Chapter 11
Identification of Causal Chains for Sustainable Tourism Development Within Two Chilean Patagonia National Parks: Cerro Castillo and Torres del Paine

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Abstract The Austral Macrozone of Chilean Patagonia (Aysén and Magallanes Regions) is home to 80% of the total area of the 106 protected areas (PAs) of the National System of Wildlife Protected Areas (SNASPE), and many of its PAs are experiencing intense socio-environmental challenges related to the balance between effective conservation and growing tourism development, in the face of uncertainty and change. This chapter takes an in-depth look at the causal chains for sustainable tourism development within the Cerro Castillo and Torres del Paine National Parks, using Ante Mandić's (Environ Syst Decis 40(4):560–576, 2020) conception of the *Drivers, Pressures, State, Impact, and Response (DPSIR) model* for advancing the sustainability of PAs that are managing nature-based tourism growth. Outcomes of

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the study represent an important first step for developing a better understanding of the causal chains related to the economic, social, and environmental dynamics of tourism in PAs within Chilean Patagonia and validate the value of moving forward with Mandić's (Environ Syst Decis 40(4):560–576, 2020) to advance understanding of tourism's effects on their conservation and management and thus, improve their potential for sustainability.

Keywords Patagonia · Tourism · Protected areas · Drivers, Pressures, State, Impact, and Response (DPSIR) model · Causal chains · Sustainable development

11.1 Introduction

The sustainable development and provision of nature-based tourism experiences provoke various socio-environmental challenges for protected areas (PAs) that require effective planning, management, and coordination with a range of actors, in a context that is increasingly complex and unpredictable (Gale et al., 2019; Kohl, 2018; Mandić, 2020; McCool, 2009; Spenceley et al., 2018). This situation becomes especially critical in the Austral Macrozone of Chilean Patagonia (Aysén and Magallanes Regions), which houses more than 80% of the total area protected within the 106 PAs of the National System of Wildlife Protected Areas (SNASPE for its acronym in Spanish, Fig. 11.1).

The two regions of this macrozone contain vast territories with low degrees of human intervention. Patagonian PAs protect fragile ecosystems, including highly biodiverse ocean and fjords, mountain environments, glaciers, wetlands, grasslands, and steppe, all of which are highly sensitive to climate change, and provide vital habitat for a range of species, including the emblematic puma (*Puma concolor*) and the huemul (*Hippocamelus bisulcus*) (Chilean National Forestry Corporation 2007, 2009b). Their uniqueness and fragility also make them very attractive settings for nature-based tourism (Barrena et al., 2019), which is an important axis of regional and local development that requires adequate planning and management to ensure sustainability.

11.1.1 Evaluation of the Linkages Between Tourism Use and PA Conservation

One of the tools that has been used to understand causal chains is the *Drivers, Pressures, State, Impact, and Response (DPSIR) model*, a framework which facilitates understanding of the complex cause and effect relationships generated between human activities, the environment and society (Gari et al., 2015; Patrício et al., 2016). Within the model, *drivers* are defined as the social, economic, and/or

Fig. 11.1 Units of the National System of Wildlife Protected Areas (SNASPE) in the Aysén and Magallanes Regions

ecological factors that cause changes in the system, determining human production and consumption activities, which exert *pressures* on the environment. These pressures generate *impacts* that affect the health of ecosystems and human beings, shaping their *state*. To correct or mitigate the negative impacts on the state, society generates *responses*, which can be directed toward any part of this causal chain (EEA, 2003). The DPSIR model has been widely used in socioecology, facilitating the analysis of factors influencing coastal and marine ecosystems (Delgado et al., 2021; Gari et al., 2015; Lewison et al., 2016), processes affecting marine and

terrestrial PA conservation (Eklund & Cabeza, 2017; López & Pardo, 2018; Mandić, 2020; Ojeda-Martínez et al., 2009), the effects of productive activities on ecosystem services (Ahmed et al., 2020; Delgado & Tironi, 2019), and the analysis of tourism and its impacts, in relation to sustainable development (Mustika et al., 2017; Ruan et al., 2019; Vera-Rebollo & Ivars-Baidals, 2003).

Recently, Mandić (2020) used the DPSIR framework to structure the challenges associated with developing sustainable tourism within PAs. Mandić's (2020) model identified a series of external and internal drivers for increasing challenges related to tourism and PAs, including *tourism growth*, *globalization*, *political*, *economic and socio-cultural environments*, *technology*, *PA management capacity*, *strategic and organizational adaptability*, and *monitoring*. Primary pressures included *increased visitation*, *access*, *promotion*, *pressure on PA features*, *changes in the position and strength of the PA system*, and *local communities*. Mandić (2020) proposed that the current state could be assessed through an evaluation of changes with respect to the *key PA features*, *visitors*, *adjacent communities*, and the *economic development of the PA*. The model suggested 30 indicators, grouped around the *ecological*, *socio-cultural*, and *economic environments*, that were drawn from leading international and PA management literature. Finally, he identified five responses to help address the challenges of sustainable tourism development in PAs, calling for *improved institutional capacity*, *multi-layer systems of planning and management*, *effective resource monitoring*, *community and visitor education*, and *stronger alliances with local communities*. Mandić (2020) concluded calling for a geographically focused follow up to his study, including consideration of the interrelations between causal chains. In this chapter, we seek to validate and expand on Mandić's (2020) model by applying it to the geographic context of two Patagonian SNASPE PAs: Cerro Castillo National Park (CCNP), in the Aysén Region, and Torres del Paine National Park (TPNP), in the Magallanes Region, using a case study approach and directed document content analysis.

11.2 Methods

The exploratory nature of this research drove the decision for case study methodology, which is particularly suitable for qualitative inquiry, where the researcher has little control over the object of study (Ebneyamini & Sadeghi Moghadam, 2018; Stake, 1994). Case study research can facilitate a deep and holistic consideration of phenomena occurring in a given context, even when variables blur the boundaries between the phenomenon and its context (Boblin et al., 2013; Harrison et al., 2017; Yin, 2009). Two Patagonian SNASPE PAs within the Austral Macrozone were chosen for the research (Fig. 11.2): Cerro Castillo National Park (CCNP), in the Aysén Region, and Torres del Paine National Park (TPNP) in the Magallanes Region. Case study sites were chosen based on their importance for both tourism and conservation, and for the contrasts they presented through differences in their stages of

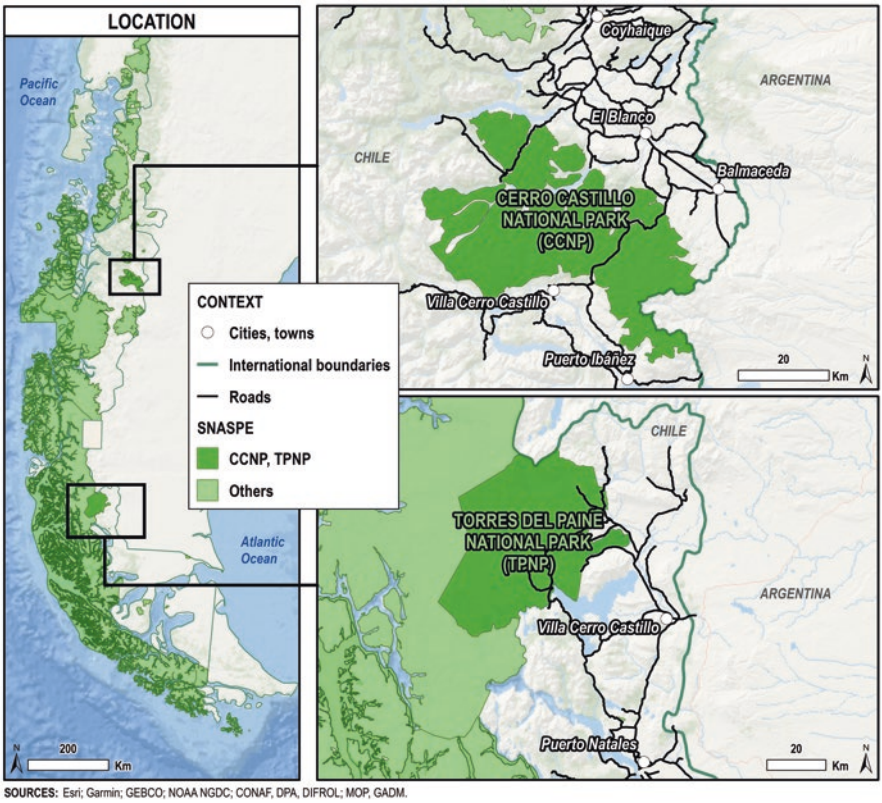

Fig. 11.2 Localization of Cerro Castillo National Park (CCNP) and Torres del Paine National Park (TPNP)

tourism development, or destination maturity. Both parks protect ecosystems of great ecological value and are surrounded by localities where tourism is one of the main economic activities (Rivas & Rojas, 2020). Both PAs are experiencing continual growth in tourism demand for their varied tourism offers that include 1-day and multi-day trails, climbing, and camping, among other activities, all of which generate economic income for local entrepreneurs. The TPNP is an example of a consolidated, mature nature-based tourism destination, with a strong influence over the regional and national economy. In contrast, the CCNP represents an emerging tourism destination with much lower visitation than the TPNP. Currently, its economic impacts are more local, but it has been prioritized nationally as one of Chile's emblematic PAs, and as such, has received significant national and international promotion as a must-see tourism destination.

For both parks, the case studies considered salient aspects of the evolution of tourism planning and use from 2000 to 2021. Given that at the time of writing

this chapter the impacts that the SARS Cov-2 pandemic will generate in the socio-economic context of both PAs are not yet fully known, this phenomenon and its implications were not considered in the analysis.

11.2.1 Data Collection

A total of 78 documents were purposefully chosen, based on their pertinence to nature-based tourism development, planning, and/or management of the CCNP, and/or TPNP, and the chosen timeframe of 2000 to 2021. Documents were obtained using Google Scholar and Google Online search engines, and a snowball sampling technique, through the document bibliographies, and recommendations from PA administrators. Documents across a national, regional and local scale were considered, including laws, policies, PA planning documents and reports, regional development strategies, and reports from public and private programs, and initiatives (Table 11.1).

Table 11.1 Sources of information used in the study

NATIONAL LEVEL DOCUMENTS	
Laws associated with tourism development in Protected Areas (4) National policies and methodologies on general planning and public use of Protected Areas (7) Scientific and gray literature on general planning and public use of Protected Areas (10)	
REGIONAL DOCUMENTS—PATAGONIA	
Scientific and gray literature related to tourism and Protected Areas (5)	
REGIONAL AND/OR LOCAL LEVEL DOCUMENTS—AYSÉN	**REGIONAL AND/OR LOCAL LEVEL DOCUMENTS—MAGALLANES**
Regional policies and strategies related to tourism and/or Protected Areas (9) Scientific and gray literature related to tourism and Protected Areas (5)	Regional policies and strategies related to tourism and/or Protected Areas (8) Scientific and gray literature related to tourism and Protected Areas (1)
GENERAL AND TOURISM PLANNING PROTECTED AREA DOCUMENTS	
Cerro Castillo National Park (CCNP)	**Torres del Paine National Park (TPNP)**
Protected Area management tools (4) Specific reports on general planning and public use of the CCNP (1) Scientific and gray literature related to the tourism development of the CCNP and/or its immediate surroundings (2)	Protected Area management tools (1) Specific reports on general planning and public use of the TPNP (4) Scientific and gray literature related to the tourism development of the TPNP and/or its immediate surroundings (17)
INTERVIEWS/COMMUNICATIONS	
CCNP	**TPNP**
CONAF personnel, CCNP (2)	CONAF personnel, TPNP (3)

Note: The number of documents/interviews reviewed are in parentheses

11.2.2 Data Analysis

The directed content analysis employed a deductive approach to validate and extend the existing DPSIR model proposed by Mandić (2020). The authors read through the 78 documents, or units of analysis (Graneheim & Lundman, 2004), extracting meaning units (e.g., words, phrases, paragraphs, or graphics with a related context or content) associated with nature-based tourism and PA management within the PAs of interest (Gale et al., 2019). Meaning units were categorized according to the five constructs of the DPSIR framework, using a process of individual coding, followed by triangulation to achieve consensus. When doubts existed about the meaning units, the research team complemented their review with semi-structured interviews with PA administrators to help clarify the context and meaning. These sessions were carried out in-person, online, or through email. Next, the intermediate DPSIR frameworks for each PA were compared to the conceptual model proposed by Mandić (2020). Mandić's constructs were validated through the data that arose in the directed content analysis and when new concepts emerged, the investigators returned to the indicator documents proposed by Mandić (2020), to ground their findings with indicators and concepts within these reference documents (IUCN and WCPA, 2017; OECD, 2004; United Nations, 2007; WTO, 2004). Additionally, national sustainability indicators for PAs and tourism destinations were considered (De la Maza et al., 2014; Rivas, 2014), and in some cases, semi-structured interviews with PA administrators were retaken to clarify perspectives.

11.3 Results and Discussion

This section presents the results for the two case studies. Each case study begins with a brief description of the PA, followed by an overview of the main concept groupings that emerged from the data, organized around the DPSIR model. Finally, each of the main concept groupings is discussed and contextualized within Mandić's (2020) model.

11.3.1 Cerro Castillo National Park Case Study

The CCNP is located in the Aysén Region of Chile, (Fig. 11.2), about 1400 km south of Santiago. It has an area of 1435 km^2 and protects several vegetation formations including temperate Andean evergreen and deciduous forest/scrub, Andean anti-boreal desert and temperate Patagonian steppe; and emblematic fauna including puma (*Puma concolor*), the Magellanic woodpecker (*Campephilus magellanicus*), the guanaco (*Lama guanicoe*), and the huemul (*Hippocamelus bisulcus*),

which is in danger of extinction (Chilean National Forestry Corporation, 2021). Surrounding population centers include Coyhaique (57 km, 49,667 inhabitants, regional capital), Balmaceda (35 km, 405 inhabitants), El Blanco (20 km, 250 inhabitants), Puerto Ingeniero Ibáñez (30 km, 764 inhabitants), and Villa Cerro Castillo (5 km, 376 inhabitants; Chilean National Statistics Institute, 2019). The CCNP is accessible by the Carretera Austral, the main north to south transportation route for the region, which crosses the PA for a 25 km stretch. CCNP received 13,350 registered visitors in 2019, placing it above the average of the other SNASPE units in the region, and is likely to have received thousands more that did not register, as the park is accessible around most of its perimeter (Chilean Subsecretary of Tourism, 2021). Figure 11.3 provides the conceptual DPSIR model that emerged from the data for the challenges associated with developing sustainable tourism within the CCNP.

11.3.1.1 Drivers

The primary external driver encountered in the CCNP data involved Mandić's (2020) *international and regional political and economic environment* category, specifically, a disconnect between high levels of public and private nature tourism promotion investment (Blair et al., 2019; Aysén Regional Government, 2014; Chilean National Tourism Service & Guazzinni Consultores, 2017; Chilean National Tourism Service, 2017), compared with extremely low conservation investment (Petit et al., 2018; Repetto-Giavelli et al., 2018; Toledo, 2017). Disparities are further complicated by the lack of a sufficient legal framework for PA management (Petit et al., 2018; Praus et al., 2011). Chile is currently advancing the Biodiversity and Protected Areas Service (SBAP, for its acronym in Spanish) bill, which will create an institution under the Ministry of the Environment to unify the administration of Chile's public, private, terrestrial, and marine PAs. The bill was unanimously approved in the Senate in 2019 (Chilean Senate, 2019), but the enactment of the law has not yet been finalized (Manzur, 2021).

Other external drivers included Mandić's (2020) *globalization,* and *international and regional tourism growth* categories, evidenced by growing visitation, and the high priority that the Aysén regional government has placed on nature-based tourism as an economic driver (Aysén Regional Government, 2009a, b, 2014; Chilean National Tourism Service, 2017). Finally, Mandić's (2020) *climate change* external driver category emerged in the data describing stresses arising from changing environmental conditions.

Internal drivers emerged in the CCNP data related to all three categories identified by Mandić (2020): *protected area management effectiveness and efficiency*, *effective flexibility and adaptability of strategic document*, and *organization structure and monitoring*. The park's management plan was recently updated in 2021, with a methodology that includes adaptive management capacity (Chilean National Forestry Corporation 2017b, 2021). The preceding management plan was developed in 2009 and based on rational comprehensive planning principles (Chilean

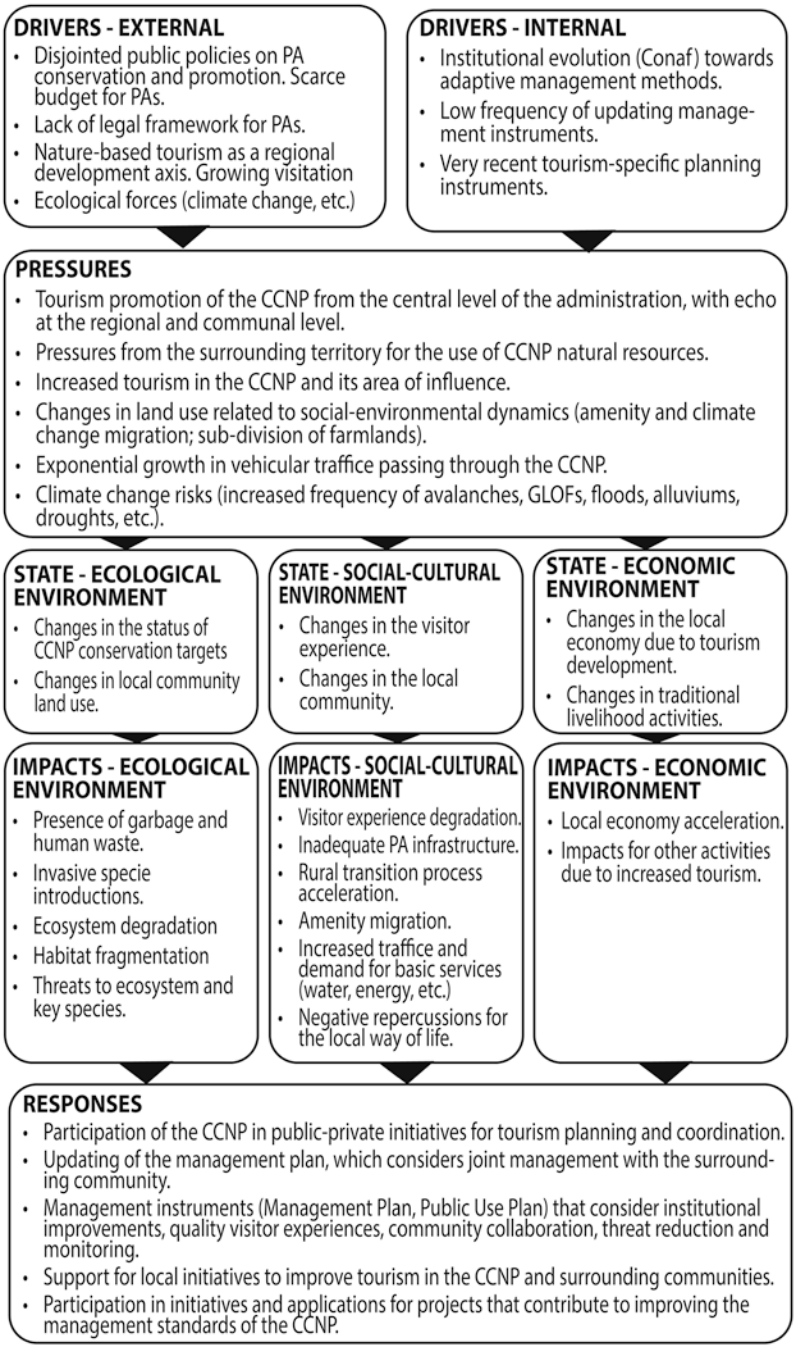

Fig. 11.3 Conceptual diagram of the Drivers, Pressures, State, Impact, and Response (DPSIR) model for the Cerro Castillo National Park (CCNP)

National Forestry Corporation, 2009b). Also, in 2017, the CCNP developed its first public use plan (PUP), dedicating significant attention to planning tourism use and establishing scenarios and protocols for ongoing monitoring and adaptive management (Chilean National Forestry Corporation, 2017c).

11.3.1.2 Pressures

The data illuminated several pressures related to sustainable tourism development within the CCNP, in alignment with the dynamics identified by Mandić (2020). A primary pressure involved Mandić's (2020) *deterioration of the local community's position*. Central government initiatives prioritizing conservation and nature-based tourism development within and around the CCNP have impacted rural transition dynamics, resulting in conflicts and low levels of trust for park administration within the communities surrounding the park. In the 1970s, when the Cerro Castillo National Reserve was established, conflicts arose over land ownership, use, purchase, and sale (Blair et al., 2019). Many of these conflicts were resolved in an authoritarian manner and have left long-standing scars which manifest as resistance to CCNP conservation ordinances and rules. For example, the CCNP experiences continual pressures from the surrounding territory related to livestock use within its boundaries, firewood extraction, and the interaction of domestic animals with wildlife (Chilean National Forestry Corporation, 2017c).

Other Mandić's (2020) pressures categories, including *facilitated accessibility and visibility* and *strengthening of the protection system*, also arose in the CCNP data. In 2018, the status of the PA was elevated from National Reserve to National Park, which implies a higher level of protection and use restrictions. The change has been accompanied by increased national, regional, and local level tourism promotion and emphasis, including global press coverage and focus. Promotion and the development of tourism services and infrastructure around the PA have captured the interest of investors, manifesting in rapid acquisition of rural properties in order to subdivide them and offer them as plots for amenity and climate-change migration. These changes and increased attention have added new fuel to previous conflict and trust issues, creating further divisions in local communities, with respect to the most appropriate uses of the CCNP (CESPA, 2019; Chilean National Forestry Corporation, 2009a; Municipality of Coyhaique, 2014; Paralelo 47, 2019; Chilean Subsecretary of Tourism, 2021). Moreover, the CCNP has experienced a pronounced *increase in number of arrivals* (Mandić, 2020), from 1033 visitors in 2009 to 13,350 in 2019 (Chilean Subsecretary of Tourism, 2021) and *increasing pressure on national park features* (Mandić, 2020), through exponential growth in vehicular traffic passing through the park, via the main regional highway, the Carretera Austral (Chilean National Forestry Corporation, 2017c; Gale et al., 2018). While visitation dropped by a little more than 50% during COVID-19 (6080 registered annual visits), it has returned with strength in 2022. Finally, as Mandić (2020) observed, there have been a number of *negative effects on protected resources due to extreme weather conditions*. In the CCNP, the following are related to the effects produced by climate

change including an increase in the frequency of avalanches, sudden glacial lake outbursts (GLOFs), floods, alluviums, and droughts, over recent decades, which have impacted tourism-related activities and are predicted to affect vegetation formations in the medium- and long-term (Chilean National Forestry Corporation, 2017c).

11.3.1.3 Status

The data obtained for the CCNP documented a series of changes resulting from the drivers and pressures affecting sustainable tourism development within the CCNP (Chilean National Forestry Corporation 2017c, 2021). With respect to the *ecological environment* (Mandić, 2020) changes related to the CCNP's conservation targets and land use in the surrounding areas. For the *socio-cultural environment* (Mandić, 2020) changes affected both the visitor experience and the well-being of the local population of the communities around the park. *Economic environment* (Mandić, 2020) changes involved an increase in the local economy due to tourism development and changes in traditional productive activities.

11.3.1.4 Impacts

CCNP data revealed *ecological environment* impacts related to park conservation targets and the proper functioning of park ecosystems (Chilean National Forestry Corporation 2017c, 2021). Inappropriate visitor behavior has led to degradation in the *state of the resource and of species* (Mandić, 2020), augmenting the presence of garbage and human waste, water contamination, introduction of invasive species, and harassment of wildlife. Although the CCNP views tourism as an engine for local development (CEQUA, 2017b), shortcomings in the availability of human and financial resources have led to a partial implementation of management and PUPs (CEQUA, 2017b), overloads for the CCNP staff, and a lack of appropriate infrastructure to meet demand. Some of the impacts of these conditions include insufficient drinking water, trails in poor condition, soil erosion and compaction, increased hazards and risks due to lacking maintenance, furtive campfires, and the existence of micro-dumps (CEQUA, 2017b; Chilean National Forestry Corporation, 2017c). While the Carretera Austral has greatly facilitated access to the park and connectivity for the region, it has fragmented important habitat within the CCNP, and speeding has caused deaths, injuries, and behavioral changes for wildlife key species (CEQUA, 2017b; Chilean National Forestry Corporation 2017c, 2021).

Socio-cultural environment impacts included *tourist and visitor satisfaction with the overall experience* (Mandić, 2020), resulting from crowding, a lack of adequate infrastructure, and a lack of informational and educational materials (Chilean National Forestry Corporation, 2017a). The *local population bordering the park* (Mandić, 2020) has also experienced impacts. In recent years, as nature-based tourism has assumed a larger role in territorial development, CCNP management has developed new local concessions and links with the community in order to improve

tourism and recreational management (Chilean National Forestry Corporation, 2017c; Inostroza & Rovira, 2020). The *number of single-day and multi-day visitors* has increased, which has impacted the *ratio of tourists/visitors to residents*, and the *percent of men and women employed in the tourism sector* (Mandić, 2020). And, growing awareness and information about the park have accelerated rural transitions and amenity migration (Blair et al., 2019), increasing the local population and demand for basic services (water, electricity, cleaning, access roads, etc.), augmenting the presence of domestic animals and vehicular traffic, and contributing to the disruption of biological corridors (Blair et al., 2019; Paralelo 47, 2019; Sepúlveda & Lara, 2021). Although some of the local population have aligned with tourism initiatives, several documents (e.g., Paralelo 47, 2019; Sepúlveda & Lara, 2021; Chilean National Tourism Service & Guazzinni Consultores, 2017) evidenced *dissatisfaction with tourism in the destination* (Mandić, 2020), citing negative repercussions for the local way of life and a fundamental difference in land values. For example, the traditional ranching culture, which is still very present, values the natural environment as a space for productive exploitation, rather than an asset to be preserved for the proper functioning of ecosystems, or for tourism and recreation (Chilean National Forestry Corporation, 2017a; Gale & Ednie, 2020; Paralelo 47, 2019). From an *economic environment* perspective, tourism development has led to *economic development of the area around the park* (Mandić, 2020). A growth of companies, businesses, and sales volumes linked to tourism is observed (Chilean National Tourism Service, 2017). Gender impacts have also been observed; for example, studies have suggested that local tourism around the CCNP employs approximately twice as many women as men, while agriculture and cattle ranching, involved approximately twice as many men as women (Paralelo 47, 2019).

11.3.1.5 Responses

The data in the CCNP indicated a number of initiatives taking place in, and around the CCNP, that align with the five Mandić (2020) responses. For example, in terms of *multi-layered PA planning and management*, CONAF has recently updated the CCNP management plan with a vision that explicitly mentions the development of basic infrastructure for the sustainable enjoyment of the natural environment and joint management with the surrounding community (Chilean National Forestry Corporation, 2021). That plan is layered with the CCNP's first PUP and complements recent community tourism plans that involved joint work with the municipality, the community and CONAF, and where the CCNP is presented as a key piece (Paralelo 47, 2019). The CCNP's management plan and PUP emphasize strategies to improve *institutional capacity building, indicator development and key resource monitoring, community and visitor education,* and *positive impacts for local communities* (Chilean National Forestry Corporation 2017c, 2021). As a tangible step in achieving these strategies, the CCNP is forming alliances with NGOs and universities to strengthen planning, management, and monitoring capacity, which have facilitated additional resources for management plan updates and grant development, social capital building with local communities, and technical support for the

application to the IUCN Green List of Protected and Conserved Areas (Programa Austral Patagonia, 2022; M. Sepúlveda, 23 de Mayo 2022, "personal communication"). Being part of this list is associated with effective and transparent management, which guarantees the conservation of nature and considers social, economic, and cultural benefits for the territories where they are inserted (IUCN & WCPA, 2017).

11.3.2 Torres del Paine National Park Case Study

The TPNP, with an area of 1814 km^2, is located at 50°57′ south latitude; 73°8′ west longitude, 2700 km south of Santiago, Chile, in the Magallanes Region (Fig. 11.2), and contains a private 44 km^2 PA, the Las Torres Reserve, within its boundaries. Since its creation in 1959, the TPNP has been considered *an ensemble of scenic beauty of exceptional tourist value* (BCN, 1962). The park includes part of the Southern Patagonia Ice Field and protects diverse ecosystems, including Magellanic deciduous forest, pre-Andean scrub, Patagonian steppe, and Andean desert (Pisano, 1974). The TPNP preserves its paleontological, archaeological, historical, cultural heritage, and a great diversity of birds and mammals, like the huemul and puma (Vela-Ruiz & Reppetto-Giavelli, 2017). The main population centers surrounding the TPNP are Villa Cerro Castillo (130 inhabitants) and Puerto Natales (19,023 inhabitants) (Chilean National Statistics Institute, 2019). The TPNP is accessed from the cities of Puerto Natales (100 km) and Punta Arenas (400 km). Figure 11.4 provides the conceptual DPSIR model that emerged from the data for the challenges associated with developing sustainable tourism within the TPNP.

11.3.2.1 Drivers

The data related to the TPNP suggested that one of the main external drivers is CONAF's limited ability to enforce regulations and manage the parks, which is constrained by severe underfunding of the SNASPE (less than US$2 per 10,000 km^2, per year) (Toledo, 2017), and the lack of an integrated regulatory and institutional body for PAs (Petit et al., 2018; Praus et al., 2011; Vela-Ruiz et al., 2018). In addition, the TPNP is affected by the *international and regional political and economic environment* (Mandić, 2020), and the disconnections that exist between local, regional, and national policy regarding the management, development, and promotion of tourism in the TPNP. A third external driver that emerged in the data was related to the *socio-cultural environment* (Mandić, 2020). Historically, CONAF has limited community involvement in the PA's management (CONAF, 2004); however, social manifestations have demanded greater participation in decisions involving PAs, and CONAF has increasingly moved toward including local communities in governance (Chilean National Forestry Corporation, 2020a). Other observed external drivers in TPNP are related to *globalization* and *international and regional*

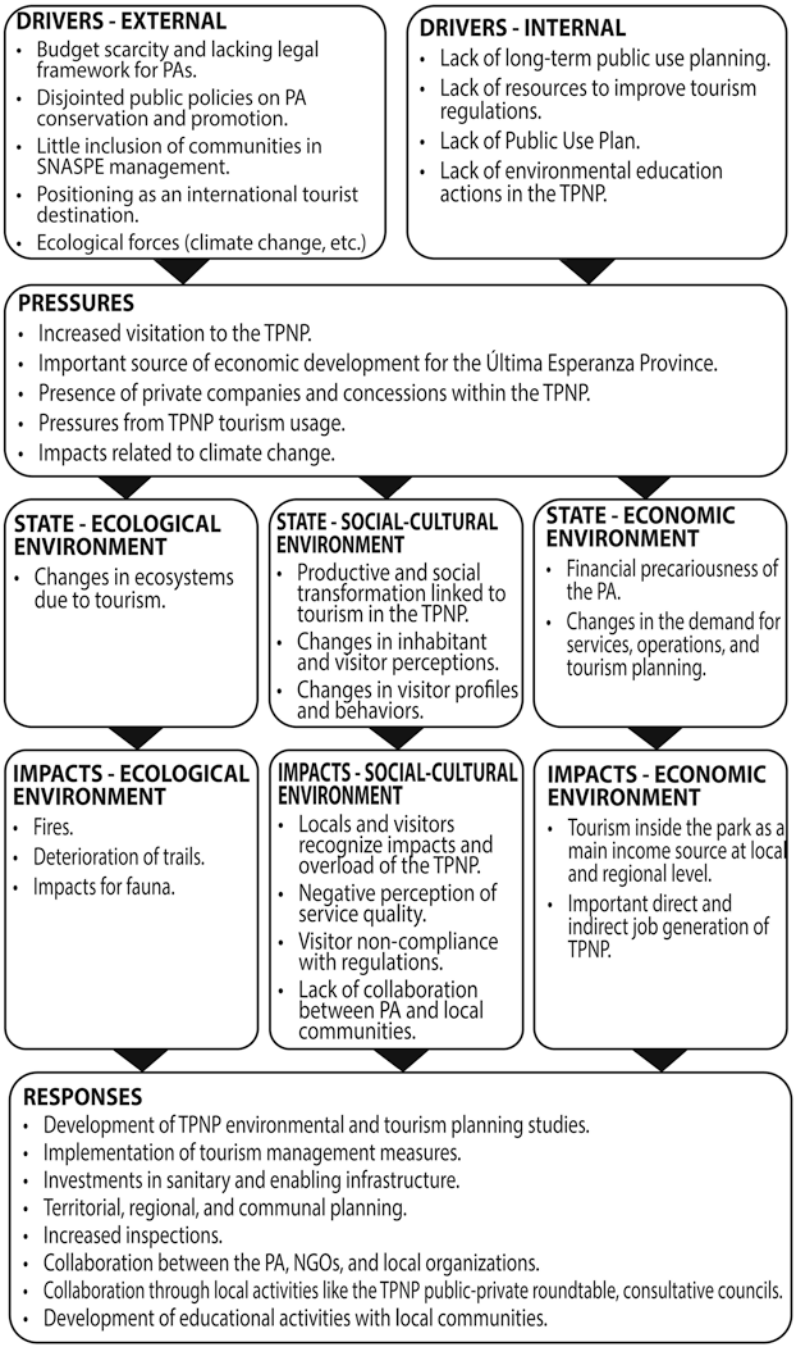

Fig. 11.4 Conceptual diagram of the Drivers, Pressures, State, Impact, and Response (DPSIR) model for the Torres del Paine National Park (TPNP)

tourism growth (Mandić, 2020). For example, the TPNP received UNESCO designation as "Man and the Biosphere Reserve" in 1978 (Chilean National Forestry Corporation, 2020b), Trip Advisor recognized TPNP as the "Eighth Wonder of the World" in 2013, and it was elected as one of the most important tourist images of Chile, and areas inside and surrounding the park were designated as a Zone of Tourism Interest (ZOIT, for its acronym in Spanish) in 2019 (Chilean Subsecretary of Tourism, 2018). These situations increased tourism promotion and visibility at national and international levels. Another important external driver affecting the sustainability of tourism in the TPNP involved Mandić's (2020) category of *climate change*. Variations in temperature and precipitation, loss of biodiversity and occurrence of extreme phenomena are threats to tourism activity in Chile (UNDP et al., 2019), as they put at risk the natural attractions of PAs (MINECON & MMA, 2019).

Similar to the situation in the CCNP, the primary internal drivers that arose in this case study were related to all three categories identified by Mandić (2020): *protected area management effectiveness and efficiency*, *effective flexibility and adaptability of strategic document and organization structure*, and *monitoring*, especially with respect to the absence of long-term public use planning. While there have been efforts to advance tourism planning and several actions has been applied to improve the tourism management (AMBAR, 2004; Vela-Ruiz et al., 2018), the TPNP does not currently have enough resources or planning instruments (e.g., PUP), to effectively regulate this activity. Further, the TPNP still needs to improve regulations, tourism impacts monitoring, and environmental education actions (CEQUA, 2017a; J. Linnebrink, 9 August 2021, "personal communication"; Vela-Ruiz et al., 2018).

11.3.2.2 Pressures

The TPNP case study surfaced a number of pressures on tourism sustainability within the park. With respect to socioeconomic pressures, the TPNP has experienced a significant *increase in the number of arrivals* (Mandić, 2020), with an average growth of 12%, between 2009 and 2019. In 2019, 304,947 visitors were registered (Chilean Subsecretary of Tourism, 2021). In 2020, visitation dropped to 142,881, as a result of the COVID-19 pandemic; but, by the end of 2021, it has returned to pre-pandemic levels. To manage increased demand, the TPNP has become the SNASPE unit at national level with the highest number of tourism concessions, and there are also tourism services in the Las Torres Reserve. The TPNP is a fundamental income source within the Última Esperanza Province (Vela-Ruiz & del Delgado, 2010); and, as such, local actors apply significant pressure to influence tourism management decisions within the TPNP (Vela-Ruiz et al., 2018). This situation, as Mandić's model (2020) identified in a broader context, often influences *the park's ability to achieve conservation objectives.* In terms of ecological pressures, the evidence supported climate change impacts (Mandić, 2020), including the retreat of mountain glaciers and the loss of glacial mass in the Southern Icefield,

affecting important TPNP tourist attractions, like the Grey Glacier (Weidemann et al., 2018).

11.3.2.3 State

Similar to the CCNP case study and the Mandić (2020) conceptual model, TPNP data documented changes related to the *ecological, socio-cultural, and economic environments*, as a result of tourism development and activity. Several scientific studies documented *ecological environment* changes that have taken place in the TPNP, and the effects these changes have had for the park conservation; for example, the ecosystem impacts generated by forest fires (Vidal et al., 2012), trails deterioration (Torres et al., 2018), and changes in structure and behavior of birds and carnivores due to food supplementation (Cabello-Cabalín, 2017). For example, in the *socio-cultural environment*, TPNP events and cycles have contributed to a constant productive and social transformation of tourism in the region, with evidence of service diversification and growth in recent years (Vela-Ruiz & del Delgado, 2010), tourist behavior changes, and changing perceptions of TPNP tourism from both local residents and visitors. From an *economic environment* perspective, tourism linked to the TPNP has been one of the main development factors for the Última Esperanza Province, especially for Puerto Natales, transforming productive activities and revitalizing social organization (Ferrer, 2003; Vela-Ruiz & del Delgado, 2010). According to Valverde (2020), in 2017, TPNP revenues from tourism services located within the park, entrance fees, and concession income, generated $US 56,284,000 in revenues directly related to tourism, and $US 182,931,000 in additional indirect revenues. This is equivalent to 3% and 10% of Magallanes' GDP, respectively.

11.3.2.4 Impacts

With respect to the ecological environment, the *state of resources and species* (Mandić, 2020) within the TPNP has been strongly affected in recent decades, due to three mega fires caused by poor tourist practices (years 1985, 2005 and 2011), that have significantly changed the attributes of the forests (Vidal et al., 2012), and the presence of invasive exotic species of flora in camping and trail sectors (Vidal et al., 2015). *Land degradation* (Mandić, 2020) has also been linked to tourism and the poor condition of mountain trails (Farrell & Marion, 2001; Torres et al., 2018), which is evidenced by changes in vegetation and soil, erosion, exposure of roots and loose rocks, habitat fragmentation due to the presence of multi-trails, and the widening of trails (Repetto & Cabello, 2015; Torres et al., 2018). Regarding fauna, Cabello-Cabalín (2017) and Repetto and Cabello (2015) point out tourism impacts related to the structure and behavior of birds and carnivores, due to food supplementation generated by poor *waste management and runoff from sewage treatment plants* (Mandić, 2020). There is also evidence of impacts from the harassment of fauna and from the use of anticoagulant poisons in lodging areas, affecting native

rodents and birds of prey Cabello-Cabalín (2017). In terms of the socio-cultural environment, evidence supported Mandić's (2020) proposition to consider *resident satisfaction with tourism in the destination* and the *impacts of tourism on the destination's destiny,* as well as *tourist and visitor satisfaction with the overall experience*. According to Fernández Génova et al. (2020), local stakeholders are critical of the way tourism has developed in TPNP and the impacts it has generated. Despite specific efforts, the TPNP has not advanced a long-term strategy to link stakeholders and establish governance that is recognized and validated by local authorities and community stakeholders. They criticize the expansion of concessions as damaging to the park, with negative consequences for the conservation and sustainability of the destination. They also question the concession model, which has not prioritized local communities (Barrena et al., 2019; Sepúlveda & Lara, 2021). In addition, several studies have negatively evaluated the quality of services provided within the TPNP (CEQUA, 2016; Chilean National Forestry Corporation and EES Ingeniería, 2019; Chilean National Forestry Corporation & Search Consultores, 2014). Trail and infrastructure crowding issues, linked to the high tour operator demand for the *W*' and *Macizo Paine* circuits (CEQUA, 2017a), which has led to overcrowding of full day trails (Torres et al., 2019). Moreover, visitor experiences have been affected by visitor behavior problems, including the use of informal campsites, use of fire in unauthorized places, and bad practices to avoid paying entrance fees and services in the park (Barrena et al., 2019). Evidence of the economic environment impacts centered on the regional dependence on TPNP related tourism as a major factor of the GNP, which relates to Mandić's (2020) identification of impacts produced through the *economic development of the park area*. In relation to *direct tourism employment* (Mandić, 2020), 6700 direct jobs were estimated in relation to the TPNP, for 2017, in the Magallanes Region and other parts of Chile (Valverde, 2020). Additionally, Valverde (2020) estimated that 10,850 indirect jobs were generated during this same year.

11.3.2.5 Responses

Some of Mandić's (2020) five responses to improve the sustainability of tourism, in and around PAs, manifested within the data for the TPNP. Nevertheless, external and internal drivers limited the PA's advances with respect to a local governance that supports the tourism management and conservation of the park, the generation of spaces for dialogue, and the collaboration between public and private stakeholders in the territory. The evidence was present to support Mandić's (2020) conceptual response about the importance of *multi-layered PA planning and management tactics.* Although the TPNP currently lacks a PUP, important actions have focused on resolving urgent gaps, prioritizing the construction of enabling infrastructure for workers, and adequate sanitation systems. Between 2014 and 2017, a tourism management system (TMS) was proposed for the TPNP through a participatory and collaborative planning process with a wide range of public and private stakeholders (Fernández Génova et al., 2020). This included a micro-zoning of public use and an action plan to improve management and visitor flow management, in addition to

proposing impact mitigation measures for trails and lodging sites through the implementation of technological innovations (Vela-Ruiz & Reppetto-Giavelli, 2017; Vela-Ruiz et al., 2018). These park planning advances have been complemented by advances in territorial planning, which *improve institutional capacity* (Mandić, 2020) for CONAF, by adding new legal tools, financial resources, management strategies and technological innovations, trying to improve tourism management (entrance payment, visitors registration system, reservations for accommodation), and to mitigate environmental problems generated by tourism activity (trail designs, fauna monitoring, sewage treatment plants). Between 2017 and 2018, Torres del Paine was declared a ZOIT destination, with an associated tourism management action plan that responds to several gaps identified in the park (Chilean Subsecretary of Tourism, 2018). In parallel, the municipalities of Torres del Paine and Natales have made progress in updating provincial tourism plans and Torres del Paine has updated tourism ordinances and established an environmental ordinance (Municipality of Natales and Municipality of Torres del Paine, 2021; Municipality of Torres del Paine, 2015, 2020a, b). In addition, the State has increased its oversight of tour operators (Martínez, 2016), and sanctions for inappropriate behavior by visitors have been more frequent and publicized (e.g., the expulsion of six tourists in 2022 for irresponsible behavior; two for improper use of cookstoves; another involved a guide charged with reckless endangerment for employing bad practices when photographing a puma in 2021). With respect to *indicator and key resource management,* CONAF has established important alliances with academia and with national and international NGOs, to improve the condition of trails and infrastructure, and work in partnership with local businesses and visitors, who collaborate with funding and concrete conservation actions (https://www.tdplegacyfund.org/). With respect to *creating positive impacts for local communities* (Mandić, 2020), important participatory efforts have been undertaken during recent years, including updating of the Torres del Paine Biosphere Reserve management plan (Chilean National Forestry Corporation, 2020b), the definition of conservation targets, the declaration of the Torres del Paine ZOIT (Chilean Subsecretary of Tourism, 2018), the TMS (Fernández Génova et al., 2020), the functioning of the park's Consultative Council, and the intermittent establishment of public-private roundtables. Finally, CONAF and other institutions are focusing efforts to improve and expand *community and visitor education* (Mandić, 2020).

11.4 Conclusions

The two case studies developed in this chapter supported Mandić's (2020) conceptual DPSIR model for advancing the sustainability of PAs that are managing nature-based tourism growth. The holistic, systems thinking DPSIR approach taken by Mandić (2020) facilitated a triple bottom line approach to conceptualizing the challenges associated with sustainable tourism development in the CCNP and TPNP. Most of the categories identified by Mandić (2020) arose in the data related

to the CCNP and TPNP, and missing categories were also helpful, as they helped illuminate geographic specific dynamics that might emerge in the future. For example, while Mandić (2020) emphasized *technological innovations* as a driver, the case studies identified little to no evidence to support this driver with respect to tourism development and management in and around the CCNP, but technological innovations have surged in TPNP as a response. The five responses Mandić (2020) posed as challenges for the sustainable development of PAs resonated well with studies and needs that emerged in the CCNP and TPNP cases, even though each of the PAs were experiencing very different contexts and levels of tourism destination development. In both cases, these responses validated current efforts to implement the new SBAP legal framework and strategy for PA management in Chile, which prioritize initiatives consistent with *improved institutional capacity, multi-layer systems of planning and management, effective resource monitoring, community and visitor education,* and *stronger alliances with local communities*. This paper expands on Mandić's (2020) conceptual work by adding a geographic focus; however, it falls short of considering the interrelations between the proposed parameters. As well, we have employed a qualitative approach, rather than taking Mandić's (2020) suggestion about "measuring each parameter and testing their mutual correlations" (p.13). While these limitations are important to consider, we believe this chapter sets the course for future work along these lines and represents an important first step for developing a better understanding of the causal chains related to the economic, social, and environmental dynamics of tourism in PAs within Chilean Patagonia, as it has validated the value of moving forward with Mandić's (2020) work, and thus, may help understanding of tourism's effects on their conservation and management and, therefore, improve the potential for sustainability.

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