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De Lucio, J.V. and Seijo, F. (2021) 'Do biosphere reserves bolster community resilience in coupled human and natural systems? Evidence from 5 case studies in Spain', *Sustainability science*, 16(6), pp. 2123–2136. doi:10.1007/s11625-021-01029-3.

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Do biosphere reserves bolster community resilience in coupled human and natural systems? Evidence from 5 case studies in Spain

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Received: 2 February 2021 / Accepted: 16 August 2021
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Abstract

Our research provides evidence that critical junctures in coupled human and natural systems may stimulate the undertaking of sustainability transition actions in biosphere reserves (BRs). Specifically, we explored whether BRs bolster community resilience, defined according to eight parameters identified in disaster management theory. We found that, based on evidence from five case studies in Spain, BR initiatives enhanced community resilience though governmental obstacles to local community initiatives and increasing telecoupling mediated by the institutional legacy effect of corporatism continues to constrain the ability of BR managers to develop what they perceive as more social-ecologically sustainable landscape management and commodity production.

Keywords Biosphere reserves · Community resilience · Coupled human and natural systems · Telecoupling · Sustainability transition actions

Introduction

Biosphere reserves (BRs) were originally conceived by UNESCO as an international network of nature conservation areas that would “lead through example” by reconciling the protection of nature with human development. The strategy was based on three guiding principles: conserving biodiversity, restoring and enhancing ecosystem services, and fostering the sustainable use of natural resources (UNESCO-MAB 2017; UNESCO 2019). While BRs have been undisputedly successful in their worldwide adoption—there are currently 714 BRs in 124 different countries—questions have emerged regarding their overall contribution to long-term ecological

and social sustainability both as defined by their original goals and in the evolving science of sustainability (Edge and McAllister 2009; Těšitel and Kušová 2010; Bavinck and Vivekanandan 2011; Onaindia et al. 2013; Reed et al. 2014; Campbell and Sacchetti 2017; Mbereko et al. 2017; Ferreira et al. 2018).

Indeed, important issues have been raised regarding not only the ecological outcomes of BR initiatives but also over their potential contribution to the human dimension of sustainability. Research into case studies has confirmed that participatory and deliberative governance is a key factor for the success of transitions to sustainability (Edge and McAllister 2009; Jungmeier et al. 2011; Onaindia et al. 2013; Reed et al. 2014; Mbereko et al. 2017). Amongst other issues, analysts have noted that BRs have often not taken into account the cultural viewpoints and economic interests of key stakeholders or the inherent political tensions and tradeoffs existing between the often conflicting and sometimes contradictory pursuit of conservation goals by state managers and economic gain by users (Coetzee et al. 2014; Seijo et al. 2020). Still others have pointed to more mundane obstacles to human system sustainability such as lack of communication and trust between managers, scientists and local communities, and the obstacles to participation and engagement of the latter in BR governance (Negev et al. 2019).

Handled by Salvatore Arico, United Nations Educational, Scientific and Cultural Organization (UNESCO) Intergovernmental Oceanographic Commission, France.

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In this study we focus on the potential contribution of BRs to coupled human and natural system (CHANS) community resilience (Leslie et al. 2015; Ferreira et al. 2018) a crucial dimension of sustainability. To explore this research question, we draw from qualitative evidence obtained from 5 BR case studies in Spain. Systems analysis has been used in the past to analyze sustainable development projects in BRs and calls have been made by experts for the inclusion of complex social-ecological system dynamics in BR design principles (Ferreira et al. 2018). Recently, there has been an increased interest on human system outcomes resulting from the governance of protected areas particularly as related to local community welfare. BRs pioneered this concern putting at the same level human system sustainability and natural conservation. BRs do not normally have a strict legal regime, as multiple models of organization and governance exist (Edge and McAllister 2009; Jungmeier et al. 2011; Bavinck and Vivekanandan 2011; Hostetler et al. 2011; Onaindia et al. 2013; García-Barríos et al. 2017; Mbereko et al. 2017; Ferreira et al. 2018). BRs are managed, in large part, based on governance networks where formal structures of government overlap with less-structured networks. The self-organized (adhocratic) initiatives proceeding from social and private entities are a more common form of management in BRs (Hahn 2011).

BRs are, in the end, institutions of collective action (Těšitel and Kušová 2010; Reed et al. 2014; Bouamrane et al. 2016; Campbell and Sacchetti 2017; Ferreira et al. 2018; Plummer et al. 2020). Their mission is the care and provisioning of collective ecosystem goods and the mobilization of transitions toward sustainability. Their effectiveness is demonstrated in the form of sustainable transition actions. Sustainable transition actions are initiatives that are usually driven by the urgency of crisis situations where the participants face real-life challenges to their livelihoods. Participants see themselves as affected by systemic variables that produce results that affect both them and the action situations. Local participants are able to self-organize, learn and adapt to change, connecting institutions on different scales. Sustainability transition actions, therefore, are similar to focal action situations or transition experiments or laboratories (McGinnis and Ostrom 2014; Charli-Joseph et al. 2018; Williams and Robinson 2020). All occur in complex systems and require participatory approaches.

Given this systemic dimension of sustainable transition actions, we contend that BRs ought to be analyzed as CHANS, that is, “integrated and complex systems in which humans and nature interact with one another” (Liu et al. 2007). The CHANS approach is more encompassing than closely related concepts such as “social-ecological systems” and “human-environmental systems”, “because CHANS includes not only social dimensions but also many other human system dimensions (e.g., economic, cultural,

political) that are not emphasized in the term of social-ecological systems” (Liu et al. 2021). Nevertheless, “all three concepts are often used interchangeably, although formally the latter two are subsets of CHANS” (Liu et al. 2021). Furthermore, the CHANS framework explicitly explores the issue of complex feedback loops between the two coupled systems and other important themes relative to our study such as legacy effects and telecoupling.

The human system as we conceive it here may include not only local communities but also other outsider stakeholders and even international CHANS networks with whom these systems may be, often inadvertently, telecoupled. Understanding CHANS dynamics both at their focal point and in the wider context of their complex networks of telecoupled CHANS’s has been identified as a key factor conditioning sustainability (Alberti et al. 2011; Liu et al. 2016; Kramer et al. 2017). In fact, it has been suggested that sustainability should be viewed as an emergent property of CHANS dynamics at multiple scales with local community resilience playing a key role as a driver of overall CHANS sustainability (Leslie et al. 2015; Faulkner et al. 2018).

A key element of CHANS sustainability is local community resilience which can be defined as a community’s capacity to respond to multiscale environmental, political and socioeconomic crises and change (Berkes and Ross 2013). Though there is no consensus in the literature over the concept’s definition, a series of elements or parameters have been identified in the disaster management literature that can play a decisive role in conditioning and thus indirectly defining it (Patel et al. 2017). A key common point of all the BR experiences we explore here is that they all emerged, as we shall see in our analysis, from a sense of impending crisis or collapse of the previous CHANS development model akin to what in the social science literature has been defined as a “critical juncture” or in ecological science as a “maturity crisis and collapse” in the adaptive and resilience cycle (Collier and Collier 1991; Gunderson and Holling 2002).

Based on evidence from the case studies presented here, we argue that BR initiatives bolstered overall community resilience though two important factors have emerged limiting long term prospects for sustainability: governance obstacles to local community initiatives and increased telecoupling of BR CHANS with other distant CHANS which constrains the ability of communities to build what they perceive as more ecologically sound strategies of landscape management and commodity production. Our main theoretical insight regarding these obstacles builds on the CHANS literature concept known as legacy effects. When legacy effects are discussed in the CHANS and SES literature they have been mainly defined as the lagged impacts of human interventions in natural systems (Liu et al. 2021). What we have found in this study is that past governance

arrangements can have legacy effects on new governance arrangements and innovative sustainable transition experiences such as the BR initiative. BR design therefore must account for and figure out how these initiatives can be made to work within human systems with a specific political, economic, social and cultural “history” or “path dependence” (Moore et al. 2018). In particular, we found that the legacy effects of corporatist systems of interest representation in the functioning of both the EU and the Spanish administrations have emerged as important conditioning factors regarding the financial and political independence of the new governance arrangements incentivized by BRs and that these are endangering, as perceived by BR managers and key stakeholders, BR community resilience vis a vis emerging global environmental challenges.

The BRs we have studied in Spain have resulted in focal action dilemmas that have been temporarily addressed by reviving more sustainable pre-industrial era CHANS productive activities with the indispensable financial support of EU and Spanish governmental subsidies. BRs have then been re-branded as post-industrial recreation oriented ecotourist human development models. However, the complex human system drivers that guaranteed the long-term sustainability of pre-industrial CHANS are no longer present. In addition, the financial arrangements which are sustaining the BR projects analyzed in this study are in and of themselves legacy effects of pre-existing governance arrangements which face financial sustainability issues of their own given the debt crisis faced by many European Union member countries. Indeed, corporatist systems of interest intermediation, as the interviewed managers and key stakeholders note, can undermine the deployment of the new sustainable development goals posited by BRs by co-opting BR initiatives into the pre-existing system of governmental subsidy dependence. Therein lies one of the main contradictions of BR initiatives in Spain, subsidies to BRs cannot compete with the larger indirect subsidies (i.e. In terms of externalized environmental costs) received by intensive agribusiness competitors based in distant telecoupled locations such as the intensive beef producers in Eastern Europe that economically outcompete sustainable extensive pastoralism initiatives in Alto Bernesga. The BR program, which offers enormous potential for jumpstarting new sustainable development initiatives, needs then to strategically reconsider, in our view, whether it may want to incentivize the creation of not only novel ecosystems but also novel CHANS (Hobbs et al. 2006). BR promoters may need to introduce in the future minimum human system requisites so as to incentivize the emergence of UN sustainable development goal compatible initiatives and not just ecotouristic oriented semi-conservationist projects of questionable long term sustainability, at least from the point of view of community resilience. A practical solution could be for BR reviews to

require the need for medium-term financial viability plans for community related initiatives linked to BR projects to prevent their capture by political interests operating within the corporatist system. Similar financial viability plans could be elaborated as well in countries with pluralist systems of interest representation where the threat to community resilience may be posed by financially powerful non-state actors.

Methods

Case study selection and the community resilience analytical framework

To conduct this research project we carried out a content analysis of the material and narratives of the 5 BRs participating in the learning network Diálogos RB from 2017 to 2019 by operationalizing via in-depth interviews the seven key qualitative attributes identified in the “community resilience” literature (Patel et al. 2017; Faulkner et al. 2018): local knowledge, community networks and relationships, communication between stakeholders, governance and leadership, natural resources, economic investments and mental outlook (Patel et al. 2017; Faulkner et al. 2018). The selection of these variables emerged from our confrontation of concepts discussed in the literature with the complex reality we have observed in our BR cases. In our view these attributes had an evident applicability to the “action situations” we observed in Spanish BRs which all emerged from severe “critical junctures” akin to natural disasters as defined in the literature that were perceived almost as an existential dilemma in these CHANS. Indeed, for the stakeholders involved in promoting these BRs what was at stake was not only the preservation of ecological values but the survival of the human communities themselves.

Issues raised in the open discussions that took place in the workshop and in the conclusions of the subsequent participatory research drove our interest to discuss links between the seven attributes identified in the disaster management literature and discuss how the creation of the BRs may have contributed to overall community resilience. Workshop members were not intended to be representative of the broader community in each study site. Instead we sought to qualitatively capture the diversity of stakeholder viewpoints through our case studies. Participants included males and females of different ages and sociodemographic groups. Case studies, as discussed in the relevant literature, are suitable in situations in which research is conducted to respond to questions about the “how” or the “why”, when there is no possibility of carrying out an experimental design or controlling the events, when they concern real-life action situations and where the frontiers between the phenomenon and its context are unclear (Yin 2014). Cases may be contingent

on the circumstances, but experientially observed patterns are not, and may be generalized as propositions (Yin 2014). Case studies have been widely used to gather information from complex CHANS that depend on previous trajectories and critical junctures (Liu et al. 2007; Hahn 2011; Méndez et al. 2012; Nykvist and von Heland 2014; Oteros-Rozas et al. 2015).

To further develop our case study approach we conducted follow-up in-depth interviews with key stakeholders and managers of five different BRs in Spain in an attempt to determine the extent to which BR initiatives have bolstered community resilience based on a content analysis of these seven attributes (see Table 1 Attribute definition). The case studies and complementary information are available on the project's website (<https://dialogosrb.net/>) and in the supplementary information to this article. Diálogos RB is a knowledge network constituted by BR managers that was founded in 2017 with the goal of sharing practical knowledge on sustainability acquired through specific hands-on experiences in the field (Herrero 2017). The network incorporated scientists to help with the different experiences' analyses. The first step in the scientific evaluation process was to identify what were perceived by concerned stakeholders as five successful BR experiences. Each experience was first described by the respective manager, and then evaluated by the group as a whole to attempt to identify collective lessons to be learned.

The five BR case studies selected were the following: Alto Bernesga, Área de Allariz, Lanzarote, Sierra de las Nieves and Montseny. Case study characteristics and their location in Spain can be seen in Table 2 and Fig. 1.

Data collection regarding the Diálogos RB learning network was organized into a series of stages, as follows. After the case studies were selected for the participatory research project, key stakeholders developed their individual case narration, formulated analytical questions, and drew preliminary conclusions in a workshop that included teams of BR managers and scientists. The workshop was conducted in March 2017 in the Organismo Autónomo de Parques Nacionales headquarters of the Spanish Network of BRs, in Madrid, Spain. Some items of general interest to the group were identified around which to collect semi-structured information. These were: (1) how to start a sustainable development initiative and the role of the BR, (2) communication, participation and training processes: role of stakeholders, institutions and BR, (3) relations between protected natural areas and BRs, (4) relations between involved rural and urban communities, (5) role of rural women initiatives, (6) identification and management of natural and human resources, (7) governance issues.

After the workshop, follow-up in depth interviews were conducted by the Diálogos RB scientific team with BR managers and other relevant stakeholders and complementary

Table 1 Community resilience attributes and their conceptual definition (Adapted from Patel et al 2017; Faulkner et al 2018; IBE-UNESCO 2015)

Community resilience attributes	Definition
Critical juncture	A period of significant change, which typically occurs in distinct ways in different countries (or other units of analysis) and which is hypothesized to produce distinct legacies
Local knowledge	The community or related group is able to assess and understand its own vulnerabilities: 1.- Information and experience acquired that allows it to face challenges 2.- Training and education; 3.- Empowerment and collective capacity to act effectively
Community networks	Ties that allow people to act collectively: "social network". Sharing moral and ethical criteria and reciprocal relationships
Communication between stakeholders	Communication understood as the creation of common meanings and understandings and the creation of opportunities for members to articulate needs, views and attitudes
Governance	Governance has been defined to refer to structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation. Governance also represents the norms, values and rules of the game through which public affairs are managed in a manner that is transparent, participatory, inclusive and responsive. Governance therefore can be subtle and may not be easily observable. In a broad sense, governance is about the culture and institutional environment in which citizens and stakeholders interact among themselves and participate in public affairs
Natural resources	Capacity of the ecological system to meet human needs in the broad sense of ecosystem goods and services, including ecosystem resilience. It could be perceived (mental framework) or assessed from biophysical data
Economic investments	Planning and ensuring that interventions provide a monetary return, the availability of credit and economic resources to undertake initiatives or to cushion adversity. The existence of material infrastructure
Mental outlook	Affective, cognitive and material relationship that people have with the place and the project

Table 2 Case study characteristics

	Alto Bernesga	Área de Allariz	Lanzarote	Montseny	Sierra de las Nieves
BR declaration	2005	2005	1993	1978	1995
Population	5600	6300	145,000	52,000	20,000
BR area (ha)	33,442	21,482	84,594	50,000	93,286
Coupled human and natural system (CHANS) values highlighted by BR declaration	Landscapes, mountains in communal property, cattle	Traditional agrarian landscape in complex mosaics (“touzás” and “sebes”)	Volcanic and arid landscape, traditional agriculture like vineyards with lapilli cover	Agrarian and forestry mountain landscape, rural–urban area	Mediterranean mountain landscape, olive groves
CHANS socio-economic subsystem legacy effects	Mining from the nineteenth century until the beginning of the twenty-first century	Industrialization, nineteenth century until the 1970s. Emigration and abandonment	Touristic development from the 1960s	Urban sprawl and natural park designation, 1970s	Touristic economy of the coast and rural abandonment since the 1960s
Community resilience risk	Loss of traditional knowledge. The absence of investment	Loss of traditional knowledge. External dependence. Social discontent	Extreme risk of environmental and social collapse. Island biophysical limits	Management model of the natural park restricting human activity	Loss of traditional knowledge, weak alternatives
Sustainable transition action (STA)	The rural woman as a driver of entrepreneurship and economic activity in the Alto Bernesga BR	Rising costs of waste management. Community composting of domestic organic material in the Allariz BR	Driving role of the BR Council in the social and ecological evolution of the Lanzarote BR	Petition of the International Biosphere Reserve Council for incorporating community stakeholder integration	Development of organic agriculture in the Sierra de las Nieves BR compatible with National Park conservation strategy
STA starting date	2007	2014	2013	2010	2009
Organization promoting STA	BR foundation	Allariz municipal government. Municipal environment councillor is also BR manager	Provincial island government (Cabildo insular)	Provincial governments of Barcelona and Girona (Diputaciones) share the BR board	BR managed by association of municipal councils (Mancomunidad de municipios Sierra de las Nieves)
Governance (day to day management)	Pola de Gordón and Villamanín municipal councils. Foundation of the BR. Association of business owners, BR manager (municipal civil servant)	Municipal council, local environmental non-governmental organizations, Association of neighbors, Association of business owners, Foundation Ramon Gonzalez Ferreiro, BR manager (municipal councillor)	Provincial island government of Lanzarote, Foundation César Manrique, BR manager (assigned by Provincial island government)	Provincial governments of Barcelona and Girona, Municipal councils (18 municipalities), Association of business owners (50 businesses), Association of rural landowners, BR manager (assigned by Barcelona provincial government)	Association of municipal councils, Association of farmers, Association of business owners; BR manager (assigned by association of municipal councils)
Governance: Funding institutions and monitoring	Provincial government of León MAB-UNESCO Program. Ministry of the Environment Spain. European Union Social Fund	SOGAMA Autonomous regional government-owned waste management company. MAB-UNESCO Program. Ministry of the Environment Spain. European Union Social Fund	Regional government of the Canary Islands, MAB-UNESCO Program. Ministry of the Environment Spain. European Union Social Fund	Provincial governments of Barcelona and Girona, MAB-UNESCO Program. Ministry of the Environment Spain. European Union Social Fund	Regional government of Andalucía, European Union Social Fund. MAB-UNESCO Program. Ministry of the Environment Spain

Table 2 (continued)

	Alto Bernesga	Área de Allariz	Lanzarote	Montseny	Sierra de las Nieves
STA key initiatives	Training courses. Creation of businesswomen association	Public information campaigns and recycling infrastructure	Public information campaigns	Regular meetings organized by municipalities with key community stakeholders to incorporate new municipalities to the BR	Training courses and support to develop organic olive grove management
Community resilience: Key results	Promotion of women entrepreneurship, strengthening of community participation, enhancement of community identity, visibility and dissemination of BR initiative in media	Reduced municipal recycling costs, recovery of traditional composting uses, promotion of local organic farming	Zoning activism to mitigate touristic development sprawl	Incorporation of all municipal territories to the BR	Organic farming methods implemented in 600 farming operations (1000 ha)

audiovisual and written material about the experiences was collected. We discarded alternative methodologies such as survey research because our research question and data sources were focused on management dilemmas as perceived by project leaders and key stakeholders rather than the general opinions and perceptions of members and users of BRs regarding the criteria identified in the disaster resilience literature. In this sense, in-depth interviews offered 4 distinct advantages over surveys for our research goals (Soss 2013): (1) in-depth, interviews can be used to pursue questions that are difficult to locate in documentary sources or everyday interactions, (2) in-depth interviews permit an exceptional degree of flexibility, control and detail in the pursuit of participant's understandings, (3) in-depth interviews are invaluable for recovering and analyzing the agency of individuals, (4) in-depth interviews offer an excellent way to map the conceptual world of participants in ways that illuminate both coherence and inconsistency (Soss 2013). A total of 33 key stakeholders were interviewed, including farmers, local entrepreneurs, local politicians and social activists, and BR managers. A white paper draft collecting all of the case studies' experiences was discussed at a workshop held in October 2017. The 33 interviews were recorded, amounting to 10–16 h of recordings per BR. For each experience, the information was structured following a chronological sequence, highlighting the different issues identified by the interviewed stakeholders. Conclusions were agreed upon by all interviewed stakeholders and subsequently published (De Lucio et al. 2019; Onaindia et al. 2019). Questions for the in-depth interviews were derived from workshop insights. To deploy the interviews and select interviewees a nonprobability purposive sampling was employed given time and budget constraints (Lavrakas 2009). We recruited the interviewees with the aid of the workshop participants based on their willingness to talk and potential informational value of their testimony as leading representatives of the collective action BR cases involved. We conducted additional complementary follow up interviews with BR top managers between September and December of 2020.

Results and discussion

The main findings of our content analysis of the workshop and the 33 follow-up in-depth interviews are summarized in Table 3. We analyzed the content of our qualitative data by defining and applying the seven key attributes identified in the disaster management literature and used them to discuss the overall potential contribution of each factor to enhanced community resilience in the five selected BR case studies. Definitions of the individual variables can be found, as previously noted, in Table 1. In addition, we added a new attribute, "critical juncture", to describe the events that sparked

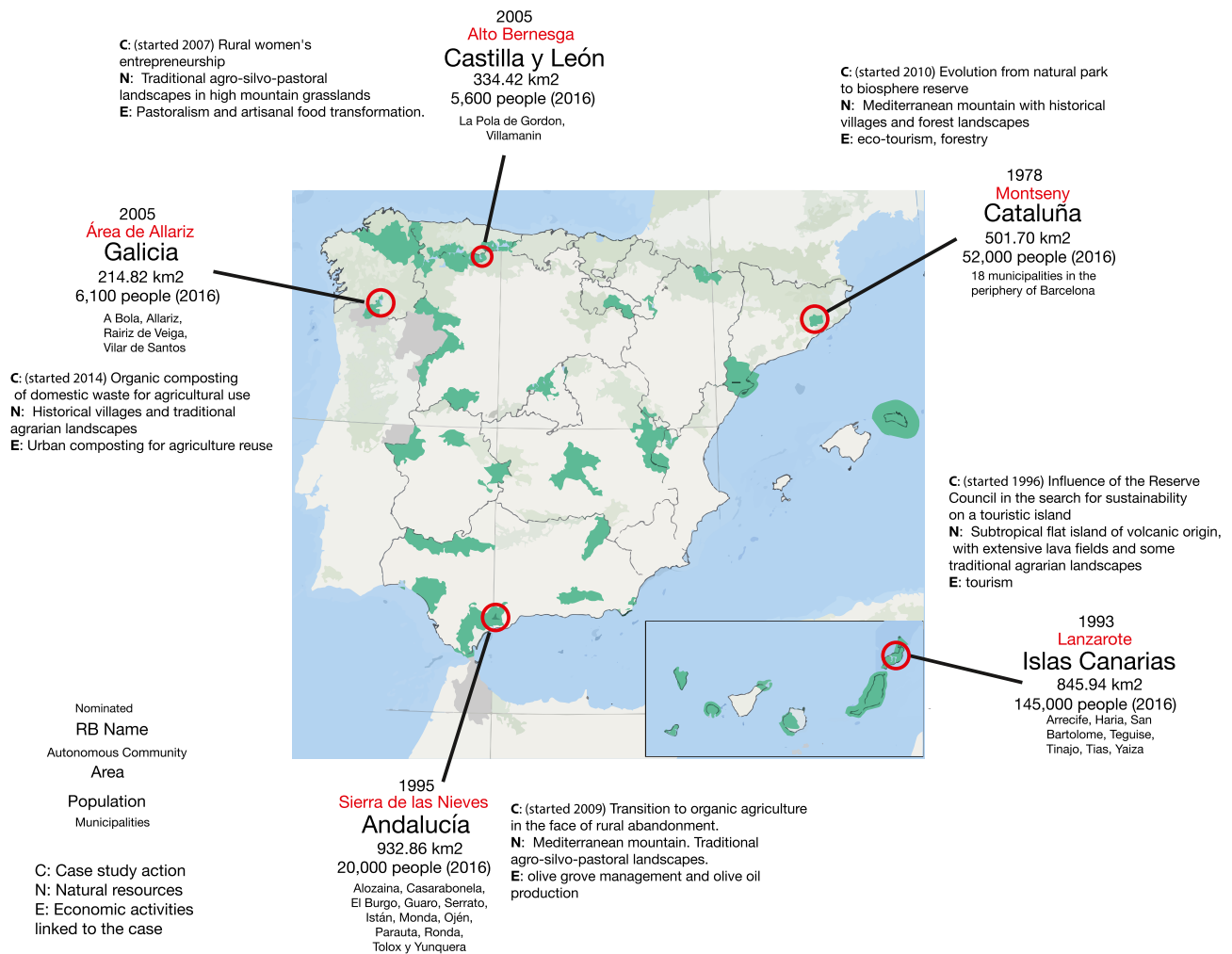


Fig. 1 Location of the biosphere reserve case studies

interest for applying for BR status and sparked the mobilization of the concerned stakeholders for collective action.

Critical junctures

In all five cases BR creation was perceived by interviewed managers and key stakeholders as an opportunity to develop an alternative human development model to the pre-existing one. Interestingly, from the point of view of original UNESCO BR goals, the BR initiatives discussed here arose from a collective will to transform and innovate—not to conserve—existing ecosystems since previous human development models were perceived as having contributed to the collapse.

The most urgent impetus for CHANS re-invention can be found in the cases of the Alto Bernesga and Allariz BRs. In Alto Bernesga the mining industry, which had been agonizing for decades and was only economically viable through state subsidies, finally collapsed in the

early years of the twenty-first century seemingly condemning the remaining population of the county to mass unemployment, early retirement or migration. In Allariz, the gradual but relentless shutdown of the textile mills that had been the main economic engine of the village's economy resulted in a similar socio-cultural climate of increasing pessimism over the future. In Allariz, however, the economic crisis was compounded with the ecological collapse of the Arnoia river's trout population due to a pollution episode in 1989. The episode sparked what some interviewees referred to as "El conflicto" (the conflict) or "a revolucion das troitas" (the trout revolution); a popular non-violent revolt against the municipality's government. In both BRs, then, the legacy of economic and ecological degradation left by the past human development model motivated a renewed communal interest in the natural environment as a way forward into the future which would ultimately result in the application for BR status.

Table 3 Case studies and community resilience attributes: main conclusions derived from stakeholder interviews

BIOSPHERE RESERVE	ALTO BERNESGA	ÁREA DE ALLARIZ	LANZAROTE	MONTSENY	SIERRA DE LAS NIEVES
CRITICAL JUNCTURE	Collapse of mining industry	Collapse of textile industry	Environmental and cultural threat of mass tourism model	Environmental and cultural threat of urban sprawl model	Environmental and cultural threat of mass tourism model
LOCAL KNOWLEDGE	Rediscovery of traditional pastoral landscapes and uses	Rediscovery of traditional agrarian landscapes and recycling practices	Revaluation of traditional architecture and landscapes and awareness of the biophysical limits of the island	Rediscovery of traditional villages and sustainable activities and integration with urban planning	Rediscovery of traditional olive groves and olive oil production and ecological certification as alternative local economic model
COMMUNITY NETWORKS	Strong presence of coal mining labor union activity preceding BR creation. BR reinforced creation of women's associations	Strong neighborhood associationism preceding BR creation. Reinforced since creation	Community-based environmentalist movement drives BR declaration	Weak before the expansion of the BR transition area. Reinforced associationism since then	Weak associationism preceding BR creation. Reinforced since BR establishment
COMMUNICATION BETWEEN STAKEHOLDERS	Perceived competing political alignments between local and statewide rural associations leads to friction	Improved since BR creation: Easier to start experiences of transition to sustainability	Improved since the creation of BR. The BR council as a channel for participation, where conflicts of interest become visible	The expansion of the BR has stimulated the participation of other stakeholders such as local communities, municipalities and companies	Improved but lingering difficulties remain to incorporate more producers and other stakeholders
GOVERNANCE	Financial dependence on European Social Fund, Spanish state's Fundacion Biodiversidad and autonomous community of Castilla y Leon	Relative dependence on regional government funds that challenge a model of waste management managed locally	The media presence and influence in public opinion of the reserve council is offset by vested interests in mass tourism development	Financial dependence on Diputacion provincial government support to promote sustainability policies	Financial dependence on European Social Fund, Spanish state's Fundacion Biodiversidad and autonomous community of Andalusia regional government
NATURAL RESOURCES	Successful in mobilizing pastoral and related artisanal activities	Successful mobilization of traditional agro-ecological practices and local recovery organic matter recycling	BR introduced the debate on the biophysical limits of the island and protection of its natural values in tourist expansion	BR promotes sustainable agroforestry such as chestnut plantations, as well as agroecology	BR partially successful in recovering traditional olive groves and its reinvention as ecological agriculture
ECONOMIC INVESTMENTS	Telecoupled with specialized gourmet statewide networks	Telecoupled with specialized networks of agro-ecological consumption and local quality product	Telecoupled with long-distance tourism	Telecoupled with commuter ecotourism and local high quality artisanal production networks	Telecoupled with the demand for quality local products from the large tourist concentrations in the vicinity
MENTAL OUTLOOK	Empowerment of women associations and enhanced role in local community economy	Reinforced sense of belonging to an innovative and environmentally responsible community	Groups linked to the objectives of the BR reinforced in their environmentalist militancy	Commitment of the municipalities to the biosphere reserve promotes environmentally aware tourism	The employment of a large part of the population in the mass tourist sector of the Costa del Sol is combined with a sense of belonging to the BR that stimulates a model of double employment

In the other 3 BRs—Lanzarote, Montseny and Sierra de las Nieves—the sense of crisis and collapse was not as acute though, instead, there was strong socio-cultural resistance to tertiary sector human development models which the three soon to be BRs seemed inevitably doomed to adopt. In the case of Lanzarote, the socio-cultural activist movement was led by Cesar Manrique—a charismatic native and world renowned designer and artist—who used his vast network of international contacts to raise awareness of the downside of the mass tourism economic development model that was gaining momentum throughout the Canary Islands and threatening, in his view and that of his supporters, the traditional architecture and landscapes of Lanzarote. In Montseny the perceived threat was the conversion of the picturesque traditional rural villages of the area into a rural tourism resort and residential suburb of sprawling Barcelona. In the Sierra de las Nieves, again, the lure of more lucrative mass tourism jobs in the Costa del Sol was singled out as a threat by BR proponents to the traditional agrarian lifestyles of the Sierra inhabitants.

Local knowledge

The critical junctures experienced by the 5 then prospective BRs in the last decades of the twentieth century and first decade of the twenty-first century led to a positive re-evaluation of the different areas' preindustrial era CHANS human development models and a rediscovery of traditional landscapes, jobs and land uses as an inspiration to start sustainability transition actions. Only in 2 of the 5 cases preindustrial era CHANS models were literally re-interpreted as economic building blocks for a post-industrial era primary sector based transition to sustainability. In Alto Bernesga and Sierra de las Nieves the BR declaration, in addition, seems to have facilitated the capture of European Social Fund monies from the European Commission in an attempt to recover a holistic process of artisanal food processing, free range pastoralism and ecological olive grove management and production as a source of ecologically sustainable employment and income for the local communities.

In the other three cases the relationship between past and future CHANS models as articulated through the BR initiative is more complex. Allariz primarily used its social composting initiative as a strategy for developing an eco-friendly municipal brand and raising environmental awareness amongst the local population, which has facilitated its positioning as an attractive eco-tourist destination. Likewise, the Montseny and Lanzarote BRs have not tried to turn back the economic clock and return to a primary sector driven post-industrial economic model. Much like in Allariz, they have sought to use traditional land use practices as a source of inspiration to rethink the future and to conserve the architecture and the landscapes of the past as a way of limiting the

ravages of mass tourism and urban sprawl while positioning their communities as attractive eco-tourist destinations.

Community networks

In 3 of the 5 cases pre-existing community networks played a key role in the drive to obtain BR status. Alto Bernesga, for instance, had a long history of labor union activism associated with the mining industry. The nearby village of Rodiezmo, in fact, has been the site for 29 years of the SOMA-FIA-UGT labor union organized “Fiesta de la mina Asturleonese” gathering which brings together about 30,000 miners every year. The event is closely linked to PSOE, the dominant party of the left in Spanish politics. In Allariz, as well, civil society organizations and associationism have been traditionally strong. The 1989 demonstrations against the municipal government coalesced these multiple local civil society associations around the BNG, a leftist Galician nationalist political party, which has governed the municipality ever since. Allariz has since served as a pilot governance experience for BNG. Finally, in Lanzarote the charismatic leadership of Cesar Manrique led to the emergence of a strong, community based local environmentalist movement which is still active today. This movement was the main promoter of the application for BR status.

In the other two cases community networks, however, can be characterized as “weak” and the decision to pursue BR status was perceived mainly as a political-institutional “top down” initiative. In the case of Montseny the BR application was implemented by the Diputación de Barcelona provincial government which wished to expand the perimeter of the BR on demand from the International Council of BRs so as to support its own institutional urban planning projects. In the Sierra de las Nieves, the BR application resulted from the partnership of the association of municipal governments of the area (Mancomunidad) and the National Park of Sierra de las Nieves authorities who saw the BR as a mechanism for reverting rural abandonment and maintaining traditionally managed olive groves in the vicinity of the National Park.

Communication between stakeholders

A key factor in self-organization is the possibility of generating collective choice rules (Ostrom 2005). All case study narratives valued highly the governance functions of the BR management body, which has created conditions for dialog and consensus building between stakeholders. Biosphere reserve participation processes in the sustainable transition actions appear in the narratives as ways to help develop common values and collective rules on the path to sustainability.

In Alto Bernesga, the BR has promoted women's participation in the decision-making process and leadership in entrepreneurial activities through the creation of a BR

sponsored formal association. However, the local association has occasionally found itself at odds with statewide agrarian and rancher unions, perhaps a consequence of their perceived alignment with competing political parties at the state level. In 2016, these divergent perspectives and interests came to the fore when BR associations were summoned by the Ministry of Agriculture in Madrid to discuss strategies vis à vis the European Union's Common Agricultural Policy's (CAP) and its impact on pastoral activities. The Alto Bernesga local associations favor free range pastoralism in mountain environments; whereas, the CAP seems to be conceived for central Europe's flat grazing meadows and the large-scale, intensive animal husbandry operations favored by statewide agrarian unions.

In the rest of BRs, BR creation is perceived to have resulted in an overall improvement in civil society participation in governance and an increase in associationism in spite of the occasional political rivalries—between political parties and the governmental institutions they control—that emerge as a result of political parties seeking to capitalize electorally and politically on BR activities and accomplishments. In Allariz, participation in the municipality's recycling program is almost universal with both individuals and small businesses engaging actively. There is a general consensus that the recycling program has resulted in a perception of the municipality as an eco-friendly, sustainable, forward-looking community. Similarly, in Montseny BR creation seems to have favored the creation of local entrepreneurial associations with an increased participation of previously absent social groups such as women and youth. Montseny interviewees noted that no one seemed to be focusing on the core protected conservation area any longer. Instead the BR has achieved greater prominence and public notoriety incentivizing the creation of eco-tourism local industries. In Lanzarote, as in the Alto Bernesga, friction between political party dominated governmental institutions and BR leadership has occasionally emerged. Initially the BR was perceived by conservative parties as a leftist initiative. Ironically, after election results brought to power leftist parties again, these became suspicious of BR managers for their prolonged political co-habitation with conservative parties and threatened with restricting BR funding. In Sierra de las Nieves, the BR initiative was again perceived as being closely linked with a specific political party's organizational network.

Governance

As an Alto Bernesga interviewee succinctly stated, funding makes the difference between “doing something or doing nothing”. In the 5 BR cases studied here governmental organizations played a crucial role in obtaining the funds necessary for creating and continuing to operate the BRs.

This is probably the greatest vulnerability for community resilience that we have observed in our analysis since it limits the autonomy of BR managers and local communities and it allows for governmental and political interference with everyday management decisions and local community initiatives. Political interference, emanates from all governance institutions operating within Spain; the European Union (EU), the Spanish state, autonomous community regional governments and municipalities. In 3 of the 5 cases—Alto Bernesga, Lanzarote and Sierra de las Nieves—much of the funding for the BR's activities comes from the EU's social cohesion funds but is brokered by autonomous community regional governments. Though the EU's influence in BR governance is seldom felt directly in some extreme cases it has used its financial muscle to gain political leverage. In 2016, EU funds to a project involving the Alto Bernesga BR were temporarily frozen due to sanctions being imposed on the Turkish government where scientists advising BR managers suspected to have participated in a coup were incarcerated. The episode, though short lived, revealed the risks associated with an overreliance on EU funds. Political interference is more evident in the form of autonomous community regional government and local governance agency interventions in management decisions. In the cases of Allariz and Montseny funding is derived from municipal and provincial government authorities with some monies obtained, in the former case, from the autonomous regional government. Again, the interviewees perceived this financial dependence as a potential risk for BR institutional autonomy.

BR dependence on government funding is a complex issue related to Europe's wide adoption of the corporate pluralist system of interest representation after World War II (Schmitter 1979). The topic is therefore too broad to be dealt with here. Suffice it to say that BR managers and local stakeholders perceive it as a governance weakness over which they have very little control, as well as a source of constant friction with political institutions and agencies.

Natural resources

All the studied BRs reported the revival of traditional practices for the sustainable mobilization of natural resources for human development as an outstanding accomplishment of BR creation. In Alto Bernesga 10 meat processing plants use BR supported labeling generating approximately 200 jobs. About 20 restaurants are linked in turn to these plants by providing a market for its products. Nevertheless, there are some important sustainability issues resulting from the increasing telecoupling of the Alto Bernesga CHANS to other distant CHANS. Meat produced in the BR is commercialized through gourmet stores located throughout Spain but the main source of meat for the processing plants actually comes from Central European countries due to their

cheaper production prices and higher fat content which is better than the local meat for the production of cold cuts. In Montseny and Sierra de las Nieves local producers have also been mobilized successfully in large part due to the BR. Forested surface in the Montseny BR is believed to have increased significantly due to subsidized chestnut tree plantation by private forest owners. Chestnut production is intended to generate an ecologically sustainable source of income in the long term. Sierra de las Nieves accomplishments have been relatively modest with 1% of total olive plantations in the area now adhering to organic certification. In Allariz the municipal composting initiative is also perceived as a great success and popular participation is almost universal. The initiative has made Allariz less dependent on the autonomous community's SOGAMA solid waste public company and reinforced the competitiveness of neighboring agro-ecological farms thus filling in a gap in the autonomous community's recycling process. The specific accomplishments of the Lanzarote BR are more difficult to measure, due to the scarce agricultural productivity of its arid natural environment, though the revival of the traditional vineyard landscapes associated with the local Malvasia grape variety is credited in part to the BR's promotional efforts.

Economic investments

The direct economic returns of BR creation, in all five cases, is negligible in comparison with indirect returns. We believe that this has a negative impact on community resilience. Certainly, in all the studied BRs there has been some return on the investment (i.e. BR creation) though cost–benefit analyses including payoffs in difficult to quantify ecosystem services would be needed to determine whether direct benefits (for e.g. €8,000 in recycling savings in Allariz) outweigh costs from other institutional subsidies. It is clear that the main economic return of BR creation in all cases has been the promotion of the five areas as eco-touristic (Allariz, Lanzarote, Sierra de las Nieves, Alto Bernesga), residential (Montseny, Allariz, Alto Bernesga) destinations or both. In both cases, this has made all sites economically dependent on telecoupled CHANS which provide the eco-tourists or commuters on which the BR economies depend. As discussed in “Community networks”, there are no easy strategies for BRs to address this perceived vulnerability. Tourism is a phenomenon linked to globalization and its long-term ecological sustainability impacts on human development are a controversial and debated issue that lies beyond the scope of this study (Sharpley 2021).

Mental outlook

BR managers and interviewed stakeholders are moderately optimistic over BR creation impact on raising community

environmental consciousness, engagement in governance and fomenting place attachment. As a result of the COVID crisis lockdowns Alto Bernesga, Allariz and Montseny BR managers have noted an increase in population (200 new inhabitants in the case of Allariz) probably a consequence of commuters and occasional visitors settling in as teleworkers. Indeed, in Allariz new community members equally demanded access to the recycling network and better internet connections. Whether this demographic trend will continue into the future once the COVID public health crisis subsides remains to be seen. Conversely in Lanzarote and Sierra de las Nieves the COVID public health crisis has provoked an important dip in available BR resources since both areas are heavily dependent economically on the touristic industry. In Lanzarote, the creation of the BR is estimated to have prevented the construction of 4000 hospitality units in the island though 8000 illegal constructions linked to tourism were also legalized in the past few years. This trend could consolidate in the future if, as an aftermath to the deep COVID economic crisis, economic pressure mounts to further develop the mass tourism model in Lanzarote. A similar mixed record was highlighted by the Sierra de las Nieves managers. Since the 2008 financial crisis, part time agricultural work in ecological olive grove farms has increased but so has the dependence of locals on touristic employment in the Costa del Sol mass tourism resorts.

There have also been other less tangible mental outlook benefits resulting from BR creation. In Alto Bernesga and Montseny women associations linked to BR initiatives have taken on a more prominent role in political and economic governance and, in the latter, municipal authorities have modified their ideological discourse to include frequent references to the importance of sustainability. In Lanzarote, Sierra de las Nieves and Allariz BR creation is perceived to have bolstered community identity and pride, and therefore place attachment. In Lanzarote the BR supported BIOC-RIT initiative has engaged local entrepreneurs (<http://www.lanzarotebiosfera.org/ordenacion/paisaje>) and furthered Cesar Manrique's vision of the role played by landscape in building community identity and also a distinctive commercial brand different from the “sun and beach” imagery prevailing in Canary Islands government tourism advertising campaigns.

Conclusions

BR creation seems to have bolstered community resilience in the five case studies we have analyzed though this main finding must be nuanced given possible case study selection bias issues (all the case studies analyzed here were selected with the help of BR managers as examples of successful BR initiatives) and the qualitative nature of our evidence.

BR managers and stakeholders perceived a positive impact on 6 out of the 8 attributes or parameters defining community resilience in the disaster management literature which is encouraging. Two important caveats related to governance and telecoupling issues however stand out. Dependence on government funding, a consequence of the corporate pluralist system existing in Europe, generates, according to the participants in this study, important vulnerabilities both in terms of long term economic sustainability and political interference with BR management. In this regard initiatives leading to greater BR financial independence through perhaps branding or origin certification of commodities produced in BRs could perhaps prove beneficial. Similarly, CHANS telecoupling, an inevitable consequence of an increasingly globalized world, results in decreased autonomy on the part of local communities regarding the sustainable production of goods and services associated with BR ecological conservation goals. Unfortunately, this factor is beyond the control of BR managers and community stakeholders which notably increases the uncertainty regarding the future sustainability of the 5 BRs we have analyzed. However, the empowerment of local communities, increased place attachment and raised awareness over the value of the natural environment may be shaping, in light of our findings, what Geels refers to as “transition to sustainability niches” (Geels and Schot 2010). Indeed, greater stakeholder participation in BR management could perhaps contribute to the search for creative and sustainable strategies to adapt to this challenge.

In sum, the research presented in this article provides evidence, by means of case studies, that adaptive crises in CHANS can give rise to critical junctures that, in turn, stimulate the undertaking of “sustainability transition actions”. BR creation facilitated the emergence of favorable social-ecological conditions that allowed these actions to take place. Our findings show that reserve managers and local stakeholders perceive the success of sustainability transition initiatives as the end of a process of collective acquisition of credible knowledge about the social and ecological interactions, on which collective resources depend that have direct influence in their lifestyle choices and wellbeing. Caring for the values of trust and reciprocity, leading to the creation of community values related to the common good, requires active listening and good communication processes. The ability to set and change standards based on collective learning benefits from the commitment of the actors to the experience of the community. Greater communication and cooperation between different levels of government and power structures is a relevant condition for the success of sustainability transition initiatives. BR projects can thus help guide other initiatives. Practical experiences developed in local settings are a fundamental form of knowledge creation in the development of sustainability science (Persson et al.

2018). The way knowledge is created, shared, and used by society can crucially influence transformation processes and can play a major role in creating improved sustainability outcomes.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11625-021-01029-3>.

Acknowledgements Both authors would like to thank anonymous reviewers for their comments and suggestions. We also thank Beni Rodríguez, Juana Barber, Bernardo Varela, Aquilino Miguélez and Tomás Rueda as actors and managers of the biosphere reserves for sharing their experiences through in-person workshops, field interviews, and by providing documentation. Cristina Herrero and Antonio Pou are responsible for the first collection and writing of the experiences, made possible through their field work and interviews. This project received support from the Ministry for Ecological Transition of the Spanish government through the Fundación Vida Sostenible and the Ofyestes Association. FS acknowledges support from the grant DARE: “Data Driven Models of Forest Drought Vulnerability and Resilience across spatial and temporal Scales: Application to the Spanish Climate Change Adaptation Strategy” RTI2018-096884-B-C32; MICIU; Ministerio de Ciencia, Innovación y Universidades), SPAIN”.

References

- Alberti M, Asbjornsen H, Baker LA et al (2011) Research on coupled human and natural systems (CHANS): approach, challenges, and strategies. *Bull Ecol Soc Am* 92:218–228. <https://doi.org/10.1890/0012-9623-92.2.218>
- Bavinck M, Vivekanandan V (2011) Conservation, conflict and the governance of fisher wellbeing: analysis of the establishment of the Gulf of Mannar National Park and Biosphere Reserve. *Environ Manag* 47:593–602. <https://doi.org/10.1007/s00267-010-9578-z>
- Berkes F, Ross H (2013) Community resilience: toward an integrated approach. *Soc Nat Resour* 26:5–20. <https://doi.org/10.1080/08941920.2012.736605>
- Bouamrane M, Spierenburg M, Agrawal A et al (2016) Stakeholder engagement and biodiversity conservation challenges in social-ecological systems: some insights from biosphere reserves in western Africa and France. *Ecol Soc*. <https://doi.org/10.5751/ES-08812-210425>
- Campbell C, Sacchetti S (2017) Editorial: community-based, collaborative solutions to sustainable economic development in and around biosphere reserves. *JEOD* 6:1–9. <https://doi.org/10.5947/jeod.2017.001>
- Charli-Joseph L, Siqueiros-Garcia JM, Eakin H et al (2018) Promoting agency for social-ecological transformation: a transformation-lab in the Xochimilco social-ecological system. *Ecol Soc*. <https://doi.org/10.5751/ES-10214-230246>
- Coetzee BWT, Gaston KJ, Chown SL (2014) Local scale comparisons of biodiversity as a test for global protected area ecological performance: a meta-analysis. *PLoS ONE* 9:e105824. <https://doi.org/10.1371/journal.pone.0105824>
- Collier RB, Collier D (1991) Critical junctures and historical legacies. Shaping the political arena: critical junctures, trade unions, and the State in Latin America. Princeton University Press, Princeton, pp 27–39
- Edge S, McAllister ML (2009) Place-based local governance and sustainable communities: lessons from Canadian biosphere reserves. *J Environ Plan Manag* 52:279–295. <https://doi.org/10.1080/09640560802703058>

- Faulkner L, Brown K, Quinn T (2018) Analyzing community resilience as an emergent property of dynamic social-ecological systems. *E&S* 23:art24. <https://doi.org/10.5751/ES-09784-230124>
- Ferreira A, Zimmermann H, Santos R, von Wehrden H (2018) A social-ecological systems framework as a tool for understanding the effectiveness of biosphere reserve management. *Sustainability* 10:3608. <https://doi.org/10.3390/su10103608>
- García-Barrios L, Cruz-Morales J, Vandermeer J, Perfecto I (2017) The Azteca Chess experience: learning how to share concepts of ecological complexity with small coffee farmers. *Ecol Soc*. <https://doi.org/10.5751/ES-09184-220237>
- Geels FW, Schot J (2010) The dynamics of socio-technical transitions: a sociotechnical perspective in grin'. In: Rotmans J, Schot J (eds) *Transitions to sustainable development: new directions in the study of long term transformative change*. Routledge, London
- Gunderson LH, Holling CS (eds) (2002) *Panarchy: understanding transformations in systems of humans and nature*. Island Press, Washington
- Hahn T (2011) Self-organized governance networks for ecosystem management: who is accountable? *Ecol Soc*. <https://doi.org/10.5751/ES-04043-160218>
- Herrero C (2017) Biosphere reserves: learning spaces for sustainability. *Int J UNESCO Biosph Reserv* 1:77–84
- Hobbs RJ, Arico S, Aronson J et al (2006) Novel ecosystems: theoretical and management aspects of the new ecological world order. *Glob Ecol Biogeogr* 15:1–7. <https://doi.org/10.1111/j.1466-822X.2006.00212.x>
- Hostetler M, Allen W, Meurk C (2011) Conserving urban biodiversity? Creating green infrastructure is only the first step. *Landsc Urban Plan* 100:369–371. <https://doi.org/10.1016/j.landurbplan.2011.01.011>
- IBE-UNESCO (2015) Concept of governance. In: *Int Bur Educ*. <http://www.ibe.unesco.org/en/geqaf/technicalnotes/concept-governance>. Accessed 6 Jun 2021
- Jungmeier M, Paul-Horn I, Zollner D et al (2011) Biosphere reserves as a long-term intervention in a region—strategies, processes, topics and principles of different participative planning and management regimes of biosphere reserves. *Eco.mont J Prot Mt Areas Res*. <https://doi.org/10.1553/eco.mont-3-1s29>
- Kramer DB, Hartter J, Boag AE et al (2017) Top 40 questions in coupled human and natural systems (CHANS) research. *E&S* 22:art44. <https://doi.org/10.5751/ES-09429-220244>
- Lavrakas PJ (2009) *Encyclopedia of survey research methods*. Sage Publications, Thousand Oaks
- Leslie HM, Basurto X, Nenadovic M et al (2015) Operationalizing the social-ecological systems framework to assess sustainability. *Proc Natl Acad Sci* 112:5979–5984. <https://doi.org/10.1073/pnas.1414640112>
- Liu J, Dietz T, Carpenter SR et al (2007) Complexity of coupled human and natural systems. *Science* 317:1513–1516. <https://doi.org/10.1126/science.1144004>
- Liu J, Yang W, Li S (2016) Framing ecosystem services in the telecoupled anthropocene. *Front Ecol Environ* 14:27–36. <https://doi.org/10.1002/16-0188.1>
- Liu J, Dietz T, Carpenter SR et al (2021) Coupled human and natural systems: the evolution and applications of an integrated framework: this article belongs to *Ambio's* 50th anniversary collection. Theme: anthropocene. *Ambio*. <https://doi.org/10.1007/s13280-020-01488-5>
- De Lucio JV, Herrero C, Rodríguez B, et al (2019) Claves de éxito de las experiencias de transición a la sostenibilidad en reservas de biosfera: Investigación participativa de casos de ciclo adaptativo e intervención sobre sistemas ecológicos y sociales. *Forum de Sostenibilidad Cátedra UNESCO sobre Desarrollo Sostenible de la Universidad del País Vasco UPV/EHU* 9
- Mbereko A, Kupika OL, Gandiwa E (2017) Linking social and ecological sustainability: an analysis of livelihoods and the hanging natural resources in the Middle Zambezi Biosphere Reserve. *J Entrep Organ Divers* 6:49–68. <https://doi.org/10.5947/jeod.2017.004>
- McGinnis MD, Ostrom E (2014) Social-ecological system framework: initial changes and continuing challenges. *Ecol Soc*. <https://doi.org/10.5751/ES-06387-190230>
- Méndez PF, Isendahl N, Amezaga JM, Santamaría L (2012) Facilitating transitional processes in rigid institutional regimes for water management and wetland conservation: experience from the Guadalquivir Estuary. *Ecol Soc*. <https://doi.org/10.5751/ES-04494-170126>
- Moore JB, Horti A, Fielding BA (2018) Evaluation of the nutrient content of yogurts: a comprehensive survey of yogurt products in the major UK supermarkets. *BMJ Open*. <https://doi.org/10.1136/bmjopen-2017-021387>
- Negev M, Sagie H, Orenstein DE et al (2019) Using the ecosystem services framework for defining diverse human-nature relationships in a multi-ethnic biosphere reserve. *Ecosyst Serv* 39:100989. <https://doi.org/10.1016/j.ecoser.2019.100989>
- Nykvist B, von Heland J (2014) Social-ecological memory as a source of general and specified resilience. *Ecol Soc*. <https://doi.org/10.5751/ES-06167-190247>
- Onaindia M, Ballesteros F, Alonso G et al (2013) Participatory process to prioritize actions for a sustainable management in a biosphere reserve. *Environ Sci Policy* 33:283–294. <https://doi.org/10.1016/j.envsci.2013.05.012>
- Onaindia M, Herrero C, Hernández A et al (2019) Co-creation of sustainable development knowledge in biosphere reserves. In: Reed MG, Price MF (eds) *UNESCO biosphere reserves, 1st edn*. Taylor and Francis, pp 269–280
- Ostrom E (2005) *Understanding institutional diversity*. Princeton University Press, Princeton
- Oteros-Rozas E, Martín-López B, Daw TM et al (2015) Participatory scenario planning in place-based social-ecological research: insights and experiences from 23 case studies. *Ecol Soc*. <https://doi.org/10.5751/ES-07985-200432>
- Patel S, Rogers M, Amlôt R, Rubin G (2017) What do we mean by 'Community Resilience'? A systematic literature review of how it is defined in the literature. *PLOS Curr*. <https://doi.org/10.1371/currents.dis.db775aff25efc5ac4f0660ad9c9f7db2>
- Persson J, Johansson EL, Olsson L (2018) Harnessing local knowledge for scientific knowledge production: challenges and pitfalls within evidence-based sustainability studies. *E&S* 23:art38. <https://doi.org/10.5751/ES-10608-230438>
- Plummer R, Baird J, Farhad S, Witkowski S (2020) How do biosphere stewards actively shape trajectories of social-ecological change? *J Environ Manag* 261:110139. <https://doi.org/10.1016/j.jenvman.2020.110139>
- Reed MG, Godmaire H, Abernethy P, Guertin M-A (2014) Building a community of practice for sustainability: strengthening learning and collective action of Canadian biosphere reserves through a national partnership. *J Environ Manag* 145:230–239. <https://doi.org/10.1016/j.jenvman.2014.06.030>
- Schmitter PC (1979) Still the century of corporatism? In: Lehmbruch G, Schmitter PC (eds) *Trends toward corporatist intermediation*. Sage Publications, London, pp 7–52
- Seijo F, Godoy MM, Guglielmin D et al (2020) Conflicting frames about ownership and land use drive wildfire ignitions in a protected conservation area. *Environ Manag* 65:448–462. <https://doi.org/10.1007/s00267-020-01265-w>
- Sharpley R (2021) 20th Anniversary reflective commentary—on the need for sustainable tourism consumption. *Tour Stud* 28:146879762098608. <https://doi.org/10.1177/146879762098608>

- Soss J (2013) Talking our way to meaningful explanations a practice-centered view of interviewing for interpretive research. In: Yanow D, Schwartz-Shea P (eds) *Interpretation and method*, 2nd edn. M.E. Sharpe, Armonk, pp 161–182
- Těšitel J, Kušová D (2010) Biosphere reserves. Suggested model of the institution of commons. *J Landsc Ecol* 3:17
- UNESCO (2019) Biosphere reserves. In: UNESCO. <https://en.unesco.org/biosphere>. Accessed 15 May 2020
- UNESCO-MAB (2017) *A New Roadmap for the Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves: MAB Strategy (2015–2025), Lima Action Plan (2016–2025), Lima Declaration*. UNESCO, Paris
- Williams S, Robinson J (2020) Measuring sustainability: an evaluation framework for sustainability transition experiments. *Environ Sci Policy* 103:58–66. <https://doi.org/10.1016/j.envsci.2019.10.012>
- Yin RK (2014) *Case study research: design and methods*, 5th edn. Sage Publications, Los Angeles

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