



Biosphere Reserves as catalysts for sustainability transformations: five strategies to support place-based innovation

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Place-based innovations are expected to provide transformative solutions to global wicked problems. Biosphere Reserves, as designated model regions for sustainable development and sustainability transformations, are bound to support place-based innovations. Yet, empirical scientific evidence about innovation in Biosphere Reserves is rare so far. Hence, we review recent findings on innovations, grassroots, and transitions in Biosphere Reserves. We highlight five pathways in which place-based innovations develop in or with Biosphere Reserves. Following, we propose five strategies for Biosphere Reserves to purposefully support place-based innovations. Finally, we argue that Biosphere Reserves research should focus on transformation governance, and we call for support from policy and from the World Network to support innovation and enhance cross-boundary learning.

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Introduction

Sustainability transformations are gaining momentum in policy and science and calling attention to the need for radical changes in the political, personal, and practical

spheres of human activities as a means to address global wicked problems [1,2]. Following Patterson et al. [3], sustainability transformations “refer to fundamental changes in structural, functional, relational, and cognitive aspects of socio-technical-ecological systems that lead to new patterns of interactions and outcomes”. Often considered to contribute to broader, multifaceted societal transformation processes, sustainability innovations and initiatives offer more grounded and place-based approaches to understanding and supporting transformations [4,5]. Place-based sustainability innovations and initiatives (hereafter referred to as innovations) can be considered as new pathways aiming to meet societal needs and generate positive outcomes for social-ecological integrity and equity [6]. Yet, there is a need to better understand how to support place-based — often small-scale — innovations, and how to ensure cross-case learning and mutual support across spatial and governance scales [7,8].

At the interface of science, governance, and management, UNESCO Biosphere Reserves offer excellent learning platforms to test, evaluate, and share good practices of place-based sustainability innovations across geographic and governance scales [9]. The Man and Biosphere (MAB) Programme, in particular with the Seville Strategy and the Lima Action Plan, has increasingly highlighted Biosphere Reserves as model regions dedicated to sustainability transformations [10–12]. As such, they are expected to serve as place-based learning laboratories, initiate and showcase solutions, and serve cross-scale learning through the World Network of Biosphere Reserves (WNBR) [13–15]. Nonetheless, meeting these ambitious expectations remains a challenge, and evidence about the impacts of Biosphere Reserves as learning laboratories for sustainability innovations remains scarce to date [16].

This review therefore articulates recent learnings and inspiring examples of the potential of Biosphere Reserves to support place-based innovations in multiple ways.

The lack of scientific evidence for transformative impact of Biosphere Reserves

While scientific research in Biosphere Reserves still mainly focuses on natural sciences, there is a lack of evidence on their contributions to sustainability transformations [16].

Still, some recent empirical insights can inform strategies for Biosphere Reserves to support place-based innovations. For example, several studies have explored social-ecological transformation processes based on adaptive co-management models in Kristianstad Vattenrike (Sweden) [17,18]. Biosphere Reserves were shown to function as model regions for sustainability transitions and grassroot innovations, by building on multi-level actor coalitions and by strengthening local networks [19,20]. By enhancing community resilience, Biosphere Reserves were found to support agroecological transitions [21,22]. Dabard & Mann [6] illustrated how a Biosphere Reserve administration supported sustainability innovations by providing financial resources and expertise, building networks, and facilitating partnerships. Comparing the Schorfheide-Chorin (Germany) and Fontainebleau-Gâtinais (France) Biosphere Reserves, Dabard et al. [23] showed the key role of Biosphere Reserves to host and support diverse sustainability innovations in agriculture, education, energy, mobility, or tourism. Albeit rare, these studies demonstrate the relevance of Biosphere Reserves in supporting place-based sustainability innovations for transformations.

Five pathways and strategies for Biosphere Reserves to support sustainability transformations

In this short review, we highlight five pathways in which place-based innovations benefit from Biosphere Reserves, and we propose five related strategies to purposefully support innovations (Figure 1). We illustrate this with examples from recent publications, our own empirical research [6,23,24] or concrete examples from European Biosphere Reserves. Note that these pathways encapsulate two complementary understandings of Biosphere Reserves as (1) their governance and administrative bodies, which implement innovative projects and take various forms in different contexts (hereafter Biosphere Reserves administration); and (2) specific places, in which other people and organisations may innovate.

Pathway #1 Biosphere Reserves as places where innovation spontaneously develops

In many cases, various actors develop place-based innovations without the involvement of the respective Biosphere Reserve administration. For instance, Kratzer et al. [20] and Dabard et al. [23] conducted inventories of innovations in several European Biosphere Reserves. Those inventories showed that many innovations developed without the involvement of the administration and sometimes even without the awareness that these initiatives were located within the Biosphere Reserve.

Strategy #1 Strengthen communication and outreach activities to collect information, build awareness of, and increase the visibility of existing innovations. For instance, Biosphere Reserve administrations can conduct inventories of place-based initiatives, entrepreneurs, and

innovations [23,20,25]. In the French Network of Biosphere Reserves (MAB France), the competition *Trophées de la Biosphère* (Biosphere Trophies) rewards the most promising local initiatives in each Biosphere Reserve since 2014 [26].

Pathway #2 Biosphere Reserves as places that inspire place-based innovations

Biosphere Reserves can frame a regional identity and shared sense of place [9,27,28], and, as such, they can inspire place-based innovations. Indeed, place-based innovations require a strong context-fit [29,30], which ideally aligns with the specific goals and regional objectives of the Biosphere Reserves [6,21]. For instance, regional frameworks for sustainable development were adopted in the Lake Vänern Archipelago and Mount Kinnekulle Biosphere Reserve (Sweden), which inspired several local entrepreneurs to develop sustainability-oriented business approaches in agri-food, tourism, or energy sectors [25].

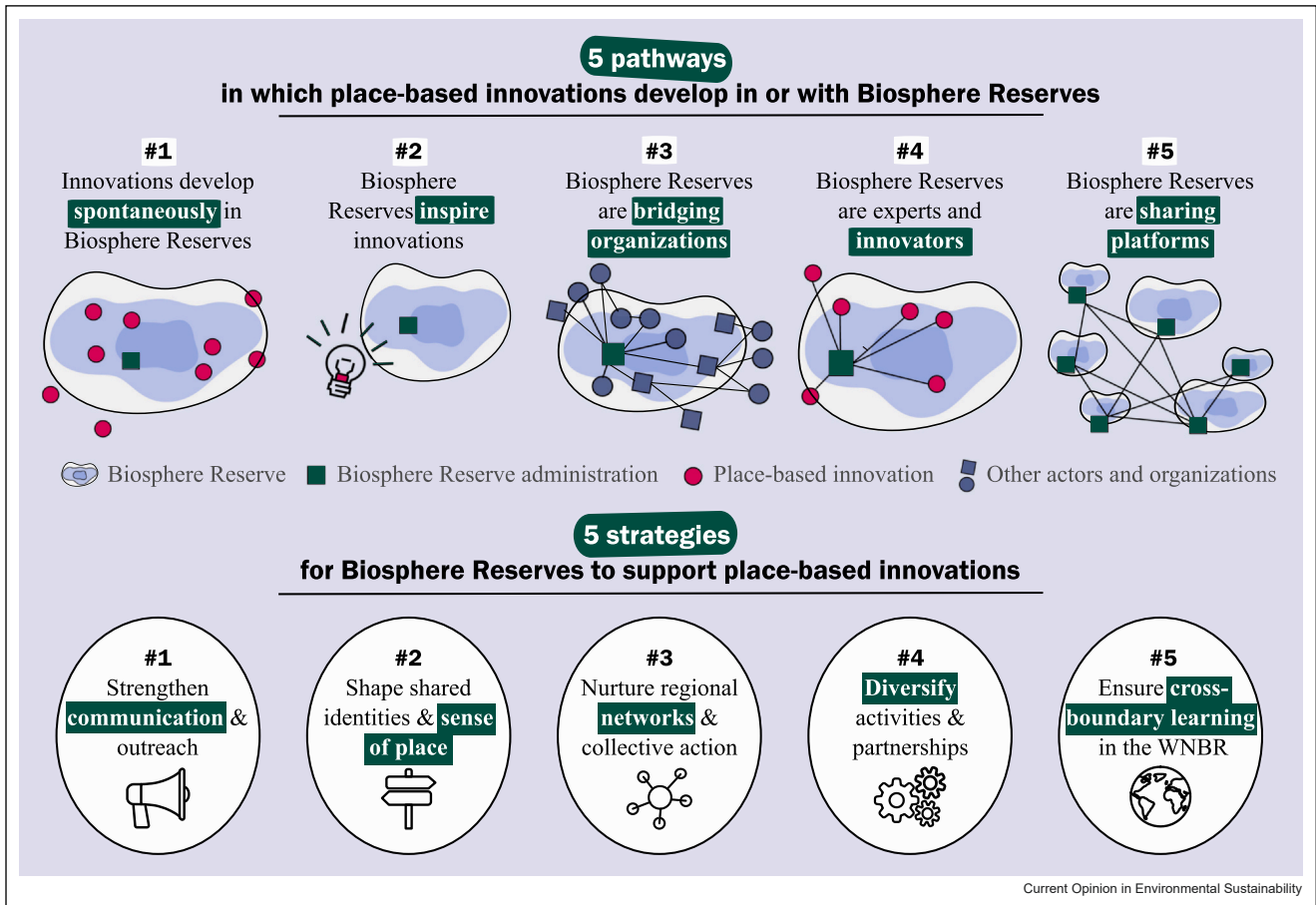
Strategy #2 Shape shared identities and sense of place through collaborative goal setting, participation, and communication. For example, regional labels highlight products, producers, or initiatives that contribute to meeting the Biosphere Reserves' goals. The Spreewald Biosphere Reserve (Germany) created the label '*Spreewald Dachmarke*' for local products that foster traditional production methods [31]. In the Dordogne Basin Biosphere Reserve (France), a regional scenario approach helped to develop a vision for 2040, involving a variety of local actors and promoting a regional identity and shared sense of place [32].

Pathway #3 Biosphere Reserves as bridging organisations in innovative networks

Biosphere Reserve administrations are bridging organisations that can facilitate networks and partnerships [33]. Cooperative networks can support the development and diffusion of grassroots innovations [34], sustainability initiatives [21,35], and innovations [24]. In this regard, Biosphere Reserve administrations can play the role of gatekeepers connecting actors and organisations at different governance levels [36–38]. For example, the Mariñas Coruñesas Biosphere Reserve (Spain) supported local agroecological initiatives in terms of funding and visibility, providing a window of opportunity for alternative agricultural models [22].

Strategy #3 Nurture regional networks and collective action to promote shared visions, collaboration, and knowledge sharing across actors and organisations. For instance, administrations can facilitate networking activities [39], such as forums, entrepreneurs meetings, and labelling initiatives. Biosphere Reserves can promote communication between initiatives and innovations, academia, entrepreneurship, or civil society. Such diversity is

Figure 1



Five pathways and five strategies for Biosphere Reserves to support place-based innovations. Own illustration, Biosphere Reserve icon adapted from: (<https://www.unesco.org/en/mab/wnbr/about>).

crucial to connect diverse goals, values, and knowledge for collective action that lead to innovations [24,40]. For instance, the Regional Nature Parc Gâtinais français, which is part of the Fontainebleau-Gâtinais Biosphere Reserve (France), created a co-working space to host local entrepreneurs in a rural area where such services are rare [41].

Pathway #4: Biosphere Reserve administrations as innovators

Biosphere Reserve administrations, building on in-house expertise, often carry out multiple projects and activities that have a strong innovative character [23]. For instance, Kristianstad Vattenrike Biosphere Area (Sweden) has built a strong expertise in nature-based education and recreation and has carried out multiple pioneer activities to strengthen sense of place and raise awareness, among other goals [18,27]. In this regard, it is worth acknowledging the innovative, experimental, or pioneering character of many activities launched by Biosphere Reserves themselves. Such an expansion of

activities needs to be facilitated by strong partnerships with various actors, building on diverse expertise, knowledge, and capacities [23,42].

Strategy # 4 Diversify activities and partnerships to build on existing capacities, knowledge, and expertise. Biosphere Reserve administrations could expand their (innovative) activities by developing projects partly related to their respective fields of expertise, building on past experiences and new partnerships. The Regional Nature Parc Gâtinais français has developed projects dedicated to different forms of agriculture in the last decades, starting with a regional value-chain for medicinal herbs and using gained expertise and partnerships to develop a hemp sector, a label for local watercress and other crops with strong cultural heritage [23,43].

Pathway #5 Biosphere Reserves as sharing platforms within the World Network of Biosphere Reserves

A major feature of the MAB Programme is the WNBR [11]. The WNBR could foster learning opportunities about

transformative activities conducted within and by Biosphere Reserves. Yet, there is limited scientific evidence of the capacity and contributions of the WNBR to foster learning and knowledge exchange [14,44]. Learning across Biosphere Reserves can be facilitated by focussing on shared interests within one or several countries, as exemplified in the Spanish Network of Biosphere Reserves [14]. For instance, the biannual EuroMAB conference fosters cross-boundary learning and, in its last edition, called for more intensive cooperation and exchange within the WNBR [45]. However, at the global level, it seems that there is still much potential in the WNBR for cross-boundary learning [9,44].

Strategy #5 Ensure cross-boundary learning and knowledge-sharing, notably through the World Network of Biosphere Reserves, about place-based sustainability innovations in various Biosphere Reserves. Knowledge co-creation processes among various types of actors were shown to foster sustainability transitions in several Spanish Biosphere Reserves [46]. An example from Canada can illustrate the mechanism of strengthening learning despite linguistic differences. Practitioners from 16 Biospheres, together with researchers from the University of Saskatchewan and policy actors, built an action-research partnership to facilitate collective learning around the themes of tourism, land use, and education [39,47]. Such network and co-creation approaches across governance and spatial scales, involving various actors and spanning across cultural and linguistic boundaries, should be further experimented with, to better articulate the potential of the WNBR to spread and amplify sustainability transformations.

Implications for research and policy

Strengthen research about and with Biosphere Reserves as regional innovations systems

To better understand how to enhance the transformative potential of Biosphere Reserves, there is a need for a shift in research towards sustainability transformations and governance [14], where Biosphere Reserves are studied as ‘open sky laboratories for sustainable development’ [48]. Exploring how Biosphere Reserves can function as regional innovation systems is a promising approach to support the development of tailored solutions to specific territorial challenges [25,30,40,49]. In particular, there is a need to understand how to shift existing regional networks towards innovative practices, how to foster learning and cooperation within and across Biosphere Reserves, and how to support local sustainable and social entrepreneurs [9,24,49]. Such research would require long-term transdisciplinary partnerships [9].

Policy implications

To strengthen the role of Biosphere Reserves as model regions and real-world laboratories for experimentations,

innovations, and learning, future MAB policies should provide guidelines to monitor, highlight, implement, and share learnings from place-based sustainability innovations. For instance, the periodic evaluation process could be used for monitoring place-based innovations, initiatives, and entrepreneurs, and for assessing their impacts [9,50]. Adapted digital platforms and infrastructure could be developed to enable cross-boundary sharing. Indeed, it is crucial to strengthen learning across sites within the WNBR to tap deeper into the global knowledge pool about place-based solutions for sustainability [44]. Building trusting and diverse networks requires stable funding and resources in the long term. The member states and national MAB committees should therefore ease access to funding, provide updated data, communicate research priorities, and foster transdisciplinary partnerships [51].

Conclusions

We proposed five strategies for Biosphere Reserve administrations, departing from least time- and cost-intensive strategies focussing on collecting information and communication to strategies towards nurturing collaborative networks, developing new activities, and diversifying partnerships. The capacity to implement such strategies deeply depends on governance models and local contexts. In this regard, we should acknowledge that Biosphere Reserves can be facing various challenges or pursuing specific goals — and that contributing to societal transformations may not be an adequate mission for all Biosphere Reserves at any time. Nevertheless, the inspiring examples provided in this perspective exemplify the capacity of Biosphere Reserves to contribute to sustainability transformations in various context-specific manners. To enhance the transformative potential of Biosphere Reserves and of place-based innovations, there is a need for guidelines to share learnings across Biosphere Reserves. In fact, we argue that many existing initiatives and projects can be regarded as place-based sustainability innovations. Such activities could gain visibility once Biosphere Reserves, as well as researchers, make more confident use of wordings such as ‘innovations’, ‘transitions’, and ‘initiatives’ to characterise and communicate about existing projects within Biosphere Reserves. For this purpose, we call for a stronger engagement towards research about and with place-based innovations for sustainability transformations in Biosphere Reserves, notably through long-term and transdisciplinary studies.

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CRedit authorship contribution statement

CHD: Conceptualization, Investigation, Visualization, Writing – original draft, Writing – review & editing. **CM:** Conceptualization, Writing – review & editing. **BML:** Conceptualization, Writing – review & editing.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

None.

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- of special interest
- of outstanding interest

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