



# Structuring challenges of sustainable tourism development in protected natural areas with driving force–pressure–state–impact–response (DPSIR) framework

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## Abstract

Protected natural areas (PA) are often regarded as areas of high recreational value; thus, many of them are increasingly threatened by tourism development. This has spurred interest in research across socio-economic and biophysical context to respond to the complexity of this global issue. This study applies the DPSIR framework to nature-based tourism development to discuss the cause–effect links and to consider a range of social responses to advance the objective of sustainability of these exceptional areas. Instead of site-perspective, the study builds upon an inductive and Ground theory approach to emphasise the need for (eco)system thinking to identify priorities for actions. The proposed framework delivers the analysis of global and local drivers of change to generate a profound understanding of Triple bottom line impact processes and response implications. The study demonstrates that sustainability of nature-based tourism and resilience of PAs are not possible in the absence of developed institutional capacity, multi-layer management system, monitoring, education and the consent of the community.

**Keywords** Nature-based tourism · Sustainable tourism · Protected natural areas · Overtourism · Resilience · DPSIR

## 1 Introduction

Protected natural areas play an increasingly important role in shaping the settings for tourism development. They provide opportunities for recreation and learning and thus contribute to human well-being and environmental awareness (Schägner et al. 2016). Many regions of the world depend on protected areas (PA) to support community development, viewing them as importance resources (Gale et al. 2019). They are established and managed by individual national or regional governments, though there is a wide range of variations across the globe (Rutty et al. 2015a). A variety of driving forces and contextual factors have led to an increasingly contentious decision-making environment, making solutions for sustainable nature-based tourism more complex (Mccool 2016). The increasing debate on role of the protected natural

areas in provision of ecosystem services including recreation (Johnson et al. 2019; Kulczyk et al. 2018; Scholte et al. 2018; Zulian et al. 2018), and latest challenges related to *overtourism* (Peeters et al. 2018) in such areas indicate that solely protection measures are not enough to build resilient parks. Furthermore, the global analysis of protected area management effectiveness (Leverington et al. 2010b) indicates major and significant management deficiencies within more than 54% of sites. Thus, a new approach to nature-based tourism development is desperately needed and should be wisely planned and built on a multi-layer management system (Dudley and Stolton 2018; Mandić 2019). Management of fragile ecosystems requires a proactive integral approach (Alexander 2013), which implies that national park (NP) and protected area managers are well-informed about all the challenges that they have to face, and the forces that can influence park features. Despite acknowledging the importance of an integrated approach, current management frameworks seem to be insufficient to tackle increasing visitation, considering that tourism and recreation are the third major threat influencing heritage sites (IUCN 2017). In Europe, the conservation outlook has deteriorated for six out of nine sites including, Ancient and Primeval Beech Forests of the Carpathians and

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other regions of Europe, Bialowieza Forest (Belarus/Poland), Plitvice Lakes National Park (Croatia), Pitons, cirques and remparts of Reunion Island (France), Lake Baikal (Russian Federation) and Laurisilva of Madeira (Portugal), and improved for only three sites between 2014 and 2017. In most cases, these negative changes are related to massive tourism and visitation and its side effects, namely water pollution, alien spaces and climate change. The growing importance of tourism in overall economic development requires adaptability, considering that in many cases, policymakers will be willing to accept trade-offs between conservation and recreation due to expected economic impacts. Therefore, protected natural area governance and nature-based tourism development require a holistic approach and proactivity (Mandić and Petrić 2020). Prevention will inevitably delay resource deterioration; however, recovery may indicate they are already lost, or as Buckley (2018) said, measures to mitigate tourism-related challenges can be understood as political signals that human-modified landscapes are also valuable for conservation. This gives conservation opponents a licence to modify wilderness.

Although many countries are still considering tourism to be an environmentally friendly and smokeless industry (Dowling 1992; Holden 2000), examples of tourism-related adverse effects deny such attitudes (Canteiro et al. 2018; Rankin et al. 2015; Tolvanen and Kangas 2016). Thus, indeed, there is a need to reframe the way we all think about sustainable nature-based tourism, incorporating a greater focus on resilience, adaptivity and diversity of and withing PAs (Gale et al. 2019). McCool (2016) advocate the need for new paradigms in PA tourism planning characterised with integrated planning based on a holistic approach. According to McCool and Bosak (2015) PA managers including those dealing with sustainable tourism operate in a complex and dynamic environment, where competing goals and lack of science challenge their ability to frame problems and develop responses. Thus, operational frameworks would help managers to frame the challenge by structuring thinking processes, reason assumptions forcing consideration of a range of nonlinear cause–effect relations, indicators of change and alternatives in a productive way.

This study applies Driving Forces–Pressures–States–Impact–Responses (DPSIR) environmental framework (OECD 2001) to conceptualise and discuss the challenges of sustainable tourism development in national parks. It demonstrates the way this established tool might be used to gain insight and frame recent and relevant challenges related to nature-based tourism development efficiently and to deliver a range of feasible alternatives and solutions. The study applies a holistic approach to PAs by identifying Drivers placing Pressure on fragile ecosystems, and changing the State of the park features, thus inducing social, economic or environmental Impacts. In the end, we discuss the

outcomes—social Responses, i.e. current challenges of sustainable tourism development in NPs.

These complex environment-development-tourism relations are insufficiently addressed, especially in Mediterranean-protected areas, due to a relatively short history of recreation development. However, *overtourism* and massive visitation growth rates (Mandić 2019; Petrić and Mandić 2014; Weaver and Lawton 2017) call for action and push practitioners to find user-friendly operative tools and frameworks to improve both, operational and strategic decision-making processes. In this study, we acknowledge the Dudley and Stolton's (2018) call for action to think about what is needed and what opportunities and challenges exist to identify priorities for action by protected area managers, policymakers and supporters in the next few years. Built upon an inductive qualitative approach, the paper conceptualises challenges by embedding the DPSIR scheme, which is often used for structuring sustainability issues, supporting decision-making processes and developing integrated methodologies and approaches (Atkins et al. 2011; Helming et al. 2011; Koundouri et al. 2016; Kuldna et al. 2009; Ness et al. 2010). The study focuses on the nexus between PAs management, conservation and sustainable tourism development and sheds light on the future research agenda.

## 2 Protected areas and tourism development: a brief overview

Economic and tourism development and natural resources are strongly interrelated. Moreover, there is an opinion that long-term reliance on natural resources can result in sustainable development (Barro 1990; Barro and Sala-i-Martin 1992; Rigall-I-Torrent and Fluvià 2011; Shaw and Williams 2004; Engel et al. 2008; Sharpley 2009), considering that natural capital can be used to explain the constant marginal returns and long-term sustainable growth in the absence of technological progress in Solow growth model (Barro and Sala-i-Martin 1992; Rebelo 1991; Rigall-I-Torrent and Fluvià 2011). Parallel to the emergence of the literature dealing with sustainable development, many studies have highlighted tourism–environment interaction and the negative impact of mass tourism on natural and built environments (Farrell and Runyan 1991). The growing debate on the potentials and pitfalls of this industry has resulted in the search for better approaches to environmentally sensitive tourism (Mgonja et al. 2015; Nepal 2002a, b). Last two decades, tourism has evolved into the complex system incorporating many different special interest tourism forms, some of which are more or less sustainable than others. Although natural capital remained the fundamental driver of tourism development

in most destinations, resources are often exploited without a proper strategic framework. According to Berge (2006) one of the potential reasons is the fact that with a few notable exceptions, environmental protection and management of common-pool resources, as PNA are, have not been discussed together, considering that the economic theory of environmental problems and policies was usually addressed as a problem of allocating responsibility for externalities. Thus, Berge (2006) points out the lack of the collective action in finding an institutional arrangement to overcome the problems inherent in the ungoverned usage of such resources at a socially optimal level as the core challenge of sustainable PA management.

IUCN, along with UNWTO and UNESCO does tremendous effort on steering and restraining development and its impact upon protected natural areas (PA), an important manifestation of natural capital. PAs are meant to be centres of excellence where knowledge on heritage value and conservation management are passed on to the others (UNESCO 2012). Thus, education propounds as an intrinsic part of the site's management, enabling and fostering appreciation and respect toward the natural heritage (Trakolis 2001). The integration of educations of visitors, local and indigenous community in PA governance (e.g. NP Kakadu in Australia,<sup>1</sup> NP Yellowstone in the USA, NP Plitvice lakes in Croatia<sup>2</sup>), reflects the shift in dominant protected area management philosophy, and results in more considerable attention being paid to ethical, social, cultural and economic as well as biological and scenic values (Obenaus 2005). Management and conservation frameworks are nowadays expected to be flexible and adaptable to balance the dynamic relationship between nature conservation, economic (tourism) and social (local and indigenous community) development.

In many cases nature-based tourism arises as an acceptable development alternative for many communities (Bello et al. 2017; Mayer et al. 2010; Spenceley and Goodwin 2007; Zapata et al. 2011), considering that if carefully planned and managed, tourism offers the opportunity to break so-called "marginalisation" (Nepal 2002a, b). Tourism and national parks have a long history together. In the early twentieth century, the US National Park Service (NPS) aimed to include into the park system all areas that contained scenery of supreme and distinctive

quality, or some natural feature as extraordinary or unique as to be of general interest and importance (Hall 2018; Rutty et al. 2015). They were meant to attract visitors to national parks, while simultaneously keeping the parklands in an unimpaired state. The initial low number of visitors was delivering such policy goals; however, with the enormous expansion of tourism flows, significant pressures on fragile biological systems emerged. Early worries that national parks will practically be lying fallow vanished, while the focus shifted on management issues and challenges. The same trends could be identified within European national parks, whose majority of visitors nowadays are tourists visiting destinations or parks exclusively.

The national park management system aims to protect resources for future generations, educate, contribute to the health and pleasure of the people, and deliver national interest (Hall 2018). Guided by these objectives, economic or progressive conservation was the dominant metaphor for natural resources management, including tourism, in the industrialised world for most of the twentieth century. The shift in this leading development paradigm, which followed the Stockholm conference (1972), and later a conference in Rio—Earth summit (1992) resulted in the development of contemporary park management system (CPMS), based on the World List of National Parks and Equivalent Reserves delivered by IUCN's Commission on National parks and Protected Areas (1962). Although recognised for its essential contribution, tourism was not integrated into the CPMS. In some manner, this lack of understanding facilitated the pressures on protected areas. The twenty-first century has brought new challenges for protected natural areas within all three tiers, namely economy (e.g. sustainable financing), society (e.g. local and indigenous community rights and development) and environment (e.g. climate change, and fire management<sup>3</sup>). More than ever before, responsible governing institutions are expected to recognise them, to adapt, and to use protection categories as tools for planning and indicators of change (Dudley 2010). In some manner, the World Heritage Outlook (IUCN 2017) suggests we all failed to do so.

The diversity of PA governance approaches across the globe has stimulated the development of various methods for tourism planning (Hall 2018). Researchers and practitioners made tremendous effort to evolve PA frameworks to address existing and anticipated issues, among others throughout the development of visitor management tools, policies to minimise impacts on wilderness and tools to provide sustainable recreation (Table 1). Nowadays, sustainable tourism is recognised as the most important commercial use of protected areas (Spenceley 2017), and

<sup>1</sup> Management plans: NP Kakadu—Australia <https://www.environment.gov.au/system/files/resources/1f88c5a3-409c-4ed9-9129-ea0aadd4f33/files/kakadu-management-plan-2016-2026.pdf>; NP Yellowstone—USA <https://www.nps.gov/yell/learn/management/reyp.htm>; NP Plitvice lakes – Croatia <https://np-plitvicka-jezera.hr/files/file/NpPlitvice-management-plan.pdf>, (accessed 15 June 2017).

<sup>2</sup> Education in National park Plitvice Lakes, [https://np-plitvicka-jezera.hr/files/file/dokumenti/Obrazac\\_PR\\_RAS\\_VP\\_151\\_2016.pdf](https://np-plitvicka-jezera.hr/files/file/dokumenti/Obrazac_PR_RAS_VP_151_2016.pdf), (accessed 25 May 2017).

<sup>3</sup> Publications in National park Kakadu, <https://www.environment.gov.au/topics/national-parks/kakadu-national-park/publications>, (accessed 15 June 2017).

**Table 1** Tourism and recreation management frameworks

Frameworks identified by Alexander (2013)		Frameworks identified by McCool (2016)		
Framework	Key references	Framework	Key references	
<i>ROS</i> Recreation Opportunities Spectrum	Clark and Stankey (1979)	Recreation opportunity spectrum-based frameworks	Clark and Stankey (1979)	
<i>LAC</i> Limits of Acceptable Change	Stankey et al. (1984)		Recreational opportunity spectrum	Driver and Brown (1978)
			Tourism opportunity spectrum	Hawson (2001)
		Water recreation opportunity spectrum	Haas et al. (2004)	
<i>VAMP</i> Visitor Activities Management Planning	Graham et al. (1988)	Limits of acceptable change-based framework	Stankey et al. (1985)	
<i>VIM</i> Visitor Impact Management	Graefe et al. (1990)	Limits of acceptable change	Graefe et al. (1990)	
		Visitor impact management	Hof and Lime (1997)	
		Visitor experience and resource protection	Manidis (1997)	
		Tourism optimisation and management model		
<i>TOS</i> Tourism Opportunities Spectrum	Butler and Waldbrook (1991)	The benefits-based management framework—the 1990s	Driver and Bruns (1999)	
<i>VERP</i> Visitor Experience and Resource Protection	Manning et al. (1995)	Carry (visitor) capacity-based frameworks—the 1960s	Lime and Stankey (1971)	
<i>ECOS</i> Ecotourism Opportunity Spectrum	Boyd and Butler (1996)	Social	Haas (2002)	
		Biophysical		
		Facility		
<i>PAVIM</i> Protected Area Visitor Impact Management	Farell and Marion (2002)	Placed-based frameworks—the 2000s	Kruger and Jakes (2003)	

Source Adapted from Alexander (2013) "Management Planning for Nature Conservation", Springer, London. and Mccool (2016) "Reframing Sustainable Tourism", Springer, London

adaptive co-management (ACM) as a reliable management approach suitable to improve governance of tourism in PA and achieve the desired balance between conservation and recreation (Mandić 2019). Until very recently, management and planning for protected areas in Europe have been mainly concerned with habitat and species protection and have, in general, placed significantly less emphasis on providing for tourism and people (Alexander 2013). Consequently, in some vibrant European destinations (e.g. Croatia) tourism has recently been integrated into the national park management planning, mostly due to the growing importance of nature-based tourism, and threats related to massive visitation, i.e. *overtourism* (Dharmaratne et al. 2000; Petrić and Mandić 2014). Undoubtedly, tourism impacts ecosystem, soil, vegetation, water, air and wildlife (Eagles et al. 2002). To prevent deterioration of resources, PA governance should build upon ecotourism management principles (Obenaus 2005), and address both, people (all stakeholder groups) and tourism development (accessibility, carrying capacity, monitoring, legislation, facilities), throughout proper policy measures (Alexander 2013). This holistic approach provides a feasible environment for sustainable development to be reached, and the benefits of tourism development to be equally distributed.

### 3 Methodology

This study applies the inductive approach and DPSIR methodology to identify the challenges of sustainable tourism development in protected natural areas. First, Becken and Job (2014) suggest there is a need for a better understanding of internal and external influences to understand the evolution of PAs and to improve their management and effectiveness. Thus, they propose conduction of simultaneous analysis of global and local drivers of change to generate a more profound understanding of impact processes and response implications. Such an integrated analysis was used in this study to identify fundamental driving forces within the DPSIR framework. To deliver conclusions in this process, the analysis of relevant literature published in the last decade in ScienceDirect (<https://www.sciencedirect.com>) and Taylor & Francis Online (<https://www.tandfonline.com>) scientific databases was conducted. It should be noted that study adopts a holistic approach, thus to support conclusions only those studies that were considered to be most relevant were retained. The inclusion of similar references, i.e. studies demonstrating same or similar conclusions, would not contribute the overall merit of

this paper; in spite, this should be acknowledged as a potential limitation. Second, the identification of pressure, state and impact indicators is interrelated with and based on "Tripple bottom line" approach to development, with social (including cultural) factors being given equal weighting to environmental and economic factors. This type of analysis and following decision-making based on the holistic interpretation of sustainability is strongly advocated by IUCN in their Protected area governance and management publication (Trevor et al. 2016). When choosing the indicators, the attention was given to Indicators of Sustainable Development (United Nations 2007), OECD Environmental indicators (OECD 2001) and Indicators of sustainable development for Tourism Destinations (World Tourism Organization 2004). Additionally, the European Commission has launched The European Tourism Indicator System (European Commission 2016), to help destinations to monitor and measure their sustainable tourism performance, using a common comparable approach. However, considering the scope and aim of this study, we have decided mostly to rely on the first three frameworks. Third, the Grounded theory<sup>4</sup> approach was adopted to generate responses, which are considered to be the challenges of sustainable tourism in protected natural areas. Finally, the conclusions are drawn based on the causal chain of the impacts and results of the analysis delivered in the DPSIR framework.

### 3.1 DPSIR framework

DPSIR stands for Driving Forces-Pressures-State-Impacts-Responses. It has evolved to address the conceptual problems and related criticism of former Pressure-State-Response (PSR) framework developed by OECD in 1994 (Carr et al. 2007). This concept implies the existence of a chain of causal links starting with driving forces through pressures to states and impacts on ecosystems, human health and functions, eventually leading to political responses, i.e. prioritisation and target-setting (Kristensen 2004) (Fig. 1). Drivers usually refer to vital social processes shaping human activity, and by that, have a direct impact on the environment (Carr et al. 2007). Human activities induce pressures influencing the state of the environment, and consequently generating different types of impacts (Díaz-Delgado et al. 2009), which require responses, i.e. institutional efforts to address undesired change of the state.

The DPSIR framework is often used in the sustainable development literature to explore the way social and

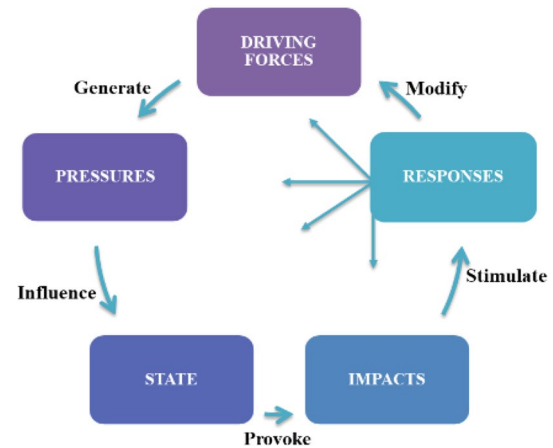


Fig. 1 DPSIR framework. Source Adapted from Kristensen (2004), "The DPSIR Framework", National Environmental Research Institute, Denmark

environmental factors interact (Atkins et al. 2011; Helming et al. 2011; Ness et al. 2010), and thus contributes to the broadening of the understating on environmental challenges on scales ranging from global to local. Bidone and Lacerda (2004) rely on a framework to evaluate sustainability in coastal areas. They identify socio-economic and physical drivers with accompanying indicators, e.g. demographic growth, residential land occupation, gross domestic product per capita, income distribution, HDI and seasonal change in climate condition. Furthermore, the authors suggest using cost-benefit analysis in which standards of sustainability are fixed, and the analysis attempts to highlight the cost means of achieving them. Ness et al. (2010) consider driving forces to be the independent, external causes or forces that underline movement toward or away from desired targets. In their research, pressures are considered both, as positive and negative, although most conceptualisations focus on negative. State variables describe the condition, i.e. changes in the system induced by pressure, while the impacts are seen as measurable damages to the environment or human health. Atkins et al. (2011) focus on the marine environment, while (Koundouri et al. 2016) developed a methodology for the sustainable environmental and socio-economic management of river ecosystems. The latter consider population growth, political, economic, social, technological, agricultural and industrial changes to be fundamental driving forces inducing a change of the state of welfare, well-being and ecosystem.

A framework has also found its way in tourism studies, where it has been applied to assess the wildlife tourism risks (Mustika et al. 2017), to measure sustainability in mass tourist destinations (Rebollo and Baidal 2003), and for sustainable tourism planning and climate change adaptation (Bonzanigo et al. 2016). Most recently, Ruan et al. (2019) rely on the DPSIR model to evaluate the mechanism of

<sup>4</sup> Grounded theory is introduced as an inductive, comparative methodology that provides systematic guidelines for gathering, synthesizing, analysing, and conceptualizing qualitative data for the purpose of theory construction. <https://www.sciencedirect.com/topics/neurosciences/grounded-theory>, (30 November 2019).

ecological tourism security as a critical way of measuring the sustainable development of tourism destinations. In general, the authors conclude that the DPSIR model can effectively measure the operational status of tourism ecosystem considering that compared to other models, is characterised with comprehensive content, strong logic and can fully reflect the interaction relationship among tourists, tourism destinations and environment.

Despite providing a holistic approach, the framework has been criticised due to its linearity, difficulties with selecting proper indicators within each of the DPSIR categories and potential oversimplification of the challenge it addresses (Klijn 2004). Furthermore, there is also the challenge to encompass the multi-dimensional and multi-level relations between parameters (Ness et al. 2010), and implicit hierarchical structure (Helming et al. 2011), i.e. considering that the framework delivers a hierarchy of elements and actors, individuals and groups who are affected by social and environmental changes have only the potential to address impacts (Carr et al. 2007). However, most of the criticism rests on a misunderstanding of DPSIR, or as pointed by Karageorgis et al. (2006), “to understand cause-effect relationship related to a particular environmental issue, one must focus on the link between the different categories, and it is in this focus that the application of specific social science on physical science models becomes appropriate”. Even though DPSIR has been criticised for focusing on the causal chain, rather than addressing complex interrelationships (Helming et al. 2011), the approach is useful because the connections between the identified and selected indicators describe causalities (Niemeijer and De Groot 2008). Thus, the approach can be an effective mean of structuring causalities of environmental issues and potentially can serve as an information basis for policymakers.

#### 4 Results: development of a conceptual framework

This section delivers a conceptual framework (Fig. 2), that building on DPSIR logic visualises causal links between driving forces and pressures, elaborates on expected changes in the state of the resources and three-tier impacts induced by tourism development. It proposes responses, which aim to foster parks resilience and enable sustainable tourism development. The premise of this framework is that protected areas and tourism destinations coexist. They are influenced by the changes in tourism demand and supply as well as within internal and external environments. From the demand side, tourism pressures relate to an increase in the number of visitors and the frequency of visits, i.e.

seasonality, density,<sup>5</sup> and the impact of visitors’ activities. From the supply side, tourism development requires, visitor concentrations, infrastructure, facilities and thus facilitate urbanisation. The responses proposed at the bottom of Fig. 2 are seen as challenges, which PA managers should address to develop nature-based tourism sustainably.

#### 4.1 Driving forces

Although the global protected areas network has undergone an unprecedented rate of expansion over the last few decades, biodiversity continues to decline (Dudley and Stolton, 2018). Tourism development appears to be among the significant threats influencing world heritage sites (IUCN 2017), and considering the current trends (UNWTO 2018), it is expected that the number of visitors in major protected areas will continue to increase steadily. Therefore, the identification of significant tourism-related pressures and adequate responses to address them seems to be the prerequisite for sustainability and resilience of PNAs.

To improve the current management and effectiveness of the PAs, we must understand various internal and external influences that affect them (Becken and Job 2014). While external usually refers to something that is beyond reach, internal implies that if there is a willingness, generators of change could be addressed, and consequently the system improved. Building on that, driving forces influencing sustainable tourism development in national parks indicated in Fig. 2 are seen externally, i.e. *globalisation, tourism growth, climate change, political, economic, socio-cultural environment and technological innovations*, and internally, i.e. *the efficiency and effectiveness of management system, flexibility and adaptability of strategic documents and internal organisation, and monitoring*.

Globalisation appears to be a significant force influencing tourism and many other industries. Outsourcing, transnational ownership structures and investments, cross-border marketing collaborations, the purchase and sale of expertise and free movement of labour are developments not confined to manufacturing alone, but also highly relevant for the modernisation of tourism (Hjalager 2007). The issue of whether globalisation is beneficial remains controversial, mainly because globalisation policies are often examined without consideration of their interactions with key sectors of the economy, notably tourism (Sugiyarto et al. 2003). Beneficial or not, globalisation remains one of the fundamental driving forces affecting national and regional economies, and consequently sustainable tourism development. In some manner, globalisation processes have boosted the growth of international and regional tourism. Over the last 25 years, tourism arrivals have almost tripled from 435 million in 1990 to

<sup>5</sup> Most recently addressed as overcrowding in the context of overtourism.

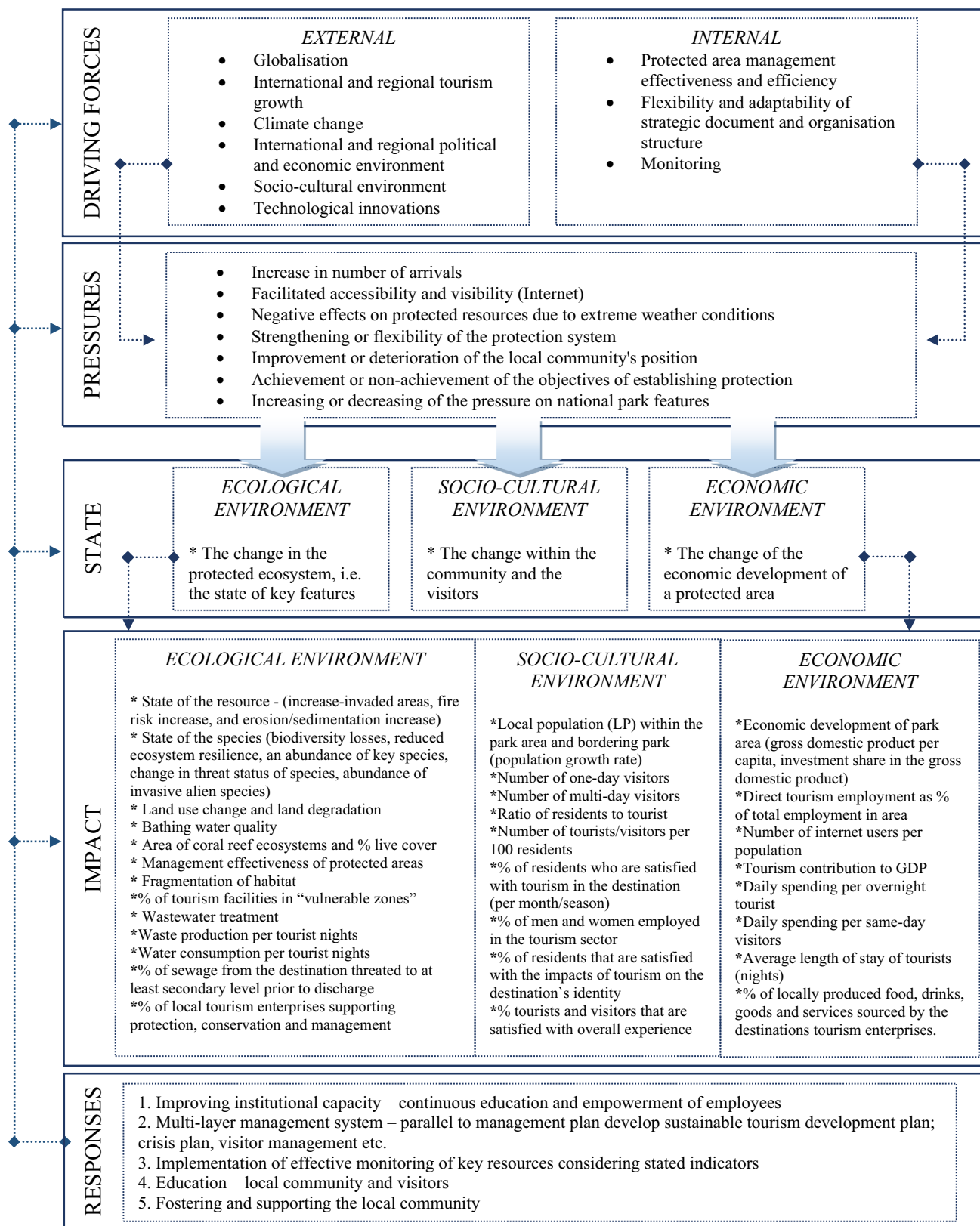


Fig. 2 DPSIR conceptual framework

1326 million in 2017 (UNWTO 2018). In the same period, Europe has remained the major tourism destination with 51% of the world's market share and 3.3% annual growth in 2017 by comparison with 2016 (UNWTO 2018). The number of tourists, tourism induced revenues, and development of infrastructure and facilities indicates the destinations' position in the life cycle (TALC) (Butler 2006a, b; Buhalis 2000; Ivars i Baidal et al. 2013; Mandić et al. 2018). This is important because a higher position in TALC (e.g. development, stagnation) implies stronger tourism-induced pressures on destination space (Haugland et al. 2011; Nunkoo and Ramkissoon 2011) including protected areas, and potentially *overtourism*. Tourism development appears to be in the top three most widespread threats for natural world heritage, globally, while in Europe, tourism, visitation and recreation remain key factor-inducing site deterioration (IUCN 2017).

Along with globalisation and tourism, rapid industrial and economic development prompted climate change (Holman et al. 2005), influencing the most fragile ecological systems. The impact of climate change on tourism has been the subject of consideration for many years (Hall 2008; Weaver 2011). However, the causal relationship between tourism and climate change is a much recent concern (Scott et al. 2008). Researchers agree that the impacts of climate change differ considering the type of the protected feature (e.g. vegetation and wildlife, as discussed in Tolvanen and Kangas (2016) and the tourism destination (e.g. mountain protected areas and destinations as discussed in Byers (2007), while some of them are particularly sensitive to changes in climate.

Furthermore, tourism development is highly influenced by the changes occurring in international and regional political and economic environments. Complete reliance on tourism as a development alternative due to weak national economic performances and breakdown of traditional industries, along with the sudden changes in the political environment, can induce (accidentally or deliberately) neglect of protected natural resources, i.e. massive, limitless expansions of visitors, uncontrolled economic development, urbanisation. Additionally, the adverse economic and political trends can negatively influence the role and the attitudes of the government toward the protected area management and planning throughout reduction of public financing, poor strategic planning, allowing excessive construction, nepotism, etc. In all cases, the sustainability of the protected areas is threatened.

Any change occurring in a socio-cultural environment represents potential drivers influencing the state of the natural resources. Both members of the local community and visitors who arrive at the destination can induce change. Tourism development is indivisible from the socio-cultural environment. The members of the local community should be empowered to make a joint decision on what aspects of their destination they would like to incorporate into the

tourism product (Mccool 2016) and what type of tourism they want. Harmon (2003) refers to tourism and recreation as intangible values derived from protected natural areas. These values are a social effect of protected areas as they change the social lives and well-being of the people who visit the parks and the people living in them (West et al. 2006). Considering that effective management of protected areas is often obstructed by conflicts associated with the social impacts imposed on local communities (Jones et al. 2017), researchers have paid particular attention to the local community-park management relations (Bello et al. 2017, 2016; Goodwin 2002; Mearns 2012; Nyaupane and Poudel 2011). According to Mutanga et al. (2015), the four most important factors influencing these relationships are a history of creation, benefits and costs associated with living close to a national park, socio-demographic factors, and community involvement in conservation-related development projects. Furthermore, the involvement of the local and indigenous community is more successful where park planning is participatory and where political and socio-economic reforms are underway (Nepal 2002a, b).

Technological innovations have dramatically changed the way people live and work, but also the way they explore the destination, collect information and purchase services. Nowadays, due to the internet, destinations are more accessible than ever before. The ease in obtaining and managing information has prevailed natural areas of outstanding value to remain hidden. Tourists can, with ease find information about every national park, learn about it, view photos on different websites and applications, and make travel decisions. The massive application of ICT has facilitated the development of smart tourism and smart tourism destinations. Smart destinations are typically thought about as smart tourism ecosystems—tourism systems that take advantage of smart technology in creating, managing and delivering intelligent touristic services, experiences and are characterised by intensive information sharing and value co-creation (Gretzel et al. 2015a, b). The technology and various technological solutions potentially affect all elements of destination appeal, i.e. attractions, public and private amenities, accessibility, human resources, image, character and price (Mandić and Garbin Praničević 2019a, b). In the context of protected areas and national parks, it can be used to track time–space visitor movements (East et al. 2017; Kádár 2014; Kim et al. 2019; McGehee et al. 2012), improve visitor experience (Kim et al. 2018; tom Dieck et al. 2016; Tussyadiah et al. 2018) and balance conservation of nature and recreation opportunity (Korpilo et al. 2017; Tomczyk and Ewertowski 2013). Additionally, Mandić (2019) indicates that parks also rely on technological solutions to address external pressures, among others, climate change and ecological disasters. This has facilitated the development of



the Smart park initiative<sup>6</sup> where technology is primarily used for protection of endangered species and the conservation of the environment.

Park management structure, planning processes and resulting efficiency and effectiveness determine the nature of internal impacts. After all, the sustainability of tourism development in national parks reflects the success of protected area management. Effectiveness is strongly linked to having a good management plan (Leverington et al. 2010a), that should be driven by management objectives and policies aiming to conserve and enhance the values for which the site has been inscribed (Dudley 2010). Proper management planning requires improvement of the institutional capacity, i.e. recognising that the most capable staff will not be sufficient if not supported through appropriate laws, policies, and programmes at the institutional level (UNESCO 2012). Furthermore, there is also a need to address the issue of appropriate land use in national parks related to their recreational function (Newsome 2014), and expectations to achieve an increasingly diverse set of conservation, social and economic objectives (Noel and Weigel 2008; Watson et al. 2014).

A large and complex site should utilise a multi-layered management system rather than a single management plan (UNESCO 2012). According to Islam et al. (2018), adaptive co-management (ACM), provides a feasible management alternative, which enables the improvement of the governance of tourism in protected natural areas. Monitoring, as an essential element of ACM, highlights the management success and identifies management aspects that require improvement throughout a set of indicators pointing out potential change (Mills et al. 2015).

## 4.2 Pressures–state–impacts

In what manner stated external and internal drivers pose pressures on protected features and induce a change in the state of the resources? The answer to this question requires the analysis of potential changes that each of the drivers could induce.

- Globalisation and overall international and regional tourism development are accompanied by the growing number of visitors in vibrant destinations and protected natural areas. The increasing number of visitors in national parks on a global scale is a consequence of visitors' willingness to spend more time in pure and unique natural surroundings. Moreover, it is estimated that over 50% of tourism activities are nature-based, focusing mostly on protected areas and wildlife resources (Anderson 2010).

The development of ecotourism (Medina 2005) and nature-based tourism (Ziffer 1989) within national parks additionally attracts visitors. Evidence can be found in many national parks—tourism destinations in the world. National park Plitvice Lakes (UNESCO world heritage) in Croatia has faced a 54.07% increase in visitors in the period from 2007 to 2016 (MINT, 2008; 2016), and thus faces deterioration of the conservation outlook (2014–2017) from good with some concerns to significant concern (IUCN 2017).

- Overall travel infrastructure and transportation systems are becoming smarter (Papathanassis 2017). Consequently, national parks and protected natural sites are becoming increasingly accessible and visible due to the improvement and development of means of transportation and sharing of information (Instagram, Facebook, TripAdvisor). Additionally, technological infrastructure enables the delivery of different services through various functionalities, interactions and interfaces (Law et al. 2009, 2014; Wang et al. 2012).
- Climate change induces potentially the most visible pressures on fragile protected natural features (Hall 2008; Weaver 2011). The extreme weather conditions may cause a change in the biological and ecological system and result in species and biodiversity loss. Furthermore, they can be related to the emergence of invasive non-native species in national parks and PAs (Finch 2012), thus deteriorating protected features.
- Pressures provoked by a change in economic and socio-cultural environment can influence both ecological systems and the local community. They usually stimulate public sector response, leading to strengthening or loosening the protection of the resources. The government has the power and the tools to address negative influences by widening the protected area, setting up visitor restriction, introducing laws and regulations. Moreover, public actions stipulate the impact on the community and induce positive change (Romero-Brito et al. 2016).
- The internal drivers provoke mostly positive change. The effective NP management, flexible and adaptable strategic documents and adequate monitoring will foster sustainable development and sustainable use of resources within the protected area. How will these positive pressures impact park management depend mostly on the importance that responsible (public) actors place on them? If the government finds it essential to balance conservation and recreation, they will surely do it by enabling these internal drivers and thus improving the whole governance system.

The pressures influence the *state* of the NPs' ecological, socio-cultural and economic environment. State of the

<sup>6</sup> Smart parks initiative, <https://www.smartparks.org/>, (10 January 2019).

ecological environment reflects the induced alterations of the protected ecosystem. It is essential to identify indicators that can be used to monitor the state of the park features and the impacts of measures introduced to mitigate pressures. The socio-cultural environment reflects the interrelations between the local and indigenous community, visitors and park management. Social impacts generated by tourism development in NPs can refer to a variety of issues such as the change on people's way of life, their culture, community and its cohesion, political system, environment, rights, their fears and aspirations (Jones et al. 2017; Vanclay 2003). Finally, the state of the economic environment reflects the tourism development impact on the economic development of park area, i.e. gravitating population and traditional (developed traditionally before the establishment of protection) and current industries (induced by sustainable tourism).

Changes in the state of the ecological, socio-cultural and economic environment provoke *impacts*. They are difficult to measure due to the limited number of available and reliable indicators. Currently, there are four international indicator frameworks, i.e. OECD (2001) *Environmental Indicators – toward sustainable development*, UN (2007) *Indicators of Sustainable development: guidelines and methodologies* World Tourism Organization (2004), Indicators of sustainable development for Tourism Destinations and EU (2016) *The European Tourism Indicator System (ETIS)*. The reliable sources of indicators are also conducted and published scientific research among others on sustainable development (Bidone and Lacerda 2004; Odermatt 2006), climate change (Holman et al. 2005) and biodiversity (Díaz-Delgado et al. 2009; Kuldna et al. 2009; Le Maitre et al. 2009). Although available indicators can be used to track the general changes in the state of all three dimensions of the environment, each NP has its specifics. That means that managers of the NPs should be capable of identifying and developing tailor-made indicator lists. Considering their scope, ecological environment indicators can be used to trace down various impacts on both, state of the resources and species. The potential list includes the following indicators, namely the increase-invaded areas, biodiversity losses, marine tropic index (for coastal NP), abundance of key species, wastewater treatment, fragmentation of habitat and management effectiveness of protected areas. Socio-cultural environment indicators reflect the impacts of tourism development in NPs on local and indigenous community. According to the UN (2007), the visitor-population relations and their implications should be analysed using tourism development and education indicators. In that manner, population growth and level of education could be used to describe the local socio-cultural

trends, while the ratio of the resident and tourist reveals the importance of sustainable tourism for a specific community. Depending on the expected benefits, the community will perhaps be willing to make trade-offs between conservation and development (Cooper et al. 2008). Finally, when considering potential indicators describing impacts on the economic environment, the following indicators may be used, namely economic development of the protected area, inflation rate, employment rate, number of internet users and the tourism contribution to GDP etc. These indicators will potentially contribute, enlightening the stage of the economic development of the protected area and reveal its degree of tourism dependency.

### 4.3 Responses

Impacts stimulate responses aiming to address change in the state of the NP resources due to the pressures generated by, among others, tourism development. As the framework suggests (Fig. 2), impacts are induced by different internal and external forces. NP management has the opportunity and responsibility to address the internal drivers comprehensively to minimise any future pressures and potentially negative impacts. On the other hand, external drivers should be traced, and their potential negative impacts minimised. This way of structuring cause–effect relations throughout potential indicators of change leads to a range of social responses indicated below. The responses reflect tools to address the tourism-induced three-tier impacts, i.e. challenges that have to be addressed to build resilient parks and to develop nature-based tourism sustainably.

#### 4.3.1 Improvement of institutional capacity

Institutional capacity reflects the ability of government agencies to provide public goods and services and ensure that laws and regulations are enforced (Jameson et al. 2002). The efficiency of an NP management system depends on law support, policies and programmes at the institutional level. A proper institutional framework provides the basis to address the external and internal driving forces, while adequate national regulations grant effective management planning in PAs. Both, i.e. institutional framework and legislation facilitate the balance between conservation, tourism development and recreation, foster sustainable financing (Dudley and Stolton 2018; Whitelaw et al. 2014) and enable those responsible for management to address pressures and minimise the negative impact on site. Thus, establishing and maintaining good governance across the diversity of ownership and responsibility arrangements is critical for the future effectiveness and acceptability of protected areas (Lockwood 2010).

### 4.3.2 Multi-layer management system

The management system of NPs should be comprehensive, able to balance conservation, tourism development and recreation, maintain the current state of NPs features and resolve emerging issues. The increased visitation, climate change and change in economic, socio-cultural and technological environment invoke a holistic planning approach. Among others, tourism development plans, visitor management strategies and climate change strategies should be standard for NPs in a vibrant tourism destination.

### 4.3.3 Implementation of effective monitoring

Monitoring protected areas and their surroundings is essential not only because of PAs vulnerability to different anthropogenic pressures (Lucas et al. 2012) but also for internal management, public governance and fulfilment of different national and international regulations. The most important reason for monitoring is to track the state of significant resources and NP features. Biodiversity losses, an abundance of critical species, change in the threat status of species usually occurs through time (Alviola et al. 2005). The effective and adaptive monitoring framework provides the NP managers with tools to act promptly to reduce potential negative impacts and thus achieve sustainability.

### 4.3.4 Education

Heritage sites, including NPs, have the responsibility to educate both the community and visitors. NPs UK,<sup>7</sup> on their website, provides valuable information that can be used by visitors, students and teachers. They have developed *The Moorland Indicators of Climate Change Initiative (MICCI)* project to allow secondary school students to take part in real-world climate science, helping to make concepts learned in the classroom come to life. Their proactivity has induced the positive spillovers on the local community. Consequently, the unemployment in the NP Lake District is lower than the regional and national average, while the level of self-employment is almost double the national rate at almost one in five of the economically active population.<sup>8</sup> Different visitor management tools can influence the visitors' onsite behaviour; however, the desired long-term impact can only be achieved with education. In Croatia, in the NP Plitvice Lakes, the unique form of the Code of Conduct<sup>9</sup> has been

developed to discourage any unacceptable behaviour and educate on park-protected features.

### 4.3.5 Fostering and supporting the local community

Local community gravitating and living in NP areas has a vital role in its development and conservation. In many cases, strong regulations can contribute negatively, while enforced participation positively affects their potential for economic development. NPs and protected areas often provide critical resources for the local community, and the benefits of conservation must exceed the costs (Barnes et al. 2017). In many cases, community attitudes toward tourism development are correlated with its impacts, among others, economic ones (Bello et al. 2016, 2017). Considering that the level of disposable personal income and employment, i.e. major economic impacts, are highly dependent on the type of tourism developed (Goodwin 2002; Zapata et al. 2011), it is vital to plan tourism wisely. A community-based bottom-up approach to tourism development, built upon active participation and equal and fair benefit sharing, is often proclaimed as an acceptable alternative (Zapata et al. 2011). Nepal (2002a, b) additionally highlights the importance of co-ownership of protected areas and self-determination as critical issues in community involvement in protected areas management, the lack of which could result in violence, disruption of traditional lifestyles, erosion of cultural values and unsustainable resources extractions.

## 5 Discussion and conclusion

Tourism is by far the most extensive use of protected natural areas, with growing positive and negative environmental, socio-cultural and ecological influence. The fact that international tourist arrivals grew by 7.0% in 2017, which is the highest increase since the 2009 global economic crisis and well above UNWTO's long-term forecast of 3.8% per year for the period 2010 to 2020 (UNWTO 2018), and that tourism in protected areas is a significant part of the global tourism industry, calls for action. It is crucial to be proactive, to think about the future of biodiversity and protected areas, to set goals and introduce policy measures to ensure that global conservation and development are balanced (Dudley and Stolton 2018). This requires, among others, the creation of robust and resilient protected area systems, maximisation and equitably shared benefits of protected areas, use of new technologies, effective governance, financing and many more. Despite park tourism governance and park tourism impact monitoring being proclaimed as research priorities (Eagles 2014), there are still some significant gaps within knowledge and solutions. To some extent, we could agree that the gaps are the consequence of the complexity and

<sup>7</sup> National parks in UK, <https://www.nationalparks.gov.uk/about-us>, (7 June 2017).

<sup>8</sup> National park Lake district, <https://www.lakedistrict.gov.uk/learn/ing/economy-and-employment>, (7 June 2017).

<sup>9</sup> National park Plitvice Lakes, Code of conduct, <https://np-plitvicka-jezera.hr/planirajte-posjet/pravila-ponasanja/>, (7 June 2017).

multidisciplinary of tourism-protected areas relations. However, they are also induced by researchers prioritising specific research topics, among others, conservation (Le Saout et al. 2014; Romero-Brito et al. 2016; Whitelaw et al. 2014), participative planning (Jones et al. 2017; Nepal, 2002a, b; West et al. 2006), spatial planning (Mills et al. 2015; White et al. 2005), and mitigation of climate changes (Becken and Job 2014; Hall 2008; Ruttly et al. 2015b; Tolvanen and Kangas 2016; Weaver 2011) which additionally highlights the lack of a holistic approach to park tourism governance. This has led to an ungrateful situation where conservators invoke the protection of natural resources, and the tourism industry insists on proclaiming almost declaratively that every nature-based tourism activity is to be ecological and sustainable tourism. An agile industry, with a lack of an institutional response and a decrease of governmental funding, creates a feasible but long-term unsustainable alternative especially for PA struggling with heavy visitation in the summer season. In line with that, recently launched the Aichi Target 11 Dashboard (<https://www.protectedplanet.net/target-11-dashboard>) indicate a need to improve the effectiveness of PA management, especially in the context of Mediterranean countries<sup>10</sup>—leading tourism destinations. Consequently, there is a desperate need for operative and flexible frameworks that will enable park managers and those with the responsibility to structure thinking processes to deliver solutions and to be proactive, instead of reactive. Considering PAs are sensitive to all of the human-generated environmental changes, a successful PA effort will require putting them squarely in the centre of the human agenda (Lovejoy 2006). This requires the Ecosystem Approach, meaning that they should be integrated into the broader landscape and seascape and relevant sectors, bearing in mind the importance of complementarity and spatial configuration.<sup>11</sup> Bennett et al. (2019) propose Inclusive governance model, which in general emphasises that decision making structures and processes are representative of diverse actors from civil society, private sector and governments. In general, this approach, which they apply to the Blue Economy is highly relevant for all other aspects of the ecosystem.

This study applies the DPSIR framework to nature-based tourism development to discuss the cause–effect links and to

consider a range of social responses to advance the objective of sustainability of these exceptional areas. Instead of site-perspective, the study builds upon an inductive and ground theory approach to emphasise the need for (eco)system<sup>12</sup> thinking to identify priorities for actions. Thus, instead of providing solutions for one specific PA, we aim to provide the system guidelines and priorities. Such an approach has its benefits and drawbacks. In general, the DPSIR framework enabled the integrated approach, i.e. in this case to structure and interrelated the influences of the internal and external drivers on PAs to propose system responses. It is crucial to emphasise that the relationship between the causes and effects are not always linear. This means that the substantial changes can occur with high levels of use and critical thresholds for each environment vary with the activity and may be challenging to determine in advance (Wall 2019). Thus, although holistically the causality and synergy between elements is evident, and leads to the development of social responses, the lack of tighter geographical focus limits its potential and usage.

Finally, we would like to highlight three vital topics that are partially addressed throughout this framework and which are, in our humble opinion, important to be additionally addressed in future nature-based tourism research.

## 5.1 Institutional capacity

Institutions are a prerequisite and warrant of a long-lasting and desired balance between conservation and tourism development. They need to be reliable, adaptive, efficient and smart to address challenges and lead parks and protected areas in a post-2020 era. Despite efforts done in this field, there are still significant knowledge gaps, especially in the context of policy, governance and decision-making, all of which influence the efficiency of park management. Due to limited capacities of governments to reconcile economic development with environmental sustainability, the European Commission<sup>13</sup> has initiated to support countries that wish to transform towards inclusive green economies throughout sustainable management of natural capital. Protected areas have gained a critical role in this process as they are considered the cornerstone of the European Union's global strategy for the protection of nature and wildlife and as significant economic assets and sources of employment in management, tourism and associated private enterprises. Countries are expected to develop, to utilise nature-based solutions, and contribute to

<sup>10</sup> Considering the proportion of a county's terrestrial and the marine area covered by protected areas where management effectiveness evaluations have been reported as being undertaken, the results are quite discouraging. With the general targets set at 17% of terrestrial and 10% of Marine area, Croatia records 8% and 1%; Italy 1% and 0%; Spain 3% and 0%; France 1% and 0% and Greece 1% and 0%. <https://www.protectedplanet.net/target-11-dashboard>, (05 December 2019).

<sup>11</sup> Convention of Biological Diversity, <https://www.cbd.int/sp/targets/rationale/target-11/>, (05 December 2019).

<sup>12</sup> Systems thinking is widely believed to be critical in handling the complexity facing the world in the coming decades (Arnold and Wade 2015).

<sup>13</sup> International cooperation and development, environment in EU, [https://ec.europa.eu/europeaid/sectors/environment\\_en](https://ec.europa.eu/europeaid/sectors/environment_en), (2 February 2019).

the achievement of common goals set by the EU Biodiversity strategy 2020,<sup>14</sup> a part of which are tourism and recreation as ecosystem services. Building on smart ideas, policies and tools, institutions should enable the environment for sustainable tourism development in protected natural areas to be reached. Despite significant contribution of previous research, we would like to stress out that there is still gap in the understanding of the relations between institutions acting at different governmental levels, and in different sectors, and their effectiveness and contribution in achieving the direct aims of protected area designation and management, and balanced development, in particular, the collaboration between protected area governing bodies, governmental institutions and destination management and marketing organization.

## 5.2 Tourism governance

As tourism becomes increasingly important in the overall economy, so does the nature-based tourism, i.e. activities in NPs and other PAs. Among several, probably the most significant challenge of tourism in the Mediterranean region is high seasonality, i.e. most visitors arrive during the summer season. Due to a decrease of governmental funding, to ensure financial stability, the PAs are unwillingly accepting trade-offs, i.e. tourism revenues and massive visitation vs conservation of resources. Moreover, despite awareness of this problem (high seasonality and negative environmental impacts), destinations insist on selling parks, i.e. to promote them as an integrated part of a destination tourism product. This leads to the following conclusions, namely, (a) there is a significant lack in the strategic nature-based tourism development planning, and (b) tourism governance in protected natural areas requires a holistic, bottom-up (participatory) approach. Protected areas should be discussed as tourism destinations, not secondary sights, and tourism development should be planned accordingly and not solely addressed throughout visitor management tools. Thus, the future research should aim to analyse the reconciliation between hard-edge single-objective conservation minds and those seeking much broader outcomes, such as the inclusion of public enjoyment as a purpose of the designation, and changing relationship between public goods and land use in terms of changes in tourism and recreation (a holistic view); and the adaptations of governance focused on promotion of collaborative learning between all parties involved, and changing social needs as well as environmental and economic conditions into a broader development agenda (the Green growth framework vs volume growth strategies).

## 5.3 Benefits for the local community

Tourism should be planned and developed for the benefit of the local community. If the local community cannot progress, why should they develop tourism? Considering that it is in their best interests, governments and relevant institutions should focus on retaining positive impacts on a local scale by developing relevant short-term and long-term goals and setting up monitoring to track the changes that occur. The most recent challenges related to overtourism suggest that there is a need for more research to enlighten the complexity of the impacts of excessive tourism development on communities living on the territory or near protected areas (systematic and interdependent assessment); the factor influencing communities' attitudes toward visitors and tourism development and their involvement in planning processes; and the sentiments of hosts and resident to have early warning of the psychological and social forms of potential overtourism development.

## 5.4 Final remarks

This paper has suggested an approach that combines the DPSIR framework and inductive and ground theory approach to elaborate on cause-effect relations within nature-based tourism destinations. We rely on a holistic and system thinking to deliver social responses which are considered to be a prerequisite of resilient parks and sustainability of tourism development. This suggests that the main weakness of this paper is lack of geographical focus and thus the inability to quantify the links between proposed parameters. The framework considers multiple parallel causal chains and assists in structuring thinking about indicators in terms of causality chains (Schianetz and Kavanagh 2008). However, they do not include the interrelations between the various causal chains. Thus, we suggest future research to apply the site-specific approach and to measure each parameter and to test their mutual correlations. An appropriate tool for that would be Partial Least Squares-Structural Equation Modeling (PLS-SEM) (Ali et al. 2018), that has a growing importance in the hospitality and tourism research.

Furthermore, we rely on a triple bottom line approach to identify the potential changes in the state and the impacts. This is highly related to system thinking; however, DPSIR might help to structure the processes and discuss the alternatives within each of the tiers individually. Thus, the framework allows not only to communicate on specific issues but also might support the information requirements good PA stewardship requires.

<sup>14</sup> Biodiversity strategy, EU, [https://ec.europa.eu/environment/nature/biodiversity/strategy/index\\_en.htm#stra](https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm#stra), (2 February 2019).

## References

- Alexander M (2013) Management planning for nature conservation—a theoretical basis & practical guide. Springer, London
- Ali F, Rasoolimanesh SM, Cobanoglu C (2018) Applying partial least squares in tourism and hospitality research. Emerald Group Publishing, Bingley. <https://doi.org/10.1108/9781787566996>
- Alviola PA, Balete DS, Danielsen F, Jensen AE, Enghoff M, Mendoza M, Tagtag A, Custodio C (2005) Does monitoring matter? A quantitative assessment of management decisions from locally-based monitoring of protected areas. *Biodivers Conserv* 14:2633–2652. <https://doi.org/10.1007/s10531-005-8392-z>
- Anderson W (2010) Determinants of all inclusive travel expenditure. *Tour Rev* 65:4–15. <https://doi.org/10.1108/16605371011083495>
- Arnold RD, Wade JP (2015) A definition of systems thinking: a systems approach. *Procedia Comput Sci* 44:669–678. <https://doi.org/10.1016/j.procs.2015.03.050>
- Atkins JP, Burdon D, Elliott M, Gregory AJ (2011) Management of the marine environment: integrating ecosystem services and societal benefits with the DPSIR framework in a systems approach. *Mar Pollut Bull* 62:215–226. <https://doi.org/10.1016/j.marpolbul.2010.12.012>
- Barnes MD, Craigie ID, Dudley N, Hockings M (2017) Understanding local-scale drivers of biodiversity outcomes in terrestrial protected areas. *Ann N Y Acad Sci* 1399:42–60. <https://doi.org/10.1111/nyas.13154>
- Barro RJ (1990) Government spending in a simple model of endogenous growth. *J Polit Econ* 98:S103–S125. <https://doi.org/10.1086/261726>
- Barro RJ, Sala-i-martin X (1992) Convergence. *J Polit Econ* 100:223–251
- Becken S, Job H (2014) Protected areas in an era of global–local change. *J Sustain Tour* 22:507–527. <https://doi.org/10.1080/09669582.2013.877913>
- Bello FG, Carr N, Lovelock B (2016) Community participation framework for protected area-based tourism planning. *Tour Plan Dev* 13:469–485. <https://doi.org/10.1080/21568316.2015.1136838>
- Bello FG, Lovelock B, Carr N (2017) Constraints of community participation in protected area-based tourism planning: the case of Malawi. *J Ecotourism* 16:131–151. <https://doi.org/10.1080/14724049.2016.1251444>
- Bennett NJ, Cisneros-montemayor AM, Blythe J, Silver JJ, Singh G, Andrews N, Calò A, Christie P, Franco AD, Finkbeiner EM, Gelcich S, Guidetti P, Harper S, Hotte N, Kittinger JN, Billon PL, Lister J, López R, Lama D, Mckinley E, Scholtens J, Solás A, Sowman M, Talloni-álvarez N, Teh LCL, Voyer M, Sumaila UR (2019) Towards a sustainable and equitable blue. *Nat Sustain* 2:991–993. <https://doi.org/10.1038/s41893-019-0404-1>
- Berge E (2006) Protected areas and traditional commons: Values and institutions. *Nor Geogr Tidsskr* 60:65–76. <https://doi.org/10.1080/00291950600548907>
- Bidone ED, Lacerda LD (2004) The use of DPSIR framework to evaluate sustainability in coastal areas. Case study: Guanabara Bay basin, Rio de Janeiro. *Brazil Reg Environ Chang* 4:5–16. <https://doi.org/10.1007/s10113-003-0059-2>
- Bonzanigo L, Giupponi C, Balbi S (2016) Sustainable tourism planning and climate change adaptation in the Alps: a case study of winter tourism in mountain communities in the Dolomites. *J Sustain Tour* 24:637–652. <https://doi.org/10.1080/09669582.2015.1122013>
- Buckley R (2018) Tourism and natural world heritage: a complicated relationship. *J Travel Res* 57:563–578. <https://doi.org/10.1177/0047287517713723>
- Buhalis D (2000) Marketing the competitive destination of the future. *Tour Manag* 21:97–116. [https://doi.org/10.1016/S0261-5177\(99\)00095-3](https://doi.org/10.1016/S0261-5177(99)00095-3)
- Butler, R. W. (2006a). The tourism area life cycle Vol. 1: applications and modifications. Channelview, Clevedon
- Butler, R. W. (2006b). The tourism area life cycle Vol. 2: conceptual and theoretical issues. Channelview, Clevedon
- Byers AC (2007) 27 Changing climates, changing lives: strengthening adaptive response capacities to climate change in the Huascarán Biosphere Reserve, Peru, and Sagarmatha (Mt. Everest) National Park. *Nepal Dev Earth Surf Process* 10:249–250. [https://doi.org/10.1016/S0928-2025\(06\)10027-9](https://doi.org/10.1016/S0928-2025(06)10027-9)
- Canteiro M, Córdova-Tapia F, Brazeiro A (2018) Tourism impact assessment: a tool to evaluate the environmental impacts of touristic activities in Natural Protected Areas. *Tour Manag Perspect* 28:220–227. <https://doi.org/10.1016/j.tmp.2018.09.007>
- Carr ER, Wingard PM, Yorty SC, Thompson MC, Jensen NK, Roberson J (2007) Applying DPSIR to sustainable development. *Int J Sustain Dev World Ecol* 14:543–555. <https://doi.org/10.1080/13504500709469753>
- Cooper C, Fletcher J, Gilbert D, Wanhill S (2008) Tourism principles and practice, 4th edn. Pearson Education Limited, Essex, UK
- Dharmaratne GS, Yee Sang F, Walling LJ (2000) Tourism potentials for financing protected areas. *Ann Tour Res* 27:590–610. [https://doi.org/10.1016/S0160-7383\(99\)00109-7](https://doi.org/10.1016/S0160-7383(99)00109-7)
- Díaz-Delgado R, Plutzar C, Haberl H, Gaube V, Krauze K, Peterseil J, Vadineanu A, Neuner A, Singh SJ (2009) Towards an integrated model of socioeconomic biodiversity drivers, pressures and impacts. A feasibility study based on three European long-term socio-ecological research platforms. *Ecol Econ* 68:1797–1812. <https://doi.org/10.1016/j.ecolecon.2008.11.013>
- Dowling R (1992) Tourism and environmental integration: the journey from idealism to realism. In: Cooper C, Lockwood A (eds) *Progress in tourism, recreation and hospitality management*, vol 4. Belhaven Press, London, pp 33–46
- Dudley N (2010) Guidelines for applying protected area management categories. Guidelines for applying protected area management categories. <https://doi.org/10.2305/iucn.ch.2008.paps.2.en>
- Dudley N, Stolton S (2018) PROTECTED AREAS: challenges and responses for the coming decade. Equilibrium Research, Bristol
- Engel S, Pagiola S, Wunder S (2008) Designing payments for environmental services in theory and practice: an overview of the issue. *Ecol Econ* 65:663–674
- Eagles PFJ (2014) Research priorities in park tourism. *J Sustain Tour* 22:528–549. <https://doi.org/10.1080/09669582.2013.785554>
- Eagles PFJ, McCool SF, Haynes CD. World Tourism Organization, Resources IU for C of N Natural (2002) Sustainable tourism in protected area. IUCN, Gland
- East D, Osborne P, Kemp S, Woodfine T (2017) Combining GPS & survey data improves understanding of visitor behaviour. *Tour Manag* 61:307–320. <https://doi.org/10.1016/j.tourman.2017.02.021>
- European Commission (2016) The European tourism indicator. System. <https://doi.org/10.2873/982144>
- Farrell BH, Runyan D (1991) Ecology and tourism. *Ann Tour Res* 18:26–40. [https://doi.org/10.1016/0160-7383\(91\)90037-C](https://doi.org/10.1016/0160-7383(91)90037-C)
- Finch D (2012) Climate change in grasslands, shrub lands, and deserts of the interior American West: a review and needs assessment. General Technical Report. Department of Agriculture, Forest Services, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-GTR-285>
- Gale T, Ednie A, Beefink K (2019) Worldviews, levels of consciousness, and the evolution of planning paradigms in protected areas. *J Sustain Tour* 27:1609–1633. <https://doi.org/10.1080/09669582.2019.1639720>

- Goodwin H (2002) Local community involvement in tourism around National Parks: opportunities and constraints. *Curr Issues Tour* 5:338–360. <https://doi.org/10.1080/13683500208667928>
- Gretzel U, Sigala M, Xiang Z, Koo C (2015a) Smart tourism: foundations and developments. *Electron Mark* 25:179–188. <https://doi.org/10.1007/s12525-015-0196-8>
- Gretzel U, Werthner H, Koo C, Lamsfus C (2015b) Conceptual foundations for understanding smart tourism ecosystems. *Comput Human Behav* 50:558–563. <https://doi.org/10.1016/j.chb.2015.03.043>
- Hall CM (2008) Tourism and climate change: Knowledge gaps and issues. *Tour Recreat Res* 33:339–350. <https://doi.org/10.1080/02508281.2008.11081557>
- Hall CM (2018) *The Routledge handbook of tourism and sustainability*. Routledge, London
- Harmon D (2003) Intangible values of protected areas. *Policy Matters* 12:9–22
- Haugland SA, Ness H, Grønseth BO, Aarstad J (2011) Development of tourism destinations. An integrated multilevel perspective. *Ann Tour Res* 38:268–290. <https://doi.org/10.1016/j.annals.2010.08.008>
- Helming K, Krippner B, Tscherning K, Paloma SG, Sieber S (2011) Does research applying the DPSIR framework support decision making? *Land use policy* 29:102–110. <https://doi.org/10.1016/j.landusepol.2011.05.009>
- Hjalager AM (2007) Stages in the economic globalization of tourism. *Ann Tour Res* 34:437–457. <https://doi.org/10.1016/j.annals.2006.10.006>
- Holden A (2000) *Environment and tourism*. Routledge, London
- Holman IP, Audsley E, Shackley S, Berry PM, Nicholls RJ, Harrison PA, Rounsevell MDA (2005) A regional, multi-sectoral and integrated assessment of the impacts of climate and socio-economic change in the UK. *Clim Change* 71:43–73. <https://doi.org/10.1007/s10584-005-5956-6>
- Islam MW, Ruhanen L, Ritchie BW (2018) Adaptive co-management: A novel approach to tourism destination governance? *J Hosp Tour Manag* 37:97–106. <https://doi.org/10.1016/j.jhtm.2017.10.009>
- IUCN (2017) *IUCN World Heritage Outlook 2*. IUCN, Gland
- Ivars i Baidal JA, Rodríguez Sánchez I, Verarebollo JF (2013) The evolution of mass tourism destinations: New approaches beyond deterministic models in Benidorm (Spain). *Tour Manag* 34:184–195. <https://doi.org/10.1016/j.tourman.2012.04.009>
- Jameson SC, Tupper MH, Ridley JM (2002) The three screen doors: can marine “protected” areas be effective? *Mar Pollut Bull* 44:1177–1183
- Johnson DN, van Riper CJ, Chu M, Winkler-Schor S (2019) Comparing the social values of ecosystem services in US and Australian marine protected areas. *Ecosyst Serv* 37:100919. <https://doi.org/10.1016/j.ecoser.2019.100919>
- Jones N, McGinlay J, Dimitrakopoulos PG (2017) Improving social impact assessment of protected areas: a review of the literature and directions for future research. *Environ Impact Assess Rev* 64:1–7. <https://doi.org/10.1016/j.eiar.2016.12.007>
- Kádár B (2014) Measuring tourist activities in cities using geotagged photography. *Tour Geogr* 16:88–104. <https://doi.org/10.1080/14616688.2013.868029>
- Karageorgis AP, Kapsimalis V, Kontogianni A, Skourtos M, Turner KR, Salomons W (2006) Impact of 100-year human interventions on the deltaic coastal zone of the Inner Thermaikos Gulf (Greece): a DPSIR framework analysis. *Environ Manage* 38:304–315. <https://doi.org/10.1007/s00267-004-0290-8>
- Kim J, Thapa B, Jang S, Yang E (2018) Seasonal spatial activity patterns of visitors with a mobile exercise application at Seoraksan National Park. *South Korea Sustain*. <https://doi.org/10.3390/su10072263>
- Kim J, Thapa B, Jang S (2019) GPS-based mobile exercise application: an alternative tool to assess spatio-temporal patterns of visitors’ activities in a National Park. *J Park Recreat Admi* 37:18666. <https://doi.org/10.18666/jpra-2019-9175>
- Klijn JA (2004) Driving forces behind landscape transformation in Europe, from a conceptual approach to policy options. *New Dimension Eur Landsc* 201:218. [https://doi.org/10.1007/978-1-4020-2911-0\\_14](https://doi.org/10.1007/978-1-4020-2911-0_14)
- Korpilo S, Virtanen T, Lehvävirta S (2017) Smartphone GPS tracking— inexpensive and efficient data collection on recreational movement. *Landsc Urban Plan* 157:608–617. <https://doi.org/10.1016/j.landurbplan.2016.08.005>
- Koundouri P, Ker Rault P, Pergamalis V, Skianis V, Souliotis I (2016) Development of an integrated methodology for the sustainable environmental and socio-economic management of river ecosystems. *Sci Total Environ* 540:90–100. <https://doi.org/10.1016/j.scitotenv.2015.07.082>
- Kristensen P (2004) The DPSIR framework. A comprehensive/detailed Assessment of the vulnerability of water resources to environmental change in Africa using river basin approach. UNEP Headquarters, Nairobi. <https://doi.org/10.1007/978-3-642-20736-5>
- Kulczyk S, Woźniak E, Derek M (2018) Landscape, facilities and visitors: an integrated model of recreational ecosystem services. *Ecosyst Serv* 31:491–501. <https://doi.org/10.1016/j.ecoser.2018.02.016>
- Kuldna P, Peterson K, Poltimäe H, Luig J (2009) An application of DPSIR framework to identify issues of pollinator loss. *Ecol Econ* 69:32–42. <https://doi.org/10.1016/j.ecolecon.2009.01.005>
- Law R, Leung R, Buhalis D (2009) Information technology applications in hospitality and tourism: a review of publications from 2005 to 2007. *J Travel Tour Mark* 26:599–623. <https://doi.org/10.1080/10548400903163160>
- Law R, Buhalis D, Cobanoglu C (2014) Progress on information and communication technologies in hospitality and tourism. *Int J Contemp Hosp Manag*. <https://doi.org/10.1108/IJCHM-08-2013-0367>
- Le Maitre DC, Forsyth GG, Robertson MP, Stafford L, Wessels N, Brown A, Wannenburgh A, Van Wilgen BW, Richardson DM, Roura-Pascual N, Chapman RA (2009) Ecology and management of alien plant invasions in South African fynbos: Accommodating key complexities in objective decision making. *Biol Conserv* 142:1595–1604. <https://doi.org/10.1016/j.bioco.2009.02.029>
- Le Saout S, Hoffmann M, Shi Y, Hughes A, Bernard C, Brooks TM, Bertzky B, Butchart SHM, Stuart SN, Badman T, Rodrigues ASL (2014) Science-2013-AreasProtegidasmundo. *Science* 342:803–805
- Leverington F, Costa KL, Courrau J, Pavese H, Nolte C, Marr M, Coad L, Burgess N, Bomhard B, Hockings M (2010a) Methods review of management effectiveness evaluation in protected areas—a global study. University of Brisbane, Brisbane. <https://doi.org/10.1007/s00267-010-9564-5>
- Leverington F, Costa KL, Pavese H, Lisle A, Hockings M (2010b) A global analysis of protected area management effectiveness. *Environ Manag* 46:685–698. <https://doi.org/10.1007/s00267-010-9564-5>
- Lockwood M (2010) Good governance for terrestrial protected areas: a framework, principles and performance outcomes. *J Environ Manage* 91:754–766. <https://doi.org/10.1016/j.jenvman.2009.10.005>
- Lovejoy TE (2006) Protected areas: a prism for a changing world. *Trends Ecol Evol* 21:329–333. <https://doi.org/10.1016/j.tree.2006.04.005>
- Lucas R, Honrado JP, Tarantino C, Nagendra H, Mairota P, Adamo M, Jongman RHG (2012) Remote sensing for conservation monitoring: assessing protected areas, habitat extent, habitat condition,

- species diversity, and threats. *Ecol Indic* 33:45–59. <https://doi.org/10.1016/j.ecolind.2012.09.014>
- Mandić A (2019) Nature-based solutions for sustainable tourism development in protected natural areas: a review. *Environ Syst Decis*. <https://doi.org/10.1007/s10669-019-09718-2>
- Mandić A, Garbin Praničević D (2019a) e-Review of tourism research (eRTR), Vol. 16, No. 2/3, 2019 <https://ertr.tamu.edu>. *e-Rev Tour Res* 16:234–243
- Mandić A, Garbin Praničević D (2019) Progress on the role of ICTs in establishing destination appeal: Implications for smart tourism destination development. *J Hosp Tour Technol*. <https://doi.org/10.1108/JHTT-06-2018-0047>
- Mandić A, Petrić L (2020) The impacts of location and attributes of protected natural areas on hotel prices: implications for sustainable tourism development. *Environ Dev Sustain*. <https://doi.org/10.1007/s10668-020-00611-6>
- Mandić A, Mrnjavac Ž, Kordić L (2018) Tourism infrastructure, recreational facilities and tourism development. *Tour Hosp Manag*. <https://doi.org/10.20867/thm.24.1.12>
- Mayer M, Müller M, Woltering M, Arnegger J, Job H (2010) The economic impact of tourism in six German national parks. *Landsc Urban Plan* 97:73–82. <https://doi.org/10.1016/j.landurbplan.2010.04.013>
- McCool SF (2016) Reframing Sustainable. *Tourism*. <https://doi.org/10.1007/978-94-017-7209-9>
- McCool SF, Bosak K (2015) Preface. *Reframing sustain tourism*. Springer, Dordrecht. <https://doi.org/10.1007/978-94-017-7209-9>
- McGehee NG, Goetchus C, Norman WC, Beeco JA, Hallo JC, McGee J (2012) GPS as a method for assessing spatial and temporal use distributions of nature-based tourists. *J Travel Res* 51:591–606. <https://doi.org/10.1177/0047287511431325>
- Mearns KF (2012) Community-based tourism and peace parks benefit local communities through conservation in Southern Africa. *Acta Acad* 44:70–87
- Medina LK (2005) Ecotourism and certification: confronting the principles and pragmatics of socially responsible tourism. *J Sustain Tour* 13:281–295. <https://doi.org/10.1080/01434630508668557>
- Mgonja JT, Sirima A, Mkumbo PJ (2015) A review of ecotourism in Tanzania: magnitude, challenges, and prospects for sustainability. *J Ecotourism* 14:264–277. <https://doi.org/10.1080/14724049.2015.1114623>
- Mills M, Weeks R, Pressey RL, Gleason MG, Eisma-Osorio RL, Lombard AT, Harris JM, Killmer AB, White A, Morrison TH (2015) Real-world progress in overcoming the challenges of adaptive spatial planning in marine protected areas. *Biol Conserv* 181:54–63. <https://doi.org/10.1016/j.biocon.2014.10.028>
- Mustika PLK, Welters R, Ryan GE, D’Lima C, Sorongon-Yap P, Jutapruet S, Peter C (2017) A rapid assessment of wildlife tourism risk posed to cetaceans in Asia. *J Sustain Tour* 25:1138–1158. <https://doi.org/10.1080/09669582.2016.1257012>
- Mutanga CN, Vengesayi S, Muboko N, Gandiwa E (2015) Towards harmonious conservation relationships: a framework for understanding protected area staff-local community relationships in developing countries. *J Nat Conserv* 25:8–16. <https://doi.org/10.1016/j.jnc.2015.02.006>
- Nepal SK (2002a) Tourism in protected areas. *Ann Tour Res* 27:661–681. [https://doi.org/10.1016/s0160-7383\(99\)00105-x](https://doi.org/10.1016/s0160-7383(99)00105-x)
- Nepal SK (2002b) Involving indigenous peoples in protected area management: Comparative perspectives from Nepal, Thailand, and China. *Environ Manag* 30:748–763. <https://doi.org/10.1007/s00267-002-2710-y>
- Ness B, Anderberg S, Olsson L (2010) Structuring problems in sustainability science: the multi-level DPSIR framework. *Geoforum* 41:479–488. <https://doi.org/10.1016/j.geoforum.2009.12.005>
- Newsome D (2014) Appropriate policy development and research needs in response to adventure racing in protected areas. *Biol Conserv* 171:259–269. <https://doi.org/10.1016/j.biocon.2014.01.008>
- Niemeijer D, De Groot RS (2008) Framing environmental indicators: moving from causal chains to causal networks. *Environ Dev Sustain* 10:89–106. <https://doi.org/10.1007/s10668-006-9040-9>
- Noel JF, Weigel JY (2008) Marine protected areas: from conservation to sustainable development. *Int J Sustain Dev* 10:233. <https://doi.org/10.1504/ijisd.2007.017645>
- Nunkoo R, Ramkissoon H (2011) Current issues in method and practice structural equation modelling and regression analysis in tourism research. *Curr Issues Tour* 1:1–26
- Nyaupane GP, Poudel S (2011) Linkages among biodiversity, livelihood, and tourism. *Ann Tour Res* 38:1344–1366. <https://doi.org/10.1016/j.annals.2011.03.006>
- Obenaus S (2005) Ecotourism: sustainable tourism in national parks and protected areas: Banff National Park in Canada and Nationalpark Gesäuse in Austria—a comparison. pp 1–170
- Odermatt S (2006) Evaluation of mountain case studies by means of sustainability variables. *Mt Res Dev* 24:336–341. [https://doi.org/10.1659/0276-4741\(2004\)024\[0336:eomcsbj\]2.0.co;2](https://doi.org/10.1659/0276-4741(2004)024[0336:eomcsbj]2.0.co;2)
- OECD (2001) OECD environmental indicators: towards sustainable development. OECD, Paris <https://doi.org/10.1177/009155218501300304>
- Papathanassis A (2017) Cruise tourism management : state of the art conceptualising cruise tourism: key perspectives and challenges. *Tour Rev* 1:11. <https://doi.org/10.1108/TR-01-2017-0003>
- Peeters P, Gössling S, Klijs J, Milano C, Novelli M, Dijkmans C, Eijgelaar E, Hartman S, Heslinga J, Isaac R, Mitas O, Moretti S, Nawijn J, Papp B, Postma A (2018) Research for TRAN Committee—overtourism: impact and possible policy responses. European Parliament, Brussels
- Petrić L, Mandić A (2014) Visitor management tools for protected areas focused on sustainable tourism development: the croatian experience. *Environ Eng Manag J* 13:1483–1495
- Rankin BL, Ballantyne M, Pickering CM (2015) Tourism and recreation listed as a threat for a wide diversity of vascular plants: a continental scale review. *J Environ Manag* 154:293–298. <https://doi.org/10.1016/j.jenvman.2014.10.035>
- Rebello S (1991) Long-run policy analysis and long-run growth. *J Polit Econ* 99:500–521. <https://doi.org/10.1086/261764>
- Rebollo JFV, Baidal JAI (2003) Measuring sustainability in a mass tourist destination: pressures, perceptions and policy responses in torrevieja. Spain *J Sustain Tour* 11:181–203. <https://doi.org/10.1080/09669580308667202>
- Rigall-I-Torrent R, Fluvia M (2011) Managing tourism products and destinations embedding public good components: a hedonic approach. *Tour Manag* 32:244–255. <https://doi.org/10.1016/j.tourman.2009.12.009>
- Romero-Brito TP, Buckley RC, Byrne J (2016) NGO partnerships in using ecotourism for conservation: Systematic review and meta-analysis. *PLoS ONE* 11:1–19. <https://doi.org/10.1371/journal.pone.0166919>
- Ruan W, Li Y, Zhang S, Liu CH (2019) Evaluation and drive mechanism of tourism ecological security based on the DPSIR-DEA model. *Tour Manag* 75:609–625. <https://doi.org/10.1016/j.tourman.2019.06.021>
- Rutty M, Hall CM, Grossling S, Scott D (2015) The global effects and impacts of tourism. In Hall CM, Grossling S, Scott D (eds) *The Routledge handbook of tourism*. Routledge, Abingdon
- Schägner JP, Brander L, Maes J, Paracchini ML, Hartje V (2016) Mapping recreational visits and values of European National Parks by combining statistical modelling and unit value transfer. *J Nat Conserv* 31:71–84. <https://doi.org/10.1016/j.jnc.2016.03.001>
- Schianetz K, Kavanagh L (2008) Sustainability indicators for tourism destinations: a complex adaptive systems approach using



- systemic indicator systems. *J Sustain Tour* 16:601–628. <https://doi.org/10.1080/09669580802159651>
- Scholte SSK, Daams M, Farjon H, Sijtsma FJ, van Teeffelen AJA, Verburg PH (2018) Mapping recreation as an ecosystem service: considering scale, interregional differences and the influence of physical attributes. *Landscape Urban Plan* 175:149–160. <https://doi.org/10.1016/j.landurbplan.2018.03.011>
- Scott D, Amelung B, Becken S, Ceron J-P, Dubois G, Gössling S (2008) Climate change and tourism: responding to global challenges. United Nations World Tourism Organization, Madrid. United Nations Environment Program, Paris. World Meteorological Organization, Geneva.
- Sharpley R (2009) Tourism development and the environment: beyond sustainability? UK and USA, Earthscan
- Shaw G, Williams AM (2004) Tourism and tourism spaces. *Tourism Spaces*. <https://doi.org/10.4135/9781446220528>
- Spenceley A (2017) Tourism and protected areas: comparing the 2003 and 2014 IUCN World Parks Congress. *Tourism Hosp Res* 17:8–23. <https://doi.org/10.1177/1467358415612515>
- Spenceley A, Goodwin H (2007) Nature-based tourism and poverty alleviation: impacts of private sector and parastatal enterprises in and around Kruger National Park, South Africa. *Curr Issues Tour* 10:255–277. <https://doi.org/10.2167/cit305.0>
- Sugiyarto G, Blake A, Sinclair MT (2003) Tourism and globalization: Economic Impact in Indonesia. *Ann Tour Res* 30:683–701. [https://doi.org/10.1016/S0160-7383\(03\)00048-3](https://doi.org/10.1016/S0160-7383(03)00048-3)
- Tolvanen A, Kangas K (2016) Tourism, biodiversity and protected areas—review from northern Fennoscandia. *J Environ Manag* 169:58–66. <https://doi.org/10.1016/j.jenvman.2015.12.011>
- tom Dieck MC, Jung T, Han DI (2016) Mapping requirements for the wearable smart glasses augmented reality museum application. *J Hosp Tour Technol* 7:230–253. <https://doi.org/10.1108/JHTT-09-2015-0036>
- Tomczyk AM, Ewertowski M (2013) Planning of recreational trails in protected areas: application of regression tree analysis and geographic information systems. *Appl Geogr* 40:129–139. <https://doi.org/10.1016/j.apgeog.2013.02.004>
- Trakolis D (2001) Local people's perceptions of planning and management issues in Prespes Lakes National Park, Greece. *J Environ Manag* 61:227–241. <https://doi.org/10.1006/jema.2000.0410>
- Trevor S, Kathy M, Ernesto EH (2016) Protected area governance and management. ANU Press, Canberra
- Tussyadiah IP, Jung TH, Tomdieck MC (2018) Embodiment of wearable augmented reality technology in tourism experiences. *J Travel Res* 57:597–611. <https://doi.org/10.1177/0047287517709090>
- United Nations (2007) Indicators of sustainable development: guidelines and methodologies. United Nations, New York. <https://doi.org/10.1016/j.cirpj.2010.03.002>
- UNESCO (2012) Managing natural world heritage: World Heritage Resource Manual. UNESCO, Paris, France
- UNWTO (2018) 2018 Edition UNWTO International Tourism Trends 2017. UNWTO, Madrid pp 1–20.
- Vancly F (2003) International principles for social impact assessment. *Impact Assess Proj Apprais* 21:5–12. <https://doi.org/10.3152/147154603781766491>
- Wall G (2019) Perspectives on the environment and overtourism. In: Doods R, Butler RW (eds) *Overtourism: issues, realities and solutions*. De Gruyter studies in tourism. De Gruyter, Berlin/Boston
- Wang D, Park S, Fesenmaier DR (2012) The role of smartphones in mediating the touristic experience. *J Travel Res*. <https://doi.org/10.1177/0047287511426341>
- Watson JEM, Dudley N, Segan DB, Hockings M (2014) The performance and potential of protected areas. *Nature* 515:67–73. <https://doi.org/10.1038/nature13947>
- Weaver D (2011) Can sustainable tourism survive climate change? *J Sustain Tour* 19:5–15. <https://doi.org/10.1080/09669582.2010.536242>
- Weaver DB, Lawton LJ (2017) A new visitation paradigm for protected areas. *Tour Manag* 60:140–146. <https://doi.org/10.1016/j.tourman.2016.11.018>
- West P, Igoe J, Brockington D (2006) Parks and peoples: the social impact of protected areas. *Annu Rev Anthropol* 35:251–277. <https://doi.org/10.1146/annurev.anthro.35.081705.123308>
- White AT, Christie P, D'Agnes H, Lowry K, Milne N (2005) Designing ICM projects for sustainability: lessons from the Philippines and Indonesia. *Ocean Coast Manag* 48:271–296. <https://doi.org/10.1016/j.ocecoaman.2005.04.007>
- Whitelaw PA, King BEM, Tolkach D (2014) Protected areas, conservation and tourism—financing the sustainable dream. *J Sustain Tour* 22:584–603. <https://doi.org/10.1080/09669582.2013.873445>
- World Tourism Organization (2004) Indicators of sustainable development for tourism destinations, tourism's potential as a sustainable development strategy. In *Proceedings from the 2004 WTO tourism policy forum at the George Washington University, Washington, DC, USA*, pp 18–20 October 2004.
- Zapata MJ, Hall CM, Lindo P, Vanderschaeghe M (2011) Can community-based tourism contribute to development and poverty alleviation? Lessons from Nicaragua. *Curr Issues Tour* 14:725–749. <https://doi.org/10.1080/13683500.2011.559200>
- Ziffer K (1989) *Ecotourism: the Uneasy Alliance*. Conservation International and Ernest and Young, Washington, DC
- Zulian G, Maes J, Vallecillo S, La Notte A, Ferrini S (2018) Ecosystem services accounts: valuing the actual flow of nature-based recreation from ecosystems to people. *Ecol Modell* 392:196–211. <https://doi.org/10.1016/j.ecolmodel.2018.09.023>

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