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Chapter 18

Catalyzing Holistic Conservation-Based Development Through Ethical Travel Experiences Rooted in the Bioculture of Patagonia's Subantarctic Natural Laboratories



Trace Gale-Detrich, Laura Sánchez Jardón, Andrés Adiego, Ricardo Rozzi, Pamela Maldonado, Matías Navarrete Almonacid, José Coloma Zapata, Diego Hernández Soto, Manuel Mora Chepo, Ronald Cancino Salas, Fabien Bourlon, Rodrigo Villa-Martínez, Lorna Moldenhauer Ortega, and Carla Henríquez V.

Abstract Synchronous losses of biological, linguistic, and cultural diversity are contributing to processes of *biocultural homogenization*, a persistent downgrading in how people perceive biodiversity, environmental, and cultural conditions, and what they consider as *normal*. Some have linked biocultural homogenization with neoliberal practices that emphasize standardization and efficiencies in order to enhance capital accumulation. In Chile, which is highly centralized, urban, and centered

T. Gale-Detrich (✉)

Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Sustainable Tourism Research Line, Human-Environmental Interactions Group, Coyhaique, Aysén Region, Chile

Cape Horn International Center (CHIC), Puerto Williams, Chile

e-mail: tracegale@ciep.cl

L. S. Jardón

Cape Horn International Center (CHIC), Puerto Williams, Chile

Universidad de Magallanes, Coyhaique University Center, Coyhaique, Aysén Region, Chile

e-mail: laura.sanchez@umag.cl

A. Adiego

Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Sustainable Tourism Research Line, Human-Environmental Interactions Group, Coyhaique, Aysén Region, Chile

Department of Geography and Territorial Planning, Universidad de Zaragoza, Zaragoza, Spain

e-mail: andres.adiego@ciep.cl

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around neoliberal development, *biocultural homogenization* is especially concerning, as it may lower support for conservation. Thus, when thinking about conservation-based development in Patagonia, locally driven initiatives that foster biocultural reawakening, democratize science, and catalyze sustainable development, might help address biocultural homogenization and build conservation support. This mixed-methods, intrinsic case study explored three initiatives underway in the Aysén and Magallanes regions of Chile that address some of these outcomes: (1) Subantarctic Natural Laboratories; (2) 3-Hs Biocultural Ethic and FEP Cycle Approach; and (3) Scientific Tourism Collaborative Learning Networks. We sought to better understand their methods and implementations and explore how their

R. Rozzi

Cape Horn International Center (CHIC), Puerto Williams, Chile

Department of Philosophy & Religion Studies, University of North Texas, Denton, TX, USA

Universidad de Magallanes, Sub-Antarctic Biocultural Conservation Program,
Puerto Williams, Chile

e-mail: rozzi@unt.edu

P. Maldonado

Universidad de Magallanes, GAIA Antártica Investigation Center, Punta Arenas, Chile

e-mail: pamela.maldonado@umag.cl

M. N. Almonacid · D. H. Soto

Department of Social Sciences, Universidad de la Frontera, Temuco, Araucanía Region, Chile

e-mail: m.navarrete17@ufromail.cl

J. C. Zapata

Universidad de la Frontera, Center for Social Research of the South,

Temuco, Araucanía Region, Chile

M. M. Chepo · R. C. Salas

Universidad de la Frontera, Temuco, Araucanía Region, Chile

e-mail: manuel.mora@ufrontera.cl; ronald.cancino@ufrontera.cl

F. Bourlon

Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Sustainable Tourism
Research Line, Human-Environmental Interactions Group, Coyhaique, Aysén Region, Chile

Université Grenoble Alpes, Institute of Urban Planning and Alpine Geography – UMR 5194,
Grenoble, Isère, France

e-mail: fabienbourlon@ciep.cl; Fabien.bourlon@umrpacte.fr

R. Villa-Martínez

Cape Horn International Center (CHIC), Puerto Williams, Chile

GAIA Antártica Investigation Center, Universidad de Magallanes, Punta Arenas, Chile

e-mail: rodrigo.villa@umag.cl

L. M. Ortega

Universidad de Magallanes, Coyhaique University Center, Coyhaique, Aysén Region, Chile

e-mail: lorna.moldenhauer@umag.cl

C. Henríquez V.

GAIA Antártica Investigation Center, Universidad de Magallanes, Punta Arenas, Chile

e-mail: carla.henriquez@umag.cl

integration might strengthen conservation-based development in Patagonia, through ethical travel experiences rooted in the bioculture of local communities. Results suggest promise for a combined approach; thus, additional research and consideration are merited.

Keywords Patagonia · Biocultural homogenization · Conservation-based development · Ethical travel · Natural laboratories · Biocultural ethic · Field environmental philosophy

18.1 Introduction

18.1.1 *Biocultural Homogenization*

Synchronous losses of biological, linguistic, and cultural diversity are contributing to increasing disconnections between human and non-human worlds. These losses have been associated with a persistent downgrading in how people perceive biodiversity, environmental and cultural conditions, plurality, and what they consider as *normal* (Gavin et al. 2015; Kesebir and Kesebir 2017; Maffi 2018; Rozzi et al. 2006; Rozzi 2012). This phenomenon, known as *biocultural homogenization*, has been linked to the progressive decline of human/human and human/non-human interactions (*extinction of experience*), which appears to diminish understanding and support for biodiversity protection (Soga and Gaston 2016, 2020). Specifically, scholars have noted that biocultural homogenization likely contributes to the general underestimation of the scope and extent of long-term environmental and cultural changes taking place, and accelerating loss of local biodiversity, languages, and culture (Rozzi et al. 2008; Rozzi 2012; Mackey and Claudie 2015).

Similar dynamics have provoked a loss of cultural diversity in much of the world; especially in terms of intangible cultural heritage, including oral traditions, rituals, festive events, social practices, performing arts, and knowledge and practices concerning nature, the universe, and traditional relationships that tie together land, flora, fauna, funga, and people (Bridgewater and Rotherham 2019; Mackey and Claudie 2015). Over the last century, intangible cultural heritage has eroded, as an increasingly hegemonic one-dimensional cultural lens has been evoked through popular media, standardized educational curriculums, and national food programs (e.g., fast food, standardized school lunches, plastic handicrafts, Disneyfication, English language use), at the expense of native species, ancient cultures, languages, medicines, religions, beliefs, and place-based ways of knowing (Rozzi 2018; Söukand et al. 2022). These lenses pigeonhole our descriptions and understandings of the diversity of humans and other-than-humans, reducing diversity to a few quantitative indicators and syllogisms.

Apart from numerous health and well-being risks that arise from decreased human/human and human/non-human interactions that occur along with rural to

urban transitions (Barreau et al. 2019; Chen et al. 2015; Commission on Social Determinants of Health 2008; Cox et al. 2018; Dalzell 2018; Kjellstrom 2006; Ledent 2012; Morris 2016; Senese and Wilson 2013; Weiss et al. 2020), authors have concluded that biocultural homogenization may drive significant biodiversity loss (Bridgewater and Rotherham 2019; Cox et al. 2018, Gavin et al. 2015; Rozzi et al. 2006; Stokes 2006). Stokes (2006) pointed out that in an increasingly urban world, most surviving biodiversity is conserved because people have decided its protection is important to them. Yet, as people become more isolated from nature, and culture becomes more homogenized, knowledge and support for environmental issues and nature conservation will likely decline (Bridgewater and Rotherham 2019; Cox et al. 2018).

18.1.2 Conservation-Based Development

To date, the concept of conservation-based development (CBD) in Patagonia has largely been advanced through private conservation initiatives that largely align with preservationist approaches that have been proposed globally. For example, Wilson's (2016) Half-Earth initiative called for protecting 50% of the world's land and sea, from human intervention or activity (Wilson 2016). While Wilson's Half-Earth proposal sought hardline preservation and protection, the more recent 30 × 30 Movement (Campaign for Nature 2021) proposes that ambitious protection goals will only be achieved by recognizing and incorporating a mixture of public and private lands with varying degrees of sustainable use (Campaign for Nature 2021; Wilson 2016). Differences in these and other global conservation proposals rest on the dilemma between integration of human and non-human worlds—*land sharing*—and/or the separation—*land sparing*—of these worlds (Fischer et al. 2014). Nature-based tourism is one of the most common uses of protected areas (PAs) to date, under a land-sharing framework, that combines conservation with the sustainable use of natural attractions and existing territorial infrastructure, including roads, PAs, trails, and ferry routes (Baum et al. 2017).

When developed and executed in a sustainable manner, these forms of CBD can help contribute to the UN Sustainable Development goals, especially with respect to biodiversity conservation through PAs and social/economic development through nature-based tourism (Carius and Job 2019; Deutsches Nationalkomitee MAB and UNESCO 2005; Hall 2019; Oldekop et al. 2016). Nevertheless, these forms of CBD largely remain rooted in the dominant neoliberal economic frameworks and paradigms, which have been criticized for overly narrow conceptions of nature that lead to its commodification, increased urbanization, worsening social inequities, and a homogenization of goods, services, and arts, driven by standardization and a constant focus on increased efficiencies and capital accumulation (Baldwin et al. 2019; Beer 2022; Butler 2018; Conway and Heynen 2006; Flores 2013; Gjorgjioska and Tomicic 2019; Igoe and Brockington 2007; Kashwan et al. 2019; Khan 2015; Kumi et al. 2014; Ranta 2018; Shreve 2012; Sims 2017; Slocum et al. 2019; Stahler-Sholk

2007; Wolters 2022). In essence, dominant neoliberal models have reinforced the one-dimensional practices that have led to the biocultural homogenization we currently experience (Flores 2013; Gjorgjioska and Tomacic 2019; Ranta 2018; Shreve 2012; Sims 2017; Stahler-Sholk 2007). Ranta (2018) posed, "...we are experiencing a crisis of humanity: a situation in which our social relations, our bodies, and our minds are being commoditized at an increasing pace. Development, as we know it, has reached its limits economically, environmentally, and socially" (p. 20).

Acknowledging these trends, conservation leaders have begun to recognize that neoliberal driven science and conservation models are not the only (or perhaps best) answer for addressing biodiversity declines. Increasingly, they are including "public education, policy, and other nonbiological dimensions in their work" (Stokes 2006, p. 6). Concretely, Rozzi et al. (2012) called for biological and cultural conservation initiatives—including ecotourism and other forms of tourism that seek to develop in a sustainable manner—to consider the sociocultural and ecological contexts of the ecoregions in which they work. These contexts must take a central role in programs, tourism offerings, and other efforts to connect humans with each other and with other forms of nature, facilitating transformative personal experiences that draw on a biocultural ethic, linking humans and nature within their common habitat (Rozzi et al. 2006; Rozzi 1999, 2012). For example, Rozzi et al. (2006) presented ten inter-related principles to link biocultural conservation to nature conservation, calling for (1) inter-institutional cooperation; (2) participatory approaches; (3) interdisciplinary conservation approaches that bridge humanities and sciences; (4) networking and international cooperation; (5) communication through the media; (6) flagship species; (7) outdoor education; (8) economic sustainability and ecotourism; (9) administrative sustainability; and (10) conservation research and conceptual sustainability, which they described as a continuously evolving process for perceiving, understanding, and co-existing with biocultural diversity.

Much has been written about the conflicts and tensions that have evolved in Patagonia when neoliberal development models and practices of nature-based tourism have been inserted, at a large scale, from *above* or *outside* (e.g., Aliste et al. 2018; Bachmann Vargas and van Koppen 2020; Borrie et al. 2020; Inostroza and Cànoves 2014; Núñez et al. 2021; Schweitzer 2020). Chilean policy, law, and practice have long-favored neoliberal development driven by the transnational private sector, through open, free markets, government guarantees, weak government regulation, and authority, especially in peripheral territories like Patagonia (Borrie et al. 2020; Khan 2015; Kashwan et al. 2019; Latta and Aguayo 2012; Miranda Cabaña 2016; Núñez et al. 2018, 2019, 2020; Orellana Calderón 2020).

Yet, there are several initiatives currently underway *within* and *from* Patagonia that seek to foster biocultural reawakening, democratize science, and catalyze more holistic approaches to sustainable development through ethical travel experiences. For example, a biocultural ethic approach, combining transdisciplinary science, environmental philosophy, and a series of replicable tools (i.e., Field Environmental Philosophy, 3-Hs Model) with education and ecotourism, has evolved within the UNESCO Cape Horn Biosphere Reserve (CHBR), in the southernmost Magallanes region of Chile. In parallel, for almost two decades, communities and researchers in

Aysén have worked to define models for combining science and tourism, through bottom-up, collaborative approaches (Bourlon et al. 2021, 2022; Bourlon and Mao 2011). Finally, a fairly recent initiative has taken a pluralistic approach to evolve and expand on the concept of *natural laboratories* (Aguilera and Larrain 2018, 2021; Rozzi 2018).

We believe a more conscious integration of these concepts and initiatives might impulse a path forward, enabling a locally driven evolution of CBD, which permits Patagonian territories to begin to evolve dominant neoliberal economic frameworks and paradigms, moving toward new models of sustainable development that encompass a more holistic view of human and non-human well-beings. Thus, we employ this chapter to explore each of these three initiatives and understand their methods, trajectories, strengths, and potential to contribute to our vision of CBD, through approaches that can be developed *within* and *from* Patagonia. Our guiding question is: How might we integrate current practices to achieve holistic CBD through ethical travel experiences rooted in subantarctic bioculture? (Fig. 18.1).

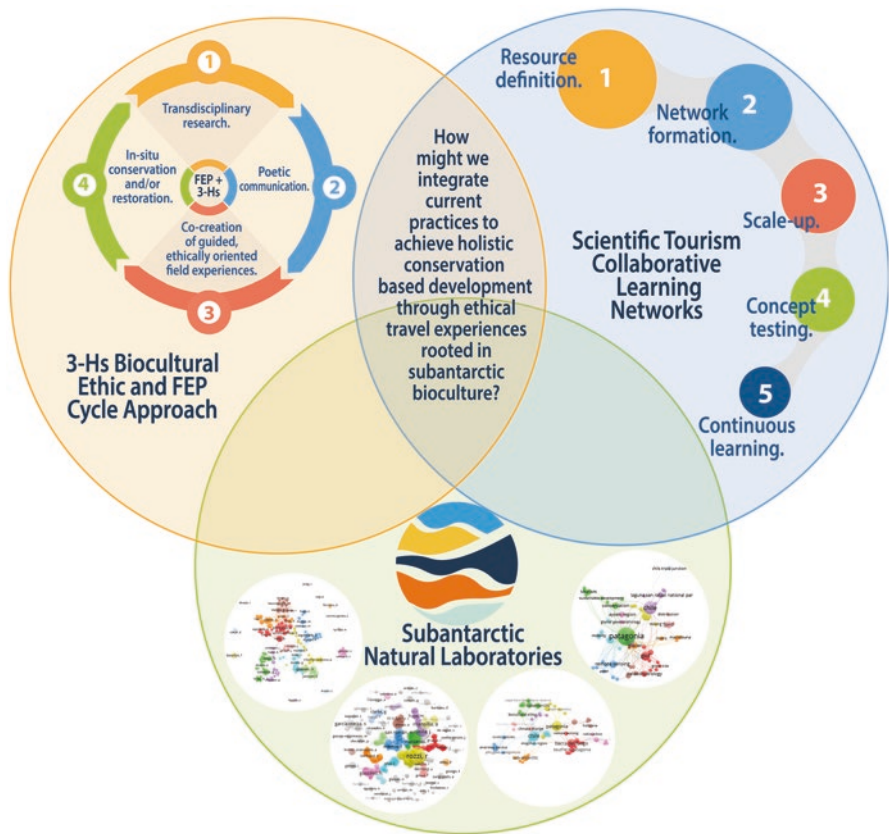


Fig. 18.1 Conceptual map for holistic conservation-based development through ethical travel experiences rooted in subantarctic bioculture

18.2 Methods

This chapter presents a mixed-methods intrinsic case study of three initiatives taking place in Chilean Patagonia—(1) the Collaborative network for the development of subantarctic natural laboratories: Strengthening scientific research and its socio-environmental and economic impacts in the Austral Macrozone project; (2) the pluralist, transdisciplinary, co-constructed educational and ecotourism programs within Omora Ethnobotanical Park (OEP); and (3) the collaborative learning networks that have been fostered around Scientific Tourism (ST) in Aysén—as possible components of an integrative post-neoliberal approach to CBD (Fig. 18.1). We chose these specific initiatives as our case study based on the particularities they involved, their trajectory within the territory, and our desire to better understand their potential for integration (Boblin et al. 2013; Stake 2003).

Qualitative inquiry focused on understanding the methods and strategies each initiative used to foster sustainable development through ethical travel experiences. For each of the three initiatives, we assembled a collection of primary and secondary data, including project documents, reports, and published academic papers; open-ended interviews with initiative collaborators, and participant observation during training initiatives, project work, and field visits (Ebneyamini and Sadeghi Moghadam 2018; Harrison et al. 2017; Rashid et al. 2019).

In addition, for the subantarctic natural laboratories (SNLs) initiative, a systematized geo-literature review and mixed methods geobibliometric analysis helped us evaluate and situate the scientific production that has occurred in two pilot SNLs during recent decades (Gale et al. 2022; Zakaria et al. 2021). These studies employed mixed methods, with a descriptive cross-sectional design. We began with a systematized literature review of peer-reviewed scientific output within the SNLs, during the period between 2000 and 2022, based on a consensual list of toponyms. Next, we invited project collaborators to nominate scientific output they felt to be important that did not surface in our search. At times, their submissions extended the original timeframe we had considered. The articles were georeferenced based on the sampling sites specified in the research. This allowed us to consider spatial aspects of the research and output in subsequent analysis. For the geobibliometric analysis, we employed VOSviewer software (version 1.6.15) to visualize bibliometric networks within the dataset, performing co-authorship and co-occurrence analyses to create graphics that would allow us to understand trends with respect to the lines of specialization and scientific collaboration in the pilot sites under study (van Eck and Waltman 2020). Clustering and relative link strength (collaboration) were indicated through differences in color, circle size, and the thickness of connecting lines (van Eck and Waltman 2020).

While data gathering and processing differed for each of the three initiatives, there were many similarities. For example, each of the three initiatives involved periods of time in which public funding was received. During these times, a fairly standard format of reporting occurred detailing objectives, beneficiaries, process, and outcomes. These commonalities allowed us to follow the recommendations of case study methodology experts (Ebneyamini and Sadeghi Moghadam 2018; Stake

2003) with respect to the holistic treatment of the intrinsic links and subjective realities of the data. A data saturation strategy guided decisions about the amount of data that was collected: the research team continued to explore and collect data until we agreed that no significant new information remained (Harrison et al. 2017; Rashid et al. 2019).

Qualitative data were processed and analyzed through an iterative approach of examining, categorizing, and tabulating the evidence gathered for each initiative to understand their processes, methods, and outcomes, with respect to our research interests: fostering biocultural reawakening, democratizing science, and catalyzing more holistic approaches to sustainable development through ethical travel experiences (Ebneyamini and Sadeghi Moghadam 2018). Our process involved a collaborative approach to data reduction, data display, and conclusion drawing and verification, in which the lead researcher conducted an initial open coding of the data to draw out primary themes, and then member checking and triangulation were employed to ensure agreement among the research team about core conclusions. Doubts and questions were resolved through an iterative process of engagement between the data and key informants who had directly participated within the three initiatives (Harrison et al. 2017; Rashid et al. 2019).

18.3 Results: Components of a Biocultural Conservation-Based Development System for Patagonia

The following section describes the results of the mixed-methods intrinsic case study with sub-sections dedicated to each of the three initiatives taking place in Chilean Patagonia: (1) Subantarctic Natural Laboratories; (2) 3-Hs Biocultural Ethic and FEP Cycle Approach; and (3) Scientific Tourism Collaborative Learning Networks.

18.3.1 Subantarctic Natural Laboratories: Fostering Transdisciplinary Research and Stewardship in Patagonia

Over the past decade, the concept of *natural laboratories* has emerged in Chile, in recognition of the potential to root science and learning within territories and harness the potential for positive spillover for local communities and economies (Aguilera 2013; Aguilera and Larraín 2021; Audretsch and Keilback 2007; Chilean National Innovation Council for Competitiveness 2013; Guridi 2018; Guridi et al. 2020). In this context, natural laboratories represent unique places that offer biophysical singularities and conditions, making them advantageous for scientific research and knowledge advancement (Aguilera 2013; Aguilera and Larraín, 2018).

These processes can occur at different spatial scales, from the micro-scale (e.g., in the collagen of a fossil bone), locality, country or continent level (Australia, Antarctica), to the macro-scale like the planet Earth. The areas of knowledge covered by these natural laboratories include earth sciences, medical, social, political, psychological, ethology, and communications.

An initial case of application of the natural laboratories concept in Chile is the one that was used to promote and internationalize astronomical research in the Atacama Desert: in Chile's northern regions, unique geologic, ecologic, climatic and atmospheric conditions conform some of the clearest, darkest, and driest skies in the world, favoring astronomic research (Aguilera and Larraín 2021; Barandiaran 2015). Chile began forming international agreements for astronomical research in the 1960s, and has since prioritized the development of policy, infrastructure, and capacities needed to ensure that this geography remains one of the best in the world for collaborative astronomical science. Moreover, since the late 1990s, strategic efforts have ensured that Chileans have sufficient access and opportunities to participate and benefit from the science taking place (Aguilera and Larraín 2021; Barandiaran 2015; Guridi 2018; Guridi et al. 2020).

Aguilera and Larraín (2021) posited the importance of local settings, interests, and actions regarding natural laboratories, recognizing these aspects as being central for enabling collaborative scientific advances and positive spillover effects. Specifically, they highlighted the need to cultivate local interest in the science taking place, suggesting the participation and support of local communities; both in terms of fostering transdisciplinary perspectives and mutual learning, and in the potential for science to create positive spillover effects for social and entrepreneurial innovation. They also emphasized the importance of protecting the unique conditions of natural laboratories, calling for policy, law, and practice that would ensure their territorial protection and conservation (Aguilera and Larraín 2021).

In 2021, Chile's National Agency for Research and Development (ANID) published a national call for proposals among actors in the Science, Technology, Knowledge and Innovation ecosystem, to promote the development of natural laboratories related to Chilean ocean, mountain, sky, desert, subantarctic, and Antarctic territories. They sought roadmaps for,

...the implementation of scientific research in Natural Laboratories in harmony with the actors that coexist in these territories, considering those factors that support the development of scientific activity in them and the effects and impacts that such activity imposes on them. (anid.cl/concursos/concurso/?id=741)

18.3.1.1 Locally Led Conceptualization and Implementation of Subantarctic Natural Laboratories

Responding to this call, a group of scientific institutions working in the subantarctic regions of Aysén and Magallanes (i.e., University of Magallanes, CIEP, Pontificia Universidad Católica de Chile, and the Universidad de la Frontera) were awarded the funding to advance their proposal, *Collaborative network for the development of*

subantarctic natural laboratories: Strengthening scientific research and its socio-environmental and economic impacts in the Austral Macrozone (Aysén and Magallanes). During 2022 and 2023, the project has established and coordinated a transdisciplinary collaborative network to co-define what subantarctic natural laboratories (SNLs) should encompass within the territory, including geographies, scientific, social, and ethical dimensions. Work has focused on identifying and prioritizing specific needs or areas for the Austral Macrozone, including the stakeholders and/or sectors that might benefit from purposeful involvement in science and related development, in accordance with pre-existing initiatives in the southern territory. A series of conceptualization workshops and participatory mapping exercises produced the following consensual working definition of SNLs:

SNLs comprise sites or geographic areas within the subantarctic Chilean region between 43° and 60° South, where processes and/or phenomena of scientific interest occur that, from a regional and global perspective, are essential to understand. The LNSs will promote forms of scientific development that integrate social dimensions, facilitating impact within the national and international scientific community, as well as in local communities. It is also fundamental that the science developed in SNLs encompasses activities and multiple scientific disciplinary perspectives. SNLs should be linked with public policies that enable the continuous development and improvement of place-based scientific capacities (i.e., disciplinary-related capacities and facilitating elements, such as access, infrastructure, and equipment), which enable the decentralized development of science, technology, knowledge, and innovation. Hence, these LNSs contribute to sustainable development of the local territory.

Working from this definition, transdisciplinary processes and collaborators defined four pilot LNSs: Palena River Delta (PRD), San Rafael Lagoon (SRL), Madre de Dios Archipelago (MDA), and Cape Horn (CH). Then, among other initiatives that have advanced work to operationalize the LNS concept within the Austral Macrozone territory, a geobibliographic characterization of scientific knowledge production, interests, and actors was developed for the two larger pilot LNSs—SRL and CH—to understand how science has been concentrated and evolved over the past few decades.

18.3.1.2 Geobibliographic Characterization of the Subantarctic San Rafael Lagoon Natural Laboratory Pilot Area

A total of 225 articles, published between 2000 and 2022, surfaced within the geobibliographic characterization of the SRL-SNL pilot area. These articles involved a total of 699 co-authors (Fig. 18.2). Articles were concentrated most heavily around Caleta Tortel, with several studies related to the Martínez, Baker, and Steffen Fjords. The eastern reaches of the Northern Patagonia Ice Field represented another research hotspot, with several projects situated around Cochrane, and the area of the Nef and Colonia Glaciers. The rest of the Northern Patagonia Ice Field and the areas surrounding the San Rafael Lagoon and Glacier were also represented within the

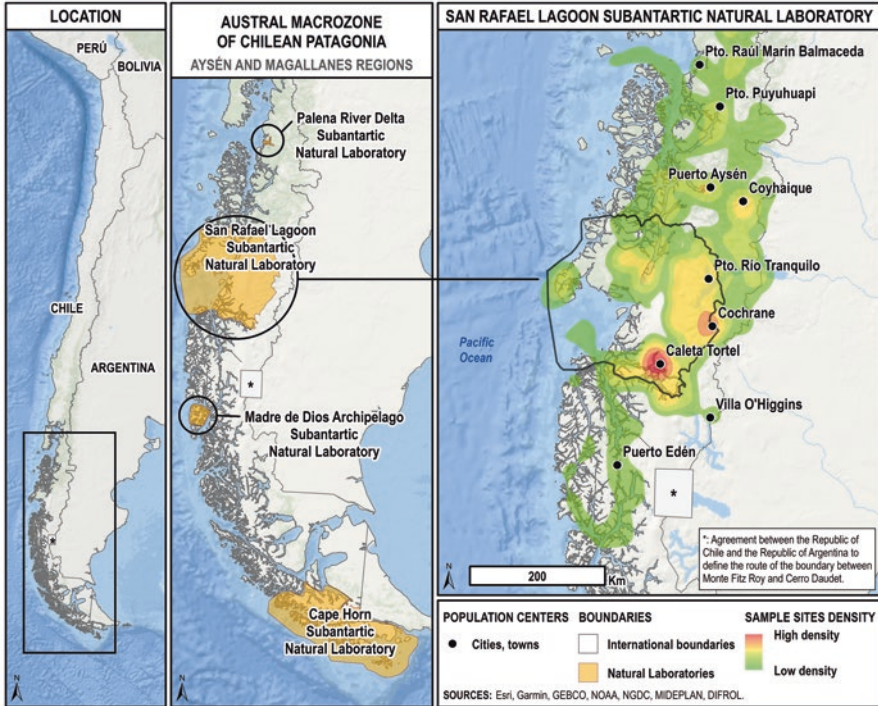


Fig. 18.2 Scientific hotspots of the San Rafael Lagoon subantarctic natural laboratory pilot area

research as well as isolated points in the surrounding communities of Coyhaique, the Aysén Fjord near Puerto Aysén, and the Puyuhuapi Fjord near Puerto Puyuhuapi.

Figure 18.3 demonstrates the co-authorship networks that emerged within the scientific literature characterized for the SRL-SNL pilot site, during the period 2000–2022. A total of 699 authors were identified. Of note are Glasser, N. (13 articles), Bertrand, S. (12 articles), Harrison, S. (12 articles), Casassa, G. (10 articles), and Reid, B. (10 articles), who were co-authors with 10 or more publications each. Most authors were involved in less than three publications. Algorithmic clustering approaches were used to construct article-level classifications based on the 70 keywords that were identified within the SRL-SNL articles, returning a total of 184 links between them. The links between keywords were analyzed using the Leiden algorithm (Traag et al. 2019), identifying 13 independent clusters. The first six of these clusters helped us infer the main lines of research that have occurred within the SRL-SNL pilot site, during the period 2000–2022. These lines have been described as: *Glaciology and climate change in Patagonia*, *Patagonian flora and fauna*, *Tourism, territories, and landscapes*, *Consequences of glacial melting in the Baker River*, *Photogrammetry applied to glaciological studies*, and *Hydrochemistry and marine biology*.

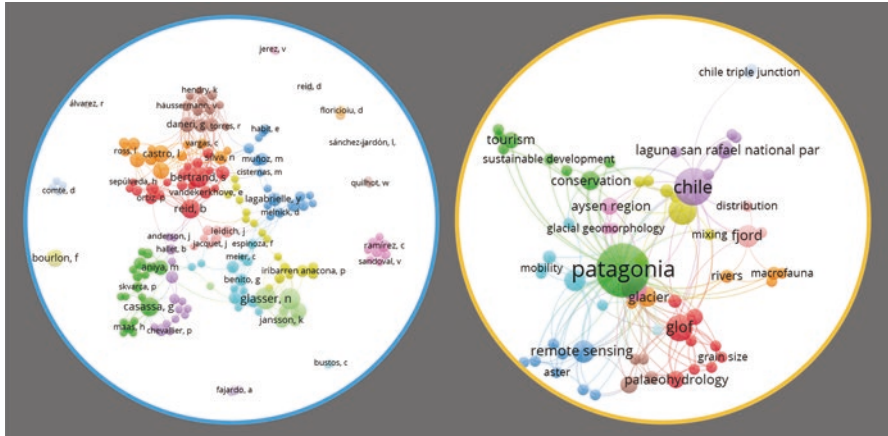


Fig. 18.3 Co-authorship and keyword networks for the scientific literature produced for the San Rafael Lagoon subantarctic natural laboratory pilot area, during the period 2000–2022

Table 18.1 Keywords associated with each of the six research lines in the San Rafael Lagoon subantarctic natural laboratory pilot area

Research line	Associated keywords
Glaciology and climate change in Patagonia	Patagonia, Chile, GLOF, North Patagonian Icefield, remote sensing, climate change, South America, fjord, Aysén region, conservation, geomorphology, glacier, mountain glaciers, palaeohydrology, aster, cachet 2 lake, glacier velocity, holocene, late holocene, neoglaciation, passive microwave, “little ice age,” floodplain, glacier mapping, Tierra del Fuego, turbidite, grain size, Laguna san Rafael National Park, little ice age, rivers
Patagonian flora and fauna	Chilean Patagonia, biodiversity, biogeography, endemism, flora, mixing, lichens
Tourism, territories, and landscapes	Tourism, territory, actors, landscape
Consequences of glacier melting in the Baker River	Baker river, glacial retreat, mobility
Photogrammetry applied to glaciological studies	Disaster monitoring, image sequence processing, photogrammetric network
Hydrochemistry and marine biology	Macrofauna, <i>Percichthys trucha</i> , stable isotopes

Glaciology and climate change in Patagonia was the most developed research line that emerged, while the *Tourism, Territories, and Landscapes*, and *Photogrammetry applied to glaciological studies* lines showed high levels of specialization and low volumes of output. The *Patagonian flora and fauna* and *Hydrochemistry and marine biology* lines were less developed, suggesting that these areas represent emergent interest within the SRL-SNL. Table 18.1 provides the primary keywords associated with the research in each of the six research lines of the SRL-SNL.

18.3.1.3 Geobibliographic Characterization of the Cape Horn Subantarctic Natural Laboratory Pilot Area

A total of 150 articles, published between 1980 and 2022, surfaced within the geobibliographic characterization of the CH-SNL subantarctic natural laboratory pilot area (Fig. 18.4). These articles involved a total of 529 co-authors. Articles were concentrated most heavily around Puerto Williams, with studies located in and around the OEP on Navarino Island, the Beagle Channel, and the Yendegai Fjord. A little further west, we found another hotspot, related to the Darwin Mountain Range and Pía Bay. Other areas of research concentration were identified around Punta Arenas and in the Cape Horn Archipelago, in the southernmost part of the CH-SNL limits. Some terrestrial sectors like the Isla Grande de Tierra del Fuego north of Puerto Williams, the Brunswick Peninsula near Punta Arenas, and the area around Inútil Bay near Porvenir were also reflected within the dataset, as were some maritime sectors, like the Strait of Magellan and other fjords of the Magellanic archipelago.

Figure 18.5 demonstrates the co-authorship networks that emerged within the scientific literature characterized for the CH-SNL pilot site, during the period 1980–2022. For this pilot SNL, a total of 529 authors were identified. The most

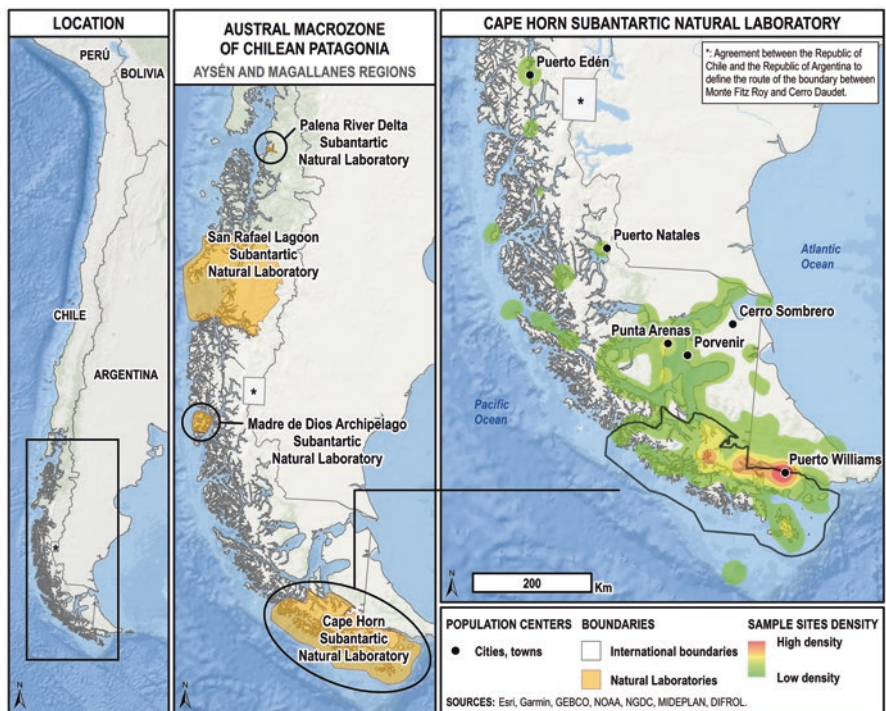


Fig. 18.4 Scientific hotspots of the Cape Horn subantarctic natural laboratory pilot area

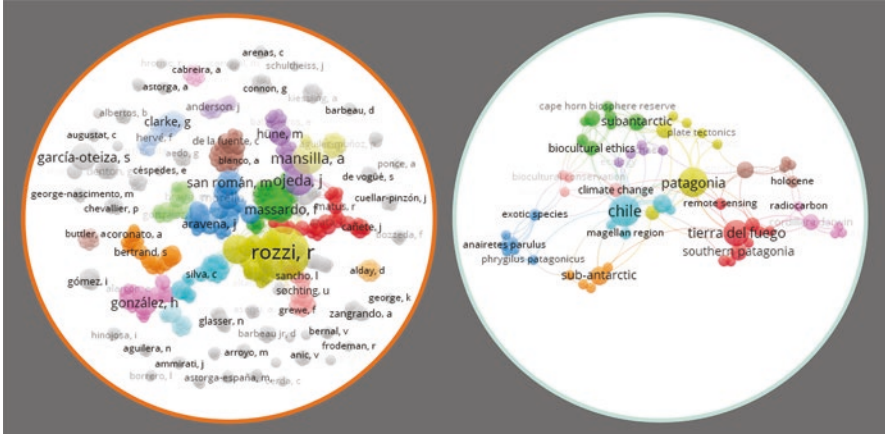


Fig. 18.5 Co-authorship and keyword networks for the scientific literature produced for the Cape Horn subantarctic natural laboratory pilot, during the period 1980–2022

productive co-authors were Rozzi, R. with 23 publications, Mansilla, A. with eight publications, Mackenzie, R., and Ojeda, J. with seven publications each, and García-Oteiza, S. with six publications. The remaining authors have five or fewer publications. A total of 61 keywords were identified within the CH-SNL articles, with 163 links between them. As before, the Leiden algorithm (Traag et al. 2019) was employed to identify links between the keywords, returning seven independent clusters that were coherent enough to be considered lines of research. These lines have been described as: *Biodiversity conservation in sub-Antarctic Patagonia*, *Biocultural resources in the face of climate change*, *Paleo-archaeology of Tierra del Fuego*, *Ornithological studies in Tierra del Fuego*, *Postglacial South American palynology*, *Geological studies in the Isla Grande of Tierra del Fuego*, and *Endozoochoric in the subantarctic territory*.

Table 18.2 provides the primary keywords associated with the research in each of the six research lines of the CH-SNL.

The *Biodiversity conservation in sub-Antarctic Patagonia* and *Biocultural resources in the face of climate change* lines were the most developed; but require further specialization and development in order to be considered as *consolidated*. The *Postglacial South American palynology* and *Ornithological studies in Tierra del Fuego* lines showed good rates of development, despite high levels of specialization and low volumes of output. The *Paleo-archaeology of Tierra del Fuego*, *Geological studies in the Isla Grande de Tierra del Fuego*, *Endozoochoric studies in the sub-Antarctic territory*, and *Hydrochemistry and marine biology* lines had not reached important levels of performance, because they deal with emerging topics within the CH-LNS.

Table 18.2 Keywords associated with each of the seven research lines in the Cape Horn subantarctic natural laboratory pilot

Research line	Associated keywords
Biodiversity conservation in sub-Antarctic Patagonia	Chile, Patagonia, conservation, subantarctic, biogeography, biodiversity, drake passage, glacier, Antarctica, limnology, archaea, bacteria, plate tectonics, protected areas, tectonics
Biocultural resources in the face of climate change	Environmental ethics, biocultural ethics, climate change, field environmental philosophy, bryophytes, Cape Horn biosphere reserve, ecology, lichens, sub-Antarctic Magellanic ecoregion, biocultural conservation, biosphere reserves, Cape Horn
Paleo-archaeology of Tierra del Fuego	Tierra del Fuego, southern Patagonia, little ice age, remote sensing, beagle channel, hunter-gatherers, neoglacial, southernmost South America, zooarchaeology
Ornithological studies in Tierra del Fuego	Exotic species, <i>Elaenia albiceps</i> , <i>Anairetes parulus</i> , <i>Navarino</i> , <i>Phrygilus patagonicus</i> , <i>Turdus falcklandii</i> , <i>Zonotrichia capensis</i>
Postglacial South American palynology	South America, holocene, pollen analysis, pollen preservation, southern westerly winds
Geological studies in the Isla Grande of Tierra del Fuego	Cordillera Darwin, in situ monazite, pseudosection, radiocarbon, thermocalc
Endozoochoric studies in the sub-Antarctic territory	Sub-Antarctic, diet, distribution, endozoochoric, mosses

18.3.2 *Tools for Rebuilding Connections: The Habits, Co-inHabitants, Habitats (3-Hs) Biocultural Ethic and the Field Environmental Philosophy Cycle*

Over the past 20 years, the OEP has developed and practiced a novel methodological approach to break down the barriers created by biocultural homogenization and reconnect visitors and students with other people, culture, and nature. The *Field Environmental Philosophy* (FEP) Cycle Approach (Fig. 18.6) helps participants overcome the physical and conceptual barriers that catalyze processes of biocultural homogenization through a purposeful cycle involving (1) transdisciplinary ecology and philosophy research, (2) composition of metaphors and communication through simple narratives, (3) design of field activities guided with an ecological and ethical orientation, and (4) the identification and implementation of in situ conservation areas. The FEP Cycle Approach is based on a systemic approach of the biocultural ethic (i.e., 3-Hs) that values the links that have co-evolved between life *Habits* of *co-inHabitants* (humans and other-than-humans) who share a common *Habitat* (Rozzi 2012). The FEP Cycle Approach represents a philosophical practice for epistemological and ethical reasons. It is *epistemological* because participants not only investigate biological and cultural diversity, but they also investigate the methods, languages, and worldviews through which scientific and other forms of ecological knowledge are forged. It is *ethical* because the aim is not only to research and learn about biological and cultural diversity but, foremost, to learn to respectfully co-inhabit within it.



Fig. 18.6 The four-step cycle of the field environmental philosophy methodological approach

Whether or not conservation has an ethical obligation to benefit local communities is a question of values that should be negotiated and debated from the community level to transnational conservation forums (Igoe and Brockington 2007; Kashwan et al. 2019; Khan 2015; Kumi et al. 2014; Ranta 2018; Shreve 2012; Sims 2017). But such negotiations and debates are better informed by considering the role that humans from diverse cultures have played for centuries in the maintenance of biodiversity in different ecosystems, and the current role they play as custodians of biocultural rights (Bavikatte and Bennett 2015; Rozzi et al. 2018). A foundational principle of the biocultural ethic’s 3-Hs framework is that conservation takes place in social-cultural-political contexts which are influenced by local biophysical and culturally particular conditions (Rozzi 2015b).

Thus, the FEP Cycle Approach recognizes that multiple forms of knowledge are necessary to solve social-environmental problems. For this reason, findings and data generated through this process are co-produced with and for the community, including decision makers and government authorities, to yield practices and actions that address problems at distinct scales. This integration of theory and practice fosters an ethic of responsibility, community solidarity, and concern for the well-being of the ecosystems, including their human and other-than-human co-inhabitants (Rozzi et al. 2012).

Applying the 3-Hs Biocultural Ethic and FEP Cycle in Omora Ethnobotanical Park The OEP, created in 2000, near Puerto Williams, is one of the core PAs within the Cape Horn Biosphere Reserve, and Chile's southernmost continental Long-Term Socio-Ecological Research (LTSER) site. With more than 20 years of ongoing research, monitoring, and community outreach, the OEP helps protect a representative mosaic of the Cape Horn archipelago's sub-Antarctic habitats found south of Tierra del Fuego, including the Róbalo River watershed and the Dientes de Navarino Mountain Range. Pluralist, transdisciplinary, co-constructed educational and ecotourism programs, based on the FEP Cycle Approach and the 3-Hs model, have promoted direct encounters with biocultural diversity for more than 20 years in OEP, forming an integral and long-standing priority within the OEP approach (Figs. 18.7 and 18.8).

These programs have been developed to help participants recover an awareness of their coexistence with a multiplicity of human and non-human beings. They help the OEP remediate the reduction of biocultural diversity taking place within the context of global and climate change, by rebuilding connections between humans and nature (Rozzi et al. 2010a, b, 2014). As such, they are a central part in the OEP approach to linking biocultural conservation with nature conservation, through the ten interrelated principles mentioned above.

These, and other FEP Cycle Approach experiences, have demonstrated the capacity of this methodology to transform socio-ecological relationships (Rozzi et al. 2014). They can involve an endless range of non-human inhabitants and a wide range of human participants in their creation and lived experiences: scientists, university students, administrators, policymakers, politicians, families, local holders of knowledge and experience, teachers, and schoolchildren, to name a few. They help people to "change the lenses" with which they normally experience bioculture. For example, the poetic communication and co-created field experiences help them appreciate values and symbolic-linguistic realities, usually reserved for philosophers (Rozzi et al. 2014). And, these first-hand experiences, driven by transdisciplinary research, transform their understanding of ecosystems, permitting them to approach and value new biophysical dimensions, usually studied by ecologists (Rozzi et al. 2014).

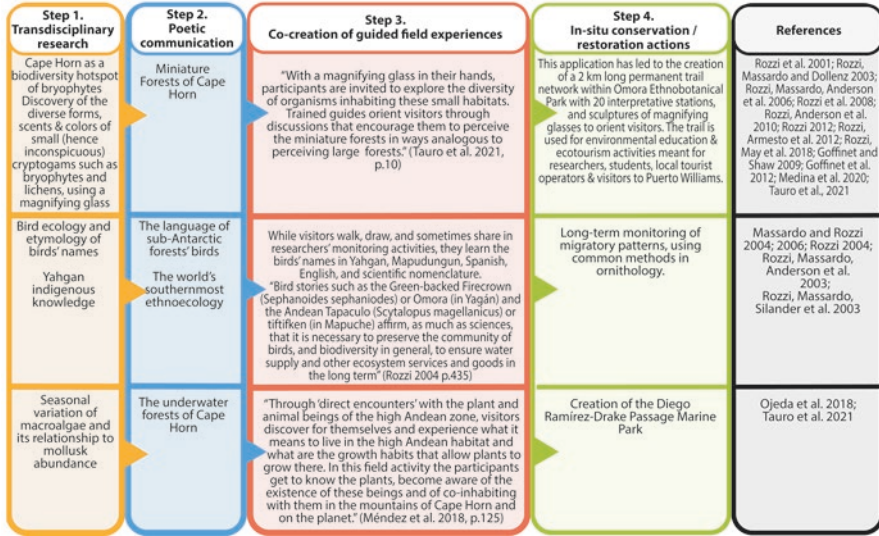


Fig. 18.7 Field environmental philosophy cycle approach: Bryophytes; Bird ecology and etymology; and Microalgae examples from Omora ethnobotanical park

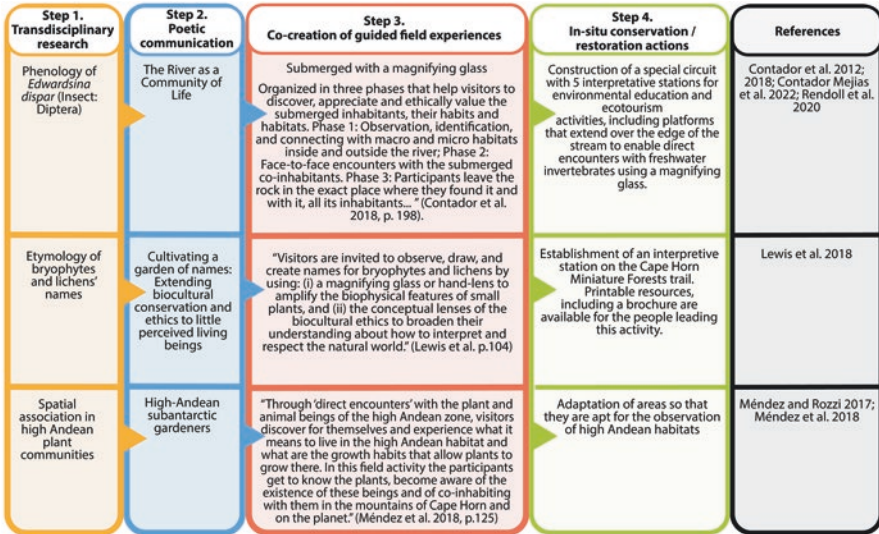


Fig. 18.8 Field environmental philosophy cycle approach: Phenology; Entomology of bryophytes and lichen; and Spatial association examples from Omora ethnobotanical park

18.3.3 Collaborative Learning Networks: Scientific Tourism Research and Development in Aysén

Around 2006, the concept of *Scientific Tourism* (ST) began to evolve within the Aysén Region of Chilean Patagonia, influenced by growing recognition of the importance science could play in Western Patagonia for understanding the social-cultural and natural processes associated with climate change. Discussions advanced the idea of positioning tourism in Aysén in relation to areas of science, and in 2007, the Center for Investigation in Ecosystems of Patagonia (CIEP) was awarded funding for an initial regional innovation project that would develop concrete proposals around how to develop and promote ST. This project enabled early research to advance around the objectives and forms of ST.

From the offset, ST in Aysén focused on supporting socio-ecological systems sustainability while augmenting territorial connections, competitiveness, and concern (Bourlon 2020; Bourlon et al. 2021, 2022; Mao and Bourlon 2011, 2016; Mao et al. 2016). Actors defined ST as, “an activity where visitors participate in the generation and dissemination of scientific knowledge being developed by research and development centers” (scientific-tourism.org). It differed from learning tourism in that it was (and is) grounded in the scientific process and focused on knowledge generation and dissemination (Bourlon and Torres 2016). Four main segments for ST experiences have been identified that can overlap and intersect within destinations and projects: (1) exploration and adventure tourism, with a scientific dimension; (2) cultural tourism of scientific interpretation, which is close to ecotourism or, also, to industrial tourism; (3) scientific eco-volunteering; and (4) scientific research tourism (Bourlon and Mao 2011).

A second project, from 2009 to 2012, complemented project research with actions designed to create the structure and capacities for a ST Collaborative Learning Network. The project established the Consortium for ST in Patagonia, made up of nine Chilean and five international companies. CIEP coordinated the group of participating institutions through a management model called the Center for ST in Patagonia (CTCP) with the objective of supporting public activities, articulating pilot public-private ST initiatives, and knowledge sharing with organizations linked to the conservation and care of natural and cultural heritage. A broad group of experts was convened within a *Council for Science and Tourism in Aysén*, including representatives of the private sector (e.g., Coyhaique Chamber of Tourism, Patagonian Guides School, Conservación Patagónica, Grande Traversée des Alpes in France), the public sector (Chilean National Forestry Corporation; National Environment Commission; regional councils of culture, public lands, agricultural services, tourism, and hydric resources; representatives of municipalities and the regional government), and academic and research institutions (CIEP; Trapananda Center of the Universidad Austral de Chile; Department of Sociology and Anthropology of the Universidad de Concepción; the National Museum of Natural History of Santiago; the Museum of Pre-Columbian Art of Santiago; the Society of History and Geography of Aysén; Aúmen Conservation; University of Grenoble in

France; the University of Montana; the University of West Virginia; and The Sonoran Institute in the United States). During the project, the Council contributed to regional socioeconomic development based on tourism, supporting regional operators and entrepreneurs by providing work methodologies and offering training in the field of science with the aim of bringing science and tourism together. As well, the Council advised the CTCP on strategic lines of action and best practices to ensure that the ST concept safeguarded the regional public interest in terms of environmental protection, local economic development, and dissemination of the natural and cultural heritage.

The collaborative, interdisciplinary nature of the project achieved through the ST Collaborative Learning Network approach, became a core aspect that has defined subsequent ST in Aysén and beyond. From 2013 to 2016, this approach was employed for ST development within the Patagonian Archipelagos, as part of a technical cooperation agreement between CIEP and the Multilateral Investment Fund of the Inter-American Development Bank. During this period, work focused on helping local communities and tourism operators, working within the Patagonian archipelagos, develops a world-class destination for ST. Through the integration of tourism and science, this destination would enhance the development of scientific knowledge of its fragile ecosystems and transform that science into the primary resource for the creation of economically viable, socially inclusive, and environmentally sustainable tourism products. Through the expansion of the ST alliance of public and private partners with new actors who were strongly committed to inclusive territorial development of the Aysén coast, the project sought to promote ST as a mechanism for improving the quality of life and socioeconomic growth of local communities within the coastal towns of Aysén.

Over the years, as researchers and communities have learned together, ST development has become increasingly focused on connecting communities with their territories through science (Veloso 2021). In fact, the ST product development process (Fig. 18.9), which is built through ST Collaborative Learning Networks, has been shown to provide benefits for communities, in and of itself. Working through this process can contribute to sustainable practices that support resource patrimonialization and territorial coherence (Bourlon 2020; Bourlon and Torres 2016). The ST development process works through knowledge and learning exchanges which strengthen the scientific process, local knowledge, and heritage through coordinated collaboration and research conducted by scientists, stakeholders, communities, and visitors. This resulting collaboration chain, “increases focus and awareness around natural and cultural resource management, incentivizing a more resilient form of tourism development” (Bourlon et al. 2021, p. 20).

In the first stage, scientific heritage resources are identified for the geography of focus. During the second stage, destination level actor networks are cultivated, by matching local actors with scientists who live and/or work in the area, tourism entrepreneurs, and technical organizations (e.g., local government, funders, tourism management institutions), based on mutual areas of focus. Once the network has begun to work together, focus shifts in the third stage to a collaborative identification and prioritization of sites and themes that would be apt for linking scientific

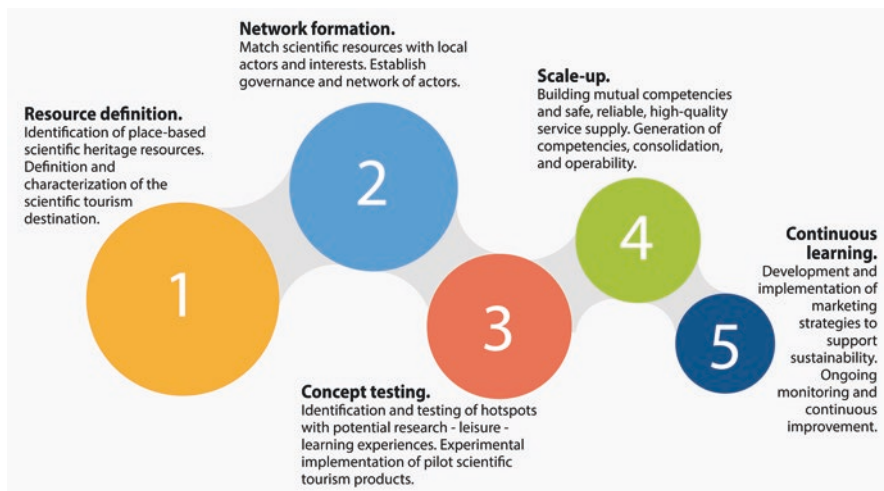


Fig. 18.9 The five-phase Scientific Tourism Collaborative Learning Networks product development process

research with recreation and educational activities through pilot initiatives. This phase includes the process of developing the conceptual pilot initiatives, including plans for the activities, staffing needs, appropriate group sizes, protocols to ensure the resilience of resources and safety of participants, and initial pricing guides. The fourth phase implements the pilot, through a series of experiential learning tests that help the network build mutual competencies, refine a service supply-chain, and produce materials to support scientific dissemination and participatory science. During this phase, initial experiences are conducted with small groups of visitors who can provide feedback to help refine processes. Once the ST products have been thoroughly tested and supply-chains systems are consolidated, final pricing is set, and the fifth stage develops and implements strategies for communication, promotion, and market access to foster economic viability (Bourlon et al. 2021).

Collaborative Learning Networks Apply the Five-Phase Scientific Tourism Process in Aysén Since its creation, the ST process has been used to develop a range of products and destinations within local communities throughout the Aysén Region (Figs. 18.10 and 18.11). Thus, ST emphasizes the scientific heritage of places and people. It seeks to develop networks of local actors and scientists within a specific geography, so that they begin to learn together, in a process that joins collaborative transdisciplinary science, tourism, and traditional research practices. When communities decide to become ST destinations, they choose one or more long-term areas of science and begin a process of long-term study, experience, learning, and monitoring. Working together with the scientific community, they design tourism programs to integrate scientific fieldwork with tourism experiences. This process helps communities and territories build shared knowledge through its collaborative learning network approach.

1 Initiative / Lead Scientist	2 Local Actors Network	3 Outcomes	4 Scientific Fields	5 Geography in Aysén
Resource definition. "Patagonian Geographies of the Imaginary" <i>Gabriel Inostroza, Universidad Austral de Chile, Patagonia Campus</i>	Network formation. Actors from the tourism sector, municipalities, guides, and park guards; Austral University of Chile, Patagonia Campus; Centro de Investigación en Ecosistemas de la Patagonia (CIEP); National Agency for Research and Development (ANID); Destino Patagonia; Ecotourism Patagonia Explorers; Aysén Films; Rio Exploradores Tourism; Society of History and Geography of Aysén; National Forestry Corporation (CONAF), Aysén Region, Association of Tourism Professionals of Chilean Patagonia (APROT).	Concept testing. This study involved a range of actors and experiential activities in terrain to explore how social representations of the lived and imaginary spaces of the General Carrera Lake and the Explorers Valley are constructed.	Scale-up. Related experiences were associated with: Territorial Planning and Productive Activities Ocean and Earth Dynamics History and Culture	Continuous learning. Opportunities for operators around General Carrera Lake, Exploradores Valley, Puerto Ingeniero Ibáñez
Resource definition. "Conservation tourism in Coastal Protected Areas" <i>Madeleine Hamamé, CIEP</i>	Network formation. CIEP; ANID; Turismo Cauelche Turismo y Servicios Cisnes Ltda.; University of Aysén; Centre for the Study of Regional Development and Public Policy (CEDER); University of Los Lagos; Puerto Cisnes Chamber of Tourism and Commerce; Professional Group of Nautical Tourism and Conservation of Cetaceans; Municipality of Cisnes; Puerto Gaviota Tourism Committee; CONAF; Aysén Regional Government (GORE)	Concept testing. Increased knowledge of the distribution and relative abundance of benthic species of Magdalena Island National Park and of cetacean species in the Puyuhuaqui Fjord. Finally, it generated social capital indicators for coastal localities that carry out tourism associated with cetacean sightings (Marin Balmaceda, Puyuhuaqui, and Puerto Gaviota).	Scale-up. Related experiences were associated with: Benthic Biodiversity Cetaceans' acoustics (dolphins, porpoises) Social Sciences	Continuous learning. Opportunities for operators around Cisnes Commune, Puerto Cisnes, Puerto Gaviota
Resource definition. "Community Cetacean Census" <i>Jacqueline Boldt, Universidad Austral de Chile, Patagonia Campus; Aysén Mira el Mar NGO</i>	Network formation. Aysén Mira el Mar NGO; University Austral de Chile; Municipality of Cisnes; Puerto Cisnes Chamber of Tourism and Commerce; Professional Group of Nautical Tourism and Conservation of Cetaceans; Municipality of Cisnes; Puerto Gaviota Tourism Committee	Concept testing. Aysén Mira el Mar invited the citizens of Aysén to identify and learn about the insular territory in which they live and work, as a landscape of opportunities; an archipelagic zone where fjords and channels connect us to a conservation territory that belongs to all.	Scale-up. Related experiences were associated with: Earth and Ocean Dynamics Territorial Planning and Productive Activities Flora, Fauna, Ecosystems and Population Dynamics	Continuous learning. Opportunities for the community and operators around Cisnes Commune, Puerto Cisnes, Puerto Gaviota

Fig. 18.10 Recent sustainable tourism initiatives in Aysén: Patagonian geographies of the imaginary; conservation tourism in coastal protected areas; and Community Cetacean Census

1 Initiative / Lead Scientist	2 Local Actors Network	3 Outcomes	4 Scientific Fields	5 Geography in Aysén
Resource definition. "Exploring the Ofqui Isthmus" <i>Fabien Bourlon, CIEP</i>	Network formation. CIEP; University Grenoble Alpes, France; Destination Patagonia; Rio Exploradores Tourism; 15 professionals and researchers linked to various disciplines (botany, geology, biology, anthropology, tourism, among others)	Concept testing. The 3-week "Istmo de Ofqui Expedition" explored the San Rafael Lagoon National Park and Biosphere Reserve, gathering important information on a fragile and unknown ecosystem that is already subject to tourism, fishing and industrial activities.	Scale-up. Related experiences were associated with: History and Culture Flora, Fauna, Ecosystems and Population Dynamics	Continuous learning. Opportunities for operators around Aysén Province, San Rafael Lagoon National Park and Biosphere Reserve
Resource definition. "Route of the Museums of Aysén" <i>Gustavo Saldivia, Museum Regional of Aysén</i>	Network formation. Aysén Regional Museum Team; Local public officials and tourism guides in the Municipalities of Ibáñez and Tortel, Universidad Austral de Chile, CIEP, Arkas Consultores, Sociedad de Historia y Geografía.	Concept testing. Regional tourism operators learned about and integrated regional heritage (cultural and natural) with their local tourism products and services, introducing scientific content within their tourism operations, through a structured process of knowledge transfer that happened within their local communities and settings.	Scale-up. Related experiences were associated with: Flora, Fauna, Ecosystems and Population Dynamics History and Culture Earth and Ocean Dynamics	Continuous learning. Opportunities for operators around Communes of Río Ibáñez and Tortel
Resource definition. "Palena River Basin, from the Steppe to the Sea" <i>Fabien Bourlon, CIEP</i>	Network formation. Corporation for the Development of Aysén; CIEP; 30 agro-tourism service providers and local operators; Merrill Foundation, Switzerland.	Concept testing. Employed the scientific tourism process with communities in the north of the region, producing informative scientific knowledge sheets on heritage and scientific topics and training workshops to build awareness, learning, and tourism valorization.	Scale-up. Related experiences were associated with: Flora, Fauna, Ecosystems and Population Dynamics History and Culture Earth and Ocean Dynamics	Continuous learning. Opportunities for the community and operators around Provinces of Aysén and Coyhaique, Communes of Cisnes and Lago Verde

Fig. 18.11 Recent sustainable tourism initiatives in Aysén: Route of the Museums of Aysén; exploring the Ofqui Isthmus; and Palena River Basin, from the steppe to the sea

18.4 Discussion

This section discusses important considerations related to possible integration of the three initiatives developed within the Aysén and Magallanes regions of Chilean Patagonia: (1) 3-Hs Biocultural Ethic and FEP Cycle Approaches; (2) ST Collaborative Learning Networks; (3) Subantarctic Natural Laboratories, to promote biocultural conservation and more holistic forms of CBD (Hanspach et al. 2020). We begin by considering the potential to transfer the local experiences of the FEP Cycle Approach within the OEP and ST Collaborative Learning Networks within Aysén to other geographies, cultures, and contexts, as this would be an important consideration for building an integrated approach. Then, we discuss how the geobibliometric results can inform local strategies, employing an integrated approach.

18.4.1 *Considerations for Transferability of the FEP Cycle Approach and Scientific Tourism Learning Networks*

FEP's methodological approach seeks to integrate social, economic, and environmental dimensions of sustainability by generating new links between biological and cultural diversity at different spatial and social scales. By incorporating a philosophical foundation, the FEP Cycle Approach broadens both understanding and practices of sustainable tourism. What is more, recent experiences suggest strong potential to replicate and transfer the FEP Cycle Approach within other geographies, cultures, and contexts, including the Aysén Region.

Already, there are initiatives within the Aysén region that have incorporated the 3-Hs biocultural ethic. For example, social and environmental challenges for sustainable development drove an innovation based on wild and cultivated edible mushrooms, called *Hongusto* (from *hongo* = fungi and *gusto* = taste). *Hongusto* links key regional actors in education, tourism, and agricultural production with the scientific community, around basic knowledge of the ecology and biodiversity of edible fungi, offering a reference for regional initiatives for research, conservation, tourism, and sustainable production of mushrooms (Sánchez-Jardón et al. 2017). Before the project, fungi species diversity and ecological relevance were almost completely unknown; hence, local communities underestimated the long-term environmental consequences of potential biodiversity losses. The project incorporated ethical travel experiences through *fungus tourism* itineraries which continue to inspire local tour guides offering mycological tours. Rozzi's (1999) biocultural ethics was also employed in Aysén to inform the "Subantarctic Sciences Open Laboratory," an initiative aimed at fostering the in situ connections between scientists and local communities. The initiative questioned why laboratories are typically reserved for scientists and viewed as the places from which the most valuable scientific knowledge is generated. Hence, the project employed open-spaces within the communities of Aysén to conduct scientific processes, including environmental

knowledge exchange, research dissemination, and idea generation around solutions for environmental issues, and nature-based tourism concerns (Sánchez-Jardón et al. 2022).

The complete FEP Cycle Approach has been transferred to a range of other geographies, cultures, and biophysical contexts. It helped advance transdisciplinary research and experiences related to the starfish along the California Gulf, which are part of the rich biodiversity of southern Baja California. In this sea, starfishes have been widely studied from the natural sciences, but not from human disciplines. Nevertheless, native languages and traditions are still alive among fishermen and communities that inhabit the Baja California territory. Using the interdisciplinary approach of FEP, Moreno-Terrazas et al. (2022) investigated education and conservation processes that have occurred around the coastal and marine areas of Baja California Sur, combining marine biology, environmental history, and philosophy. With this approach, Moreno-Terrazas et al. (2022) designed a low-impact ecotourism practice oriented around the metaphor, *from the starfishes to the stars in the sky* and two field activities: *starfish viewing*, and *marine philosophical hiking*. These experiences facilitate face-to-face encounters with marine co-inhabitants that shine in the ineffable vermilion landscape of submerged ecosystems.

The ST Collaborative Learning Networks approach, as developed in Aysén, has also been replicated within other geographies, cultures, and contexts. For example, in 2018, existing networks were combined and expanded through the creation of the International Network for Scientific Tourism Research and Development (ISTN). The ISTN brings together institutions and actors in the fields of university education, scientific research, and tourism management, to promote mutual learning, collaboration, and support between researchers, trainers, entrepreneurs, public managers, and local communities that are interested in analyzing and promoting this form of tourism. ISTN members represent institutions around the world, including CIEP, the Universidad Austral de Chile, the Université Grenoble Alpes in France, the Université de Québec Trois Rivières in Canada, the Universidade de Caxias do Sul in Brazil, Chile's Pontificia Universidad Católica, the Victoria University of Wellington New Zealand, the Universidade de Algarve and the Polytechnic Institute of Tomar in Portugal, the Universidad Agraria Nacional La Molina of Peru, the Corporación Privada para el Desarrollo de Aysén, the Tecnológico de Estudios Superiores in Valle de Bravo Mexico, the Regional Museum of Aysén, the La Croisée des routes in the French Alps, the Aysén Mira al Mar Foundation, the Centro de Estudios Avanzados en Zonas Áridas (CEAZA), and the Centre de Recherches de Ecosystèmes d'Altitude (CREA) in Chamonix France.

A number of international ST projects have been developed through the local learning networks of the ISTN members. These include the Bravo Valley Monarch Butterfly Network in central Mexico; the Alpine Botanical Garden, Chalet-laboratory, and Alpe Gallery of Lautaret, France; ST training and support for the creation of a UNESCO Geopark in the Campos de Cima da Serra Gaúcha; a volunteering ST project with walking tours through Algarve's Mediterranean landscape and flora in Portugal; the Mont Blanc participatory science program, and Project RefLab, which involves high mountain ST based climate change monitoring in the Sentinel Shelters of the French Alps (Viallette et al. 2021).

18.4.2 Implications of the Geobibliometric Analysis of the Science Occurring in Pilot Subantarctic Natural Laboratories

While the 3-H framework of the biocultural ethic and the FEP Cycle Approach provide the methodological tools for co-constructing ethical travel experiences rooted in bioculture, and ST Collaborative Learning Networks offer the frameworks for building systems and commercialization, the development of subantarctic natural laboratories (SNLs) may provide an important ongoing policy and program mechanism to facilitate the evolution of subantarctic scientific research agendas and approaches. Results of the geobibliometric analysis developed within this intrinsic case study demonstrate some of the core themes and actors advancing scientific understanding within the SRL-SNL and CH-SNL and help identify gaps that require future concentration and support. For example, within the SRL there was a broad, well-developed line of research around glaciology and climate change that seems apt for incorporation within co-constructing ethical travel experiences. Other lines, which are less developed (e.g., *Consequences of glacier melting in the Baker River; Hydrochemistry and marine biology*), might find a way forward within the transdisciplinary approaches of the FEP Cycle Approach. And, while this area did indicate some social consideration, within the highly specialized work of the *Tourism, Territories, and Landscapes* line, the overall lack of socio-environmental approaches suggests the need for focused research agendas and capacity-building. The keywords that surfaced within the CH-SNL seemed much more connected to the local territory while, for example, many of the SRL-SNL keywords focused on broad concepts with global implications, but, with little specificity related to “place” (e.g., *Patagonia, Chile, remote sensing, climate change, fjord, glacier, biodiversity, landscape, mobility, macrofauna, stable isotopes*). In contrast, the CH-SNL keywords frequently (but not always) referenced place-based toponyms and phenomena (e.g., *subantarctic, Drake Passage, Antarctica, Cape Horn Biosphere Reserve, sub-Antarctic Magellanic ecoregion, Cape Horn, Tierra del Fuego, Beagle Channel, southernmost South America, southern westerly winds, Cordillera Darwin*). Species-based research also seemed to follow this trend. For example, within the Patagonian flora and fauna line of the SRL-SNL, keywords included broad concepts (i.e., *Chilean Patagonia, biodiversity, biogeography, endemism, flora, mixing, lichens*); yet, in the CH-SNL, the keywords for the Ornithological studies in Tierra del Fuego research line were very specific (i.e., *exotic species, Elaenia albiceps, Anairetes parulus, Navarino, Phrygilus patagonicus, Turdus falcklandii, Zonotrichia capensis*). These differences provoke a number of new research questions that merit future work. For example, has the place-based influence of the biocultural ethic that has been developed within CH-SNL provoked a more place-based long-term research agenda? How do these differences in focus affect local communities? How do they impact global research agendas? How would natural laboratory policies and programs best catalyze new capacities and strengths within these two, very distinct research agendas?

18.5 Conclusions

Rozzi (1999) coupled these 3-Hs of the biocultural ethic with three concepts of Earth Stewardship: the *habits* of stewardship, the communities of *co-inhabitants*, which include the *stewards*, and of course, the *habitats* of the Earth. By coupling the 3-Hs with Earth Stewardship concepts, the participation of stewards within habitats becomes explicit (Rozzi 2015b). Moreover, stewardship becomes an ethical imperative that should be incorporated into development policies as a matter of ecosocial justice (Rozzi 2015a). This approach markedly contrasts with the preservationist approach of the Half-Earth Project that calls for keeping half of the world's land and sea as wild and protected from human intervention or activity as possible (Wilson 2016). The Half-Earth initiative does not appropriately include the positive synergistic correlations found between biological and cultural diversity (Gorenflo et al. 2012; Maffi 2018).

Yet, as this chapter has demonstrated, there are several initiatives currently underway *within* and *from* Patagonia that seek to foster biocultural reawakening, democratize science, and catalyze more holistic approaches to sustainable development through ethical travel experiences. Based on the results of this intrinsic case study, we believe the three approaches that were analyzed (Fig. 18.1) offer the potential to move away from a preservationist approach and realize the potential of these positive synergistic correlations, through co-created scientifically based travel experiences dedicated to the conservation of nature and sociocultural aspects of local communities and its developed sustainably, integrating science, education, ethics, and economic profits (Rozzi et al. 2010a, b; Tauro et al. 2021).

We believe that the 3-Hs framework of the biocultural ethic and the FEP Cycle Approach can be linked with ST Collaborative Learning Networks, enhancing stages one through three of the existing ST Collaborative Learning Network product development process. This integration would enhance the potential of ST to link place-based scientific heritage resources with unforgettable experiences that could lead to increased well-being for those who visit and for those who are visited, potentially awakening in both a biocultural ethic for stewardship. And the integration of these two practices begins to formalize a process for locally driven CBD that moves from dominant neoliberal economic frameworks and paradigms, toward new models of sustainable development that encompass a more holistic view of human and non-human well-being. The SNL concept enhances these prospects by providing important resources, processes, policy, and oversight to support scientific agendas, processes, and governance within the unique and special places in which ethical biocultural travel experiences can occur, enabling collaborative scientific advances and positive spillover effects.

An integration of these three initiatives might lead to a new way of traveling or *touring* that better connects science and tourism by inviting visitors to appreciate the life *habits* of the *co-in-Habitants* (humans and other-than-humans) in their local shared *habitats* (Rozzi et al. 2012). Rozzi et al. (2010a, b) defined five essential attributes for developing ethical travel experiences rooted in local bioculture: (1) to value the uniqueness of each of the habitats visited, (2) to promote the conservation of

habitats that support biological and cultural diversity (and their interrelationships), (3) to propose a framework of tourism practices that foster careful co-habitation relationships, (4) to seek the well-being of visitors and hosts who can maintain and promote their traditional practices, and (5) to consider the interrelationships between social, economic, and environmental sustainability (Rozzi et al. 2010a, b). These types of ethical travel experiences may represent a practice that invites both members of local communities and visitors to be guardians for the care of biocultural diversity. Moreover, tourism rooted in bioculture may catalyze experiences of ethical and aesthetic reconnection of society with nature. Additional research is warranted to test these hypotheses and the integration of these three initiatives.

Focused collaborative development of SNLs provide a socio-political framework for locally led strategies, providing them with important territorial monitoring information, improved scientific support and capacity, and the potential to influence and actively participate in place-based research agendas. When SNLs are developed to include the core habitats and areas protected through Chile's network of PAs (e.g., OEP, San Rafael Lagoon National Park, and Cape Horn National Park), and/or are protected under international accords and frameworks, like the UNESCO Man and the Biosphere (MAB) program, additional layers of oversight can further support locally led governance and stewardship. Specifically, this intergovernmental scientific program that operates under a land-sharing paradigm, supports a scientific basis for strengthening relationships between people and nature in their shared habitats, through socio-environmental approaches that promote bioculturally appropriate approaches to economic development (Deutsches Nationalkomitee MAB and UNESCO 2005; Fischer et al. 2014). Accordingly, these areas have systems for control and dialogue with scientists, which can be harnessed and improved through the development of collaborative governance and stewardship programs. According to the MAB website (en.unesco.org/mab), Biosphere Reserves are "learning places for sustainable development," where local communities and stakeholders actively participate in local level governance, stewardship, and monitoring, supported by tools, training, and experience sharing, through the MAB network of 701 Biosphere Reserves in 134 countries (Deutsches Nationalkomitee MAB and UNESCO 2005).

Rozzi et al.'s (2006) ten principles for linking biocultural conservation to nature conservation emphasized the importance of an integrated network for biocultural conservation, including locally led governance and stewardship, economic sustainability and ecotourism, national and international collaboration, and ethical outdoor education that helps humans connect with each other and with nature, within their shared habitat. To evolve toward post-neoliberal paradigms, these approaches must encounter legal and policy-based mechanisms that will allow them to overcome weak government regulation and authority, and obtain the resources and capacities needed to make locally led strategies that reject commodification and biocultural homogenization competitive (Khan 2015; Kashwan et al. 2019; Kumi et al. 2014; Orellana Calderón 2020).

The three initiatives analyzed within this case study seem to offer promising components for an integrated biocultural conservation network within the subantarctic Austral Macrozone of Chilean Patagonia. The FEP approach employed within the OEP has a long-standing record of integrating environmental ethics, arts,

sciences, and education within the co-production of new educational and ecotourism programs and activities, as demonstrated within the six examples. The active Collaborative Learning Networks that have been fostered around ST in Aysén demonstrate ongoing interest amongst local communities to involve themselves with the science occurring in their territories through tourism. In addition, SNLs within Chilean PAs, and especially UNESCO Biosphere Reserves, provide innovative normative mechanisms for social linkage so that science of international importance can also support locally led strategies toward post-neoliberal forms of sustainable CBD (Deutsches Nationalkomitee MAB and UNESCO 2005).

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