of Life

The quality of life may be influenced by several economic, physical, environmental, institutional and other non-economic factors. These are the real per capita income, the disparity of incomes, longevity of life, the level of education, sanitation, the availability of medical services and other amenities of life such as access to telephone, radio and television services; the provision and extent of social security; the civil and political liberties to people; the environmental conditions such as the level of air pollution; institutional factors such as government effectiveness, regulatory quality, rule of law and political stability; social conditions such as crime rate and divorce rate; personal values such as honesty, truthfulness, altruism and so on; and the list could be very long. The data on some variables, such as the disparity of incomes, crime rate and divorce rate, are available only for a few SIDS for different years, whereas some other variables such as honesty and truthfulness are just not quantifiable.

In this study, we consider 12 important attributes of well-being for which comparable data are available for 37 SIDS for the year 2017. The attributes are as follows: A1 is GDP per capita at purchasing power parity (constant 2011 international $), A2 is life expectancy at birth (years), A3 is primary school enrolment (percentage net), A4 is mortality rate for children under the age of five years (per 1000 live births), A5 is access to electricity (percentage of population) and A6 is the physicians (per 1000 people). These attributes of life are self-explanatory. For A1, A2, A3, A5 and A6, the higher the number/values, the better the ranking of a country. For A4, the higher the number/values, the lower the ranking. Data for these attributes are obtained from *World Development Indicators* produced by World Bank (2019a).

A7–A10 are the indicators of quality of institutions prevailing in the country. A7 is government effectiveness, which is a composite index focusing on inputs such as the quality of bureaucracy and independence of the civil service from political pressures, required for any government to implement good policies and deliver public goods. A8 is the political stability and the absence of violence/terrorism which measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. A9 is the overall quality of regulatory structure which controls market prices, tax system and the banking and other institutions. A10 is the rule of law which captures the extent to which a society is successful in protecting the socio-economic and property rights of citizens. The values of each of these indicators range between −2.5 and 2.5, and the higher values reflect the higher quality of institutions. These data are obtained from the World Bank (2019b).

A11 and A12 are, respectively, the indicators of political rights and civil liberties. Political rights allow citizens to participate in the governance of their country and get involved in political activities. The countries are coded with scores ranging from 1 to 7, which reflect the state of prevailing political liberties. The country with a score of 1 implies that citizens have the highest degree of political liberty, and the country coded with a score 7 implies the worst political liberties. All other scores lying between 1 and 7 represent different degrees of political liberties. The civil liberties measure the extent to which people are able to express their opinions in public without fear of punishment. In other words, civil liberties include freedom of religion, freedom of speech, freedom of press, freedom of assembly and freedom to support or question government policies. Countries are again coded with scores 1 to 7, representing highest to the lowest degrees of civil liberty. The data on these indicators relating to 2017 are taken from Freedom House (2018).

The data on all the 12 indicators of quality of life for 37 SIDS for 2017 are presented in Appendix. If the value of any indicator was not available for 2017, the value of the recent past year was used.

8.4 Ranking of Quality of Life

Table 8.2 presents the ranking of quality of life based on Borda scores. This table shows that Barbados ranks first and Singapore second on the ladder of quality of life. The Appendix reveals that while Singapore performs better than Barbados in terms of per capita GDP, its performance in terms of attributes such as political and civil liberties is inferior to Barbados. Most of the countries in the top quintile are from the Caribbean region. Even in the second quintile of quality of life, half of the countries are from the Caribbean region. Other countries that fall in this quintile are Bahrain and Seychelles from AIMS and Samoa and Palau from the Pacific region. Two of the Pacific island countries, namely, Tuvalu and Kiribati, are in the middle quintile of the quality of life, and other Pacific countries such as Solomon Islands, Papua New Guinea and Timor-Leste are in the fourth quintile of quality of life. The quality of life is ranked lowest in Haiti and second lowest in Guinea-Bissau.

The ranking of countries by individual attributes of well-being, except political rights and civil liberties, shows strong correlations with each other, as well as with the Borda ranking (Table 8.3). These correlations cannot be used to imply any causal relationship between the attributes.

Table 8.2 Borda ranking of quality of life

Country name	*Region*	*Borda rank*	*Quintile*
Barbados	1	1	First Quintile
Singapore	3	2	
St. Kitts and Nevis	1	3	
Bahamas, The	1	4	
Antigua and Barbuda	1	5	
Mauritius	3	6	
Dominica	1	7	
St. Lucia	1	8	Second Quintile
Trinidad and Tobago	1	9	
St. Vincent and the Grenadines	1	10	
Grenada	1	11	
Palau	2	12.5	
Bahrain	3	12.5	
Samoa	2	14	
Seychelles	3	15	
Jamaica	1	16	Third Quintile
Belize	1	17	
Cabo Verde	3	18	
Dominican Republic	1	19	
Maldives	3	20	
Tuvalu	2	21	
Kiribati	2	22	
Fiji	2	23	Fourth Quintile
Suriname	1	24	
Federated States of Micronesia	2	25	
Nauru	2	26	
Guyana	1	27	
Marshall Islands	2	28	
Vanuatu	2	29	
Tonga	2	30	
Timor-Leste	2	31	Fifth Quintile
Sao Tome and Principe	3	32	
Solomon Islands	2	33	
Papua New Guinea	2	34	
Comoros	3	35	
Guinea-Bissau	3	36	
Haiti	1	37	

Note: In column 2, region code 1 is for Caribbean, code 2 for Pacific and code 3 for AIMS. Out of 37 countries, 15 are from Caribbean region, 13 are from Pacific region and 9 are from AIMS

Table 8.3 Pearson rank correlations

	BR	*R1*	*R2*	*R2*	*R4*	*R5*	*R6*	*R7*	*R8*	*R9*	*R10*	*R11*	*R12*
BR	1.00	0.81	0.75	0.63	0.76	0.81	0.76	0.87	0.62	0.88	0.76	0.29	0.39
R1		1.00	0.66	0.60	0.74	0.79	0.82	0.72	0.25	0.77	0.41	0.08	0.03
R2			1.00	0.59	0.78	0.59	0.58	0.63	0.28	0.79	0.50	0.04	0.01
R3				1.00	0.48	0.53	0.53	0.55	0.24	0.59	0.42	0.11	0.01
R4					1.00	0.63	0.65	0.68	0.26	0.75	0.48	0.09	0.05
R5						1.00	0.74	0.63	0.42	0.64	0.53	0.25	0.29
R6							1.00	0.58	0.28	0.63	0.34	0.20	0.10
R7								1.00	0.58	0.83	0.70	0.31	0.26
R8									1.00	0.39	0.79	0.61	0.63
R9										1.00	0.68	0.20	0.13
R10											1.00	0.48	0.52
R11												1.00	0.91
R12													1

Notes*:* BR denote the Borda ranking. R1, R2, ..., R12 denote rankings according to attributes A1, A2, ..., A12

They should be viewed as a statistical link in the inter-island data observed at a point of time. The rank correlation between the Borda scores and the per capita GDP is 0.80. This does not imply any causal relationship between the Borda ranking and the ranking based on per capita income.

Ranking of countries by two institutional quality indicators, government effectiveness and regulatory structure, is highly correlated with the Borda ranking. This implies that public actions which improve the government effectiveness and regulations are likely to enhance the quality of life. The correlations between political and civil liberties and some physical indicators are quite low. This should not be taken to mean that political and civil liberties are less effective in influencing the quality of life in small island countries. If people lose these liberties overnight due to some coup or other unforeseen circumstances, the economic and physical attributes of well-being remain unchanged in the country. Thus, a low rank correction between these liberties and physical attributes only implies that the observed liberties are more volatile than the physical attributes in small island countries. The rank correlation between rankings by political and civil liberties is quite high (0.91). It implies that countries which provide political liberties of high (low) degree also provide civil liberties of high (low) degree to their citizens.

8.5 Emerging Issues

A number of issues emerge from our analysis of the quality of life presented above. One is how climate change, global warming and steady increase in the frequency and severity of natural disasters, including cyclones, flooding and heatwaves, affect the quality of life of people living in small island countries. Other emerging issues are related to the institutional and public policies that might influence the well-being (quality of life) in small islands.

The vulnerability of small islands to natural disasters and climate change affects not only the macroeconomic profile but also the well-being of people living in the coastal areas. The public policies that are oriented towards promoting human development may not always be linked to their capacity for resilience against natural calamities. Scandurra et.al (2018) have provided vulnerability indices for SIDS for 2014. These indices cover many dimensions, and their values range between 0 (no vulnerability) and 1 (most vulnerable). The vulnerability indices for 2017 are not available. They are not likely to change much in the short run; hence, 2014 index values are taken as a proxy for 2017 for our analysis. In our discussion below, the index values are parenthesized for ready reference. Singapore is vulnerable (with a low index value of 0.14) to natural disasters and is placed in the top quintile of the quality of life (Table 8.2). Such a good performance of Singapore in terms of quality of life is perhaps due to its locational advantage and prudent development strategies. While the vulnerability index for Mauritius is twice that for Singapore, it is only 4 ranks below Singapore on the ladder of quality of life. Over the years Mauritius has followed a concerted strategy focusing on nation building with strong and inclusive institutions and equitable public investment policy (Overseas Development Institute 2010). This may be taken to mean that a country, even if it is vulnerable to natural disasters and unforeseen climate shocks, can achieve higher quality of life by following a good development policy.

Some of the highly vulnerable countries such as San Tome and Principe (0.49), Solomon Islands (index value 0.55), Papua New Guinea (0.53), Comoros (0.40), Guinea-Bissau (0.50) and Haiti (0.51) are in the lowest quintile of the quality of life. Given their exposure to natural calamities, the real challenge is how to enhance their domestic savings and attract more development aid to improve the quality of life in these economies.

The international aid agencies generally look at the effectiveness of institutions before making any decision on aid to small island economies. The quality of institutions in small islands is quite poor. The issue that emerge is how these countries can improve the effectiveness of their institutions.

The rankings of political and civil liberties are weakly correlated with Borda ranking, as well as with the economic and physical attributes. These liberties promote the social fabrics and create an environment that is conducive to sustainable human development. It would be a challenge to enhance the political and civil liberties, given that many of the small islands have weak democracies. For instance, the democracy in the Pacific Islands has never been a carbon copy of its Western counterparts, but the divergence is set to grow wider due to kinship relations in pollical life and corruptions.

8.6 Conclusions

This chapter has compared the quality of life across 37 SIDS based on the Borda ranking rule. A data set for 12 indicators of quality of life for 2017 is used for ranking the countries. These indicators include not only economic and physical indicators, but also the quality of institutions and political and civil liberties available to people. Our results reveal that Barbados ranks first followed by Singapore in the ranking of quality of life. Most of the Caribbean countries are in the first quintile of quality of life ranking, whereas most of the Pacific countries are in the fourth quintile of quality of life. The rank of Haiti is the lowest and that of Guinea-Bissau is the second lowest on the ladder of quality of life.

The political and civil liberties, though weakly correlated with the observed quality of life, are important on their own. These liberties are known to be quite conducive to promoting human capabilities and social relations. The ranking of countries by government effectiveness and regulatory structure is highly correlated with the Borda ranking. This may be taken to mean that public actions which improve the quality of government effectiveness and regulation controls are likely to enhance the quality of life.

Appendix: Data on Attributes of Quality of Life for 2017

S No	*Country*	*Region*	*A1*	*A2*	*A3*	*A4*	*A5*
1	Antigua and Barbuda	1	22855.7	76.8	94.19	5.2	100
2	The Bahamas	1	28705.3	73.6	75.36 [2016]	8.6	100
3	Barbados	1	16,839	79	94.99	11.6	100
4	Belize	1	7726.4	74.4	96.18	11.8	98.27
5	Dominica	1	9438.4 [2002]	77 [2002]	95.42 [2016]	32.2	100
6	Dominican Republic	1	14953.4	73.7	92.87	24.8	100
7	Grenada	1	13396.9	72.4	93.64 [2008]	13.8	94.7
8	Guyana	1	7399.1	69.6	93.09 [2012]	25.9	90.86
9	Haiti	1	1653	63.3	58 [1997]	50.8	43.75
10	Jamaica	1	8153.9	74.3	82.52	12.8	99.51
11	St Kitts and Nevis	1	27679.1 [2002]	71 [2002]	93.79 [2015]	10.1	100
12	St Lucia	1	12333.7	75.9	94.87	15.2	98.76
13	St Vincent and the Grenadines	1	10704.3	72.3	93.58	15.3	100
14	Suriname	1	13636.3	71.5	86.07	17.4	96.78
15	Trinidad and Tobago	1	28566.8	73.2	95.28 [2010]	16.9	100
16	Federated States of Micronesia	2	3185.3	67.6	85.46 [2015]	26.4	80.76
17	Fiji	2	9379.3	67.3	96.76 [2016]	21.4	96
18	Kiribati	2	2025	67.9	94.69	42.4	98.61
19	Marshall Islands	2	3532.3 [2000]	65.2 [2000]	73.15 [2016]	28.1	94.76
20	Nauru	2	13669.8	67.4	93.7 [2016]	27.2	99.55
21	Palau	2	16474.2 [2005]	69 [2005]	94.92 [2014]	17.1	100
22	Papua New Guinea	2	3880.7	64	73.65[2016]	38.9	54.43

23	Samoa	2	6069.6	73	94.47	14	96.8
24	Solomon Islands	2	2126.4	72.6	69.52	17.6	62.9
25	Timor-Leste	2	6740.9	69	93.7	40.7	80.38
26	Tonga	2	5746	70.7	85.94 [2015]	13.8	97.97
27	Tuvalu	2	3548.2	66.9	76.25 [2016]	21.2	100
28	Vanuatu	2	2827.1	70.2	79.84 [2015]	22.9	62.78
29	Bahrain	3	43320.4	77	97.28	6.2	100
30	Cabo Verde	3	6387.1	72.6	92.86	17.2	92.91
31	Comoros	3	2500.6	63.9	79.84	52.8	79.93
32	Guinea-Bissau	3	1576.8	67.4	71.25 [2010]	84.5	26.05
33	Maldives	3	13332.9	78.3	95.42	7.7	99.8
34	Mauritius	3	20319.5	74.5	95.81	12.9	98.03
35	Sao Tome and Principe	3	3011.1	69.9	93.08	25.2	72.51
36	Seychelles	3	26415.8	74.3	92.03	12.6	100
37	Singapore	3	87760.4	82.9	99.67	2.2	100

S No	*Country*	*Region*	*A6*	*A7*	*A8*	*A9*	*A10*	*A11*	*A12*
1	Antigua and Barbuda	1	2.76	0.01	0.75	0.25	0.44	2	2
2	The Bahamas	1	1.94	0.58	0.99	0.12	0.19	1	1
3	Barbados	1	2.49	0.84	0.97	0.49	0.66	1	1
4	Belize	1	1.13	−0.64	0.04	−0.54	−0.96	1	2
5	Dominica	1	1.08	−0.25	1.2	0.13	0.65	1	1
6	Dominican Republic	1	1.56	−0.37	0.16	−0.08	−0.42	3	3
7	Grenada	1	1.45	−0.18	1.01	−0.05	0.44	1	2
8	Guyana	1	0.69 [2010]	−0.29	−0.04	−0.39	−0.29	2	3
9	Haiti	1	0.14 [2011]	−2.07	−0.7	−1.32	−1.09	5	5
10	Jamaica	1	1.32	0.49	0.31	0.14	−0.16	2	3
11	St Kitts and Nevis	1	2.52 [2015]	0.56	0.65	0.55	0.53	1	1
12	St Lucia	1	0.11 [2009]	0.27	0.99	0.31	0.6	1	1
13	St Vincent and the Grenadines	1	0.66 [2010]	0.27	0.89	0.25	0.43	1	1
14	Suriname	1	0.71 [2009]	−0.62	0.13	−0.54	−0.15	2	2
15	Trinidad and Tobago	1	2.67 [2015]	0.26	0.28	0.03	−0.11	2	2
16	Federated States of Micronesia	2	0.18 [2010]	0.09	1.18	−0.99	0.01	1	1
17	Fiji	2	0.84 [2015]	0.09	0.64	−0.22	−0.25	3	3
18	Kiribati	2	0.2 [2013]	−0.25	0.88	−0.83	0.53	1	1
19	Marshall Islands	2	0.46 [2012]	−1.55	0.87	−1.03	0.14	1	1
20	Nauru	2	1.24 [2015]	−0.43	0.52	−1.1	−0.73	2	2
21	Palau	2	1.18 [2014]	−0.23	0.87	−0.6	0.28	1	1
22	Papua New Guinea	2	0.05 [2010]	−0.67	−0.7	−0.65	−0.83	3	3
23	Samoa	2	0.34 [2016]	0.62	1.18	−0.08	0.87	2	2
24	Solomon Islands	2	0.292016]	−1.01	0.2	−0.8	−0.21	3	2

25	Timor-Leste	2	0.72	−1	0.07	−0.74	−1.17	2	3
26	Tonga	2	0.52 [2013]	−1.12	−0.9	−0.79	−0.72	2	2
27	Tuvalu	2	0.92 [2014]	−0.74	1.24	−0.79	0.56	1	1
28	Vanuatu	2	0.17 [2016]	−0.9	0.7	−0.33	0.49	2	2
29	Bahrain	3	0.93 [2015]	0.19	−1	0.41	0.45	7	6
30	Cabo Verde	3	0.77 [2015	0.17	0.77	−0.2	0.42	1	1
31	Comoros	3	0.17 [2012]	−1.57	0.04	−1.04	−1.05	3	4
32	Guinea-Bissau	3	0.2 [2010]	−1.77	−0.5	−1.18	−1.44	5	5
33	Maldives	3	1.04 [2016]	−0.45	0.23	−0.42	−0.62	5	5
34	Mauritius	3	2.02 [2015]	0.9	0.97	1	0.68	1	2
35	Sao Tome and Principe	3	0.32 [2015]	−0.75	0.19	−0.83	−0.7	2	2
36	Seychelles	3	0.95 [2016]	0.41	0.79	−0.18	0.1	3	3
37	Singapore	3	2.31 [2016]	2.22	1.62	2.12	1.82	4	4

Note 1: A1: GDP per capita at purchsing power parity (constant 2011 international \$); A2: Life expectancy at birth (years); A3: Primary school enrolment (percentage net); A4: Mortality rate under 5 (per 1000 live births); A5: Access to electricity (percentage of population); A6: Physicians per 1000 people; A7: Government effectiveness; A8: Political stability and absence of violence/terrorism; A9: Regularity quality; A10: Rule of law; A11: Political rights; A12: Civil liberty.

Note 2: In column 3, the region codes are as follows: 1 for Caribbean, 2 for the Pacific and 3 for AIMS.

Note 3: The data for vast majority of attributes and countries relate to 2017. Where data were not available for 2017, values from the past year are used. For the benefit of readers, such years are bracketed in the table.

References

Arrow, K. J. (1963). *Social Choice and Individual Values*. New York: John Wiley & Sons.

Bilbao-Ubillos, J. (2013). The Limits of Human Development Index: The Complementary Role of Economic and Social Cohesion, Development Strategies and Sustainability. *Sustainable Development, 21*(6), 400–412.

Borda, J. C. (1785). *Memoire sur les elections au Scrutin*. Paris: Histoire de I' Academie Royale des Sciences.

Dasgupta, P., & Weale, M. (1992). On Measuring the Quality of Life. *World Development, 20*, 119–131.

Freedom House. (2018). *Freedom in the World 2018*. New York: Rowman & Littlefield Publishers, Inc.

Hicks, D. A. (1997). The Inequality-Adjusted Human Development Index: A Constructive Proposal. *World Development, 25*(8), 1283–1212.

Moulin, H. (1988). *Axioms of Cooperative Decision-Making*. Cambridge: Cambridge University Press.

Noorbakhsh, F. (1998). A Modified Human Development Index. *World Development, 26*(3), 517.

OECD-World Bank. (2016). *Climate and Disaster Resilience Financing in Small Island Developing States*. New York.

Overseas Development Institute. (2010). *Progress in Economic Conditions in Mauritius: Success Against the Odds*. London.

Paul, S. (1996). A Modified Human Development Index and International Comparison. *Applied Economics Letters, 3*, 677–682.

Paul, S. (1997). The Quality of Life: An International Comparison Based on Ordinal Measures. *Applied Economics Letters, 4*, 411–414.

Scandurra, G., Romano, A. A., Ronghi, M., & Carfora, A. (2018). On the Vulnerability of Small Island Developing States: A Dynamic Analysis. *Ecological Indicators, 84*, 382–392.

Slottje, D. J. (1991). Measuring the Quality of Life Across Countries. *The Review of Economics and Statistics, 73*(4), 684–693.

Smith, J. H. (1973). Aggregation of Preferences with Variable Electorate. *Econometrica, 41*, 1027–1041.

UN-OHRLLS. (2015). *Small Island Developing States in Numbers: Climate Change Edition 2015*. New York: United Nations Office of the High Representative for Least developed Countries and Small Island Developing States.

World Bank. (2019a). *World Development Indicators*. Washington, DC.

World Bank (2019b). *Worldwide Governance Indicators*, Available on line at: http://info.worldbank.org/governance/wgi/#home. These indicators are produced by Daniel Kaufmann of Natural Resource Governance Institute (NRGI) and Brookings Institution, and Aart Kraay of World Bank Development Research Group. Washington.

Young, H. P. (1974). An Axiomatization of Borda's Rule. *Journal of Economic Theory, 9*, 43–52.

CHAPTER 9

Disease, Environment and Health Policy Response

Brijesh C. Purohit

9.1 Introduction

Among the Small Island Developing States (SIDS),[1] nearly 40 countries have less than 1.5 million population (www.worldbank.org/en/country/smallstates). The SIDS are generally characterized by remoteness and insularity, susceptibility to natural disasters and climate change and limited institutional capacity. A few studies on health issues conducted so far indicate that healthcare systems as such are not a priority (Tremblay 2012). Besides the fact remains that main focus in these analyses is on public health without looking into the systems' capacity delivering care per se or the discussion is in isolation from country financing. For a holistic understanding, many aspects of healthcare system including health issues, disease and mortality patterns, environmental and ecological disturbances, healthcare financing and its sources in the overall budgets of individual SID, and delivery as well as institutional capacity of these nations need to be taken into account.

B. C. Purohit (✉)
Madras School of Economics, Chennai, India
e-mail: brijesh@mse.ac.in

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_9

The problems of healthcare provisioning in geographically separated and small populations is quite different from other countries due to uniqueness of health needs, more expensive services due to remote geographic locations and typical need for emergency and specialists' services emerging due to frequent climatic disturbances in these areas.

Smaller nations are also less economically diversified; they are more often dependent on tourism and import of the bulk of their food and supplies. The financing of these smaller health systems is usually through taxation. It is also noteworthy that smaller islands nations with large tourist industries experience substantial pressure on their public health, sanitation and prevention and infrastructure.

Some other features of such small states also include undeveloped natural beauty and remoteness, a small population with limited human capital, and a confined land area, labour market and capacity constraints, relatively few employment opportunities, skilled labour migration to other locations, an inadequate local production or exports, and lack of education facilities restricting the scope of adequate specialization.

Thus, the tax base for most of small states is paltry and inadequate to meet the cost of adequate and proper health services. Geographically, barriers of remoteness and lack of proper connectivity with the outer world makes further dent on chances of cheaper healthcare provision in these countries.

9.2 Economy, Health and Disease Profile

SIDS has a total population of 49,863,000. These are categorized into Africa, Asia and the Pacific, Europe, the Latin America and Caribbean (Fig. 9.1). These four regions comprise respectively 5.31, 25.82, 2.38 and 66.48 percent of the total populations of SIDS (Fig. 9.2).

The per capita incomes are presented in Fig. 9.3. These indicate that range lies between US$278–7850 (Comoros–Seychelles), US$545–20,544 (Papua New Guinea–Singapore), US$9245–11,504 (Malta–Cyprus) and US$431–14,856 (Haiti–Bahamas), respectively, for Africa, Asia and the Pacific, Europe, and the Latin America and the Caribbean. These denote large variations in terms of economy in these SIDS across continents.

Likewise, very high variations in other demographic variables are observable across continents in SIDS (Table 9.1). In terms of urbanization it is the highest in SIDS of Asia and the Pacific (13–100 percent). Notably the life expectancy in terms of healthy expected years of life at

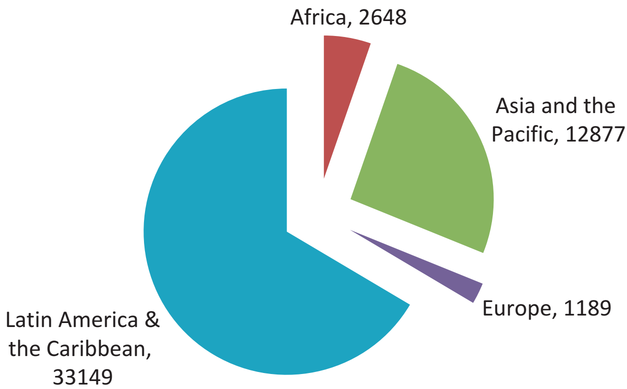


Fig. 9.1 Population of SIDS across continents (in thousands). (Source: Estimated)

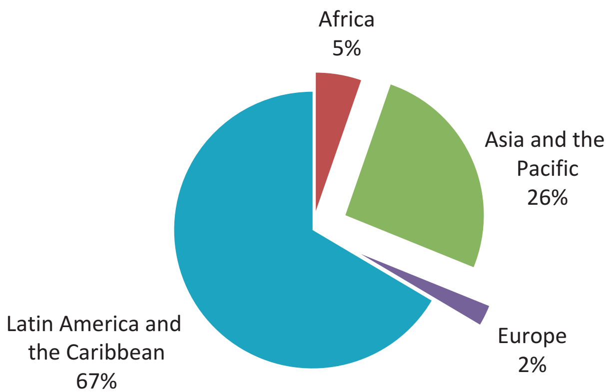


Fig. 9.2 Percentage across continents of SIDS population. (Source: Estimated)

birth (HALE) is higher in Europe (67–71 years) relative to others (Table 9.1, column 4). By contrast, the male and female mortality are also high in SIDS of other subcontinents relative to Europe (Table 9.1, columns 5–6). These variations seem to be a natural outcome of large differentials in SIDS' geography, resources and governing systems. Thus, to bring about an improvement in health status in such diverse nations, WHO and other agencies are putting efforts on improving the

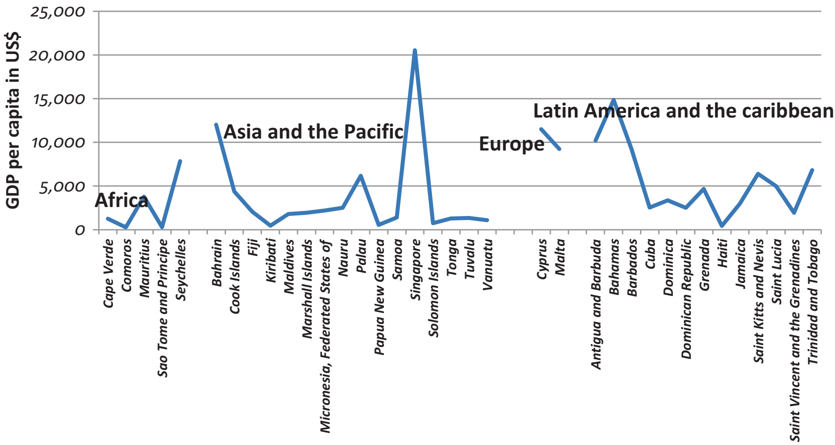


Fig. 9.3 Per capita income of SIDS (in US$). (Source: Estimated)

immunization coverage across five preventable diseases and non-communicable diseases.

As presented in Table 9.2, in the year 2016 (or the latest available year) immunization coverage for diphtheria, tetanus toxoid, and pertussis (DTP3), hepatitis B (HepB3), Polio (Pol3), measles-containing vaccine second dose and malaria control has improved in most of the SIDS. In the last decade, most of the SIDS have shown improvements in the immunization coverage, and the deaths due to Malaria also exhibit decline in those SIDS which are endemic to this vector-borne disease (Table 9.2; last column). The maximum immunization (99 percent) has been done for diphtheria in the SIDS including Maldives, Cuba, Dominica, Fiji, Niue and Soloman islands (Table 9.2, last but one row). Likewise, the maximum coverage in other immunizations has been nearly 99 percent. It suggests that health policy has been fairly operative in most of the SIDS as far as these preventive measures are concerned. The mortality due to non-communicable diseases per lakh of age-standardized population in 2016 has varied between 252 per lakh to 874 per lakh, respectively, related to Singapore and Papua New Guinea (Table 9.3). Most of the SIDS has depicted reduction in mortality in the duration between the years 2000 and 2015.

Environmental and climatic indicators for SIDS are presented in Table 9.4. These depict notable variations in the indicators of carbon

Table 9.1 Urbanization, life expectancy and mortality in SIDS

	Small island state	*Urban (%)*	*HALE (at birth)*	*Males (under-five mortality)*	*Females (under-five mortality)*
Africa	Cape Verde	62	60.8	42	30
	Comoros	33	54.6	80	72
	Mauritius	43	62.4	20	14
	Sao Tome and Principe	47	54.4	80	82
	Seychelles	64	61.2	15	10
Range		*33–64*	*54–63*	*15–80*	*10–82*
Asia and the Pacific	Bahrain	92	64.3	13	10
	Cook Islands	59	61.6	21	19
	Fiji	49	58.8	30	27
	Kiribati	39	54	80	69
	Maldives	27	57.8	38	43
	Marshall Islands	72	54.8	46	36
	Micronesia, Federated States of	28	57.7	63	51
	Nauru	100	55.1	18	12
	Niue	NR	60.4	38	24
	Palau	72	59.6	24	22
	Papua New Guinea	13	51.9	98	92
	Samoa	22	59.7	27	21
	Singapore	100	70.1	4	3
	Solomon Islands	20	56.2	86	75
	Tonga	38	61.8	23	15
	Tuvalu	52	53	72	56
	Vanuatu	20	58.9	40	40
Range		*13–100*	*51.9–64.3*	*4–98*	*3–92*
Europe	Cyprus	57	67.6	7	7
	Malta	91	71	7	6
Range		*57–91*	*67.6–71*	*7*	*6–7*
Latin America and the Caribbean	Antigua and Barbuda	37	61.9	22	18
	Bahamas	89	63.3	13	11
	Barbados	50	65.6	17	15
	Cuba	75	68.3	8	7
	Dominica	71	63.7	13	14
	Dominican Republic	65	59.6	37	30

(*continued*)

Table 9.1 (continued)

	Small island state	*Urban (%)*	*HALE (at birth)*	*Males (under-five mortality)*	*Females (under-five mortality)*
	Grenada	38	59.2	25	21
	Haiti	36	43.8	138	128
	Jamaica	56	65.1	16	14
	Saint Kitts and Nevis	34	61.5	20	24
	Saint Lucia	38	62.7	14	15
	Saint Vincent and the Grenadines	55	61	25	20
	Trinidad and Tobago	74	62	24	18
Range		*36–89*	*43.8–68.3*	*8–138*	*7–128*

Source: Environmental Health Perspectives • volume 114 I number 12 I December 2006

dioxide (CO_2) emissions (megatons), energy consumption per capita (kg oil equivalent) and annual precipitation (mm). The maximum CO_2 emissions are for high per capita SIDS (Singapore) and minimum of this emission is depicted for Tuvalu. Likewise, the highest and lowest energy consumption is for Bahrain (12,889 kg oil equivalent) and Comoros (38 kg oil equivalent) (Table 9.4, columns 3 and 4). Notably, climatic variations are marked also in terms of annual precipitation rate. It varies from 70 (for Cape Verde) to 3746 (for Palau) (see the last column of Table 9.4). Such high variations indicate the need for health policy responses to tune according to environmental conditions and provide requisite preventive or curative facilities accordingly.

Taking into consideration our foregoing analysis, we have tried to check the simple correlation and Spearman rank correlation for five major variables depicting health and state of development of SIDS through per capita income and urbanization. The results are presented in Tables 9.5 and 9.6. The results indicate that both the development indicators, namely per capita income and urbanization, have positive correlation with life expectancy and negative correlations with male and female mortality. The respective coefficients of correlations are generally above 0.50. Thus, we further conducted a priori simple causal analysis using regression. Regression results for SIDS with healthy life years expected as dependent

Table 9.2 Immunization coverage among one-year-olds (%) for diphtheria, hepatitis, polio and nationally recommended age for measles and incidence of malaria in SIDS

(SIDS↓) for diphtheria, hepatitis, polio and measles (%)→	*Diphtheria, tetanus toxoid and pertussis (DTP3)*	*Percent change in the duration*	*Hepatitis B (HepB3)*	*Percent change in the duration*	*Polio (Pol3)*	*Percent change in the duration*	*Measles-containing vaccine second dose (MCV2)*	*Percent change in the duration*	*Malaria -reported deaths(nos.)*	*Percent change in the duration*
	2016	2000–16	2015	2000–15	2016	2000–16	2016	2000–16	2014	2000–14
Cape Verde	96	6	96	56	95	5	95	–4	2	2
Comoros	91	21	91	63	92	22		0	0	–28
Guinea-Bissau	87	38	87	7	87	35		0	357	–278
Maldives	99	1	99	1	99	1	99	43	na	0
Mauritius	96	8	72	–20	96	8	92	12	na	0
Sao Tome and Principe	96	14	96	53	96	9	76	5	0	–254
Seychelles	96	–2	97	1	96	–2	99	1	na	0
Singapore	97	–1	96	1	96	–2	88	–10	na	0
Antigua and Barbuda	99	4	99	3	86	–10	87	41	na	0
Bahamas	94	–5	94	73	94	3	74	–21	na	0
Barbados	97	4	97	79	97	11	87	75	na	0
Belize	95	4	95	–1	96	5	96	9	0	0
Cuba	99	4	99	1	98	0	99	46	na	0
Dominica	99	0	99	6	99	0	92	30	na	0
Dominican Republic	87	9	80	14	82	11		0	4	–2

(*continued*)

Table 9.2 (continued)

(SIDS↓) for diphtheria, hepatitis, polio and measles (%)→	*Diphtheria, tetanus toxoid and pertussis (DTP3)*	*Percent change in the duration*	*Hepatitis B (HepB3)*	*Percent change in the duration*	*Polio (Pol3)*	*Percent change in the duration*	*Measles-containing vaccine second dose (MCV2)*	*Percent change in the duration*	*Malaria -reported deaths(nos.)*	*Percent change in the duration*
Grenada	96	−1	96	0	98	1	85	11	na	0
Guyana	97	9	97	12	94	15	94	6	11	−18
Haiti	58	17	58	−10	56	6	26	26	9	−7
Jamaica	99	6	98	62	99	4	85	−11	na	0
Saint Kitts and Nevis	97	−1	98	−1	99	1	97	−2	na	0
Saint Lucia	95	25	95	81	95	25	88	−1	na	0
Saint Vincent and the Grenadines	98	0	98	67	97	−2	99	0	na	0
Suriname	91	20	91	8	91	21	44	26	0	−24
Trinidad and Tobago	97	7	97	92	84	−6	65	−15	na	na
Cook Islands	99	7	99	6	99	7	90	20	na	na
Fiji	99	9	99	1	99	8	94	20	na	na
Kiribati	81	−9	81	−4	82	−8	79	44	na	na
Marshall Islands	71	32	73	−3	69	33	49	43	na	na
Nauru	91	47	91	−4	91	64	96	1	na	na
Niue	99	0	99	0	99	0	99	0	na	na
Palau	98	2	98	0	98	2	95	20	na	na

Papua New Guinea	72	13	66	7	73	22		0	203	na
Samoa	62	−33	55	−34	57	−37	44	−40	na	na
Solomon Islands	99	13	99	16	99	11		0	23	na
Timor-Leste	85	31	85	6	83	0	22	22	1	na
Tonga	78	−13	78	−13	80	−11	85	3	na	na
Tuvalu	94	12	94	−5	94	12	92	−7	na	na
Vanuatu	64	−7	64	−4	65	−2	na	na	0	na
Maximum	99	47	99	92	99	64	99	75	357	2
Minimum	0	−33	0	−34	0	−37	0	−40	0	−278

Source: www.worldbank.org/en/country/smallstates

Table 9.3 Pattern of non-communicable diseases in SIDS

SIDS	*Non-communicable diseases*											
	Age-standardized mortality rate by cause (per 100,000 population)						*Total NCD Deaths (in thousands)*					
	Both sexes (2016)	*2000–15*	*Male*	*2000–15*	*Female*	*2000–15*	*Both sexes*	*2000–15*	*Male*	*2000–15*	*Female*	*2000–15*
Cape Verde	528.4	96.7	573.2	91.4	499.7	97.3	1.9	−0.4	0.8	−0.1	1	−0.2
Comoros	680.8	44.6	573.2	52.5	499.7	39	1.9	−0.7	0.8	−0.3	1	−0.3
Guinea-Bissau	690.5	61.4	573.2	55.6	499.7	65.9	1.9	−1	0.8	−0.5	1	−0.4
Maldives	409.8	301.3	573.2	269.5	499.7	328	1.9	0	0.8	0	1	0
Mauritius	567.8	196.9	573.2	244.4	499.7	161	1.9	−1.5	0.8	−0.8	1	−0.8
Sao Tome and Principe	594.6	22.2	573.2	24.7	499.7	17	1.9	−0.1	0.8	−0.1	1	0
Seychelles	581	59.6	573.2	71.9	499.7	58.8	1.9	−0.1	0.8	−0.1	1	−0.1
Singapore	251.8	165.4	573.2	189.3	499.7	142	1.9	−5.6	0.8	−3.3	1	−2.2
Antigua and Barbuda	470.6	106.3	573.2	135.9	499.7	84.1	1.9	0	0.8	0	1	0
Bahamas	450	65.6	573.2	40.5	499.7	87.9	1.9	−0.7	0.8	−0.5	1	−0.4
Barbados	523.9	111.1	573.2	115.5	499.7	110.9	1.9	−0.2	0.8	−0.2	1	0
Belize	719.5	61	573.2	61.7	499.7	62.5	1.9	−0.4	0.8	−0.3	1	−0.1
Cuba	396.2	56.7	573.2	54.1	499.7	59	1.9	−16.5	0.8	−9.5	1	−7
Dominican Republic	460.8	15.3	573.2	1.6	499.7	24.8	1.9	−15.8	0.8	−8.2	1	−7.7
Grenada	711.1	55.4	573.2	46	499.7	68.7	1.9	0	0.8	0	1	0
Guyana	834.9	48	573.2	78.7	499.7	21.5	1.9	−1	0.8	−0.4	1	−0.5
Haiti	756.2	−40.3	573.2	−42.1	499.7	−39.9	1.9	−17.3	0.8	−8	1	−9.2
Jamaica	439.6	89.6	573.2	106.5	499.7	72.8	1.9	−1.3	0.8	−0.6	1	−0.7
Saint Lucia	506.4	136.4	573.2	115.4	499.7	154.8	1.9	−0.2	0.8	−0.1	1	0
Saint Vincent and the Grenadines	672.7	−15.8	573.2	−35.2	499.7	8.4	1.9	−0.1	0.8	−0.1	1	−0.1

Suriname	607.4	169.9	573.2	194.2	499.7	146.9	1.9	−0.4	0.8	−0.1	1	−0.2
Trinidad and Tobago	681.6	82.8	573.2	116.4	499.7	58.7	1.9	−2.4	0.8	−1.2	1	−1.2
Fiji	806.9	123.8	573.2	110.5	499.7	133.9	1.9	−1.5	0.8	−1	1	−0.5
Kiribati	794	48	573.2	74.3	499.7	32.1	1.9	−0.1	0.8	0	1	0
Papua New Guinea	873.7	22.7	573.2	16.6	499.7	24.7	1.9	−11.5	0.8	−6	1	−5.5
Samoa	582.9	165.6	573.2	183.2	499.7	137.5	1.9	−0.1	0.8	−0.1	1	0
Solomon Islands	769.5	46.7	573.2	28.3	499.7	64.2	1.9	−0.7	0.8	−0.4	1	−0.3
Timor-Leste	608.1	122.6	573.2	88.6	499.7	146.7	1.9	−1.5	0.8	−0.7	1	−0.8
Tonga	607.3	72.4	573.2	27.3	499.7	99.9	1.9	−0.1	0.8	−0.1	1	0
Maximum	873.7	301.3	573.2	269.5	499.7	328	1.9	0	0.8	0	1	0
Minimum	251.8	−40.3	573.2	−42.1	499.7	−39.9	1.9	−17.3	0.8	−9.5	1	−9.2

Source: www.worldbank.org/en/country/smallstates

Table 9.4 Environment and climate indicators in small island states

Continent	*Small island state*	*CO_2 emissions (megatons)*	*Energy consumption per capita (kg oil equivalent)*	*Annual temperature (°C)*		*Annual precipitation (mm)*
				Minimum	*Maximum*	
Africa	Cape Verde	121	108	23.5[a]	29.3	70
	Comoros	66	38	21.2	29.5	2700
	Mauritius	1704	680	20.2	26.9	1793
	Sao Tome and Principe	77	226	23.3[b]	28.6[b]	1040[b,c]
	Seychelles	198	893	23.9	31.0	2172
Asia and the Pacific	Bahrain	14,847	12,889	14.1	38.0	72
	Cook Islands	22	578	20.7[b]	26.7[b]	2103[b]
	Fiji	755	323	20.4	31.0	3040
	Kiribati	22	100	27.6	28.1	100
	Maldives	304	557	25.1	31.5	1951
	Marshall Islands	NR	NR	26.7	27.7	2407
	Micronesia, Federated States of	141	NR	23.4[b]	31.2[b]	469[b]
	Nauru	139	3666	25.0[b]	29.9[b]	2236
	Niue	NR				
	Palau	234	4404	24.2[b]	31#	3746
	Papua New Guinea	2451	188	25.4	27.7	1150
	Samoa	132	287	24.4[b]	29.9[b]	2928
	Singapore	35,634	3873	24.9	31.6	2191
	Solomon Islands	161	128	22.3	30.7	3290
	Tonga	121	406	20.2[b]	26.8[b]	1610[b]
	Tuvalu	5	NR	NR	NR	NR
	Vanuatu	62	138	21.5	28.2	2222
Europe	Cyprus	5456	2365	7.3	32.3	320
	Malta	1759	2841	9.2	30.7	553
Latin America and the Caribbean	Antigua and Barbuda	337	1799	23.9	29.6	1052

(*continued*)

Table 9.4 (continued)

Continent	*Small island state*	*CO_2 emissions (megatons)*	*Energy consumption per capita (kg oil equivalent)*	*Annual temperature (°C)*		*Annual precipitation (mm)*
				Minimum	*Maximum*	
	Bahamas	1740	1994	16.7	31.8	1360
	Barbados	898	1438	25.1	27.1	1273
	Cuba	25,113	581	18.6	31.6	1189
	Dominica	81	419	21.6	30.5	654
	Dominican Republic	13,224	847	19.6	31.5	1448
	Grenada	183	707	25.1[b]	29.3[b]	1359[b]
	Haiti	1389	63	NR	NR	NR
	Jamaica	10,728	1301	22.9	31.4	813
	Saint Kitts and Nevis	103	807	25.1[b]	29.3[b]	NR
	Saint Lucia	198	741	25.9[b]	29.1[b]	NR
	Saint Vincent and the Grenadines	161	505	NR	NR	NR
	Trinidad and Tobago	21,966	8084	23.2	31.8	1714
	Maximum	35,634 (for Singapore)	12,889 (Bahrain)	nc	nc	3746 (Palau)
	Minimum	5 (Tuvalu)	38 (Comoros)	nc	nc	70 (Cape Verde)

Source: Environmental Health Perspectives • volume 114 I number 12 I December 2006

Data from United Nations (2003) and WHO (2002)

Data missing. *NR* not reported. *nc* not calculated

[a]Average mean temperature

[b]Data from the Weather Channel (2004)

variable on per capita GDP and carbon emission are presented in Tables 9.7 and 9.8. The results indicate that in the presence of per capita GDP other development indicator or climatic variable do not appear significant (Table 9.7). Thus, instead of using per capita income, we used urbanization along with climatic variable CO_2 emissions, and results indicated that

Table 9.5 Correlations

	GDP per capita in US$	*Urban (%)*	*HALE (at birth)*	*Males (under-five mortality)*	*Females (under-five mortality)*
GDP per capita in US$	1				
Urban (%)	0.5809	1			
HALE (at birth)	0.6613	0.4846	1		
Males (under-five mortality)	−0.5831	−0.5376	−0.8778	1	
Females (under-five mortality)	−0.5662	−0.5576	−0.8622	0.9899	1

Source: Estimated

Table 9.6 Spearman correlation

	GDP per capita in US$	*Urban (%)*	*HALE (at birth)*	*Males (under-five mortality)*	*Females (under-five mortality)*
GDP per capita in US$	1				
Urban (%)	0.5674*	1			
HALE (at birth)	0.7930*	0.5062*	1		
Males (under-five mortality)	−0.8517*	−0.6294*	−0.9138*	1	
Females (under-five mortality)	−0.8088*	−0.6742*	−0.8874*	0.9696*	1

Source: Estimated

*5 percent significance

both these were positively significant for healthy expected years of life (Table 9.8). These indicate that developmental inputs in terms of increasing production[2] and higher per capita income are essential for providing better resources to maintain and increase longevity in SIDS.

Table 9.7 Regression results for SIDS with healthy life years expected as dependent variable on per capita GDP and carbon emission

Number of observations = 36; F(2, 33) = 14.22;			
Prob > F = 0.0000; R-squared = 0.4629;			
Adj R squared = 0.4303			
HALE (at birth)	Coefficient	t values	P>|t|
GDP per capita in US$	0.0007	3.87	0
CO_2 emissions (megatons)	0.0001	1.25	0.219
Constant	56.6253	58.65	0

Source: Author's estimation

Table 9.8 Regression results for SIDS using healthy life years expected using urbanization and carbon emission

Number of observations = 36			
F(2, 33) =7.18			
Prob > F = 0.0026			
R-squared = 0.3033			
Adj R-squared= 0.2611			
HALE (at birth)	Coefficient	t values	P>|t|
Urban (%)	0.077018	1.99	0.055
CO_2 emissions (megatons)	0.000199	1.8	0.081
Constant	55.26059	27.12	0

Source: Author's estimation

9.3 Other Evidence on Health Policy Responses

Though presumably most of the governments of different countries comprising SIDS may be acting to protect their denizens from health-related disasters and endemic health diseases, the evidence on such responses is at best fragmentary. Part of this evidence emerges from WHO or UN documents and their focus is on a group of SIDS belonging to one or another continents. Besides it is observed that there are a number of gaps and threats in SIDS which affect children largely along with other population in these islands.

For example, according to a World Health Organization report (2003), the environment presents potential risk factors for children's health. Focusing on the Eastern Caribbean which comprises one of the segments of SIDS only, for instance, one observes absence or unavailability of sources of information on environmental hazards as potential risk factors for human health. Among all the factors, rather complete information on potential environmental risk factors for children health in SIDS in the Eastern Caribbean is on sources of drinking water and adequacy of toilet facilities (Table 9.9). As per the UNICEF estimates, the proportions of population accessing improved drinking water and adequate sanitation facilities across rural and urban areas in Caribbean SIDS range from 89 to 100 per cent. Thus, the absence of such information on risk factors may also impinge upon the proper health facilities in the SIDS. Despite paucity of resources and information on national health policies of individual SID, the fragmentary evidence again, for instance from Caribbean region, indicates that there have been attempts by international NGOs like Red Cross, UNESCO as well as local groups to promote children's education on the environment (Table 9.10). In a similar manner there have been national acts in different SIDS that provide for the care and protection of children and their relevance in circumstances of natural disasters (Table 9.11). Specific attempts by UNICEF in these countries are also notable to restrict damage due to natural disasters leading to health hazards (Table 9.12).

Likewise, another evidence from Pacific continents relating to SIDS indicate that the most prominent public health problems in Pacific Island countries remain those of infectious diseases, like respiratory diseases related to overcrowding, and gastroenteric diseases related to water pollution, poor sanitation and inappropriate health and hygiene practices (Russell 2011). In this regard, the government response in terms of warnings to boil water goes unheeded largely due to the high fuel costs involved. In some places in Pacific, like Tarawa (in 1987) and Pohnpei (in 2000), sewage contamination has also led to cholera outbreaks. In the Pacific SIDS even, Malaria is a significant problem with more than 800 deaths reported each year. The disease is endemic in Papua New Guinea, the Solomon Islands and Vanuatu but it is not found in Polynesia or Micronesia due to the absence of the vector mosquito. Factors like migration and inter-island travel exacerbate this problem. To some extent the health policy response in Solomon Islands, for instance through periodic mass screening, treatment and follow-up of all positive cases, has reduced transmission across smaller townships.

There is also a concern about the emergence of HIV/AIDS in Pacific Island countries. As the published statistics indicate, in 2008 itself there were 29,629 confirmed cases and majority of cases were from Papua New Guinea. Thus, the Pacific Island countries fall into three clusters: Papua New Guinea, which is the overwhelming locus of the Pacific epidemic;

Table 9.9 Global environmental risk factors for children: correlated health concerns and risk levels in SIDS Countries in the Eastern Caribbean

Risk factors ↓/correlated health concerns→	*Perinatal diseases*	*Respiratory diseases*	*Diarrhea diseases*	*Insect-borne diseases*	*Physical injuries*	*SIDS reporting on risk factors*
Housing and shelter	+ + +	+ + +	+ +	+ + +	++	Not assessed
Water supply and quality	+	+	+ + +	+ +	++ +	A NT, BAR, DOM, MON, SKN, SLU,SVG, TCI
Food safety and security of supply	+ +	+ +	+ + +	+ +	++ +	Not assessed
Sanitation and hygiene	+	+	+ + +	+ + +	++	ANT, BAR, DOM, MON, SKN, SLU,SVG, TCI
Solid wastes	+ +	+ +	+ + +	+ + +	++	None
Outdoor air pollution	+ +	+ +	+	+	+	None
Indoor air pollution	+ + +	+ + +	+	+	+	None
Hazardous wastes	+ + +	+	+	+	++ +	BAR, GRE and SLU
Accidents	+ +	+ +	+ +	+	++ +	N/A
Natural hazards(disasters)	+ +	+ +	+ +	+ + +	++ +	DOM, SLU,TCI (1960–2005)
Disease-carrying vectors	+ +	+	+ +	+ + +	+	DOM, SLU,SVG (2007)
Social/work environment	+ + +	+ +	+ + +	+ + +	++ +	N/A

Source: Leonard O'Garro and Violet Speek-Warnery (2009)

Key: refers to health concerns correlated with risk factors; high risk +++, medium risk ++, low risk +

ANU Antigua and Barbuda, *BAR* Barbados, *DOM* Dominica, *GRE* Grenada, *MON* Montserrat, *SKN* St Kitts and Nevis, *SLU* St Lucia, *SvG* St Vincent and the Grenadines, *TCI* Turks and Caicos

Table 9.10 National policies and activities undertaken SIDS in the Eastern Caribbean to promote children's education on the environment

SIDS	*Name of national policy framework*	*Main national-level activities undertaken in support of national policy and sponsoring agencies*
Antigua and Barbuda	Antigua and Barbuda National Plan to Reduce Vulnerability of School Buildings to Natural Disasters	Promoting awareness of climate change (Antigua and Barbuda Red Cross)
Barbados	The National Strategic Plan of Barbados 20,052,025	Promoting environmentally and socially sustainable use of marine areas (Barbados Marine Trust) Youth involvement in environmental protection (Barbados Environment Youth Programme) Promoting public awareness of the importance of the marine environment (Coastal Zone Management Unit) Promoting awareness of the environment among youth and schools (Barbados Environmental Youth Programme) Fostering greater understanding of the Caribbean Sea and its resources (Caribbean Sea Project)
British Virgin Islands	Integrated Development Strategy	Promoting importance of disaster preparedness (Department of Disaster Management) Advancing environmental protection and sustainable development (Jost van Dykes Society) Promoting respect for and sustainable use of the environment (Jean-Michel Cousteau's Ocean Futures Society) Publishing newsletter encouraging students to become environmentally aware and to be engaged in the preservation of their environment (Robinson O'Neal Memorial Primary School) Promoting marine conservation (Sail Caribbean Foxtrot Environment Service and Sailing Adventures Programme)

(*continued*)

Table 9.10 (continued)

SIDS	*Name of national policy framework*	*Main national-level activities undertaken in support of national policy and sponsoring agencies*
Dominica	Dominica: A Plan of Action for Localizing and Achieving the Millennium Development Goals	Promoting projects for the protection of rivers and streams (Youth Development Division of the Ministry of Education, Human Resource Development, Sports and Youth Affairs; Dominica National Commission for UNESCO) Promoting involvement of youths in the preservation of the natural environment/ Dominica Youth Environment Organization
Grenada	Basic Education Reform Project	Providing public education on solid waste targeting schools and youth clubs (Grenada Solid Waste Management Authority) Promoting environmental awareness and conservation (The Grenada Education and Development Project) Promoting the importance of tourism and the role of environmental protection in enhancing the beauty of Grenada (Grenada Board of Tourism)
Montserrat	Not available	Promoting beach conservation (Department of Environment and Coastal Resources Adopt-a-Beach Programme)
St Kitts and Nevis	St Kitts: A Plan of Action for Achieving the Millennium Development Goals	Using Information Communication Technology to raise environmental awareness (The Nevis Historical and Conservation Society) Promoting environment awareness (Nevis Public Library)
St Lucia	National Youth Policy	Promoting waste management (St Lucia Waste Management Authority)

Source: Same as Table 9.9

Table 9.11 National policies catering for the care and protection of children and their relevance in circumstances of natural disasters in SIDS in Eastern Caribbean

SIDS	*Policies of relevance to the care and protection of children*	*Objectives of policy in relation to care and protection of children*
Antigua and Barbuda	Childcare and Protection Act 2003	Provide for the protection of children from abuse and neglect
	Sexual Offences Act 1995	Protect children from sexual abuse
Barbados	Protection of Children Act (1991)	Provide for protection from exploitation and pornographic activities
	The Prevention of Cruelty to Children Act (1981)	Provide for protection from abuse and neglect
	The Sexual Offences Act (1992)	Provide for protection from Sexual abuse
	The Maintenance Act (1981 and Regulation 1982)	Ensure financial support of children by parents
	Offences Against the Person Act (1992)	Provide protection of children from abuse
	The Family Law Act (1981 and Regulation 1982)	Provide for the resolution of matters for dissolution of marriages or unions other than marriage. Provide also for parental rights and the custody and guardian of children
	Child Care Board Act (1981)	Provide for a range of service of services to children to ensure their care and protection
	Domestic Violence (Protection Orders) Act (1992)	Provide for granting of protection orders in domestic violence and related matters
	The Status of Children Reform Act (1979)	Establish status and inheritance rights of minors
	The Education Act (2001)	Provide for the education of children, including those with disabilities
	The Juvenile Offenders Act (1932)	Provide for juvenile justice for children in conflict with the law
	Health Services Act	Provide for health services to children, including those living with HIV/AIDS
British Virgin Islands	Domestic Violence Act (1996)	Protection of family members in situations of domestic violence

(*continued*)

Table 9.11 (continued)

SIDS	*Policies of relevance to the care and protection of children*	*Objectives of policy in relation to care and protection of children*
Dominica	Sexual Offences Act (1998)	Provide protection from sexual abuse
	Children and Young Persons Act (1990)	Provide for the care and control of children and young persons
	Maintenance Act	Provide for maintenance of children by parents
	Infant's Protection Act	Provide for protection of infants
	Guardianship of Infants Act	Provide for guardianship
Grenada	Child Protection Act (1998)	Provide for protection of children
	Adoption Act (1994)	Provide for the adoption of minors
	Status of Children Act (1991)	Establish status and inheritance rights of minors
Montserrat	Family Act (1995)	Establish provision for family welfare
St Kitts and Nevis	The Probation and Child Welfare Board Act (1994)	Provide for the care and protection of abused and neglected children and children in conflict with the law. Provide also for mandatory reporting of child abuse cases
	The Juvenile Act	Provide for jurisdiction over juveniles in conflict with the law
	The domestic Violence Act (2000)	Provide for protection of family members in situations of domestic violence
St Vincent and the Grenadines	Domestic Violence Act (1995)	Protection of family members in situations of domestic violence
St Lucia	Education Act (1999)	Provide for education of all children, including those with disabilities
	The Health Act	Establish provisions for healthcare
	Domestic Violence Act (1995)	Provide for protection of family members in situations of domestic violence
	Children and Young Act (1972)	Provide for the care and control of children and young persons

Source: Leonard O'Garro and Violet Speek-Warnery (2009)

Table 9.12 National disaster plans catering for children, mothers and families in the partner countries of the UNICEF Office for Barbados and the Eastern Caribbean

SIDS	*Name of disaster plan*	*Main objectives of plan*	*Special provisions for children, mothers and families*
Antigua and Barbuda	National Disaster Management Act (2002)	Prepare for meteorological hazards and man-made emergencies	None
	Emergency Shelter Policy National Disaster Management Plan	Provide for efficient operation of shelters during disasters and emergencies	Yes. (Special programme for supervision of children)
Barbados	The Emergency Management Act (2006) National Disaster Emergency Plan	Prepare country for meteorological hazards and man-made emergencies	None
Dominica	National Disaster Management Plan	Prepare country for meteorological hazards and man-made emergencies	None
Grenada	National Disaster Management Plan	Prepare country for meteorological hazards and man-made emergencies	None
	Disaster Psychosocial Response Plan	Provide counselling and services to traumatized children and families in the aftermath of natural disasters	Yes
Montserrat	Disaster Management Act (57/2002) State of Emergency Act (64/1997) Disaster Management Plan	Prepare country for meteorological hazards and man-made emergencies	None

(*continued*)

Table 9.12 (continued)

SIDS	*Name of disaster plan*	*Main objectives of plan*	*Special provisions for children, mothers and families*
St Kitts and Nevis	Disaster Management Act (5/1998)	Provide legal framework for emergency management	None
	National Disaster Management Plan (1999)	Mobilize human and material resources of the island in disaster/emergency planning and management	None
	St Kitts Disaster Mitigation Plan and Policy (2001)		
	Development Control and Planning Act (2000)		
	Nevis Disaster Plan (2005)		
St Lucia	The Disaster Management Act (30/2006)	Provide for disaster management	None
	Occupational Health and Safety Act (1985)	Protect employees from industrial hazards and injury	None
	Police Ordinance (1965)	Mandate police to assist in the protection of life during emergencies and disasters	None
	National Emergency and Disaster Response Plan		
St Vincent and the Grenadines	National Emergency and Disaster Management Act (2006) Replaced the National Disaster Relief Act and National Disaster Management Plan	Provide for prevention, preparedness, response, mitigation and recovery in relation to hazards, disasters and emergencies and the establishment of the National Emergency Management Organization	None

Source: UNICEF.org

Fiji, French Polynesia, New Caledonia and Guam, where there are significant numbers of HIV cases; and the other countries with fewer known cases. Another communicable disease, namely tuberculosis (TB), in 2008 accounted for 15,443 new cases in the Pacific island region. Out of this, only seven Pacific Island countries account for 80 percent of all TB cases with Papua New Guinea, Marshall Islands, Kiribati, Micronesia, Vanuatu, Fiji and Solomon Islands having a high prevalence. Similarly, the problems of lifestyle disease like obesity, cardiovascular diseases, hypertension and diabetes are also reported from Pacific islands.

The health policy response in the form of investment in the development of national nutrition action plans and interventions to promote healthy eating and physical activity has been rather unsuccessful which is shown by poor nutrition and obesity in the populace. Besides, the factors like globalization have also added to poor nutrition in Pacific Islands due to trade and tariff agreements impinging on food security and increased dependence on imported food of poor nutritional quality. Notably relative to 9 percent in Caribbean islands, Pacific island countries are spending nearly 13 percent of their total government expenditure on health, and it has increased for most countries between 1995 and 2006. However, the spending pattern of government health expenditure is skewed towards curative care, whereas a strong focus on primary care services to ensure improved immunization coverage and lower infant mortality rates is more desirable.

Another area demanding health policy response in Pacific SIDS is the shortage of health workers which is reflected in an average health worker density of about 3 per 1000 population, compared to much higher densities of more than 10 per 1000 population in developed countries such as Australia and New Zealand. Even the factor like the number of physicians also bags a policy response which per 1000 populations is very low (Table 9.13). Despite the fact that nurses make up the majority of the health workforce, their strength is insufficient for the primary healthcare needs of rural areas (Table 9.13).

Table 9.13 Some aspects of healthcare expenditure and manpower in Pacific Island nations

Pacific Island country / territory	*Total health expenditure as % of GDP 2006*	*Per capita expenditure on health 2006 (intl $)*	*Doctors / 1000 people*	*Nurses and midwives / 1000 people*
Cook Islands	4.5	566	1.1 (2004)	4.7 (2004)
Fiji	4	280	0.5 (2003)	2.0 (2003)
Kiribati	13	290	0.2 (2004)	3.0 (2004)
Marshall Islands	15	607	0.5 (2000)	3.0 (2000)
Micronesia (Federated States)	12.5	491	0.6 (2003)	2.3 (2003)
Nauru	11	303	1.0 (2004)	4.9 (2004)
Niue	13.5	298	2.4 (2004)	11.0 (2004)
Palau	11	1084	1.6 (2000)	6.1 (2004)
Papua New Guinea	3.5	134	0.1 (2000)	0.5 (2000)
Samoa	5	232	0.3 (2003)	1.7 (2003)
Solomon Islands	4.5	107	0.1 (2003)	1.4 (2003)
Tonga	6	289	0.3 (2002)	3.4 (2002)
Tuvalu	12	205	1.0 (2003)	4.6 (2003)
Vanuatu	4	139	0.1 (2004)	1.7 (2004)
Timor L'Este	17	169	–	–
Australia	8	3122	3.5 (2001)	9.7 (2001)
New Zealand	9	2477	2.1 (2002)	8.9 (2003)

Source: Russell (2011); Data from United Nations Economic and Social Commission for Asia and the Pacific (2010). Statistical Yearbook for Asia and the Pacific 2009

9.4 Conclusions

This chapter explores healthcare systems of SIDS. Based on available evidence of various parameters of health, pertinent issues, and environmental and ecological factors, it is observed that there has been a reduction in mortality between the years 2000 and 2015. However, variations in environmental and climatic indicators demand a better tuning of policies. More should be invested in national nutrition action plans and interventions to promote healthy lifestyle. Merely curative care focus is unwarranted, and enhancement of primary care services are necessary to further lower infant mortality rates. No doubt, more developmental inputs can also help considerably.

Annexure

Table 9.14 Classification of SIDS[a]

Atlantic, Indian Ocean, Mediterranean and South China Sea	Cabo Verde
	Comoros
	Guinea-Bissau
	Maldives
	Mauritius
	Sao Tome and Principe
	Seychelles
	Singapore
Caribbean Region	Antigua and Barbuda
	Bahamas
	Barbados
	Belize
	Cuba
	Dominica
	Dominican Republic
	Grenada
	Guyana
	Haiti
	Jamaica
	Saint Kitts and Nevis
	Saint Lucia
	Saint Vincent and the Grenadines
	Suriname
	Trinidad and Tobago
Pacific Region	Cook Islands*
	Fiji
	Kiribati
	Marshall Islands
	Federated States of Micronesia
	Nauru
	Niue*
	Palau
	Papua New Guinea
	Samoa
	Solomon Islands
	Timor-Leste
	Tonga
	Tuvalu
	Vanuatu

Niue* and Cook Islands* are not independent but associated to New Zealand and are not members of the United Nations. However, their status has been accepted by the United Nation Organization as equivalent to independence for international law purposes. Full list available at http://www.sidsnet.org

[a]This list includes independent small island states that are members of the United Nations

Notes

1. See Annexure Table 9.14.
2. Indicated by higher CO_2 emissions associated more with factory production or other pollution-producing technologies.

References

Ebi, K. L., Lewis, N. D., & Corvalan, C. (2006, July 11). Climate Variability and Change and Their Potential Health Effects in Small Island States: Information for Adaptation Planning in the Health Sector. *Environmental Health Perspectives, 114*(12), 1957–1963. Published online: https://doi.org/10.1289/ehp.8429; Research Mini-Monograph.

O'Garro, L., & Speek-Warnery, V. (2009, October). *Gap Analysis: Children and Climate Change in SIDS of the Eastern Caribbean* (Paper No 5).

Russell, L. (2011, April). *Poverty, Climate Change and Health in Pacific Island Countries; Issues to Consider in Discussion, Debate and Policy Development*. Menzies Centre for Health Policy, University of Sydney.

Small Island Developing States Network (SIDSnet). www.sidsnet.org

Tremblay, M. (2012). *The Health Systems of Small and Island Countries: Issues and Overview*. Tremblay Consulting, Cassis Limited.

United Nations. (2003). *World Statistics Pocketbook: Small Island Developing States*. Available: http://www.sidsnet.org/docshare/other/20040219161354_sids_statistics.pdf. www.worldbank.org/en/country/smallstates

WHO. (2002). *World Health Report 2002: Reducing Risks, Promoting Healthy Life*. Geneva: World Health Organization.

World Health Organization (2003). *Making a Difference: Indicators to Improve Children's Health*. Geneva, Switzerland. Available: http://www.who.int/phe/children/en/cehindic.pdf

PART III

Climate Change and Natural Resources

CHAPTER 10

Climate Change, Sea Level Dynamics, and Mitigation

Shyam Nath and Yeti Nisha Madhoo

10.1 Introduction

This chapter discusses the dilemma faced by small island developing countries (SIDS), which have higher growth prospects but face survival challenges due to climate change associated with induced sea level rise and natural hazards. Climate change is characterized by a rise in the earth's average temperature (also called global warming) leading to long-lasting alterations in weather patterns and disturbing the ecosystem balance. Emissions of greenhouse gases (GHGs), particularly carbon dioxide (CO_2), in the atmosphere are directly correlated to this phenomenon. While the greenhouse effect is a natural occurrence, increase in GHGs can also be attributed to human activities. This notion of climate change-induced human activity goes almost two centuries back in history (Weart 2008). It is estimated that an average person could produce about 5 tons of CO_2 annually, of which one-fourth may remain in the atmosphere for over a thousand years (Le Quéré et al. 2018; Archer et al. 2009).

S. Nath (✉) • Y. N. Madhoo
Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, India
e-mail: shyamnath@am.amrita.edu; yetinishamadhoo@am.amrita.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_10

Climate change effects are reflected in temperature changes. Hsiang and Kopp (2018) document that from "the late 19th century, global mean surface temperature has increased by about 1.0°C, with the trend accelerating after 1980. Almost every location on the planet has exhibited an upward temperature trend over this period (Wuebbles et al., 2017). Warming has also been substantially faster over land than the ocean – between 1880-1900 and 1997-2017, land has warmed 1.4°C (2.5°F) on average while the oceans warmed roughly 0.6°C (1.1°F)." With global warming, increase in polar ice melting and thawing of the permafrost is contributing to an unprecedented rate of sea level rise (IPCC 2018). This development would have severe consequences for small islands in terms of economic activities and threat of survival.

The focus of this chapter is twofold: (i) discuss the trends in sea level dynamics and contributory factors, particularly CO_2 emissions as a threat to the survival of SIDS; and (ii) examine the alternative strategies to minimize the accumulation and growth of CO_2 emissions. The rest of the chapter is structured as follows. Section 10.2 discusses geographic location, economic opportunities, and challenges. Section 10.3 outlines implications of climate change and global warming in terms of CO_2 emissions and examines the adverse consequences of geographic location caused by climate change with special reference to sea level rise and survival of SIDS. Section 10.4 lists various potential measures to reduce CO_2 emissions as a mitigation strategy. Finally, the last section concludes with policy issues.

10.2 Geographic Location, Growth Opportunities, and Challenges

Recent literature on development economics discusses three complementary paths to explain differential growth outcomes across countries: globalization, institutions, and geography as main sources of development (see Rodrik et al. 2004). The first group attributes differential economic achievement to globalization, that is, export-driven development policy led by trade liberalization and FDI backed by complementary national policies. The second group focuses on variables that arise from countries' institutional growth. In fostering development, the rule of law and property rights assume special significance. The third group focuses on geography, which is demonstrated to form the country's destiny. In this literature, geographic location and climate have immediate consequences for labour productivity, institutional quality and transportation costs, and global trade (for a summary, see Nath and Madhoo 2008). Moreover, economic growth rates are asserted to have some connection with coastal, tropical and temperate conditions. That is, coastal countries would generally have higher incomes than landlocked countries, and coastal population density promotes growth as opposed to population internal density (Nordhaus 1993).

While SIDS are a highly diverse group of countries in terms of size, population, and location, they can also be categorized in terms of their gross national income as low-income, (upper- and lower-) middle-income, and high-income states. Table 10.1 shows that SIDS economies generally enjoy good income status: 29 per cent of these small islands belong to the high-income category; 64 per cent are in the middle-income group, with 33 per cent being higher middle income and 31 per cent lower middle

Table 10.1 Income classification of SIDS

Upper middle income	*Lower middle income*	*High income*	*Low income*
American Samoa	Belize	Aruba	Comoros
Antigua and Barbuda	Cape Verde	Bahamas	Guinea-Bissau
Cuba	Fiji	Bahrain	Haiti
Dominica	Guyana	Barbados	
Dominican Republic	Kiribati	French Polynesia	
Grenada	Marshall Islands	Guam	
Jamaica	FSM	New Caledonia	
Maldives	Papua New Guinea	Puerto Rico	
Mauritius	Samoa	Singapore	
Palau	São Tomé and Principe	St. Kitts and Nevis	
Seychelles	Solomon Islands	Trinidad and Tobago	
St. Lucia	Timor-Leste	U.S. Virgin Islands	
St. Vincent and the Grenadines	Tonga		
Suriname	Vanuatu		
Tuvalu			

Source: United Nations (2013). Small Island Developing States Fact Sheet income, while the low-income group consists of only 7 per cent of SIDS (UN-OHRLLS 2013).

The distribution of SIDS across income groups, in which very few fall in the low-income category, supports the contention that the coastal location may have engendered major economic pay-offs through international tourism and exploitation of ocean resources. They have also enjoyed financial and technical support from past colonizers and international financial institutions. The support extends in the form of preferential treatment under the most-favoured nations clause for their exports. While economists have highlighted the importance of the coastal location for economic growth via international trade and sea tourism, much less emphasis has been laid on the flipside of geographic location from the vagaries of climate change and sea level dynamics caused by global warming and CO_2 emissions. The estimates of damages to SIDS due to climate change may be difficult to obtain but uncertainties about the gains in the future would have dampening effects on such efforts. These issues with upcoming challenges are discussed in the following sections.

10.3 Climate Change, Sea Level Rise, and Survival Challenges

Humans have engaged in large-scale intervention in natural systems through agricultural and industrial activities. As Hsiang and Kopp (2018) very aptly observe: “Agricultural revolutions transformed forests into farmlands; pursuit of minerals has carved the earth’s surface; dams and reservoirs now manipulate the flow of almost all rivers; and synthetic fertilizers now flood the nitrogen cycle.” Climate change occurs when changes in the earth’s climate system engender new weather patterns that prevail over an extended period of the time. When the sunrays reach the earth’s atmosphere, a small fraction of the energy is absorbed by gases like ozone and water vapour, some of it is reflected by clouds and bright ground surface (e.g. sea and ice), but most of the solar radiation is absorbed by the earth’s surface (NASA 2009). Light energy is transformed into heat as molecules that constitute matter become “excited” and move more rapidly. However, temperature does not keep rising as the molecules re-radiate thermal infrared radiation in all directions including back to space. The retained heat that stays in the earth’s system is called “greenhouse gases” because they serve to hold heat in like the glass walls of a

Table 10.2 Sources of carbon dioxide

Natural sources of CO_2	*Percent*	*Human sources of CO_2*	*Percent*
Ocean-atmosphere exchange	42.84	Fossil fuel use	87.00
Plant and animal respiration	28.56	Land use	9.00
Soil respiration and decomposition	28.56	Industrial processes	4.00

Source: Adapted from Le Quéré et al. (2013)

greenhouse. Greenhouse gases, such as CO_2, methane and nitrous oxide, heat the climate system by trapping the infrared light coming from the sun and produce warming effects.

As seen in Table 10.2, the largest natural source of CO_2 emissions is from ocean-atmosphere exchange (42.84%). The process works in a way that the oceans contain dissolved carbon dioxide, which is released into the air at the sea surface. Moreover, as regards human sources of CO_2 emissions, use of fossil fuels tops the list (Table 10.2). The interaction between human activity, climate change, and CO_2 emissions is a complex phenomenon. However, CO_2 emission is supposed to be the major culprit in causing ozone layer depletion, having a greater warming effect and other environmental episodes including sea level rise.

United Nations (2013) Factsheet reports information on CO_2 emissions in SIDS. While the mean emissions of CO_2 is 4.7 Mt. (megatons) in SIDS, the distribution of these emissions across the islands is highly skewed. Only six SIDS belonging to high-income and upper-middle-income categories emit more than 5 Mt. of CO_2, whereas the remaining 86 per cent SIDS produce less than the average. It is noteworthy that some islands like Kiribati and Niue record country-level emissions of zero and therefore do not contribute to global warming. Trinidad and Tobago is the largest emitter in the SIDS group—with almost 50 Mt. Yet, in comparison to the 13,258 Mt. produced on average by other high-income countries, CO_2 emissions of Trinidad and Tobago appear negligible. Altogether, SIDS account for less than 1 per cent of global GHG emissions. Moreover, it is important to note that the contribution of SIDS in these environmental adversaries is much lower than that of non-SIDS due to their smaller scale of industrial activity, transportation, population growth, and land use changes (Table 10.3).

CO_2 emissions due to climate change would entail several visible consequences, namely natural hazards, rising temperatures and agricultural

Table 10.3 Historical and top 15 current emissions of carbon dioxide from fossil fuel combustion and cement production

	Cumulative 1751–2014		*Emissions 2014*		*Emissions per capita, 2014*
Country	*(gigatons CO_2)*	*% of Global*	*(gigatons CO_2)*	*% of Global*	*(tons CO_2)*
China	174.7	12	10.3	30	7.5
United States	375.9	26	5.3	15	16.2
India	41.7	3	2.2	7	1.7
Russia / USSR	151.3	11	1.7	5	11.9
Japan	53.5	4	1.2	4	9.6
Germany	86.5	6	0.7	2	8.9
Iran	14.8	1	0.6	2	8.3
Saudi Arabia	12.0	1	0.6	2	19.5
South Korea	14.0	1	0.6	2	11.7
Canada	29.5	2	0.5	2	15.1
Brazil	12.9	1	0.5	2	2.6
South Africa	18.4	1	0.5	1	9.1
Mexico	17.5	1	0.5	1	3.8
Indonesia	11.0	1	0.5	1	1.8
United Kingdom	75.2	5	0.4	1	6.5
World	**1434.0**	**100**	**34.1**	**100**	**4.7**

Source: Boden et al. (2017)

productivity changes. Quantifying the effects of climate change and global warming can be a stupendous task because it would require data on damages, human-economic response, and ecological dynamics. Besides scenario-building, counterfactual analysis involving present and future counterfactuals would need to be employed. It is obvious that these counterfactuals would tend to be hypothetical in different degrees (for a comprehensive and critical analysis of physical science and econometric approaches, see Auffhammer 2018). However, the major reflection of climate change is through its effects on sea level dynamics, which can be supported by data on sea level changes.

Global warming measured by rising temperature is contributing to global sea level rise in three ways (see Hare et al. 2011):

(i) Glaciers and ice sheets worldwide are melting and adding water to ocean. This is the major source of sea level rise.
(ii) The volume of the ocean is expanding as the water warms. The top 100 metres of the world oceans are expanding as they get warmer—a phenomenon called thermal expansion. Sea level rise will not be uniform across coastal areas of different nations.
(iii) A less significant contributor to sea level rise is a fall in liquid water on land, namely from rivers and lakes, reservoirs, aquifers and soil moisture. According to Lindsey (2019), the major cause of the shift of water from land to ocean is groundwater pumping.

The breakdown of the different sources of sea level rise is portrayed in Fig. 10.1. The black line depicts the observed global sea level by satellite altimeters from 1993 to 2017. Estimates of different contributions to sea level rise are represented by the red line for thermal expansion and the blue line for added water, predominantly due to melting glaciers. Aggregating these two estimates (i.e. thermal plus added water) produces the purple line, which interestingly matches the observed sea level (black line) very closely.

It is contended that the rise in sea level during the twentieth century was more rapid than that experienced in the past 2800 years and the rate of increase in the last quarter century has been almost double that of the twentieth century mean (Sweet et al. 2017). What is vital is that the sea level and

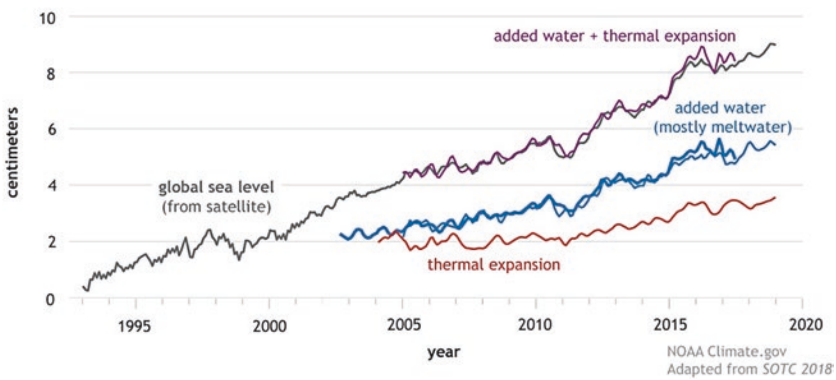


Fig. 10.1 Contributors global sea level rise (1993–2018). (Taken from: https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level (Accessed Dec 2019))

the location of SIDS have a very intimate relationship, which would have implications for the survival of these islands. Some of them have reached the stage of virtual extinction (Box 10.1). According to the United Nations (2013), on average, 26 per cent of the land area of SIDS is 5 metres or less above sea level. Nevertheless, these islands are quite heterogenous. The whole terrestrial area of the Maldives and Tuvalu, for instance, falls below 5 metres so that "rising sea level threatens their very survival" (United Nations 2013). Papua New Guinea, on the other hand, has 1.8 per cent of its land area below 5 metres so that sea level rise may not prove to be a serious danger. The same source records that around 67 per cent SIDS have less than one-fourth of their land area below the 5 metre benchmark. The remaining 33 per cent SIDS having larger terrestrial fraction at that level would be endangered. Sweet and Park (2014) note that impacts of relative sea level rise include increased frequency or probability of coastal flooding relative to fixed elevations, with severe implications for these small islands.

Box 10.1 SIDS Survival vs. Sea Level Rise

SIDS are considered to be at disproportionately higher risk of adverse effects of global warming and associated sea level rise. Four atoll nations are at greatest risk, including Kiribati, Tuvalu, the Maldives, and the Marshall Islands. For thousands of years, Marshallese have embraced their watery environment. But powerful tropical cyclones, damaged reefs, and fisheries, worsening droughts, and sea level rise threaten them to relocate or elevate. One proposal that is being discussed is to build a new island or to lift an existing one. "With 600 billion tons of melting ice pouring into seas that absorb heat twice as fast as it did 18 years ago, the Marshallese will need to move quickly." Water invades coastal areas rapidly, causing soil erosion and threatening crops, homes, and recreation areas. Wetland floods and pollution of aquifers impact each place's flora and fauna, causing habitat destruction for fish, birds, plants, and many other animals. Rise in sea level can cause heavy rains and strong winds, and unleash severe storms, threatening vulnerable islands on their way. If water continues to rise, people living in coastal communities will be forced to leave their homes and move to another area. This is known as climate-change-induced migration. Low-lying islands would be swallowed by oceans, causing large areas of land and even some nations to vanish.

Source: Adapted from Letman (2018).

10.4 Regulating CO_2 Emissions as Mitigation Strategy

To combat the negative effects of climate change, two broad categories of measures are discussed, namely mitigation and adaptation strategies. While the former includes methods to control emission trends having a dampening impact on warming, the latter focuses on how to live with such adversaries (see Box 10.2). This section is devoted to discussing the alternative ways to reduce or divert CO_2 emissions in an attempt to minimize their effects as a mitigation strategy. The objective of lowering down the CO_2 emissions can be achieved either by moving away to production and consumption activities that either minimize the growth of CO_2 emissions or displace growing CO_2 emissions or by doing both.

Box 10.2 Mitigation and Adaptation Strategies

The 2018 Intergovernmental Panel on Climate Change (IPCC) Special Report on 1.5 Degrees of Global Warming stresses the need for urgent climate actions to stay within the safety limits established by the Paris Agreement (IPCC 2018). More specifically, GHG emissions will need to reach net-zero by the mid-century and peak before 2030. As GEF (2020) puts it, mitigation of climate change "is about reducing the release of GHG emissions that are warming our planet. Mitigation strategies include retrofitting buildings to make them more energy efficient; adopting renewable energy sources like solar, wind and small hydro; helping cities develop more sustainable transport such as bus rapid transit, electric vehicles, and biofuels; and promoting more sustainable uses of land and forests." Adaptation, according to the European Commission (2020), implies "anticipating the adverse effects of climate change and taking appropriate action to prevent or minimize the damage they can cause, or taking advantage of opportunities that may arise. It has been shown that well planned, early adaptation action saves money and lives later. Examples of adaptation measures include: using scarce water resources more efficiently; adapting building codes to future climate conditions and extreme weather events; building flood defences and raising the levels of dykes; developing drought-tolerant crops; choosing tree species and forestry practices less vulnerable to storms and fires; and setting aside land corridors to help species migrate."

It is important to note that the focus of this chapter is climate governance and issues related to ocean governance are not raised here. With this background, some important mitigation strategies that have potential to regulate CO_2 emissions are described in this section.

10.4.1 International and Regional Climate Agreements

International cooperation seems to be most promising step to deal with the problem of global warming and CO_2 emissions. It is however well documented that important international agreements, namely the Kyoto Protocol, the Montreal Treaty, and Paris 21, to deal with rapidly growing global CO_2 emissions have been largely unsuccessful. The primary reason is that since CO_2 emission is a Global public bad, each country wants a free ride and enjoy the benefits of actions taken by other countries. This behaviour can be observed on the part of countries while investing in technology development and renewable energy projects. If one country invests and others do not, investment cost will be borne by the initiator but its benefits will be shared by others as well. On the other hand, if this country does not invest, it saves the investment cost and shares the benefits of actions taken by others. If others are also not taking such initiatives, this country is still better off and loses only the benefits that do not exist. So, the dominant strategy will be to stay put and allow the environmental degradation from the use of technology and fuel that are not environment friendly.

Given the reluctance on the part of country governments to behave as a group at the global level, Nordhaus (2015) has suggested formation of climate clubs consisting of like-minded countries to participate in projects to alleviate the menace of global warming and CO_2 emissions. These clubs can be formed on the regional and non-regional bases and to provide incentive to join the club, imports from non-members would face tariff walls. While it is argued that such clubs may have a contagion effect, such attempts may be thwarted by trade treaties. Moreover, it may conflict with the ideals of globalization and may develop plethora of tariff regimes (for more details on climate clubs, see Chap. 18 by Larry D. Schroeder and Shyam Nath in this volume).

10.4.2 Increasing the Efficiency of Carbon Sinks and Carbon Capture

Carbon sinks can be a natural process using forests, rivers, ocean, and clouds. With technological development, CO_2 can be captured out of air, industrial source, or power plant using a variety of techniques such as absorption, adsorption, chemical looping, membrane gas separation, and amines. While they have the capacity to capture a sizeable amount (70/80%), the use of the energy would marginally add to the operating cost and pollution level. The latter would depend on the kind of energy used, derived from fossil or green sources.

The technologies of capture from industries and recapture from the atmosphere are proven to work across the globe. Haszeldine (2019) reports that "CO_2 can be stored in chemically reactive basalt, where growth of new minerals can lock up CO_2 at very low cost." It is documented that there are 17 operating carbon capture projects in the world, capturing 31.5Mt of CO_2 emissions per year, of which 3.7 is stored either in deep geological formations, or in the form of mineral carbonates. What is vital is that natural processes of carbon sinks are facilitated by afforestation and reducing ocean pollution. Deep ocean storage is not used as it could acidify the ocean.

Jacobson (2019), however, casts doubt on the net benefits of carbon capture. His analysis using alternative scenarios reveals that carbon capture is inefficient and entails high social cost—including increased air pollution and health costs. In his view, the best solution for replacing fossil fuels is to focus on renewable alternatives like solar and wind.

10.4.3 Green Technology and Renewable Energy Driven Growth

A major channel of CO_2 reduction can be via big investments in green technology and renewable resources, which seem to be practical and more feasible alternatives. In the absence of data, however, it is difficult to calculate and compare the gains from this switchover as the economic costs comprise static and dynamic costs, and the period varies from short to long run. Moreover, exploratory initial investments may not be cost effective and may necessitate subsidies and concessional loans to attract investments in the renewable energy sector. It is worthy to note that financial costs and some economic costs are easy to identify but environmental costs and benefits may remain difficult to measure and capture. Thus, in the absence of any state-of-the-art cost and benefit analysis, policy support would become mandatory.

In one illustrative study using the engineering (static) costs, Gillingham and Stock (2018) generate estimates of the unsubsidized costs of various technologies to reduce GHG emissions relative to existing coal generation. From their findings reported in Table 10.4, the least expensive technologies to reduce emissions relative to coal are onshore wind and natural gas combined cycle (both costing around 24$ per ton of CO_2), followed by utility-scale solar photovoltaics (28$/ton CO_2). Progressively more expensive technologies are natural gas with carbon capture and storage technology, advanced nuclear technologies and other carbon capture technologies. Offshore wind and solar thermal are the most expensive options, costing 3.75 and 4.71 times that of solar photovoltaics, respectively. These estimates however do not include positive health effects that may be generated by decline in local air pollution and focus solely on climate benefits of switching from coal.

The engineering cost estimates generated in Table 10.4 may be subject to several important limitations, impacting policy decisions. While some estimates are reasonably reliable due to wide current usage (e.g. onshore wind, natural gas combined cycle), other technologies that passed a technical feasibility test entailed large cost overruns at the project implementation phase, indicating that these costs may be underestimates (e.g.

Table 10.4 New source generation costs when compared to existing coal generation

Technology	*Cost estimate ($2017/ton CO_2)*
Onshore wind	24
Natural gas combined cycle	24
Utility-scale solar photovoltaic	28
Natural gas with carbon capture and storage	42
Advanced nuclear	58
Coal retrofit with carbon capture and storage	84
New coal with carbon capture and storage	95
Offshore wind	105
Solar thermal	132

Source: Gillingham and Stock (2018)

advanced nuclear, carbon capture and storage). Moreover, the study does not allow the cost to vary regionally depending on local conditions (like local fuel prices, wind). It is important to note that the costs of switching technologies are different from the costs of a policy designed to encourage technology switching. Further, Gillingham and Stock (2018) report that the engineering cost estimates generated do not consider behavioural responses or indirect emissions like methane gas injected in the environment due to production activities or transportation.

Their analysis not only covers the costs and trade-offs of short-term technological solutions, but also digs deeper into the social cost and the likely outcome of different policy measures governments could take to reduce emissions. They also consider a long-term perspective that accounts for how spending on new technologies today may lower the cost of reducing emissions in the future. It can be assumed that benefits of such technologies will be passed on to SIDS as the location of CO_2 emissions are elsewhere.

There is an urgent need to institutionalize investment in alternative clean technology and energy sources at the global level. Such green investments can be encouraged by alternative funding mechanisms and through multilateral cooperative ventures to share the risks. Participatory arrangements such as the Clean Development Mechanism (CDM) and Joint Implementation (JI) coming from the Kyoto Protocol may assume greater significance in attempts to reduce CO_2 emissions. These mechanisms allow polluters in developed countries to buy pollution rights by investing in clean energy and afforestation projects in developing and developed countries, respectively. It is important to note that CDM and JI provide mechanism to offset the enhanced CO_2 emissions in developed countries, which have hit their quota of pollution rights.

10.4.4 Minimizing the Impact of Sun Rays on the Earth's Surface: Geoengineering

The field of geoengineering, also called climate engineering, looks at proposals to offset some effects of GHG emissions, and is thus increasingly relevant to economists (Caldeira et al. 2013). One widely advocated intervention is solar radiation management, which attempts to increase the atmosphere's reflectivity so that the earth absorbs less solar radiation. Some mechanisms advocated include spraying aerosol precursors in the upper atmosphere mimicking the method by which volcanoes have cooled the earth's surface historically. Major volcanic eruptions produce an aerosol layer in the stratosphere that may be large enough to affect the earth's climate. A dominant component of this volcanic aerosol layer is sulphur dioxide (SO_2) gas, which is converted into sulphuric acid over weeks of release in the stratosphere and is scattered across the globe by winds (Allen 2015). These aerosols may stay more than a year in that sphere and reflect sunlight so that less sun energy reaches the lower atmosphere. In this way, a cooling effect is generated.

Another geoengineering approach is "cloud brightening," which is designed to increase the reflectivity of the planet's cloud cover, thereby decreasing the amount of solar radiation reaching the earth (Caldeira et al. 2013). Proctor et al. (2018) argue that while cloud brightening (also called "cloud whitening") is appealing in theory and may be employed, for example, to cool an urban environment in the event of extreme heat waves, the economic costs and unintended effects of such intervention have not been adequately examined.

Reynolds (2019) provides an illuminating discussion of the dilemmas of solar geoengineering. Although the approach seems technologically feasible, effective and less expensive than alternate methods, it may entail serious physical and social risks. To date, the solar geoengineering proposals speculated are largely untested. Moreover, such experiments would necessitate cooperation and consent of countries likely to be affected, as well as compensation mechanisms for possible harm such as from outdoor activities.

10.4.5 Defensive Expenditure vs. Global Carbon Tax

The fiscal measures, namely defensive expenditure and carbon tax, are derived from the basic tenets of sustainable development, that is, resource utilization in the present should not preclude its availability in the future. In other words, there should be a defensive approach to preserve the productive capacity of the environmental resource for future use. This can be achieved in two ways. One, while production takes place, a part of income should be spent on rejuvenation of environmental resource so that the growth of CO_2 emissions declines. We call it defensive or restoration expenditure. Two, income generated should be taxed on the basis of carbon footprint of the activity. The proceeds of the carbon tax should be spent to restore the quality of environment in terms of reduced CO_2 emissions.

It is, however, worthy to note that for the success of carbon tax, the determination of tax base, that is, CO_2 emissions by countries, is crucial. There is a growing realization based on evidence that the current production-based GHG accounting framework does not give a true picture of a country's responsibilities towards global emissions (Gupta et al. 2018). It is indicated that production emissions of developed countries have gone down, which can be attributed to shifting of energy-based industries to developing countries. However, their consumption emissions have increased, which is supported by imports from these countries. Attempts have been made to quantify the carbon leakage from developed to developing countries with some evidence in support from the trade flow data (Zhang and Fang 2019). This mechanism would increase the responsibility of non-island countries and major CO_2-producing and exporting countries in terms of carbon tax.

It is important to mention that in the first method, the responsibility can be decentralized at the points of production and income generation, that is, the industry or firm level. In the second method, the role of government assumes special significance. A global carbon tax can serve the purpose of controlling CO_2 emissions, which can be administered by a super-national government such as the United Nations.

10.4.6 Lobbying by SIDS as Importers and Climate Victims

The role of lobbying is of great importance as it helps in eliciting international cooperation, more particularly the modus operandi of how the interests of SIDS are taken into account in the absence of any effective SIDS lobby. A critical review of the roles of AOSIS, UNDESA and the three global conferences on SIDS in 1994, 2005 and the more recent in Samoa in 2014 would improve the understanding of the complex behaviour of countries that are on the radar of CO_2 pollution. It is important to work out the implications of CO_2 abatement responsibility for SIDS as they are net importers of goods that are produced elsewhere.

10.4.7 Policy-Based Economic Slowdown

Reduction in output may be another important channel to reduce CO_2 emissions. It is an established fact that producing output of goods and services (GDP) is a polluting activity, which involves use of fossil fuels and generation of carbon (CO_2). It is startling to note that due to the emergence of COVID-19, followed by lockouts of economic and social activities, some interesting projections have surfaced to show that CO_2 emissions might fall tentatively between 0.5 and 2.2 per cent in 2020 (Hausfather and Wang 2020). During normal times, however, sovereign nations preoccupied with raising their standard of living and economic output, would never voluntarily accept a lower economic growth rate as a channel to lower carbon intensity and CO_2 emissions.

10.5 Conclusion and Policy Issues

Economic analysts and policymakers have highlighted the importance of geographic location of small islands for economic growth via international trade and sea tourism. However, much less emphasis has been laid in the development literature on the flipside of geographic location susceptible to the vagaries of climate change. Climate change, global warming and sea level rise would have dramatic effects worldwide but the effects would be more alarming for coastal areas of nations and small islands scattered across the globe. It is worthy to note that the largest natural source of CO_2 emissions is the ocean-atmosphere interaction. As regards human sources of emissions, use of fossil fuels tops the list. What is vital is that different alternative strategies would need to be explored to slow down the formation of CO_2 emissions to safeguard global interests in general and that of SIDS in particular.

Since international cooperation through agreements to deal with climate change is not forthcoming as warranted, channels available to combat the growth of CO_2 emissions are as follows: clean or green energy alternatives, carbon capture and storage for longer periods, and geoengineering to whiten the earth's surface so that sun rays are deflected back to atmosphere. Alternatives such as defensive expenditure to rejuvenate environmental resources and a global carbon tax to finance projects that address the issue of CO_2 emissions are also worth consideration. Given the focus on sustainable development of small islands here, attention has not been paid to the migration dimensions emanating from sea level rise and unexpected natural hazards.

References

Allen, B. (2015). Atmospheric Aerosols: What Are They, and Why Are They So Important?. *National Aeronautics and Space Administration*, *6*. Available at: https://www.nasa.gov/centers/langley/news/factsheets/Aerosols.html. Accessed 25 Mar 2020.

Archer, D., Eby, M., Brovkin, V., Ridgwell, A., Cao, L., Mikolajewicz, U., Caldeira, K., Matsumoto, K., Munhoven, G., Montenegro, A., & Tokos, K. (2009). Atmospheric Lifetime of Fossil Fuel Carbon Dioxide. *Annual Review of Earth and Planetary Sciences, 37*(1), 117–134.

Auffhammer, M. (2018). Quantifying Economic Damages from Climate Change. *The Journal of Economic Perspectives, 32*(4), 33–52.

Boden, T., Marland, G., & Andres, R. J. (2017). *Global, Regional, and National Fossil-Fuel CO_2 Emissions (1751–2014) (V. 2017)*. Oak Ridge: Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory (ORNL). https://doi.org/10.3334/CDIAC/00001_V2017.

Caldeira, K., Bala, G., & Cao, L. (2013). The Science of Geoengineering. *Annual Review of Earth and Planetary Sciences, 41*(1), 231–256.

European Commission. (2020). *Adaptation to Climate Change*. Available at: https://ec.europa.eu/clima/policies/adaptation_en. Accessed 3 Jan 2020.

GEF (Global Environmental Facility). (2020). *Climate Change Mitigation*. Available at: https://www.thegef.org/topics/climate-change-mitigation. Accessed 3 Jan 2020.

Gillingham, K., & Stock, J. (2018). The Cost of Reducing Greenhouse Gas Emissions. *Journal of Economic Perspectives, 32*(4), 53–72.

Gupta, H., Rashmi, R. R., & Bhat, J. R. (2018). Estimating Greenhouse Gas Emissions: Does the Production Based Methodology Reflect Global Reality? *Economic & Political Weekly, 53*(43), 38–45.

Hare, B., Schaeffer, M., Perrette, M., & Mengel, M. (2011). Future Sea Level Rise and Its Implications for SIDS and LDCs. *Climate Analytics*, Durban. Available at: www.climateanalylitics.org

Haszeldine, S. (2019). *Climate Emergency CoP 25: Carbon Capture Essential to Our Future*, Down To Earth. Available at: https://www.downtoearth.org.in/news/

Hausfather, Z., & Wang, S. (2020, March 26). *There Is No Climate Silver Lining To COVID-19*. The Breakthrough Institute, Oakland, CA, USA. Available at: https://thebreakthrough.org/issues/energy/covid-emissions. Accessed 16 Apr 2020.

Hsiang, S., & Kopp, R. (2018). An Economist's Guide to Climate Change Science. *The Journal of Economic Perspectives, 32*(4), 3–32.

IPCC (Intergovernmental Panel on Climate Change). (2018). *Global Warming of 1.5° C: An IPCC Special Report on the Impacts of Global Warming of 1.5° C*

Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. Intergovernmental Panel on Climate Change.

Jacobson, M. Z. (2019). The Health and Climate Impacts of Carbon Capture and Direct Air Capture. *Energy and Environmental Science, 12*, 3567–3574.

Le Quéré, C., et al. (2013). *The Global Carbon Budget 1959–2011*. Available at: https://www.earth-syst-sci-data.net/6/235/2014/essd-6-235-2014.pdf. Accessed 6 Jan 2020.

Le Quéré, C., et al. (2018). Global Carbon Budget 2017. *Earth System Science Data, 10*(1), 405–448.

Letman, J. (2018). Rising seas give island nation a stark choice: relocate or elevate. National Geographic, 19. Available at: https://www.nationalgeographic.com/environment/2018/11/rising-seas-force-marshall-islands-relocate-elevateartificial-islands/

Lindsey, R. (2019). Climate Change: Global Sea Level. *ClimateWatch Magazine*. Available at: https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level. Accessed 6 Jan 2020.

NASA (National Aeronautics and Space Administration). (2009). *Earth's Energy Budget*. Available at: https://earthobservatory.nasa.gov/features/EnergyBalance/page4.php.

Nath, S., & Madhoo, Y. N. (2008). A Shared Growth Story of Economic Success: The Case of Mauritius. In B. J. Ndulu, S. A. O'Connell, J. P. Azam, R. H. Bates, A. K. Fosu, J. W. Gunning, & D. Nijinkeu (Eds.), *The Political Economy of Economic Growth in Africa, 1960–2000* (Vol. 2, pp. 369–400). Cambridge: Cambridge University Press.

Nordhaus, W. D. (1993). Climate and Economic Development. In L. H. Summers & S. Shah (Eds.), *Proceedings of the World Bank Annual Conference on Development Economics 1992* (pp. 55–376). Washington, DC: World Bank.

Nordhaus, W. D. (2015). Climate Clubs: Overcoming Free-riding in International Climate Policy. *American Economic Review, 105*(4), 1339–1370.

Proctor, J., Hsiang, S., Burney, J., Burke, M., & Schlenker, W. (2018). Estimating Global Agricultural Effects of Geoengineering Using Volcanic Eruptions. *Nature, 560*(7719), 480–483.

Reynolds, J. L. (2019). Solar Geoengineering to reduce Climate Change: A Review of Governance Proposals. *Proceedings of the Royal Society A, 475*(2229), 20190255.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development. *Journal of Economic Growth, 9*(2), 131–165.

Sweet, W. V., & Park, J. (2014). From the Extreme to the Mean: Acceleration and Tipping Points of Coastal Inundation from Sea Level Rise. *Earth's Future, 2*(12), 579–600.

Sweet, W. V., Horton, R., Kopp, R. E., LeGrande, A. N., & Romanou, A. (2017). Sea Level Rise. In D. J. Wuebbles, D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, & T. K. Maycock (Eds.), *Climate Science Special Report: Fourth National Climate Assessment* (Vol. I, pp. 333–363). Washington, DC: U.S. Global Change Research Program. Chapter 12.

United Nations. (2013). *Small Island Developing States Fact Sheet*. Available at: http://unohrlls.org/en/factsheets/. Accessed 6 Jan 2020.

UN-OHRLLS (UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States). (2013). *Small Island Developing States (SIDS) Statistics*. Available at: http://unohrlls.org/custom-content/uploads/2013/09/Small-Island-Developing-States-Factsheet-2013-.pdf. Accessed 18 Dec 1999.

Weart, S. R. (2008). *The Discovery of Global Warming*. Harvard University Press.

Wuebbles, D. J., Fahey, D. W., Hibbard, K. A., Dokken, D. J., Stewart, B. C., & Maycock, T. K. (Eds.). (2017). *Climate Science Special Report: Fourth National Climate Assessment* (Vol. 1). Washington, DC: U.S. Global Change Research Program.

Zhang, Q., & Fang, K. (2019). Comment on "Consumption-based Versus Production-Based Accounting of CO_2 Emissions: Is There Evidence for Carbon Leakage?". *Environmental Science & Policy, 101*, 94–06.

CHAPTER 11

Institutional and Policy Analysis: Water Security and Disaster Management in Small Island Developing States

Chloe Wale, Nidhi Nagabhatla, and Duminda Perera

11.1 Introduction

Small Island Developing States (SIDS) are a distinct group of 38 developing countries scattered across three regions (Fig. 11.1). The SIDS are highly vulnerable to water resources variability, natural disasters, and impacts of climate change. The Intergovernmental Panel on Climate

C. Wale (✉) • N. Nagabhatla
McMaster University, Hamilton, ON, Canada

United Nations University Institute for Water, Environment and Health, Hamilton, ON, Canada
e-mail: walec@mcmaster.ca; Nidhi.Nagabhatla@unu.edu

D. Perera
McMaster University, Hamilton, ON, Canada

United Nations University Institute for Water, Environment and Health, Hamilton, ON, Canada

University of Ottawa, Ottawa, ON, Canada
e-mail: duminda.perera@unu.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_11

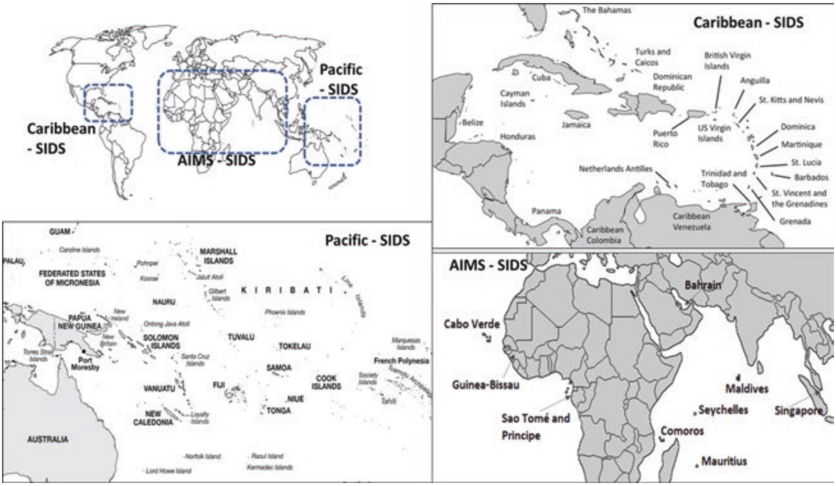


Fig. 11.1 Distribution of SIDS in the global geographical landscape. (Source: Adopted from Gheuens et al. 2019)

Change (IPCC 2018) predicts that the intensity and frequency of disasters will further increase due to global warming and impeding development. Extreme climatic cases such as heat waves, sea-level rise, coastal flooding, and frequent cyclones could make these island states uninhabitable (Söjstedt and Povitkina 2017). Most SIDS will experience such phenomena due to their high level of exposure and vulnerability to risks imposed by climate change. Population growth, increased tourism, and climatic variability have put enormous stress on the water resources of SIDS. This has produced problems in securing continuous supply of freshwater. Long-term droughts and decreased rainfall have intensified the water security issue in SIDS. Tuvalu, for example, already had problems with water supply in 2011 when it had no rain for six months, and 1500 of its population of 11,000 were left with no access to freshwater (Gheuens et al. 2019).

SIDS have a disproportionately higher vulnerability to natural disasters (IPCC 2018). According to the Emergency Events Database (EM-DAT) created by the Centre for Research on the Epidemiology of Disasters (CRED), in SIDS, the number of registered water- and climate disasters rose from 212 (1978–1997) to 377 (1998–2018), an increase of almost 178%, compared with an increase of 151% globally (Gheuens et al. 2019).

Decision-makers, policy lobbyists and resource managers need to outline integrated and participatory Disaster Risk Management (DRM) strategies to reduce the vulnerabilities in SIDS.

The UN-Water definition of water security is 'the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability' (United Nations 2013). In this light, water security is a tolerable level of water-related risks to society. Water security covers risks related to drinking water, ecosystems, climate change, water supply for food and energy production, governance, transboundary cooperation, political stability and financing.

Overuse of coasts and oceans for economic development contributes to land, water and coastal pollution. Lack of proper infrastructure for wastewater treatment provides further critical challenges (Gheuens et al. 2019). Changes in rainfall due to climate change can make matters worse.

The increasingly critical challenges faced by SIDS require good governance and high-quality institutions along with sound monitoring and well-equipped implementation agencies and actors (Söjstedt and Povitkina 2017). This chapter describes ways to improve water security within the context of international guidelines. The chapter sets out a ten-point agenda (TAP) for improved water security for SIDS.

11.2 SIDS and Sustainable Development: Global Agreements, Policies and Resolutions

SIDS are scarce in fresh water. They are scattered across vast saltwater oceans and are vulnerable to massive natural disasters. The year 2019 was named 'year of billion-dollar disasters as climate crisis escalates'. The Bahamas have been exposed to devastating climate results like Hurricane Dorian (Russell 2019). UNICEF reports the displacement of 150,000–760,000 children in the Caribbean due to climate-related disasters. Figure 11.2 sets out the threats to water security posed by climate change. Integrative strategies were introduced in the early 2000s, utilizing partnerships, and the implementation or supporting efforts on local, national, regional, and international levels (56th session General Assembly, February 2002). The 2005 SIDS Mauritius Strategy sets out a guideline

Resolution #	***Item***	***Explanation***
A/RES/51/183: Implementation of the outcome of the Global Conference on the Sustainable Development of SIDS *Date of Adoption* ***11/02/1997***	***Item 15:*** *"Stresses that small island developing States are particularly vulnerable to global climate change and sea-level rise, and that the potential effects of global climate change and sea-level rise are increased strength and frequency of tropical storms…"*	*This item begins to recognize the importance of climate change and its impact on water, specifically sea level rise. The vulnerability of SIDS allows climate change to increase the rise of sea-level, leading to higher strength and frequency of tropical storms. Item 15 declares the stress of this topic to be significant and need to be investigated on priority.*
A/RES/56/198: Further implementation of the outcome of the Global Conference on the Sustainable Development of Small Island Developing States *Date of Adoption* ***15/02/2002***	*"small island developing States can experience specific problems arising from… vulnerability to natural disasters, fragile ecosystems, lack of natural resources, limited freshwater supply…"*	*SIDS are experiencing a crucial lack of natural resources and limited freshwater supply as a result of their vulnerability to natural disasters and fragile ecosystems.*
A/RES/65/2: Outcome document of the High-level Review Meeting on the Implementation of the Mauritius Strategy for the Further Implementation of the Programof Action for the Sustainable Development of Small Island Developing States *Date of Adoption* ***15/10/2010***	***Item 22:*** *"Note with concern that water quality and availability constitute serious constraints in small island developing States…assistance to small island developing States for capacity-building for the development and further implementation of freshwater and sanitation programs"*	*Water quantity and availability are of great concern in SIDS. Further development for freshwater and sanitation programmes is necessary.*
A/RES/69/15: SIDS Accelerated Modalities of Action (SAMOA) Pathway *Date of Adoption* ***15/12/2014***	***Item 64:*** *"We recognize that small island developing States face numerous challenges with respect to freshwater resources, including pollution, the overexploitation of surface, ground and coastal waters, saline intrusion, drought and water scarcity, soil erosion, water and wastewater treatment and the lack of access to sanitation and hygiene."*	*The challenges to water supply faced by SIDS regarding freshwater resources, pollution, overexploitation of surface, ground, and coastal waters, saline intrusion, drought and water scarcity, soil erosion, water and wastewater treatment are diverse and multifaced. These challenges are recognized by the General Assembly and plans to expand/improve facilities are set to be implemented.*
A/RES/74/3: Political declaration of the high-level meeting to review progress made in addressing the priorities of small island developing States through the implementation of the SAMOA Pathway *Date of Adoption* ***21/10/2019***	***Item 30 (u): "****Urgent action to address the adverse impacts of climate change, including those related to sea level rise and extreme weather events…as well as through threats to water availability…support small island developing States to address the water and sanitation challenges outlined in the Samoa Pathway…"*	*This point reiterates the impacts the climate crisis has on SIDS in relation to water supply. It affects sea level and extreme weather events. It also poses threats to water availability and outlines the need to support SIDS in addressing water and sanitation challenges.*

Fig. 11.2 Chronological timeline between 1997 and 2019 outlining water security and climate change challenges faced and addressed by SIDS

for action and the UN focused on enhancing political commitments and public awareness of the importance of sustainable development issues in SIDS (65th session General Assembly, 2010). This development was specified in establishing protected areas for marine, coastal and terrestrial biodiversity. United Nations Declaration A/RES/65/2 (outcome document of the High-level Review Meeting on the implementation of the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, 2010) indicated that water quality and availability are constituting severe limitations for the island states, outlining that capacity-building measures need to be strengthened, including improvement and expansion of freshwater and sanitation programmes, as well as practices that promote water-use efficiency.

In 2014, the SAMOA Pathway was developed, which addressed the land, water, climate, and development challenges faced by SIDS (United Nations 2014). Resolutions at this time dedicated entire sections to water and sanitation, recognizing the significant challenges being faced and how to address them through integrated management of land and water resources, improved facilities and infrastructure, expansion of wastewater treatment, and by mitigating the effects of saltwater intrusion (69th session General Assembly, December 2014).

During the most recent General Assembly in October 2019, a high-level review took place to assess the five years of implementation of the SAMOA Pathway. United Nations Declaration A/RES/74/3 reiterates the relation between climate change and its impact on water supply, urging that further action be completed immediately to prevent damage to the sustainable development progress of SIDS.

11.3 An Overview of the Regional Agreement: The SAMOA Pathway

The SAMOA Pathway targets the sustainable development of SIDS through a partnership model. The objectives of this pathway are to continue sustainable development efforts through a set of projects. In addition, the pathway aims to foster entrepreneurship and innovation, support initiatives that increase capacity, create jobs, promote the use of information for education and employment, endorse gender equality, and help set up national regulatory and policy frameworks.

The progress with implementation of the SAMOA Pathway includes the pursuit of the UN Sustainable Development Goals (SDGs). The SDGs agenda is set to be implemented by 2030 with substantial coverage of improving water quality, eliminating dumping, and minimizing the release of hazardous chemicals, halving the proportion of untreated wastewater, and collective action to promote reuse and recycling. In particular, the objectives outlined in the pathways align specifically with SDGs 4, 5, 6, 8, 9, and 17. The SDG goal on water (SDG 6) is embedded in some or most of the SDG targets either directly or indirectly. For instance, the innovation focus of SDG 9 strives to build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation in and across all sectors, including water. SIDS with accessibility issues to water, food, energy security, and global development challenges of economic and policy can benefit from the 'integration' of the SAMOA Pathway and the SDG Agenda (United Nations 2019). It is anticipated that SDG 6, which strives to ensure availability and sustainable management of water and sanitation for all, will significantly improve the approach to a secure future in water and disaster management for SIDS (Gheuens et al. 2019).

11.4 Smart Strategy (Ten-Point Agenda) as a Guideline to Transform Theory into Practical Action for SIDS

Shaping a sustainable water future for SIDS through the adoption of smart strategies—Ten-Point Agenda (TAP)—can provide an integrated future direction towards achieving water security and DRM. To accomplish these plans in the future, various interventions planned by multiple agencies offer potential benefits. The outlined TAP compiles partnerships, target goals, and challenges, much like the 2030 Agenda for Sustainable Development, providing diverse narratives as to how SIDS can move from the fertile ground of theory and research into practical actions.

11.4.1 Global Framework Can Serve as a Base Frame for SIDS to Design Their Own Agenda

The Global Framework for Climate Services (https://gfcs.wmo.int/) is one such example. Introduced in 2011 as a multi-stakeholder framework to reduce vulnerability to climate hazards and to improve the provision of climate services and information to promote better climate-related decision-making (UNDP 2017). Components of the framework include a user interface platform, a climate services information system, observation and monitoring, research, modeling, and prediction, as well as a capacity development component. The framework aims to mainstream climate science into decision-making at all levels of sustainability planning and to equip countries that are most vulnerable to various climate risks, with SIDS projects among high-risk zones. The agenda outlined by such frameworks, if adopted smartly and appropriately by the island states to fit their context, can help them improve and overcome sustainability goals and targets challenges. For example, the countries/regions have designed regional or national projects in response to this framework, including the Africa-Asia Drought Risk Peer Assistance Network. That targets mitigation of the risks of drought and improves livelihood by creating a knowledge sharing platform among drought-prone countries to facilitate effectively proven drought risk management practices (UNDP 2017).

Action is needed in the face of waste products from the tourism sector. In the Maldives, for example, 1000 tons of waste per day comes solely from tourist resorts to the central waste management facilities of the islands. A large portion of this waste is being transferred onto barges and dumped into the ocean (Kapmeier and Gonçalves 2018). It has been found that 90% of all food waste generated in tourist resorts is discarded into the sea. With high and increasing sea levels, this waste will end up back on islands of the Maldives, contributing significant contamination to fresh and coastal waters, soil and land resources (Kapmeier and Gonçalves 2018). In this context, multilateral partnership such as the Global Partnership for Sustainable Tourism is an excellent example of a corporate agenda network to take action. It is an agreed arrangement of tourism stakeholders of the public and private sectors, non-profit organizations, UN agencies and programmes, international organizations and academic institutions (United Nations 2016).

11.4.2 Acknowledging the Role and Potential of Regional Initiatives by SIDS for Scaling and Wider Adoption

Initiative such as the Caribbean Drought and Precipitation Monitoring Network (CDPMN) launched in Barbados 2010 presents a good example of joint initiative by the Caribbean countries aimed at allowing access to water, appointing better practices for water resource management, and managing data and information (including meteorological flux and seasonality, wet and dry conditions). This alignment can serve as good leverage for coordinating funding and programme implementation.

11.4.3 Setting an Integrated Agenda Towards Shaping Sustainable Water Future for SIDS

The coral reefs in many SIDS have suffered from bleaching stemming from sea surface temperature and other climate change effects. Island states like Dominica reported over 15% of reefs showing signs of bleaching at the start of the millennium, projecting that this trend will likely increase in the future due to a mix of natural and anthropogenic factors (UNFCCC 2005). In the 2030 Agenda for SDGs, one of the set targets within SDG 14 is to conserve and sustainably use the oceans, seas and marine resources for sustainable development. This proposes that countries conserve at least 10% of coastal and marine areas from development. By doing so, SIDS, like other mainland states, can better tackle flood risks, drainage issues and water tables (UNFCCC 2005), which also allows for improved DRM.

11.4.4 Scaling the Existing Partnership Mechanisms to Achieve Development and Sustainability Goals

Cooperation mechanisms are crucial to creating a support system for achieving objectives for economic growth and sustainable development. Best practices and mechanisms applied at the local, regional and global levels offer innovative and efficient tools (such as nature-based solutions) to balance the competing and conflicting challenges related to natural resource systems (WWAP 2018). The experts, projects, and organizations addressing these measures can further partner at the SIDS scale such as Global Ocean Acidification Observing Network (GOA-ON) that manages cooperation mechanisms to work towards ocean resource management. For instance, GOA-ON developed and operated the initiative 'GOA-ON Pier2Peer' programme—a mentorship initiative that pairs senior researchers with early-career scientists—providing a platform for co-operation that will connect the ocean communities regionally and internationally. The programme has so far been executed in Mauritius, Seychelles and several Caribbean nations (http://www.goa-on.org/pier2peer/pier2peer.php).

Planning to implement similar strategies includes prioritizing operations in states that are resource-poor and have limited data, information and knowledge infrastructure and capacity (United Nations 2018).

11.4.5 Focus on Community-Based Planning and Building Community Resilience

Community-based planning can serve as crucial steps for SIDS towards building long-term community resilience. The Global Environment Facility (GEF) Small Grants Program entered a partnership with the Australian Government Overseas Aid Program (2009) to improve the resiliency in SIDS (37 island states were part of this partnership). This program in tackling water-related issues has made significant progress.

The Global Partnership for Oceans (which is a growing alliance of over 140 governments, international organizations, civil society groups, and private sector interests committed to addressing the threats to the health, productivity and resilience of the ocean) brings together ocean stakeholders including the IOC (Intergovernmental Oceanographic Commission), GEF, FAO (The Food and Agriculture Organization), IUCN (International Union for Conservation of Nature), the World Bank, UNEP Grid Arendal (a centre collaborating with the United Nations Environment Programme, located in Arendal, Norway), and the UNEP Regional Seas Program to implement methodologies to target the goal of significantly increasing global food fish production for both sustainable aquaculture and sustainable fisheries by adopting best practices and reducing environmental and disease risk in order to stimulate investment. The wastewater reuse and recycling technologies and practices applied by Singapore's Ulu Pandan wastewater treatment demonstration plant provide a useful reference for other SIDS (AECOM 2018).

An initiative like SIDS-SIDS Sustainable Energy Initiative (SIDS Dock), comprising 31 SIDS members from all three regions, is an institution created by The Caribbean Community Climate Change Centre (CCCCC) to increase energy security and reduce greenhouse gases (Henderson 2013). The organization provides tools that support efforts and encourage the island states to enforce renewable energy, energy efficiency, energy access, and low carbon development targets by 2030. The alignment with the SDG agenda is evident.

11.4.6 Integration of Regional and Global Agenda for Coordinated Action, and Planning (SAMOA Pathway, 2030 Agenda and the Sendai Framework)

Along with the SAMOA Pathway, the 2030 Agenda and the Sendai Framework are global agreements and monitoring systems that build on the Hyogo Framework for Action and Disaster Risk Reduction and the Sendai Framework for Disaster Risk Reduction 2015–2030. It is expected that the national targets and indicators will contribute to the achievement of the outcome and goals of these frameworks. The Sendai Framework is also explicit on the agenda of improving water-use efficiency, managing over-extraction of groundwater, and mitigation of saltwater intrusion. It states that better addressing such challenges can serve extremely beneficial in securing future water needs for vulnerable nations such as SIDS (Gheuens et al. 2019).

11.4.7 Strengthening Existing Water Governance and Climate Change Adaptation Arrangements at State and Regional Scales

In order to build strong water governance, climate change adaptation and DRM strategy, it is important to establish and/or strengthen local and regional alliances to facilitate sharing of best practice models, tools, innovations and lessons learned on policy options and technology applications across the SIDS nations and regions. A good example is the Trinidad and Tobago's New Water Pollution Rules and Water Pollution Regulations. These rules have been set in motion since 2019 to prevent water pollution and ensure ambient water quality (Environmental Management Act 2020).

11.4.8 Revisiting and Revising the Models of Knowledge-Sharing Platforms

The International Partnership for Expanding Waste Management Services of Local Authorities (IPLA) is a knowledge platform among partners such as municipalities, governments, the private sector, NGOs, academic and research institutions, international and donor organizations, and UN agencies. Its aim is to address waste management issues specifically at the municipal level (United Nations Centre for Regional Development 2011). Many of the Caribbean SIDS operate using knowledge communication across national boundaries to promote best practices in waste-water management.

11.4.9 Standardizing the SIDS Indicator Matrix for Monitoring and Evaluation of Water Security and DRM

There is a wide gap in access to safe drinking water in SIDS—many adversely affected by water related disasters. It is recommended that standardizing a SIDS indicator matrix for monitoring and evaluation of water security and DRM could be useful over the long term to assess progress.

11.4.10 Addressing Economic and Development Challenges in a Balanced and Integrated Way

Methods to address some common economic challenges faced by SIDS comprise promoting ecotourism, agritourism, cultural tourism, sustainable tourism, and protection of water resources and ecosystems (United Nations 2019). An integrated ecosystem approach to water security planning and DRM activities is required to support economic and development challenges better.

11.5 Conclusion

Disaster risk and water security are adversely affected by climate change. Regional collaboration is essential to provide a common platform for partnerships, projects and programmes across SIDS. Once partnerships are formed between organizations and stakeholders, the SAMOA Pathway and the Sendai Framework both can function to outline effective practices and lessons for others to improve. The Third International Conference on Small Island Developing States (2014) shared many partnership reports and successful outcomes, ensuring that SIDS issues remain high on the UN's agenda (United Nations 2014).

Knowledge transfer for sustainability planning or technology is essential for progress. Developing a collective agenda for SIDS on policy for food-water-energy security is critical for coherent planning and action based on best practice. The ten-point agenda plan can be a starting point for inter-regional co-operation.

Acknowledgements The authors express immense gratitude to McMaster University for support to work in collaboration with UNU INWEH. This study is also supported by UNU-INWEH through a long-term agreement with Global Affairs Canada.

References

AECOM. (2018). *Singapore's Advanced Wastewater Treatment Technologies Wins Global Recognition (2018)*. AECOM. Available at: https://www.aecom.com/sg/singapores-advanced-wastewater-treatment-technologies-wins-global-recognition/. Accessed 13 Jan 2020.

Gheuens, J., Nagabhatla, N., & Perera, D. (2019). Disaster-Risk, Water Security Challenges and Strategies in Small Island Developing States (SIDS). *Water, 11*(4), 637–665.

Henderson, V. (2013). *United Nations. SIDS DOCK: Facilitating the Transformation of the SIDS Energy Sector ECTOR to Enable Climate Change Adaptation: "25-50-25 by 2033"*. Available at: https://sustainabledevelopment.un.org/content/documents/3779henderson.pdf. Accessed 15 Jan 2020.

Intergovernmental Panel on Climate Change. (2018). *Global Warming of 1.5º C*. Geneva: IPCC. Accessed 2 Nov 2018.

Kapmeier, F., & Gonçalves, P. (2018). Wasted Paradise? Policies for the Small Island States to Manage Tourism-driven Growth while Controlling Waste Generation: The Case of The Maldives. *System Dynamics Review, 34*(1–2), 172–221.

Russell, G. (2019, December 27). 2019 Named Year of Billion-Dollar Disasters as Climate Crisis Escalates. *The National*. Available at: https://www.thenational.scot/news/18123732.2019-labelled-year-billion-dollar-disasters-christian-aid/. Accessed 15 Jan 2020.

SAMOA Pathway Caribbean Regional Preparatory Meeting. (2018). *United Nations*. Available at: https://www.cepal.org/en/events/samoa-pathway-caribbean-regional-preparatory-meeting. Accessed 13 Dec 2019. (KEEP).

Söjstedt, M., & Povitkina, M. (2017). Vulnerability of Small Island Developing States to Natural Disasters. *Journal of Environment & Development, 26*, 82–105. Accessed 2 Nov 2018.

UNDP. (2017). *Africa-Asia Drought Risk Peer Assistance Network*. Global Policy Centre on Resilient, UNDP.

UNFCCC. (2005). Climate Change and Small Island Developing States. *United Nations Framework Convention on Climate Change*. Bonn, Germany. Available at: https://unfccc.int/resource/docs/publications/cc_sids.pdf. Accessed 13 Dec 2019.

United Nations. (2013). *UN Water Annual Report 2013*. UN Waters, United Nations.

United Nations. (2014). *SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway*. New York: UN Publishing. Available at: https://sustainabledevelopment.un.org/sids2014/samoapathway. Accessed 11 Dec 2019.

United Nations. (2016). *Global Partnership for Sustainable Tourism*. New York: UN Publishing. Available at: http://www.sids2014.org/partnerships/?p=7411. Accessed 13 Dec 2019.

United Nations. (2018). *SIDS Partnership Framework*. New York: UN Publishing. Available at: https://sustainabledevelopment.un.org/sids/partnershipframework. Accessed 14 Nov 2019.

United Nations. (2019). *Sustainable Development Goals 2019*. SDGs Knowledge Pathways, United Nations.

United Nations Centre for Regional Development. (2011). *IPLA-International Partnership for Expanding Waste Management Services of Local Authorities (2011)*. New York: UN Publishing. Available at: http://www.uncrd.or.jp/index.php?menu=378. Accessed 13 Dec 2019.

WWAP (United Nations World Water Assessment Programme). (2018). *The United Nations World Water Development Report 2018: Nature-Based Solutions*. Paris: UNESCO. Available at: www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2018-nature-based-solutions/. Accessed 15 Jan 2020.

CHAPTER 12

Potential Restoration Approaches for Heavily Logged Tropical Forests in Solomon Islands

Eric Katovai, Dawnie D. Katovai, and William F. Laurance

12.1 Introduction

Small tropical island countries are becoming more vulnerable to forest loss due to industrial logging. These countries are mostly of lower socio-economic status and often heavily dependent on logging for economic revenue (Sloan and Sayer 2015). This scenario is highly apparent in the Solomon Islands, where log export alone contributes between 50 and 70% to the country's annual export revenue (Katovai et al. 2015). Annual log

E. Katovai (✉)
The University of the South Pacific, Suva, Fiji

James Cook University, Caims, QLD, Australia
e-mail: eric.katovai@usp.ac.fj

D. D. Katovai
The University of the South Pacific, Suva, Fiji

W. F. Laurance
James Cook University, Caims, QLD, Australia
e-mail: bill.laurance@jcu.edu.au

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_12

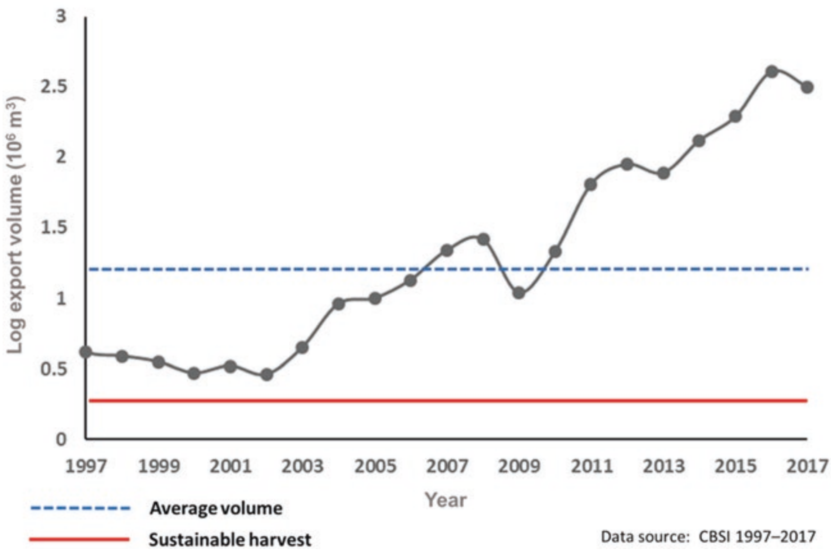


Fig. 12.1 Log export volume for the Solomon Islands between 1997 and 2017. The economy of the Solomon Islands has been heavily reliant on log export, resulting in a steep increase in logging activities in the country, with harvest quadrupling beyond the sustainable yield

exports in the Solomon Islands had been consistent in the 1980s and 1990s but increased steeply within the last decade (Fig. 12.1) (CBSI 1997–2017). Recent research has predicted that log export volumes will soon peak and then sharply decline within the next decade mainly due to unsustainable harvesting associated with bad logging practices (Shearman et al. 2012; Katovai et al. 2015). In spite of many concerns about past and current logging practices, and proposals to address excessive damage through remedial and preventive actions in the Solomon Islands, relatively little has been achieved in this frontier (Laurance et al. 2011, 2012; Katovai et al. 2016).

Industrial logging in Solomon Islands is mostly selective and operated by companies from Asia. Trees are usually harvested based on size and species preference (Katovai et al. 2015). However, unregulated harvesting and the lack of monitoring by authorities often result in highly degraded forest landscapes across the country (Fig. 12.2a). Furthermore, unregulated logging practices lead to the deforestation of large forest tracts within logging concessions for temporary logging, machinery and fuel storage, logging

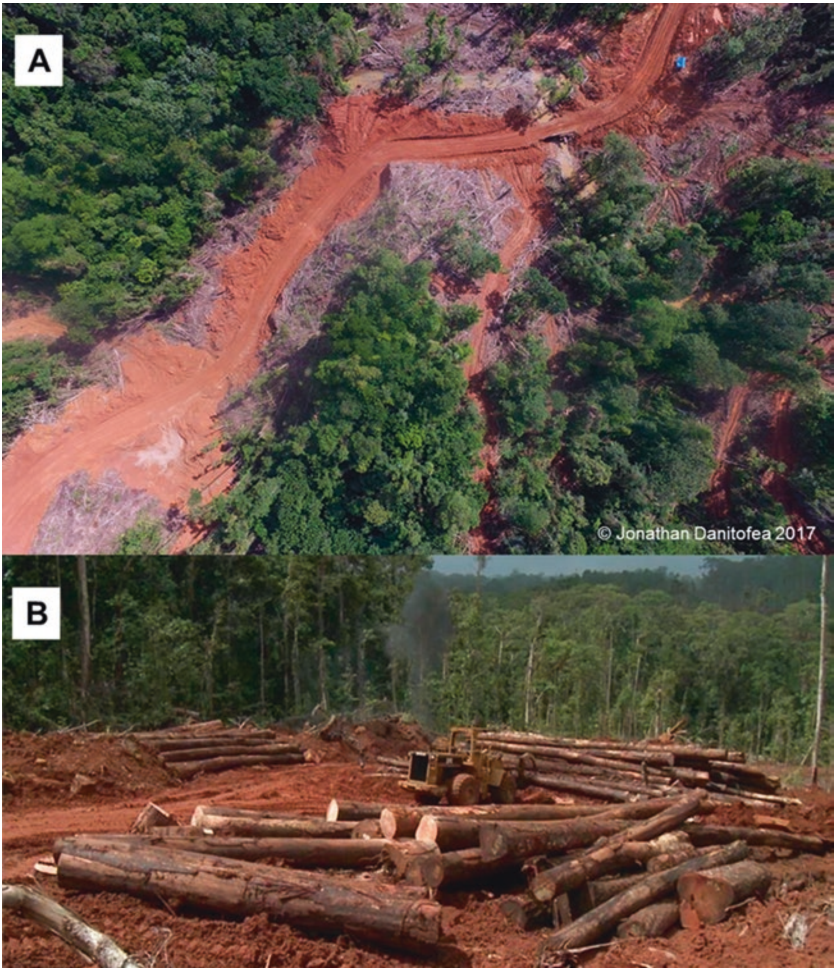


Fig. 12.2 A highly logged forest landscape (**a**) and a large forest tract deforested for temporary log storage (**b**) in Solomon Islands

camps and dense networks of roads and skidding trails (Fig. 12.2b) (Jackson et al. 2002). In heavily or repeatedly logged stands, damage incurred from tree harvest and the associated land uses can be so intense that natural regeneration is insufficient to allow floristic and functional recovery to pre-cut levels. Permanent shifts in climax vegetation in these logged stands may consequently trigger changes in the faunal diversity structure (Katovai et al. 2016). Here we outline restoration approaches that have been successfully implemented in human-degraded tropical landscapes that can potentially assist the recovery of highly logged forests in Solomon Islands.

12.2 Passive Restoration Approaches

Restoration of forest gaps is vital for the sustainability and livelihood of the forest. However, the question remains: how comparable will the restored forest be to the pre-disturbed stand in terms of ecological and biological values? There is no universal answer to this question as forest and gap dynamics vary spatially and temporally. To understand how gap dynamics influence the process of regeneration, let us consider the synergies of four primary sources that determine the quality of natural regeneration in gaps. Each of these factors varies in their role in gap regeneration.

12.2.1 Regeneration of Pre-existing Forest Vegetation

Regeneration of pre-existing forest species that have survived following a disturbance may utilize the abundance of light, which was often a limiting factor for growth and recruitment of understorey and sub-canopy plants at the pre-disturbed stage. These species may include juveniles of climax species that dominate the canopy prior to disturbance, which are in dormancy in the undergrowth awaiting an appropriate environment to flourish (Denslow et al. 2001). Gap re-growth represents an amalgamation of shade-intolerant pioneers and shade-tolerant plants. Yet due to the complexities of vegetation responses and the lack of detailed information, regeneration of pre-existing forest vegetation (termed "advanced regeneration") remains excluded from gap dynamic models (Dietze and Clark 2008).

12.2.2 Germination from the Soil Seed Bank

Germination from the soil seed bank is important for gap regeneration and diversification. Prior studies have shown that this natural process occurs in forests in response to the availability of light, with seed germination triggered by certain light wavelengths that result from direct sunlight (Brokaw and Busing 2000; Rüger et al. 2011). However, not all forest stands possess seed banks capable of dormancy for extended periods of time. For instance, a study of 18 late succession species on Barro Colorado Island showed no dormancy capability among them (Augspurger 1984). The absence of pioneers in the soil seed bank across the Bornean heath forest also illustrates the lack of dormancy of certain succession specialists (Whitmore and Hadley 1991). It is also important to note that by definition forest gap dynamics are not applicable to all forest stands as the concept revolves around sapling growth from seed banks. Much is still unknown about the temporal and spatial scales of seed banks in tropical forests.

12.2.3 Sprouting from Damaged Roots and Stems

Sprouting from damaged roots and stems also plays an important role in gap regeneration (Dietze and Clark 2008). This is particularly common in forests within the cyclone and hurricane zones, that is 7–20° latitude, where wind damage is highly intense and frequent (Laurance and Curran 2008). In cases where the seed bank regeneration does not occur, sprouting regrowth may dominate the gap restoration phase. Therefore, it is possible that species composition at the early gap phase regeneration will resemble the pre-existing flora but have a lower floral diversity as not all pre-disturbance species would survive through the disturbance regime (Dietze and Clark 2008).

12.2.4 Seed Rain

The fourth source of regeneration is termed “seed rain”, which is a practical description of how seeds disperse into a gap via vectors such as animals, particularly frugivorous birds and bats (Ceccon and Hernández 2009) but also including some scansorial animals such as mammals and ants. The role of birds in re-seeding degraded forests in the tropics has been well documented (Pejchar et al. 2008; Graham and Page 2012; Reid et al. 2012). A widely anticipated challenge in tropical forest regeneration, particularly in heavily degraded landscapes, is the lack of seed diversity to permit the later stages of regeneration and succession (Chazdon 2008; Budiharta et al. 2014). Numerous studies have since focused on ways to actively restore degraded forests through appropriate re-seeding approaches (e.g. Chazdon

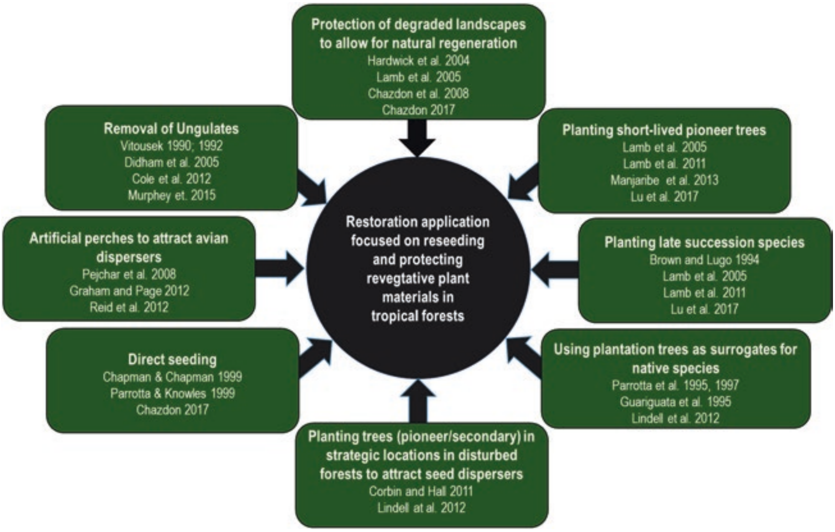


Fig. 12.3 Ecological restoration approaches widely used in tropical landscapes. An integrated approach whereby several techniques implemented concurrently can potentially aid success in heavily logged forests

2008; Cole et al. 2010; Graham and Page 2012). Through these efforts, a range of approaches have been developed and trialled, some of which have shown considerable success (Fig. 12.3).

12.2.5 Protection of Logged Forest Landscapes to Enhance Natural Regeneration

It is evident that forest restoration through natural regeneration can be improved by protecting previously logged forests (Margules et al. 2002; Chazdon 2008, 2017). The inclusion of adjacent undisturbed forest in these protected zones is important for provisioning an influx of seeds and faunal seed dispersers (Chazdon 2008, 2017). This strategy is feasible in areas where forests are not entirely cleared, hence leaving fragmented patches of forests capable of producing seeds that would then be vectored into forest gaps by animals or natural dispersal processes (Lamb et al. 2005). Nevertheless, forest recovery through this approach may fail in heavily logged landscapes if the system has crossed an ecological threshold that inhibits the perseverance and proliferation of forest species (Hobbs et al. 2006), or if logged forests are severely hunted or burned leading to defaunation or further forest degradation. Exceeding this ecological threshold limits natural regeneration to an altered state, generally associated with light-demanding vegetation (Lamb et al. 2005). For example, the loss of topsoil and/or increased soil compaction associated with heavy logging equipment hinder the establishment and growth of late successional vegetation, resulting in the high influx of non-tree and other invasive non-forest species (Vieira and Scariot 2006). Such floristic change increases the risk of wildfires, consequently reducing woody plant recruitment and favouring the proliferation of grasses and other fire-tolerant vegetation (Lamb et al. 2005; Lamb 2011). Many examples of fire-induced vegetation communities are evident throughout the tropics (e.g. Connell 1978; Zanne and Chapman 2001; Maeto et al. 2009).

12.3 Active Restoration Approaches

12.3.1 Tree Planting

In cases where unaided recovery is not possible for logged forest landscapes, several restoration strategies have been proposed. Most studies on tropical forest restoration have highlighted three broad approaches by which floral diversity can be actively restored. These are centred on the concept of restoration through planting. Though an expensive and in most cases an extensive exercise, restoration planting has been proven successful in many empirical studies (e.g. Parrotta and Knowles 1999; Chazdon 2008; Cole et al. 2010; Lamb 2011).

The first approach includes restoration plantings using several pioneer ephemeral nurse trees. The early establishment and rapid growth of nurse trees usually shade off light-demanding non-tree vegetation, including grasses and other undesirable alien species (Lamb et al. 2005). This effect creates a favourable environment for the regeneration of secondary forest species, some of which lay dormant in the topsoil awaiting the right conditions for germination (Lamb et al. 2005).

The second approach involves planting a range of species from later successional stages that improves the chances for a species-rich climax stand (Cole et al. 2011). This approach is particularly useful in the event where the soil seed bank has few live seeds of late successional species. The resultant species and structural assemblage of the restored community heavily depends on the variety and viability of the introduced seeds and therefore can be predetermined to a certain extent (Cole et al. 2011). Where seed collection is done within the proximity of logged forests, local knowledge is vital when selecting native species for re-seeding as this ensures that the restored forest has a high value for forest-dependent communities (Lu et al. 2017).

The third approach involves planting commercial tree species on deforested landscapes. Tree plantations can offer restoration values for native understorey vegetation (Parrotta 1995; Guariguata et al. 1995; Parrotta and Knowles 1999; Lindell et al. 2013). For instance, the successful germination and establishment of late successional species are potentially enhanced by planting commercial trees, as they shade out light-demanding pioneer competitors such as lianas and woody shrubs (Guariguata and Ostertag 2001). The soil may also aid restoration via high nutrient levels retained from the decomposition of pre-existing vegetation. The range of seed dispersers attracted to tree plantations may also aid in the rejuvenation of the topsoil, enhancing successful restoration of understorey native vegetation (Parrotta 1995; Parrotta and Knowles 1999; Katovai et al. 2012).

Despite the restoration values that tree plantations offer, the development of many tree plantations in the tropics is influenced solely by economic considerations. Many commercial plantations have been converted from large forest areas that had previously been cleared for agriculture and cattle ranching (Chazdon 2008). Successful efforts in restoring heavily degrading landscapes by tree plantations depend entirely on future management strategies. Current strategies such as cyclic clear-felling and replanting strategies prevailing in many tropical regions need to be reassessed. The effects of this process on the regeneration of native vegetation are still unknown. However, it may be suggested that further degradation of soil seed banks may result from repeated mechanical disturbances during the process of harvesting and extraction of logs, and soil clearing during preparation for replanting.

Nucleation may be an alternative approach to restore heavily degraded landscapes. This strategy involves planting small clusters of selected tree species (sometimes termed “framework tree species”; Goosem and Tucker 2013) within the degraded site and allowing them to disperse as well as attract seed dispersers, subsequently increasing seed rain into the disturbed landscape (Corbin and Holl 2012; Lindell et al. 2013; Goosem and Tucker 2013). This approach was successful with bird dispersers but not for larger mammalian seed dispersers (Corbin and Holl 2012). Although implementation of this approach is relatively inexpensive, restoration efforts may be impractical or too expensive at large spatial scales (Corbin and Holl 2012). However, there are still gaps in our understanding of the optimal design and long-term viability of such approaches (Corbin and Holl 2012; Lindell et al. 2013).

12.3.2 Direct Seeding

Direct seeding is an approach that involves dispersing seeds directly within disturbed landscapes. Such an approach requires a greater number of seed species of more mature successional stages (Chapman and Chapman 1999; Lamb et al. 2005; Lamb 2012). Planting usually requires high densities (e.g. 92,500 seeds per hectare; Parrotta 1995). The climax forest stand depicted in this approach is practically a function of the competitive interactions among the seedlings as they grow and mature. Ideally, this approach resembles a degraded forestland with an initial seed bank that, given the appropriate conditions, will undergo successful regeneration. The number of species that can be successfully established by direct seedling is limited by seed supply, although establishment costs may be lower than other approaches. Reforestation of open fields under appropriate conditions is possible (e.g. with the control of grasses or other competing species); however, it may be most useful in enhancing diversity where some tree cover is already present (Lamb et al. 2005). This approach is not as versatile as those previously discussed as ecophysiological conditions needed for initial germination are often narrowly specific because most seeds of climax species germinate and dominate only in the late successional stages.

12.3.3 Artificial Perches

The most important seed dispersers in tropical forests are birds, which are responsible for dispersing >50% of trees across forested landscapes (Graham and Page 2012). Hence, an approach that is widely used to maximize seed dispersal in degraded sites is the erection of artificial perches. Birds are known to use tall trees on gap edges for perching; by increasing artificial perches in gaps, bird colonization, and seed populations and diversity are increased, particularly under the perches (Pejchar et al. 2008). Although seed recruitment has been enhanced through artificial perches, the composition of seed rain largely depends on the foraging sites of visiting dispersers, which may include degraded forest sites, as evident in a recent study in Indonesian peat swamp forests (Graham and Page 2012). Studies have also shown that seed recruitment into degraded forests is coupled with the structural complexity within a given degraded environment, whereby simple environs such as abandoned grazed pastures usually have lower zoochorous recruitment (i.e. seeds dispersed by animals) than more complex environs (Pejchar et al. 2008; Graham and Page 2012; Reid et al. 2012).

12.3.4 Removal of Ungulates

Removal of ungulates from restoration sites is complimentary to both natural and assisted regeneration. Studies have shown that non-native ungulates can supress regeneration in the forest understorey through rooting, trampling and browsing of plant materials above and within the topsoil (Ickes et al. 2001; Didham 2011; Cole et al. 2012). Areas with a high population density of native ungulates may also produce the same effect (Cole et al. 2012). In contrast, the absence of ungulates may result in the high proliferation of invasive non-native plants, subsequently changing the vegetation structure of restored forests (Cole et al. 2012). Before embracing this approach, it is necessary to take into account the ecological importance of ungulates within the ecosystem.

12.4 Conclusions

We have outlined various restoration approaches that have been successfully trialled in highly degraded and deforested tropical landscapes. Although some stand-alone approaches have been successful, we strongly suggest that an amalgamation of carefully selected approaches is applied to any restoration effort. Such an integrative approach may achieve better outcomes and perhaps be more economically viable than stand-alone efforts. With increasing land use intensification through poor logging practices in the Solomon Islands, the need for landscape-scale restoration will certainly grow. It is therefore critical that forest restoration models and policies pertaining to their implementations should be developed. Meanwhile, the need for future research is critical to examine the cost, effectiveness and limitations of these approaches in highly logged forests. Information from this research can aid the development of forest restoration models and policies specifically designed for the Solomon Islands, as well as provide critical information for other small tropical islands vulnerable to industrial logging.

References

Augspurger, C. K. (1984). Seedling Survival of Tropical Tree Species: Interactions of Dispersal Distance, Light-gaps, and Pathogens. *Ecology, 65*, 1705–1712.

Brokaw, N., & Busing, R. T. (2000). Niche Versus Chance and Tree Diversity in Forest Gaps. *Tree, 15*, 183–188.

Budiharta, S., Meijaard, E., Erskine, P. D., Rondinini, C., Pacifici, M., & Wilson, K. A. (2014). Restoring Degraded Tropical Forests for Carbon and Biodiversity. *Environmental Research Letters, 9*, 114020.

CBSI. 1997 – 2017. *Annual Reports, Central Bank of Solomon Islands*. http://www.cbsi.com.sb/index.php?id=105. Accessed Jan 2018.

Ceccon, E., & Hernández, P. (2009). Seed Rain Dynamics following Disturbance Exclusion in a Secondary Tropical Dry Forest in Morelos, Mexico. *Revista de Biologia Tropical, San Jose, 57*, 257–269.

Chapman, C. A., & Chapman, L. J. (1999). Forest Restoration in Abandoned Agricultural Land: A Case Study from East Africa. *Conservation Biology, 13*, 1301–1311.

Chazdon, R. L. (2008). Beyond Deforestation: Restoring Forests and Ecosystem Services on Degraded Lands. *Science, 320*, 1458–1460.

Chazdon, R. L. (2017). Landscape Restoration, Natural Regeneration, and the Forests of the Future. *Annals of the Missouri Botanical Garden, 102*, 251–257.

Cole, R. J., Holl, K. D., & Zahawi, R. A. (2010). Seed Rain Under Tree Islands Planted to Restore Degraded Lands in a Tropical Agricultural Landscape. *Ecological Applications, 20*, 1255–1269.

Cole, R. J., Holl, K. D., Keene, C. L., & Zahawi, R. A. (2011). Direct Seeding of Late-Successional Trees to Restore Tropical Montane Forest. *Forest Ecology and Management, 261*, 1590–1597.

Cole, R. J., Litton, C. M., Koontz, M. M., & Loh, R. K. (2012). Vegetation Recovery 16 Years After Feral Pig Removal From a Wet Hawaiian Forest. *Biotropica, 44*, 463–471.

Connell, J. H. (1978). Diversity in Tropical Rain Forests and Coral Reefs. *Science, 199*, 1302.

Corbin, J. D., & Holl, K. D. (2012). Applied Nucleation as a Forest Restoration Strategy. *Forest Ecology and Management, 265*, 37–46.

Denslow, J. S., Ellison, A. M., & Sanford, R. E. (2001). Treefall Gap Size Effects on Above and Below Ground Processes in a Tropical Wet Forest. *Journal of Ecology, 86*, 597–609.

Didham, R. K. (2011). Life After Logging: Strategic Withdrawal From the Garden of Eden or Tactical Error for Wilderness Conservation? *Biotropica, 43*, 393–395.

Dietze, M. C., & Clark, J. S. (2008). Changing the Gap Dynamics Paradigm: Vegetative Regeneration Control on Forest Response to Disturbance. *Ecological Monographs, 78*, 331–347.

Goosem, S., & Tucker, N. I. J. (2013). *Repairing the Rainforest* (2nd ed.). Cairns: Wet Tropics Management Authority and Biotropica Australia Pty. Ltd.

Graham, L. L. B., & Page, S. E. (2012). Artificial Bird Perches for the Regeneration of Degraded tropical Peat Swamp Forest: A Restoration Tool With Limited Potential. *Restoration Ecology, 20*, 631–637.

Guariguata, M. R., & Ostertag, R. (2001). Neotropical Secondary Forest Succession: Changes in Structural and Functional Characteristics. *Forest Ecology and Management, 148*, 185–206.

Guariguata, M. R., Rheingans, R., & Montagnini, F. (1995). Early Woody Invasion Under Tree Plantations in Costa Rica: Implications for Forest Restoration. *Restoration Ecology, 3*, 252–260.

Hobbs, R. J., Arico, S., Aronson, J., Baron, J. S., Bridgewater, P., Cramer, V. A., Epstein, P. R., Ewel, J. J., Klink, C. A., Lugo, A. E., Norton, D., Ojima, E., Richardson, D. M., Sanderson, E. W., Valladares, F., Vilà, M., Zamora, R., & Zobel, M. (2006). Novel Ecosystems: Theoretical and Management Aspects of the New Ecological World Order. *Global Ecology and Biogeography, 15*, 1–7.

Ickes, K., Dewalt, S. J., & Appanah, S. (2001). Effects of Native Pigs (*Sus scrofa*) on Woody Understorey Vegetation in a Malaysian Lowland Rain Forest. *Journal of Tropical Ecology, 17*, 191–206.

Jackson, S. M., Fredericksen, T. S., & Malcolm, J. R. (2002). Area Disturbed and Residual Stand Damage Following Logging in a Bolivian Tropical Forest. *Forest Ecology and Management, 166*, 271–283.

Katovai, E., Burley, A. L., & Mayfield, M. M. (2012). Understory Plant Species and Functional Diversity in the Degraded Wet Tropical Forests of Kolombangara Island, Solomon Islands. *Biological Conservation, 145*, 214–224.

Katovai, E., Edwards, W., & Laurance, W. F. (2015). Dynamics of Logging in Solomon Islands: The Need for Restoration and Conservation Alternatives. *Tropical Conservation Science, 8*, 718–731.

Katovai, E., Sirikolo, M., Srinivasan, U., Edwards, W., & Laurance, W. F. (2016). Factors Influencing Tree Diversity and Compositional change Across Logged Forests in the Solomon Islands. *Forest Ecology and Management, 372*, 53–63.

Lamb, D. (2011). *Regreening the Bare Hills: Tropical Forest Restoration in the Asia-Pacific Region*. Dordrecht: Springer.

Lamb, D. (2012). The Third Big Silvicultural Challenge. *Journal of Tropical Forest Science, 24*, 295–299.

Lamb, D., Erskine, P. D., & Parrotta, J. A. (2005). Restoration of Degraded Tropical Forest Landscapes. *Science, 310*, 1628–1632.

Laurance, W. F., & Curran, T. J. (2008). Impacts of Wind Disturbance on Fragmented Tropical Forests: A Review and Synthesis. *Austral Ecology, 33*, 399–408.

Laurance, W. F., Camargo, J. L. C., Luizão, R. C. C., Laurance, S. G., Pimm, S. L., Bruna, E. M., Stouffer, P. C., Williamson, G. B., Benítez-Malvido, J., Vasconcelos, H. L., Van Houtan, K. S., Zartman, C. E., Boyle, S. A., Didham, R. K., Andrade, A., & Lovejoy, T. E. (2011). The Fate of Amazonian Forest Fragments: A 32-Year Investigation. *Biological Conservation, 144*, 56–67.

Laurance, W. F., Useche, D. C., Rendeiro, J., Kalka, M., et al. (2012). Averting Biodiversity Collapse in Tropical Forest Protected Areas. *Nature, 489*, 290–294.

Lindell, C. A., Reid, J. L., & Cole, R. J. (2013). Planting Design Effects on Avian Seed Dispersers in a Tropical Forest Restoration Experiment. *Restoration Ecology, 21*, 515–522.

Lu, Y., Ranjitkar, S., Harrison, R. D., Xu, J., Ou, X., Ma, X., & He, J. (2017). Selection of Native Tree Species for Subtropical Forest Restoration in Southwest China. *PLoS One, 12*, e0170418.

Maeto, K., Noerdjito, W., Belokobylskij, S., & Fukuyama, K. (2009). Recovery of Species Diversity and Composition of Braconid Parasitic Wasps After Reforestation of Degraded Grasslands in Lowland East Kalimantan. *Journal of Insect Conservation, 13*, 245–257.

Margules, C. R., Pressey, R. L., & Williams, P. H. (2002). Representing Biodiversity: Data and Procedures for Identifying Priority Areas for Conservation. *Journal of Biological Sciences.* (Suppl. 2*, 27*, 309–326).

Parrotta, J. A. (1995). Influence of Overstory Composition on Understory Colonization by Native Species in Plantations on a Degraded Tropical Site. *Journal of Vegetation Science, 6*, 627–636.

Parrotta, J. A., & Knowles, O. H. (1999). Restoration of Tropical Moist Forests on Bauxite-mined Lands in the Brazilian Amazon. *Restoration Ecology, 7*, 103–116.

Pejchar, L., Pringle, R. M., Ranganathan, J., Zook, J. R., Duran, G., Oveido, F., & Daily, G. C. (2008). Birds as Agents of Seed Dispersal in a Human-dominated Landscape in Southern Costa Rica. *Biological Conservation, 141*, 536–544.

Reid, J. L., Katsuki, K. N., & Holl, K. D. (2012). Do Birds Bias Measurements of Seed Rain? *Journal of Tropical Ecology, 28*, 421–422.

Rüger, N., Berger, U., Hubbell, S. P., Vieilledent, G., & Condit, R. (2011). Growth Strategies of Tropical Tree Species: Disentangling Light and Size Effects. *PLOS ONE, 6*, e25330.

Shearman, P., Bryan, J., & Laurance, W. F. (2012). Are We Approaching 'Peak Timber' in the Tropics? *Biology Conservation, 151*, 17–21.

Sloan, S., & Sayer, J. A. (2015). Forest Resources Assessment of 2015 Shows Positive Global Trends But Forest Loss and Degradation Persist in Poor Tropical Countries. *Forest Ecology and Management, 352*, 134–145.

Vieira, L. M., & Scariot, A. (2006). Principles of Natural Regeneration of Tropical Dry Forests for Restoration. *Restoration Ecology, 14*, 11–20.
Whitmore, T. C., & Hadley, M. (1991). *Rain Forest Regeneration and Management, Man and Biosphere Series* (Vol. 6). UK: The Parthenon Publishing Group.
Zanne, A. E., & Chapman, C. A. (2001). Expediting Reforestation in Tropical Forests Grasslands: Distance and Isolation from Seed Sources in Plantations. *Ecological Applications, 11*, 1610–1621.

CHAPTER 13

Climate Change and Heatwaves

John Laing Roberts

13.1 Introduction

Climate change is projected to bring about increasing frequency of seasonal shifts in weather and extreme events such as heatwaves, with small island states being particularly vulnerable (Masson-Delmotte et al. 2018). Heatwaves are defined as a marked warming of the air over a large area lasting a few days or weeks (WMO 2018). This basic definition can be extended to include other variables such as humidity and wind speed (Robinson 2001) and human stress (Nairn and Fawcett 2013). These definitions highlight two features of heatwaves. First, they are defined as relative to the local normal climate conditions, and second they acknowledge the local human and ecological capacity for adaptation to normal conditions. These two factors combine to create the special risk of heatwaves, which can have substantial adverse impact if mitigating action is not taken. Heatwaves have hit the Caribbean Islands in 2019 (CBC 2019) and in the Pacific a marine heatwave has been seriously threatening marine ecology on which the Pacific (Earth Observatory 2019), Islands heavily depend (NASA 2019).

J. L. Roberts (✉)
Indian Ocean Commission, Ebène, Mauritius
e-mail: john.laing@hotmail.com

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_13

The World Meteorological records for highest recorded temperatures show that many SIDS have experienced their highest ever recorded temperatures in the last three years (WMO 2019a). There is growing international concern about the impact of heatwaves (WMO 2019b; Pleidere et al. 2019) and that in SIDS they will have severe adverse impact on development (Asariosis 2018; Bundoo 2008).

Overall Climate Change has focused risk reduction activities in SIDS on early warning systems and mitigating action against natural disasters, such as high winds and heavy rain, bringing with them floods and destruction of property, droughts and wildfires, widely affecting farming and causing environmental damage. These disasters have also prompted action for the protection of coastlines, reinforcing infrastructures and search and rescue of people directly affected, followed by action for building back better to avoid similar adverse outcomes (UNFCCC 2005). Progress has been uneven and is subject to continual critical review (UN Sustainable Development Unit 2018), and heatwaves are now being recognised as a somewhat neglected high risk to health, economic and social welfare (Ventimiglia 2019), which will increasingly hit SIDS, which have much to learn from the impact of heatwaves elsewhere.

Current adaptive measures are necessary, but not sufficient parts of any broad strategy for adaptation and risk reduction. More attention is needed to respond to the secondary impact of these global climatic changes (Roberts and Bonne 2019). The secondary impact has important economic effects hitting many businesses dependent on critical infrastructure and services, such as power and transport systems, as well as outside workers and those vulnerable people whose survival depends on continuing medical and social support systems, which often suffer long-term severe disruption after natural disasters, especially in small island developing states (SIDS) (European Environment Agency 2019; Yang et al. 2018).

The human impact of heatwaves is great and may have been underestimated in the past. The heatwaves in France in 2019, with record high temperatures, led to 1500 excess deaths. People most at risk of the ill effects of heatwaves through hyperthermia are people working outside and those who are elderly, pregnant women and those on certain medications, including remedies for heart disease, Parkinson's, antihistamines, laxatives, illicit drugs and alcohol. In the USA heatwaves claim more lives than all the other weather-related exposures combined (Helman 2019).

13.1.1 Human Impact of High Temperature

Heatwaves increase the risk of hyperthermia. The stages of hypothermia are well understood and without intervention can rapidly lead to disability and death (Schraga et al. 2018). The critical temperatures beyond which the human body can continue to function are evident and the environmental temperatures that give rise to changes in body temperatures are also well documented (WHO 2013), (Mayo Clinic 2019; Baker and Shlin 2019).

But meteorological records of air temperature can be misleading as they are recorded in the shade and may be importantly lower than the observed levels in direct sunlight, where outside workers and tourists may be exposed. What are termed ‘heat islands’ in urban areas, where the impact of high-density building, traffic and reflective road surfaces, can expose people to higher risk than is indicated by the official weather recording systems (US Environmental Protection Agency 2019). Heat islands are not restricted to large countries but have been carefully measured in Mauritius, in the capital, Port Louis (Allami and Elahee 2014).

Mortality due to heatwaves has been found to be greater in populations subject to lowest average temperatures, for they are thus not accustomed to high temperatures and their environment may not be well adapted to cope with them. But migration and tourism can put some people unexpectedly at risk. The effect of excessive heat on the human body is usually immediate but may take up to three days to have its full direct impact (Tobias and Diaz 2014).

13.1.2 Ambient and Apparent Temperature

An important distinction has been made between the ambient temperature and the apparent temperature to which people are exposed (Steadman 1979). Standard reporting of ambient temperature is by international convention measured by equipment placed in shaded ‘Stevenson’ boxes. These must stand 5 ft above the ground located on grass or dirt surface with good ventilation and should be at least 100 ft from any concrete or paved surface to avoid radiation from such surfaces and must be covered against any effect of precipitation (WMO 2008). This is far from the conditions to which people are exposed in real life.

To assess the actual temperature to which people are exposed, which Steadman has defined as the apparent temperature, he prepared from his assessments complex equations taking into account direct sunlight, radiation from the local environment, air pressure, the angle of the sun, the angle of the object to the sun, clothing and other covering, air currents and the amount of the body exposed. From his observations and assessments, he showed that the apparent temperature to which someone might be exposed could be up to 10 °C or more than the recorded ambient temperature. These findings have important implications for policies on the reduction of risk from heatwaves. Moreover the application of Bergmann and Allen's rules shows that there is a negative correlation between apparent temperature and body mass in human and other animals (Blackburn et al. 2004); for the ratio of body surface to body volume is critical in determining the efficiency of sweating as a natural cooling mechanism to avoid hyperthermia. The ratio of body surface to body volume decreases with body mass. Thus, overweight people are at greater risk of hyperthermia.

13.1.3 Hyperthermia

When the officially recorded air temperature rises above 35 °C (95 °F), the risk of hyperthermia rises for all people exposed and is greater for those in direct sunlight (McGregor et al. 2015). The body system seeks homeostasis by adjustments of metabolism, but in high temperatures and elevated humidity, this is inhibited and even the process of sweating may not be sufficient to restore the normal body balance and the core body temperature 35.5–37.5 °C. If the core body temperature rises to 38 °C, the process of hyperthermia can be initiated, giving rise to increasingly serious adverse health events, from headaches, to nausea, vomiting, muscle cramp, fatigue and heat exhaustion. Beyond a core body temperature of 40.6 °C, heat stroke may set in bringing with it mental stress, confusion, loss of consciousness, breakdown of heart muscles and blood vessels, damage to liver and kidneys, convulsions, coma and death (Helman 2019; Benmartina et al. 2015).

This process can affect people of all ages, but children and people over 75 years are more susceptible to hypothermia. People with chronic conditions, including heart disease, diabetes, kidney malfunction, are especially at risk. The risk of hyperthermia is also greater in people not accustomed to high temperatures. People who are used to hot weather can, in very hot weather, produce up to two litres of sweat per hour: those who are not used to it may only achieve 1 litre per hour. Acclimatisation may take up to ten days and may be adversely affected by intake of alcohol or drugs.

Hyperthermia can result from mere long-term exposure to a very hot environment, or it can develop from strenuous physical exertion in a hot environment such as with athletes, firefighters and military personnel or others working outside, unsheltered from the sun. Hyperthermia is associated with high morbidity and mortality, especially when cooling is delayed. Redistribution of blood to the peripheral parts of the body, combined with loss of fluids and electrolytes in perspiration, puts a burden on the heart, which can prove critical in people with heart disease.

13.1.4 Other Adverse Effects of Heatwaves on Humans

In addition to hyperthermia, humans risk contracting skin cancer by exposure of unprotected skin to the ultraviolet (UV) elements in sunlight. UV can damage the deoxyribonucleic acid (DNA), the genetic material of skin, causing cells to grow abnormally to replace lost tissue, leading to melanoma or skin cancer. Getting sunburn once every two years triples the chance of cell damage, leading to skin cancer (Cancer Research UK 2019). Those who are not accustomed to high temperatures and with lighter skin are at greater risk from extended and repeated exposure to UV. Moreover, in such cases, if the UV has damaged the DNA, the use of aftersun cream may ease the discomfort but will not reverse the damage to DNA (WHO 2004).

Dehydration is a further risk of exposure to unusually hot weather, which occurs when the loss of body fluids through perspiration exceeds fluid intake (Mayo Clinic 2019). Body temperature and heart rate increase with the level of dehydration; sweating reduces the body temperature but sheds body fluid and causes sodium and electrolyte loss (Baker and Shlin 2019). Children, elderly and disabled people are especially at risk where they have problems in getting access to water and may not be able to say or communicate to others that they are thirsty. Older adults are also vulnerable to dehydration, as they have a lower volume of water in their bodies than others. Dehydration can lead to fatigue, dizziness, confusion, seizures and unconsciousness.

Sunburn is a common effect of unprotected exposure to UV, frequently through the practice of sun tanning. There is a clearly established link between sun tanning, sunburn and cancer and also to damage to the cornea of the eyes (Cancer Research UK 2019; Rodrigues-Sain 2019; US Food and Drug Administration 2019).

13.1.5 *Secondary Impact of Heatwaves*

Heatwaves are prolonged periods of hot weather which have both primary and secondary adverse effects. The secondary or indirect effects include the reduction in productivity, overloading of power systems by the increased use of air conditioning, power cuts that reduce the access to emergency health services, disruption of landline and mobile phone communications and inhibiting calls for help and advice. This can involve disruption of life-sustaining medical systems such as renal dialysis, emergency surgical and obstetric services and medical support services, such as pharmacy deliveries and supplies, putting at risk those people who depend on ready supply of such services on a daily basis. The 2003 heatwaves in European summer gave rise to an estimated 50,000 excess deaths (Bruckner 2005).

Assessment of the true secondary impact of such natural disasters depends on the reliable certification of the cause of death. Detailed study of the impact of hurricane Maria, in Puerta Rico, in 2018 showed that under-reporting of the hurricane, as an indirect cause of death, was common and failed to account for probably as many as 95 per cent of the deaths following the storm in that small island state (Roberts and Bonne 2019). Excess mortality associated with heatwaves is likely to increase worldwide (Gutterman et al. 2017) and especially in tropical and subtropical regions (Yuming et al. 2018) and may well follow this pattern of under-reporting, with the apparent immediate death toll comparatively low and subsequently outweighed by the much higher assessments of the secondary impact on the most vulnerable people, loss of productivity, smaller harvests, volatile prices, water shortage, forest fires and forest and shrubland loss (Ventimiglia 2019).

13.2 Economic and Social Impact

The UK Economic and Social Council undertook a review of the economic and social impact of extreme weather conditions arising from climate change and the implications for policy in the UK (Economic and Social Research Council, UK 2016). This review, which covered heatwaves, cold waves, flooding and strong winds, highlighted the expected adverse effects on food management, water and energy security. It emphasised the importance of policymakers drawing up wide-ranging plans. These should take into account the medium- and long-term impact of climate change using a multi-sectoral approach. It is expected that the longer indirect economic and social impact of such events will rise in line with their increasing frequency and severity.

In the USA, a major cross-sector analysis (Lazo et al. 2011) has been undertaken for the evidence of the impact of extreme weather condition using 70 years of meteorological and finance data (International Environmental Data Rescue Organisation 2012). It studied agriculture, communications, construction, manufacturing, mining, retail trade, services, transportation, utilities, wholesale trade and finance. The study found that the most hit sectors were mining (coal, gas and oil) and agriculture. The overall sensitivity of GDP to extreme weather events was greater than 3 per cent. The study called for adaptive measures to provide greater insulation of factory roofs, better drainage systems and a switch to more weather-resistant agricultural crops, together with improved weather forecasting.

13.3 Prevention and Mitigation

Prevention in the face of heatwaves, in developed countries, has focused on early warning systems (Neufeldt et al. 2019) and the provision of longer-term weather forecasts. Heat relief shelters are now increasingly offered, and emergency services provide home visits to people at risk and on call (Ventimiglia 2019; WHO 2013). During heatwaves, water utility companies are advised to avoid cutting off domestic water supplies and fire and rescue services to increase staffing and vigilance.

It is recognised that much can be done by developing urban planning to reduce the prevalence of heat islands in cities (WHO 2004). Special training for medical teams is encouraged to adopt the safe practices in body cooling after hyperthermia and sunburn (Tobias and Diaz 2014).

Policy on heatwaves and health is becoming increasingly a focus of attention. In 2008 the WHO European Office set out guidelines on heat health action planning (McGregor et al. 2015) and in 2019 they reviewed the response to the guidelines (Hoekstra 2018) announcing a five-year work plan 2019–23 working with the Global Heat Health Information Network, but many SIDS have been late arrivals in these processes.

More research is needed on morbidity and the effectiveness of healthcare response to heatwaves (Hoekstra 2018). Countries should establish registers of people vulnerable to heatwaves to help in providing early warning and support to them. This is all the more important as the number of heatwaves is expected to double over the next 30 years as is the population of elderly dependent people.

Whilst some evaluation of interventions has been carried out, more clearly needs to be done to set out advice on cost-effective practice. This needs to cover early warning systems, health promotion advice and behavioural change, health service staff training, delivery of support system to the most vulnerable, physiological effects of heatwaves on different people and urban planning and provision, including green spaces, public water supply and cooling sprays, road and building orientation, natural ventilation and solar-powered ventilation.

The Commonwealth Secretariat has published the results of a review of strengthening disaster resilience based upon latest research studies, especially those building on emerging technology (Khonje and Mitchell 2019), such as mobile and satellite data systems for geographical mapping, sensor technology for early warning systems, blockchain methods for improved insurance products and mainstreaming gender for improved perspectives in disaster risk reduction. The report also draws attention to the policy significance of the secondary or indirect impact of disasters and the vulnerability of the increasing number of isolated elderly and disabled people and those living in institutional care (Roberts and Bonne 2019). The issue of extreme temperatures was not covered in this report, but the global impact of heatwaves is now attracting more attention with many countries hit by heatwaves in 2019.

13.4 Discussion

Studies have shown that responsiveness in SIDS to the increasing hazard of heatwaves has been mixed, though they are greatly at risk from climate change, which can have a substantially greater human, economic and social impact than in larger and continental countries (Corvalam et al. 2018). More study is needed on the risks of hyperthermia and skin cancers in tourist and migrant populations, who may be less aware of the implications of exposing their bodies to UV for long periods and of consuming large quantities of alcohol when they are less acclimatised to the tropical sun and may have travelled from their own countries during the winter period.

The European Office of WHO through its Centre for Environment and Health in Bonn, Germany has made substantial strides in tackling the policy issues of heatwaves by the publication of guidelines for planning and action and an evaluation of them and the collation of the evidence base (Hoekstra 2018). In particular they identify a serious gap in the evidence of effectiveness of measures proposed and taken since the heat health guidelines were issued in 2008. More study is needed on the gender difference in impact, risk perception, health behaviour, migrant workers, effectiveness of interventions and the criteria used for assessment.

The WHO European Office is extending its work and collaboration with the Global Heat Health Information Network and Heat Shield (Kobenhavns Universitet 2019). These programmes in the European region with the WHO and the European Union working closely together aim to establish a research and development momentum on heat health as part of the broader programmes on climate change. They aim to offer member states the best available evidence-based guidance and support drawn from sponsored innovative work in the field. For example, EXTREMA (Emergency Information System for Extreme Temperatures) is being tested in Paris, Rotterdam and Mallorca (National Observatory of Athens 2018). It offers real-time temperature surveillance on a 1 km^2 grid, with a mobile app, available on mobile phones, to provide early warning of extreme temperatures to institutions and to the public. It provides early warning, location of refuges with cooling services and can be used to profile people at risk by characteristics such as age, use of medications and chronic conditions. Some of the collaborating centres have added location of swimming pools, parks and water facilities. Added options are being considered for air pollution and pollen counts.

WHO European Office is also working on heat health through the Healthy Cities Network (Hoekstra 2018). The small island of Cyprus is one of the collaborating centres carrying the overall aims of finding research-based technical solutions to exposure to extreme temperature, with scenario-specific policies developed, implemented and evaluated to establish their health, economic and social benefits and costs (Heaviside et al. 2016).

These advances provide a challenge to small and island states outside Europe, which do not seem to have become involved in these developments yet are at greater risk of extreme temperatures in the future and are less well prepared. Evaluation of intervention on heatwaves and on Climate Change adaptation and intervention is lacking (Klock and Nunn 2019). Despite the many adaptation measures taken, structural, physical and behavioural, there is little to show how far such investment has yielded results in terms of reducing vulnerability and increasing resilience.

Reviews of policy and action on the issue of heatwaves in SIDS can focus on primary, secondary and tertiary aspects for possible intervention.

Primary intervention is concerned with reducing and avoiding the risks for geographical areas and for the most vulnerable people. This may include improved weather forecasting; better early warning systems; the provision of safe cool refuge centres; and targeting people most vulnerable to heatwaves, such as outside workers, elderly isolated people, pregnant women and babies, people in schools and colleges. It can include maintaining domestic water supplies and water in public places and designing habitats to reduce the impact of heatwaves with shaded areas, parks, swimming pools and water fountains and sprays. Primary prevention can cover training of emergency response staff and the provision of equipment and supplies.

Secondary prevention is directed to rapid and effective response to heatwaves when they are forecast and active. Action may include directing people to available cooling centres and delivery of emergency paramedical, medical and nursing services for patients with hyperthermia, heat stroke, sunburns and heat exhaustion.

Tertiary prevention includes responding to the longer-term health, economic and social impact of heatwaves and retrofitting buildings and redesigning habitation for the future better adapted to climate change.

13.5 Conclusions and Recommendations

Heatwaves are prolonged periods of excessively high temperatures. Studies show that SIDS are extremely vulnerable to climate change, and the prospect of an increasing frequency and intensity of heatwaves will have a serious adverse impact on health and on economic and social welfare, with losses in GDP greater than the global average.

SIDS and other small states, except those within the European Union (Koppe 2004), are yet to be drawn coherently into action against this growing threat of heatwaves or to join with the emerging global networks on these risks and their policy implications. Hyperthermia, sunstroke, sunburn and skin cancer present substantial and growing risks to their populations and to migrant and tourists in SIDS. Most at risk are small children, pregnant women, elderly people with chronic illnesses and people who are overweight or heavy drinkers of alcohol and also outdoor workers. The effective temperatures to which people are exposed in direct UV may be as much as 10 °C greater than the officially reported ambient temperatures, which are recorded in the shade, protected from added heat from buildings and road surfaces. Local resident islanders become acclimatised to the normal range of their climate, but this traditional pattern is now changing, and it will present adaptation challenges SIDS have yet to face, both on coastlines and in those cities and towns which are built away from the cooling sea breezes.

Urban areas tend to have heat islands, even in island states, where extreme temperatures are further exaggerated by the local environment, presenting special risks to those outside workers, those who are not mobile, those who live alone or are in institutional care and who are not alert to the risks.

SIDS and other small states need to consolidate their awareness of this growing aspect of Climate Change, becoming more acquainted with the growing reviews of policy and action plans (Global Heat Health Information Network 2019, Isaacson 2019) and contributing to the accumulation of evidence on cost-effective intervention. They then need to assimilate the risks within their lists of major priorities for development and assess their relative importance to them.

SIDS embrace, as a group, a wide variety of stages of human, economic and social development, with diverse needs and priorities. In approaching the issues of the increasing risk of heatwaves, as an aspect of climate change, they need to reassess their basic needs and the opportunities for adaptation. Regional bodies in the Caribbean, the Pacific and Indian Oceans can play a key part in assembling evidence on the future risks and the costs and benefits of the choices for intervention, assisting the local islanders for shaping their futures within the context of their existing needs.

References

Allami, Z., & Elahee, M. K. (2014). *Exploring the Urban Heat Island (UHI) Effect in Port Louis, Research Papers. University of Mauritius.* Available at: https://www.ajol.info/index.php/umrj/article/viewFile/134575/124208. Accessed 15 Jan 2020)

Asariosis, R. (2018). *2018 Demonstrates Extreme Weather's Impact on Development*. United Nations Conference on Trade and Development. Available at: https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1840. Accessed 08 Dec 2019

Baker, H., & Shlin, D. R. (2019). Sun Exposure, Chapter 3. In *Environmental Hazards and other Non-infectious Health Risks*. Atlanta: Centre for Disease Control and Prevention, Saving Lives and Protecting People.

Benmartina, T., Deguen, S., Kaufman, J. S., & Smargiassis, A. (2015). Review Article: Vulnerability to Heat-related Mortality: A Systematic Review, Meta-analysis, and Meta-regression Analysis. *Epidemiology, 26*, 781–793.

Blackburn, T. M., et al. (2004). Bergamann's Rule. *Ecography*, *27*(6), 715–24. Available at: https://www.jstor.org/stable/3683671?seq=1#page_scan_tab_contents. Accessed 4 Nov 2019.

Bruckner, G. (2005, July–September 2). Vulnerable Populations: Leasons Learnt from The Summer Heat Waves of 2003 in Europe. *Eurosurveillance 70*, 7–9

Bundoo, S. Y. (2008). *The Changing Climate of Mauritius, Mauritius Meteorological: Service and United Nations Food and Agricultural Organisation*. Available at: http://www.fao.org/fileadmin/user_upload/foodclimate/forum/Boodhoos.pdf. Accessed 15 Jan 2020.

Cancer Research UK. (2019). *How Does Sun-burn and UV Cause Skin Cancer*: Available at: https://www.cancerresearchuk.org/about-cancer/causes-of-cancer/sun-uv-and-cancer/how-does-the-sun-and-uv-cause-cancer. Accessed: 18 Oct 2019.

CBC. (2019). *Heatwave: PAHO urges Caribbean to prepare for Heatwaves, Caribbean Broadcasting Company*. Available at: https://www.cbc.bb/2019/12/20/paho-urges-caribbean-to-prepare-for-heatwave/. Accessed 15 Jan 2020.

Corvalam, C., Ebi, K., Villalobos Prat, E., & Campbell Lendrum, D. (2018). *Climate Change and Health in SIDS*. Geneva: WHO. Available at: https://apps.who.int/iris/bitstream/handle/10665/279987/9789241514996-eng.pdf?ua=1. Accessed 4 Nov 2019.

Earth Observatory. (2019). *Marine Heatwave Returns to the North East Pacific*. NASA. Available at: https://earthobservatory.nasa.gov/images/145602/marine-heat-wave-returns-to-the-northeast-pacific. Accessed 15 Jan 2020.

Economic and Social Research Council, UK. (2016). *Responding to Extreme Weather Conditions*. Available at: https://esrc.ukri.org/news-events-and-publications/evidence-briefings/responding-to-extreme-weather-events/. Accessed on 5 Nov 2019.

European Environment Agency. (2019). *Economic Losses From Climatic Related Extremes in Europe*. EEA. Available at: https://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment-2. Accessed 31 Oct 2019.

Global Heat Health Information Network. (2019) Available at: https://www.ghhin.org/. Accessed 3 Nov 2019.

Gutterman, S., Brimblecombe, S., Dexter, N., Dnaldson, K., Jones, C., King, P., & Pomazkin, D. (2017). *Climate Change and Mortality, International Actuarial Association*. Available at: https://www.actuaries.org/CTTEES_ENVIRO/Papers/REWG_CCandMortality_final_Nov2017.pdf. Accessed 1 Nov 2019.

Heaviside, C., et al. (2016, November). Heat Related Mortality in Cyprus. For Current and Future Climatic Scenarios. *Science Total Environment*. Available at: https://mafiadoc.com/heat-related-mortality-in-cyprus-for-current-and-future-_5a9828431723dd689cd4edf8.html

Helman, R. S. (Ed.) (2019, August). *Heatstroke, Medscape*. Available at: https://emedicine.medscape.com/article/166320-overview. Accessed 03 Nov 2019.

Hoekstra, M. (2018). *Updating the Evidence Related to Heat Health Action Planning*. Copenhagen: WHO European Office. Available at: http://www.euro.who.int/__data/assets/pdf_file/0015/405330/HHAP-report.pdf?ua=1. Accessed 27 Oct 2019. http://www.euro.who.int/__data/assets/pdf_file/0015/405330/HHAP-report.pdf?ua=. Accessed 4 Nov 2019. https://www.ncbi.nlm.nih.gov/pubmed/26332052. Accessed 1 Nov 2019.

International Environmental Data Rescue Organisation. (2012). *The Economic Impact of Extreme Weather in the USA*. Available at: http://iedro.org/articles/economic-impact/

Isaacson, J. (2019). *Understanding and Addressing the Risks of Extreme Heat on Human Health, Climate Links*. USAID. Available at: https://www.climate-links.org/blog/understanding-and-addressing-risks-extreme-heat-human-health. Accessed 3 Nov 2019.

Khonje, W. H., & Mitchell, T. (2019). *Strengthening Disaster Resilience in Small States*. London: Commonwealth Secretariat. Available at: https://books.the-commonwealth.org/small-states-0. Accessed on 27 Oct 2019.

Klock, C., & Nunn, P. (2019). Adaptation to Climate Change in Small Island Developing States: A Systematic Literature Review of Academic Research. Available at: https://journals.sagepub.com/doi/abs/10.1177/1070496519835895?journalCode=jeda. Accessed 28 Oct 2019.

Kobenhavns Universitet. (2019). *Heatshield, Fact Sheet*. CORDIS, EU. Available at: https://cordis.europa.eu/project/rcn/200678/factsheet/en. Accessed 27 Oct 2019.

Koppe, C. et al. (2004). *Heatwaves: Risks and Responses*. Copenhagen: WHO. Available at: http://www.euro.who.int/en/publications/abstracts/heat-waves-risks-and-responses. Accessed 21 Oct 2019.

Lazo, J. K., et al. (2011). U.S. Economic Sensitivity to Weather Variability. *Bulletin of the American Meteorological Society, 92*, 709–720.

Masson-Delmotte, V., et al. (2018). *Global Warming at 1.5°C*. IPCC Special Report, Working Group 1, Technical Support Unit: Available at website: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf. Accessed 31 Oct 2019.

Mayo Clinic. (2019). *Dehydration, Patient Health Information*. Mayo Foundation for Medical Education and Research. Available at: https://www.mayoclinic.org/diseases-conditions/dehydration/symptoms-causes/syc-20354086. Accessed 20 Oct 2019.

McGregor, G. R., et al. (2015). *Heatwaves and Health, Guidance on Warning System Development*. Geneva: WMO No. 1142/WHO. Available at: https://www.who.int/globalchange/publications/WMO_WHO_Heat_Health_Guidance_2015.pdf\. Accessed 1 Nov 2019.

Nairn, J., & Fawcett, R. (2013). *Defining Heat Waves, World Meteorological Organisation*. Available at: https://www.cawcr.gov.au/technical-reports/CTR_060.pdf; https://library.andwmo.int/index.php?lvl=notice_display&id=14490#.Xh6r2Mj7RPY. Accessed 15 Jan 2020.

NASA 2019, Marine heat wave returns to NorthEast Pacific, Earth Observatory. Available at https://earthobservatory.nasa.gov/images/145602/marine-heat-wave-returns-to-the-northeast-pacific. Accessed 2 July 2020.

National Observatory of Athens. (2018). *EXTReme TEMperature Alert for Europe*. EXTREMA, European Commission. Available at: https://ec.europa.eu/echo/funding-evaluations/financing-civil-protection-europe/selected-projects/extreme-temperature-alerts_en. Accessed 4 Nov 2019.

Neufeldt H et al. 2019, The Adaptation Gap Report 2018, United Nations Environment Programme, UNEP, Nairobi, Kenya. Available at: https://unep-dtu.org/wp-content/uploads/2019/04/agr-final-version-2018.pdf. Accessed 21 October 2019.

Pleidere, P., et al. (2019). Summer Weather Becomes More Persistent in a 2°C World. *Nature Climate Change*, *9*, 666–671. Available at: Available at: https://www.nature.com/articles/s41558-019-0555-0?proof=true1. Accessed 2 July 2020.

Roberts, J. L., & Bonne, G. (2019). *Fresh Lessons on Preparedness for Disasters, Chapter 9 in Strengthening Disaster Resilience in Small States, Commonwealth Perspectives*. London: Commonwealth Secretariat. Available at: https://books.thecommonwealth.org/small-states-0. Accessed 27 Oct 2019.

Robinson, P. J., (2001). On the definition of heat wave. *Journal of Applied Meteorology, 40*, 762–775. Available at: http://danida.vnu.edu.vn/cpis/files/Refs/Heat%20Waves/On%20the%20Definition%20of%20a%20Heat%20Wave.pdf. Accessed 2 July 2020.

Rodrigues-Sain, R. (2019). *The Sun and Your Eyes*. New York: The Skin Cancer Foundation. Available at: https://www.skincancer.org/skin-cancer-prevention/sun-protection/eye-protection/. Accessed 22 Oct 2019.

Schraga, E. D., et al. (2018). *Cooling Techniques for Hyperthermia, Medscape May*. Available at: https://emedicine.medscape.com/article/149546-overview#a2. Accessed 31 Oct 2019.

Steadman, R. G. (1979, July). The Assessment of Sultriness, the Effects of Wind, Extra-radiation and Biometric Pressure on Apparent Temperature. *Journal of Applied Meteorology, American Meteorological Association*, 861–873, Available at: https://journals.ametsoc.org/doi/pdf/10.1175/1520-0450%281979%29018%3C0861%3ATAOSPI%3E2.0.CO%3B2. Accessed 4 Nov 2019.

The Adaptation Gap. 2018. (UNEP) Nairobi. Available at: https://unepdtu.org/wp-content/uploads/2019/04/agr-final-version-2018.pdf. Accessed 21 Oct 2019.

Tobias A., & Diaz J. (2014). Heatwaves, Human Health, and Climate Change In Freedman B (Ed.), *Global Environmental Change* (pp. 447–453). Springer. Available at: https://www.aureliotobias.com/uploads/9/7/4/3/9743878/chp_3a10.1007_2f978-94-007-5784-4_19.pdf. Accessed 4 Nov 2019.

UN Sustainable Development Unit. (2018, November). *Inter-regional Meeting for Mid-Term Review of the Samoan Pathway*. New York: UN. Available at: https://sustainabledevelopment.un.org/content/documents/21058Final_Samoa_Outcome.pdf. Accessed 31 Oct 2019.

UNFCCC. (2005). *Climate Change, Small Island Developing States*. Bonn: Climate Change Secretariat. Available at: https://unfccc.int/resource/docs/publications/cc_sids.pdf. Accessed 31 Oct 2019.

US Environmental Protection Agency. (2019). *Heat Island Cooling Strategies*. EPA. Available at: https://www.epa.gov/heat-islands/heat-island-cooling-strategies. Accessed 3 Nov 2019.

US Food and Drug Administration. (2019). *The Risks of Tanning*. FDA, USA Government. Available at: https://www.fda.gov/radiation-emitting-products/tanning/risks-tanning. Accessed 22 Oct 2019.

Ventimiglia, A. (2019). *Heatwave, Futurearth*. Geneva: WMO/WHO. Available at: https://futureearth.org/wp-content/uploads/2019/07/issuebrief_07_11.pdf. Accessed 1 Nov 2019.

WHO. (2004). *Heatwaves, Risks and Responses*. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/96965/E82629.pdf. Accessed 20 Oct 2019.

WHO. (2013). *Climate Change and Health, a Tool to Estimate Health and Adaptation Costs*. Available at: http://www.euro.who.int/en/publications/abstracts/climate-change-and-health-a-tool-to-estimate-health-and-adaptation-costs. Accessed 4 Nov 2019.

WMO. (2008). *Guide to Meteorological Instruments and methods of Observation, No.8*. Geneva: WMO. Available at: https://www.weather.gov/media/epz/mesonet/CWOP-WMO8.pdf. Accessed 31 Oct 2019.

WMO. (2018). Guidelines on the definition and monitoring of extreme weather and climate events. *Final Draft Report, WMO Geneva*. Available at: https://www.wmo.int/pages/prog/wcp/ccl/documents/guidelinesonthedefintion-andmonitoringofextremeweatherandclimateevents_09032018.pdf. Accessed 2 July 2020.
WMO. (2019a). *Global Weather and Climate Extremes Archive*. Available at: https://web.archive.org/web/20190627080608/https://wmo.asu.edu/content/world-meteorological-organization-global-weather-climate-extremes-archive. Accessed 8 Dec 2019.
WMO (2019b, July). *Matched and Maybe Broke the Record of the Hottest Month Since Analysis Began*. Geneva: World Meteorological Office. Available at: https://public.wmo.int/en/media/news/july-matched-and-maybe-broke-record-hottest-month-analysis-began. Accessed 31 Oct 2019.
Yang, X. et al. (2018). Assessment of the Economic Impacts of Heatwaves. *Journal of Cleaner Production*, *171*: 811–819: Available at: https://www.sciencedirect.com/science/article/pii/S0959652617323624. Accessed 31 Oct 2019.
Yuming, G. et al. (2018). Quantifying Excess Deaths Related to Heatwaves Under Climate Change Scenarios, a Multi Country Time Series Modelling Study. *Public Library of Science*. Available at: https://www.preventionweb.net/publications/view/59689. Accessed 1 Nov 2019.

PART IV

Environmental Governance and Challenges

CHAPTER 14

Promoting the Blue Economy: The Challenge

Raj Mohabeer and John Laing Roberts

14.1 Introduction

Conventionally, economics has been about the flow and value of goods and services produced by the combination of fixed capital assets and labour. This framework for analysis has undergone major changes in the twentieth and twenty-first centuries (see Chap. 1 of this book for a detailed account of this change of course). As an antidote to the conventional view of economics, in more recent years, the concept of the Green Economy has been promoted by policy makers to recognise the importance of natural resources in the production process (UNEP 2019). The original notion of the Blue Economy (BE) was to give emphasis to the somewhat neglected potential of the better management of maritime resources, especially those which surround mall remote islands (Cadogan 2016). A more radical meaning of the Blue Economy, advanced by Gunter Pauli of the Club of

R. Mohabeer (✉)
Indian Ocean Commission, Port Louis, Mauritius
e-mail: raj.mohabeer@coi-ioc.org

J. L. Roberts
Indian Ocean Commission, Ebène, Mauritius
e-mail: john.laing@hotmail.com

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_14

Rome, is to incorporate into the process of economic management, and development economics, the notion of Nature's process of re-using all waste: for Nature, unlike humans, consumes, and re-uses all waste, in a circular process of sustainable natural life (Pauli 2010).

This chapter is about how the Indian Ocean Commission (IOC) has been pursuing these dual notions of the Blue Economy with its regional partners presenting practical examples of action which may be of wider application in other regions of Small Islands Development States.

Integrating the concept of BE in development policies and strategies is still in its infancy in the Western Indian Ocean region. The Island and coastal States have taken initiatives to promote BE as an emerging economic sector, but without adequate attention to the social or equity aspects or the sustainability and eco-systems. This may be addressed if region, together with Development Assistance, provides the adequate instruments to address the lack of know-how, resources, and technology. Then the region can develop a clearer process at national and wider regional level for a strategy and practical plans for BE. The aims and objectives should guide the policies of the various ministries and departments as well as the private sector. This should be complemented by a coherent regional approach including all the Island and Coastal States which are connected by the same ocean as ensuring sustainable management of the ocean cannot be realised individually by one Island or Coastal State.

Having recognised the shortcomings of the traditional development strategies, several concepts have been promoted—Green Economy, Bio Economy, Blue Economy, Circular Economy, and so on. Each of the concepts has different assumptions and implies different means of implementation strategy, though all aim to reconcile economic, environmental, and social goals.

What has happened has been that the concepts have become blurred and policy makers have moved on with to a new buzzword without fully implementing the last. Momentum is lost as the various actors try to adopt the new front-runner guideline and confusion abounds.

It was nearly 50 years ago that the Meadows and Randers Jorgen published the death knell on then current forms of development (Meadows et al. 1972) in *Limits to Growth*, posing three key questions underpinning unsustainable development. They asked:

1. What will happen if the growth of the population remains unchecked?
2. What will be the environmental consequences if economic growth continues at its current pace?
3. What can be done to ensure a human economy that provides sufficiently for all and that also fits within the physical limits of the earth?

They also provided three comments on those questions for their analysis of the then current patterns of production, consumption, and population dynamics. Crucially, they asserted that 'If the present growth trends…continue unchanged, the limits to growth in the planet will be reached within the next 100 years' (that is by 2072). They then added some hope: 'It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future.' They optimistically added, 'If the world's people decide to strive for the second outcome, rather than the first, the sooner they begin working to attain it the greater will be their chances of success.'

It is nearly half a century since that challenge was published, as part of the work of the Club of Rome, yet there has been but modest change for the better in the attempts to avoid the global catastrophe despite the many conferences and treaties. We now see in the Indian Ocean region and its wider region fresh signs of climate change and increasingly recognise the need for a more comprehensive strategy and programme of action.

There have been concerted attempts at reducing air, water and land pollution, recycling systems, and limitation of population growth. But waste contuse to increase with development and pollution shows little sign of reduction in the region (see Figs. 14.1 and 14.2). So the region has been attracted to the reinterpretation of the BE on the lines promoted by Gunter Pauli (Pauli 2019).

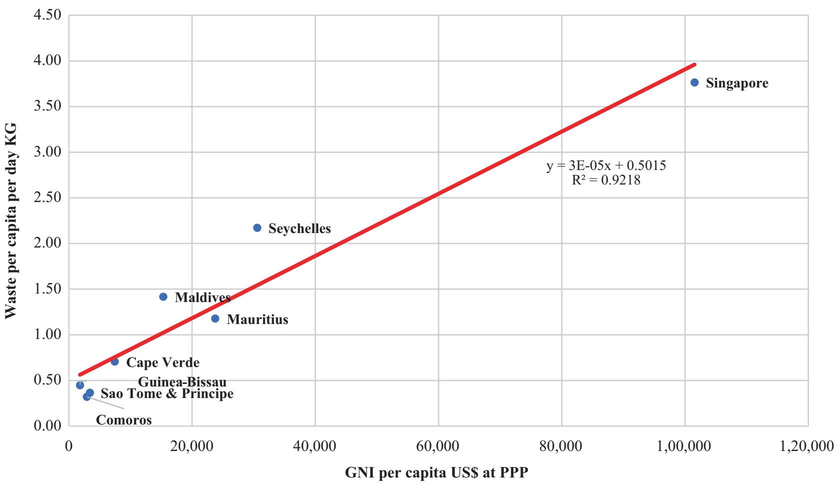


Fig. 14.1 Waste per capita per day and gross (GNI National Income) per capita (IOC Region). (Source: World Bank Database 2019)

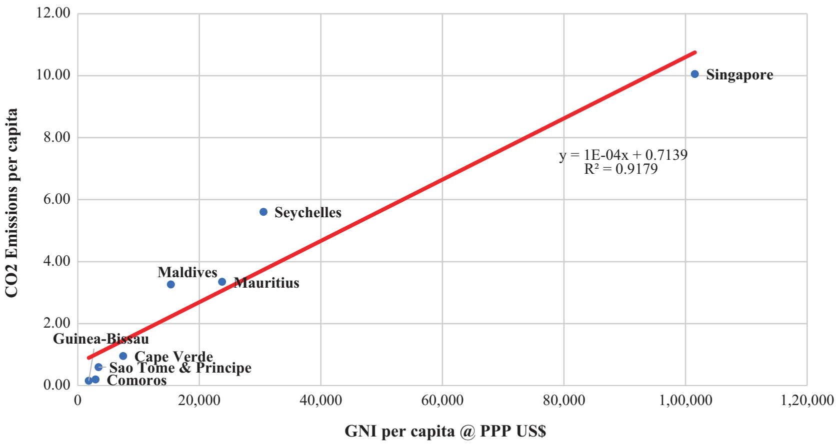


Fig. 14.2 GNI and CO_2 emissions (IOC Region). (Source: World Bank database 2019)

For there is an increasing realisation that we approach the crisis that Meadows and colleagues predicted. Moreover, the IOC accepts that poverty, famine, inequality, and environmental degradation can no longer be overcome by continued economic growth simply monitored by GDP. For this too often involves the loss of vital natural capital. Thus, the prospect of environmental collapse looms nearer and cohesive action must be advanced.

In 1992 the same authors of the *Limits to Growth* in the sequel *Beyond the Limits* gave further warnings that we were fast approaching global collapse, though a shift to sustainable ways was still technically and economically possible (Meadows et al. 1992); and they wrote. '*We think*, a better world is possible.' In the IOC region, in the past decade sustainability has been gaining general political interest amongst non-state actors, academia, NGOs and policy makers. In the next section we outline what steps are being taken in this region to avert the environmental crisis.

14.2 Action on the Blue Economy

The Blue Economy (BE) developments in the IOC and related regions have been stimulated by the BE concepts promoted by Gunter Pauli. In his writings, and through the movement he has sponsored, Gunter Pauli has set out the principles on which his concept of the BE rests (Pauli 2010, 2019). These can be summarised under the following key points:

- The BE is not simply an ocean-based economy, or the Green Economy applied to all resource development.
- It is the integration of ocean-based and land-based economies.
- It adopts Nature's efficiency of producing zero waste as the basis for human development.
- It uses waste from one process of production as a source of energy for another.
- It pursues social inclusiveness, self-sufficiency for all and equity, that are principles that will ensure more opportunity from one generation to the next embracing production and consumption.

These principles have been elaborated in a series of international meetings (Pauli 2016, 2019; UNEP 2016; Gredig 2019), covering Europe (European Commission 2012), the Pacific SIDS (Pauli 2017), the Indian Ocean Rim countries (Cadogan 2016) and the Seychelles (Roy 2019).

The concept of the Green Economy, with which Pauli was at first associated, in his time with the Club of Rome, includes renewable energy, green buildings, clean transportation, water management, waste management, and natural resource management. Pauli's BE concept, which emerged from viewing the planet earth from outer-space, where the picture is dominated by the blue of the oceans, integrates the process of circular production within all sectors, through innovative entrepreneurial initiatives, covering marine and coastal areas, sea-bed natural capital, aquaculture, and marine energy. This BE movement has been pursuing the ten-year goal of promoting 100 initiatives pursuing the best technologies inspired by nature, significantly affecting the global economy and generating 100 million jobs.

The bold international action plan led by Gunter Pauli has provided an underlying inspiration to the IOC endeavours, emerging from a series of Forums co-ordinated by the IOC and principally funded by the World Bank. These Forums bring together government, private sector leaders and NGOs, youth leaders, entrepreneurs, financial partners, and the media from across the wider region. The latest of these events was in December 2019, in Mauritius.[1] Key points emerging from the IOC December 2019 Forum are set out in Table 14.1, including the winners of the BE Awards.

With other regional partners,[2] with its members states[3] and through its extended links to the wider region, the IOC has for many years undertaken a substantial number of projects in the fields of sustainable development and ecological protection. This wider regional collaboration has

Table 14.1 Examples of Eco-Action from the IOC December 2019 Eco. Actions Forum

Location	*Comoros*	*Madagascar*	*Middle East*	*Comoros Cabo Verde Mauritius*	*Reunion*	*Cape-Verde*
Waste Material	Waste water from distillation of ylang	Organic waste	Scorpions' venom	Glass	Rubber tyres	Abandoned fishing nets in the sea
Method	Filtering	composting	Humane extraction	Grinding	Stripping, melting, solidifying	Grinding, heat,3- printing
New Products	non- toxic pesticide	Organic fertiliser	Pharmac-eutical	Building materials, glass sand for filtration	Building material surfaces (school playgrounds, parking walls, walk-ways, non-slip stairways and paths)	Sunglasses
Stage of development	Start-up	Start-up	Start-up	Start-up/ young enterprises	Start-up production	Start-up
Next steps	Seek financial and technical partners	Scaling up and expansion in other parts of the country	Seek financial partners for expansion	Expansion in other parts of the country	Finance and technical support for expansion and marketing	Seek additional finance and partners
Contribution to key concerns	Reduction of hazardous chemical pesticides	Diversion of waste from landfill	Creation of value from unused biological resource	Diversion of waste from landfill	Diversion of waste from landfill	Removal of fishing gear wastes (hazard for marine life) from marine environment
Women						
Youth						
Jobs	✓	✓	✓	✓	✓	✓
Recycling	✓			✓		
Ecological	✓	✓	✓			
Local Community		✓			✓	✓
Social benefits	✓	✓	✓	✓	✓	✓
Tourism		✓			✓	✓

Madagascar	*Madagascar*	*Cabo Verde*	*Cabo Verde Madagascar Mauritius*	*South Africa*	*Mauritius*	*Madagascar*
Crustacean waste	Algae	Wastewater	Plastic	Plastic	Agrowastes	Alien plant species
Enzymatic hydrolysis of shrimp carapace	Biopolymeri-sation	Filtration	Heat, remoulding	Pyrolysis	Fibre extraction and blending with other polymers	Drying and weaving
Biopolymer for heavy metal adsorption	Algoplastic	Water for irrigation	Tiles, other plastic items	Diesel oil Petrol oil Gas	Bio based composites for industrial application	Artisanal products
Innovative idea	Innovative idea	Grant received by government	Start up	New enterprise	Research	MSMEs
Finance and technical support for expansion and marketing	Finance and technical support for expansion and marketing	Expansion in all islands of CV	Scaling up	Scaling up and regional expansion	Seek finance and partners for industrial applications	Can be replicated where the alien plants are a threat
Add value to unused aquaculture waste. Help reduce heavy metal pollution of water	Reduction of plastic waste and making of biodegradable packaging	Addresses water scarcity issues	Reduction of plastic pollution	Reduction of plastic pollution	Create value from unused agricultural waste	Removal of invasive alien species
						✓
						✓
✓	✓	✓	✓	✓	✓	✓
			✓	✓	✓	✓
	✓	✓			✓	✓
✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓		✓

included working with the western African SIDS,[4] some of the member states of the Southern African Development Community (SADC)[5] and the Common Market of Eastern and Sothern Africa (COMESA).[6] The IOC also has close links through the African, Caribbean and Pacific (ACP) group of countries[7] and through some of the Indian Ocean Rim Association (IORA)[8] countries. Common features of these regional relationships include the pursuit of sustainable development, consolidation of unity, peace, and stability. As part of its role in regional co-ordination and action, the IOC and its partners have been giving an increasingly sharp focus to the BE. This has embraced more extensive and inclusive development of the marine resources of the islands and of the coastal countries of the regions, together with the promotion of the strategic theme of Nature's principle of zero waste, through an integrated process of circular ecological and human development.

14.2.1 The Potential for Africa

Just as the planet earth is dominated by the blue of its marine areas, lakes, and rivers, so Africa, which is commonly thought of as a vast land bound continent, is infused with blue. For 38 of the 54 African countries have coastlines, and the African lakes hold nearly 30 per cent of the world's total surface freshwater. More than 90 per cent of African trade is by water across its vast 13 million km^2 of exclusive marine areas. Eighty per cent of the ACP states have coastlines or are islands set amidst the largest oceans of the world.

Yet much of this potential of these dominantly blue assets, of these inter-related regions, remains underdeveloped. Traditional areas of activity have been fisheries, aquaculture, and tourism. These all require further investment through more and better seaports, navigable river courses, and maritime intra-regional connectivity systems. The IOC and its partners are now moving to provide a wider, more integrated and inclusive approach to promote and implement a blue and circular economy strategy. This in turn will press the present generation to accept to bear the cost of current unsustainable modes of living and not just pass on these costs to the next generation. It will also promote the achievement of zero waste, by reducing waste, recycling waste and re-using waste in new ways as inputs to new products. The production of compost from organic waste is a prime example of an age-old tradition that is now being adapted to the production of fresh goods from the discarded surplus of forms of consumption, such as old rubber tyres and empty glass bottles, to produce new forms of surface protection in infrastructure and new fabrics from plant waste.

14.2.2 Better Management

The maritime element of the strategy for a regionwide BE involves consolidating and better management of the traditional areas of maritime commerce, marine transport, and tourism. This will require new prospecting and co-ordinated management: it will also have integrated within it the theme of the circular economy and zero waste in all processes which can otherwise endanger vulnerable natural resources. The vital concept of intergenerational equity will be a core pursuit to ensure the externalities of current production are not passed on as an unsupportable burden to generations to come. Beyond marine commerce, transport, and tourism, there are the largely untapped fields of ocean-based renewable energy, exploration of offshore hydrocarbons, and seabed minerals. This will need to be fostered through fresh business start-ups and innovative inward investment. These fields all present challenges for ensuring that the flow of economic benefits is shared equitably across the wide region, whilst safeguarding the interests of our children and the ecological quality and sustainability of the natural resources of land and sea. In this context, we have a lot to learn from lessons from the fisheries sector, one of the oldest economic activities.

14.2.3 Capacity Building

The region increasingly recognises that certain essential elements for realising this strategy are in short supply, such as the lack of effective regionwide institutional framework for policy development, together with management, inadequate finance, and underdeveloped law to ensure that the fruits of development are shared with all the people. This is frustrating progress with the BE and the implementation of the circular economy principle. Yet the main gap is in the lack of a robust governance for shaping the future at both regional and local levels. Other vital resources are lacking. In particular R&D is in its infancy, as are the facilities for identification, adaptation, and transfer of relevant advanced technology in a digital age. This will require capacity building in a range of specialities not readily available throughout the wider IOC region and for which international market prices will have to be paid. Then there comes the continual task of sustaining these capacities against the unending pulls of the brain-drain from richer regions.

14.2.4 Promoting Intra-regional Trade and Co-operation

Much of the trade by the region in the past has been through direct international links with developed countries on other continents, Europe, Asia, Australia, the Americas. The region now needs to accelerate the growth of intraregional networks for trade and commerce and to build up south–south cooperation within the region, searching for the best solution to the common problems of island states to overcome their economic and environmental vulnerability. This will need new, more adventurous forms of private sector initiatives and more flexible and efficient public sector arrangements for doing business. That is essential for attracting and sustaining both investment and the necessary skills.

Undoubtedly implementing the strategy of a BE and nurturing the culture of circular production and consumption with zero waste are a complex and long-term process. This will require levels of co-ordination, the continual promotion of technical and regional trade initiatives, and fundamental reforms in banking and financial practices that will require both more regional cooperation and more fresh creativity than before.

14.2.5 A Coherent Programme for a Blue Economy

In the past the IOC, and its partners, have initiated change through a series of short-term projects[9] within tightly constrained logical frameworks. That may have suited the requirements of rigorous audit, but it can repress creativity and original thinking outside the box and fail to stimulate and support community initiatives more sensitive to local culture, with its own ecological and human needs and capacities.

The BE strategy will broadly link with the UN Sustainable Development Goals, targets and indicators, but will need to be selective and focused in its implementation, to ensure the pursuit of realistic targets suited to the wide range of the stages of economic and social development across the region (Roberts 2014).

The planning and management process will also need to be continually alert to the fiercely countervailing forces in the region. These have included armed robbery and piracy on the high seas; illegal, unreported and unregulated fishing (IUUF); armed trafficking in drugs and people; smuggling; illegal migration, maritime terrorism; systematic marine pollution and degradation through toxic waste and high risks of oil spillage; and corruption.

An initial key to the Blue Economy is maritime security and protection. Maritime natural resources have been taken for granted for too long: these constitute a prime example of the tragedy of the commons (Hardin 1968). As Hardin asserts: 'Maritime nations still respond automatically to the shibboleth of the "freedom of the seas." Professing to believe in the "inexhaustible resources of the oceans," they bring species after species of fish and whales closer to extinction.'

14.3 Achievements

BE cannot be achieved without addressing lawlessness and maritime crimes in the ocean. Combatting piracy on the high seas has been the focal point for international and regionwide review of better co-ordination and management of the maritime commons. Evaluation of costs and benefits of such complex action has proved problematic, but following concerted action, piracy itself has reduced over recent years (Macleod and Wardrup 2015). The Maritime Security programme (MASE) of the IOC and funded by the European Union has proved a starting point to a more collective approach to maritime crime. MASE, initially a response to the Ministerial Strategy and Action Plan adopted in 2010 in Mauritius, has reached an important landmark with the signature of two regional ministerial agreements in 2018, providing for the establishment of a modern maritime surveillance architecture covering 14 million km^2 of the Western Indian Ocean. The IOC starts a new complementary project in 2020 with EU funding to improving ports security and safety of navigation in the Eastern and Southern African and Western Indian Ocean region. The IOC has in parallel been working since 2016 through the Contact Group on Piracy off the Coast of Somalia (CGPCS) and now supports a greater international co-operation on maritime security.

14.3.1 Regional Sustainable Fishing

The IOC has promoted sustainable fishing with successive programmes for decades. Currently its ECOFISH Project funded by the EU and in the IOC region is being promoted through a long-term programme, the South West Indian Ocean Fisheries Governance and Shared Growth Project (SWIOFISH) principally funded through the Global Environment Fund of the World Bank, and the International Development Association adds to the already established Regional Fisheries Surveillance Plan. The overall aim of the initiative is to improve the economic, social and environmental benefits of households, by sustainable management of marine fisheries, and the reduced degradation of fish stocks. The double challenge henceforth is to ensure equitable benefits accruing to the population in the region and to get the main beneficiaries of fisheries to contribute to the surveillance mechanism.

14.3.2 Regional Partnerships

Progressing the BE through IOC leadership working with a wide range of regional and inter-regional partners is now gathering pace. Activities with the SIDS Youth AIMS Hub (SYAH), Entrepreneur Feminin Ocean Indien (EFOI), Jeunes Chambres International (JCI), and Synergie Jeunes, an association of young entrepreneurs of the Indian Ocean and the Union of Chambers of Commerce and Industry of the Indian Ocean (UCCIO), are proving fruitful in energising cooperation on BE action through the IOC member states, the Atlantic SIDS and the Maldives. Specific elements of this flowering programme funded by the World Bank include establishing national frameworks for promotion of circular economy, mobilising the youth, moving towards a regional ban on all plastic bottles, engaging the private sector in support for start-ups with youth and women's groups and promoting a Blue Championship for youth entrepreneurial achievement.

14.3.3 Three Pillars of Support

The IOC initiative aims at working through a structured approach for governance of its programmes depending on three pillars of endeavour. First comes investment in joint business and academic institutional research groups. The first pillar includes building up R&D, innovation and professional skills to aid technology adaptation and transfer to meet the differing island specificities. This in itself involves active networking to accelerate information exchange on best practices. This allows greater opportunities for sharing more equitably across the region the benefits arising from collaboration and the fresh investment attracted to the region. The regional support has a key role in ensuring that both investment and the yields from investment are widely shared between the centre and the periphery.

The second pillar of the initiative is cooperation itself. This is not easy across a widely dispersed region which lacks a natural centre. It is a regional concept that, unlike the Caribbean and the Pacific island regions, defies local geography and is replete with substantial variation in economic, social, and environmental development; has to overcome fundamental language, ethnic and cultural differences; and lacks a common history of the practice of coordinated dialogue and action. Yet at the heart of this drive for cooperation in the wider IOC region is the vigour of the devolved youth movement and the process of multisectoral involvement. This is then focused on the analysis of issues, the identification of ways forward, the promotion of trials to seek best practice, transfer of know-how and the broadcasting of these, adapted and suited to the local circumstances.

The third pillar of the initiative is to create greater awareness of the fundamental concepts of the blue and circular economy strategies and to create opportunities for involvement at local, national and regional levels. This has opened up fresh forms of activity with government, the private sector and NGOs working together.

14.4 Discussion

The BE concept has become an integral element in the IOC broader strategy for sustainable development but with a sharper focus on maritime development security and zero waste. Planning for sustainable development has to be ambitious in the light of the immense task entailed and the predicted short timescale before catastrophic global collapse, if we were just to continue with business as usual. For island states, this timescale for adjustment of development within sustainable limits is probably shorter. We could even hit the limits of sustainable existence within just one generation. Our faltering pace of adjustment has yet to show we are on the right track and even at the right speed. The initiatives promoted by Gunter Pauli and those by the Commonwealth Secretariat in the Seychelles, however, do give some hope of a way out for small states and islands (Barbe 2018).

Yet, in the South West Indian Ocean as a whole, working closely with neighbouring regions, concerted efforts are being made, with the IOC in a lead role, to provide more cohesive strategic coordination to national and international initiatives in the vital area, for islands, and coastal countries, of maritime security and marine sustainable development. The Seychelles have made a remarkable start (Barbe 2018; Roy 2019).

But the wider IOC region is not homogeneous. The countries vary greatly in terms of their stages of development. Table 14.2 below shows eight of the IOC region countries against nine development indicators.

Table 14.2 The Dilemmas of Development in a Divided Region: Indian Ocean and East Atlantic SIDS

	Human Development Index	*GNI/ Capita*	*Ease of Doing Business Rank*	*Infant Mortality Ratio*	*Years of Schooling Mean*	*Forest Cover*	*National Poverty*	*CO2*	*Total waste*
		US$					*Level*	*Emissions*	*metric tonnes*
						Percent Land	*Percent Popn*	*tonnes/ capita*	*per capita/day*
Class A High human development: heavy waste and pollution									
Singapore	0.935	101,532	2	2.2	16.3	23.1	0	10.05	3.76
Seychelles	0.801	30,557	100	12.2	15.5	88.4	39	5.61	2.17
Mauritius	0.795	23,751	13	11.6	15	19	8	3.35	1.18
Median values	0.801	30,557	13	12.2	15.5	23.1	8	5.61	2.17
Class B Medium human development: low waste and pollution									
Maldives	0.719	15,307	147	6.8	12.1	3.3	8	3.26	1.42
Cape Verde	0.651	7,454	137	15	11.9	22.5	35	0.96	0.71
Sao Tome & Principe	0.609	3,419	170	25.2	12.7	55.8	66	0.6	0.37
Median Values	0.651	7,454	137	15	11.9	22.5	35	0.96	0.71
Class C: Low human development: Sustainable waste and pollution									
Comoros	0.538	2,913	180	52.2	11.2	19.7	42	0.2	0.32
Guinea-Bissau	0.461	1,799	174	55.6	10.5	69.8	69	0.15	0.45
Median Values	0.499	2,356	177	53.9	10.85	44.75	55.5	0.175	0.385

https://datacatalog.worldbank.org/dataset/what-waste-global-database

Data on waste for Seychelles: http://www.meecc.gov.sc/index.php/what-we-do/waste-management/

These data show that the countries fall into three consistent groups across the nine indicators. Figure 14.1 shows that the pattern across these indicators supports the view that economic and social development brings with it increasing waste and pollution—with a rising trend of waste with income across the region.

Waste management in SIDS, which has been reviewed in detail by a research team from the University of Mauritius, has been, in the past, mostly poorly managed (Mohee et al. 2015) but rates of recycling and composting are improving gradually in SIDS and small states, with Singapore leading the way with 61 per cent of solid waste recycled. This is now being matched or approached by other small states such as Luxembourg 83 per cent, Ireland 50 per cent, Iceland 50 per cent, and Estonia 30 per cent (OECD Indicators 2019). The IOC BE strategy aims to harness the scattered initiatives that are being taken across this divided region and to shape them together at a faster rate for a better future for SIDS, before it is too late.

14.5 Conclusion

This chapter sets out the initiatives being taken in the South West Indian Ocean and related regions in the pursuit of Blue and Circular Economy, in the sustainable development of island economic, social, and ecological life.

It has been the fate of many small remote islands to have been late in realising the fruits of the agricultural revolution. They have been late in engaging in the industrial revolution, sacrificing many of their pristine natural resources in their efforts, and losing or endangering too many of their endemic species in the process of urbanisation. Some have ended up with widescale loss of their forest and natural habitat and a heavier and more harmful ecological footprint. Many are now competing to make bolder strides in the IT revolution vying for progress with 'smart cities', producing an urban sprawl, with built-up areas from shore to shore,

To what end is this pell-mell rush for higher GDP per capita? The IOC in its proposed BE strategy is marking out an alternative pathway which, in line with the Gunter Pauli movement, contributes towards a better tomorrow. There is little time to lose to save many small island states from self-destruction. Success will depend on the continuation of the IOC Blue Economy programme with sustained local, regional, and international support.

Notes

1. IOC Eco-actions Forum 9–11 December 2019: Available at website: https://www.commissionoceanindien.org/portfolio-items/eco-actions/###
2. IOC partners include The European Union, French Development Agency, World Bank, African Development Bank, the Commonwealth Secretariat and the Francophonie.
3. The five IOC member states are The Union of the Comoros, Reunion island (an overseas Department of France), Madagascar, Mauritius and the Seychelles: which together have a population of 27 million, 5.5 million km^2 exclusive marine economic zone and have benefitted from €254 million since the inauguration of the IOC in 1984.
4. The three west African SIDS are Cape Verde, the archipelago of Guinea-Bissau, and Sao Tome and Principe.
5. The 14 member states of SADC are Angola, Botswana, Congo (DR), Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Seychelles is ratifying its membership.
6. The 19 member states of COMESA are Burundi, the Comoros, the Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Sudan, Swaziland, the Seychelles, Uganda, Zambia and Zimbabwe.
7. The 79 ACP countries are Angola, Antigua and Barbuda, Belize, Cape Verde, Comoros, Bahamas, Barbados, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo (Brazzaville), Congo (Kinshasa), Cook Islands, Cote d'Ivoire, Cuba, Djibouti, Dominica, Dominican Republic, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Grenada, Republic of Guinea, Guinea-Bissau, Equatorial Guinea, Guyana, Haiti, Jamaica, Kenya, Kiribati, Lesotho, Liberia, Madagascar, Malawi, Mali, Marshall Islands, Mauritania, Mauritius, Micronesia, Mozambique, Namibia, Nauru, Niger, Nigeria, Niue, Palau, Papua New Guinea, Rwanda, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Solomon Islands, Samoa, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Suriname, Swaziland, Tanzania, Timor Leste, Togo, Tonga, Trinidad and Tobago, Tuvalu, Uganda, Vanuatu, Zambia, and Zimbabwe.
8. The 22 IORA countries are Australia, Bangladesh, the Comoros, India, Indonesia, Islamic Republic of Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Sultanate of Oman, the Seychelles, Singapore, Somalia, South Africa, Sri Lanka, Tanzania, Thailand, the United Arab Emirates, and Yemen.

   The IORA has nine dialogue partners: China, Egypt, France, Germany, Japan, Turkey, the Republic of Korea, the United Kingdom and the United States of America.

9. Projects within the IOC have included OILSPILL Pollution (1996–2000); Tuna Tagging (2001–5) ISLANDS (2010–17); ARPEGE (Schools' Environmental education); GDZCOI (Integrated Coastal Zone management) (2013–17); SMARTFISH (2012–18); Marine Highway and pollution from oil-spill (2007–12).

References

Barbe, C. (2018). *The Seychelles Blue Economy. A Pathway for Prosperity*. Clifton Hill: Available at: https://slideplayer.com/slide/14296172/. Accessed 1 Nov 2019.

Cadogan, R. (2016). *Seychelles Blue Economy Roadmap and Implementation*. Commonwealth Secretariat. Available at: https://thecommonwealth.org/project/seychelles-blue-economy-strategic-roadmap-and-implementation. Accessed 15 Nov 2019.

European Commission. (2012). *Switched Programme, Switching Towards more Sustainable Consumption and Production (SCP) Patterns in the Mediterranean*. Available at website: https://ec.europa.eu/environment/marine/pdf/SWITCH-MED_project.pdf. Accessed 15 Nov 2019.

Gredig, U. (2019). *Interview with Gunter Pauli at the Zermatt Summit on the Blue Economy*. Available at: https://www.youtube.com/watch?v=fpIpYoM6qCE. Accessed 15 Nov 2019.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, *162*, 1243–1248. Available at . https://science.sciencemag.org/content/162/3859/1243. Accessed 4 Dec 2019.

https://www.orfonline.org/research/blue-economy-in-the-indian-ocean-governance-perspectives-for-sustainable-development-in-the-region-47449/. Accessed 15 Nov 2019.

Macleod, M., & Wardrup, W. M. (2015). Operational Analysis at Combined Maritime Forces. In *32nd International Symposium of Military Operational Research*. HMSO. Available at: http://www.lessonsfrompiracy.net/files/2015/12/32ismor_macleod_wardrop_paper.pdf. Accessed 4 Dec 2019.

Meadows, D. H., Meadows, D., & Randers, J. (1972). In Universe Books (Ed.), *The Limits to Growth*. New York.

Meadows, D. H., Meadows, D., & Randers, J. (1992). *Beyond the Limits, Global Collapse of a Sustainable Future*. London: Earthscan.

Mohee, R., Mauthoor, S., Bunchoo, Z.M., Somargoo, G., Soubhany, N. and Gunasee, S. (2015, September). Current Status of Solid Waste Management in Small Island Developing States: A Review. *Waste Management*, *43*, 539–49, Elsevier. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26116009. Accessed 27 Dec 39):

OECD (2019/2015). Municipal Waste. *OECD Environment Statistics (Database)*. https://doi.org/10.1787/data-00601-en. Accessed 27 Dec 2019.

Pauli, G. (2010). *The Blue Economy: Towards a Culturally Rich and Sustainable Society with Economic Growth*. Scribed Inc. Available at: https://www.scribd.com/doc/31043198/Gunter-Pauli-The-Blue-Economy. Accessed 15 Nov 2019.

Pauli, G. (2016). *Action Plan*. Available at: https://planbleu.org/sites/default/files/upload/files/Scoping_Study_Blue_Economy.pdf. Accessed 15 Nov 2019.

Pauli, G. (2017). *Self-Funded Events for Small Islands*. Available at: http://pacificidf.org/wp-content/uploads/2017/08/SELF-FUNDED-INNOVATIONS-FOR-SMALL-ISLAND-COUNTRIES.jpg

Pauli, G. (2019). *Principles of the Blue Economy*. Available at: https://www.google.com/search?q=blue+economy+principles&sa=X&rlz=1C1AWFC_enGB857GB857&tbm=isch&source=iu&ictx=1&fir=4FzyVT2ydPRaT-M%253A%252CepLsyvBfo-vE7M%252C_&vet=1&usg=AI4_-kQ2ef9PqS66FgGADxJuOGgOHRM-Ng&ved=2ahUKEwjE8Mqs9-HlAhVBxYUKHekLA0MQ9QEwAHoECAUQAw&biw=102. Accessed 11 Nov 2019.

Roberts, J. L. (2014). *The Divided Region, Progressing RIO+20 Outcomes in the AIMS Region*. Indian Ocean Commission.

Roy, A. (2019). *Blue Economy in the Indian Ocean: Governance Perspectives for Sustainable Development in the Region*. Observer Research Foundation (ORF) Occasional Paper. Available at: UN (2019) SDG Database. https://unstats.un.org/sdgs/indicators/database/. Accessed 4 Dec 2019.

UNEP. (2016). *Blue Economy Project, Scoping Study*. UNEP. Available at : https://planbleu.org/sites/default/files/upload/files/Scoping_Study_Blue_Economy.pdf. Accessed 15 Nov 2019.

UNEP. (2019). *Why Does the Green Economy Matter?* Kenya: United Nations Environment Programme. Available at: https://www.unenvironment.org/explore-topics/green-economy/why-does-green-economy-matter.

CHAPTER 15

Assessing the Progress of Environmental Governance in Small Island Economies

John Laing Roberts

15.1 Introduction

Recent scientific concern at the evident acceleration of climate change, and the breakdown of the global consensus on reducing greenhouse gases, comes at a time when accurate monitoring of environmental governance is all the more vital. The notion of the critical environmental and climatic impact of humankind has been proposed as one of the formally accepted geological era of planet earth, as global warming could be running out of control (Stephen et al. 2011) and the planet now moving beyond the previously predicted limits of sustainable growth, heading towards global collapse (Meadows et al. 1992). Moreover, recent studies of the impact of the increasing trend in the frequency and intensity of extreme natural climatic events have shown critical flaws in the quality of assessment of their human, economic and environmental damage (Roberts and Bonne 2019). In small island states, these effects can cause long-term devastation, arising from their economic and environmental vulnerability and their limited capacity for resilience. Better environmental monitoring is crucial for designing strategic adaptation to climate change and disaster risk

J. L. Roberts (✉)
Indian Ocean Commission, Ebène, Mauritius
e-mail: john.laing@hotmail.com

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_15

reduction in this new geological era that has been designated the Anthropocene[1] (Scobie 2019). But current official methods of monitoring progress in governance are both flawed and poorly reported, leading to an urgent need for simpler alternative reliable measurements.

15.2 The Mirage of Official Measures

It is apparent from United Nations (UN) reports (UN 2017; UN 2019a) that the natural environment is fast declining and mitigating action is too slow.[2] Poverty, hunger and illiteracy remain too high. Conflict, natural disasters and discrimination increase the burden of these global problems.

Despite these sweeping conclusions, the UNEP has reported that the Sustainable Development Goal (SDG) system lacks data on 68 per cent of the SDG indicators (Campbell 2019). This is at least an advance on previous years when there was a lack of data on 80 per cent of the SDG indicators (Roberts 2018). Where data are available, the UNEP has found that 'the world is only on track to meet 22 per cent of the environment-related SDGs' (Campbell 2019). In the UNEP Global Environmental Outlook report 2019 (UNEP 2019), the shift to the SDG system has clearly presented enormous problems for countries. The UNEP 2019 report states, '*the data requirements for the SDG indicators are almost as unprecedented as the SDGs themselves*'. As highlighted in the United Nations 2019 report on the SDGs, tracking their progress will require a shift in how data are collected, processed, analysed and disseminated, including a move to using data from new, diverse and innovative sources (UN 2019a). Yet, however innovative the sources are, they cannot substitute for country sources where measurements are made directly from prime data.

In the Asia and Pacific region of the UN, a report has shown that on the 62 SDG indicators on the environment there are sufficient data on only 31 per cent of indictors and no data on 58 per cent (UNESCAP 2019).

This is evidently a serious and fundamental problem with the SDG data system which has been clearly overambitious especially for small states. The SDG database on small states is a mirage for those seeking substance for reliable comparative analysis. The former more compact MDG system had its problems, but was not so heavily overwhelmed by missing data. One comparative study after ten years of reporting on MDGs showed 40 per cent missing data overall and 44 per cent for small states (Roberts and Ibitoye 2012). This comparative study showed the variation between reporting levels for different MDGs was 71 per cent missing for small states on Poverty MDG 1; and 1 per cent missing for small states on Child Health MDG 4; on MDG 7, Ensure Environmental Sustainability, there was 34 per cent missing data for small states.

To overcome the missing data problem with SDGs, the UN Statistics Division inserts estimated values, which can be misleading in assessing real trends and confusing when the estimates are examined against local specialist studies.

Small island developing states (SIDS) and other small states are amongst the most economically and environmentally vulnerable countries in the world. It is therefore vital that accurate and timely data are available for them to assess the progress they are making on sustainable development and on environmental management. An assessment of data availability for the principal environmental SDG indicators for the 12 micro-SIDS[3] and for other island states where data exist is examined next.

15.3 Performance of SIDS on Environmental Governance

The Sustainable Development Goals, Targets and Indicators have been approved by the members states of the United Nations (UN) as the official system for monitoring progress and are now supposed to be fully operational (UN 2019b). Sadly, there are many gaps and flaws in the reporting and presentation, especially for small states.

SDG indicator 1.1.4 purports to present a measure of country performance on the provision of safe water; it is however a near duplicate of SDG indicator 6.1.1. The former refers to people using basic drinking water services; the latter to people using safely managed drinking water. On the UN SDG database, all 12 of the micro-states examined have data for SDG 1.4.1 all presented to at least 2 decimal places. Yet all are designated as estimates. For Tuvalu, the smallest of the micro-states examined with a population of just 12,000, the reported estimated percentage values for SDG 1.4.1 are, for all areas, urban and rural combined, in the year 2001, 97.89143 (up to five decimal places!), and for the year 2017, 99.27. That looks like celebratory success.

Alternative sources of information for Tuvalu however show a quite different picture. For example, an expert report on water resources and management on Tuvalu, based on field studies, found that the majority of houses on Tuvalu use water wells, some not protected from contamination and pollution from adjacent pit latrines and septic tanks. The water quality is often poor and ground water is both contaminated and infused with sea water. The country consists of nine low-lying atolls, the highest being five metres above sea level providing problems in finding ground water clear from sea water intrusion. Where rainwater harvesting from roofs is carried out, systems need repair, water quality lacks monitoring and training is needed on the correct construction of systems and their maintenance for safe drinking water. Water-borne disease is common from contaminated drinking water with only limited supplies of imported bottled water (Talima and Tausia 2007; Pacific Community 2017).

By cross checking in the UN SDG database against the near duplicate SDG 6.1.1, for water provision, values are given for Tuvalu, each year, from 2001 to 2017 (UN 2019b). These percentage values for the population with safely managed drinking water range from 49.16 for the year 2001 to 49.79 for 2017. All values are stated as estimates, not country reported data. But the values differ substantially from both those provided in SDG 1.4.1 and from the local field study reports, which show lack of a water management system up to 2017, together with prevalent risks of pollution and sea water intrusion in well water and the lack of hygiene in rainwater harvesting methods.

The discrepancy between the local field work reports and the UN estimated values for availability of safe water in Tuvalu undermines confidence in the UN database and its use of estimated values.

SDG 1.5.3 and SDG 13.1.2 both list countries that have undertaken the adoption and implementation of national disaster risk reduction (DRR) strategies in line with the Sendai Framework. There are no data in the UN database on these two indicators for any of the 12 micro-states under review, though there are in some cases data on the impact of disasters, noted as being subject to a further validation process, for 6 of the 12 micro-states under review (UN 2019a).

On SDG 15.1.1, forest cover as a proportion of land area, there are values covering all the 12 micro-states, but for only 4 of these[4] are for data from country sources, the rest are FAO estimates. Only one of these countries reports an increase in forest cover, Palau, where the forest cover increased from 86.01587 (sic) per cent in the year 2000 to 86.6152 per cent in 2005 and reported the same level in 2010 and 2001, an increase confirmed in reports (Mongabay 2010), though noting that further coordinated management of forests and biodiversity in Palau is called for, to counteract the adverse environmental impact of urban development (Kitalong 2008).

On SDG 8.4.1, the material footprint per capita, there are no data reported for the 12 micro-states considered here. So, it is necessary to look elsewhere for data on the impact of development on ecology in small states. The Global Footprint Network publishes current data on the ecological footprint[5] (EF) for many countries including 11 Island states (Global Footprint Network 2019). Figure 15.1 presents an analysis of the ecological footprint per capita (EFC), for these island states, together with data for these same states for the UNDP Human Development Index (HDI)[6] (UNDP 2018, 2019). This shows that the ecological footprint per capita is higher in those countries with higher HDI values.

For example, those island countries with an HDI value below 0.7, such as Haiti, Comoros and Vanuatu, have EFC values below 2.0 hectares and an HDI of less than 0.8, which have together been considered the target

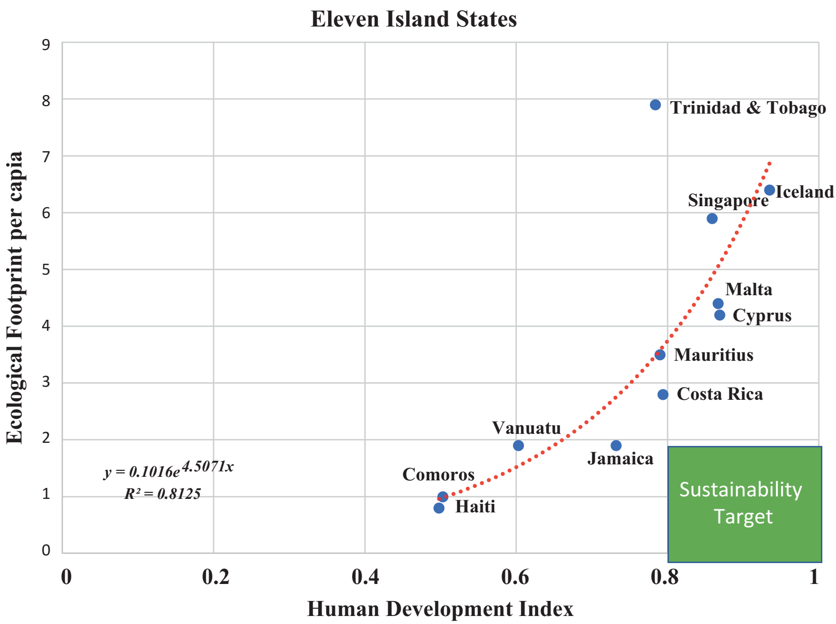


Fig. 15.1 Ecological footprints and Human Development Index. (Sources: Global Footprint Network 2019; UNDP 2019)

for sustainability by UNEP (UNEP 2019). Whilst those with the highest levels of HDI, Iceland, Singapore and Trinidad and Tobago, also have elevated levels of EFC more than twice that of the islands with the lower levels of HDI.

In seeking pathways for their future development, the countries with a lower HDI should seek a strategy which avoids further increases in EFC. Those countries with high HDI and already high levels of EFC should seek to stabilise their HDI whilst finding ways to reduce their adverse impact on their ecology. It is not evident this is happening.[7]

A further analysis using EF for island states[8] examines the influence of population growth on total country ecological footprint (Table 15.1), since the use of EFC conceals the large variation in population size and population growth even within these island states. For this purpose, total EF for each country was calculated using total population data and the EFC. Then keeping EFC constant, and using the mean annual rate of

Table 15.1 Ecological footprint in selected island states

Selected island states	*Population (million)*	*Mean population growth rate, 2000–2018 (per cent per year)*	*Ecological footprint per head, 2016 (hectare)*	*Projected population, 2030 (million)*	*Calculated total ecological footprint, 2019 (million hectare)*	*Calculated ecological footprint, 2030 (million hectare)*
Vanuatu	0.3	2.0	1.9	0.38	0.58	0.72
Iceland	0.4	1.3	6.4	0.40	2.59	2.99
Malta	0.5	1.2	4.4	0.58	2.23	2.54
Comoros	0.8	2.4	1.0	1.06	0.82	1.06
Cyprus	1.2	1.3	4.2	1.40	5.11	5.88
Mauritius	1.3	0.4	3.5	1.36	4.57	4.77
Trinidad and Tobago	1.4	0.5	7.9	1.49	11.12	11.54
Jamaica	2.9	0.6	1.9	3.12	5.54	5.92
Costa Rica	5.0	1.3	2.8	5.81	14.18	16.35
Singapore	5.6	1.9	5.9	7.02	33.67	41.41
Haiti	11.1	1.5	0.8	13.27	9.01	10.62
Total	30.5			35.98	80.42	104.18

Sources: Global Footprint Network (2019); World Bank (2019) population growth for each country for the period 2000–2018, a projection was calculated for each country for the population for the year 2030 and the total EF for that date.

The results are shown in Table 15.1. They show that, for the countries with small populations, their projected population size by 2030 has little impact on their projected total ecological footprint. Even for Trinidad and Tobago, with a high EFC of 7.9 hectares, the total projected ecological footprint for the country remains low, due to a small total population and a modest population growth rate.

Moreover, whilst the island state of Haiti has a large population (11.1 million), it has a low EFC (0.8 hectares per capita), which, with its modest mean annual population growth rate of 1.5 per cent, provides a projection by 2030 of an increased national EF of 244,000 hectares. This compares with an increase of 7.7 million hectares in the total EF of Singapore over the period to 2030 (see Table 15.1).

The use of population growth projections serves to emphasise the continuing importance of projected demographic change in the assessment of environmental governance, harking back to the concerns of the Meadows report (Meadows et al. 1992) nearly three decades ago. Thus, population growth remains a key factor in ecological impact and in environmental management, though demography as a whole plays a modest role in the SDGs.

By contrast for 20 years the Yale Centre for Environmental Law and Policy has been publishing data and analysis of country performance on environmental management and ecosystem vitality. The latest covers 180 countries including 28 island states (Yale Centre for Environmental Law and Policy 2019). The 24 performance indicators used cover 10 category issues including air, water and sanitation, agriculture, energy, forests, fisheries, biodiversity and habitat. Countries are ranked on current and past performances and separate country profiles are provided showing the assessments across the range of indicators. A supplementary technical analysis is available (Wendling et al. 2018). This provides details of the methodology adopted for computing the indices and the sources of data used. Missing data are noted and for some indicators were a substantial problem especially for small and island states. For example, on the indicators for wastewater treatment there were 60 of the 180 countries with missing data, including 14 of the 28 island states in the 2018 report. On Sustainable Nitrogen management there were 100 countries with missing data including 21 of the island states. The report provides baseline and current data for assessment of temporal change. With problems of available data for certain years, the baselines for countries range from 2000 to 2008; the current data range from 2010 to 2017. The latest report is a considerable improvement on earlier versions (Roberts 2006).

The report is a major contribution to the assessment of environmental management in island states, which rather overshadows that available through the UN report on SDGs. The current Environmental Performance Index (EPI) rankings for island states range from Malta ranked as 4th best[9] of the 180 countries and Haiti ranked as 174th. Using country profiles, it is possible to identify the environmental areas in which countries have made progress and those in which their poor rankings warrant further action.

Neither the SDG system nor the EPI analysis offer economic models for action to reduce vulnerability and increase resilience. Investment requirements will vary according to the stage of economic and social development of the countries themselves and the political perception of their relative priorities, the marginal cost of improvements in moving towards targets, the cost-effectiveness of measures, the extent of insurance protection against natural disasters, and the availability of the critical resources and skills for analysis and action.

The available comparative data are improving, but slowly. Major gaps in data are a challenge to analysis and a potential trap for the unwary where these gaps have been filled by fake data, based on estimates of convoluted means, and modelled and imputed entries to evade the absence of hard prime data. More thought needs to be given to small states for a sharper focus on the data critical to decision making and related to the essential interests of each country within a global context.

15.4 Conclusions

Small states, especially micro-SIDS, have limited capacity for data collection and analysis. It therefore is more rational for them to keep to a small discrete set of indicators for tracking environmental governance and their performance on containing development within ecological limits.

For decisions on macro-economic performance, policy makers make do with a handful of indicators of the economic fundamentals, such as GDP, unemployment, balance of trade, consumer prices and currency comparative value. It would be helpful for policy makers in small states to give priority to just the few SDG indicators that would be most cost-effective in guiding their decisions on sustainable development. With 68 per cent of data on SDGs missing overall, and the tables on small states being a concoction of estimates, modelled values and missing data, it is little wonder that small states are even further behind with huge gaps remaining and unlikely to be filled with country collected values.

The present SDG system for SIDS and other small states is just too unwieldy for the purpose and therefore largely lacks the potential bonus SDGs for comparative analysis to plot their own pathway. Data outside the SDG system, on the ecological footprint and the Human Development Index of UNDP, however do throw some illumination on the pattern of development and its ecological impact (see Fig. 15.1). Close examination of the UN SDG reports themselves and the database on which they depend reveals that there is much subterfuge in compiling the official reports by trying to make up for lack of data from the countries by inserting estimates of what the real data might be together with manipulated or modelled data. The Yale Environmental Performance Index (Yale Centre for Environmental Law and Policy 2019) provides a major contribution to assessment of environmental management, with substantial coverage of island states, yet even this service suffers from gaps in data. And there can be no substitute for the real data and no amount of statistical wizardry can paper over the gaps.

Short of the wildly ambitious SDG system, rife with non-compliance, being officially abandoned, small states should focus on data on vital elements that relate to policy making and can be realistically collected and reported. Some such data exist at present outside the SDG system. These items include the Human Development Index and the Global Footprint Network Index. Others where compliance seems manageable for small states include the Red Index of threatened species (IUCN 2019) and the Yale Environmental Performance Index.

It is clear from the limited data available that some of the most vulnerable small island states are on an unsustainable pathway of development and urgent action is needed to correct their course and to avoid other less developed small states from following them towards irreversible environmental degradation. But the current SDG system provides little help for reliable comparative analysis or pointers for policy development.

Notes

1. Most scientists agree that humans have had a hand in warming Earth's climate since the industrial revolution—some even argue that we are living in a new geological era, dubbed the Anthropocene (Waters et al. 2016; Stephen et al. 2011).
2. The UN Sustainable Development Goals report (UN 2019a) specifies the decline in great detail. Climate change and other factors are threatening many animal and plant species with extinction. Poverty levels remain high. Conflict, natural disasters and discrimination exacerbate the crisis.
3. Antigua and Barbuda, Dominica, Grenada, Kiribati, Marshall Islands, Nauru, Palau, St Kitts and Nevis, St Vincent and the Grenadines, Seychelles, Tonga, and Tuvalu. All countries each with a population of less than 110,000.
4. Palau, Seychelles., St Kitts and Nevis, and Tonga provided country data on forest cover.
5. On the demand side, the Ecological Footprint measures the ecological assets that a given population requires to produce the natural resources it consumes (including plant-based food and fibre products, livestock and fish products, timber and other forest products, space for urban infrastructure) and to absorb its waste, especially carbon emissions. The Ecological Footprint tracks the use of six categories of productive surface areas: cropland, grazing land, fishing grounds, built-up land, forest area and carbon demand on land (Global Footprint Network 2019; Lin et al. 2019).
6. The Human Development Index (HDI) calculated by the UNDP is a composite index embracing life expectation, education and GDP.
7. The possibility of EFC affecting life expectancy cannot be ruled out in this simple cross-sectional analysis. For HDI includes life expectancy. Further time series analysis of individual countries would be worthwhile if such data were to exist. Meanwhile the precautionary principle seems warranted of seeking to reduce EFC for countries with HDI equal or above 0.8 and for those with HDI < 0.8 to maintain EFC within 2.0 hectares.
8. The 11 island states for this analysis of projected population growth and projected total country EF are: Comoros, Costa Rica, Cyprus, Haiti, Iceland, Jamaica, Malta, Mauritius, Singapore, Trinidad and Tobago, and Vanuatu.
9. The high ranking for Malta is somewhat paradoxical as it has just 1.1 per cent of its land area with forest cover (World Bank 2016) and its ecological footprint per capita is twice as high as the recommended UNEP level for sustainability (see Fig. 15.1).

References

Campbell, J. (2019). *We Lack Data for 68% of SDG Indicators.* UNEP. Available at website: https://un-spbf.org/editorial/we-lack-data-for-68-of-sdg-indicators-closing-data-gaps-essential-to-achieving-sdgs/. Accessed 18 Nov 2019.

Global Footprint Network. (2019). *Advancing the Science of Sustainability*. Oakland, CA and Geneva. Available at website: https://www.footprintnetwork.org/. Accessed 25 Nov 2019.

IUCN. (2019). *Red List Index*. Available at website: https://www.iucnredlist.org/assessment/red-list-index; https://www.iucnredlist.org/resources/summary-statistics#Summary%20Tables.

Kitalong, A. H. (2008). Forests of Palau: A Long Term Perspective. *Micron, 40*(1/2), 9–31. Available at: https://www.researchgate.net/publication/253041195_Forests_of_Palau_A_long_term_perspective. Accessed 25 Nov 2019.

Lin, D., Hanscom, L., Murthy, A., Galli, A., Evans, M., Neill, E., Mancini, M. S., Martindill, J., Medouar, F., Huang, S., & Wackernagel, M. (2019). *Ecological Footprint Accounting for Countries: Updates and Results of the National Footprint Accounts, 2012–2018*. Global Footprint Network. Available at: https://www.mdpi.com/2079-9276/7/3/58. Accessed 25 Nov 2019.

Meadows, D. H., Meadows, D., & Randers, J. (1992). *Beyond the Limits, Global Collapse of a Sustainable Future*. London: Earthscan.

Mongabay. (2010). *Palau Forest Information and Data*. Mongabay. Available at website: https://rainforests.mongabay.com/deforestation/2000/Palau.htm. Accessed 20 Nov 2019.

Pacific Community Partnership. (2017). *Water and Sanitation Program*. Geoscience Division. Available at website: http://www.pacificwater.org/pages.cfm/country-information/tuvalu.html. Accessed 19 Nov 2019.

Roberts, J. L. (2006). Building Resilience Through Better Environmental Management in Small Island States: Experience From the AIMS Small Island States. In L. Briguglio, G. Cordina, & E. Kisanga (Eds.), *Building The Economic Resilience of Small States*. London: Islands and Small States Institute of Malta, Malta and the Commonwealth Secretariat. Chapter 12.

Roberts, J. L. (2018). Small Island Developing States and Sustainable Development Goals: Curse or Cure? In L. Briguglio (Ed.), *Handbook of Small States* (pp. 517–529). London/New York: Routledge.

Roberts, J. L., & Ibitoye, I. (2012). *The Big Divide, A Ten-Year Report of Small Island Developing States and the Millennium Development Goals*. London: Commonwealth Secretariat.

Roberts, J. L., & Bonne, G. (2019). Fresh Lessons in Preparedness for Disasters, Chapter 9. In: W. Khonje & T. Mitchell (Eds.), *Strengthening Resilience in Small States, Commonwealth Secretariat*. Available at: https://books.thecommonwealth.org/strengthening-disaster-resilience-small-states-paperback. Also available as an E.book. Accessed 6 July 2020.

Scobie, M. (2019). *Environmental Governance and Small States*. New Horizons in Environmental Politics, Edward Elgar Publications. Available at website: https://www.e-elgar.com/shop/global-environmental-governance-and-small-states

Stephen, W., Greenwald, J., Crutzen, P., & McNeil, J. (2011). The Anthropocene Conceptual and Historical Perspective. *Philosophical Transactions of the Royal Society, A, Mathematical, Physical and Engineering Sciences*. Available at website: https://www.scirp.org/(S(lz5mqp453edsnp55rrgjct55))/reference/ReferencesPapers.aspx?ReferenceID=2087423. Accessed 29 Nov 2019.

Talima, F., & Tausia, L. (2007). *National Integrated Water Resource Management Diagnostic Report*. Tuvalu, SOPAC, UNEP, GEF. Available at website: http://www.pacificwater.org/userfiles/file/GEF%20IWRM%20Final%20Docs/SOPAC%20Diagnostic%20Report%20Tuvalu%2022_10_07.pdf. Accessed 19 Nov 2019.

UN. (2017). *Sustainable Development Goals Report*, UN, New York. Available at website: https://unstats.un.org/sdgs/files/report/2017/thesustainabledevelopmentgoalsreport2017.pdf. Accessed 23 Oct 2020.

UN. (2019a). *The Sustainable Development Goals Report*. United Nations, New York. Available at: https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf. Accessed 13 Nov 2019, 27 Nov 2019.

UN. (2019b). *SDG Indicators Database*. Available at: https://unstats.un.org/sdgs/indicators/database/. Accessed 18 Nov 2019, 20 Nov 2019, 26 Nov 2019.

UNDP. (2018). *Human Development Indices and Indicators, Statistical Update*. Available at website: http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf. Accessed 27 Nov 2019.

UNDP. (2019). *Human Development Report on Inequality*. UNDP, New York. Available at website. http://www.hdr.undp.org/. Accessed 27 Nov 2019.

UNEP. (2019). Global Environmental Outlook GEO 6-Healthy Planet, Healthy People. In *Future Data and Knowledge Needs*. Nairobi: UNEP. Chapter 25. Available at website: https://wedocs.unep.org/handle/20.500.11822/27539

UNESCAP. (2019). *Asia and Pacific SDG Progress Report, Data Sources and Gaps*. United Nations Economic and Social Commission for Asia and the Pacific. Available at website: https://www.unescap.org/sites/default/files/Part_III_Data_source_gaps_Asia-Pacific_SDG_Progress_Report2019.pdf. Accessed 18 Nov 2019, 27 Nov 19.

Waters, C., Zalasiewicz, J., Summerhayes, C., Barnosky, A. D., Poirier, C., & Galuszka, A. (2016). The Anthropocene Is Functionally and Stratigraphically Distinct from the Holocene. *Science, 351*(6269), aad2622. Available at website: https://science.sciencemag.org/contWatersent/351/6269/aad2622. Accessed 29 Nov 2019.

Wendling, Z. A., Emerson, J. W., Esty, D. C., Levy, M. A., de Sherbinin, A. (2018). *Environmental Performance Index, Technical Appendix*. New Haven,: Yale Centre for Environmental Law and Policy. Available at: https://epi.envirocenter.yale.edu/downloads/epi2018technicalappendixv05.pdf

World Bank. (2016). *Forest Cover (% of Land Area) Malta*. World Bank, New York. Available at website: https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=MT. Accessed 15 Dec 2019.

World Bank. (2019). *Development Indicators*. Washington, DC: World Bank Group. Available at website. https://databank.worldbank.org/reports.aspx?source=2&series=SP.POP.GROW&country=. Accessed 25 Nov 2019.

Yale Centre for Environmental Law and Policy. (2019). *2018 Environmental Performance Index*. Centre for International Earth Science Information Network, Earth Institute, Columbia University. Available at website: https://epi.envirocenter.yale.edu/. Accessed 02 Dec 2019.

CHAPTER 16

Overseas Development Assistance and Climate Resilience: A Case Study of Tonga

Partha Gangopadhyay and Khushbu Rai

16.1 Introduction

Small Island Developing States (SIDS) face extraordinary threats from climate shocks. For the 15 Pacific Island Countries (PICs), climate change has posed an unprecedented threat to the entire Pacific community. The perception of an imminent threat to PICs from climate change is intricately associated with the following apprehensions:

- Erosion of community coping capacity
- Imminent threat to economic growth and critical infrastructure
- Gradual disappearance of long-term development gains achieved over the long haul

P. Gangopadhyay (✉)
Western Sydney University, Sydney, NSW, Australia
e-mail: P.Gangopadhyay@westernsydney.edu.au

K. Rai
The University of the South Pacific, Suva, Fiji

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_16

- Worsening of food and water security
- Unpredictable impacts upon human health

Among the PICs, Tonga has faced a unique and existential challenge from the consequences of climate change as most of Tonga's residents live and critical infrastructure are located on vulnerable atoll islands, principally in the region of very low-lying Tonga tapu. The United Nations has identified Tonga as one of the most vulnerable to the devastating effects of climate change, especially from rising sea level. This is a stark reality for Tonga.

As ocean water becomes hotter, it expands causing the sea level to rise. The melting of glaciers and ice sheets due to a rising global temperature also contributes to sea-level rise. The catastrophe is evidently clear in the prediction from experts that most of Tonga will be under water in less than 50 years. Moreover, Tonga is highly vulnerable to the impacts of climate change due to its geographical location and its socio-economic characteristics. Tonga is susceptible to a wide range of other climate-change impacts including increasingly intense tropical cyclones, extreme rainfall events leading to flooding, coastal erosion, heat waves, drought, ocean acidification and sea-level rise.

In order to cope with the above challenges, Tonga has enacted several key national climate-change policies and strategies and legislation, which will provide the necessary foundation to formalise well-concerted and effective climate-change action. As an example, Tonga has committed to producing 50% of its energy output from renewable sources by 2020. Moreover, it has unleashed a series of measures in integrating resilience across all sectors. In this context, external aid has played a critical role in improving climate resilience. Under its aid partnership, Australia supports the Tongan government and people of Tonga to foster climate resilience for creating environmentally sustainable development pathways. Australia invested an estimated Aus$8.6 million as a climate-change support to Tonga over the period 2015–16 to 2017–18.

Australia is a key partner in Tonga's transition to renewable energy through reducing its reliance on imported fossil fuel by enhancing energy security of Tonga. The main challenge for energy security is how to harness reliable, safe and affordable solar energy in Tonga. By integrating climate risks across the aid programmes, the donor countries help increase Tonga's resilience to the impacts of climate change. As examples:

- The current Australia–Tonga Aid Partnership (2016–2019) focuses upon “disaster resilience as a cross-cutting issue”
- Active policies are formulated to build resilience and integrate the risks of climate change into all key sectors of the aid programme

The PICs also benefit from the global humanitarian and disaster risk reduction programmes. Many donor countries contribute to the risk reduction programme. Australia is a key player in the global climate finance mechanism, including the Green Climate Fund (GCF; Aus$200 million committed by Australia over four years from 2015) and the Global Environment Facility ($93 million committed, 2014–15 to 2017–18). These funds support a wide range of resilience-building and emissions-reduction projects in the Pacific region. Australia uses its seat on the Green Climate Fund Board and the Global Environment Facility Council to draft suitable policies and processes, and highlights the climate-change disasters for the PICs and the vulnerability of the people in the Pacific for creating Pacific-focused proposals. The Green Climate Fund has approved the Pacific Renewable Energy Investment Program, which has a key project worth US$5 million for a technical assistance facility to prepare and implement sub-projects for Tonga and six other Pacific Island Countries.

The chapter is organised as follows. Section 16.2 provides a summary of the background of research on human security, which broadly covers the main insights on climate resilience. In Sect. 16.3, we present an overview of how overseas development assistance (ODA) has affected vulnerability resilience of Pacific Islands, including Tonga. Section 16.4 develops an index of vulnerability for Tonga and explores its long-run relationship with ODA, energy (oil) prices and global warming. Section 16.5 brings together the conclusions.

16.2 Background of Analysis in the Context of Human Security

Tonga is widely held to have only two seasons in a year: a warm wet season from November to April, and a cooler dry season from May to October. The wet season also poses the most dangerous risks from adverse weather conditions for the island, as the season is often called the cyclone season for Tonga. During the 50 years from 1960 to 2010, over 80 cyclones hit 400 kilometres of Tonga tapu, the main island. The average frequency of annual cyclones ranges from one to two cyclones every season. While severity of cyclones and their damages vary, when a cyclone is large enough to cause damage, the impacts are very heavy. Tonga is one of the most vulnerable countries to the devastating effects of climate change, especially from rising sea level. In this section, we focus on linking the ravages of climate shocks to human security issues in Tonga.

A periscopic, yet generic, view of human (in)security can be suitably appreciated from the work of Fukuyama (1989). We are at a critical juncture of human history as our civilisation has been under serious threats from anthropogenic factors. Human security is in peril. Roughly speaking, human security can be best understood by using a negative term called human insecurity. Human insecurity is our existential threat from violent conflict and poverty, humanitarian crises and epidemic diseases. We also tend to put injustice and inequality in the narrow space of human insecurity. Broadly speaking, hence, human security is all about security of individuals and their communities, global humanity and harmony. Human security can be summarised in the following triad:

- Human security is about absence of fear for individuals
- Human security is about freedom from want for individuals
- Human security is about freedom to live in dignity, peace and harmony

Hence, human security is radically different from the traditional mandate of security studies that have clear foci on military force, territorial control and sovereignty in exercising state power.

This section explores the relatively uncharted land of human security by riveting on some of the most serious challenges that human security faces in the South Pacific due to climate shocks. By bringing together a diversity of views, we provide a comprehensive understanding of human (in)security in Tonga.

16.2.1 Special Geographical Features of Tonga and the Pacific Island Countries (PICs)

All PICs put together contribute to 0.4% of the total global land mass. The population of the PICs is roughly around 0.15% of the total global population. Yet PICs are scattered over 165.2 million km^2 in the Pacific Ocean, which accounts for 44% of the world's ocean, which gives an indication of the locational circumstances of PICs.

16.2.2 Human Insecurity in Tonga from Environmental Adversities

The Kingdom of Tonga is an archipelago consisting of four groups of islands. Its location in the Pacific can be best understood with respect to a reference to Australia: it is located northeast of Australia. It is also imperative to note that Tonga is the only Pacific Island nation that has not been colonised. Tonga's islands are encircled by fringing reefs; most of the islands in Tonga originate from coralline. One more topographic characteristic is that the majority of these islands are flat except for a handful raised by tectonic movements. Not surprisingly, the multiple effects of climate change pose a significant threat to the flat and low-lying islands of Tonga. Tonga adopted a few adaptation projects, which include:

- Public awareness programmes
- Coastal revegetation
- Coastal protection
- Expansion of water collection systems
- Expansion of agroforestry

As mentioned above, tropical cyclones hit Tonga during the wet season, often causing extensive damage on local infrastructure, agriculture and major food sources. On the other hand, droughts often ravage Tonga during the dry season, accelerating a depletion of potable water. Freshwater is hence a scarce commodity for Tonga. The two main sources of freshwater in Tonga are (i) stored rainwater, and (ii) freshwater lens found in highly porous limestone substrate. A major problem in this context is the fact that groundwater supplies are subject to saltwater pollution, or intrusion, as a result of rising sea levels. As per documented evidence there has been a general increase in sea level of 14 mm/year between 1993 and 2001. The consequence of climate change is twofold: first, a rise in mean sea level around Tonga and intrusion of saltwater into the stocks of freshwater. Secondly, extreme weather events are also feared to contribute to an increase in flooding of low-lying areas. The economic reliance of Tonga upon climate-sensitive sectors such as agriculture and fisheries further compounds the problems. Coastal resources, for example, fisheries, are vital to livelihoods of Tongans. There are livelihood challenges for Tongans due to heavily relying upon coral reefs, mangroves and beaches, which are seriously endangered from the effects of climate change. The coaster degradation has been rampant in Tonga due to coastal developments such as the mining of beach sand, sea-level rise and extreme events caused by climate change. Thus, Tonga has been highly vulnerable to the impacts of climate change due to its geographical location and its socio-economic characteristics.

16.3 Overseas Development Aid and Climate-Change Resilience: An Overview

SIDS are recognised by the United Nations as a special group of environmentally and economically vulnerable countries. SIDS rely heavily on official development assistance (ODA) to manage and wisely use limited coastal resources with resilience in response to natural disasters. In particular, these States have an obligation to participate in efforts to combat climate change through the New Climate Regime adopted at the 21st Conference of Parties to the United Nations Framework Convention on Climate Change (Choi et al. 2018, p. 1466). In view of these developments, SIDS are called on to mechanise ways to mitigate severity of climate change and to manage resources with frameworks designed around adaptability and resilience. In practice, some policy makers integrate resilience with adaptation and mitigation, whereas others incorporate it into disaster risk management. On the other hand, the pledges under the Paris Agreement 2015 to commit US$100 billion annually till 2020 came almost as a compulsion for the developed countries. Partly due to the integration of various channels through which funding enters, the distinction between climate finance and official development aid has been blurred (ODA; Ryan 2019). The fund-architecture has various labels such as Least Developed Country Fund (LDCF), the Adaptation Fund (AF), the Climate Investment Fund (CIF) and the Green Climate Fund (GCF), amongst others, and is sourced bilaterally, multilaterally or through established global trust funds (OECD 2016). "Many bilateral donors extend ODA for climate and disaster resilience finance to SIDS in the form of concessional grants and loans" (ibid., p. 16).

Inevitably, small island countries are increasingly becoming reliant on technical and financial support from the international development partners. However, one of the most critical impediments to the process of accessing international climate finance and/or gauging the longevity of its effectiveness is getting reliable data, due to the lack thereof. Moreover, the existing literature consists of either qualitative studies or of aggregated Pacific data with the greater Asian countries (Atteridge and Canales 2017; Barnard et al. 2013), masking any indication of possible patterns on the flow of bilateral/multilateral climate funds, its allocation and its effectiveness in improving resilience of the Pacific communities. Nonetheless, climate finances are a prominent element at any step of redressing risks and the inflows of official development aid (which predominantly target climate-change objectives) provide a close proxy to examine the impact of mitigation and adaptation.

Official development aid facilitates climate-change resilience in SIDS by means of developing adaptive capacity. The Organization for Economic Co-operation and Development's (OECD 2016) scrutiny of the Development Assistance Committee (DAC) list of ODA recipients exhibits that more than 60% of total development aid is directed towards adaptive capacity-building projects. The World Bank (2008) estimates adaptation costs (inclusive of ODA, concessional finance and foreign direct investments) to fall between US$10 and 40 billion per annum for developing nations. Ayers and Huq (2008, p. 2) discuss two specific channels which address the role of ODA in climate resilience: (i) by means of traditional development role of ODA, and (ii) through "mainstreaming adaptation into development planning to achieve climate resilient planning". They further expound that ODA can be used for *climate-proofing* as they are absorbed into development investments, particularly in areas of climate-change adaptation.

Robinson and Dornan (2017) point out that the SIDS status (as opposed to being a least developed country) improves the likelihood of accessing climate finance, subject to how the country vulnerability gets measured. Building on this, Robinson and Gilfillan (2017) studied the effectiveness of these climate funds in terms of adaption-related activities. The authors write on the essential roles of regional institutions, the likes of Secretariat of the Pacific Community (SPC) and Secretariat of the Pacific Regional Environment Programme (SPREP), in expediting finances to support concerns on coastal management, food security, water source and so on. In the Pacific, the framework for resilient development, spearheaded by SPC, provides for an integrated approach to address climate change and disaster risk management in tandem. Incorporating climate-change resilience with disaster risk management reduces wastage of resources that would otherwise be invested separately in the two areas of urgency within the region. Under this framework, resilience among

SIDS is built by integrating actions into sectors such as health, culture, education, water and sanitation, social assistance, energy, agriculture, tourism, environment and infrastructure (Pacific Community 2016). The approach is sustainable given that these sectors are foundations of livelihood and economic development in SIDS.

The OECD DAC Creditor Reporting System (CRS) reviewed the climate finance landscape for the SIDS between 2010 and 2014 to provide an overarching view. Of the US$5.7 billion per annum pledged and committed, 14% unequivocally was invested into climate resilience projects (OECD 2016). This comprises prioritising areas of climate adaptation, activities in the forestry sector and disaster resilience programmes. The donors of funds to Tonga in order of significance were Japan, Climate Investment Funds (collaboration of Asian Development Bank, European Bank for Re-construction and Development, Inter-American Development Bank and World Bank Group), Australia and New Zealand. Additionally, the renewable energy sector—especially solar energy and the environmental policy—has received the most investment (see Fig. 16.1).

Tonga is ranked the fourth most disaster-prone country in the world by World Bank (2013), which estimates between 1 and 9% of loss from their gross domestic product due to natural disasters per year. Although Tonga is ranked as an Upper Middle-Income Country (UMIC), the unprecedented rate of damage from disasters affect the standard of living, and they have a substantial adverse impact on food security, water source, tourism and the fisheries industry.

16.4 Vulnerability and Resilience Policy in Tonga

Before commenting on the adequacy of resilience policies against climate change, we try to have a proper understanding and quantification of climate-induced vulnerability. Therefore, we first construct vulnerability indices for Tonga for the period 1976–2015 and then see whether vulnerability has long-run relationship with variables that are of concern to Tonga.

16.4.1 Developing an Index of Vulnerability for Tonga

We choose four different types of factors to develop a vulnerability index (VI) for each year during 1976–2015. The first factor, to measure long-term vulnerability, derives from the environmental sustainability of any

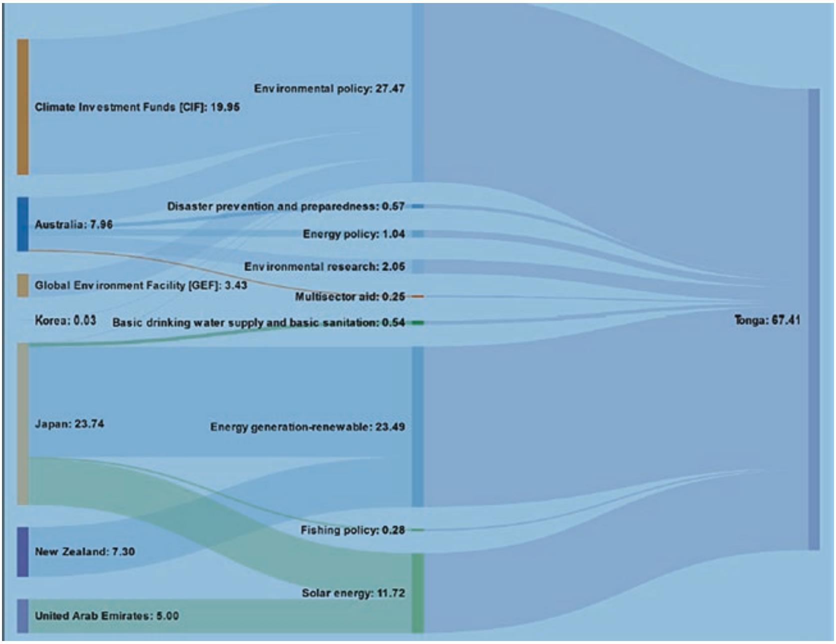


Fig. 16.1 Donors of climate finance and sector allocation to Tonga (million US$, 2010–2014). (Source: Atteridge and Canales 2017—OECD DAC CRS database)

country, which indicates the carbon footprint of the region and is being measured by the per capita carbon emission (CO_2) in Tonga. The larger the CO_2, we posit that the larger is the vulnerability due to potential environmental hazards in Tonga. The second factor is the source of vulnerability due to various forms of mortality to capture the vulnerability of people in terms of two indicators termed *INFANTD* and *DEATHR*. *INFANTD* is the infant death rate and *DEATHR* is the death rate in Tonga. These mortality rates, affected by climate shocks, can make Tonga extremely fragile. Finally, we take into consideration the impact of the agricultural sector on the sustainability of Tonga, for the livelihoods of people are critically linked to the agrarian economy. We have chosen three indicators for this purpose, *ARLAND*, *FOODPROD* and *CEREALPROD*: *ARLAND* is the per capita arable land in Tonga while *FOODPROD* and *CEREALPROD* are indices of food productivity and cereal productivity in Tonga. The agrarian economy of Tonga still plays an important part in providing employment and ensuring food security in the region. The decline in *ARLAND* can be a major source of vulnerability along with fluctuations in water levels. Since the data on water levels are unavailable, we have chosen *ARLAND* as an indicator of the pressure of resources in the country. Food insecurity is an important source of vulnerability and the slowing down of *FOODPROD* will be a serious concern in the region. We have hence chosen *FOODPROD* as an indicator variable for vulnerability. In a similar vein, *CEREALPROD* is an indicator of the long-term viability of maintaining livestock as any stalling of its productivity will pose serious problems in the food chain of the region.

We apply the principal component analysis (PCA) to the above six variables, namely *CO2, INFANTD, DEATHR, ARLAND, FOODPROD* and *CEREALPROD* for which annual data are available from the development indicators of the World Bank for the period 1976–2015. The PCA enables us to derive an index of vulnerability for Tonga. While the details of PCA are presented in Appendix A, estimates of the index of vulnerability for the period 1976–2015 are shown in Fig. 16.2. It may be noted from this figure that from 1976 to 1997, the vulnerability of Tonga has

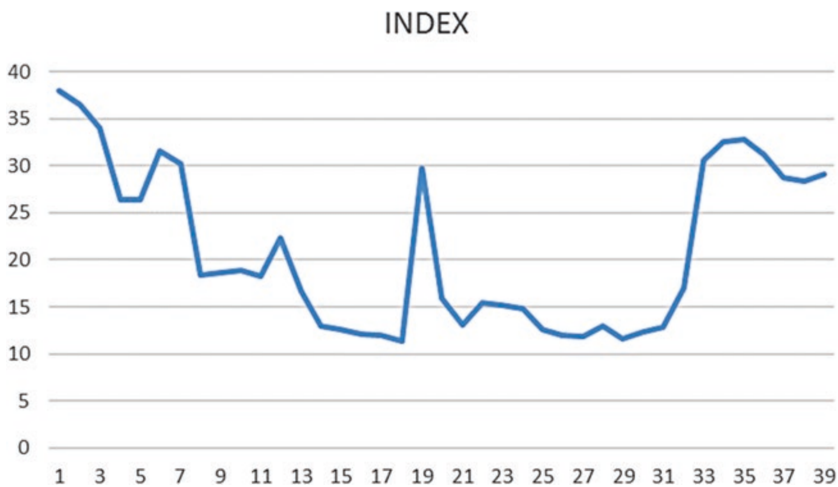


Fig. 16.2 Vulnerability index for Tonga, 1976–2015. Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data)

declined, though with significant fluctuations. Since 1998, Tonga's vulnerability has been rising at an alarming rate.

We now turn to investigating whether vulnerability had a long-run relationship with overseas development assistance, energy price shocks and global warming. Such an analysis is likely to guide resilience policy in Tonga.

16.4.2 Unveiling Long-Run Relationship: A Guide to Resilience Policies

Figure 16.3 shows the time path of overseas assistance (ODA), which has been steadily rising especially with a faster rate since 1997. Figure 16.4 shows that Tonga has been facing an energy crisis due to rising oil prices during 1976–2015. Figure 16.5 documents the rising global temperature over the years. Each of these series shows stochastic variability with upward trend over a time span of four decades.

Do ODA global temperature and oil prices have any relationship with vulnerability? Based on the application of statistical tests (presented in Appendix A), we find a long-run relationship between vulnerability, global

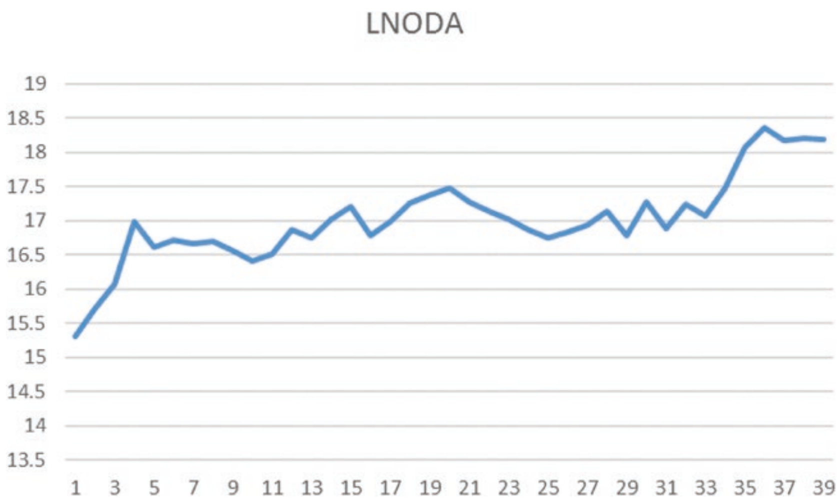


Fig. 16.3 Time profile of overseas development assistance (ODA) to Tonga. Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data)

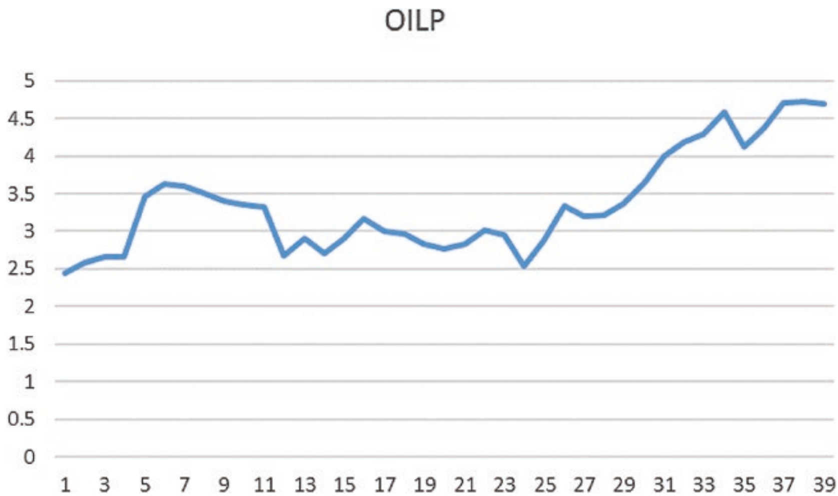


Fig. 16.4 Oil price (OILP) dynamics overtime. Note: Year = 1, Year 39 = 2015. (Source: Created by the authors from publicly available data)

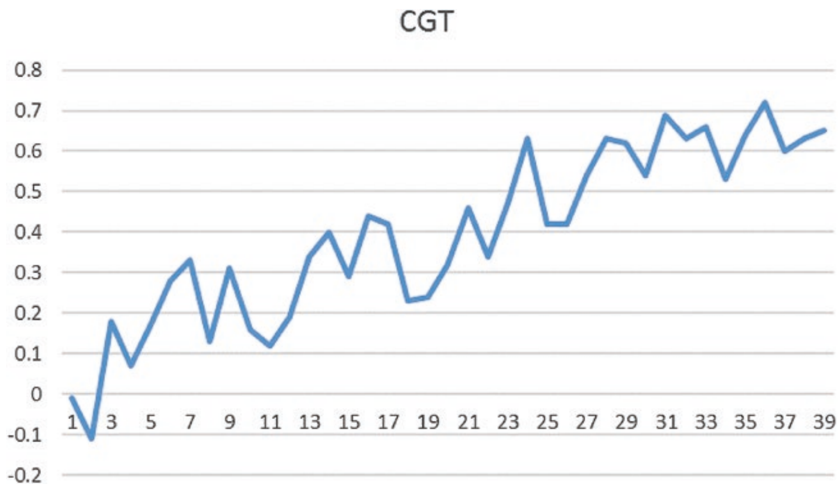


Fig. 16.5 Annual change in global temperature (CGT). Note: Year 1 = 1976, Year 39 = 2015. (Source: Created by the authors from publicly available data)

warming and energy prices. The energy price shocks contribute to the vulnerability in Tonga. The global warming encourages Tonga to adopt mitigation and adaptive policies to build resilience. However, the statistical tests do not support long-run relationship between vulnerability and ODA, implying that ODA is not being effective in reducing vulnerability in Tonga.

Thus, there is a need for more effective domestic policies as well as international support for building resilience capacity in Tonga. In order to foster resilience, the nation plans investing in building cyclone-proof houses, improving early warning disaster alertness systems, plus investing in improving water sources by building dams and on infrastructure for energy sustainability (OECD 2016).

16.5 Conclusions

There are three critical elements in creating climate resilience for small island developing states like Tonga: (i) overseas development assistance (ODA), (ii) adaptation strategies and (iii) mitigation of carbon footprints through energy security. By creating a dataset for Tonga, we examined the relative importance of these three critically important elements for Tonga's climate resilience. From the long-run relationship, extracted from the dataset, we are able to find some interesting insights for climate resilience hitherto not known for SIDS and PICs: first, we found that ODA does not impact the climate resilience for Tonga. Secondly, we find that the policy pressure on the government of Tonga for ensuring energy security, captured from the oil price dynamics, impacts adversely on the climate resilience of Tonga. Thirdly, we find that the fear of consequences of climate change, captured by the rising global temperature, seems to have motived the government of Tonga to build climate resilience.

Appendix A. Principal Component Analysis (PCA) and Tests of Long-Run Relationship

Principal Component Analysis (PCA)

It is important to emphasise that the PCA is a statistical procedure that applies an orthogonal transformation of the variables to create a new set of observations of correlated variables into a set of values of uncorrelated variables. These new and linearly correlated variables are the principal components such that the number of principal components is less than or equal to the number of original variables. What is important for us is to note that the PCA undertakes transformation in such a way that the first principal component has the largest possible variance, which thereby accounts for the maximum variability in the data. Each succeeding component in turn has the highest variance with the additional constraint that it is orthogonal to the preceding components. The resulting vectors are an uncorrelated orthogonal basic set. The principal components are orthogonal since they are the eigenvectors of the symmetric covariance matrix. We use the first three PCAs as the basis for deriving the vulnerability index of Tonga (VIT) so that the weights from the PCA accord us the case that explains the greatest variability in the variables chosen to reflect vulnerability in the region. We label the vulnerability of Tonga as VIT and define VIT as the following:

$$\begin{aligned} \text{VIT} = w_1 * \text{CO}_2 + w_2 * \text{INFANTD} + w_3 * \text{DEATHR} + w_4 * \text{ARLAND} \\ + w_5 * \text{FOODPROD} + w_6 * \text{CEREALPROD} \end{aligned} \tag{16.1}$$

The weights used in the above equation are provided in Table A.1.

Tests of Long-Run Relationship

This section provides details on the relationship between vulnerability index and other variables of interest. To undertake the analysis, we use the autoregressive distributed lag (ARDL) bounds testing approach to deal

Table A.1 The weights in the vulnerability index of Tonga (VIT)

Variables	*Weights*	*Definition*
CO_2	0.43	Demeaned CO_2
INFANTD	0.31	Demeaned INFANTD
DEATHR	0.20	Demeaned DEATHR
ARLAND	0.05	Demeaned ARLAND
FOODPROD	0.04	Demeaned FOODPROD
CEREALPROD	0.0005	Demeaned CEREALPROD
Total	1	

with problems of autocorrelation and non-stationarity of key variables. Given the importance of addressing problems of autocorrelation and non-stationarity in order to get reliable results, the analysis uses time series methods to investigate the short-run and long-run dynamics of the relationship between VIT and some of the relevant variables. The method is that of the autoregressive distributed lag (ARDL) bounds testing approach recommended by Pesaran et al. (2001) to testing for cointegration between VIT vis-à-vis overseas development assistance (ODA), change in global temperature (CGT) and oil price (OILP). An application of the approach is also undertaken by Gangopadhyay and Nilakantan (2018). The ARDL approach involves two steps:

- Step 1 tests for the presence of a long-run relationship between the variables of interest.
- If such a relationship is shown to exist, then Step 2 estimates the short-run and long-run parameters of the relationship.

We begin by verifying that none of our variables of interest is integrated of order greater than one, or I(1). From simple unit roots tests we ensured that the variables of interest are appropriate for the application of the ARDL and the non-linear ARDL (NARDL) bounds testing methodology. Thus, the postulated model for ARDL bounds testing yields:

$$\Delta y_t = \alpha_0 + \rho y_{t-1} + aoilp_{t-1} + \tau w_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta y_{t-i} + \sum_{i=0}^{q-1} b_i \Delta oilp_{t-i} + \omega_t \ldots \qquad (16.2)$$

where, y is the dependent variable, vulnerability index; *oilp* is the logarithmic transformation of oil prices (OILP); W is a vector of other deterministic variables (ODA, CGT) and ω_t is an *iid* stochastic process. The two variables, y and *oilp* in above equation, are not cointegrated if $\rho = a = 0$. Pesaran et al. (2001) have proposed the F-test to test the presence of cointegration in the estimated ARDL model. The decision is based on two critical bounds: the upper and the lower one. When the F-statistic is greater than the upper bound, the null hypothesis is rejected, which implies that there is a long-run relationship between y and *op*. The ARDL model in the above equation assumes a linear combination of y and other variables like *oilp*, which indicates a symmetric adjustment in the long- and the short-run of the dependent variable to any shock in *oilp*—the variable of interest. Note that this model is consistent with Pesaran et al. (2001) who have developed a linear cointegration autoregressive distributed lag (ARDL) model to evaluate simultaneously long- and short-run effects. In their model, the dependent variable (y_t) responds symmetrically to both increases and decreases in the independent variable (op_t). To do this, we use the ARDL bounds testing approach of Pesaran et al. (2001).

The advantage of using this approach is that one does not need to worry about endogeneity between variables since coefficient estimates in the presence of cointegration have the super consistency property, implying that endogeneity does not affect the results (see Granger 1981; Granger and Yoon 2002; Toda and Yamamoto 1995). The super consistency property of the estimates holds even if there are omitted stationary variables (Herzer and Strulig 2013). Step 1 of the ARDL approach involves estimating an unrestricted ARDL Error Correction Model (ECM), as shown in the generic model. The results are given in Table A.2.

The table reveals that *ODA*, *CGT* and *OILP* or *oilp* are correlated with vulnerability though they are not all statistically significant. Both *ODA* and *oilp* increases are found to increase vulnerability of Tonga, though the impact of *ODA* is not statistically significant. One of the main sources of vulnerability of Tonga comes from energy price shocks as highlighted by the coefficient of *OILP*, which is statistically significant. The coefficient of

Table A.2 Autoregressive distributed lag (ARDL) results (Eq. 16.2): Vulnerability Index of Tonga (VIT) vis-à-vis Variables of Interest

Variables	*Coefficients*
VIT_{t-1}	−0.63***
LONG-RUN	
ODA_{t-1}	4.5
CGT_{t-1}	−24.9*
$oilp_{t-1}$	10.56***
SHORT-RUN	
ΔCGT_{t-1}	15.03*
Constant	−9.03**
No of obs	39
Adj R squared	0.26
F-statistic for no cointegration	4.36**
Cointegration	Yes

Note: ***1%, ** 95%, *90%

CGT is negative and statistically significant. This may be taken to mean that an increase in temperature calls forth more adaptation efforts, which will in turn decrease vulnerability.

For the short run, the presence of significant relationship in the first difference exists between *CGT* and *VIT*. It is also important to note that the statistically significant error correction term (VIT_{t-1}) from Table A.2 indicates, the coefficient being less than 1, the presence of a highly stable long-run relationship as postulated in the equation. Once again, the *F*-statistic indicates the presence of a stable long-run relationship between *VIT* vis-à-vis *ODA*, *CGT* and *OILP* at 5% level of significance.

References

Atteridge, A., & Canales, N. (2017). *Climate Finance in the Pacific: An Overview of Flows to the Region's Small Island Developing States*. Stockholm: Stockholm Environment Institute. (Report). Available at: https://www.sei.org/publications/pacific-climate-finance/. Accessed 15 July 2019.

Ayers, M., & Huq, S. (2008). *Supporting Adaptation to Climate Change: What Role for Official Development Assistance?* London: International Institute for Environment and Development. (Report). Available at: https://www.iied.org/supporting-adaptation-climate-change-what-role-for-official-development-assistance. Accessed: 18 July 2019.

Barnard, S., Nakhooda, S., Caravani, A., & Schalatek, L. (2013). *Climate Finance Regional Briefing: Asia and Pacific*. Climate Finance Fundamentals 8. Overseas Development Institute (ODI), UK and Heinrich Boll Stiftungi North America (Report). Available at: https://www.cbd.int/financial/climatechange/asia-climate.pdf. Accessed 15 July 2019.

Choi, Y. E., Jin, J. Y., Chang, Y. S., Jang, B., & Chon, J. (2018). Role of Official Development Assistance in Enhancing Resilient Coastal Community in Small Island Developing States. *Journal of Coastal Research, 85*(sp1), 1466–1470.

Fukuyama, F. (1989). The End of History?. *The National Interest* (16), 3–18. ISSN 0884-9382.JSTOR.24027184.

Gangopadhyay, P., & Nilakantan, R. (2018). Estimating the Effects of Climate Shocks on Collective Violence: ARDL evidence from India. *Journal of Development Studies, 54*, 441–456.

Granger, C. W. J. (1981). *Cointegrating Variables and Error Correction Models*. Working Paper. University of California, San Diego, CA.

Granger, C. W. J., & Yoon, G. (2002). *Hidden Cointegration*. Working Paper. University of California, San Diego.

Herzer, D., & Strulig, H. (2013). *Religiosity and Income: A Panel Cointegration and Causality Analysis*. Center for European Governance and Economic Development Research Discussion Paper No. 168.

OECD (2016). "OECD – DAC/DCD – Creditor Reporting System: Technical Guide to terms and data in the CRS Aid Activities database." OECD Development Assistance Committee/ Development Co-operation Directorate CRS, Paris, France. http://www.oecd.org/dac/stats/crsguide.htm

Pacific Community. (2016, November 3). *A Resilient Future: The Framework for Resilient Development in the Pacific (FRDP)* [Video file]. Retrieved from https://www.youtube.com/watch?v=T8TcTIzkDiQ&list=LL0Dpb9WBWuLvqDu9f8zBJ9w&index=9&t=482s

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics, 16*, 289–326.

Robinson, S., & Dornan, M. (2017). International Financing for Climate Change Adaptation in Small Island Developing States. *Regional Environmental Change, 17*(4), 1103–1115. https://doi.org/10.1007/s10113-016-1085-1. Accessed 25 July 2019.

Robinson, S., & Gilfillan, D. (2017). Regional organizations and climate change adaptation in Small Island developing states. *Regional Environmental Change, 17*(4), 989–1004. https://doi.org/10.1007/s10113-016-0991-6. Accessed 25 July 2019.

Ryan, F. (2019, April 24). Separating Climate Finance and ODA [Blog Post]. Retrieved from https://www.devpolicy.org/separating-climate-finance-and-oda-20190424/

The Organization for Economic Co-operation and Development. (n.d.). *Adaptation to Climate Change: International Agreements for Local Needs*. Document Prepared by the OECD and IEA for the Annex I Expert Group on the UNFCCC. http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/daclist.html. Accessed 25 July 2019.

The World Bank. (2008). WB Climate Investment Funds Receive Pledges for US$ 6.1 Billion. Thematic Experts: SDG Knowledge Hub. World Bank Press Release. Available at: http://sdg.iisd.org/news/world-bank-climate-investment-funds-receive-pledges-for-us-61-billion/. Accessed 25 July 2019.

The World Bank (2013). *Building Resilience: Integrating Climate and Disaster Risk into Development*. Lessons from World Bank Group Experience. The World Bank, Washington, DC. Available at: http://documents.worldbank.org/curated/en/762871468148506173/Main-report. Accessed 3 Aug 2019.

Toda, H. Y., & Yamamoto, T. (1995). Statistical Inferences in Vector Autoregressions with Possibly Integrated Processes. *Journal of Econometrics, 66*, 225–250.

CHAPTER 17

Overtourism, Environmental Degradation and Governance in Small Islands with Special Reference to Malta

Lino Briguglio and Marie Avellino

17.1 Introduction

17.1.1 Objectives of the Study

The objectives of this chapter are twofold, namely (a) to present a literature review on themes associated with the title of this chapter, and (b) to report the results of a survey on the attitudes towards tourism in Malta (Briguglio and Avellino 2019), so as to examine whether overtourism exists in Malta and whether the Maltese people associate tourism with environmental degradation.

Tourism is often considered as a desirable activity for the visitors, in terms of recreation, adventure, cultural enhancement and other benefits of travel, and for the host community, mostly in terms of the income and employment it generates. With improvements in income and decreases in the cost of travelling, tourism has exploded over the past decades, and in

L. Briguglio (✉) • M. Avellino
University of Malta, Msida, Malta
e-mail: lino.briguglio@um.edu.mt; marie.avellino@um.edu.mt

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_17

many destinations, the local communities have started to experience the negative side of high rates of tourist inflows, mostly arising from overcrowding, traffic congestion, misbehaviour by visitors and damage to the physical environment. In 2017 and 2018 there were several reports in the media and papers in many academic journals describing the exasperation of the local residents with what became known as "overtourism"—signifying that there are too many visitors to a particular destination at the same time.

When associating environmental degradation with tourism, most studies consider this as one of the downsides of this industry, and in terms of environmental governance, a number of measures are proposed including reduction in tourist inflow, spreading the tourists in terms of space and season, keeping them away from environmentally sensitive areas and putting in place a policy to educate tourists in environmental protection.

Environmental degradation in turn is often associated with the outstripping of tourism carrying capacity in that location. As we shall explain in Sect. 17.2 of this chapter, the exact point where carrying capacity is exceeded is difficult to measure objectively, due to various reasons including that carrying capacity is not something static, has various dimensions, depends on the good or bad behaviour of the visitors and varies according to the social and environmental policies and practices in the host destination.

17.1.2 Chapter Layout

The rest of the chapter is organised as follows. Section 17.2 reviews the literature on topics linked with the main themes of this study. A review of tourism developments in Malta between 2000 and 2018 is given in Sect. 17.3. Section 17.4 describes the results of the survey carried out by the present authors in early 2019, which had implications relating to overtourism, environmental degradation and environmental governance. The final section derives a number of implications from the results of the survey.

17.2 Literature Review

17.2.1 The Upsides and Downsides of Tourism

The economic advantages and disadvantages of tourism have been widely documented in various studies (e.g. Bryden 1973; Tribe 1999; Vogel

2001; Archer et al. 2005; Diedrich and García-Buades 2009; Ahmad et al. 2018). The most important benefits of tourism are generally associated with its contribution to the economy. Tourism seems to be more effective than other industries in generating employment and income because of its relatively high income multiplier and inter-industry linkages (Archer 1977; Briguglio 1992; Khan et al. 1995; Zaei and Zaei 2013; Stephanos and Polo 2016).

However, with the rapid growth in tourism, several writers expressed reservations about the nature and size of the benefits attributable to tourism and expressed a degree of scepticism about the potentialities of tourism as a means of maximising the welfare of the resident population (e.g. Archer et al. 2005; Bastias-Perex and Var 1995; Andereck et al. 2007; Andereck and Vogt 2000). There are studies that even dispute the extent or existence of net economic benefits of tourism referring mostly to the increasing demand on the scarce resources of the tourist area, particularly land, water and housing (Martín et al. 2018). Tourism may also have negative effects on employment in the sense that the sector is often characterised by very low wages and unsatisfactory working conditions (Walmsley 2017).

The debate on the pros and cons of tourism has often been conducted on three broad concepts, namely tourism carrying capacity, sustainable tourism and, more recently, overtourism. What follows is a brief discussion on each concept as it was dealt with in the literature. The three concepts have distinct features. Carrying capacity suggests that there is a limit as to how many tourists can visit a given destination or how much tourist development is acceptable in that destination at a given moment in time. On the other hand, sustainable tourism relates, at least in theory, to the welfare of future generations. Overtourism refers to a situation where the objectives of both carrying capacity and sustainable development are abandoned. Environmental degradation features prominently in these three concepts. The literature review refers to the connection of tourism with environmental degradation and on the need for environmental governance in this regard.

17.2.2 The Concept of Tourism Carrying Capacity

The term "carrying capacity" has been used to describe the possibility that tourism has its limits, generally in terms of the number of visitors in a particular destination, suggesting that if tourism exceeds this limit, the financial benefits of tourism would be outweighed by environmental and social negative impacts (Wagar 1964; WTO 1981; Chamberlain 1997; Middleton and Hawkins 1998; Coccossis et al. 2001; Nghi et al. 2007). The concept has often been used in conjunction with sustainable tourism and overtourism.

In research relating to small-island tourism, considerable emphasis is placed on the issue of carrying capacity (Briguglio and Briguglio, 1996; McElroy and de Albuquerque 2002; Hampton and Hampton 2009). Tourism can be a major contributor to economic development of small islands, in view of their natural attractions and limited diversification possibilities. However, small islands often face carrying capacity constraints due to their limited territory and fragile ecosystem.

The tourism carrying capacity argument has important practical implications for tourism management, especially for spatial planning and standards for sustainable tourism (Mexa and Coccossis 2004; Zelenka 2014; Jovicic and Dragin 2008). Such management is fraught with difficulties (Papageorgiou and Brotherton 1999), one of which is that carrying capacity is not something static and can differ from destination to destination (Jovicic and Dragin 2008). In addition, carrying capacity is very difficult to measure (Kennel 2016; Manning 2002; Liu and Borthwick 2011) given that it has various dimensions. One approach is to measure it in terms of numbers of tourists (López-Bonilla and López-Bonilla 2008). Alternatively, the focus can be on the limitations of resources (Castellani et al. 2007).

17.2.3 The Concept of Sustainable Tourism

The concept of carrying capacity is often associated with sustainable tourism, but there are important theoretical differences between the two concepts. Sustainable tourism is a process with connotations relating to the welfare of future generations, with long run and enduring implications, and active involvement of stakeholders, including the host community (Hardy et al. 2002; Simmons 1994). In addition, it generally has global implications. On the other hand, carrying capacity has a more local orientation and generally refers to the current community in the host destination. Carrying capacity is sometimes interpreted as a form of application of sustainable tourism, in that both relate to the impacts and limits of tourism development (Butler 1996, 1999). Both concepts are based on similar principles associated with the downsides of excessiveness and overuse (Tribe et al. 2000).

Some authors referred to the imprecise definition of sustainable tourism (Pigram 1990; Murphy 1998; Butler 1999; McCool et al. 2001; Liu 2003) suggesting that it is easy to theorise about sustainable tourism but more challenging to develop an effective, yet practical, measurement process. In spite of the problems with definition, measurement and implementation of sustainable tourism, the subject attracted a large number of studies. Ruhanen et al. (2015) conducted a literature review on the subject over a 25-year span, based on studies in four highest-ranked journals in the tourism field through empirical research.

17.2.4 The Concept of Overtourism

Disregard for carrying capacity and sustainable tourism could lead to a situation of overtourism. This term is generally associated with the downsides of tourism including overcrowding, traffic congestion, excessive development and takeover of facilities by tourists. These negative impacts were identified before the term "overtourism" started to be used frequently in the literature (see, e.g. Archer et al. 2005), but with the increased occurrence of these tourism disadvantages in various tourist destinations, notably Barcelona and Venice, the term has evolved to illustrate the manifestations and dangers of uncontrolled tourism.

According to Goodwin (2017), overtourism describes destinations "where hosts or guests, locals or visitors, feel that there are too many visitors and that the quality of life in the area or the quality of the experience has deteriorated unacceptably." The author argues that this contrasts with the concept of "responsible tourism" which is about using tourism to make better places to live in and better places to visit", which, in other words, is associated with creating shared values for host communities, for business and for tourists. According to the same author the term was coined in 2012, although the challenge of managing tourism sustainably for residents had been recognised decades earlier. However, after 2012, there has been a radical change in the perceptions of local residents in many countries regarding tourism, possibly, according to Goodwin, because in many destinations a tipping point had been reached.

One factor that may have led to overtourism is the decreasing cost of travel including the low-cost air travel and low-cost accommodation, such as Airbnb (Stanchev 2018; Silver 2018). This is an argument put forward by Martín et al. (2018) when discussing overtourism in Barcelona. They consider supply and demand in this regard as having responded to each other, with the increased tourist flows finding a response in an increase in hotel rooms and rooms outside of hotels. This resulted in negative attitudes towards tourism. According to these authors, as a result of overtourism, the positive economic impact often associated with this industry is counteracted by increases in the cost of living and an increase in rental prices for the local community.

A term that gained popularity as a result of overtourism is tourismphobia. Milano et al. (2018) refer to this term when discussing the host country antagonism and social unrest as a result of the social discomfort ushered in by excessive tourism. These problems had been identified decades earlier in Doxey (1975), Plog (1977) and Butler (1980) in the context of the tourism life cycle. The presence of too many tourists accompanied by badly planned spatial development measures are often considered as the main causes of tourismphobia. Milano (2017) gives examples of prominent cases in this regard referring to Hong Kong, Rio de Janeiro, Malta, Barcelona, Dubrovnik and Venice. Overtourism, paradoxically, could even lead to economic problems, at least in the industry itself, contradicting the idea that more tourists are good for the economy. Stanchev (2018) refers to the rise in the cost of living in this regard. According to this author, the negative economic aspects include loss of traditional retail trade, rise in property prices and land speculation, lack of housing availability for the locals and excessive use of limited resources. Walmsley (2017) writes about the employment effect of overtourism, particularly the poor working conditions in the tourism sector in terms of pay and working conditions.

17.2.5 The Connection Between Tourism and the Physical Environment

The analysis by Mathieson and Wall (1982) is often considered as a seminal study relating to connection of tourism and environmental degradation. A basic message in this study is that many countries, attracted by the economic benefits of tourism, tended to disregard its negative impacts on the environment.

In the literature, various tourism impacts on the environment are identified. Butler (2000) lists the following processes: pollution (litter, human waste, fuel waste), consumption (collecting, hunting, fishing) and trampling (soil and vegetation compaction) along with habitat modification through development, such as water modification (irrigation, dams, channelisation), vegetation removal and landform modification, which are common to most forms of human activity in the natural environment.

Ecologists, biologists and other physical scientists have long studied the ways in which humans affect their natural environment. Buckley (2011) distinguishes between different critical impacts of tourism on the environment with regard to different types of tourism aspects, including greenhouse gases for airlines, liquid wastes for cruise ships, water and energy conservation for urban hotels, vegetation clearance and wildlife displacement for rural resorts, and a range of direct and indirect local impacts on plants and animals for nature-based and adventure tourism in parks and wilderness areas.

Various studies assert that negative impacts of tourism on the physical environment are particularly severe on island destinations, because the natural environment is often the main tourist attraction. For instance, Dixon et al. (2001) find that tourism is one of the most important economic activities in the Caribbean Islands, which rely largely on the natural environment to lure visitors.

Briguglio (2008) listed a number of environmental impacts on small islands, while arguing that in the absence of tourism, small-island jurisdictions would still face serious environmental problems associated with their geographical and natural characteristics, as they tend to have unique and fragile ecosystems. Also certain services associated with tourism will still be needed in the absence of this industry. For example, international flights and shipping would still be required, for example for trade and migration. Airports and seaports in islands take up very large areas in proportion to the total space available, posing increased land-use pressure, as well as air and sea pollution. In the case of air traffic, flying craft also contribute considerably to noise pollution, often affecting practically the whole population of small islands. Other aspects of environmental impacts such as waste generation also occur in the absence of tourism. The author argues, however, that tourism exacerbates these negative environmental impacts.

Another problem faced by small-island jurisdictions relates to population density and carrying capacity. Many islands experience high tourism densities in relation to their population and land area. The concept of carrying capacity is very important in this regard, since small islands tend to very quickly reach that threshold level beyond which the natural ecosystem will be irreversibly damaged (McElroy and De Albuquerque 1998, 2002).

Farrell and Runyan (1991) in reviewing the literature up to 1990 state that locations that receive the highest environmental impacts include coastlines and islands. The authors argue that environmental quality appears in a variety of different ways, from narrowly focused topics through degrees of integration to, in theory, the most completely integrated studies concerned with sustainable development.

In referring to the Maldives and Goa, Sawkar et al. (1998) state that in small islands the environment, largely associated with beaches and sunshine, is a major factor leading to comparative advantage in tourism in islands. The authors argue that this therefore leads to a marked spatial concentration of tourism development along the coast, with heavy demand for resources in these places. It poses major changes in land use; causes shortage of resources, such as land and water; and damage to coastal aquifers, the sand dune system and mangrove vegetation.

17.2.6 Tourism and Environmental Governance

The environmental problems connected with tourism call for environmental governance, which in the literature is associated with a number of common themes including its connection with multi-level participatory structures, its complexity, its legitimacy and the role of market forces in its delivery.

Lemos and Agrawal (2006, 297) define environmental governance as "interventions aiming at changes in environment-related incentives, knowledge, institutions, decision making, and behaviours". Specifically, this refers, the authors contend, to the set of regulatory processes, mechanisms and organisations through which political actors influence environmental actions and outcomes. The authors state that governance in this regard should be distinguished from government, as the former includes the actions of the state and, in addition, encompasses actors such as communities, businesses and NGOs. This definition is very relevant to the environmental management of tourism, particularly island tourism, where, as stated, the environmental impacts of tourism tend to be very pronounced.

A common theme in studies on environmental governance relates to participatory structures, again a theme of direct relevance to island tourism. With reference to the role of involvement of civil society and business in environmental governance, Alberton and Palermo (2012), in their introduction to the book, refer to the "the new environmental governance" involving a wide range of stakeholders in decision-making processes. The authors state that following the mode of governance based on command and control regulation and later based on market-based instruments, a new phase was evolving with its most important features being regularity flexibility and collaborative multi-level governance.

Another issue that is commonly discussed with regard to environmental governance, of direct relevance to tourism, is the extent to which it should be market oriented. Cashore (2002) refers to non-state-market-driven governance systems, the purpose of which is to develop and implement environmentally and socially responsible management practices. Instead of traditional state authority, these systems rely on market's supply chain to create incentives. However, the author concludes that the quest for profit-maximising alone, while very important, does not take into account the complex environmental governance systems and the types of legitimacy-granting evaluations that occur. The environmental governance approaches suggested by the author to replace state-centred modes would require the support of stewardship organisations for moral reasons, and standards organisations for pragmatic reasons.

17.3 Tourism and Tourism Policy in Malta

17.3.1 Incoming Tourists

The number of tourists visiting Malta has increased rapidly between 2010 and 2018 as can be seen from Fig. 17.1, with incoming tourists almost doubling, increasing from 1.33 million to 2.59 million during that period, at an average annual rate of 8.7% per annum.

Receipts from tourism have also increased rapidly between 2010 and 2018, at an average annual rate of 8.1% per annum in nominal terms. Expenditure per capita, however, tended to decrease at an average annual rate of 3.5% during this same period.

Tourism in Malta is seasonal, as shown in Fig. 17.2. In 2017, 46% of tourists visited Malta during the summer months (June to September), mostly in August, while about 15% visited during the winter months (December to February). The remaining 39% visited during the shoulder months (March to May, October and November).

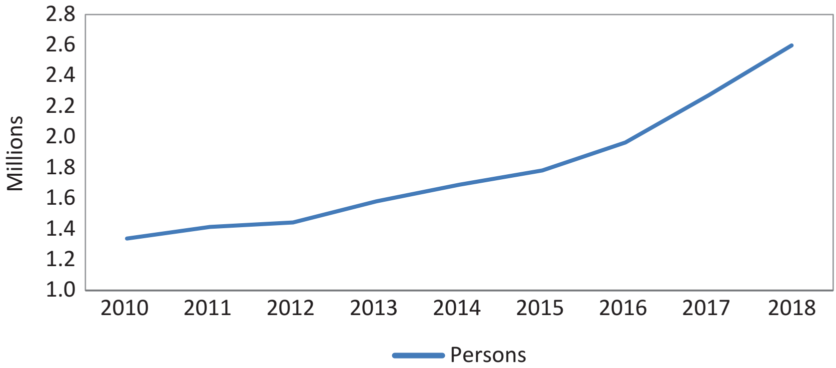


Fig. 17.1 Inbound tourism. (Source: Malta Tourism Authority [2018]. *Tourism in Malta—Facts and Figs. 2017*)

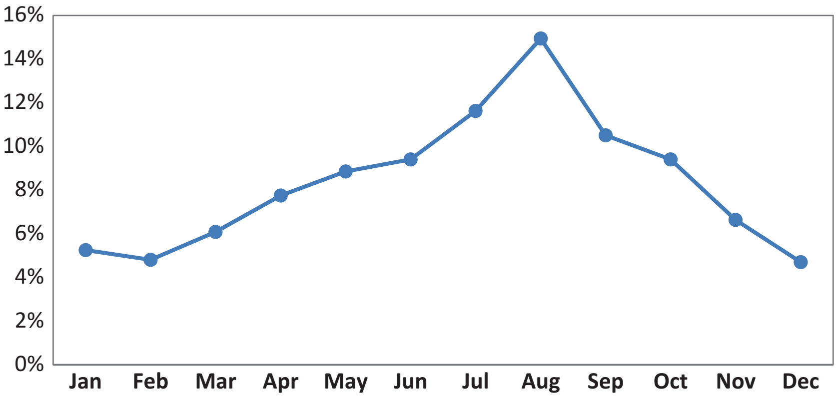


Fig. 17.2 Seasonal tourism, 2017. (Source: Malta Tourism Authority 2018)

17.3.2 Motives for Visiting Malta

About 75% of tourist visit Malta as holiday destination. The remaining 25% visit mostly for business reasons and to visit their family or friends. According to the Malta Tourism Authority (MTA) survey for 2017, Malta's main tourist attraction are considered to be its climate and surrounding sea, as well as its historical and cultural heritage (MTA 2018). Other important motives were scuba diving and English language tuition.

17.3.3 Why Tourism Increased Rapidly

Despite the various downsides of tourism in Malta,[1] the sector has grown rapidly since 2010. This may be due to various factors including the increase in the operations of low-cost carriers, which have probably contributed to favourable airline fares, improved connectivity and publicity for Malta[2] (Attard 2018; Graham and Dennis 2010; Pulina and Cortés-Jiménez 2010). Political problems in competing destinations in North Africa and the Middle East may have also contributed to the increase of tourism inflows in Malta.

17.3.4 Official Tourism Policy in Malta

There are various documents which delineate the Maltese government's strategies, policies and plans relating to tourism. Malta's congenial climate, its sea, its culture and its historical heritage are often mentioned as major attractions, and these documents are accompanied by pictures depicting these attractions.

Sustainability is given some prominence as well in these documents. For example, in 2007, one of the main objectives of the Nationalist Government's Tourism Policy for the Maltese Islands 2007–2011 was to "Develop tourism in a sustainable way to ensure an improved quality of life through the conservation and maintenance of environmental and socio-cultural resources" (Ministry for Tourism and Culture 2007). In 2012, the same government issued another document (Ministry for Tourism, Culture and the Environment 2012) updating the tourism policy for the period 2012–2016, again referring to sustainability throughout the document. With a change in government, a new tourism policy for 2015–2020 was published (Ministry for Tourism 2015). Again, the lofty objective of sustainability was mentioned in different parts of the document.

In practice however, sustainability was often offered lip-service only and the success of the industry was generally measured in terms of tourist numbers by the tourism authorities. The dependence of mass tourism continued unabated, and very little, if at all, was done to reverse this trend.

The objective of improving the quality of tourist often features in the mentioned government policy and plans but the reverse may have happened in practice. With the increasing presence of low-cost carriers and cheap travel from Sicily, the dependence on low-quality tourism has very probably increased.

17.3.5 Overtourism in Malta

There seems to be a growing awareness of the downsides of overtourism in the Maltese Islands. An interesting stance was taken by the Malta Hotels and Restaurants Association (MHRA)[3] when in 2014 the Association called for a tourism vision with a longer-term perspective, based on sustainable development.[4] A similar call was made in 2018 by the same Association when it called the authorities to establish the maximum number of tourists that Malta can cope with due to its limited geographical size and high population density.[5]

Academics at the University of Malta also sounded alarm bells at the prospect of overtourism (Ebejer et al. 2018).[6]

So far, there have not been public demonstrations in Malta against overtourism, but the awareness among local communities that too much tourism has various downsides is growing.

17.4 Survey on Overtourism and Environmental Degradation in Malta

In early 2019, the present authors conducted an on-line survey (using the Qualtrics software[7]) of 400 respondents from Malta and Gozo, to assess whether overtourism existed in Malta and to explore views on its environmental impact.

The first part of the questionnaire dealt with information about the respondent regarding various categories including age, education, residence and connection with tourism business.

The second part consisted of the following statements to which the respondents were asked to agree or disagree:

1. I wish to see more tourists residing in the town/village where I reside.
2. I think that an excessive number of tourists create social discomfort in the town/village where I reside.
3. I think that excessive number of tourists degrade the physical environment of the town/village where I reside.

4. I wish to see more hotels built and restaurants and other shops opened in the town/village where I reside to cater for tourists.

The third part consisted of two additional questions related to the respondents' perceptions regarding the advantages and disadvantages of tourism and the reasons for rapid increase in tourist inflows into Malta.

The responses to the six statements were cross-compared with age, educational attainment, residing in high-tourist-density locations and having an occupation in tourist-related business. It was assumed that older persons, persons with high levels of education, persons living in high-tourism-density localities and persons not working directly in the tourist sector would tend to be less welcoming of high tourism influx than the other corresponding categories of respondents. The cross-comparison with income could not be tested as many respondents did not divulge their income.

Here we only report on survey responses relevant to the theme of this chapter, namely those relating to overtourism and environmental impacts.

17.4.1 The Responses

In response to the statement "I wish to see more tourists in the town/village where I reside", only 18.3% of the respondents agreed that they wished to see more tourists in their town or village, while 51% of the respondents disagreed.[8] The remaining 30.7% were undecided. The vast majority of respondents who agreed or disagreed (excluding those who neither agreed nor disagreed) were therefore against a tourism inflow increase. The results were interpreted as indicating that overtourism exists.

Respondents living in high-tourist-density localities and those aged 60+ years expressed a lower degree of agreement than the average in their wish to see more tourists in their location. Conversely, respondents who work directly in tourism-related occupations showed a significantly higher degree of agreement with the statement than the average.

17.4.2 Degradation of the Environment Caused by Tourists

In response to the statement "I think that too many tourists degrade the physical environment of the town/village where I reside", 45.8% agreed, 37.8% disagreed and 16.4% were undecided. Again, as expected, respondents living in high-tourist-density locations expressed a higher degree of agreement than the average in associating tourism with environmental degradation.

17.4.3 Advantages and Disadvantages of Tourism

The respondents were asked to mention up to two important advantages and up to two important disadvantages of tourism. This question did not contain any prompted advantages or disadvantages.[9]

The main advantages reported related to economic benefits in terms of income and employment.

The main disadvantages of tourism mentioned by respondents are the following, with environmental degradation being given most mentions.

1. Environmental degradation, including generation of waste and excessive construction activity (44%)
2. Overcrowding, traffic congestion and noise (33%)
3. Loss of cultural identity and socio-cultural clashes, including bad behaviour by tourists (15%)
4. Price increases, including rent, partly due to demand by tourists (5%)
5. Unbalanced economy due to excessive dependence on tourism (2.3%)

17.4.4 Other Comments

The respondents were asked to add comments if they so wished, and 68 out of 400 respondents did so. Most comments started with the admission that tourism generates economic benefits, but then went on to mention a number of tourism-related problems. A common problem that was identified related to the environment, mostly due to the rapid and seemingly badly planned construction of hotels and other tourist-related buildings, the strain on resources and the generation of waste and litter caused by the large number of tourists, pointing to weakness in environmental governance.

Other frequent comments referred to overcrowding, traffic congestion and noise pollution in certain areas caused by the high number of tourists, factors often associated with environmental degradation and weak environmental governance.

Some comments related to the need to introduce an environmental tax, the need to increase the funding to Local Councils in areas with high tourist density so as to generate funds for upgrading these areas and the need to involve the local community in decision-making relating to tourism. All these matters are again associated with environmental governance.

17.5 Implications and Conclusion

The literature review presented in this chapter as well as responses from our survey indicate that economic benefit is the main advantage that can be derived from tourism while environmental degradation is one of the main disadvantages. As discussed earlier, environmental degradation is often associated with weak environmental governance.

The results of our survey indicate that in the Maltese Islands overtourism appears to have set in, given the consistent responses by the majority of respondents who agreed or disagreed (excluding those who remained neutral in this regard) that they do not wish to see more tourists in their location, associating the excessive number of tourists with social discomfort and environmental degradation.

An implication of these results is that Malta should aim at higher-spending tourists, given the wish expressed by most respondents that volume of respondents should not increase, whereas at the same time, tourism is considered as an important contributor to the economy.

This requires that the Maltese Islands become a better-quality destination. However, as things have developed in recent years, the authorities would seem to disregard the necessity of upgrading the tourist product in practice, although a lot of lip-service is paid to this requirement.

The present study clearly suggests that good environmental governance is called for and that government policy should aim at mitigating the negative environmental effects of tourism not just for the well-being of the local residents but also to give a positive and memorable experience to the tourist. For this purpose, rationing tourism inflows in line with the carrying capacity of the destination[10] should be encouraged. Such an exercise should be carried out in the context of democratisation of tourism development planning, involving the active participation of stakeholders, including, most importantly, the host community. This would not probably be an easy policy to carry out, as there are various conflicting interests and agendas involved in tourism. For example, business interests, often seeking short-term gains, rather than social responsibility, are not likely to relish constraints on their freedom of operation in order to protect the environment. Politicians often gain political mileage by bragging about tourism numbers.As a result, the tourist industry may generate negative social, cultural and environmental impacts. These impacts have a long-term dimension and are hard to quantify and validate, rendering the democratisation process even more challenging.

However, to end with an optimistic note, tourism itself, particularly overtourism, tends to generate a higher degree of awareness, among the host community, of the benefits of good environmental governance, involving inclusiveness in decision-making in this regard, and the movements against overtourism in various parts of the world attest to this.

Notes

1. See Mulvihill (2016), Scicluna (2017) and Dodds (2007) for a list of tourism downsides in Malta.
2. Low-cost carriers operate from a large number of airports and the name "Malta" is shown on the screens showing arrivals and departure. This serves to make thousands of passengers aware of Malta as a low-cost carrier destination.
3. The MHRA is an association representing the owners of tourism business establishments. More information is Available on line at: http://mhra.org.mt/sample-page/about-the-mhra/
4. https://www.timesofmalta.com/articles/view/20140617/local/mhra-suggests-setting-maximum-carrying-capacity-for-malta-as-it-calls.523836
5. Available on line at: https://www.timesofmalta.com/articles/view/20180518/local/mhra-tourism-warning.679389
6. Available on line at: https://www.um.edu.mt/newspoint/events/umevents/2017/12/tourismcarrying-capacityinmalta
7. The survey was distributed through Facebook, using a number of Facebook Group sites in Malta. The target of 400 responses by Maltese residents aged 18 and over was set in line with accepted statistical procedure relating to the size of the sample in relation to the population, and once this number of respondents was reached, no further responses were considered. On the advantages and disadvantages of using on-line questionnaires, see Stern et al. (2017) and Kuru and Pasek (2016).
8. In all categories the difference between the proportion of those who agreed and those who disagreed was statistically significant at the 5% level.
9. The manner in which the responses were measured is explained in Briguglio and Avellino (2019).
10. In Malta, the number of tourists in 2018 was about five times the size of the population, rendering Malta as a destination with one of the highest

tourist densities in the world. According to Smith (2017), basing on United Nations World Tourism Organization (UNWTO) 2014 Statistics, the destinations with the highest tourism density per capita were almost all small islands, with Malta ranking 14th in the world.

References

Ahmad, F., Draz, M., & Su, L. (2018). *Taking the Bad with the Good: The Nexus Between Tourism and Environmental Degradation in the Lower Middle Income Southeast Asian Economies*. Available on line at SSRN e-library: https://ssrn.com/abstract=3206531. Accessed 30 Nov 2019.

Alberton, M., & Palermo, F. (Eds.). (2012). *Environmental Protection in Multi-Layered Systems: Comparative Lessons from the Water Sector* (Vol. 1). Leiden: Martinus Nijhoff Publishers.

Andereck, K., & Vogt, C. A. (2000). The Relationship Between Residents' Attitudes Toward Tourism and Tourism Development Options. *Journal of Travel Research, 39*(1), 27–36.

Andereck, K., Vogt, C. A., Valentine, K. M., & Knopf, R. C. (2007). A Cross-cultural Analysis of Tourism and Quality of Life Perceptions. *Journal of Sustainable Tourism, 15*(5), 483–502.

Archer, B. (1977). *Tourism Multipliers: The State-of-the-Art*. Cardiff: University of Wales Press.

Archer, B., Cooper, C., & Ruhanen, L. (2005). The Positive and Negative Impacts of Tourism. In W. F. Theobald (Ed.), *Global Tourism 3* (pp. 79–102). Amsterdam: Elsevier.

Attard, S. (2018). The Evolution of Malta's Tourism Product over Recent Years. *Central Bank of Malta Quarterly Review, 2018*(4), 41–55.

Bastias-Perex, P., & Var, T. (1995). Perceived Impacts of Tourism by Residents. *Annals of Tourism Research, 22*, 208–209.

Briguglio, L. (1992). Tourism Multipliers in the Maltese Economy. In P. Johnson & B. Thomas (Eds.), *Perspectives on Tourism Policy* (pp. 69–86). London: Mansell Publishers.

Briguglio, L., & Briguglio, M. (1996). *Sustainable tourism in the Maltese islands. Sustainable tourism in islands and small states: case studies*, 162–179. London, Pinter Publishers.

Briguglio, L. (2008). Sustainable Tourism on Small Island Jurisdictions with Special Reference to Malta. *Journal of Tourism Research, 1*(1), 29–39.

Briguglio, L., & Avellino, M. (2019). Has Overtourism Reached the Maltese Islands? *Occasional Papers on Islands and Small States*. ISSN 1024-6282, Number: 2019/01: Islands and Small States Institute of the University of Malta.

Bryden, J. M. (1973). *Tourism and Development: A Case Study of the Commonwealth Caribbean*. Cambridge: Cambridge University Press.

Buckley, R. (2011). Tourism and Environment. *Annual Review of Environment and Resources, 36*, 397–416.

Butler, R. W. (1980). The Concept of a Tourist Area Cycle of Evolution: Implications for Management of Resources. *Canadian Geographer/Le Géographe Canadian, 24*(1), 5–12.

Butler, R. W. (1996). The Concept of Carrying Capacity for Tourism Destinations: Dead or Merely Buried? *Progress in Tourism and Hospitality Research, 2*(3), 283–293.

Butler, R. W. (1999). Sustainable Tourism: A State–of–the–Art Review. *Tourism Geographies, 1*, 7–25.

Butler, R. W. (2000). Tourism and the Environment: A Geographical Perspective. *Tourism Geographies, 2*(3), 337–358.

Cashore, B. (2002). Legitimacy and the Privatization of Environmental Governance: How Non–Tate Market–driven (NSMD) Governance Systems Gain Rule–Making Authority. *Governance, 15*(4), 503–529.

Castellani, V., Sala, S., & Pitea, D. (2007). A New Method for Tourism Carrying Capacity Assessment. Ecosystems and Sustainable Development VI. *Transactions on Ecology and the Environment, 106*, 365–374.

Chamberlain, K. (1997). *Carrying Capacity* (UNEP Industry and Environment 8). Paris: UNEP.

Coccossis, H., Mexa, A., Collovini, A., Parpairis, A., & Konstandoglou, M. (2001). *Defining, Measuring and Evaluating Carrying Capacity in European Tourism Destinations.* B4-3040/2000/294577/MAR/D2. Final Report, Athens. http://ec.europa.eu/environment/iczm/pdf/tcca_en.pdf

Diedrich, A., & García-Buades, E. (2009). Local Perceptions of Tourism as Indicators of Destination Decline. *Tourism Management, 30*(4), 512–521.

Dixon, J., Hamilton, K., Pagiola, S., & Segnestam, L. (2001). Tourism and the Environment in the Caribbean: An Economic Framework. Environment Department Paper, No. 80, Washington DC, The World Bank

Dodds, R. (2007). Malta's Tourism Policy: Standing Still or Advancing Towards Sustainability? *Island Studies Journal, 2*(1), 47–66.

Doxey, G. V. (1975). A Causation Theory of Visitor/Resident Irritants: Methodology and Research Inferences. In *Proceedings of the Travel Research Association 6th Annual Conference* (pp. 195–198). San Diego: Travel Research Association.

Ebejer, J., Butcher, J., & Avellino, M. (2018). *Overtourism: Is It Over for the Growth of Tourism*? Available on line at: https://www.um.edu.mt/library/oar//handle/123456789/42426. Accessed on 30 Nov 2019.

Farrell, B. H., & Runyan, D. (1991). Ecology and Tourism. *Annals of Tourism Research, 18*(1), 26–40.

Goodwin, H. (2017). *The Challenge of Overtourism*. Responsible Tourism Partnership Working Paper. Available on line at: http://haroldgoodwin.info/pubs/RTP'WP4Overtourism01'2017.pdf. Accessed on 30 Nov 2019.

Graham, A., & Dennis, N. (2010). The Impact of Low-Cost Airline Operations to Malta. *Journal of Air Transport Management, 16*(3), 127–136.

Hampton, M., & Hampton, J. (2009). Is the Beach Party Over? Tourism and the Environment in Small Islands: A Case Study of Gili Trawangan, Lombok, Indonesia. In *Tourism in Southeast Asia: Challenges and New Directions* (pp. 286–308). Copenhagen: NIAS Press.

Hardy, A., Beeton, R. J. S., & Pearson, L. (2002). Sustainable Tourism: An Overview of the Concept and Its Position in Relation to Conceptualization of Tourism. *Journal of Sustainable Tourism, 10*, 475–496.

Jovicic, D., & Dragin, A. (2008). The Assessment of Carrying Capacity – A Crucial Tool for Managing Tourism Effects in Tourist Destinations. *Turizam, 12*, 4–11.

Kennel, J. (2016). Carrying Capacity. In *Encyclopedia of Tourism* (pp. 133–135). Switzerland: Springer International Publishing.

Khan, H., Phang, S. Y., & Toh, R. S. (1995). The Multiplier Effect: Singapore's Hospitality Industry. *Cornell Hotel and Restaurant Administration Quarterly, 36*(1), 64–69.

Kuru, O., & Pasek, J. (2016). Improving Social Media Measurement in Surveys: Avoiding Acquiescence Bias in Facebook Research. *Computers in Human Behavior, 57*, 82–92.

Lemos, M. C., & Agrawal, A. (2006). Environmental Governance. *Annual Review of Environment and Resources, 31*, 297–325.

Liu, Z. (2003). Sustainable Tourism Development: A Critique. *Journal of Sustainable Tourism, 11*(6), 459–475.

Liu, R. Z., & Borthwick, A. G. L. (2011). Measurement and Assessment of Carrying Capacity of the Environment in Ningbo, China. *Journal of Environmental Management, 92*, 2047–2053.

López-Bonilla, L. M., & López-Bonilla, J. M. (2008). Measuring Social Carrying Capacity: An Exploratory Study. *Tourismos: An International Multidisciplinary Journal of Tourism, 3*(1), 116–134.

Malta Tourism Authority. (2018). *Tourism in Malta – Facts and Figures 2017*. Malta: MTA.

Manning, R. E. (2002). How Much is Too Much? Carrying Capacity of National Parks and Protected Areas. In A. Arnberger, C. Brandenburg, & A. Muhar (Eds.), *Proceedings International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas* (pp. 306–313). Wien: Bodenkultur University Vienna.

Martín, J., Guaita Martínez, J., & Salinas Fernández, J. (2018). An Analysis of the Factors behind the Citizen's Attitude of Rejection towards Tourism in a

Context of Overtourism and Economic Dependence on This Activity. *Sustainability, 10*(8), 2–18.

Mathieson, A., & Wall, G. (1982). *Tourism, Economic, Physical and Social Impacts.* London/New York: Longman.

McCool, S. F., Moisey, R. N., & Nickerson, N. P. (2001). What Should Tourism Sustain? *Journal of Travel Research, 40*(2), 124–131.

McElroy, J. L., & De Albuquerque, K. (1998). Tourism Penetration Index in Small Caribbean Islands. *Annals of Tourism Research, 25*(1), 145–168.

McElroy, J. L., & de Albuquerque, K. (2002). Problems for Managing Sustainable Tourism in Small Islands. In *Island Tourism and Sustainable Development: Caribbean, Pacific, and Mediterranean Experiences* (pp. 15–31). London: Praeger.

Mexa, A., & Coccossis, H. (2004). Tourism Carrying Capacity: A Theoretical Overview. In H. Coccossis & A. Mexa (Eds.), *The Challenge of Tourist Carrying Capacity Assessment* (pp. 37–53). Hants: Ashgate Publishing.

Middleton, V. C., & Hawkins, R. (1998). *Sustainable Tourism: A Marketing Perspective*. Oxford: Butterworth-Heinemann.

Milano, C. (2017). *Overtourism and Tourismphobia: Global Trends and Local Contexts*. Barcelona: Ostelea School of Tourism and Hospitality.

Milano, C., Cheer, J. M., & Novelli, M. (2018). Overtourism: A Growing Global Problem. *The Conversation*. Available online: https://theconversation.com/overtourism-a-growing-global-problem-100029. Accessed on 30 Nov 2019.

Ministry for Tourism. (2015). *National Tourism Policy*. Available on line at: https://tourism.gov.mt/en/Documents/FINALBOOKLETexport9.pdf. Accessed on 30 Nov 2019.

Ministry for Tourism and Culture. (2007). *Tourism Policy for the Maltese Islands 2007–2011*. Available on line at: https://tourism.gov.mt/en/departments-sections-units/pages/departments-sections-units%20sub%20pages/eu%20affairs%20and%20policy%20development/tourism%20policy.pdf. Accessed on 30 Nov 2019.

Ministry for Tourism, Culture and the Environment. (2012). *Tourism Policy for the Maltese Islands: 2012–2016*. Available on line at: https://tourism.gov.mt/en/Departments-Sections-Units/Pages/Departments-Sections-Units%20Sub%20Pages/EU%20Affairs%20and%20Policy%20Development/Grant%20Scheme%20for%20Tourism/Call4/Tourism_Policy_2012-2016.pdf. Accessed on 30 Nov 2019.

Mulvihill, L. (2016). *Thirteen Truths (Good and Bad) You'll Discover When Visiting Malta*. In Europe, Lifestyle, Malta, Retirement/Living, Travel. Available on line at: https://www.liveandinvestoverseas.com/travel/13-truths-when-visiting-malta/. Accessed on 30 Nov 2019.

Murphy, P. E. (1998). Tourism and sustainable development. In W. F. Theobald (Ed.), *Global Tourism* (pp. 173–190). Oxford: Butterworth-Heinemann.

Nghi, T., Thanh Lan, N., Dinh Thai, N., Mai, D., & Xuan Thanh, D. (2007). Tourism Carrying Capacity Assessment for Phong Nha – Ke Bang And Dong Hoi, Quang Binh Province. *VNU Journal of Science, Earth Sciences, 23*, 80–87.

Papageorgiou, K., & Brotherton, I. (1999). A management Planning Framework Based on Ecological, Perceptual and Economic Carrying Capacity: The Case Study of Vikos-Aoos National Park, Greece. *Journal of Environmental Management, 56*(4), 271–284.

Pigram, J. J. (1990). Sustainable Tourism-Policy Considerations. *Journal of Tourism Studies, 1*(2), 2–9.

Plog, S. (1977). Why Destinations Rise And Fall In Popularity. In E. Kelly (Ed.), *Domestic and International Tourism* (pp. 26–28). Wellesley: Institute of Certified Travel Agents.

Pulina, M., & Cortés-Jiménez, I. (2010). Have Low-Cost Carriers Influenced tourism Demand and Supply? The Case of Alghero, Italy. *Tourism Analysis, 15*(6), 617–635.

Ruhanen, L., Weiler, B., Moyle, B. D., & McLennan, C. L. (2015). Trends and Patterns in Sustainable Tourism Research: A 25-Year Bibliometric Analysis. *Journal of Sustainable Tourism, 23*(4), 517–535.

Sawkar, K., Noronha, L., Mascarenhas, A., Chauhan, O. S., & Saeed, S. (1998). *Tourism and the Environment – Case Studies on Goa, India, and the Maldives.* Washington, DC: The World Bank.

Scicluna, M. (2017, April 19). Quality Tourism. *The Times of Malta*. Available at: https://timesofmalta.com/articles/view/Quality-tourism.645595. Accessed on 30 Nov 2019.

Silver, J. (2018) Airbnb and the Short-Term Rental Revolution – How English Cities Are Suffering. *The Conversation*. Available on line http://theconversation.com/airbnb-and-the-short-term-rental-revolution-how-english-cities-are-suffering-101720. Accessed on 30 Nov 2019.

Simmons, D. G. (1994). Community Participation in Tourism Planning. *Tourism Management, 15*, 98–108.

Smith, O. (2017). *The 51 Destinations Where Tourists Outnumber Locals*. Available on line at: https://www.telegraph.co.uk/travel/maps-and-graphics/countries-where-tourists-outnumber-locals/. Accessed on 30 Nov 2019.

Stanchev, R. (2018). *The Most Affected European Destinations by Over-Tourism*. Faculty of Tourism, University of the Balearic Islands, Palma de Mallorca.

Stephanos, K., & Polo, A. (2016). The Multiplier of Tourism and Its Beneficial Properties for the National and Local Economy. *Journal of Regional and Socio-Economic Issues, 6*(1), 49–61.

Stern, M. J., Bilgen, I., McClain, C., & Hunscher, B. (2017). Effective Sampling from Social Media Sites and Search Engines for Web Surveys: Demographic and Data Quality Differences in Surveys of Google and Facebook Users. *Social Science Computer Review, 35*(6), 713–732.

Tribe, J. (1999). *The Economics of Leisure and Tourism*. Oxford: Butterworth-Heinemann.

Tribe, J., Font, X., Grittis, N., Vickery, R., & Yale, K. (2000). *Environmental Management for Rural Tourism and Recreation*. London: Cassell.

Vogel, H. L. (2001). *Travel Industry Economics*. Cambridge: Cambridge University Press.

Wagar, J. A. (1964). The Carrying Capacity of Wildlands for Recreation. *Forest Science Monographs, 7*, 1–23.

Walmsley, A. (2017). *Overtourism and Underemployment: A Modern Labour Market Dilemma*. Paper Presented at Responsible Tourism in Destinations 13 – Tackling Overtourism – Local Responses, 29–30 September 2017 – Hannesarholt, Reykjavik, Iceland.

WTO. (1981). *Saturation of Tourist Destinations*. Madrid: Report of the Secretary General.

Zaei, M. E., & Zaei, M. E. (2013). The Impacts of Tourism Industry on Host Community. *European Journal of Tourism Hospitality and Research, 1*(2), 12–21.

Zelenka, J. (2014). The Concept of Carrying Capacity in Tourism. *Amfiteatru Economic Journal, 16*(36), 641–654.

PART V

Global Environment and Sustainable Development

CHAPTER 18

International Climate Diplomacy, Collective Action and SIDS

Larry D. Schroeder and Shyam Nath

18.1 Introduction

Climate change, particularly global warming, can have a profound effect on the welfare of Small Island Developing States (SIDS). What is vital is that while there are growth prospects, climate adversaries are more profound (see Nath and Madhoo in this volume on climate change, sea-level dynamics and mitigation). The science behind these changes in the climate is well understood as are the alterations in human behaviours necessary to stabilize or even reverse planetary warming. However, the adoption and implementation of the public policies required to bring about the behavioural changes are much more difficult to achieve. There are some good reasons for this. The policy challenges are linked to the fact that even though the behaviours that lead to climate change occur in one location,

L. D. Schroeder (✉)
Syracuse University, Syracuse, NY, USA
e-mail: ldschroe@maxwell.syr.edu

S. Nath
Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, India
e-mail: shyamnath@am.amrita.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_18

their effects are experienced throughout the world. There are also other attributes of this phenomenon that create policy challenges. These attributes that create challenges to effective policies are nicely summarized in Wagner and Weitzman's (2015) popular book *Climate Shock: The Economic Consequences of a Hotter Planet*. They assert that global warming has four important attributes—it is global, long term, irreversible and uncertain. Global means we are all affected regardless of whether or not we add to the problem. This point is certainly obvious to the residents and leaders of SIDS. As Wagner and Weitzman (2015, p. 8) add, "It doesn't matter where on the planet a ton is being emitted. Impact may be regional, but the phenomenon is global and – among environmental problems – almost uniquely so".

The fact that the effects are long term and uncertain also create obstacles for effective public policies to be carried out immediately. There are costs associated with lowering carbon dioxide (CO_2) emissions; for example, clean production of electricity may be more costly than using coal and these costs are realized by current electricity consumers whereas the benefits of a cleaner environment with less carbon in the air will be enjoyed only over the long-term future. Likewise, there is still uncertainty about the timing of these outcomes. This uncertainty brings with it a willingness of policy makers to opt on the side of doing little or nothing immediately since the highly predictable current costs of undertaking policies may exceed the *expected costs* of not undertaking those policies. Thus, there are unfortunately reasons why policy makers in individual countries are hesitant in moving forward to alleviate the excess carbon being emitted into the atmosphere. The less than hoped for outcomes of climate meetings such as the Kyoto Protocol, Montreal treaty and Paris21 negotiations reflect this hesitancy on the part of many nations to implement the policies necessary to combat global warming.

The objective here is to consider what the economics and international relations literatures suggest might be ways to encourage nations to undertake the collective actions necessary to meet the targets of global CO_2 emissions which can lead to less catastrophic outcomes currently forecast for many of the SIDS. The following section addresses the issue of free riding that is generally anticipated to occur in cases of international public goods and the role of leadership necessary to lead to positive collective outcomes. Section 3 concentrates on how to promote inter-nation cooperation with particular attention paid to climate clubs. A final section summarizes the arguments made here.

18.2 International Cooperation for Climate Change Policy

When global warming is slowed, in general, all countries benefit. From political science and economic theory, the improvements in environmental conditions throughout the world are known as international public goods. The dilemma created by an international or global public good is that it creates a strong incentive for free riding. As noted above, policies that reduce pollutants that contribute to climate change generally impose costs on countries that carry out such policies. A country therefore may have an incentive *not* to undertake such policies under the presumption that if all other countries implement efforts to reduce global climate change, that country can reap the environmental benefits without having to bear any of the costs. In that sense the country is free riding on the efforts of other jurisdictions. Of course, if all or even the majority of countries follow this strategy, there would be no aggregate positive effect on slowing climate change.

Free riding is not unique to climate change; it has been acknowledged as a potential problem for all public goods whether local, regional or country wide in scope.[1] Solving the free rider problem requires for the parties involved to reach a joint decision often called “collective action”. The collective decision must also include provision to monitor the actions of the various interested parties and to punish those that break the rules in an attempt to become a free rider.

The generic issues of reaching collective decisions have been studied at various levels, from relatively small groups of individual actors to nations with the issue of global climate change as an example of national decision-making. An interesting exploration of the alternative types of outcomes from a collective decision-making process at the international level is found in Barrett (2007). He distinguishes among various types of international public goods and acknowledges that in some instances a single nation may find it in its own self-interest to intervene and handle the international public good. The hypothetical example he cites is of an asteroid hurtling through the atmosphere that, if/when it strikes earth, would lead to widescale destruction of property and loss of life over the entire world. A single (probably wealthy) nation could find it in its self-interest to destroy or somehow reroute the asteroid using its own resources even though all humanity on earth would benefit.

Sandler (2010) provides a list of factors that can improve the likelihood that nations will undertake policies to correct for the problems of global public goods. One important entry on his list is the expectation of benefits, net of the costs of those policies. According to Sandler, it is desirable that policies lead to mutual net gains for all countries as opposed to some gaining and others losing. Closely linked is the hypothesis that outcomes be equitable and, as suggested above, that the expected net benefits be realized in the fairly near term as opposed to far in the future.[2] Another factor, originally hypothesized by Olson (1965) in his pathbreaking book on collective action, is the number of participants affected by the public good; of course, in the case of climate change the number of the affected parties (nations) is extremely large hence lowering the likelihood of a successful outcome.

Another factor on Sandler's list is "leadership". It is this factor that may be most relevant for SIDS. In the case of SIDS the Alliance of Small Island States (AOSIS) can provide a mechanism for leadership for policies to fight the adversaries of climate change. Indeed the AOSIS was formed at the Second World Climate Conference in 1990 as the SIDS recognized the importance of climate change to their long-term viability.[3] Unfortunately in spite of the potential extremely high costs of climate change on small island states, the SIDS do not possess tremendous power to lead climate change policy reforms. However, as analysed by Corneloup and Mol (2014), there are other ways that the SIDS can exhibit leadership in the climate change debate and, thereby, help to overcome the collective action problems associated with an international public good.

Corneloup and Mol (2014) note that various authors, for example, Young (1991), Underdal (1994), Tallberg (2006) and Mitchell (2010), "have emphasized the role of leadership in achieving results in international negotiations" (p. 284) with negotiations critical for coping with collective action issues. That literature posits four types of leadership strategies—structural, entrepreneurial, intellectual and environmental. The first of these relies on the power of the negotiator—with its power obtained from its high level of resources and economic wealth. Obviously, the SIDS cannot rely on this leadership strategy given their relatively low level of resources.

According to this institutional bargaining model of leadership in international negotiations, structural power is not the only strategy that countries use to lead. As articulated by Corneloup and Mol, entrepreneurial leadership entails using strategies to help set the agenda and determine which issues will be given most attention. Intellectual leadership emphasizes science and research-based ideas to support positions taken by such leaders. An environmental leader illustrates how policies implemented in his or her own domestic situations have led to improvements and, therefore, makes it likely that the policies can work on an international scale.

Corneloup and Mol then illustrate how representatives of small island states used these various strategies prior to the Copenhagen Summit in December 2009 in three different portions of the overall agenda—the limit to rising temperatures, how vulnerable countries could fund any policies and the degree to which any policies would be legally bounded. The evidence provided, based on a variety of background source information, supports the three leadership approaches suggested in the bargaining model. But, based on their overall assessment, the authors suggest that at the heart of the bargaining methods used by representatives of the SIDS was "moral" leadership. That is, by emphasizing the potential effects on their citizenry of climate change, negotiators from the small island states were able to play a role in the proceedings considerably greater than what their populations and economic wealth would predict and, as such, help at least a bit in achieving a collective approach to climate change.[4]

18.3 Specific Collective Policy Approaches to Mitigation of Effects of Climate Change

If the small island states can provide leadership in the international fight against climate change, there remains the question of an effective organizational design that would lead to collective action. How can sovereign states be organized to work together and implement policies to slow global warming which can and will have such disastrous effects on the SIDS?

One interesting organizational approach that has gained considerable attention in the literature is through the use of "climate clubs" (see Box 18.1 on categorization of club goods). The concept of "clubs" to overcome market failures associated with public goods and their variants has a long history in public economics.[5] But even in that literature as well as the more recent discussion of climate clubs, there are alternative conceptual approaches to the formation of clubs. One approach is based on the voluntary formation and joining of a club whereas the other focuses on club formation almost entirely to overcome the issue of free riding. In this section, we consider each starting with the one that emphasizes free riding minimization.

Box 18.1 Club Goods

In the economics literature, a public good is one where not only can non-payers enjoy that good but also if the good is consumed (enjoyed) by one, it does not diminish the availability of the good to others. A variation on this situation is where it is feasible to exclude those unwilling or unable to pay but where one's enjoyment of the good does not diminish others from consuming the good, at least until the use of the good or service becomes congested. It is in this variation on public goods that the idea of a "club" good was formed. The most thorough initial elaboration on club goods is that of Buchanan (1965) who illustrated that by forming a club with the ability to exclude those unwilling to pay, the club could continue to add members to the point where adding additional members would lead to congestion in utilizing the services offered by the club. An example would be of a swimming pool which is fenced. Since there are significant fixed costs associated with the operation of the pool, adding more members decreases the cost per member. However, at some point the pool could be congested, therefore no additional members would be allowed to join since the total costs per member including the congestion costs would exceed the additional benefits current members enjoy.

18.3.1 Exclusionary Approach to a Climate Club

In this case, the club is established in order to provide benefits to its members and, by excluding non-members, ensure that they do not free ride and obtain the benefits of the club's service. The paper by Nordhaus (2015) takes this approach. He argues that an effective way to combat climate change would be for a climate club to be formed that includes nations willing to implement policies designed to diminish the production of greenhouse gases (GHG) that constitute the primary causal factor associated with climate change. If the member countries succeed in lowering GHG emissions, not only do they benefit (along with future generations) *but* also do the non-members of the club. That is, the non-member nations become free riders and do not have to bear the costs of imposing policies that lower GHG emissions locally. The question then is how to create incentives in the system to overcome such free riding.

Nordhaus proposes the use of sanctions against non-member nations of the club. Specifically, he recommends imposing tariffs on imports from non-member nations into club member nations. Since exports can be substantial income generators for many countries, it is anticipated that this form of sanction would encourage an exporting country to join the club. Nordhaus goes on to consider whether the tariffs should be linked to the amounts of carbon contained in the imported product or more simply be a uniform tariff imposed on all imports from the non-club member country. He opts for the latter given the administrative costs of implementing a carbon-based duty. What is not discussed by Nordhaus (as he admits) are the political and legal issues associated with creation of a climate club in this form, particularly through the use of tariffs as the sanctioning mechanism. For example, trade treaties could preclude the use of tariffs as sanctioning device.

One issue that is considered by Nordhaus and which is relevant to the discussion below is how such a climate club would be established. His conclusion is that a "top-down" approach will be necessary; that is, either an international organization, perhaps the United Nations (UN), or a group of particularly powerful countries would need to take the lead and form the initial club. His paper provides an argument against the "bottom-up" formulation of coalitions. The argument is that "…theoretical and empirical studies indicate that bottom-up coalitions for cartels and global public goods tend to be small, fragile, and unstable" (p. 1344).

18.3.2 Voluntary Memberships in Climate Clubs

The top-down approach runs counter to the arguments made by a variety of other scholars who also advocate for the formation of climate clubs but argue they should be voluntary and non-hierarchical. For example, Keohane and Victor (2011) argue that (1) different states have different interests related to climate change, (2) there is considerable uncertainty around the complex forces associated with climate change, and (3) there are different linkages among different states with these three forces that "create incentives for governments and non-state actors to invest in a wide array of institutions rather than a single hierarchy" (p. 8). Their call for a "regime complex" runs counter to the single integrated regime that attempts to create a comprehensive package of reforms to be followed by all.

Hovi et al. (2016) define a climate club as "…any international actor group that (1) starts with fewer members than the UNFCCC [United

Nations Framework Convention on Climate Change] has and (2) aims to cooperate on one or more climate-change related activities, notably mitigation, adaptation, climate engineering or climate compensation" (p. 2). While these are clubs, they differ in their intent from the clubs envisioned by Buchanan (and Nordhaus) where a club is formed to minimize the problem of free riders who obtain benefits from a service without bearing the costs. Under the definition stated above, the voluntary nature of states joining a club that creates benefits for club members and non-members alike requires that at least the member states anticipate benefits to themselves that exceed the costs. But just as a Buchanan-type club allows for lower costs per member as more members are invited to join up to the point where congestion occurs, a climate club with additional members that comply with the club's anti-climate change policies will provide additional benefits for all.

Victor (2015) considers the types of tasks that voluntary climate clubs could perform and similarly argues that, as suggested above, one of their important efforts is to "entice reluctant countries" (p. 2) to join. He suggests that the clubs might even try to impose Nordhaus-like trade penalties on the non-joiners. Victor also argues that club members might impose policies related to international trade to recognize that imports from other countries (in or outside a club) may contain embodied carbon and that border adjustments should be made to reflect those external costs that the exporting country is imposing on the rest of the world. Unfortunately, as Nordhaus indicates, the administrative costs of such measures can make implementation extremely difficult. Other tasks a carbon club might undertake would be to design and demonstrate technological methods to decrease airborne pollutants, assisting other countries either with technical assistance or with monetary compensation to adapt new technologies and, most economically, tackle easier, less costly problems first.

There have been some attempts to understand how climate clubs (the voluntary type) can help in the fight against climate change. Weischer et al. (2012) analyse 17 clubs with much of the article focused on a description of what those clubs attempt to do, how they are organized and funded, as well as a review of what motivated their formation. They conclude that the analysed clubs have made contributions to overcoming global warming but that a "transformational club" is still needed if more significant results can be obtained. They argue that in order for a climate club to be transformational, it must satisfy four criteria. These include that the benefits have to be significant (since there will be costs associated with joining), all members of the club derive benefits, that the benefits derived conform to existing international law and, finally and perhaps most difficult to obtain, that benefits accrue *only* to club members and not to others.

There is another strand of literature that relates at least indirectly to climate clubs and their organization. This literature is closely linked to the work on collective action by the late Elinor Ostrom. While effects on the climate can be viewed as a global public good (or "bad"), another way of thinking about air and its pollution by greenhouse gases (GHG) is that air is a common property resource not unlike unfenced pastures, communal forests or underground water aquifers. In her award-winning book on *Governing the Commons* (1990), Ostrom documents the ways self-governing organizations are able to cope with collective action issues. Thus, the move to considering climate change within the framework of common property was a natural one for Ostrom. As stated in Ostrom (2014), generation of greenhouse gases is the result of millions of local micro-level decisions by households (e.g., what type of automobile, if any, to purchase and use) and firms (e.g., whether to adopt technologies that will reduce the CO_2 pollutants emitted to the air). When considered this way, efforts for control of climate change can become a much more localized endeavour than commonly thought of in the international literature even though the consequences of those decisions affect both those in that same location and nations throughout the world.

This conceptualization of the climate change issue leads Ostrom and others (e.g., Dorsch and Flachsiand 2017; Paavola 2012) to argue that the appropriate organizational form to tackle climate change problems is a decentralized or "polycentric" one.[6] Again this suggests that a single hierarchical approach to climate policy is less likely to be successful than one with multiple, even small scale, efforts to overcome the problems. As Ostrom states (2014, p. 1115) "It is obviously much easier to craft solutions for collective action problems related to smaller-scale common-pool resources than for the global commons".

How does all this relate back to the issues faced by the Small Island Developing States? Even if leaders of SIDS were sympathetic to and strong supporters of the single hierarchical climate club advocated by Nordhaus, their standing in the international community of nations is unlikely to give them a position of leadership that would result in such a club.

More promising is the idea of multiple, smaller climate clubs with different foci and powers. As suggested above, the unique climate change consequences impacting the SIDS can give them leadership roles in helping to encourage the formation of climate clubs. Interestingly, a small island state, with little carbon-generating footprint but with high costs associated with the failure to control the generation of GHG, has strong incentives to do all in its power to encourage the formation of climate clubs that are effective at slowing climate change.

18.4 Summary and Conclusions

This chapter has considered some of the challenges associated with finding diplomatic solutions to the problem of climate change since global warming is certainly one of the most pressing issues faced today by small island states. As detailed here global climate change is an international public good which can create incentives for countries to become free riders in attempts to implement policies designed to slow global warming. That is, a country that does nothing to improve environmental conditions can still enjoy environmental benefits of other country's efforts. Overcoming this issue requires effective collective action efforts. The international relations literature suggests that one important determinant of those collective efforts is leadership. This is one area where the SIDS can, and have, influenced diplomatic efforts at improving the environment.

We also consider the potential role for climate clubs to be an organizational setup that can lead to improved environmental conditions with two different arrangements for such clubs detailed. One is the "top-down" hierarchical approach championed by William Nordhaus in which either a group of large economically important countries or an international organization such as the UN would take the lead in establishing a club of member nations which would pursue policies designed to improve the global environment. To overcome the issue of free riding, the members of the club would impose tariffs on the imports from nations that opt to remain outside the club with the expectation that the economic costs of such tariffs would encourage non-member nations to join. For SIDS, it is highly likely that they would immediately join such a club; however, given their size and importance in the world economy, probably they would not be primary leading organizers of this type of club.

SIDS would much more likely be active participants in the alternative arrangements for climate clubs. These clubs are formed voluntarily and are non-hierarchical and created when groups of countries find sufficient commonality in interests to jointly pursue climate-improving efforts by sharing information, providing technical advice or even monetary support for mutually beneficial projects.

The non-hierarchical approach in these types of clubs also leads to the recommendation that they be organized with multiple centres, that is, a polycentric or decentralized approach. Some efforts may be highly localized in a variety of places whereas others might be regional and span national boundaries.

In spite of the pessimistic outlook for continual global warming with its potentially devastating effects on the SIDS, this review suggests that there might be ways for serious diplomatic approaches to reverse the current trends. However, it will take conserted communal efforts and small island states may play leadership roles in making that happen.

Notes

1. Attacking the free rider problem at the national or sub-national level is somewhat easier since governments can use taxes, user charges or regulations to minimize free ridership. At the international level this is more problematic given the sovereignty of nations unwilling to grant similar powers to some higher authority.
2. This issue is especially relevant for climate change. Where societal benefits, even though massive, cannot be anticipated in the near term but costs are immediately relevant, only extremely low social discount rates can lead analysts to argue that policies are economically efficient.
3. For a discussion of that formation and the roles of AOSIS in climate change policy discussions since 1990, see Ronneberg (2016).
4. In its September 18, 2019, issue, the *Economist* included an article entitled "Island states have an outsized influence on climate policy".
5. For an early highly theoretical discussion of public and club goods, see Cornes and Sandler (1986).
6. The concept of "polycentricity" as an organizational principle in governance has been a common theme of the work by both Vincent and Elinor Ostrom. It was, for example, used by V. Ostrom, Tiebout and Warren in their 1961 article regarding the organization of governments in a metropolitan area with overlapping jurisdictions taking on different roles depending on the nature and costs of producing the services being provided by those subnational governments.

References

Barrett, S. (2007). *Why Cooperate?: The Incentive to Supply Global Public Goods*. Oxford: Oxford University Press.

Buchanan, J. M. (1965). The Economic Theory of Clubs. *Economica, 32*(125), 1–14.

Corneloup, I. d. A., & Mol, A. P. J. (2014). Small Island Developing States and International Climate Change Negotiations: The Power of Moral 'Leadership'. *International Environmental Agreements, 14*, 281–297.

Cornes, R., & Sandler, T. (1986). *The Theory of Externalities, Public Goods and Club Goods*. London: Cambridge University Press.

Dorsch, M., & Flachsiand, C. (2017). A Polycentric Approach to Global Climate Governance. *Global Environmental Politics, 17*(2), 45–64.

Hovi, J., Sprinz, D. F., Saelen, H., & Underdal, A. (2016). Climate Change Mitigation: A Role for Climate Clubs?. *Palgrave Communications: Humanities, Social Sciences Business*. Downloaded from https://www.nature.com/articles/palcomms201620.pdf

Keohane, R. O., & Victor, D. G. (2011). The Regime Complex for Climate Change. *Perspectives on Politics, 9*(1), 7–23.

Mitchell, R. B. (2010). *International Politics and the Environment*. London: Sage.

Nordhaus, W. (2015). Climate Clubs: Overcoming Free-riding in International Climate Policy. *American Economic Review, 105*(4), 1339–1370.

Olson, M. (1965). *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Cambridge University Press.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Ostrom, E. (2014). A Polycentric Approach for Coping with Climate Change. *Annals of Economics and Finance, 15*(1), 97–134.

Ostrom, V., Tiebout, C. M., & Warren, R. (1961). The Organization of Government in Metropolitan Areas: A Theoretical Inquiry. *American Political Science Review, 55*(4), 831–842.

Paavola, J. (2012). Climate Change: The Ultimate Tragedy of the Commons? In D. H. Cole & E. Ostrom (Eds.), *Property in Land and Other Resources* (pp. 417–433). Cambridge: Lincoln Institute of Land Policy.

Ronneberg, E. (2016). Small Islands and the Big Issue: Climate Change and the Role of the Alliance of Small Island States. In K. Gray, R. Tarasofsky, & C. Carlarne (Eds.), *The Oxford Handbook of International Climate Change Law* (pp. 762–775). Oxford: Oxford University Press.

Sandler, T. (2010). Overcoming Global and Regional Collective Action Impediments. *Global Policy, 1*(1), 40–50.

Tallberg, J. (2006). *Leadership and Negotiation in the European Union*. Cambridge: Cambridge University Press.

Underdal, A. (1994). Leadership Theory: Rediscovering the Arts of Management. In W. I. Zartmaan (Ed.), *International Multilateral Negotiation: Approaches to the Management of Complexity* (pp. 178–197). San Francisco: Jossey-Bass.

Victor, D. G. (2015). *The Case for Climate Clubs*. E15Initiative. Geneva. International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Wagner, G., & Weitzman, M. L. (2015). *Climate Shock: The Economic Consequences of a Hotter Planet*. Princeton: Princeton University Press.

Weischer, L., Morgan, J., & Patel, M. (2012). Climate Clubs: Can Small Groups of Countries Make a Big Difference in Addressing Climate Change? *Review of European Community & International Environmental Law, 21*(3), 177–192.

Young, O. R. (1991). Political Leadership and Regime Formation: On the Development of Institutions in International Society. *International Organization, 45*(3), 281–308.

CHAPTER 19

International Development Goals and Small Island Developing States

Simon Feeny, Alberto Posso, and Sefa Awaworyi Churchill

19.1 Introduction

The development challenges facing small island developing states (SIDS) are well known. In addition to the difficulties facing all developing countries, their small size and limited domestic markets prevent them from enjoying the advantages of economies of scale and can hinder growth of the private sector. SIDS usually have narrow resource bases and therefore a high dependence on international trade. Often geographic isolation implies high transportation costs for their imports and exports. SIDS are also highly exposed to external shocks that can derail improvements in development. These shocks can take the forms of natural disasters such as earthquakes and tsunamis, and climatic shocks such as floods and cyclones, as well as sharp rises in the prices of oil and food (Briguglio 1995; Feeny et al. 2014). Longer term climate change also poses considerable risks.

S. Feeny (✉) • A. Posso • S. A. Churchill
RMIT University, Melbourne, VIC, Australia
e-mail: simon.feeny@rmit.edu.au; alberto.posso@rmit.edu.au; sefa.awaworyichurchill@rmit.edu.au

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_19

It is therefore not surprising that SIDS have devised numerous action plans and signed up to numerous international agreements to assist them in overcoming the challenges of their development. Together with all other members of the United Nations, SIDS were committed to achieving the Millennium Development Goals (MDGs) by signing the Millennium Declaration in September 2000.[1] The MDGs were set to be achieved by 2015. SIDS also adopted the 2030 Agenda for Sustainable Development at the United Nations Sustainable Development Summit in September 2015, committing themselves to achieving 17 Sustainable Development Goals (SDGs) by 2030. The SDGs came into force on 1 January 2016.

Sitting alongside the commitments to achieving the MDGs, SIDS also had specific action plans for the environment and sustainable development that emanated from a number of United Nations conferences. They included the United Nations' Conference on Environment and Development held in Rio de Janeiro, 1992 (also known as the Earth Summit), the World Summit on Sustainable Development held in Johannesburg, 2002, and the United Nations' Conference on Sustainable Development, Rio de Janeiro, 2012 (also known as Rio +20).

Moreover, a further three international conferences have been held in recognition of the special circumstances facing SIDS, resulting in further plans for action. The UN Global Conference on the Sustainable Development of SIDS held in Barbados 1994 led to the Barbados Programme of Action (BPOA). This was a plan to address the economic, environmental and social vulnerabilities facing SIDS. Progress towards the BPOA was reviewed and commitments renewed in the Mauritius Strategy of Implementation (MSI) of 2005. Again, actions and strategies were devised, which were intended to support SIDS in achieving internationally agreed goals such as the MDGs. More recently, an international Conference on SIDS was held in Samoa in 2014. The SIDS Accelerated Modalities of Action (SAMOA) Pathway adopted at the conference identified priority areas for SIDS and called for urgent actions and support for SIDS' efforts to achieve their sustainable development (UN 2017).

Such international agreements are clearly well intentioned. However, signing up to such agreements does not ensure progress and can even present additional challenges for SIDS. Their small size implies that SIDS face a much larger administrative burden in signing up to international agreements and development goals. Officials must spend large amounts of time in negotiations and meetings. Large amounts of data are required for monitoring progress towards development targets and examining which interventions have the most impact. Governments must also develop plans of action, establish budgets and coordinate any assistance provided by international partners. It is therefore crucial that any international development goals that SIDS sign up to are highly relevant to their development needs, are ambitious but achievable and are affordable in terms of meeting the costs of monitoring progress, as well as the costs of their achievement.

This chapter provides a critique of past and current global development goals with respect to their application to SIDS. The remainder of this chapter is structured as follows. Section 2 provides a background to the MDGs and the SDGs, including how they were devised and some of their critiques. Section 3 presents arguments over how appropriate the MDGs and the SDGs are for SIDS. Section 4 provides some empirical evidence on whether SIDS made greater or less progress towards the achievement of the MDGs than other countries. This analysis can reveal whether the specific constraints SIDS face have hampered their progress towards MDG achievement. The specific SIDS that made the most and least progress towards the MDGs are also identified and explanations provided. Section 5 provides some recommendations for how the international community can assist SIDS with development goals and progress more generally. Finally, Section 6 concludes with the main findings and arguments of the chapter.

19.2 The Millennium and Sustainable Development Goals

The MDGs represented a set of eight internationally agreed goals to improve the well-being of the poor in developing countries. They included (i) eradicating extreme poverty and hunger; (ii) achieving universal primary education; (iii) promoting gender equality; (iv) reducing child mortality; (v) improving maternal health; (vi) combating HIV/AIDS, malaria and other diseases; (vii) ensuring environmental sustainability; and (viii) developing a global partnership for development (UN 2015). The eight goals were assessed against the achievement of 21 targets and 60 indicators. The eighth goal made it clear that for poorer countries to achieve the first seven goals, it is vital that richer countries deliver on their end of the bargain with inter alia more effective aid, more sustainable debt relief and fairer trade rules.

At a global level, in at least one respect, the MDGs were clearly a great success. The goals galvanised global efforts to reduce poverty and greatly raised the profile of development issues facing poor countries. However, the goals were also subject to much criticism. The MDGs were sometimes criticised for being devised in a top-down process within the United Nations with little consultation and participation of developing countries and civil society. Others argued that the goals were too ambitious for some developing countries to achieve and countries that did not meet the targets being wrongly labelled as failures. This could undermine support for policy reforms and foreign aid (Clemens et al. 2007).

Another criticism is that the MDG targets relate to averages which can mask inequality in progress and development outcomes both across and within countries. The poor do not necessarily gain from average progress and this is particularly true for indigenous people, ethnic minorities and those living in remote areas (Vandemoortele 2002). A further criticism of the MDGs is that they relate to quantitative targets and neglect issues surrounding the quality of progress (Feeny and Clarke 2008). For example, the second goal of achieving universal primary education might have led to higher school enrolments at the expense of the quality of education received by children.

The MDGs were originally designed to be achieved at a global level. However, it quickly became common practice for progress to be assessed at a country level, with annual charts being produced highlighting the goals and targets that specific countries were 'on track' or 'off track' with respect to their achievement. At a global level, good progress was made towards the MDGs although not all of the goals were achieved. It is also true that progress was uneven. While Asia achieved many of the goals, Sub-Saharan Africa and the Pacific achieved very few. In many countries progress towards the goals was hampered by price hikes of food and fuel, the global economic crisis, climate change and conflict.

Most positively, at the global level, the headline goal of reducing by half the proportion of people living in extreme poverty was achieved prior to the 2015 deadline. In 1990, nearly half of the population in the developing world lived on less than US$1.25 a day; that proportion dropped to 14% in 2015 (UN 2015). This was largely due to the remarkable progress in reducing poverty in the world's two most populous countries: China and India. Poverty did not fall across all developing countries and actually increased in some African countries including Nigeria, the Central African Republic, Ivory Coast, Kenya and Zambia (UN 2015).

Other statistics provide further positive news. In 2015, the primary school net enrolment rate in developing countries reached 91%, up from 83% in 2000. The global under-five mortality rate declined by more than half and the maternal mortality ratio declined by 45%. By 2015, 91% of the global population was using an improved drinking water source, compared to 76% in 1990, and 2.1 billion people had gained access to improved sanitation (UN 2015). Specific progress towards the MDGs made by SIDS is discussed in Sect. 4.

The successors to the MDGs; the SDGs, arose from the 2030 Development Agenda entitled Transforming our world: the 2030 Agenda for Sustainable Development. They came into effect on 1 January 2016 and are to be achieved by 2030. Compared to the MDGs, there was much greater consultation and participation in devising the SDGs. This led to a commitment to a greater number of goals: 17 in total. Progress towards the SDGs is to be assessed using data for 169 targets and 230 indicators. While the MDGs are mostly applied to developing countries, the SDGs, also known as the Global Goals, are the responsibilities of all nations.

The SDGs are much broader and more ambitious than their predecessors. They include ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans and forests. They explicitly aim to reduce inequalities and there is a specific goal for peace and justice. Similar to the MDGs, the SDGs have been criticised for being too ambitious. In particular, eradicating extreme poverty by 2030 will be very difficult to achieve. Other argue that there are too many SDGs for countries to truly commit to and that they will cost too much. It is estimated that the achievement of the SDGs will require between US$2 trillion to US$3 trillion per year up to 2030 (The Economist 2015).

Another criticism is that the SDGs are contradictory in their nature. Progress towards one goal is likely to undermine progress towards another. For example, achieving the goal of zero hunger will require greater water and fertiliser to be used in agriculture as well as deforestation to increase the amount of arable land. Progress towards this goal will therefore likely impact on progress towards the targets of reducing water scarcity and conserving forests and freshwater ecosystems.

19.3 The Appropriateness of the MDGs and SDGs for SIDS

Arguably the SDGs have greater relevance to SIDS. While the MDGs were concerned with development, the SDGs are concerned with sustainable development and are therefore particularly appropriate to SIDS. However, the criticism of both sets of goals being too ambitious is particularly applicable to SIDS given their special circumstances and the numerous challenges they face in pursuit of development. This is the motivation for examining whether their progress towards the MDGs differed from that of other developing countries in Sec. 4.

A credible response to this is that SIDS could tailor the SDGs to be more appropriate for their circumstances. This might involve amending the specific targets, focusing on some rather than others, or even establishing other targets and indicators. This was supposed to be the case for the MDGs although very few countries ended up tailoring them. Papua New Guinea provides one example of a SIDS that did, making the targets less ambitious and, therefore, more achievable for that country. Arguably this led to greater support for the MDGs amongst its people. The SDGs also recognise that each country needs to take into account its national realities and circumstances, and should tailor targets and indicators in order to effectively integrate the SDGs into their national plans.

The large number of indicators is another particular facet of the SDGS, which makes them of questionable appropriateness to SIDS in their current form. There is currently a paucity of relevant data to monitor progress towards most of the SDGs in SIDS and often they have environments which make data collection expensive and difficult. The United Nations Statistical Commission's Interagency and Expert Group on SDG Indicators (IAEG-SDGs) has finalised 230 individual indicators to monitor the 17 goals and 169 targets. Dunning (2016) finds that about half of the 230 indicators lack acceptable country coverage, agreed-upon methodologies or both. She finds that for the indicator on the proportion of the population below the international poverty line, 72 of the 193 UN member states report no data for this indicator since at least 2000 and that this includes 19 SIDS.

19.4 SIDS Versus Developing Country Progress Towards the MDGs

This section of the chapter estimates an empirical analysis of country-level data to examine the progress that SIDS made towards the MDGs and whether their progress was better or worse than that for other developing countries. While the specific challenges facing SIDS, discussed above, might have impeded progress towards the MDGs, their small size might have led to greater development efforts and resources being more successful.

Data on country performance pertaining to the achievement of MDGs are drawn from the World Bank (2017) and the Centre for Global Development (CGD) (2013) databases. The CGD reports a composite MDG Progress Index for developing countries based on eight core MDG targets, relating to extreme poverty, hunger, education, gender equality, child mortality, maternal mortality, the incidence of HIV/AIDS and access to safe water. The index provides country progress scores, on a scale of zero to 8, where a score of zero indicates that a country has not achieved any of the eight targets, while a score of 8 suggests that a country has achieved all eight targets. The analysis conducted in this chapter uses this MDG Progress Index to gauge the overall progress made by SIDS and how that compares with non-SIDS. Second, based on data from the World Bank's World Development Indicators (WDI) database, the chapter also presents an analysis which focuses on the eight individual indicators used for the composite progress index. Appendix 2 presents a description of each variable drawn from the World Bank and CGD databases.

From the outset, it is important to mention the notable gaps in data. Despite the commitment by 37 SIDS towards the achievement of the MDGs, readily available data are inadequate to evaluate the progress made by 29 of these SIDS, and for some indicators for which data is available, there are major gaps. This issue of data paucity for SIDS in general is returned to below.

To understand and compare the progress made by SIDS relative to non-SIDS, the chapter adopts regression models where the MDG Progress Index and individual progress indicators are used as dependent variables. A dummy variable which takes the value of one if the country is a small island developing state and zero otherwise is included in these models. The coefficient attached to this dummy variable provides an indication of the progress made by SIDS compared to non-SIDS after controlling for relevant covariates. Covariates included in the regressions include a measure of institutional quality, a measure of country-level income, and measures of economic growth and urbanisation. Regressions in Table 19.1 provide an overview of the performance of SIDS compared to non-SIDS with regard to the achievement of MDG goals. Results are discussed in turn.

19.4.1 Composite MDG Progress Index

Given the ordinal nature of the Progress Index, regression analysis for the MDG Progress Index (Table 19.1 Column 1) is conducted using the ordered logit regression technique. Based on the MDI progress Index regression, results suggest that SIDS made relatively less progress towards the attainment of the MDGs compared to non-SIDS. The coefficient on the SIDS dummy variable is negative, large and statistically significant. This finding is based on a sample of 18 SIDS[2] in a total sample of 111 countries.

19.4.2 Eradicating Extreme Poverty

Progress on this goal is poorly reported across countries. A large percentage of data is missing from the World Bank data on the incidence of income poverty. However, based on a sample of 12 SIDS for which data are available over the period under review, the average percentage of population living on less than US$1.90 Purchasing Power Parity (PPP) a day is 7.81%. The initial and current average percentages of population living on less than US$1.90 a day are 12.76% and 10.60%, respectively. Thus, considering the initial and current values, it appears SIDS have observed some degree of decline in the percentage of population living on less than US$1.90 a day. This is further supported by the average year-on-year change in the percentage of population living on less than US$1.90 a day over the period, which is −0.871. Despite the progress made, compared to non-SIDS, results suggest that, on average, SIDS made less progress towards the attainment of the MDG goal relating to the eradication of extreme poverty. Specifically, the coefficient on the SIDS dummy from the poverty regression in Table 19.1 suggests that SIDS, over the period under review, on average, recorded a higher percentage of population living on less than US$1.90 a day, compared to non-SIDS.

Table 19.1 Regressions results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	*MDG Progress Index*	*Poverty*	*Hunger*	*Education*	*Gender*	*Infant mortality*	*Maternal mortality*	*HIV*	*Water*
Initial Values		0.054***	0.046***	0.006***	0.541***	0.018***	0.002***	0.216***	0.012***
		(0.004)	(0.001)	(0.000)	(0.030)	(0.000)	(0.000)	(0.006)	(0.000)
Institution	1.041***	−0.060	−0.032	0.024***	0.012***	−0.191***	−0.226***	0.016	0.012***
	(0.372)	(0.121)	(0.022)	(0.007)	(0.003)	(0.021)	(0.039)	(0.068)	(0.004)
GDPPC	−0.028	−0.671***	−0.119***	−0.029***	0.002	−0.121***	−0.452***	−0.287***	−0.014***
	(0.288)	(0.112)	(0.020)	(0.006)	(0.003)	(0.013)	(0.033)	(0.050)	(0.004)
GDPPC growth	0.264***	−0.009	−0.007***	0.002**	0.001**	0.000	−0.014***	−0.018***	0.000
	(0.091)	(0.013)	(0.003)	(0.001)	(0.000)	(0.002)	(0.004)	(0.007)	(0.000)
Urbanisation	0.174	0.989***	−0.160***	−0.011	−0.009*	0.032	−0.009	0.096	0.002
	(0.579)	(0.180)	(0.032)	(0.013)	(0.005)	(0.026)	(0.052)	(0.075)	(0.007)
SIDS dummy	−1.161**	0.626***	0.059**	−0.007	−0.015***	0.275***	0.331***	0.522***	−0.032***
	(0.468)	(0.132)	(0.028)	(0.008)	(0.003)	(0.026)	(0.046)	(0.096)	(0.005)
Constant		1.962**	3.026***	4.263***	−0.527***	3.107***	7.633***	0.834***	3.524***
		(0.849)	(0.137)	(0.047)	(0.027)	(0.095)	(0.280)	(0.272)	(0.023)
Observations	111	586	1652	1528	1523	1894	1749	1575	1758
Number of SIDS	18	12	14	17	17	18	16	10	18
R-squared		0.636	0.800	0.495	0.648	0.829	0.764	0.665	0.887

Ordered logit regression results reported in Column 1 (Based on cross-section data); Pooled OLS regression results reported in Columns 2 to 9 (Based on panel data);

Source: Computed Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

19.4.3 Eradicating Extreme Hunger

The data on extreme hunger shows that over the period under review, the average percentage of the SIDS population whose food intake is insufficient to meet dietary energy requirements was 12.45%, while the initial and latest average percentages are 14.06% and 11.35%, respectively. This is based on a sample of 14 SIDS for which data are available. Results from the regression analysis suggest that, on average, SIDS made less progress towards the attainment of the MDG goal relating to the eradication of extreme hunger, compared to non-SIDS.

19.4.4 Achieving Universal Primary Education

With regards to the achievement of universal primary education, the data on 17 SIDS indicate an initial average ratio of total enrolment in primary school at 102.51 and a current average ratio of 106.95, an indication of progress in achieving universal primary education. This conclusion is further supported by a year-on-year change average of 0.48. Comparing SIDS to non-SIDS, regression results suggest that the progress made by SIDS compared to non-SIDS is not statistically different. This is evident from the coefficient on the SIDS dummy, which is statistically insignificant.

19.4.5 Promoting Gender Equality

The measure of gender equality here is captured by the Gender Parity Index (GPI), which is a ratio of girls to boys enrolled in public and private schools. Using the GPI, the data suggests a marginal decline in the ratio of girls to boys enrolled in public and private schools. This is evident given an average change of −0.001 over the period under review for 17 SIDS although the initial and current average ratios are reported as 0.966 and 0.973, respectively. Compared to non-SIDS, on average, SIDS recorded lower ratios of girls to boys enrolled in public and private schools. This shows higher levels of gender inequality among SIDS, a further indication that non-SIDS have performed better than SIDS in promoting gender equality.

19.4.6 Reducing Child Mortality

The data on SIDS shows that over the period from 2000 to 2016, for every 1000 live births in a given year, an average of 25.56 infants die before reaching one year of age. The initial and current average values are 28.22 and 22.85, respectively, suggesting progress. The year-on-year average percentage change also suggests an about 1% decline in infant mortality. Further, regression results based on 18 SIDS show that, SIDS on average, recorded higher numbers of infants dying before reaching one year of age per 1000 live births in a given year. This suggests that compared to non-SIDS, SIDS have performed poorly in attaining the goal of reducing child mortality.

19.4.7 Reducing Maternal Mortality

The data on maternal mortality shows that for every 100,000 live births, an average of 146.82 women die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination. The evidence, which is based on 16 SIDS, also suggests a 1.2% decline in maternal mortality over the period. This decline in maternal mortality is also evident when the initial and current values, which are 171.13 and 126.13, respectively, are compared. Despite the slight decline in maternal mortality, compared to non-SIDS, regression results suggest that SIDS, on average, recorded higher numbers of women who die from pregnancy-related causes.

19.4.8 Combating HIV/AIDS

Based on a sample of 10 SIDS for which data are available over the period under review, the average percentage of people aged 15–49 that are infected with HIV is 1.12%. A comparison of the initial average percentage of 1.30% and the current average percentage of 1.39% suggests a marginal increase in the prevalence of HIV. This is also consistent with the average year-on-year change of 0.002, suggesting an increase in the percentage of the SIDS population between the ages of 15 and 49 who are infected with HIV. Compared to non-SIDS, on average, SIDS recorded higher percentages of people between ages 15–49 who are infected with HIV, over the period under review.

19.4.9 Improved Access to Water

SIDS appear to have recorded significant progress with regard to improved access to water. First, based on data available on 18 SIDS over the period from 2000 to 2016, the initial average percentage of population using an improved drinking water source of 85.64% increased to 89.44% by the end of the period under review. Further, on average, 87.577% of the SIDS population used an improved water source, while the average year-on-year change in the percentage of the population using an improved drinking water source was 0.166, suggesting some progress in attaining this goal. However, compared to non-SIDS, regression results suggest that, on average, SIDS recorded lower percentages of their population using improved drinking water sources.

Overall, based on the average values for SIDS only, SIDS seem to have made some progress with regard to the achievement of the selected goals including poverty eradication, achieving universal primary education, reducing infant and maternal mortality, and improved access to water. However, compared to non-SIDS, SIDS have made less progress across all goals, a finding which is also evident from the regression using the MDG Progress Index.

19.4.10 Country-Specific Progress

It is important to highlight that not all SIDS are the same and that there is a great of heterogeneity amongst SIDS regarding their progress towards the MDGs. Indeed, as shown in Appendix 3, Belize and Guyana stand out as having made great progress towards the MDGs, while Papua New Guinea (PNG) made the least progress. Explaining these variations is not an easy task.

The impressive performance of Belize and Guyana is likely owed to unique and nuanced contextual characteristics. A targeted conditional cash transfer contributed to Belize reaching targets relating to health and education (UNDP 2013). Sustained economic growth has moved Guyana from a Highly Indebted Poor Country (HIPC) to a middle-income country. The country has benefitted from bauxite and gold in addition to its agricultural exports. Economic growth has allowed the government to provide greater support to the social sectors and achieve good progress towards many of the MDGs (GoG 2011). High levels of remittances have also played a significant role in promoting human development in Guyana. Important development challenges remain in both these countries.

A number of arguments could be advanced for why PNG has made relatively poor progress. Governance issues, poor law and order, and inadequate infrastructure are likely to have played important roles (Hayward-Jones 2016). Arguably the single-largest threat to PNG's social services and health sector is the HIV epidemic. According to the United Nations,[3] in the 1980s, evidence suggests that PNG accounted for about 21% of all new HIV cases reported in the Pacific, and this rose to over 95% by 2008. HIV has significant impact on health care costs and the sustainability of an effective labour force. Thus, this HIV epidemic has the potential not only to undo the country's progress towards human development but also to influence the level of investment within the country. A weak labour force and health threats can erode investor confidence and retard economic growth further. The country also suffers from poor institutional quality and high levels of gender inequality.

19.5 Implications for the International Community

The empirical analysis suggests that despite progress made on many fronts, SIDS have lagged behind other developing countries in achieving improvements in well-being as measured by the MDG indicators. Given that the SDGs are much broader and even more ambitious, it seems reasonable that SIDS focus on particular goals and targets. The other pertinent issue is ensuring that the requisite data are available to monitor the progress towards their achievement.

As discussed above, SIDS share many of the problems of most developing countries; however, they are also subject to unique vulnerabilities, paramount of which are climate change and natural disasters. For example, SIDS in the Pacific experience an average of three major disasters each year, while 8 of the 14 countries in that region are among the 20 countries in the world with the highest average annual disaster losses relative to GDP (United Nations in the Pacific 2017). In this regard, SDG Goal 13—Taking Urgent Action to Combat Climate Change—is arguably the most relevant for SIDS, but one which requires action by all countries. Thus, existing indicators and data collection efforts could potentially be centred around this goal to ensure a unique policy cohesiveness that maximises outcomes relative to exiting resources and capacity constraints. This approach could potentially expand the United Nations Pacific Strategy climate change, disaster resilience and environmental protection outcome to all SIDS (United Nations in the Pacific 2017). By focusing on the integration of climate change and disaster risk management as a pillar of all development programmes in SIDS, these nations could also work towards achieving complimentary goals.

Having disaggregated data will also be important to inform policy. For example, Feeny et al. (2018) show that men and women respond differently to covariate shocks, with women often meeting an excessive amount of the burden of the shock. Therefore, a comprehensive plan for climate change should pay attention to gender-sensitive development plans, with disaster responses providing gender-sensitive recovery support to restore livelihoods, community infrastructure and essential public services to displaced persons and affected communities. Countries could also provide services that ensure that sexual and reproductive health and rights and violence against women and girls are considered in contingency plans, considering the needs of women, adolescents and youth in affected areas.

Likewise, given that up-to-date labour market data are crucial for the provision of baseline information for post-disaster needs assessment, international organisations could assist governments to ensure that national labour statistics are regularly collected, at least in the most vulnerable areas. Pre-disaster statistics, in turn, will inform policymakers on the impact of a disaster on employment and livelihoods while also informing on equality and poverty issues, both pertinent to other SDGs. Similarly and for the same purpose, data could be collected to aid in the assessment of child vulnerability mapping and safe water, sanitation and hygiene.

Studying the conditions of children carefully in SIDS is of importance for the future of these nations. Our analysis reveals that there is no statistically significant difference between school enrolments between SIDS and other developing countries. However, as mentioned above, the MDGs have been criticised for focusing on enrolment and not on quality. Indeed, the international community should focus on capturing measures of attendance and quality of schooling. Posso and Feeny (2016) find evidence that although enrolled in school, many children in Melanesia do not attend classes. Moreover, their study shows that more educated parents are less likely to send their children to school. The latter may be indicative that parents do not perceive the value of education, which may reflect issues of quality and relevance. The international community should strive toward assessing educational quality and relevance, perhaps using initiatives like the OECD's Programme for International Student Assessment (PISA) tests, but tailored to the educational needs of SIDS and other developing countries.

Indeed, it has been argued that due to their vulnerability to climate risk, macroeconomic indicators in SIDS should focus on the environment and natural disasters. SIDS show a large direct dependence on the environment for generating income, with the primary sector remaining the principal source of employment. Therefore, macroeconomic measures need to consider factors such as environmental degradation and sustainability. Some experts argue that SIDS need to establish value-based and physical (non-monetised) macroeconomic accounting standards (Tisdell and Fairbairn 1996). Consequently, microeconomic measures of well-being in SIDS, particularly those that aim to focus progress towards the SDGs, should also consider the relatively high importance of the environment in these nations.

Overall, many observers and development practitioners are often confronted by the insufficient technical capacity of government and statistical offices (Haque et al. 2015). It is perhaps this constraint that is inhibiting a more nuanced link between the collection of internationally comparable data and its adoption to local contexts. The international community must continue and enhance its efforts to build capacity amongst government officials to ensure that not just data, but the right data, are collected in SIDS and other developing countries.

Establishing a framework centred on climate change and disaster relief will allow countries to focus on the most vulnerable groups, thereby building capacity to expand their analyses and data collection efforts to every segment of society. Realistically, most SIDS will always face the problem of assessing the conditions and delivering services to remote areas. It is often these remote regions that are most vulnerable to climate change. Lessons on assessing conditions in those areas can be used to expand their efforts to other regions. Governments could benefit from new telecommunications technologies including the use of drones to survey these locations.

19.6 Conclusion

The international community increasingly benchmarks development across countries. The agenda of reducing inequality and leaving no one behind accentuates the need for this exercise. As such, SIDS and other developing countries are committed to an increasing number of international development goals, targets and agendas. The existence of targets can be useful to identify priorities, focus development efforts, improve accountability and learn through monitoring and evaluation. However, given the special circumstances of SIDS, the formulation and implementation of such goals warrants special attention.

This chapter uses the MDG Progress Index to statistically estimate the overall progress made by SIDS relative to other developing countries towards eradicating poverty using internationally recognised measures. The empirical analysis reveals that despite some progress, SIDS have lagged behind other developing countries. This chapter provides empirical evidence that suggests SIDS made less progress towards the MDGs that developing countries made (on average). This provides caution against SIDS adopting very ambitious targets that are unlikely to be met and if the SDGs are to be truly embraced by the policymakers in such countries, then they should be tailored to their specific circumstances. Goals and targets should remain ambitious but must also be achievable.

In tailoring the SDGs, SIDS should focus on a small select number of goals given that adopting a large number of goals and targets will impose a large administrative burden on government officials, possibly to the detriment of their other tasks and responsibilities. For the goals and targets to meaningful, SIDS must also ensure data are available to monitor their progress towards their achievement. Finally, the achievement of targets should be costed in order to deem them as reasonable. The international community must then assist SIDS with finance when domestic resources fall short of the requirements.

Appendix 1: Sovereign SIDS by Region

Region/country	*Available data for regression analysis*
Caribbean	
Antigua and Barbuda	No
Bahamas	No
Barbados	No
Belize	Yes
Cuba	Yes
Dominica	Yes

(*continued*)

(continued)

Region/country	*Available data for regression analysis*
Dominican Republic	Yes
Grenada	Yes
Haiti	Yes
Jamaica	Yes
St. Kitts and Nevis	No
St. Lucia	No
St. Vincent and the Grenadines	No
Trinidad and Tobago	No
Sub-Saharan Africa	
Cape Verde	No
Comoros	Yes
Guinea-Bissau	Yes
Mauritius	No
Sao Tome and Principe	Yes
Seychelles	No
Latin America	
Guyana	Yes
Suriname	Yes
Asia	
Maldives	No
Singapore	No
Timor Leste	No
Pacific	
Federated States of Micronesia	No
Fiji	Yes
Kiribati	No
Marshall Islands	No
Nauru	No
Palau	No
Papua New Guinea	Yes
Samoa	Yes
Solomon Islands	Yes
Tonga	Yes
Tuvalu	No
Vanuatu	Yes

Appendix 2: Description of Variables and Data Source

MDI Progress Index—Overall MDG progress score on a 0 to 8 scale from the Centre for Global Development (CGD) Database.
World Bank Data 2000–2016
Poverty—Percentage of the population living on less than US$1.90 a day (proxy for extreme poverty)
Hunger—Percentage of a population whose food intake is insufficient to meet dietary energy requirements continuously (proxy for extreme hunger)
Education—Ratio of total enrolment in primary, regardless of age, to the population of the age group that officially corresponds to the level of education (proxy for the achievement of universal primary education)
Gender— Gender parity index, that is, ratio of girls to boys enrolled in public and private schools (proxy for gender equality)
Infant mortality—Number of infants dying before reaching one year of age, per 1,000 live births in a given year
Maternal mortality—Number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births
HIV—Percentage of people ages 15-49 who are infected with HIV
Water—Percentage of the population using an improved drinking water source. Improved drinking water source includes piped water on premises, and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection)
Institution—Average of World Bank's World Governance Indicators (WGI) measures of institutional quality including government effectiveness, control of corruption, political stability, voice and accountability, rule of law and regulatory quality.
GDPPC—GDP per capita (constant 2010 US$)
GDPPC growth—GDP per capita growth (annual %)
Urbanisation—Urban Population (Percentage)

Appendix 3: MDG Progress Index by Country

Country	*Progress Index*
Belize	4.5
Guyana	4.5
Cuba	4
Vanuatu	4
Comoros	3.5
Fiji	3.5
Jamaica	3.5
Tonga	3.5
Grenada	3
Mauritius	3
Seychelles	3
Samoa	3
Dominican Republic	2
Solomon Islands	2
Suriname	2
Dominica	1.5
Haiti	1.5
Papua New Guinea	0.5

Notes

1. SIDS include countries and territories. This chapter focuses on the 37 sovereign SIDS all of which are members of the United Nations. These countries are provided in Appendix 1 of this chapter.
2. See Appendix A1 for a list of SIDS included in the analysis.
3. http://data.unaids.org/pub/report/2009/20091202_pacificcommission_en.pdf

References

Briguglio, L. (1995). Small Island Developing States and their Economic Vulnerabilities. *World Development*, *23*, 1615–1632.

Centre for Global Development (2013). *MDG Progress Index: Gauging Country-Level Achievements*. https://www.cgdev.org/page/mdg-progress-index-gauging-country-level-achievements

Clemens, M., Kenny, C., & Moss, T. (2007). The Trouble with the MDGS: Confronting Expectations of Aid and Development Success. *World Development, 35*(5), 735–751.

Dunning, C. (2016). *230 Indicators Approved for SDG Agenda*. https://www.cgdev.org/blog/230-indicators-approved-sdg-agenda. Accessed 18 Dec 2017.

Economist. (2015). *The 169 commandments*. https://www.economist.com/news/leaders/21647286-proposed-sustainable-development-goals-would-be-worse-useless-169-commandments. Accessed 18 Dec 2017.

Feeny, S., & Clarke, M. (2008). Achieving the Millennium Development Goals in the Asia-Pacific Region: The Role of International Assistance. *Asia Pacific Viewpoint, 49*(2), 198–212.

Feeny, S., Iamsiraroj, S., & McGillivray, M. (2014). Remittances and Economic Growth: Bigger Impacts in Smaller Countries? *Journal of Development Studies, 50*(8), 1055–1066.

Feeny, S., McDonald, L., Posso, A., Donahue, J., & Eccles, K. (2018). Gendered Impacts of Global Economic Shocks: Findings from Household in Melanesia. *Pacific Studies, 40*(3), 329–356.

GoG. (2011). *Millennium Development Goals Guyana Report 2011*. Guyana: Government of Guyana.

Haque, T. A., Knight, D., & Jayasuriya, D. (2015). Capacity Constraints and Public Financial Management in Small Pacific Island Countries. *Asia & the Pacific Policy Studies, 2*(3), 609–622.

Hayward-Jones, J. (2016). *The Future of Papua New Guinea: Old Challenges for New Leaders*. Sydney: Lowy Institute Analyses.

Posso, A., & Feeny, S. (2016). Beyond enrolments: the determinants of primary-school attendance in Melanesia. *Journal of the Asia Pacific Economy, 21*(4), 531–548.

Tisdell, C., & Fairbairn, T. I. (1996). Chapter 4: The Scope for Applying Green Accounting and Environmental Economics to Small Island Economies. In R. Gabbay, R. Ghosh, & M. A. B. Siddique (Eds.), *Economics of Small Island Nations* (pp. 63–90). Perth: Centre for Migration and Development Studies.

UN. (2015). *United Nations Millennium Development Goals Report 2015*. New York: United Nations.

UN. (2017). *United Nations Sustainable Development Knowledge Platform: Small Island Developing States*. United Nations Department of Economic and Social Affairs. https://sustainabledevelopment.un.org/topics/sids. Accessed 18 Dec 2017.

UNDP. (2013). *Millennium Development Goals Report and Post 2015 Agenda: Belize*. Belize City: United Nations Development Programme.

United Nations in the Pacific. (2017). *United Nations Pacific Strategy: A Multi-Country Sustainable Development Framework in the Pacific Region*. Suva/Apia: Office of the UN Resident Coordinator.

Vandemoortele, J. (2002). *Are the Millennium Development Goals Feasible?* New York: United Nations Development Programme.

World Bank. (2017). *World Development Indicators Database*. Washington: World Bank.

CHAPTER 20

Saving Small Islands: Does Institutional Quality Matter?

Yeti Nisha Madhoo

20.1 Introduction

Persisting environmental degradation worldwide is recognized as a threat to sustainable development of all countries. The situation would appear to be more critical for small island developing states (SIDS), which are by nature vulnerable. The special case of SIDS within the context of sustainable development was first formally acknowledged internationally at the United Nations Conference on Environment and Development (UNCED) in 1992. Chapter 17 of Agenda 21 states: 'Small Island Developing States, and islands supporting small communities are a special case both for environment and development. They are ecologically fragile and vulnerable. Their small size, limited resources, geographic dispersion and isolation from markets, place them at a disadvantage economically and prevent economies of scale'. Due to these characteristics, economic growth–environmental quality trade-offs in SIDS are likely to produce more severe outcomes on nature than in non-SIDS, highlighting the need for (special) well-designed environmental policies, and for attention to be paid to their

Y. N. Madhoo (✉)
Amrita Vishwa Vidyapeetham University, Kollam, India
e-mail: yetinishamadhoo@am.amrita.edu

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_20

implementation and enforcement. Empirical studies relating effective environmental management to institutions have focused mainly on developed-country experiences or world sample rather than on SIDS as a group (see Scrieciu, 2015, for a recent review). This chapter attempts to address this gap in the literature.

In theory, general ineffectiveness of environmental policy instruments is predicted due to public goods characteristics of most environmental commodities and lack of incentives to cooperate to ensure sustainable resource use. Moreover, political economy factors such as corruption and lobbying are cited as significant drivers of policy failures. Tests linking institutions (institutional quality or failure) to environmental performance have typically been conducted at the level of legislations or implementation. At the legislative level, direct negative impact of corruption on degree of stringency of environmental regulations is evidenced (Fredriksson and Vollebergh 2009; Fredriksson and Svensson 2003; Damania et al., 2003; Pellegrini and Gerlagh, 2006). Robust impact of other measures of institutions, namely democracy and civil liberties, on legislative stringency are however not obtained (Eliste and Fredriksson 2002; Fredriksson and Svensson 2003; Pellegrini and Gerlagh, 2006).

Studies have also analysed the influence of lobbies, particularly agriculture (e.g., Eliste and Fredriksson, 2002), industry, environmental groups (Fredriksson et al., 2005) and foreign firms (e.g., Cole et al., 2006, Cole and Fredriksson 2009), on stringency of environmental legislation. Fredriksson et al. (2005), for example, find that environmental lobbies tend to strengthen stringency of environmental policy (measured by lead content of gasoline) in rich and developing countries whereas pressure from industrial group works to weaken stringency. The nexus between foreign firms and stringency of environmental regulations has been specifically explored while testing for the pollution haven hypothesis, that is, countries with weak environmental regulations will specialize in pollution-intensive production, attracting (polluting) foreign direct investment (FDI) from countries where environmental regulations are more stringent. Findings tend to support that environmental stringency affects location of pollution-intensive industries/firms conditional upon other factors like corruption. Cole et al. (2006), for example, find that if the degree of corruptibility is sufficiently high (low), FDI leads to less (more) stringent environmental policy, so that FDI contributes to (mitigates) the creation of a pollution haven.

Government unwillingness to impose strict regulations may also be due to economic growth targets (involving trade-offs with environmental goals), international trade and competitiveness pressures. Using data on 140 countries for the period 1980–2003, Cao and Prakash (2012) find that, in response to trade pressures, governments lower regulatory stringency via de facto changes (lowering the enforcement of existing regulations) rather than *de jure* changes (rewriting regulations).

At the level of implementation of environmental regulations, studies have mainly been conducted at industry/firm level to understand compliance in terms of selected pollutants or have focused on actions of environmental lobby groups. Binder and Neumayer (2005) demonstrate that environmental non-governmental organizations reduce significantly air pollutants including sulphur dioxide (SO_2), smoke and heavy particulates concentration. In a review of the literature on the effectiveness of environmental laws, Faure (2011) notes that the developed countries like the USA, the UK, Germany and Belgium have low probability of inspection, detection and prosecution (following detection). However, 'targeting' enforcement efforts whereby environmental agencies and prosecutors focus their efforts on specific categories of polluters or violations (in the industrial sector more specifically) have resulted in improved overall compliance in these countries (see also survey by Gray and Shimshack 2011).

In developing countries, Blackman (2010) observes that environmental regulations are typically lacking and are poorly enforced. Anecdotal evidence from large countries, like India, Indonesia and Thailand, suggest that corruption and lobbying have stalled the drafting of environmental legislation and prevented effective implementation of pollution control laws (Lopez and Mitra, 2000). In their review of findings in emerging economies, Earnhart et al. (2014) document that regulatory agencies are subject to widespread capture by industry lobbies, and government and civil society provide weak incentives for corporate environmental compliance.

To the author's knowledge, few studies in this stream have focused on SIDS per se. In a conference paper, Madhoo (2013) empirically examines determinants of environmental legislative stringency in SIDS in 2008. Due to constrained dataset on SIDS (seven islands), the author uses world sample for analysis and specifies interactive models to capture sectoral lobby pressure in SIDS. Industry in small islands is found to exert negative impact on environmental stringency, with rent-seeking behaviour channelled through corrupt practices. No evidence is however obtained on environmental legislative damage caused by agricultural and tourism lobbies in these islands.

In a recent study, Jagers et al. (2016) hypothesize that five island-specific factors, namely isolation, smallness, ethnic fractionalization, low probability of conflicts and colonial legacy, facilitating collective action would indirectly imply stronger institutions so that island states have better environmental performance as compared to continental states. To test their contentions, the authors estimate models with a host of 105 individual environmental indicators. Cross-sectional econometric results are ambiguous: island states seem to perform better in some environmental indicators but with no difference from mainland states or even worse, in others.

We conjecture that the inclusion of numerous unidimensional indicators by these researchers may have obscured possible generalizations differentiating environmental performance in islands as opposed to continental states. In this study, we posit that multidimensional (composite) indicators may yield some distinct patterns of policy performance. Our analysis is centred on the achievement of two broad multidimensional targets of environmental policy, namely impact on human health (EH) and on the natural ecosystem vitality (EV). Narrowing down the focus in this manner may allow better assessment of targeted regulatory mechanism with direct implications for policy. Thus, the present chapter seeks to contribute to the scant literature on SIDS by explicitly exploring linkages between environmental performance (EH and EV) and institutional quality in SIDS versus non-SIDS. Unlike the mainstream empirical literature, we employ descriptive empirical analysis to draw inferences regarding (direct and possible indirect) links between institutions and environmental performance instead of econometric modelling approaches that are subject to important limitations affecting the robustness of findings.

The chapter is organized as follows. Section 2 tests whether SIDS group of countries appears disadvantaged in terms of environmental impacts on humans (EH) and on nature (EV) as opposed to non-SIDS using cross-sectional descriptive analysis. To understand the context of differences in environmental outcomes, selected socio-economic characteristics and institutional quality measures of these two groups are examined. The aim here is to obtain, from a bird's eye view, some insight on whether better institutions in one group (SIDS/non-SIDS) appear clearly linked to improved environmental quality or is it that some (exogenous) characteristics such as population dynamics and economic diversification seem to matter more. Section 3 quantifies the magnitude and significance of associations between institutional variables and environmental performance in SIDS and non-SIDS using correlation analysis. To complicate matters, economic differences between the two groups such as over-reliance on environmentally intensive sector(s) may affect indirectly the linkage between environmental quality and institutional quality. The existence of such possible indirect channels is inferred by investigating linear and non-linear relations between environmental quality and sectors of the economy (agriculture, industry and tourism). The final section concludes the analysis with some recommendations for environmental management and policy in SIDS and for further research.

20.2 Background: Environmental Performance and Characteristics of SIDS and Non-SIDS

Environmental performance can be viewed as the outcome of formulation, implementation and enforcement of environmental policies. The stringency of such policies would depend on the institutional mechanism and may have varied due to complex linkages with goals of economic growth. From the survey conducted by Scrieciu (2015), available data on environmental stringency for developing countries include individual indicators like carbon dioxide (CO_2) emissions, energy-intensity measures, sulphur dioxide (SO_2) emissions and lead content of petrol across countries; as well as general composite indices developed by international organizations or constructed by researchers, such as those based on United Nations Conference on Trade and Development (UNCTAD) and UNCED survey data (Dasgupta et al. 1999); perception-based indicators drawing on the World Economic Forum (WEF) Executive Opinion Survey; and performance-based indicators relative to the realization of environmental policy targets (refer to www.epi.yale.edu). Such aggregate measures of stringency facilitate comparisons across countries or jurisdictions, and help to synthesize various aspects of environmental policy stringency.

We use composite environmental performance indicators developed by Yale University and Columbia University in collaboration with the WEF to assess the average environmental performance of countries in SIDS group versus non-SIDS (https://epi.envirocenter.yale.edu/). The measures of environmental quality considered include overall environmental performance index (EPI) in two areas, namely environmental human health (EH) and ecosystem vitality (EV). Three policy sub-categories considered to compute EH index include an air quality index (EH.Air), an index of health impacts on humans due to air and water pollution (EH.EH) and a safe water and sanitation index (EH.Water). EV is generated from various sub-indices focusing on impacts on nature. Examples are water pollution affecting nature (EV.Water), agricultural practices (EV.Agr), biodiversity and habitat conservation (EV.BioHab), productive natural resources like fisheries (EV.fish) and forestry (EV.forest) as well as impact on climate change (EV.Climate). Weights are used in the computation of EH, EV and EPI (see Hsu et al., 2016, for information on construction of these indices). For example, EH and EV are assigned equal weights in the computation of overall EPI (50% each). Cross-country data on these indices for year 2014 are employed to identify pockets of vulnerability of SIDS.

Table 20.1 conducts preliminary tests on various aggregate and sub-indicators of environmental performance in SIDS sample of countries versus non-SIDS. Tests of differences are conducted with unequal variances assumed for both samples. Cross-sectional analysis yields that aggregate environmental performance index (EPI) of non-SIDS significantly exceeds that of SIDS at the 10% level of significance (p-value = 0.09). This implies that the realization of overall environmental policy targets is more successful in non-SIDS than in small islands. However, a closer look at the two major policy areas shows that SIDS group performs significantly better than non-SIDS in terms of environmental human health (EH) whereas more severe harm is observed in SIDS to nature (EV). At the level of sub-indices, we find that substantially better result of EH in SIDS is due to better air quality (EH.Air in Table 20.1). As regards health impacts arising from air and water pollution (EH.EH), and due to unsafe water quality and lack of sanitation (EH.Water), SIDS do not appear to perform differently from non-SIDS, on average (p-value greater than 0.10).

Coming to environmental effects on the natural ecosystem, non-SIDS appear to perform significantly better than SIDS in terms of overall EV targets (p-value = 0.00). Most components of EV, namely sustainable agricultural practices measured by the nitrogen use efficiency and nitrogen balance in the soil, biodiversity and natural habitat health, and wastewater management, yield similar results. In the case of fisheries (EV.fish), scores of the two samples of countries are not statistically different. Conversely, SIDS appear to have achieved larger reduction of forest cover loss (EV.

Table 20.1 Environmental performance of SIDS versus non-SIDS (2014)

	Mean		p-*Value for test of difference in means*	
	Non-SIDS (No. of countries)	*SIDS (No. of countries)*	*Ha:* diff ≠ *0*	*Ha:* diff > *0*
EPI (Overall environmental performance index)	67.736 (151)	64.218 (29)	0.17	0.09[a]
EH (Environmental health)	70.584 (151)	78.238 (29)	0.02[a]	0.99
EH.Air: air quality	72.614 (151)	89.559 (29)	0.00[a]	1.00
EH.EH: human health impacts of air and water pollution	65.971 (151)	71.410 (29)	0.22	0.87
EH.Water: water quality	73.167 (151)	73.747 (29)	0.88	0.56
EV (Ecosystem vitality)	64.889 (151)	50.197 (29)	0.00[a]	0.00[a]
EV.Agr: nitrogen balance	86.246 (143)	69.052 (23)	0.00[a]	0.00[a]
EV.BioHab: biodiversity and habitat	75.835 (151)	62.434 (29)	0.01[a]	0.00[a]
EV.Fish: fish	49.166 (107)	52.640 (29)	0.38	0.81
EV.Forest: forest	50.809 (108)	66.861 (13)	0.04[a]	0.98
EV.Water: wastewater	52.736 (151)	29.348 (29)	0.00[a]	0.00[a]

Abbreviations: *SIDS* Small island developing states, *EPI* Overall environmental performance index encompassing effects on human health (EH) and on the natural ecosystem vitality, *EH* Environmental performance with impact on human health, *EV* Environmental performance with impact on the natural ecosystem vitality, *Diff* Mean (non-SIDS sample) minus mean (SIDS sample)

Note: Tests are conducted with unequal variances assumed for both samples

The null hypothesis for difference in means in both cases is H0 : diff =0

[a]Denotes conventional levels of significance ranging from 1% to 10%. More specifically p value <0.1, <0.5, and <0.10 represent significance at the 1%, 5% and 10% levels, respectively

Source: Computed using data from Hsu et al. (2016) (http://epi2016.yale.edu/)

forest) than non-SIDS. Due to lack of data, differences in climate change impacts have not been included in this analysis.

It is instructive to highlight that 24 SIDS out of 29 (82.76%) have an EV score less than 62.52, that is, the aggregate sample mean for both groups of countries. Alarmingly, we also observe that 51.17% of small islands record an EV score less than 50.20, which is the mean for the SIDS group. SIDS in this critical zone include Antigua and Barbuda, Bahamas, Barbados, Cape Verde, Comoros, Grenada, Haiti, Maldives, Mauritius, Papua New Guinea, Sao Tome and Principe, Seychelles, Solomon Islands, Timor-Leste and Vanuatu. Conversely, about 65.52% SIDS enjoy EH quality that is greater than the island mean of 78.24. Nine SIDS having air quality lower than the aggregate sample average are: Cape Verde, Comoros, Guinea-Bissau, Haiti, Papua New Guinea, Sao Tome and Principe, Solomon Islands, Timor-Leste and Vanuatu.

In the next stage, we examine the socio-economic profile of the two samples of countries comprising institutional quality dimensions that may manifest in differences in EH and EV. The aim here is to see whether some clear associations emerge between environmental quality, specific socio-economic island characteristics and policy driven measures.

20.2.1 Socio-Economic Characteristics and Institutional Quality

Table 20.2 distinguishes SIDS and non-SIDS countries based on selected socio-economic characteristics and measures of institutional quality. While population size in SIDS is smaller than that of non-SIDS, population density in SIDS is about 1.7 times higher, which may indicate higher demand for living space per square kilometre and more stress on natural resources to meet this demand. Moreover, the extent of urbanization in SIDS is lower than in non-SIDS where urban population growth also exceeds that of small island states on average. Nevertheless, while more than 50% of the population in small islands reside in rural areas, the growth rate of urban population in SIDS exceeds that of rural population by about 5.5 times whereas in non-SIDS the growth rate of urban population exceeds that of rural population by about 4.9 times. Thus, the extent of urbanization may be more critical to SIDS: higher rate of growth of urban population would create spatial imbalances due to higher population density in urban areas, already constrained by space. As regards the remaining social indicators, no marked difference is apparent between the two groups of countries with respect to primary education and poverty levels. On the other hand, small islands seem to display much higher inequality on average (Gini being 40.2 as opposed to 37.2 in non-SIDS). However, findings on poverty and Gini may not be robust due to small size of the SIDS sample (eight countries).

Table 20.2 Selected socio-economic and institutional quality characteristics of SIDS vs. non-SIDS (2014)

	SIDS			*Non-SIDS*		
Variable	N	*Mean*	*SD*	N	*Mean*	*SD*
Social characteristics						
Population (persons, millions)	28	0.91	1.61	117	33.84	52.31
Population growth	37	1.35	1.52	156	1.47	1.43
Population ages, 15–64 (% of total)	31	63.94	5.93	152	63.34	7.12
Urban population (% of total)	37	47.99	24.37	156	58.89	22.91
Urban population growth (annual %)	37	1.81	1.90	156	2.17	1.82
Rural population growth (annual %)	35	0.33	1.39	155	0.44	1.80
Population density (people per sq. km of land area)	37	433.06	1256.20	155	255.54	1536.00
School enrolment, primary (% net)	29	89.14	7.48	135	89.23	12.65
Poverty gap at 3.20 dollar a day (2011 PPP) (% of population)	8	9.70	8.88	107	9.34	14.26
Gini	8	40.81	4.25	107	37.22	7.93
Economic indicators						
ln GDP, PPP (constant 2011 international dollar)	36	21.62	1.95	149	25.55	1.82
ln GDP per capita (constant 2010 US dollar)	37	8.45	1.02	150	8.55	1.54
GDP per capita growth (annual %)	37	2.31	4.49	150	1.66	5.83
Agriculture, value added (% of GDP)	31	11.33	10.36	140	12.46	12.07
Industry, value added (% of GDP)	31	18.42	8.51	141	30.18	12.18
Services, value added (% of GDP)	31	70.26	10.01	140	57.44	13.29
ln tourist arrivals	32	12.22	1.99	126	14.87	1.65
International tourism, receipts (% of total exports)	23	47.20	29.16	125	11.95	11.20
Tourist receipts (% GDP)	23	22.23	18.76	124	4.35	4.38
Imports of goods and services (% of GDP)	31	62.81	26.93	149	46.56	23.37
Exports of goods and services (% of GDP)	31	45.50	34.67	149	41.75	26.92
Foreign direct investment, net inflows (% of GDP)	36	6.23	5.57	149	3.86	6.13
Foreign direct investment, net outflows (% of GDP)	34	−0.13	5.52	140	0.82	8.22
Trade (% of GDP)	31	108.31	57.53	149	88.31	47.55
Institutional quality						
No. of environmental treaties	36	53.36	16.54	153	89.33	53.35
No. of environmental treaties ratified	36	47.63	16.08	153	77.56	47.32

(*continued*)

Table 20.2 (continued)

	SIDS			Non-SIDS		
Variable	N	*Mean*	*SD*	N	*Mean*	*SD*
Government effectiveness (WB)	37	−0.27	0.82	155	−0.02	1.03
Control of corruption (WB)	37	0.04	0.72	155	−0.11	1.05
Rule of law (WB)	37	−0.11	0.70	157	−0.04	1.05
Legal structure and security of property rights (FI)	17	4.98	1.40	141	5.21	1.59
Regulatory quality (WB)	37	−0.31	0.73	155	−0.03	1.03
Voice and accountability (WB)	37	0.46	0.66	157	−0.14	1.04
Civil liberty (FH)	37	2.35	1.34	157	3.52	1.97
Level of democracy (FH)	37	8.27	2.05	157	6.38	3.16
Political stability and absence of violence/terrorism (WB)	37	0.51	0.52	157	−0.21	1.02
Economic freedom (FI)	17	6.86	0.76	141	6.80	0.92
Tax revenue (% of GDP) (WB)	25	22.08	10.16	118	16.77	7.67

Abbreviations: *SIDS* Small island developing states, *N* No. of countries, *SD* Standard deviation, *ln* Natural logarithm, *PPP* Purchasing power parity, *GDP* Gross domestic product, *WB* World Bank measure, *FI* the Fraser Institute, *FH* The Freedom House

Note: Trade is measured by imports plus exports as percent of GDP

Sources: All summary statistics are computed using data from Teorell et al. (2018) except tourism measures that are published by the World Bank (2018a)

As regards economic profile, countries in both groups have attempted to achieve economic growth by diversifying their economies from agriculture to industry and services sector. The summary statistics in Table 20.2 however depict disproportionate reliance of SIDS on services, particularly tourism-related activities. The tourism sector in SIDS generates receipts amounting to 47% of total exports and 22% of the GDP as opposed to around 12% of total exports and 4% of GDP in non-SIDS. This shows intensive tourism-led growth strategy adopted by most island states. The agricultural sector in SIDS contributes about 11% of GDP that is quite similar to non-SIDS (12% of GDP). By contrast, the industrial sector is significantly less developed on average in island states (18% of GDP) relative to their counterparts (30% of GDP). Moreover, the summary statistics in Table 20.2 portray SIDS as being much more open than non-SIDS (captured by trade as percent of GDP), which is attributable to higher dependency on imports (62% in SIDS vs. 47% in non-SIDS).

Net inflows of foreign direct investment (FDI) as percent of GDP is also higher in SIDS. In their paper, Craigwell and Moore (2008) find the existence of causal relationship running from FDI to tourism in SIDS, implying that FDI provides much needed capacity for these countries to expand their tourism product. UNCTAD (2014) notes that endowments of small islands in terms of human capital and natural resources, such as oceans, sizeable exclusive economic zones, coastal environments and biodiversity, have attracted FDI to tourism and fishing activities. This is in addition to trade preference regimes that generally provide SIDS preferential access to developed-country markets. A few small islands such Papua New Guinea, Trinidad and Tobago, and Timor-Leste are also resource-rich and attract FDI in mining. On average, however, comparative advantage of SIDS in 'sea-sun-sand' tourism and reliance of the economy on tourism as the driver of economic growth may have rendered sectoral (national and foreign) lobbies more effective (than in non-SIDS) and would have led to the development of a conducive institutional framework to promote this sector.

Coming to institutional quality indicators, SIDS are shown to have smaller number of environmental treaties (total and ratified) on average than non-SIDS. International environmental agreements would involve governance checks on domestic institutions due to follow-up requirements for assessing achievement of targeted goals over time. While fewer agreements exist in SIDS, their effectiveness in achieving environmental goals in small-country context is interesting to examine and will be attempted in the next part of the analysis. Indicators of government effectiveness, control of corruption, rule of law, regulatory quality, voice and accountability, political stability and absence of political violence (terrorism) are published by the World Bank (2018b; see also Kaufmann et al., 2010). These measures are standardized with a mean of 0 and a standard deviation of 1 and typically lie between −2.5 and 2.5, with higher scores corresponding to better outcomes.

'Government effectiveness' is a composite index focusing on 'inputs' like quality of the bureaucracy and independence of the civil service from political pressures, required for the government to produce and implement good policies and deliver public goods. 'Control of corruption' measures perceptions of corrupt practices, conventionally defined as the exercise of public power for private gain. 'Rule of law' index captures the extent to which a society is successful in developing an environment in which fair and predictable rules form the basis of economic and social interactions and the extent to which property rights are protected. ‘Regulatory quality’ includes the incidence of market unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of burdens imposed by excessive regulation. ‘Voice and accountability’ index aims at measuring the extent to which citizens of a country are able to participate in the selection of governments. ‘Political stability and absence of violence/terrorism’ measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.

Additional governance indicators published by other international agencies are also used for comparing the two sets of countries. Some provide cross-checks on the robustness of the World Bank institutional quality measures. For example, ‘Civil liberty’ published by the Freedom House can be used to check ‘voice and accountability’ score results. This index captures the freedoms of expression and belief, associational and organizational rights, rule of law, and personal autonomy without interference from the state. Countries are graded between 1 (most free) and 7 (least free). The same source also publishes an index for ‘level of democracy’ that can be used as measure of institutional quality with embedded checks on governmental actions. This index scale ranges from 0 to10 where 10 corresponds to ‘most democratic’.

Another agency, the Fraser Institute, publishes an index of ‘legal structure and security of property rights’, which is used as check for the World Bank ‘rule of law’ scores. The index encompasses dimensions like integrity of the legal system, and (lack of) military interference in rule of law and the political process. It ranges from 0 to 10 where 10 corresponds to ‘highest quality system of property rights’. We also consider the Fraser Institute’s ‘economic freedom’ index, which comprises components designed to identify the consistency of institutional arrangements and policies with economic freedom. The index ranges between 0 and 10 where 0 corresponds to ‘less economic freedom’ and 10 to ‘more economic freedom’.

Table 20.2 shows that, on average, SIDS appear to enjoy higher level of democracy, higher political stability along with lower extent of terrorism, better rule of law (World Bank measure), more transparent system (captured by control of corruption), higher level of civil liberty and voice and accountability scores than non-SIDS. Tax receipt as percent of total GDP, which would be indicative of state capacity and hence institutional strength of an economy, is also found to be higher in small island states. However, SIDS are observed to perform poorly relative to non-SIDS in terms of government effectiveness, system of legal property rights (Fraser Institute measure) and regulatory quality. It is noteworthy that a pattern of association between environmental performance of SIDS (from Table 20.1) and institutional quality (Table 20.2) is not clearly apparent. Moreover, diverging performance of SIDS in terms of EH and EV within the same institutional framework may imply that complex institutional forces are at play emphasizing protection of environmental dimensions having impacts on humans but neglecting those detrimental to the natural ecosystem. In what follows, we attempt to test this hypothesis by correlating various environmental performance measures in SIDS with selected measures of institutional quality.

20.3 Environmental Performance and Institutional Quality Linkages: Correlation Analysis

Table 20.3 portrays highly significant (p-value = 0.00) associations between all measures of institutional quality and environmental performance (EPI, EH and EV) in non-SIDS. Thus, institutions appear to emerge as important constraints to environmental degradation. SIDS group displays similar results with respect to overall environmental performance index (EPI) and environmental impacts on human health (EH), excepting four cases where statistically insignificant associations exist, namely democracy, civil liberty, voice and accountability, and state capacity measured by tax revenue as percent of GDP. Insignificance may imply that these institutional measures do not have direct effects in producing better environmental results. While association does not necessarily imply causation, we conjecture that strong performance of SIDS in most aspects of institutional quality would have significantly contributed to better performance of EH.

By contrast, we do not observe significant correlation between most measures of institutional quality and ecosystem quality (EV) in small islands sample. Weak correlations exist only for government effectiveness and regulatory quality (p-values of 0.11) where SIDS score below average (see Table 20.1). Thus, unlike in non-SIDS, quality of the institutional system including presence of international environmental treaties seems to be generally ineffective in controlling natural ecosystem degradation

Table 20.3 Correlations between environmental performance, international environmental treaties and institutional quality measures: SIDS versus non-SIDS (year 2014)

Variable	*Variable name*	*SIDS*			*Non-SIDS*		
		EPI	*EH*	*EV*	*EPI*	*EH*	*EV*
env_treaty	No. of environmental treaties	0.331	0.333	0.197	0.613	0.516	0.609
	p-value	0.09	0.08	0.32	0.00	0.00	0.00
	N	28	28	28	148	148	148
env_treaty_r	No. of environmental treaties ratified	0.370	0.407	0.186	0.612	0.532	0.623
	p-value	0.05	0.03	0.34	0.00	0.00	0.00
	N	28	28	28	148	148	148
wbgi_gee	Government effectiveness	0.668	0.766	0.302	0.779	0.717	0.703
	p-value	0.00	0.00	0.11	0.00	0.00	0.00
	N	29	29	29	151	151	151
wbgi_cce	Control of corruption	0.395	0.576	0.054	0.652	0.616	0.570
	p-value	0.03	0.00	0.78	0.00	0.00	0.00
	N	29	29	29	151	151	151
wbgi_rle	Rule of law	0.465	0.581	0.161	0.704	0.635	0.651
	p-value	0.01	0.00	0.40	0.00	0.00	0.00
	N	29	29	29	151	151	151
fi_legprop	Legal property rights	0.549	0.656	0.201	0.731	0.674	0.665
	p-value	0.02	0.00	0.44	0.00	0.00	0.00
	N	17	17	17	141	141	141
wbgi_rqe	Regulatory quality	0.549	0.572	0.307	0.708	0.646	0.646
	p-value	0.00	0.00	0.11	0.00	0.00	0.00
	N	29	29	29	151	151	151
fh_ipolity2	Level of democracy (freedom house/imputed polity)	−0.016	0.186	−0.214	0.555	0.498	0.515

	p-value	0.94	0.33	0.27	0.00	0.00	0.00
	N	29	29	29	151	151	151
fh_cl	Civil liberties	−0.072	−0.350	0.208	−0.636	−0.572	−0.590
	p-value	0.71	0.09	0.28	0.00	0.00	0.00
	N	29	29	29	151	151	151
wbgi_vae	Voice and accountability	0.139	0.365	−0.147	0.656	0.583	0.617
	p-value	0.47	0.05	0.45	0.00	0.00	0.00
	N	29	29	29	151	151	151
wbgi_pve	Political stability and absence of violence/terrorism	0.457	0.692	0.035	0.623	0.591	0.542
	p-value	0.01	0.00	0.86	0.00	0.00	0.00
	N	29	29	29	151	151	151
fi_index	Economic freedom	0.637	0.627	0.381	0.575	0.540	0.510
	p-value	0.01	0.01	0.13	0.00	0.00	0.00
	N	17	17	17	141	141	141
wdi_taxrev	Tax revenue (% of GDP)	−0.230	−0.293	−0.118	0.258	0.266	0.201
	p-value	0.30	0.19	0.60	0.00	0.00	0.03
	N	22	22	22	118	118	118

Abbreviations: *SIDS* Small island developing states, *EPI* Overall environmental performance index, *EH* Environmental performance with impact on human health, *EV* Environmental performance with impact on the natural ecosystem vitality, *N* No. of countries, *fh* The Freedom House measures, *fi* the Fraser Institute measure, *wbgi* World Bank governance index

Source: Computed from data published by Teorell et al. (2018)

states. Nevertheless, improvements in government effectiveness, particularly in implementation and enforcement of environmental policies in SIDS, have potential of achieving EV targets.

To synthesize the results, all measures of institutions in non-SIDS appear significantly associated with control of environmental degradation, having impacts both on humans and on nature. In SIDS however, institutions seem more geared towards protecting human health while downplaying impacts on the natural environment. We conjecture that this may reflect disproportionate reliance on some sectors for economic growth in SIDS, having detrimental impact on the natural ecosystem. In the following figures, we attempt to assess the environmental performances of agricultural, industrial and tourism sectors in order to find some indication of trade-offs.

Figures 20.1a and 20.2a depict linear associations between these various measures of economic activity and EH and ecosystem vitality, respectively. From the cross-sectional analysis in Fig. 20.1a, we observe a positive

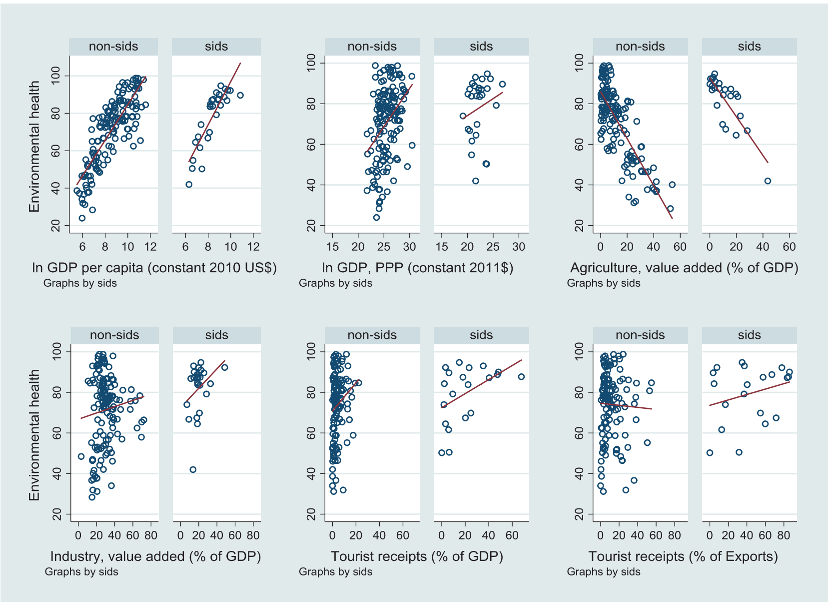


Fig. 20.1a Environmental Health and Economic Indicators—Linear Fit Line. (*Source*: Computed)

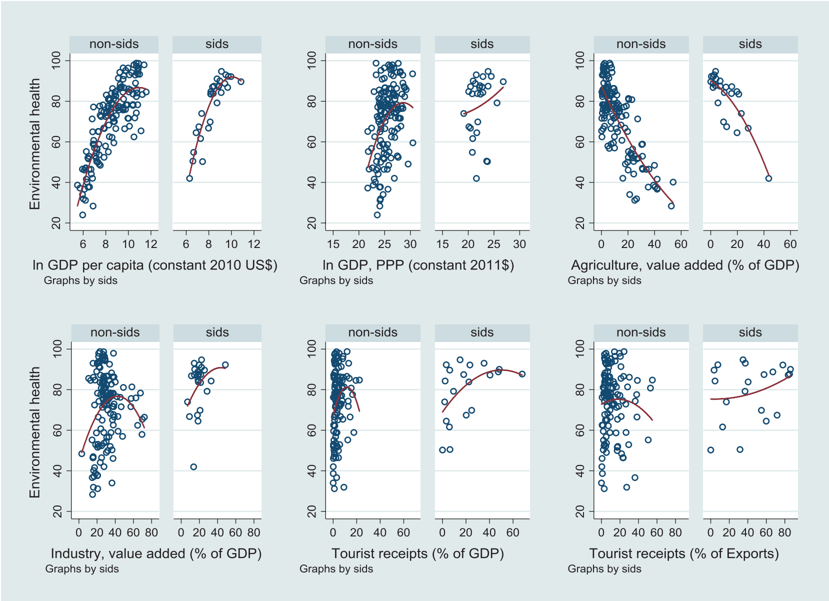


Fig. 20.1b Environmental Health and Economic Indicators—Quadratic Fit Line. (*Source*: Computed)

relationship between environmental health and two measures of economic growth in SIDS and non-SIDS, namely (i) per capita GDP and (ii) total GDP at purchasing power parity (PPP). Thus, improvements in EH would appear to go along with increases in economic growth. A positive relationship between EH and industrial sector growth is also obtained, contrary to expectations. Nevertheless, this relationship appears weaker in non-SIDS (flatter fit line) as opposed to SIDS—reflecting higher scale, diversity and environmental intensity of industrial activities in non-SIDS (with average share of 30% in GDP as against 18% in SIDS). In other words, an increase in the share of industrial sector does seem to significantly improve EH in non-SIDS unlike in SIDS, which may be specializing in less polluting industrial activities. By contrast, agriculture displays clear negative correlation with respect to EH (steep lines of fit) for both groups of countries, showing damage to EH.

As regards the tourism sector, we use two available measures to preform cross-country correlation vis-a-vis EH performance, namely tourism receipts as percent of GDP and tourism receipts as percent of total exports. Interestingly, positive correlations between EH and the first measure of tourism (as percent of GDP) emerge for both country samples. Nevertheless, a flatter fit line for SIDS would indicate slower improvements in EH as reliance of the economy on tourism increases. The second measure of tourism, which focuses on the importance of tourism in generating 'export' currency, portrays declining trendline for non-SIDS while in SIDS, a positively sloped line of fit is obtained. Nevertheless, the flat lines of fit (inelastic) for both sets of countries may be indicative of insignificant relationships between EH and tourism growth (measured as percent of total exports).

It is important to note at this stage that the lines of fit drawn in Fig. 20.1a assume linear association between the variables in the scatterplots whereas non-linear relations may exist. For instance, the environmental Kuznets curve (EKC) hypothesis predicts a non-linear inverted-*U* relationship between per capita income and environmental degradation. In other words, as an economy grows, the environment is considered as an input in the production process and thus environmental quality declines. Beyond some threshold level of income however, environment is viewed as an asset such that further increments in income are linked to improved environmental quality. This hypothesis of non-linear association between environmental quality and GDP is investigated in Figs. 20.1b and 20.2b for EH and EV, respectively.

From Fig. 20.1b, a turning point of the fitted curve appears at high level of GDP per capita beyond which EH performance eventually declines with further increases in GDP. This result is common to both groups of countries and contradicts the EKC hypothesis; improvements in environmental quality would not appear to be sustainable at higher levels of economic growth. Interestingly, however, while the turning points in GDP per capita for SIDS and non-SIDS seem similar, they however occur at lower level of EH for non-SIDS as opposed to SIDS. Thus, SIDS would seem to witness higher level of human health quality than non-SIDS even when adverse impacts of growth on EH set in. Coming to GDP at PPP as measure of total output of the economy, an inverted-*U* relationship is again not obtained for non-SIDS supporting reductions in EH at higher levels of economic activity. SIDS group, on the other hand, tends to display results portraying slight improvements in EH as aggregate GDP increases.

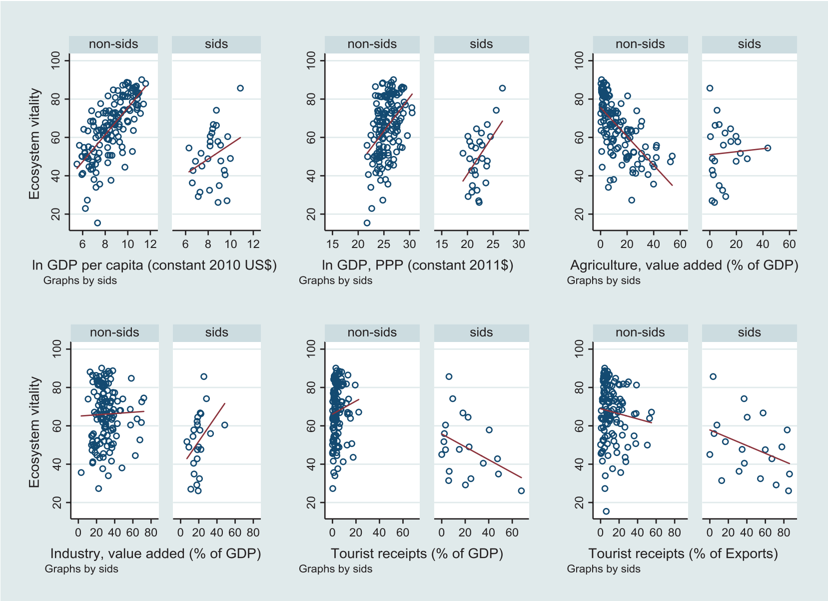


Fig. 20.2a Ecosystem Vitality and Economic Indicators—Linear Fit Line. (*Source*: Computed)

At the sectoral level, agriculture displays negative association with respect to EH supporting correlations from Fig. 20.1a. Since no evidence of turning point is apparent, linear fits seem appropriate for both samples of countries. Coming to industry, a clear inverted-*U* curve in non-SIDS shows damage to EH in non-SIDS with that sector's growth. By contrast, harm to EH due to industrialization strategy in SIDS is not evident. As regards tourism (measured by percentage in GDP and exports revenue), non-SIDS display eventual decline in EH with increased reliance on the sector. SIDS, conversely, do not display substantial damage to EH as tourism-led growth strategy intensifies; the turning point for degradation to set in occurs when tourism receipts exceed 40% of GDP. If we look at tourism receipts as percent of exports, on the other hand, the flat curve would indicate insignificant association between this measure and EH.

From the analysis of ecosystem vitality, a very different picture emerges. In both samples of countries, income variables (GDP per capita and overall GDP at PPP) appear positively correlated to EV from Fig. 20.2a.

Nevertheless, a flatter linear line of fit between income per capita and EV is seen in SIDS as opposed to non-SIDS, indicating lower levels of improvement in EV in these islands for a given rise in GDP per capita. This seems to highlight greater vulnerability (lower resilience) of the natural environment in SIDS, leading to more persistent damage. The picture in Fig. 20.2b supports these findings for GDP per capita; improvements in EV occur as growth proceeds (with no evidence of threshold relationship). As regards aggregate GDP (at PPP), on the other hand, there is some indication of an eventual decline in EV in non-SIDS with further increases in GDP. Correlations for small islands sample however largely confirm findings obtained for GDP per capita on positive association between growth and EV.

At the sectoral level, agriculture displays clear negative association with respect to EV in non-SIDS while, in SIDS, the line of fit indicates insignificant association between agricultural expansion and EV damage (Fig. 20.2a). These relationships find support in non-linear curves

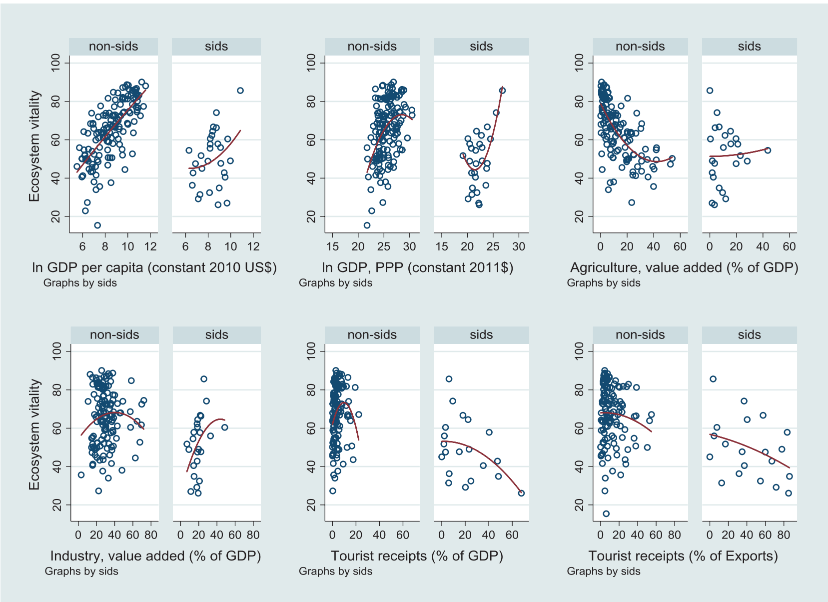


Fig. 20.2b Ecosystem Vitality and Economic Indicators—Quadratic Fit Line. (*Source*: Computed)

displayed in Fig. 20.2b. Coming to the industrial sector, the linear line of fit from Fig. 20.2a does not display significant relationship with respect to EV in non-SIDS whereas a positive correlation is observed in SIDS sample. The non-linear diagram in Fig. 20.2b, however, clearly shows an inverted-*U* relationship between industry and EV in non-SIDS indicating that increased activities of that sector beyond some threshold can be linked to deterioration of nature. Results for SIDS nevertheless remain unchanged; industrialization strategy does not appear detrimental to EV.

Focusing on the tourism sector, results are attempted in two specifications as earlier. From Fig. 20.2a, a positive relationship seems evident with respect to tourism receipts as percent of GDP for non-SIDS while a negative but seemingly insignificant correlation is obtained for tourism receipts as percent of exports revenue. Non-linear associations in Fig. 20.2b, however, reveal that increased reliance on tourism (captured by both measures) in non-SIDS would eventually be detrimental to the natural ecosystem. In SIDS, a gloomy picture emanates from both sets of figures. We find no evidence of threshold relationship with possible beneficial association at low levels of tourism development. Moreover, greater harm to EV in SIDS is indicated by steeper fitted lines of damage than in non-SIDS.

20.4 Conclusion and Policy Implications

This chapter uses correlation analysis to draw insight on the effectiveness of institutions in achieving environmental performance targets in SIDS versus non-SIDS. We categorize environmental performance with respect to their impacts on human health (EH) and on the natural ecosystem vitality (EV). SIDS are found to score significantly better than non-SIDS in terms of EH while they seem strikingly disadvantaged in terms of EV. Interestingly, correlation analysis yields significant associations between institutional quality measures and EH in SIDS whereas insignificant linkages are obtained with respect to EV. This would indicate that regulations in SIDS are more geared towards protecting the environmental human health impacts rather than nature. The situation is unlike in non-SIDS where significant associations between all institutional quality measures and both EH and EV exist. Nevertheless, lower score of institutional quality in non-SIDS may explain to some extent lower EH performance of this group.

Investigations of possible indirect impacts on effectiveness of institutions focus on economic growth goals (measured by GDP per capita and GDP at purchasing parity prices) as well as sectoral analysis approach. In SIDS, we find that improvements in EH is associated with higher income (both measures), higher share of industry in GDP and greater dependence on tourism sector (captured by tourism receipts as percent of GDP and as percent of total exports revenue). Only agricultural sector displays damage to EH in SIDS indicating environmentally unfriendly practices, involving extensive use of fertilizers and pesticides. Since overall economic goals and sectoral performances of industry and tourism do seem compatible with environmental targets, we conjecture lesser opposition, such as from lobbying behaviour, to weaken regulations aiming at EH improvement in SIDS.

Results on EV are striking; all institutional measures in SIDS are insignificantly correlated to ecosystem vitality unlike in non-SIDS. Moreover, from aggregate and sectoral analyses of the economy, overall output (GDP at PPP and GDP per capita) and industrial output (as percent of GDP) do not appear to be the major culprits in damaging EV. Similarly, harm due to agricultural activities is also not evident. What is vital is that damage to EV in SIDS seems directly attributable to the tourism sector. The problem here would get compounded as foreign lobbies in the tourism sector (as FDI) may work to effectively reduce stringency of environmental regulations in SIDS, which are heavily reliant on tourism-led growth strategy. This raises the question about the possible existence of 'race to the bottom' in SIDS; FDI would be attracted to the profitable hotel industry in these locations due to lack of stringent regulations ensuring natural ecosystem protection.

In non-SIDS, EV and economic growth goals measured by GDP per capita appear to conflict. However, in an alternative specification, correlation between EV and total GDP (at PPP) yields a turning point, above which further increases in income result in natural environment degradation. Similarly, lack of evidence of an inverted-*U* relationship is apparent between EV and (i) industry and (ii) tourism in non-SIDS displaying eventual damage to EV with these sectors' expansion. Unlike in SIDS, however, the significance of institutional quality measures indicates success of regulations in mitigating damage caused to EV. Thus, non-SIDS clearly outperform SIDS with respect to achieving EV targets.

The highlight of this analysis is that SIDS would need to devote increased attention to preserving their natural environment and devise policies balancing tourism expansion strategy and sustainable natural resource use. Eco-tourism options should be explored with a view to align economic and ecosystem protection goals. In the same vein, it is important to improve aspects of institutional quality in SIDS that have some significance in containing EV damage (e.g., government effectiveness). Given the vulnerability of small islands, potential damage to nature that may prove to be irreversible would require further investigation. Options like public–private partnership (PPP) ventures in EV protection, explicit stipulation of corporate social responsibility (CSR) commitments to meet EV targets and performance rewards for EV achievements in these small islands can also be analysed.

An important by-product of this research is indication of 'perverse EKC' for EH in both samples of countries, implying unsustainable EH improvement as growth proceeds. The finding in SIDS, however, is not very robust: trade-offs between EH and GDP per capita appear to exist where higher levels of GDP per capita would harm EH while increases in total GDP at PPP seem distinctly linked to improvements in EH. This finding of perverse EKC for EH looks more crucial for non-SIDS and would require in-depth analysis of potential degradation scenarios of different economic sectors, namely agriculture, industry and tourism. Coming to EV, however, EKC hypothesis seems largely supported in SIDS and non-SIDS.

Industry emerges as major polluter in non-SIDS unlike SIDS with respect to EH damage. Greater heterogeneity and pollution intensity of production activities in the industrial sector in non-SIDS may imply higher abatement costs and greater difficulty in spelling out and enforcing environmental regulations. This problem would be compounded as powerful industrial lobbies in non-SIDS effectively work to weaken institutions and stringency of enforcement.

In small islands scenario, the industrial sector, being less diversified and more reliant on imports of many inputs including dirty ones (whose production process generate pollution), is therefore less likely to oppose regulations due to lower abatement costs. The cost of pollution control may also be further alleviated in SIDS due to government policies such as availability of soft loans to industry and/or subsidies on green technologies. Thus, lower abatement costs in SIDS (vs. non-SIDS) would imply greater willingness to comply with regulations to achieve EH goals. This would translate in high effectiveness of institutional regulations in SIDS. Moreover, given high inflows of FDI to the tourism sector in SIDS, our results on positive association between tourism and EH find indirect support in the study by Jugurnath and Emrith (2018) where no positive and significant relationship between FDI and carbon dioxide (CO_2) emissions in SIDS is found.

It is important to note that political will in small islands in adopting the easier route of tourism-led growth reflects in the ineffectiveness of institutions in protecting the natural environment in SIDS. Thus, concerns of economic growth and environmental human health protection have taken precedence over protection of nature in SIDS. This reflects in the significance of institutional quality in achieving EH targets and their overall insignificance in achieving EV targets in SIDS contrary to non-SIDS. Thus, SIDS are found to outperform non-SIDS in terms of EH and underperform with respect to EV targets.

References

Binder, S., & Neumayer, E. (2005). Environmental Pressure Group Strength and Air Pollution: An Empirical Analysis. *Ecological Economics, 55*(4), 527–538.

Blackman, A. (2010). Alternative Pollution Control Policies in Developing Countries. *Review of Environmental Economics and Policy, 4*(2), 234–253.

Cao, X., & Prakash, A. (2012). Trade Competition and Environmental Regulations: Domestic Political Constraints and Issue Visibility. *The Journal of Politics, 74*(1), 66–82.

Cole, M. A., & Fredriksson, P. G. (2009). Institutionalized Pollution Havens. *Ecological Economics, 68*(4), 1239–1256.

Cole, M. A., Elliott, R. J. R., & Fredriksson, P. G. (2006). Endogenous Pollution Havens: Does FDI influence Environmental Regulations. *Scandinavian Journal of Economics, 108*(1), 157–178.

Craigwell, R., & Moore, W. (2008). Foreign Direct Investment and Tourism in SIDS: Evidence from Panel Causality Tests. *Tourism Analysis, 13*(4), 427–432.

Damania, R., Fredriksson, P. G., & List, J. A. (2003). Trade Liberalization, Corruption, and Environmental Policy Formation: Theory and Evidence. *Journal of Environmental Economics and Management, 46*(3), 490–512.

Dasgupta, S., Wheeler, D., Mody, A., & Roy, S. (1999). *Environmental Regulation and Development: A Cross-Country Empirical Analysis*. World Bank Policy Working Paper 1448. The World Bank.

Earnhart, D. H., Khanna, M., & Lyon, T. P. (2014). Corporate Environmental Strategies in Emerging Economies. *Review of Environmental Economics and Policy, 8*(2), 164–185.

Eliste, P., & Fredriksson, P. G. (2002). Environmental Regulations, Transfers, and Trade: Theory and Evidence. *Journal of Environmental Economics and Management, 43*(2), 234–250.

Faure, M. (2011). Effectiveness of Environmental Law: What does the Evidence tell Us? *William and Mary Environmental Law and Policy Review, 36*, 293–336.

Fredriksson, P. G., & Svensson, J. (2003). Political Instability, Corruption and Policy Formation: The Case of Environmental Policy. *Journal of Public Economics, 87*(7), 1383–1405.

Fredriksson, P. G., & Vollebergh, H. R. (2009). Corruption, Federalism, and Policy Formation in the OECD: The Case of Energy Policy. *Public Choice, 140*(1–2), 205–221.

Fredriksson, P. G., Neumayer, E., Damania, R., & Gates, S. (2005). Environmentalism, Democracy, and Pollution Control. *Journal of Environmental Economics and Management, 49*(2), 343–365.

Gray, W. B., & Shimshack, J. P. (2011). The Effectiveness of Environmental Monitoring and Enforcement: A Review of the Empirical Evidence. *Review of Environmental Economics and Policy, 5*(1), 3–24.

Hsu, A., Esty, D., Levy, M., & de Sherbinin, A. (2016). *2016 Environmental Performance Index*. New Haven: Yale University.

Jagers, S. C., Povitkina, M., Sjöstedt, M., & Sundström, A. (2016). Paradise Islands? Island States and Environmental Performance. *Sustainability, 8*(3), 285.

Jugurnath, B., & Emrith, A. (2018). Impact of Foreign Direct Investment on Environment Degradation: Evidence from SIDS Countries. *The Journal of Developing Areas, 52*(2), 13–26.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues*. World Bank Policy Research Working Paper No. 5430. Washington, DC: World Bank.

Lopez, R., & Mitra, S. (2000). Corruption, Pollution, and the Kuznets Environment Curve. *Journal of Environmental Economics and Management, 40*(2), 137–150.

Madhoo, Y. N. (2013). Political Economy of Environmental Regulation and Performance: Some Empirical Results from SIDS. *Procedia Economics and Finance, 5*, 532–541.

Pellegrini, L., & Gerlagh, R. (2006). Corruption, Democracy, and Environmental Policy: An Empirical Contribution to the Debate. *Journal of Environment and Development, 15*(3), 332–354.

Scrieciu, S. (2015). *Measuring Environmental Action and Economic Performance in Developing Countries*. GGKP Working Paper 01. Green Growth Knowledge Platform.

Teorell, J., Dahlberg, S., Holmberg, S., Rothstein, B., Alvarado Pachon, N., & Svensson, R. (2018). *The Quality of Government Standard Dataset*. Version Jan18. University of Gothenburg: The Quality of Government Institute. http://www.qog.pol.gu.se

UNCTAD (United Nations Conference on Trade and Development). (2014). *World Investment Report 2014: Investing in the SDGs: An Action Plan*. United Nations.

World Bank. (2018a). *World Development Indicators*. Available at: https://datacatalog.worldbank.org/dataset/world-development-indicators

World Bank. (2018b). *Worldwide Governance Indicators*. Available at: http://info.worldbank.org/governance/wgi/#home

CHAPTER 21

The Connectivity Challenge in the Western Indian Ocean

Raj Mohabeer

21.1 Introduction

The Island States of Indian Ocean Commission (IOC) are faced with a number of inherent challenges which hinder their economic development and prevent them from reaping the benefits from globalization (Abdoulhalik 2013). The process of regional integration is spearheaded by Common Market for Eastern and Southern Africa (COMESA), Southern African Development Community (SADC), the COMESA-SADC-Eastern African Community (EAC), Tripartite Free Trade Area (FTA) and now the Continental FTA. The primary challenges faced by the region include lack of connectivity in all its three planks—air, maritime and communications. It has small fragmented markets, with wide diversity in size and resource base of the individual economies. It suffers from a lack of economic cooperation in areas of common interest.

This chapter summarizes the work undertaken by the IOC in this field over the past years, to better define the vision and to identify the initial

R. Mohabeer (✉)
Indian Ocean Commission, Port Louis, Mauritius
e-mail: raj.mohabeer@coi-ioc.org

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_21

steps for moving forward. It is a long process with slow and uneven progress.

Trade in the region has been dominated by historical trade links to western economies and Asia. The future tasks are to build on the links, to improve the attractiveness of the region as a larger, more integrated market, to open it up as a gateway to Continental Africa and to promote intra-regional trade (Chung Tick Kan 2013). This requires:

- Marketing the region as an internal trading market and a destination for external trade,
- Responsive and focused economic cooperation and improved connectivity,
- Diversifying exports to expand trade and reduce dependence on Europe linking more closely with Africa, India and Australia,
- Becoming a Gateway to Africa, overcoming isolation and lack of connectivity by sea, air and Information and Communications Technology (ICT) with fast broadband direct linkage,
- Clustering production of goods and services to achieve economies of scale,
- Reducing existing barriers to trade and exchange of goods and services,
- Pooling of resources to enhance air, maritime and ICT connectivity and competitiveness.

21.2 Air Connectivity

Increase in air connectivity with a common airline schedule for passengers and freight can stimulate the economy by supporting increased trade, attracting new businesses to the region and encouraging investment and enhancing in all sectors. According to the IOC report (IOC 2013a), the potential exists since:

- The GDP contribution of tourism is 3 percent in the Comoros, 5 percent in Madagascar, 13 percent in Mauritius and 25 percent in the Seychelles;
- Seychelles has a small local market, with 90,000 inhabitants, and has 250,000 visitors a year;

- The direct contribution of tourism to employment is 3 percent in the Comoros, 4 percent in Madagascar, 12 percent in Mauritius and 26 percent in the Seychelles;
- Mauritius is the most connected of the islands and the Comoros the least.

21.2.1 The Airlines

There is no airline connection between the Comoros and the Seychelles, nor between Mauritius and the Comoros, nor between the Seychelles and Madagascar. Intraregional and intercontinental airport taxes make up 35 to 51 percent of the cost of an airline ticket (IOC 2011).

21.2.2 Air Freight at a Disadvantage

Rising oil prices, the limited space for cargo on passenger flights and competition from sea freight, all act as disincentives: costs by air are about nine times as expensive on the Mauritius-Rèunion route and five times on that of the Mauritius-Madagascar route compared with airlines across Europe (Wong 2013). Some air freight from Europe goes on transit through Rèunion and then by sea to Mauritius. So intraregional commerce by air is limited.

21.2.3 Air Connectivity and Regional Integration

Air connectivity suffers from (IOC 2013a) the following:

- A limited, infrequent and expensive intraregional air transport service,
- An unequal level of training for jobs in tourism,
- Variation in competitive value-for-money,
- Limited services for multi-destination itineraries,
- Low level of attractiveness of some islands for tourism,
- Limited visibility of the region, especially in emerging markets,
- Absence of a common protocol for the compilation of data on services.

Fares in the region are at least four times higher than in Europe for the same distances, and double or treble those in the Caribbean (Moore 2011). Administrative issues include the following:

- The Bilateral Air Service Agreements (BASA) rules inhibit development,
- Flights are infrequent and timetables uncoordinated,
- Unequal levels of commitment discourage cooperation and integration,
- There are 400,000 air passengers per year on the Mauritius-Rèunion route: for the rest of the IOC countries, the annual air traffic is 50,000,
- The airline fleet is fragmented and not well adapted to development,
- No company at present has suitable a fleet for the potential network,
- Most companies are in unprofitable, in debt and compromised by declining demand, exchange rates, fuel prices and taxes,
- The limited vision of the airline companies restricts their vision for the future of the region.

21.2.4 Essential Airline Reforms

The region needs:

- Harmonization of government airline taxes,
- Reduction in stopover times and an increase in direct routes,
- Free right of access to the region's markets,
- Daily flight between the member states of the IOC; and
- A low-cost company financed by regional and international capital to serve the region and, eventually, East and South Africa.

21.2.5 Liberalization of the Airline Industry

The IOC initiated a study which recommended governments to undertake a process of liberalization of the airline market, together with a more effective exchange of information, an easier passage across frontiers, fairer taxes and better consumer protection (transparency of prices, services and assistance, harmonized standards), on the lines of the European model (IOC 2014; Mariani 2013).

Singapore is considered as a model example of the "open skies" airline policy (InterVISTA-EU 2009). Mergers between companies elsewhere offer a model for the IOC region: American Airlines and US Airways have come together to form the biggest airline company in the world. Air

Guadeloupe, Air Martinique and Air Saint-Barthelemy, all three in deficit, came together in 2000 to form Air Caraibes.

In the 2013 IOC Conference on airlines, there was general consensus on the need for liberalization of regional air transport to guarantee the free circulation of people and goods between the member states of the IOC as well as the development of inter-island tourism.

21.2.6 Regional Airline Strategy

The creation of a single regional company may be the best solution for the region, viable in economic and commercial terms, and bringing together the political leaders with a long-term vision. The stakeholders of the aviation, tourism and export sectors agree that the present model is obsolete (Kwok 2013). They want action to form region-wide partnerships and common standards.

One solution has been proposed by the Seychelles to work towards a framework agreement to create an Indian Ocean Single Aviation Market (IOSAM), a model successfully used by the ASEAN (South East Asia) region (Savy 2015). The creation of a single aviation market and a regional airline is economically viable together with a low-cost airline which could be expected to create wealth, flowing from greater income for airline companies, customs, duty-free shops, integrated ground transport, travel operators, hotels and wider spending made by tourist and business travellers. The estimated value of economic activity generated by one passenger is at US$2052. The total number of passengers could increase by some 2.4 million annually producing annually some US$5 billion of new economic wealth creation within the IOC region (IOC 2014).

21.2.7 IOC's Vision for Airline Connectivity

The IOC's challenge is to achieve the upgrading of the airline service with at least one daily flight between the member states of the IOC, the creation of a dynamic network of connections, the forging of a common destiny which is visible to the rest of the world, affordable fares and direct inter-island travel.

The existing airline system is not sustainable and provides little opportunity for further development (De l'Estrac 2013). Examples of new models, as found in Europe and Singapore, demonstrate this but also that the achievement of this vision requires collective regional leadership.

The IOC continues to promote reform; there are a number of options (Sithanen 2013); but it cannot be business as usual.

21.3 Maritime Connectivity in the South-West Indian Ocean

The IOC countries are committed to continue the diversification of their economies, improve their capacities to exports, further improve the quality of their infrastructures, and increase trade. To do this, they need integrated shipping with up-to-date ports and land transport linkage to provide regional-wide maritime connectivity.

The traditional markets of the IOC countries are stagnant (IOC 2015a). So, the focus must be intra-regional economic cooperation with Continental Africa. It is estimated that the economy of the sub-Saharan region will grow at the rate of 6 percent and the African population to grow to two billion (IOC 2015a). The IOC region needs to lock into this opportunity freeing by opening up its present shipping system currently prisoner to the transport plans of a few international shipping companies. Better maritime connectivity will then lead more flourishing regional markets, wider trade, the more rapid movement of passengers and freight and the promotion of inclusive and equitable growth.

21.3.1 Maritime Costs

The cost of maritime transport is high—around 30–40 percent of the cost of consumer products—(IOC 2013a) lacks flexibility and undermines competitivity of the regional products in the global market. The ports in IOC region are at different stages of development in terms of their infrastructure for container services. Integrating the maritime systems will attract additional investment for sustained regional economic development.

A strategy for maritime connectivity requires:

- Cost-effective shipping services,
- Regular maritime transport system,
- Well-integrated chain of inter-modal maritime infrastructure and relating facilities,
- Regional economic and trade strategy and a relating coordinated regional policy for maritime transport.

The whole region shares a high dependency on imports for a variety of essential commodities and manufactured goods. But gaps in containerized systems across the region mean high overhead handling costs and delays.

Many of the countries need better inland transport infrastructure, for getting containers from several ports to their destinations, notably in Madagascar and the Comoros. The shipping lines are continually rationalizing their services on the basis of market demand, costs and freight rates. Moreover, global shipping lines are in a constant process of increasing the size of their vessels in order to decrease the costs per twenty-foot equivalent unit (TEU) transported. This puts pressure on the ports—including those of the Indian Ocean region—to adapt their infrastructure (quay length, depth) to meet this demand. But reform is confronted by the complexities of dealing in each country with different entities, ministries and institutions, with different responsibilities for maritime development.

21.3.2 Logistics Performance

How countries manage shipping and related commerce varies widely across the IOC region, and against benchmarks, with many IOC and Atlantic, Indian Ocean, Mediterranean and South China Seas (AIMS) region countries facing challenges to overcome in terms of customs procedures, infrastructure and timeliness of passage of freight, inhibiting the flow of goods (IOC 2015a) (Table 21.1).

Table 21.1 Logistics Performance Index 2019

Logistics performance index (LPI)				
Countries	*LPI rank*	*Customs[a] rank*	*Infrastructure[c] rank*	*Timeliness[b] rank*
Germany	1	1	1	3
Singapore	7	6	6	6
France	16	19	12	14
Mauritius	78	59	59	99
Sao tome and Principe	89	57	106	97
Comoros	107	72	119	120
Madagascar	128	118	128	128
Guinea-Bissau	129	144	59	118

Source: World Bank 2019

[a]Efficiency of customs and border management clearance
[b]Frequency of shipments delivered on time
[c]Quality of trade and transport infrastructure

The role of the private sector is largely confined to the actual provision of transport services (operations) or—in respect of ports—to investment for superstructure and equipment to improve operational efficiency. The private sector generally owns and manage the ports itself. This may change over time as more PPP ports in the region are introduced, despite political inertia and conservatism.

21.3.3 Shipping Volume

In 2013, a total of 850,000 TEU containers were handled in the IOC ports (i.e., excluding the port of Longoni in Mayotte), of which 36 percent were full imports, 14 percent full exports, 20 percent transhipment (full and empties) and the balance being empty containers handled (IOC 2015a).

On average about 6000 TEU are shipped per week to the IOC countries (310,000 TEU/52 weeks), indicating that one weekly service to the IOC region with a 6000 TEU vessel would almost be able to handle the total demand of the IOC region (IOC 2015a).

The IOC trade can be characterized as very unbalanced: full imports are almost three times the total of full export containers (IOC 2015a). This gives rise to expensive repositioning costs for shipping lines as they include the repositioning costs of empties in the freight rates.

21.3.4 Shipping Hub: Mauritius

Currently, Port Louis is the principal transhipment hub port for the IOC region. Port Louis handles almost 80 percent of the total transhipment containers in the IOC countries, which amounted to about 174,000 TEU[1] in 2013, followed by Toamasina, Madagascar, with a transhipment market share of 13 percent (IOC 2015a). The port of Toamasina is a relative newcomer on the transhipment market (from 2012), while Port Réunion has lost a substantial market share in transhipment containers since 2008 and is now only a marginal player. Several ports in the IOC region have ambitious development plans for container terminals in order both to meet local demand and to capture the regional container transhipment market (IOC 2015a). However, taking into account the relatively small size of the IOC economies, it is doubtful that all those container terminal development plans are required and, therefore, when materialized, this increased capacity will result in fierce competition between the ports.

21.3.5 IOC Strategy

The IOC aims to make the region an integrated economic zone to collectively attract carriers, manufacturers and traders, and to reduce the costs of inter-regional transport through improving efficiencies in the transport system and enhancing access to the whole region, promising gains in autonomy in relation to the "global carriers". This should ensure a regional maritime transport system responsive to local and regional economic development strategy. |It would offer greater security of supply.

21.3.6 What IOC Has Done

The success of introducing measures to improve the overall maritime connectivity of the IOC countries, depends on the commitment and capacities, especially at public level, of the individual IOC countries to address the above. Maritime connectivity has been on the active agenda of the Indian Ocean Commission for the last two decades. The IOC main activities are described below.

21.3.7 Establishing a Cabotage System

The IOC commissioned feasibility studies for the establishment of an IOC regional maritime cabotage service in 2009 (IOC 2009) and 2015 (IOC 2015a), on operating at sea and related transport systems. The studies concluded that the financial feasibility of a regional cabotage shipping line and services will be negative, requiring substantial initial investments by the owners and continuing funding to cover the recurring annual operating losses. It further questioned whether the private sector would be interested to operate the regional cabotage service, whereas operational management by the public sector, which has no experience in such activity, would likely result in excessively bureaucratic decision-making processes.

The establishment of a regional maritime cabotage service becomes even more complex for the following reasons:

- The heterogeneity of the IOC members with political structures, economic systems, existing infrastructure and culture extremely diverse.

- Each of the Island State constitute a very small market. Even together, the IOC countries still remain small.
- Growth would be uneven across the region.
- Political commitment is not readily translated into collective action.
- Large operators crowd out newcomers even if very small and adapted to suit the needs of the region.
- The varied quality and efficiency of ports, their infrastructure and services hold back development.
- Need for agreement on subsidizing the cabotage system which may be viewed as a distortion of existing operators resulting in dissuading the latter from commitment and investment in services in the region.
- The creation of such a service can be very complex as contributions to the service would also mean influencing the activities.

21.3.8 Promoting a South-West Indian Ocean Maritime Corridor

Maritime connectivity cannot be improved individually by one country and cannot be confined to the availability of shipping services in the region but to the entire intermodal transport chain, including ports characteristics, organization of trade facilitation in the total supply chain, including national-level transportation, the institutional and legal framework in each country and capacity in the public sector and ability to attract finance for the maritime sector. In concrete terms, these include the followings (IOC 2013b):

- Maritime services including navigation, piloting/towage, ship repair and so on
- Infrastructure such as ports, logistics at port
- Support services such as customs, bank and insurance and so on, freight forwarders
- Inland infrastructure, including national transport system, inland shipping, shortsea feeder/coastal shipping.

Working towards the establishment of a South-West Indian Ocean Maritime Corridor could be the best option. This requires updating port and related physical infrastructures and installing ICT control systems. Further detailed studies of the operational systems should be undertaken once the IOC accesses adequate resource. Moreover, progress will depend on the readiness to cooperate between partners on the plans for each country, physical works projects and education and training of management and operational staff.

A complementary activity would constitute the establishment of an observatory to monitor the overall maritime connectivity in the region focused on the following:

- Monitoring of shipping services,
- Quality of port infrastructure and equipment,
- Port user costs,
- Trade facilitation actions,
- Institutional aspects, legal and regulatory reform,
- Financing maritime transport infrastructure, and
- PPP and other models.

For a Maritime Corridor to succeed, it not only has to have access to adequate and timely funding, but it also has to be regarded as a high-priority regional project by all countries the corridor links. The main factor hampering progress in this area has been the lack of resources of the only intergovernmental organization in the region—the Indian Ocean Commission — which has the mandate to work towards the improvement of maritime transport. The essential first step is to establish and agree to implement a regional maritime connectivity strategy, each country developing its ports according to widely varying respective ambitions, policies, economic and geographical conditions and capacities but within an integrated chain.

21.4 Information and Communications Technology

This section summarizes the work of the IOC for improving digital connectivity in addressing regional and global challenges towards sustainable economic development goals. The strong growth of the global digital economy and the proximity to the actively growing African continent can lead to a significant growth in terms of services and development around the digital for the regional companies and to a strong growth of the economic weight of ICT/IT in member states as well as to creation of jobs. Different economic sectors also have a high growth potential that is not exclusively related to the domestic or subregional consumption but requires an opening to the rest of the world. Digital connectivity is now an important sector for the promotion of regional integration. Its optimal impact will only be felt when the current deficit at national levels is addressed. Individually, a member state is not able to respond adequately to address this gap given the high level of investments needed to ensure a competitive entry into the international broadband highway. The IOC is playing a catalytic role in promoting policy change through its e-IOC2020 strategy.

ICT and particularly broadband are the drivers of change in society, with human (access to knowledge, etc.) and economic development objectives. The increasing role played by the ICT sector to improving productivity and economic growth and at the same time enabling governments to provide better services have been recognized by the OECD countries. The countries of the IOC region constitute heterogeneous economies, two being LDCs with relatively high rural population and other small and vulnerable economies, needing a socio-economic boost that could be achieved by greater access to improved communication services.

21.4.1 Promoting Trade

It appears clearly that the promoting trade, economic growth and socio-economic development in the IOC region, can be achieved only through an integration of the states in the global e-economy. Because of "their insular fragility", regional cooperation is a key element. The integration of the IOC's internal markets and access to neighbouring and global markets depend highly on the quality of internal and external connectivities.

Regional connectivity is based on three planks: digital, maritime and air connectivities. In the current digitalized world, digital connectivity is now playing an even more important role for the further economic integration of the region. The service sector is becoming more and more important in all the countries with ICTs being the most important factor. This is because the contribution of the services sector to the national GDP is increasing with time and also has an important place in countries' development strategies.. The individual markets in the IOC region are sparse and small and in monopolistic situation which constitute inherent characteristics preventing optimization from the growth potential in the region.

A study undertaken by IOC in 2015 (IOC 2015b) identified the following main issues in the region, as a regional entity:

- Poor physical connectivity between neighbouring states/islands (infrastructural connectivity)
- A "digital" connectivity intra IOC, independent of private or monopolistic interests and not transiting through Europe or Asia
- High cost of digital regional connectivity

21.4.2 The Key Elements of Digital Connectivity

The e-IOC2020 endorsed by the IOC Council in 2015 aimed at the following four strategic actions:

- The implementation of infrastructures interconnecting the member states between them while strengthening connectivity towards the rest of the world,
- The establishment of economic "clusters" strengthening the development of the IT/ICT companies' expertise for better collaboration and association of know-how but also playing the showcase role with regard to the rest of the world,
- The establishment of a Regional research network grouping different national subsets, and
- The implementation of a regional digital platform.

21.4.3 Digital Connectivity: Infrastructure Development—the METISS Project

The IOC aims to promote region-wide sustainability of the regional infrastructures for ICT connectivity and with the rest of the world for better integration and economic development of the countries. This includes (IOC 2015b):

- A strong international connectivity at reasonable prices of Mbps, comparable to the rest of the world provided by the submarine cables
- The necessary national terrestrial and open-to-competition infrastructures
- A development of high and very high speed covering the whole population
- A legal and regulatory framework to ensure an effective competition of the "Internet" services

IOC actions as from 2007 constituted a pledge for improving ITC infrastructure. Several conferences and pledges made helped in Mauritius, Réunion linked to a second submarine cable—LION. Seychelles realized its isolation and vulnerability and initiated the SEAS Cable project. Comoros initiated collaboration with the World Bank. The Melting pot Indian Oceanic Submarine System (METISS) project was initiated in 2015 by the Indian Ocean Commission (IOC) with the aim to improve the conditions of access to the Internet for the populations of the South-Western Indian Ocean States. The 30th IOC Council of Ministers held on 20th May 2015 confirmed the leadership role of the IOC for the democratization of Internet access, the promotion of innovation and the creation of a modernized landscape through upgraded infrastructure.

The IOC launched the process in October 2015 and a Consortium of regional operators signed the METISS Construction and Maintenance Agreement (C&MA) on the 13th December 2017 in Port-Louis. It is for a submarine cable system running from Mauritius to South Africa through Rèunion and Madagascar. The purpose of this cable system is to provide adequate capacity for connectivity between the countries. It is also a necessity since the existing SAFE cable system will reach end of life in less than five years. A turnkey supply contract was signed between Alcatel Submarine Networks, Elettra TLC S.p.A. and the METISS Consortium for the manufacturing and construction of the METISS cable on 1st February 2018. A 25-year landing supply contract between Liquid Telecommunications South Africa (PTY) Ltd. and the METISS Consortium was signed on 30th November 2018. A detailed marine survey for the cable landings and route between Mauritius, Rèunion, Madagascar and South Africa has been carried out, enabling final technical design for required for permits and manufacturing of the cable manufacturing which has now started.

As METISS will be a totally open cable whereby any Consortium members may sell its capacity to any territory without limitation, thus enabling real competition which is expected to bring the international connectivity cost down. As South Africa is becoming a major ICT Hub in the region it is expected that around 80 percent of the content and IP Transit will be purchased in South Africa instead of buying same from Europe as presently. Thus bringing revenues to South Africa wholesales operators.

21.4.4 Other IOC Actions

IOC promoted cooperation with Estonia at both regional and bilateral levels. Several exchanges were held. The aim was to encourage cooperation between Estonia and IOC as well as bilaterally with countries in the ICT sector in areas of common interest such as a cost-effective way for improving the ICT infrastructure, promotion of e-services, human development and study missions in priority areas and the establishment of a regional Centre of Excellence promoting international cooperation on e-government, promoting cooperation between educational institutions especially on e-governance-related studies. Other actions relate to the establishment of a regional e-Governance Academy and an ICT Observatory. A decision of the IOC was made to establish it in Mauritius. Lack of resources however prevented the IOC from making progress.

21.5 Conclusion

To overcome the insularity of its Island members and to act in line with its other wider regional partners, the IOC has embarked on a long-term programme of interregional connectivity. This has embraced airlines, shipping and ICT. This chapter highlights the vision, the strategy and the initial steps that have been taken. Progress has been slow and piecemeal. But increasingly the aims have been recognized and agreed by the principal stakeholders in the public and private sectors and civil society. The role of the IOC has been to bring the key actors together to promote formal agreements and to stimulate action, supported by international partners including the European Union, the World Bank and the Commonwealth Secretariat. Initial results have been encouraging, but countervailing pressures have to be overcome in a region which is highly diverse geographically, economically and in terms of its social, cultural and historical background.

Note

1. TEU: Twenty-foot equivalent length: a measurement for containers.

References

Abdoulhalik, F. Y. (2013). *Desserte Aérienne: Contraintes, Perspectives et Attentes*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/Fakriddine_-_Presentation_Connectivite_aerienne_COMORES.pdf. Accessed 28 Jan 2020.

Chung Tick Kan, G. (2013). *Regional Airlines*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/Georges_CHUNG_Regional_Airlines.pdf. Accessed 28 Jan 2020.

De l'Estrac, J. C. (2013). *Quelle Stratégie pour le Transport Aérien?* (Available on Request at the IOC, Mauritius).

InterVISTAS-EU Consulting Inc. (2009). *The Impact of International Air Service Liberalization on Singapore*. Available at: https://www.yumpu.com/en/document/read/320621/the-impact-of-international-air-service-liberalisation-on-singapore. Accessed 28 Jan 2020.

IOC (2009). *Réalisation d'une étude sur la desserte maritime de l'océan Indien*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2011). *Air Services in the Indian Ocean Region and a Branding Concept for the Region*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2013a). *What Strategy is there for Air Transpor*t. IOC, Report on Connectivity in the Indian Ocean, May 2013, Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2013b). *The Case for a Regional Maritime Service*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2014). *Indian Ocean Aviation – The Way Forward*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2015a). *Feasibility Study on Maritime Connectivity and a Regional Cabotage Service in the South-West Indian Ocean Region*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

IOC. (2015b). *Feasibility Study for Improving the Digital Broadband Offer and Competitiveness in the Indian Ocean Commission Islands*. IOC: Mauritius (Available on Request at the IOC, Mauritius).

Kwok, J. (2013). *Intervention de l'AHRIM*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/AHRIM_-conference_connectivite_COI_2mai13.pdf. Accessed 28 Jan 2020.

Mariani, A. (2013). *What Strategy for Air Transport?* IOC: Mauritius (Available on Request at the IOC, Mauritius).

Moore, P. (2011). *Air Services in the Indian Ocean Region, and a Branding Concept for the Region*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/Paul_MOORE-_Air_Services_in_the_Indian_Ocean.pdf

Savy, D. (2015). *Seychelles Strategy: Meeting Stakeholders Expectations Whilst Simplifying the Business*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/SAVY-_seychelles_strategy_of_air_transport.pdf

Sithanen, R. (2013). *What strategy for Air Transport in COI Countries? Extinction, Irrelevance, Synergy, Taken over or Integration: à la Carte Menu?*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/Dr_SITHANEN-COI_conference__3_rd_May_2013_fin.pdf. Accessed 28 Jan 2020.

Wong, D. (2013). *Les contraintes des usagers du transport aérien et les perspectives du secteur privé*. Available at: https://www.commissionoceanindien.org/wp-content/uploads/2019/03/D_WONG_les_points_de_vue_des_importateurs_et_exportateurs.pdf. Accessed 28 Jan 2020.

World Bank. (2019). *Logistics Performance Index*. Washington, DC: World Bank. Available at: https://lpi.worldbank.org/. Accessed 28 Jan 2020.

CHAPTER 22

Overview, Emerging Issues and a Roadmap for SIDS

John Laing Roberts, Shyam Nath, Satya Paul, and Yeti Nisha Madhoo

22.1 Focus of This Book

This book is a sequel to the volume *Saving Small Island Developing States: Environmental and Natural Resource Challenges*, edited by Shyam Nath, John Laing Roberts and Yeti Nisha Madhoo (2010), published by the Commonwealth Secretariat, UK. Since then the pincer movement of rising population and increasing ecological footprint has taken a further toll on the natural resources of the planet and not least in small islands.

J. L. Roberts (✉)
Indian Ocean Commission, Ebène, Mauritius
e-mail: john.laing@hotmail.com

S. Nath • Y. N. Madhoo
Amrita Center for Economics & Governance, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, India
e-mail: shyamnath@am.amrita.edu; yetinishamadhoo@am.amrita.edu

S. Paul
ANU College of Arts and Social Sciences, Australian National University, Canberra, ACT, Australia
e-mail: satya.paul@anu.edu.au

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3_22

Moreover, the global agreements and effective actions on development and environmental issues seem to recede as time progresses and we now stand closer to the threshold of a global ecological crisis from the sum total of pre-existing risks.

The book is a fresh look at the issues of sustainable development, degradation of natural resources and vulnerability to climate change in small island developing states (SIDS). Unlike the first volume, it covers a wider canvas that comprises not only environmental challenges but also economic and social developments that add to the vulnerability of SIDS. It is important to note that most SIDS belong to higher and middle-income categories showing higher growth prospects but, adversities in the form of environmental vulnerability are more profound and pose insurmountable challenges.

The research presented by experts in the different chapters gives a sharp and less optimistic view of the task ahead. The continuing dilemma for both science and policymakers is that past patterns of human development carry with them the critical degradation of the natural resources on which that very development has depended. This trend of environmental degradation accompanying socio-economic development has persisted. However, action is more urgent now with the rising frequency of extreme events as SIDS are amongst the most vulnerable countries in the world, both economically and environmentally. Our book serves as an observatory on these highly sensitive lands which depict so clearly the adverse impact of environmental depletion but can also provide lessons for others on cost-effective intervention for sustainable development.

With new threats that are emerging fast, SIDS are rapidly becoming the early sufferers of the impact of global warming and the steady increase in frequency and severity of natural disasters, including cyclones and floods. The global pandemic of COVID-19 presents a new destabilising force, with probably a more pronounced impact on SIDS, making their current challenges more complex. These developments have put heavy pressure on limited medical technology and health services available in the islands and have severely affected their economic performance so dependent on tourism.

At present the unanticipated catastrophe of COVID-19 leaves many countries in a labyrinthine dilemma of how to elude such threats in the future. Paradoxically, the ecological implications of the pandemic may be beneficial in terms of environmental improvements such in air and water quality. But these benefits may be short-lived if economic activities resume at a ‘normal pace’ without policies from governments to alleviate degradation of the natural environment.

The chapters in the volume document the deteriorating state of SIDS and the stand that some are employing to avert the impending crisis of unsustainable economic growth with international, regional, national and community support. Despite the immense task, SIDS are putting some effort to reduce the risks of a disastrous future along a roadmap for sustainable development. It is worth noting that the book has focused principally on SIDS, but there are a growing number of examples of non-sovereign islands like Zanzibar and Hawaii, which have experimented with new strategies to address similar environment-cum-development trade-offs. Moreover, the analysis presented here may also have consequences for larger states in their attempts to reduce their own risks of catastrophe and work towards the common mission of saving planet Earth from the looming crisis of degradation of natural resources upon which human existence depends.

This book may be used as a tool box and a public policy textbook for policymakers and masters’ students on the environmental management of small island states. The volume is not limited to environmental vulnerability; it also focuses on a variety of complex issues in sustainable development. Thus, it may be of interest to development economists. The book may also attract the attention of NGOs, social workers and international organisations for the collection of evidence on ground realities and policy choices.

22.2 Overview and Emerging Issues

The book is organised in five parts. Part I explores economic and development dimensions of small island states. This is followed by a discussion on social dimensions of sustainable development in Part II. Part III discusses climate change and its impacts on natural resources. That includes sea dynamics, water security, the protection of natural forests and the emerging risk of heatwaves. Part IV examines environmental governance with select case studies. These studies cover the changing interpretation of the blue economy, institutional governance, tourism and the effect of overseas aid on climate resilience. A global perspective on sustainable development is presented in Part V.

22.2.1 Part I Economic and Development Concerns

In Chap. 1, Shyam Nath and John Laing Roberts discuss the importance of climate change and global warming in the design of sustainable growth and development models and they offer alternative suggestions for promoting sustainable development in small island economies. The authors also propose that small islands be adopted as experimental laboratories for climate risk management strategies, which would benefit both the threatened islands and the rest of the world.

Satya Paul, in Chap. 2, presents a snapshot of small island economies. The chapter begins with a discussion of macroeconomic trends in GDP growth, debt, and fiscal and trade balances. It highlights other salient features such as poverty and levels of human development. This is followed by a detailed discussion of their vulnerability to natural disasters and climatic change, and resilience capability. Finally, the chapter examines the avenues of international financial and other supports to build the resilience capability of these economies.

In Chap. 3, Augustin Kwasi Fosu and Dede Woade Gafa draw on the examples of two well-performing islands, Mauritius and Singapore, to provide strategic lessons for vulnerable SIDS on strategies that can help overcome their inherent vulnerabilities and promote economic development. The chapter concludes that building human and institutional capacities, boosting exports and infrastructure development, and promoting foreign direct investment and industrialisation under a strong public-private sector institutional partnership are the keys for fostering economic resilience and achieving sustainable development.

Trade- and growth-related strategic issues of sustainable development are discussed by Keith Nurse and Jeanelle Clarke in Chap. 4. In the context of Caribbean and Pacific small islands, the authors suggest that the boosting of trade competitiveness and growth requires more than just increased investment or upskilling of the work force. Strategic and systematic approaches are required, which aim at promoting innovation-driven enterprises, diasporic entrepreneurship and engagement, strategic government procurement and aid for trade/innovation.

In Chap. 5, Harvey Armstrong and Robert Read address the impact of tourism on the social, economic and environmental state of SIDS. Many SIDS are highly dependent on tourism, which has been boosted by the falling price of long-haul flights in jumbo jets and the growth of giant modern cruise liners, each mode of transport carrying thousands of passengers to some of the remotest islands in the world. This brings financial benefits and environmental costs. The authors call upon policymakers to carefully assess such impacts and put in place measures to mitigate the local and global adverse effects of the ecological footprint of tourism against the limited carrying capacity of SIDS.

22.2.2 Part II Social Dimensions

Peter Buker and Mark Lapping in Chap. 6 address the issues of institutional development facing SIDS. The main focus of their analysis is on judicial systems and on democratic processes. They examine the potential for the empowerment of people at the local level by rebalancing the outcomes of the two common contrary tendencies of power: integration and fragmentation.

Sefa Awaworyi Churchill, Yeti Nisha Madhoo and Shyam Nath in Chap. 7 explore the relationship between social capital and wellbeing within the two island states Trinidad and Tobago and Singapore. Shaping the future of SIDS is not just about economic growth and environmental protection; it is essentially about people, their behaviour, their values, their priorities, their happiness and discontents. The authors consider social support and social relationships to be at the heart of social capital. Making use of data from the World Values Survey, the chapter examines whether these factors can underpin well-being and the capacity of people to cope with the stress that comes from living in these SIDS that are economically and environmentally vulnerable.

In Chap. 8, Satya Paul examines the quality of life in 37 SIDS employing a set of 12 indicators derived from the latest World Bank datasets (World Development Indicators and Worldwide Governance Indicators and Freedom House report). Based on these indicators, he obtains Borda scores to rank the quality of life in the countries reviewed. He finds that Barbados tops the league, with Singapore close behind; other Caribbean SIDS are near the top of the ranking, but the Pacific SIDS trail behind, with Haiti and Guinea-Bissau bringing up the rear. His indicators for 2017 include socio-economic status, rule of law, quality of government, fairness of regulations, political stability and security, rights and liberties. He concludes, from his intensive analysis, that better governance is likely to improve the quality of life of the people governed.

Brijesh C. Purohit, in Chap. 9, analyses health care systems in SIDS. The author identifies inadequate finance, shortages of staff and lack of specialisation, as factors inhibiting better health outcomes in SIDS. Many islands continue to have substantial problems with infectious diseases such as cholera, tuberculosis, gastroenteritis, malaria and HIV/AIDS. The author stresses the need for better primary care to lower infant mortality rates, and for plans for health promotion for the prevention of non-communicable diseases.

22.2.3 Part III Climate Change and Natural Resources

Shyam Nath and Yeti Nisha Madhoo, in Chap. 10, explain the science behind the dynamics of sea level rise and threat to the coastal economic, social and environmental future triggered by increasing accumulation of atmospheric carbon dioxide (CO_2), melting of polar icecaps and thermal expansion of water. The authors suggest that switching to more cost-effective methods of production of renewable energy may be the way forward along with defensive expenditure, carbon taxation and formation of climate clubs to reduce CO_2 emissions. The feasibility of carbon capture and storage, as well as that of geo-engineering strategies (mimicking volcanic eruptions), is also examined. Additionally, the authors discuss the alternative of accepting lower economic growth as a means to lower CO_2 emissions as is evidenced by the economic slowdown during the COVID-19 threat.

In Chap. 11, Chloe Wale, Nidhi Nagabhatla and Duminda Perera examine the issue of water security and disaster management in SIDS in the face of the growing risk of natural disasters and their adverse effect on water resources. They present a ten-point plan for action on water security and disaster management, which calls for collaboration at the international, regional, national and local community levels, with a special focus on high-risk zones subject to regular drought.

The Solomon Islands face the prospect of increasing loss of natural forest through uncontrolled logging. In Chap. 12, Eric Katovai, Dawnie D. Katovai and William F. Laurance provide a detailed technical review of current forest management in these Islands. They examine the process of natural and human-aided regeneration of forest areas to mitigate the impact of industrial logging of timber for the export market. The authors set out a frank assessment of the threat to the centuries' old natural forest and the adverse impact this has on the indigenous and endangered flora and fauna. They call for further specific research in forest restoration methods to assess the best integrated approaches.

The Intergovernmental Panel on Climate Change (IPCC) forecasts the increasing frequency and intensity of extreme weather conditions in SIDS. Whilst many SIDS have become accustomed to flooding and tropical storms, heatwaves are a new predicted threat to them, affecting both the resident population and tourists. Chap. 13 by John Laing Roberts outlines the nature of this new threat, drawing on the experience of countries already hit by heatwaves arising from climate change. He offers guidelines to mitigate the impact when heatwaves come to SIDS.

22.2.4 Part IV Environmental Governance and Challenges

Raj Mohabeer and John Laing Roberts in Chap. 14 discuss the initiatives being undertaken in the South West Indian Ocean and related regions in the pursuit of 'Blue and Circular Economies' in the context of sustainable development of islands. In line with the existing literature, the authors provide a bird's eye-view of the metaphor '*blue*' to embrace the principle of nature, which produces zero waste in its wake, thus revealing the broader vision of a future human circular economy focused on reducing, recycling and reusing all waste. The chapter highlights a series of innovative start-ups that reveal the immense capacity for recycling of waste from rubber tyres, broken glass, plant fibre and even venom from scorpions.

In Chap. 15, John Laing Roberts reviews the progress of environmental governance in SIDS. On a close examination, he finds that the UN tool of the Sustainable Development Goals (SDG) system is unwieldy and unreliable. He shows that, from the analysis of various complex issues of sustainability and environment, the UN SDG system grossly underestimates the economic, social and ecological impact of the increasing frequency and strength of natural disasters as it omits to include secondary and long-term effects. He also notes similar data problems with the Yale and Columbia Universities' system of assessing environmental governance. If we are to have realistic, reliable systems of measuring environmental governance in SIDS, the author proposes that we go back to the drawing board and design data systems suited to the needs and technical capacities of SIDS themselves.

Partha Gangopadhyay and Khushbu Rai in Chap. 16 examine the effectiveness of Overseas Development Assistance in promoting climate resilience in Tonga—a Pacific island country. Curiously, their econometric analysis reveals that aid has had little effect on measured resilience, nor does the shift to renewable energy, but the country's perception of the rising global risks does motivate the government to have policies to build greater resilience in Tonga.

In Chap. 17, Lino Briguglio and Marie Avellino examine the concerns amongst the Maltese people on the growth of tourism beyond the country's carrying capacity. Their analysis, based on a social survey, shows that the local population is sensitive to the problem of over-tourism. This points to the need for better governance of international tourism.

22.2.5 Part V Global Environment and Sustainable Development

Larry Schroeder and Shyam Nath offer a critique of climate change diplomacy in Chap. 18. The authors argue that given the global nature of climate change, the problem should also be addressed at that level. The chapter reviews challenges of having governments throughout the world commit to adopt and implement environmental policies that will slow the changes in climatic conditions. In particular, the adverse behaviour of free riding nations renders international climate agreements ineffective. It is argued that SIDS can play leadership roles in collective action as the most vulnerable entities. The authors examine the creation of climate clubs as an alternative that may be a useful organisational approach to improved international environmental policies.

Simon Feeny, Alberto Posso and Sefa Awaworyi Churchill in Chap. 19 review the inadequate state of current reporting of environmental governance in SIDS. They propose a sharper focus on fewer key indicators, which could achieve greater levels of sustainable accurate reporting. This could then lead to better strategic management, especially in small states, whose commitment to data gathering is heavily constrained by limited professional capacity.

Yeti Nisha Madhoo in Chap. 20, comparing SIDS with non-SIDS, provides an analysis of the relationship between institutional quality reflecting improved environmental governance and environmental performance with impacts on (i) human health and (ii) nature's ecosystem vitality. Interestingly, the institutional framework in SIDS seems significantly geared towards protection of human health but is ineffective in mitigating degradation of the natural environment. This would reflect trade-offs between growth goals and environmental protection. Strikingly, (unsustainable) damage to nature's health in SIDS may be attributed to over-reliance on tourism as the driver of economic growth and proactive domestic and foreign tourism lobbies.

Finally, in Chap. 21, Raj Mohabeer discusses connectivity challenges in the member countries of Western Indian Ocean. The lack of regional and intra-island communications by sea and air and direct and fast broadband internet has inhibited the development of local regional commerce. The Indian Ocean Commission (IOC), as part of a wider programme for regional growth, has formulated and agreed a strategy to establish regional air services, regional shipping lines and greater ICT connectivity systems. This chapter reports on the progress made with this ambitious plan, which is in its early stages of implementation.

22.3 Roadmap for Sustainable Development

The discussion of various complex issues of sustainability and environment vulnerability presented in the chapters identifies a series of steps small states can take, which combined can offer a road map for progress with sustainable development.

First, the sustainable future of small island developing states depends upon their strategic and pro-active leadership in combating their economic and environmental problems. These economies need to develop a governance culture for establishing a resilience mechanism against the adverse economic and environmental pressures. Simultaneously, attempts at reconciling economic and social progress with the susceptibility of their fragile economic and environmental settings to natural and human pressures are equally important.

Second, sustainable development is an increasing and unrelenting challenge, not for one-off political gestures, but for all time and must be integrated in every aspect of policy and action, in all sectors, at all levels. It is not enough to boast of cleaning up one natural disaster after another. It requires a new long-term paradigm for humanity that respects nature and properly values its contribution to life and progress.

Third, the progress towards sustainable development for small states heavily depends upon adopting economic development models that give due weight to the value of natural resources. Investment should be linked to the wide range of the stages of development across the small states and should be based on best practices, evaluated by evidence of their cost-effectiveness. Account should be taken of the increasing marginal cost of movement towards targets, which also entails adapting the specificity of technical requirements.

Fourth, evidence of climate change is increasingly being recognised. All sectors should prepare for the long-term impact of climate change. They should give priority to protecting vital natural resources (air, fresh water, forest cover, protected endangered species and maritime areas etc). They should take special note of both the immediate and the longer-term impact of the expected increasing frequency and severity of natural disasters (cyclones, flooding, heatwaves etc.), giving special attention to high-risk zones and the most vulnerable people.

Fifth, small states should plan for zero waste in all processes of production and consumption, reducing, reusing and recycling material. This is an essential element in future environmental governance, which will improve environmental quality and protect vital ecosystems on which all life depends. Small states should move to cleaner, more sustainable energy production from renewable resources, such as sugar cane, working with the Global Sustainable Energy Island Initiative. They should take steps to ensure their ecological footprint does not increase in pace with their economic and human development.

Sixth, concerted efforts should be made to promote more democratic governance, empowering local people and enhancing social capital with increasing inclusive development.

Seventh, the effectiveness of institutions is a vital element in progress with sustainable development. Sound institutions affect the quality of life of people; they attract external finance, grants and technical and diplomatic support. Small states ought to make concerted efforts to enhance the quality of their institutions. The task can be greatly enhanced by support from the global, intergovernmental and regional partnerships that are emerging with wide-ranging networks in the Caribbean, the Pacific and the AIMS regions.

Eighth, small states should improve their connectivity through low cost regional airlines, integrated shipping lines and ICT linkages. These will all assist in cross fertilisation of development ideas and practices, promote resilience, and reduce the risks of isolation and its associated economic and environmental vulnerability.

Ninth, services sector development, especially in island states, should avoid over-tourism and its adverse environmental and social impact. All sectors should shape their monitoring of environmental governance to the nature of environmental priorities and local capacities for collecting, reporting and analysing data for policy development and decision-making.

Tenth, since part of small island states' problems stem from the functioning of the global economy, international cooperation and support are critical for their existence. An elevated role for international diplomacy should embrace environmental as well as health concerns.

22.4 Some Further Thoughts

As we write these suggestions, the world is being upended by the deadly COVID-19 pandemic, engulfing all states, large and small. It is serving as an extreme stress test for the resilience of social and economic systems. In its wake, fundamental questions are being raised about the way we normally live, and our human response to the nature of the risks. Faced with this peril, we are becoming more conscious of the limitations of health and social support, and of the frailty of the accepted logistics of trade, commerce and tourism activities. As the virus is infecting millions and leaving tens-of-thousands dead in its course, we are left reassessing the values by which we normally live and how to shape a better future, not least in SIDS so dependent on tourism. Thus, their immediate development and medium-term future remains in serious doubt.

The increasingly enforced lockdown is socially exacting, carrying with it a deepening economic impact. The digital revolution, however, is making working from home surprisingly acceptable to many employees and their companies, who are left considering how far those expensive city centre office suites are necessary and the burden of commuting socially and economically justifiable. Many goods and services are now being delivered direct to people rather than through normal retail outlets.

This whole new emerging pattern of lifestyle and work culture should assuredly be the focus of fresh research on sustainable development. Some of the themes as an aftermath of COVID-19 emergence can be conceptualised for further research as follows:

1. The impact of economic slowdown on a cleaner environment measured by reduction in CO_2 emissions and biodiversity in general and in SIDS in particular.
2. Feasibility of SIDS joining climate clubs to address greenhouse gas emissions as suggested by William Nordhaus and others.

3. Enhanced role of information technology in the society and for conducting economic activities.
4. Social and health consequences of the global disease episode.

What is vital is that neither this timely proposed COVID-19-linked research agenda nor the current debates over the proper management of the pandemic should divert us from the focus of this book. Our focus is dedicated to informing the alarming and increasing fundamental risks of the existing global patterns of unsustainable development and designing a research-based feasible roadmap for better shaping the future of SIDS.

Index[1]

A

Access to safe water, 345
Acemoglu, D., 54, 55
Adaptation strategies, 16, 55, 193, 295
Agritourism, 215
Agroforestry, 287
Aid for trade, 85, 88–90, 408
Air freight, 389
Airline connectivity, 391
Air pollution, 144, 195, 196, 241
Alliance of Small Island States (AOSIS), 199, 328, 335n3
American Samoa, 35
Anthropocene era, 270, 278n1
Anthropogenic, 212, 286
Antigua and Barbuda, 35, 38, 47, 54, 91n1, 96, 142, 266n7, 278n3, 368
ARDL bounds testing approach, 296–298
Arrow, K.J., 126, 143
Artificial perches, 227–228
Aruba, 34, 35
Asian Development Bank, 27, 290
Atlantic Indian Ocean, Mediterranean and South China Sea (AIMS), 21, 23, 24, 27, 142, 145, 393, 414
Attributes of life, 141, 144
Auffhammer, M., 190
Australia, 31, 33, 82, 83, 178, 260, 266n8, 284, 285, 287, 290, 388
Australia-Tonga Aid Partnership, 285
Authoritarianism, 112, 117–118

B

Bahamas, 25, 35, 38, 47, 54, 73, 91n1, 96, 142, 156, 207, 266n7, 368
Bahrain, 35, 145, 160
Barbados, 22, 27, 34, 35, 38, 47, 54, 55, 73, 88, 91n1, 142, 145, 149, 211, 266n7, 340, 368, 409

[1] Note: Page numbers followed by 'n' refer to notes.

J. L. Roberts et al. (eds.), *Shaping the Future of Small Islands*,
https://doi.org/10.1007/978-981-15-4883-3

Barbados Programme of Action 1994 (BPOA), 22, 64, 340
Barrett, S., 327
Barriers to trade, 77, 90, 388
Belize, 35, 38, 54, 60, 67n1, 75, 88, 91n1, 142, 266n7, 350
Bilateral trade, 65
Biodiversity, 65, 102, 209, 272, 275, 366, 371, 415
Biological value, 222
Blue Economy (BE), 251–265, 407
Borda rule, 141, 142
Brain drain, 31, 87, 94, 259
Buchanan, J.M., 330, 332
Bureaucracy, 33, 51, 144, 371
Butler, R.W., 101, 304–306

C

Capacity building, 65, 209, 259, 289
Cap-and-trade, *see* Emission trading rights
Cape Verde, 25, 35, 38, 40, 47, 142, 160, 266n4, 266n7, 368
Capitalism, 7, 8, 118
Carbon capture, 195–197, 200, 410
Carbon dioxide (CO2), 4, 102, 185, 188–190, 193, 195, 196, 199, 291, 292, 333, 410
Carbon footprint, 15, 102, 103, 198, 291, 295
Carbon sinks, 195
Carbon tax, 5, 198–200
Caribbean Community Climate Change Centre (CCCCC), 213
Caribbean Drought and Precipitation Monitoring Network (CDPMN), 211
Caribbean islands, 101, 178, 233, 307
Caribbean region, 21, 23–25, 71–73, 77, 80, 85, 87, 142, 145, 146, 170
Chenery, H.B., 8
Child mortality, 341, 345, 349
Circular economy, 258, 259, 262, 263, 411
Civil liberties, 140, 141, 144, 145, 147, 149, 362, 372
Civil society, 112, 114, 116, 119, 213, 308, 342, 363, 401, 418
Clean Development Mechanism (CDM), 15, 197
Climate change, v, 14, 22, 26, 31, 34, 65, 72, 87, 89, 93, 94, 101, 103, 114, 119–121, 139, 140, 148, 155, 185–200, 205–207, 209, 212, 214, 215, 233–243, 253, 269, 278n2, 283–290, 295, 325, 327–334, 335n2, 335n3, 339, 342, 343, 351–353, 366, 367, 406–408, 410–412, 414, 418
Climate clubs, 14, 17, 194, 326, 329–334, 410, 412, 415
Climate governance, 194
Climate resilience, 283–299, 407, 411
Club goods, 329, 330, 335n5
Club of Rome, 251, 253, 255
Clustering production, 388
Coastal erosion, 16, 102, 284
Coastal flooding, 192, 206
Coastal revegetation, 287
Coastal States, 252
Coastlines, 234, 243, 258, 308
Cole, M.A., 362
Cole, R.J., 223, 225, 226, 228
Collective action, 210, 325–335, 364, 396, 412
Colony, 6, 113
Command and control regulation, 309
Common Market of Eastern and Southern Africa (COMESA), 258, 266n6, 387
Common pool resources, 13, 14, 333

Community management of common pool resources, 14
Comoros, 35, 38, 40, 47, 53–55, 61, 142, 148, 160, 266n3, 266n6, 266n7, 266n8, 273, 278n8, 368, 388, 389, 393, 400
Comparative advantage, 49, 89, 94, 95, 308, 371
Concessional grants, 288
Conflict, 10, 54, 194, 278n2, 286, 342, 364, 382
Constructed sustainability, 122–124
Cooperative institutions, 13
Coordination failure, 9
Copeland rule, 141
Coral reefs, 102, 114, 212, 287
Corneloup, Ines de Agueda, 328, 329
Corporate environmental compliance, 363
Corporate social responsibility (CSR), 17, 383
Corruption, 33, 54, 55, 61, 63, 149, 260, 362, 363, 371, 372
CO2 emissions, 11, 14, 17, 160, 167, 181n2, 186, 189, 193–200, 254, 326, 365, 384, 410, 415
Counterfactual analysis, 190
Cuba, 35, 47, 55, 67n3, 142, 158, 266n7
Cultural tourism, 215
Customs union, 112
Cyclones, v, 26, 94, 148, 192, 206, 223, 284–287, 339, 406, 414, 418

D
Dasgupta, P., 140, 141
Dasgupta, S., 365
Debt, 22, 24, 33, 94, 341, 390, 408
Defensive expenditure, 17, 198–200, 410
Deforested tropical landscapes, 228
Dehydration, 237
Democracy, 54, 55, 111–124, 149, 362, 372, 373
Demographic change, 275
Deoxyribonucleic acid (DNA), 237
Development strategies, 6, 37–66, 96, 101, 148, 252, 395, 398
Digital connectivity, 397–400
Disaster management, 205–215, 410
Disaster resilience, 22, 27, 31, 240, 288, 290, 352
Disaster risk reduction (DRR), 240, 269, 272, 285
Disease and mortality patterns, 155
Diseconomies of scale, 50, 86
Diversifying exports, 388
Domar, E.D., 8
Domestic and foreign tourism lobbies, 413
Dominica, 35, 38, 47, 55, 75, 91n1, 96, 142, 158, 212, 266n7, 278n3
Dominican Republic, 35, 38, 77–79, 142, 266n7
Drought, 192, 206, 211, 234, 284, 287, 410
Dumping, 210

E
Ease of doing business (EDB), 51–53
Eastern African Community (EAC), 387
Ecological externalities of production, 4
Ecological footprint (EF), 265, 273–275, 277, 278n5, 278n8, 278n9, 405, 409, 414, 418
Ecological threshold, 224, 225
Ecological vitality, 4
Economic development, v, vi, 48, 61, 115, 207, 290, 304, 387, 392, 395, 397–399, 408, 413, 417, 418

Economic diversification, 49, 51, 53, 90, 364
Economic freedom index, 372
Economic growth, 4–9, 11, 16, 17, 38, 40, 47, 48, 51, 55, 63, 90, 187, 188, 200, 212, 252, 254, 283, 346, 350, 351, 363, 365, 370, 371, 376–378, 382, 384, 398, 407, 409, 410, 413
Economic institutions, 54
Economic models, *see* Growth models
Economic vulnerability, 27, 38, 115, 419
Economic vulnerability index (EVI), 38, 39
Economies of scale, 75, 94, 339, 361, 388
Ecosystem degradation, 103, 373
Ecosystems, 65, 185, 207, 215, 228, 252, 304, 307, 343, 366, 373, 376, 381–383, 414, 418
Ecosystem vitality (EV), 275, 364, 366–368, 373, 375, 376, 378–384, 412
Ecotourism, 215
Education, 3, 15, 33, 47, 61–63, 65, 129, 140, 143, 156, 170, 172–173, 209, 278n6, 290, 312, 313, 342, 343, 345, 350, 352, 368, 397
Emission trading rights, 14
Endogenous growth theory, *see* New growth theory
Energy efficiency, 89, 213
Energy price shocks, 293, 295, 298
Energy security, 210, 213, 239, 284, 295
Environmental and climatic indicators of SIDS, 158
Environmental and ecological disturbances, 155
Environmental budgetary head, 17
Environmental capital, 16
Environmental carrying capacity, 6, 16
Environmental costs and benefits, 11, 195
Environmental degradation, v, 6, 11, 16, 17, 194, 254, 277, 301–316, 353, 361, 373, 376, 378, 406
Environmental externalities, 17
Environmental governance, 14, 16, 17, 269–277, 302, 303, 308–309, 314–316, 407, 411–412, 414, 418
Environmental human health (EH) index, 366
Environmental Kuznets Curve (EKC), 11, 12, 378, 383
Environmental performance, 362, 364–381, 412
Environmental Performance Index (EPI), 276, 277, 366, 367, 373, 375
Environmental policy instruments, 362
Environmental resource, 6, 12–14, 198, 200
Environmental tax, 15, 314
Environmental treaties, 371, 373–375
Environmental vulnerability, 31, 37, 260, 269, 406, 407, 414
Epidemic diseases, 286
Equity, 60, 252, 255
Error Correction Model (ECM), 298
Ethnic fragmentation, 61
Ethnic groups, 60, 61
European Bank for Re-construction and Development (EBRD), 290
European style farming, colonial times, 7
European Union (EU), 30, 31, 77–79, 82, 90, 112, 241, 242, 261, 401
Evolution of developmental thoughts, 8

Export diversification, 48–51, 71
Export Processing Zone (EPZ), 50, 54, 55, 62, 65
Extreme hunger, 348

F

Fairness of regulations, 140, 409
Faunal diversity, 222
Fiji, 26, 35, 38, 47, 82, 83, 139, 142, 158, 178, 266n7
Fiscal pressure, 24, 140
Fisheries, 13, 14, 24, 34, 39, 95, 192, 213, 258, 259, 262, 275, 287, 290, 366
Floods, v, 188, 192, 193, 212, 234, 339, 406
Floral diversity, 223, 225
Food security, 22, 131, 178, 289, 290, 292
Foreign direct investment (FDI), 33, 34, 48, 49, 51–54, 61, 64, 80, 86, 186, 289, 362, 371, 382–384, 408
Forest restoration, 224, 225, 228–229, 410
Formal institutions, 60
Fossil fuel, 5, 189, 190, 195, 199, 200, 284
Frankel, J.A., 51
Freedom House, 370, 372, 375, 409
Free riding, 326, 327, 329, 330, 334, 412
Free Trade Area (FTA), 387
French Polynesia, 35, 178
Fullerton, D., 14

G

Gallup, John, 13
Gap dynamics, 222, 223
Gap regeneration, 222, 223
Gateway to Africa, 388
Gender equality, 209, 341, 345, 348
Gender Parity Index (GPI), 348
Geoengineering, 197–198, 200
Geography, 121, 157, 186, 263
Gillingham, K., 196, 197
Global climate governance, 16
Global collapse, 254, 263, 269
Global Environment Facility (GEF) Small Grants Program, 213
Global externalities, 17
Global Footprint Network, 273, 278n5
Globalization, 117, 178, 186, 194, 387
Global Ocean Acidification Observing Network (GOA-ON), 212
Global partnership for Oceans, 213
Global political economy, 71
Global public good, 326–328, 331, 333, 334
Global warming, v, 14, 16, 65, 148, 185, 186, 188–190, 192, 194, 200, 206, 269, 285, 293–295, 325–327, 329, 332, 334, 335, 406, 408
GOA-ON Pier2Peer program, 212
Government effectiveness, 33, 55, 60, 144, 147, 149, 153, 371, 373, 376, 383
Government failure, 63
Green Climate Fund (GCF), 27, 285, 288
Green Economy, 251, 252, 255
Greenhouse gas (GHG), 185, 188, 189, 199, 213, 269, 307, 330, 333, 334
Greenhouse gas emissions (GHG emissions), 189, 193, 196, 197, 330, 415
Green taxes, *see* Environmental tax
Green technology, 195–197, 383

Grenada, 26, 35, 38, 47, 54, 91n1, 96, 142, 266n7, 278n3, 368
Groundwater, 191, 214, 287
Growth–environmental quality trade-offs, 361
Growth models, 3–11, 14, 16, 17, 276, 417
Guam, 35, 178
Guillaumont, P., 26, 94
Guinea-Bissau, 25, 34, 35, 38, 40, 47, 53, 55, 142, 145, 148, 149, 266n4, 266n7, 368, 409
Guyana, 25, 35, 38, 47, 67n1, 73, 77, 88, 91n1, 142, 266n7, 350, 351

H

Haiti, 27, 34, 35, 38, 47, 50, 51, 53, 55, 91n1, 142, 145, 148, 149, 266n7, 273, 275, 276, 278n8, 368, 409
Hardin, G., 14, 261
Harrod, R.F., 8
Hazardous chemicals, 210
Health and disease profile, 156–169
Healthcare financing, 155
Health care system, 63, 155, 179, 409
Health policies, 155–179
Healthy expected years of life at birth (HALE), 156
Heat islands, 235, 239, 243
Heatwaves, v, 148, 233–243, 407, 411, 414, 418
High trading costs, 83
Hovi, J., 331
Huff, W.G., 53, 54, 62, 64
Human capability, 61–62
Human capital, 3, 9, 51, 61, 62, 64, 65, 94, 95, 156, 371
Human Development Index (HDI), 24, 25, 40, 47, 131, 140, 273, 274, 277, 278n6, 278n7
Human insecurity, 286–288
Hyperthermia, 234–237, 239, 240, 242

I

Illegal, unreported, and unregulated fishing (IUUF), 260
Immunization coverage, 158, 161–163, 178
Import-substitution (IS), 48, 50
Incentive mechanisms, 15
Incidence of HIV/AIDS, 345
India, 17, 30, 266n8, 342, 363, 388
Indian Ocean Commission (IOC), 21, 213, 252–256, 258–263, 265, 266n2, 266n3, 267n9, 387–401, 413
Indian Ocean region, 253, 393
Indian Ocean Rim Association (IORA), 258, 266n8
Indian Ocean Single Aviation Market (IOSAM), 391
Industrialisation, 48, 50, 54, 61, 63, 64, 82, 210, 379, 381, 408
Industrial logging, 219, 220, 229, 410
Infant mortality, 47, 178, 179, 349, 410
Influence of lobbies, 362
Informal institutions, 60
Information and Communication Technologies (ICT), 388, 396–401, 413, 414
Infrastructure, v, 22, 26, 31, 33, 38, 61–64, 71, 89, 100, 123, 124, 139, 156, 207, 209, 210, 213, 234, 258, 278n5, 283, 284, 287, 290, 295, 351, 352, 392, 393, 395–397, 399–401, 408
Innovation, 4–6, 8, 9, 49, 64, 77, 78, 85–90, 94, 209, 210, 214, 262, 400, 408

Innovation-driven enterprises, 85–87, 90, 408
Innovation governance, 71–90
Institutional quality (IQ), 32, 55–58, 95, 140, 147, 187, 346, 351, 361–384, 412
Institutions, 4–6, 8, 9, 27, 30, 31, 34, 51, 54, 55, 60, 61, 63–65, 96, 113, 116, 121, 122, 124, 140, 144, 148, 149, 186, 188, 207, 211, 213, 214, 241, 289, 308, 331, 362, 364, 371, 373, 376, 381–384, 393, 401, 414, 417, 418
Insularity, 37, 47, 155, 401
Integrated assessment model, 5
Intergenerational equity, 9, 259
Intergovernmental Panel on Climate Change (IPCC), 186, 193, 206, 411
Intermediate goods, 73, 74, 77, 79, 80
International climate agreements, 17, 412
International cooperation, 14, 16, 17, 64, 66, 194, 199, 200, 327–329, 401, 415
International development goals, 339–357
International Partnership for Expanding Waste Management Services of Local Authorities (IPLA), 214
International public goods, *see* Global public good
Intra-regional trade, 260, 388
Inward-looking economic policies, 48
Isolation, v, 17, 38, 94, 124, 155, 339, 361, 364, 388, 400, 414, 419

J

Jamaica, 35, 38, 47, 51, 54, 73, 77, 91n1, 142, 266n7, 278n8
Johannesburg 2002, 340
Joint Implementation (JI), 197
Jurisdiction, 111–124, 307, 327, 335n6, 365

K

Kaufmann, D., 371
Kava, 82, 83, 91n2
Keynes, John Maynard, 7
Kiribati, 25–27, 34, 35, 38, 47, 53–55, 61, 82, 83, 142, 145, 178, 189, 192, 266n7, 278n3
Kyoto Protocol, 194, 197, 326

L

Laurance, W.F., 220, 223, 410
Legal structure and security of property rights, 372
Legal systems, 15, 63, 372
Lewis, W.A., 8
Liberalisation, 8, 50, 53, 78, 186, 390–391
Life expectancy, 40, 47, 140, 141, 144, 153, 156, 159–160, 278n7
Life satisfaction, *see* Subjective wellbeing
Limits to Growth, 252–254
Logging concessions, 220
Logging practices, 220, 228
Logistics Performance Index (LPI), 393
Long-haul air travel, 103

M

Macroeconomic trends, 21–34, 408
Madagascar, 266n3, 266n6, 266n7, 266n8, 388, 389, 393, 394, 400
Maldives, 26, 34, 35, 38, 40, 60, 61, 96, 142, 158, 192, 211, 262, 266n8, 308, 368

Maritime connectivity, 392–397
Maritime Corridor, 397
Maritime development, 263, 393
Market failures, 63, 329
Marshall Islands, 34, 35, 38, 142, 178, 192, 266n7, 278n3
Maternal mortality, 343, 345, 349, 350
Mauritius, 7, 17, 22, 34, 35, 38, 47–51, 54, 55, 61, 62, 64, 65, 75, 100, 142, 148, 212, 235, 255, 261, 266n3, 266n5, 266n6, 266n7, 266n8, 278n8, 368, 388, 389, 394–395, 400, 401, 408
Mauritius Security programme (MASE), 261
Mauritius Strategy of Implementation (MSI) 2005, 340
MDG Progress Index, 345, 346, 354, 357
Measures of stringency, 365
Melanoma, 237
Melting Pot Indian Oceanic Submarine System (METISS), 399–400
Micronesia, 35, 38, 47, 53, 142, 170, 178, 266n7
Millennium Development Goals (MDGs), 270, 340–352, 354
Mineral-based exports, 82
Mirage of official measures, 270–271
Mitigation strategies, 186, 193–200
Mol, Arthur P.J., 328, 329
Montreal Treaty, 194, 326
Mortality rate, 40, 144, 153, 178, 179, 291, 343, 410
Multidimensional targets of environmental policy, 364
Multilateral trade, 82
Multiplier effects, 94, 96, 99, 100, 102

N
Natural capital, 4, 12, 254, 255
Natural disasters, v, 16, 22, 24, 26, 33, 34, 38, 39, 139, 148, 155, 170, 174–175, 205–207, 234, 238, 270, 276, 278n2, 288, 290, 339, 351, 353, 406, 408, 410, 411, 413, 414, 418, 419
Natural resources, vi, 4–5, 7, 9, 10, 15–17, 25, 75, 82, 94, 95, 114, 212, 251, 255, 259, 261, 265, 278n5, 366, 368, 371, 383, 405–407, 410–411, 413, 414, 417, 418
Nauru, 35, 38, 142, 266n7, 278n3
New Caledonia, 35, 178
New environmental paradigm, 4
New growth theory, 4, 6, 8, 9
New institutional economics, 54
Niue, 26, 35, 158, 189, 266n7
Non-communicable diseases, 87, 158, 164–165
Non-market value, 14
Nordhaus, W., 5, 12, 14, 17, 187, 194, 330–334, 415
Nucleation, 226

O
Ocean governance, vi, 194
Ocean health, 103
Ocean resources, 188, 212
Oil price (OILP), 285, 293–295, 297–299, 389
Olson, M., 328
Openness, 48–51, 67n5, 75, 95
Open skies airline policy, 390
Organisation for Economic Co-operation and Development (OECD), 25, 26, 31, 89, 288–290, 295, 353, 398

Ostrom, Elinor, 13, 14, 333, 335n6
Outward-oriented strategies, 48
Over-fishing, 103
Overseas Development Assistance (ODA), 283–299, 411
Ozone layer depletion, 189

P

Paavola, J., 333
Pacific Island, 27, 82, 94, 149, 178, 179, 233, 262, 285, 287
Pacific Island Countries (PICs), 145, 170, 178, 283–286, 295, 411
Pacific Island Forum (PIF), 21, 83
Pacific regions, 23–25, 31, 72–74, 82, 84, 88, 89, 145, 146, 270, 285
Palau, 25, 35, 38, 47, 96, 142, 145, 160, 266n7, 272, 278n3, 278n4
Papua New Guinea (PNG), 25, 27, 34, 35, 38, 47, 54, 60, 67n2, 142, 145, 148, 156, 158, 170, 178, 192, 266n7, 344, 350, 351, 368, 371
Pareto optimality, 143
Paris 21, 194
Pauli, Gunter, 251, 253–255, 263, 265
Pearce, D.W., 8
Perverse EKC, *see* Environmental Kuznets Curve (EKC)
Photosynthesis, 4
Photosynthetic product of the planet, 10–12
Physical infrastructure, 31, 51, 53, 61, 62, 121, 396
Political economy factors, 362
Political institutions, 54, 55
Political rights, 144, 145, 153
Political stability, 33, 55, 144, 153, 207, 372, 409
Political stability and absence of political violence, 371
Pollution, 6, 9, 11, 15, 16, 170, 192, 195, 199, 207, 214, 253, 260, 265, 267n9, 272, 287, 306, 307, 314, 333, 362, 363, 366, 383, 418
Pollution haven hypothesis, 362
Pollution rights, 197
Post-conflict SIDS, 61
Post-disaster reconstruction, 24, 140
Potable water, 40, 47, 287
Poverty, 7, 24, 25, 40, 47, 254, 270, 278n2, 286, 341–346, 350, 352, 354, 368, 408
Primary goods, 24, 26, 74, 79
Primary school enrolment, 40, 47, 144, 153
Prime data, 270, 276
Principal component analysis (PCA), 292, 295–299
Private–public partnership (PPP), 33, 48
Productivity, 8, 11, 13, 31, 49, 51, 61, 85, 90, 95, 96, 99, 187, 190, 213, 238, 291, 292, 398
Property rights, 14, 15, 33, 54, 63, 140, 144, 186, 372, 373
Protected zone, 224
Protectionist policies, 48, 50
Protectorate, 113
Public health, 155, 156, 170
Public policy, 4, 8, 9, 119, 124, 148, 325, 326, 407
Public–private partnership (PPP), 383
Public service delivery, 61, 65
Puerto Rico, 35
Putnam, R.D., 128

Q

Quality of institutions, 31, 33, 34, 55, 140, 144, 149
Quality of life, 125, 127, 134, 139–149, 305, 311, 409, 414, 417

R

Rainfalls, 206, 207, 284
Randers, J., 252
Recycling waste, 258
Red Index of threatened species, 277
Regulatory quality, 33, 55, 60, 144, 371–373
Remoteness, 27, 37, 39, 47, 61, 112, 117, 155, 156
Renewable energy, 15, 193–197, 213, 255, 259, 284, 290, 410, 411
Renewable resources, 195, 414
Resilience capability, 21–34, 408
Restoration approaches, 219–229
Restoration costs, *see* Defensive expenditure
Restoration through planting, 225
Reunion island, 266n3
Re-using waste, 258
Rio de Janeiro 1992, 22, 306, 340
Rio de Janeiro 2012, 340
Rodrik, D., 50, 54, 67n5, 186
Romer, D.H., 51
Romer, Paul, 5, 8
Rostow, W.W., 8
Roy, M.D., 47, 50
Rule of law, 33, 54, 55, 60, 140, 144, 153, 186, 371, 372, 409

S

Sachs, Becchetti, 67n5, 125
Saint Kitts and Nevis, 47, 54
Saint Lucia, 38, 47, 51, 54
Saint Vincent and the Grenadines, 38, 47, 54, 55
Samoa, 22, 35, 38, 40, 47, 51, 54, 55, 61, 64, 145, 340
Samoa Pathway 2014, 64, 209
Sandler, Todd, 328
Sanitation programs, 209
Sao Tome and Principe, 27, 35, 38, 47, 53, 55, 266n7, 368
Scrieciu, S., 362, 365
Sea level dynamics, 185–200, 325
Sea level rise, v, 16, 22, 26, 34, 65, 139, 185, 186, 188–192, 200, 284, 288, 410
Sea tourism, 188, 200
Secondary impact, 234, 238
Sectoral lobbies, 363
Seed bank, 222–223, 225–227
Seed diversity, 223
Seed rain, 223–224, 226, 228
Self-seeking behaviour, 6
Sendai Framework for Disaster Risk Reduction 2015–2030, 214
Service sector, 49, 398
Seychelles, 27, 35, 38, 44, 47, 51, 75, 145, 156, 212, 255, 263, 266n3, 266n5, 266n6, 266n7, 266n8, 278n3, 368, 388, 389, 391, 400
Shipping hub, 394–395
Shipping volume, 394
SIDS Accelerated Modalities of Action (SAMOA) Pathway, *see* Samoa Pathway 2014
SIDS lobby, 199
SIDS-SIDS Sustainable Energy Initiative, 213
Singapore, 27, 33–35, 38, 40, 47–51, 53–55, 61–64, 126–128, 131, 132, 134, 135, 145, 148, 149, 156, 158, 160, 213, 265, 266n8, 274, 275, 278n8, 390, 391, 408, 409

Skin cancer, 237, 240, 242
Slottje, D.J., 140, 141
Small Island Developing States (SIDS), v, vi, 6, 15–17, 21–34, 37–66, 71, 72, 74, 82, 85, 88, 90, 126, 127, 139, 144, 145, 148, 149, 155–165, 168–175, 178–180, 185–189, 192, 199, 200, 205–215, 233, 234, 239, 240, 242, 243, 255, 258, 262, 265, 266n4, 271–277, 283, 288–290, 295, 325–335, 339–357, 361–384, 405–416, 419
Social capital, 34, 60, 61, 63, 125–135, 140, 288, 409, 414, 418
Social choice theory, 141
Social cohesion, 54–61
Social empowerment, 111–124
Social impact, 100–103, 238–240, 242, 414, 418
Social networks, *see* Social capital
Solar energy, 284, 290
Solomon Islands, 25, 27, 34, 35, 38, 44, 47, 51, 53–55, 61, 145, 148, 170, 178, 219–229, 266n7, 368, 410
Solow residual, *see* Total factor productivity
Solow, Robert M., 10
Southern African Development Community (SADC), 258, 266n5, 387
South West Indian Ocean Fisheries Governance and Shared Growth (SWIOFISH), 261
Species extinction, 278n2
State capacity, 63, 372, 373
Stavins, R., 14
Stock, J., 196, 197
Strategic government procurement, 88, 90, 408
Stressors, 121
Strong sustainability, 10
Structural adjustment programme, 50
Subjective wellbeing, 125–135
Subramanian, M, A., 47, 50
Subsidy, 62
Suriname, 25, 35, 38, 47, 53, 54, 67n1, 73, 75, 91n1, 142, 266n7
Sustainable development, 3–17, 22, 31, 64, 89, 112, 122, 198, 200, 207–209, 212, 255, 258, 263, 265, 271, 277, 284, 303, 308, 312, 340, 344, 361, 406–408, 411–415, 417, 419
Sustainable Development Goals (SDGs), 210, 212, 213, 260, 270–272, 275–277, 278n2, 340–344, 351–354, 411
Sustainable human development, 149

T

Technical change, 9
Technological innovation, 5, 88
Temperate climate, 187
Ten-point agenda (TAP), 207, 210–215
Timor-Leste, 25, 38, 44, 47, 53–55, 61, 62, 67n2, 145, 368, 371
Tonga, 26, 35, 38, 44, 47, 51, 54, 82, 139, 266n7, 278n3, 278n4, 283–299, 411, 412
Total factor productivity, 11, 51
Tourism, v, 16, 24, 51, 86, 93–104, 115, 139, 156, 206, 235, 258, 259, 290, 301, 364, 388
Tourism-exporting economies, 73
Trade agreements, 65, 78, 81, 82, 84, 90
Trade competitiveness, 408
Trade liberalization, 50, 186
Tragedy of the commons, 13, 14, 261

Trinidad and Tobago (T&T), 25, 34, 35, 38, 40, 44, 47, 67n2, 73–75, 77, 88, 91n1, 126–128, 131, 133, 134, 142, 189, 214, 266n7, 274, 275, 278n8, 371, 409
Tropical cyclone, 26, 94, 192, 284, 287
Trust, *see* Social capital
Tuvalu, 26, 34, 35, 38, 44, 47, 54, 55, 61, 83, 145, 160, 192, 206, 266n7, 271, 272
Twenty-foot equivalent unit (TEU), 393, 394
2030 Agenda for Sustainable Development, 210, 343

U

Ultraviolet rays, 237, 240, 243
UN Bruntland Commission, 10
UNDESA, 199
UNEP Regional Seas Program, 213
Union of Chambers of Commerce and Industry of the Indian Ocean (UCCIO), 262
United Nations Conference on Environment and Development (UNCED), 22, 340, 361, 365
United Nations conferences on SIDS, 199
United Nations Environment Programme (UNEP), 213, 251, 255, 270, 274, 278n9
United Nations Framework Convention on Climate Change (UNFCCC), 26, 212, 234, 288, 331, 332
United Nations Sustainable Development Summit, 340
United States of America (USA), 7, 33, 65, 82, 89, 234, 239, 266n8, 363
Universal primary education, 341, 342, 348, 350
UN-OHRLLS, 22, 24–26, 37, 66, 139, 188
Unsustainable harvesting, 220
Urbanisation, 265, 156, 159–160, 167, 169, 265, 346, 368
US Virgin Islands, 35

V

Vanuatu, 25–27, 35, 38, 47, 51, 54, 61, 82, 139, 142, 170, 178, 266n7, 273, 278n8, 368
Victor, D.G., 331, 332
Voice and accountability, 33, 55, 60, 371–373
Volcanic eruptions, 198, 410

W

Wagner, G., 326
Wastewater treatment, 207, 209, 213, 275
Water borne disease, 272
Water-borne pollution, 207
Water resources, 193, 205, 206, 209, 211, 215, 271, 410
Water security, 205–215, 284, 407, 410
Water-use efficiency, 209, 214, 366
Weak sustainability, 10
Weale, M., 140, 141
Weitzman, M.L., 326
Well-being, 24, 34, 62, 113, 114, 124–135, 140–142, 144, 145, 147, 148, 207, 315, 341, 351, 353, 409
WHO guidelines on heat health, 239
Wildfires, 225, 234
World Bank, 26, 27, 31, 33, 40, 49, 51, 54, 55, 67n3, 95, 96, 144, 213, 255, 261, 262, 266n2,

278n9, 289, 290, 292, 345, 346, 370–372, 375, 400, 401
World Development Indicators (WDI), 40, 144, 345, 409
World Economic Forum (WEF), 365
World Meteorological Office (WMO), 233–235
World Values Survey (WVS), 127, 128, 134, 409
Worldwide Governance Indicators, 409

Y
Yale Centre for Environmental Law and Policy, 275, 277
Youth movement, 263

Z
Zero waste, 255, 258–260, 263, 411, 414, 418