1 Resource Management, Sustainable Development, and Governance: Introduction and Overview

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Abstract

This volume is a festschrift in honor of Bruce Mitchell, Distinguished Professor Emeritus, University of Waterloo and celebrates his contribution to the theme "resource management, sustainable development and governance." The volume is published under the *Sustainable Development Goals* (SDGs) series of Springer as chapter contributions are engaged through the lens of SDGs. This collection of studies from scholars around the world considers critical emerging issues in natural resource management not only in India but elsewhere in the context of increased population growth and economic growth which has led to the intense use of resources and in many cases has challenged the resilience limits of resource systems. The volume identifies three systems: climate change, rate of biodiversity loss, and human interference with the nitrogen cycle, as critical to sustainable preservation of ecosystems in places. Sustainable resource management is dependent on resource governance given the demands of formal and nonformal actors and other stakeholders in decision-making, planning, and resource management for sustainable development. The volume ends with several proposals for future research directions.

Keywords

Ecosystem · Governance · India · Paradigm Shifts · Resilience · Resource Management · Sustainable Development · Sustainable Development Goals

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Resource is a techno-economic concept. Elements of a geo-system, when transformed into utilizable material form resources. The knowledge base, labor, technological capacity, and economy are the prime governing factors in this process of transformation. While these basic premises are true, there is finitude (finite nature of resources), entropy, and complex ecological interdependence which combine to provide biophysical limits for resource utilization to growth (Daly 1987). To

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meet the demand of increasing population pressure and socioeconomic growth there had been intense use of resources and in many cases the resilience limits of resource systems have been surpassed. Rockstrom et al. (2009) of the Stockholm Resilience Centre conducted a study to assess safe operating space for humanity. This study identified nine indicators such as climate change, rate of biodiversity loss, nitrogen cycle, phosphorus cycle, stratospheric ozone depletion, ocean acidification, global freshwater use, change in land use, atmospheric aerosol loading, and chemical pollution for analysis. Out of these nine, three systems (climate change, rate of biodiversity loss, and human interference with the nitrogen cycle) have already crossed their respective limits. Planetary boundaries are tightly coupled and not mutually exclusive therefore transgression in one boundary may lead to serious risk in case of other boundaries. Millennium Ecosystem Assessment (MEA) report (2005) has indicated that 15 out of 24 ecosystem services examined are being degraded or used unsustainably. The apparent gains in economic development and growth have been achieved at the growing costs in the form of degradation of many ecosystem services and an increased risk of nonlinear changes. Situations in the developing countries are further complicated due to the high rate of population growth, increasing poverty, overdependence on land and water resources for economic betterment, and limited opportunity to shift surplus labor from primary to nonprimary sectors. With progress of human society, concentration of large number of people/activities in certain places, and technological advancement, the nature-human interaction frame has just not widened, but it has become nonlinear, complex, and multidimensional and is making profound changes in the ecosystem. Excessive drawdown of resources and unequal distribution of development are civilizational challenge and there is global concern about prudent resource management for smooth sailing of the spaceship-Our Earth.

The worldwide concern about these issues is perhaps well epitomized in the report of the World Commission on Environment and Development (WCED 1987)—*Our Common Future*, in which the fundamental interrelationships between environment and development and the unsustainability of current practices have been clearly spelt out. As an alternative, the concept of sustainable development has been introduced. Since then, there were Earth Summit in 1992 at Rio, World Summit on Sustainable Development at Johannesburg in 2002, and Rio+20 summit in 2012 and several other global meets to address the crisis of development and devise the way for sustainable development, a term gained wide currency even among the politicians. The WCED defined sustainable development as "Development that meets todays need without compromising the ability of the future generations to meet their needs" (WCED 1987). It is proposed to factor in intergenerational equity with the development process and at the same time the importance of meeting the need for present generation is also stressed. The sustainable development is construed as a process operating within the framework of economic, social, and ecological boundaries; however, the challenge is how to operationalize this concept and deliver.

It is now globally argued that resource management science is passing through a crisis (Holling et al. 1998). In some parlance, it has been opined that sustainability is neither a realistic goal nor a useful concept, while some other authors wandered about utility of scientific research in designing policies for sustainable management of resources (Ludwig et al. 1993). Such arguments primarily emanate from an attempt to discuss sustainability following a reductionist linear approach and trying to work out sustainable use of a particular sector of natural resources like forestry, fisheries, agriculture, etc., and formulate policy accordingly. System's perspective is often missing. The Millennium Ecosystem Assessment (MEA) report (2005) approach the sustainability issue with a set of four scenarios (Chattopadhyay and Franke 2006):

- *Global Orchestration*—Trade and liberalization dominate, ecological problems are treated reactively, poverty and inequality are reduced,

and heavy investment in education and infrastructure.
- *Order from Strength*—Nations and regions focus on their own problems. Security, protection, little attention to public goods, and a reactive approach to ecological problems.
- *Adapting Mosaic*—Regional watershed ecosystems are the focus. Local institutions are strengthened and local management strategies are developed. A proactive approach to management of ecological systems.
- *Techno Garden*—Globally connected, highly managed ecosystems. A proactive approach.

A society can position itself in the context of these four scenarios and design its own course of action. In 2000, UN General Assembly identified eight goals, known as Millennium Development Goals (MDG) for the countries to steer their development process and achieve certain milestones by 2015. The goals were as follows:

- Goal 1: Eradicate Extreme Poverty and Hunger.
- Goal 2: Achieve Universal Primary Education.
- Goal 3: Promote Gender Equality and Empower Women.
- Goal 4: Reduce Child Mortality.
- Goal 5: Improve Maternal Health.
- Goal 6: Combat HIV/AIDS, Malaria, and TB.
- Goal 7: Ensure Environmental Sustainability.
- Goal 8: Develop Global Partnership for Development.

Many of the countries could make significant progress. India performed well in some sectors and in some other sectors it must progress further (Government of India 2017a, b). Nevertheless, to continue with the momentum of MDG, the World adopted a set of new agenda and targets under "Sustainable Development Goals: Transforming our World by 2030" in 2015 to complete unfinished agenda under MDG and proceed further.

The post 2015 development agenda strongly advocated for the sustainable management of natural resources to achieve sustainable development goals. Sustainable resource management in a globalized economy warrants actions at different scales from local to global, and relevant policy formulation and management practices require a detailed scientific information base and new strategies to use resources. This calls for new institutional capacity and governance arrangements (Bringezu et al. 2016). The issue of governance is of paramount importance in striving for sustainable development.

Resource governance entails a range of political, social, economic, and administrative systems that are in place to develop and manage resources in a sustainable manner. The emphasis is on providing space for formal and nonformal actors and all other stakeholders in decision-making, planning, and resource management for sustainable development. Governance is commonly defined as "the interactions among structures, processes, and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say" (Graham et al. 2003). The institutions pertain to formal laws, rules, and regulations as well as informal norms and customary practices that guide the behavior of individuals and groups with respect to environment/natural resources. Effective institutional interventions would be those that account for this complexity of interests and interactions and aim for a sustainable outcome.

As there are competing demands and multiplicity in management authorities, the challenge of resource governance is to resolve conflicts among techno-scientific, market, policy administration, ecological, and sociopolitical actors. Besides, there are the issues of property rights, decision-makers, geographical scale, and beneficiary likely to figure in devising appropriate resource governance system. There is also a need to look beyond the immediate vicinity and consider the broader territory, establish a relationship with the surrounding areas, evolve reciprocity with the hinterlands, and operate in the frame of comanagement with other administrative units. One of the key factors in governance is interdependence and interaction among diverse actors from different territories at multiple governmental scale (Davidson et al. 2006). This will call for integration and follow system approach that looks at the resource system from provenance to consumption and market. The drivers of resource use and abuse are location-specific, so the insights on resource management should arise from local-level experiences. A careful analysis of the resource governance system, its actors, interests,

values, and processes in each locality is necessary to bring out required change in the present governance practices.

Going beyond the "instrumental and idealistic" notion of governance and an attempt to depoliticization as nowadays being advocated in some parlance, it is necessary to strike a balance among different aspects of resource management activities, ensure convergence between research and practice in resource management science, and help the society to evolve a proper governance system through democratic means of debate and stakeholder participation in policymaking. This requires multiple level interactions between government and all other stakeholders/actors, all of whom must be drawn into continuous dialog and negotiations, which may turn into conflicts and uncertainties; however, all these as part of democratic resource governance may progressively lead to concentrative process in order to reach some kind of agreement to move on to implementation and evolve iterative multilevel governance processes that continually progress through social learning and create a broader conceptual space for wide-ranging debate. Prudent resource management practices therefore cut across ecological, economic, social, and governance dimensions (Fig. 1.1). It is multi-scale and nonlinear.

Our attempt, in this volume, is to flag some of these issues through scholarly chapters with empirical data. We requested established and well-accomplished researchers to contribute. Altogether there are 36 articles covering 23 topics contributed by 60 authors. Water emerged as an important topic of discussion. It has been examined from various perspectives. Land and land use dynamics have been dealt by several authors. Among the emergent fields, there are papers on climate change, sanitation and solid waste management, disaster risk, and social impact assessment. Most of the papers are empirical studies based on microlevel field data highlighting local conditions. Theme of the volume runs as common thread among all the papers. However, considering thrust of the papers and principal argument advanced in these chapters we have organized all 36 papers into seven sections (Table 1.1).

1.1 Part I Introduction

In what follows, we highlight some of the salient points in all the contributed chapters. Part-1 which is introductory in nature has two chapters. The introductory chapter by the editors provides an overview of the conceptual aspects of resource

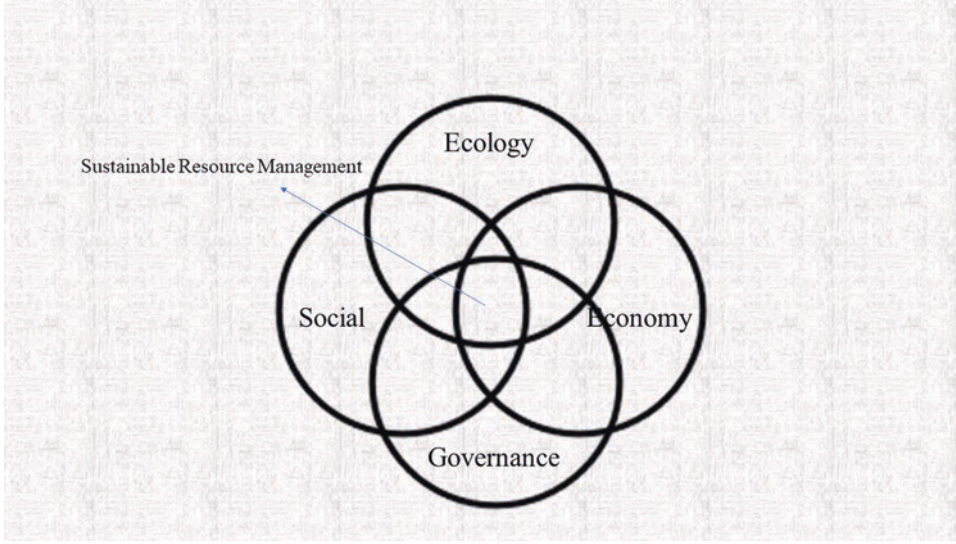

Fig. 1.1 Dimensions of Sustainable Resource Management

Table 1.1 Content organization

Section-1	Introduction (2 papers)
Section-2	Understanding Conceptual Foundations (5)
Section-3	Unpacking Problems (3)
Section-4	How Resource Management, Sustainable Development, and Governance Works: Case Studies (6)
Section-5	Exploring Human Dimensions (7)
Section-6	Response to National, Regional, and Global Change (12)
Section-7	Future Directions (1)

management, sustainable development, and governance. The second chapter in this section is a review of the illustrious career of Bruce Mitchell, Distinguished Professor Emeritus, University of Waterloo.

1.2 Part II Understanding Conceptual Foundations

The focus of part two is to develop an understanding of the conceptual foundations and consists of five chapters drawing on changing paradigms, collaborative turn in water governance, disaster risk governance and management, and regional sustainable development. More specifically, chapter 3 by Baleshwar Thakur and Rajiv R. Thakur engages with paradigm shifts in sustainable resource management both in India and globally. Resource management practices are undergoing change in India and abroad. The demand-supply and commodity mode of resource management are no more viable as has been evident from large-scale environmental degradation associated with all resource management. On the one hand, nonrenewable resources are getting exhausted and on the other hand renewable or environmental resources are under stress resulting in loss of production potential. Technological advancement has equipped the society in precision resource management at the same time it has opened the avenue for alternative resource management and material substitution. Sustainable development, which is the professed goal warrants a paradigm shift in resource management. There are several challenges. Nevertheless, a knowledge-based society, towards which we are moving has the potential to address the challenges and transit to sustainability. The next chapter in this section on "Approaching the Collaborative 'Turn' In Water Governance: A Critical Re-Appraisal," by Nigel Watson and Rob de Loë critically examines the signs for a "turn" in water management and governance towards collaborative approaches and institutional arrangements, drawing on recent literature, and their own original research and practical experiences of working with collaborative institutions and groups. They focused on collaboration in the water sector, where this approach to governance has become particularly significant. Lessons are important as collaboration is considered as a new tool to overcome many of the problems concerning water resource management. The third chapter in this section by Indrajit Pal and Jayant K. Routray on "Disaster Risk Governance and Management: An Asian Perspective" examines the "disaster risk governance" framework of various policy interventions and governance mechanisms that have been developed to improve the resiliency and sustainability of communities and reduce their vulnerability to natural disasters in the Asian region. The next two chapters deal with China and India, respectively. In Chap. 4, Bing Xue and Wanxia Ren discuss reshaping natural resource management as a key component for meeting the challenges of transitioning to sustainable development in China. In doing so, the authors review current institutional changes for natural resource management and identify key stakeholders in the governance system. In the next chapter, Sudhir K. Thakur critically engages with methodologies adopted in regional sustainable development and natural resources decision-making and raises questions about (a) the relationship between natural resources, economic progress, and sustainable development, (b) considers alternative methods to natural resources decision-making, and (c) visualization of natural resource distribution in India.

1.3 Part III Unpacking Problems

Part three contains three chapters which unpacks critical issues such as resettlement and displacement, challenges associated with urban rainwater harvesting, and capacity building in water governance. Chapter 8 on "Rethinking Resettlement as A Development Opportunity: Need for Good Practices," by Vinita Mathur and Gaurav Sikka presents some of the "good practices" in resettlement and compensation planning as observed in the case of Sardar Sarovar Project in India. It is argued that as one size does not fit all, so what may be a "good practice" in one circumstance might not be so good in another situation. There is a need for creating a shelf of "best practices" which can be treated as tools for guiding proper resettlement and achieving the aim of inclusive development. Chapter 9 by Georgina Drew on "Will the water revolution be decentralized?" traces progress in debates over urban rainwater harvesting, as well as the uptake in rainwater harvesting practices, that have taken place since the publication of the "A Water Harvesting Manual for Urban Areas," in 2003. Drawing from a selection of documents and case studies, the author argues that several disincentives persist that either deter people from taking up the clarion call of household-level rainwater harvesting, or that prevent them from doing it altogether. It has been suggested that successful moves towards decentralized urban rainwater harvesting and water management require enhanced centralized cooperation and capacity building. The next chapter in this section by Shabana Khan is on "Rethinking Capacity Building in Water Governance? This study is based on stake holders" interview which examines the interplay of risk interpretation and decision-making in the current water-governance system in Delhi by using the Risk Interpretation and Action (RIA) framework. The results highlight the need to rethink capacity building in terms of preparing varied stakeholders for their greater engagements and participation in the development of effective water governance.

1.4 Part IV How Resource Management, Sustainable Development, and Governance Work: Case Studies

Composed of six chapters, part four of the book addresses how resource management, sustainable development, and governance work through several case studies. In Chap. 11, Kapil Gavsker discusses how regional environmental governance can be a reality and an effective strategy by addressing some crucial issues towards natural resource conservation and their sustainable uses. In the context of the Eastern Ghats of India, he analyses the role of space, stakeholders, institutional structure, and socio-ethnic elements in dealing with regional environmental challenges across this ecosystem. This chapter also critically examines the contemporary development process and practices and attempts to offer a general framework to deal with regional environmental challenges. Chapter 12 on "Groundwater sustainability in Haryana," by Inder Jeet enquires the evolution, trends, present state of groundwater development, management, and governance in the state of Haryana. Some indicators like groundwater level and groundwater quality have been adopted to measure groundwater sustainability. This chapter concludes that small landholdings and intensive agricultural and government policies are the main causative factors of groundwater exploitation in Haryana. The next chapter is on "Wetland resources in the Brahmaputra Valley, Assam: Present status and development prospects" where A. K. Bhagabati and N. Deka study the distribution of wetlands, their status as natural water bodies in the Brahmaputra Valley and presents an inventory of the water and biological resources available in the wetland environments. It assesses threats and pressures on the wetlands and finally suggests some workable strategies and action plans for their sustainable development. The present relevance of the traditional knowledge systems associated with the wetland ecosystems among different tribal and non-tribal communities is

also examined in the changing environmental contexts. The last three chapters in this section are concerned with the spatial dynamics of transboundary river basins. In Chap. 14 Ramashray Prasad focuses on "Transboundary water management and governance problems in Kosi Basin," where he identifies various concerning physical issues and factors related to water in the monsoonal regime of Kosi River basin in North Bihar. This basin is located completely in the plains where the water is supplied by the Himalayan catchment lying in Nepal. Many of the problems of Kosi River basin have their genesis lying in the provenance region, over which the Government of India has little control. It is a geopolitical issue and therefore requires intergovernmental cooperation. Moving from Kosi river basin to Teesta River basin, the issues and challenges are nearly the same. Here, in Chap. 15, Sudeepta Adhikari and Subinita Kamle, present their study titled "Governance and Management of Teesta River Water Resources: A Geopolitical Appraisal." River water management is a great challenge as it involves multiple stakeholders. This chapter discusses geopolitical dimension of Teesta River water management. Geopolitical issue assumes great significance in the present context as Teesta water management is a bilateral issue between India and Bangladesh. This chapter also deals with resource use conflicts and strife over inclusive control. The last chapter in this section is concerned with governance issues for sustainable water management in Rapti River basin where Narendra K. Rana and Neha Singh present an empirical study highlighting how integration is difficult in case of a river shared by two riparian nations and identified the complexity caused by multiple stakeholders at the basin level. The study also identifies a number of governance issues like, management of floodplains and its resources, compliance to flood forecasting and warning, public utility management within the active channel zones, annual maintenance of river banks, illegal sand mining, integration of development schemes within the context of floodplain environment, livelihood issues, and the incorporation of community expectations that need to be prioritized for sustainable water management at basin scale at microlevel.

1.5 Part V Exploring Human Dimensions

Part five consists of seven chapters that explore human dimensions and their role in ecosystem services, land use change dynamics, livelihood, and their impact on sustainable land management. Chapter 17 by Krishna Prasad Poudel on "Social Transformation, Ecosystem Services and Resource Sustainability in Nepal Hills" has tried to investigate impacts of social transformation on ecosystem services and sustainability of the resource supply in the hilly region. This chapter is based on an intensive field study in three settlements, i.e., Taksar of Syangja district, Machhapuchhre of Kaski district and Bandipur of Tanahun district from the mid-hills of Nepal. These three villages represent three different ecosystems. With the modern intervention on infrastructural development, education, employment opportunities, diversification on economic activities, and social transformations have been observed. Social transformations and ecosystem services are closely linked. The second chapter in this section by Shahab Fazal, Nasrin Banu, and S. K. Azharuddin titled "Determinants of Land Use Dynamics and its Ecological Implications in India: A State Level Analysis" examines land use dynamics during the period from 1990–1991 to 2010–2011, and its ecological implications, by budgeting different category of land use in India and among states. The study brings out that India is passing through a critical phase of land transformation. The net sown area is decreasing, along with land under pastures, and miscellaneous trees, etc. Urban growth impacts land allocation under the agricultural sector. This change may affect the agrarian economy and lead to ecological challenges.

In this section, the next three chapters focus on the varying dynamics of ecosystem change in the state of Uttarakhand. Chapter 19 is on "Land Use Change and Its Impact on Ecosystem Services: Food, Livelihood, and Health Security

in Kumaon Himalayas" by Prakash C. Tiwari and Bhagwati Joshi and presents an illustration of Upper Kosi catchment in Kumaon Himalaya of India. Using remote sensing data, and a combination of qualitative and quantitative methods, this chapter has detected land use change and identified the impact of these changes on population growth. Socioeconomic fallout due to waning of ecosystem services as linked to land use change have also been discussed. In Chap. 20 Bindhy Wasini Pandey, Abhay Shankar Prasad, and Jitendra Kumar Mahto discuss "Impact of Land Use Changes on Livelihood Options: A Case Study of Upper Pasolgad Watershed, Uttarakhand." This case study in a hilly watershed highlights how land use change affects livelihood options. It considers several biophysical parameters including climate change and anthropogenic factors to assess the impact of change. Management of common property resources and sustainable livelihood are intertwined and need due care for watershed development program. Chapter 21 also has its focus on Uttarakhand however with a difference. This chapter on "Rural livelihoods and women: Glimpses from an Indian tribal village" by Purva Yadav, Shreya Akarshna, and Anuradha Shankar draws on insights from a small tribal village called Audali in Uttarakhand, India. The dominant Tharu tribe who migrated to this area from the state of Rajasthan centuries back, finds their livelihood transformed because of changing development process. Role of women became paramount at the household and community level with the changing socioeconomic profile of the household and the village. This chapter also deals with the experiences of the group of motivated Tharu women in this changed milieu.

Different from the experience of Uttarakhand, in Chap. 22, Rajesh K. Abhay and Punyatoya Patra make a compelling case for resilience approach in the long-term as they deconstruct the process of land degradation associated with traditional agricultural practices, deforestation, shifting cultivation, and mining activities in Kendujhar District of Odisha. In the last chapter of this section Nitu and R. B. Singh's study explores the livelihood situation in changing socioeconomic environments of Kangra district of Himachal Pradesh and suggests introduction of medicinal plants as part of crop diversification. The challenges of inequitable use of water and soil resources can no more be addressed through traditional crops. Human capital development through training is considered as an essential input to overcome present agricultural problems.

1.6 Part VI Response to National, Regional, and Global Change

Part six containing 12 chapters looks at a variety of sustainable resource governance challenges at different scales. Chapters examine the response to both policy and process as well as emerging opportunities in the context of climate change, population, and economic growth as well as their resultant impact on ecosystems.

In the first chapter of the book Nuthan Maharaj and Brij Maharaj critically review "Sanitation Challenges and Policy Options in Developing Countries" and present the endemic sanitation challenges experienced by developing countries. They also address the issues with specific reference to women, children, and the disabled. The influence of sanitation problems on the realization of the Millennium Developmental Goals is also analyzed and finally it assesses different policy options to attain sustainable development goals. In a related vein, Surya Tewari's Chap. 25 on "Solid waste management for environmental sustainability in India," dealt with problems of solid wastes. An emerging problem across the world, solid waste management is a major challenge to achieve environmental sustainability. The author's focus is on levels of waste generated and handled at the level of states/Union Territories and cities/towns in the country. The best practices at the country and cross-country level have been documented along with critical evaluation of the new Municipality Solid Waste Rules (2015). Chapter 26 of this volume authored by Dipankar Roy, Shobha Kumari, Akhilesh Kumar Mishra, S C Rai is unique as the author's study the dynamics of "Social Impacts Assessment of Indian Water and

Allied Policies and Programs." Social impact assessment (SIA) is having a noteworthy degree of independent applicability apart from being a subset of an environmental impact assessment (EIA) scheme. The Indian water resource sector is a specific example of the defected practice of SIA and consequent visible problems of inefficiency and underperformance. The focus of this chapter is on the link between poor SIA planning and underperformance of the sector. It has discussed the existing scope of SIA in Indian water resource management during both pre-feasibility and post-development stages. Chapter 27 by Ruchira Ghosh and M Satish Kumar is both compelling in its arguments and provides an elaborate review of challenges in solid waste management in the context of India given how human inflow to cities has made landfill sites supersaturated. The authors of this chapter argue that given the basket of opportunities within waste management in India, while the bandwagon of recycling and reuse is successful, unfortunately, "reduction" has lost its vitality. They articulate the role of smart cities framework as critical in making decentralized management approach, vis-à-vis, the significance of the informal sector and opportunities for women and children addressing livelihood, health, and hygiene. The fifth chapter in this section by Lawal M. Marafa brings out the significance of natural resource evaluation for ecotourism and geotourism in the context of Hong Kong. The author attempts to evaluate and assess the natural resource base and explore a potential site in Hong Kong for ecotourism and geotourism. The study reports a simple and effective method in identifying and assessing resources for ecotourism, geotourism, and nature-based tourism on Tung Ping Chau that can be replicated elsewhere. Such a methodology can identify attractions and inventory relevant resources for sustainable use. The study is expected to help formulate recommendations on planning and management for the sustainable development of ecotourism and geotourism in Tung Ping Chau (TPC). In Chap. 29 Pallavi V. Das draws our attention to the socio-economic impact of climate change in a section of the Western Himalayas. Das focuses on how apple farmers have been adapting in this region to climate change. Unlike the popular perception, both climate scientist and farmer perception of climate change are nearly the same. Das's chapter is evident that stakeholder's perception if honed can be used as adaptive strategy in the wake of climate change in the Himalayan region. In Chap. 30 Swarnima Singh draws on PRECIS data model to study ecosystem services due to changing climate in Kangra district of Himachal Pradesh in India. The meteorological data across western Himalayas are examined and analyzed. There is a visible increase in temperature. North-eastern and south-western parts of the district depict much significant variation in the mean minimum and mean maximum temperature. Both quantity and quality of ecosystem services were found to be affected. In Chap. 31 Shweta Rani documents the intricate relationships between urban infrastructure and the development of the urban environment influencing its sustainability. It is suggested that a proper understanding of this relationship coupled with good governance practices is necessary to address many of the problems of the Delhi Metropolitan Region (DMR). Besides, some of the best practices in good governance pertaining to this mega city have also been highlighted. The development and deployment of sanitation has become a global phenomenon. In Chap. 32, Pooja Yadav and Subhash Anand focus on the present status of sanitation in four resettlement colonies of Delhi. It is found that the services are not adequate and there is scope to improve the situation further. In Chap. 33 Srikumar Chattopadhyay and K N Harilal review water governance in Thiruvananthapuram city of Kerala. They highlight challenges such as overcoming spatial differentiation in service delivery, providing quality service, and devising measures for source sustainability as emerging concerns of urban water management in Thiruvananthapuram city. Despite a strong commitment to decentralization, the water management is fragmented and centralized with little role left for the city authority. Applicability of integrated urban water management concept has been examined. It is suggested that participatory polycentric gover-

nance may be adopted to address emerging challenges. In Chap. 34 S.C. Rai and Arpita Panda in studying Bhitarkanika Wildlife Sanctuary, Odisha, layout that Mangrove forests are one of the most productive and biodiverse wetlands. They argue that the Bhitarkanika ecosystem, a Ramsar site, in Odisha, is under stress. The continued exploitation of mangroves has led to habitat loss, changes in species composition, loss of biodiversity, and shift in dominance and survival ability. The study suggests that ecosystem services provided by the mangrove are of immense economic and livelihood value to the coastal communities. Chapter 35 which is also the last in this section by Krishna Kumar and Anjan Sen is unique in design, composition as well as content. This chapter examines Kuchai Kot-Muzaffarpur Section of East-West Highway Corridor to understand how highways have provided better connectivity and accessibility to the urban area to avail better health and educational facilities. This chapter demonstrates that highway corridor is playing an important role in the development of socioeconomic status of the region. Highway development also contributes to increased land price and triggers change in settlement pattern. Although highway generates growth impulses, it also fuels spatial inequality.

1.7 Part VI Future Directions

In this last chapter of the volume, the editors not only summarize the findings of individual chapters but also address the integration of sustainable resource management and governance as well as make recommendations for future research.

Thus, this volume provides global and local level information. We expect that this volume will serve as reference material for academicians, professionals, and students. Location-specific data brought out in some of the chapters will be helpful to the researchers of the locality. Many papers have raised new research questions, which will generate interests among researchers and students.

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