Global Environmental Change 68 (2021) 102273

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

Voices of young biosphere stewards on the strengths, weaknesses, and ways forward for 74 UNESCO Biosphere Reserves across 83 countries

Alicia Donnellan Barraclough [a,b,c,*], Lisen Schultz [b,d], Inger Elisabeth Måren [a,b,c]

[a] Department of Biological Sciences, University of Bergen, Norway
[b] UNESCO Chair on Sustainable Heritage and Environmental Management, University of Bergen, Norway
[c] Centre for Sustainable Area Management (CeSAM), University of Bergen, Bergen, Norway
[d] Stockholm Resilience Centre, Stockholm University, Sweden

ARTICLE INFO

Keywords:
Man and the Biosphere programme (MAB)
Sustainable development
Transdisciplinarity
Youth
Young stakeholders
Biosphere reserve (BR) management and governance

ABSTRACT

Young stakeholders are key actors in social-ecological systems, who have the capacity to be agents of sustainability transformation but are also at high risk of exclusion in the unfolding of global change challenges. Despite the focus of sustainability on future generations, there has been little research effort aimed at understanding young actors' roles as biosphere stewards. In this work we investigate how young stakeholders perceive and participate in the implementation of sustainability objectives in 74 Biosphere Reserves of the United Nations Educational, Scientific and Cultural Organization's (UNESCO) the Man and the Biosphere (MAB) Programme across 83 countries, through participatory group workshops, individual surveys and grey literature review. We explore to what extent youth perceptions are aligned or not with current understandings of Biosphere Reserves and how young stakeholders are acting in pursuit of Biosphere Reserve objectives. We find that young stakeholders have a comprehensive understanding of the opportunities and challenges faced by environmental governance, such as resilience and adaptation to global change and the governance challenges of implementing adaptive co-management and increasing stakeholder participation. We also show that young stakeholders can be active participants in a wide range of activities that contribute to achieving conservation and development goals in their territories. They are particularly concerned with youth participation within all levels of Biosphere Reserve functioning and with the creation of sustainable livelihood opportunities that will allow future generations to remain in their native territories. Our study provides evidence of the importance of young stakeholder knowledge and perspectives as central actors in conservation and development initiatives, like Biosphere Reserves, and of the need to increase young stakeholder integration and participation within environmental governance.

1. Introduction

The United Nations Educational, Scientific and Cultural Organization's (UNESCO) Man and the Biosphere Programme (MAB) is an intergovernmental scientific programme launched in 1971, that aims to establish a scientific basis for the improvement of relationships between people and their environments. The MAB programme's associated World Network of Biosphere Reserves (WNBR) constitutes an embodiment of sustainability science and the "Nature AND people" paradigm (Mace, 2014; Reed, 2019; Reed and Price, 2020). By 2020 there were 714 Biosphere Reserves (BRs) in 129 countries all over the world, including 21 transboundary BRs, which combined make up a land area the size of Australia (5% of the world's surface) and with a total population of 275 million people living within them (Fig. 1). BRs are intended as sites for "learning for sustainability", where biodiversity conservation and human development are combined (Fig. 1), with an emphasis on biocultural diversity, stakeholder participation, social learning, and adaptive approaches to co-management (ACM) (Ishwaran et al., 2008; Schultz et al., 2011, 2018; Reed, 2016; UNESCO, 2016; Herrero, 2017; Van Cuong et al., 2017; Bennett et al., 2018; Milne et al., 2019). BRs have also been identified as key arenas to "Support mitigation and adaptation to climate change and other aspects of global environmental change" (UNESCO, 2016).

Previous studies have shown the highly diverse landscape of ways in

* Corresponding author at: Department of Biological Sciences, University of Bergen, Norway.
E-mail address: alicia.barraclough@uib.no (A.D. Barraclough).

https://doi.org/10.1016/j.gloenvcha.2021.102273
Received 17 October 2020; Received in revised form 11 March 2021; Accepted 25 March 2021
Available online 18 April 2021

which the BR concept is understood and enacted (Schultz et al., 2011, 2018; Reed and Price, 2020). This is in part because the designation does not come with any predetermined legislation, and thus BR goals and their implementation are highly dependent on local, regional and national contexts. Even though this high diversity makes evaluating BR success far from straight forward (Price et al., 2010; Ferreira et al., 2018; Preiser et al., 2018; Schultz et al., 2018), major arenas determining implementation outcomes appear to be the year in which the BR was designated, BR governance structure and the level of stakeholder participation (Schultz et al., 2011; Van Cuong et al., 2017). One common characteristic among BRs is their special emphasis on "BR zonation", a spatial planning tool which is meant to facilitate implementation of the objectives of conservation, development, and research support (Fig. 1) by establishing three different zones ("Core", "Buffer" and "Transition"). Thus, although BR "Core areas" can be made up of Protected Area (PA) type jurisdictions, an equal emphasis of BRs can be placed on "Transition areas", which are meant to be places where communities foster socio-culturally and ecologically sustainable economic and human activities.

Broadening inclusion and participation is seen as a key transformational pathway to accomplishing the United Nations' Agenda 2030 (Sachs et al., 2019). Youth are a group of special focus in the Agenda and other sustainability relevant policy, and feature in numerous Sustainable Development Goals (SDGs); education (SDG4), job security (SDG9), reduction of inequalities (SDG11) and Climate Action (SDG13), as a part of the "leave no one behind" framework (United Nations Technology and Innovation Labs, 2019). Several SDGs make a call to increase participation and capacity building of all at risk groups, including youth, and to "Ensure responsive, inclusive, participatory and representative decision-making at all levels" (United Nations, 2019). Multilateral environmental agreements, such the Convention of Biological Diversity (CBD), also contain clauses specific to increasing youth participation in all areas of environmental governance (CBD, 2012). The need to account for young BR stakeholders is also recognized in BR framework documents, most recently in the Lima Action Plan (2015–2025), which explicitly refers to consideration of young people in "equitable and participatory planning for sustainable development in biosphere reserves" (UNESCO, 2016), and more broadly, within the whole UNESCO organization priorities: "The youth should be mainstreamed throughout all the programmes, including by ensuring youth participation in the decision-making processes for long-term and sustainable societies" (UNESCO, 2019).

However, despite the fact that these policy and research frameworks recognize the importance of young stakeholders, the study of social-ecological systems, conservation and broader global change research has dedicated very little attention to young stakeholders as actors in social-ecological systems, with few notable exceptions (Mitrofanenko et al., 2018; Gallay et al., 2020; Walker, 2020; Thew et al., 2020). What little research exists points towards the vulnerability and risk of exclusion of younger generations to specific global sustainability challenges (Ruesga-Benito et al., 2018), but also to the key importance of participation of younger generations for social transformation towards sustainability (Treude et al., 2017; Gallay et al., 2020). The lack of studies centred around young actors is a significant gap in the literature if we are to facilitate evidence-based policy and decision-making that ensures intergenerational equity (Donnellan-Barraclough et al., 2021).

People's perceptions can provide useful evidence to inform evidence-based environmental management and decision-making (Bennett, 2016). Stakeholder perceptions of environmental governance initiatives can also help understand social impacts of conservation, ecological outcomes of conservation, legitimacy of conservation governance, and acceptability of conservation management. In this work, we study the perceptions and opinions of younger stakeholders with regard to BR implementation, employing the definition of perceptions proposed by Bennett (Bennett, 2016): i.e., the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome. In addition, we study what activities youth participate in and by which they enact their values of biosphere stewardship. We seek to understand both in which ways young stakeholder perceptions align with current knowledge on the status of BRs around the world, and in which way young stakeholders provide a unique understanding of BR implementation strengths and

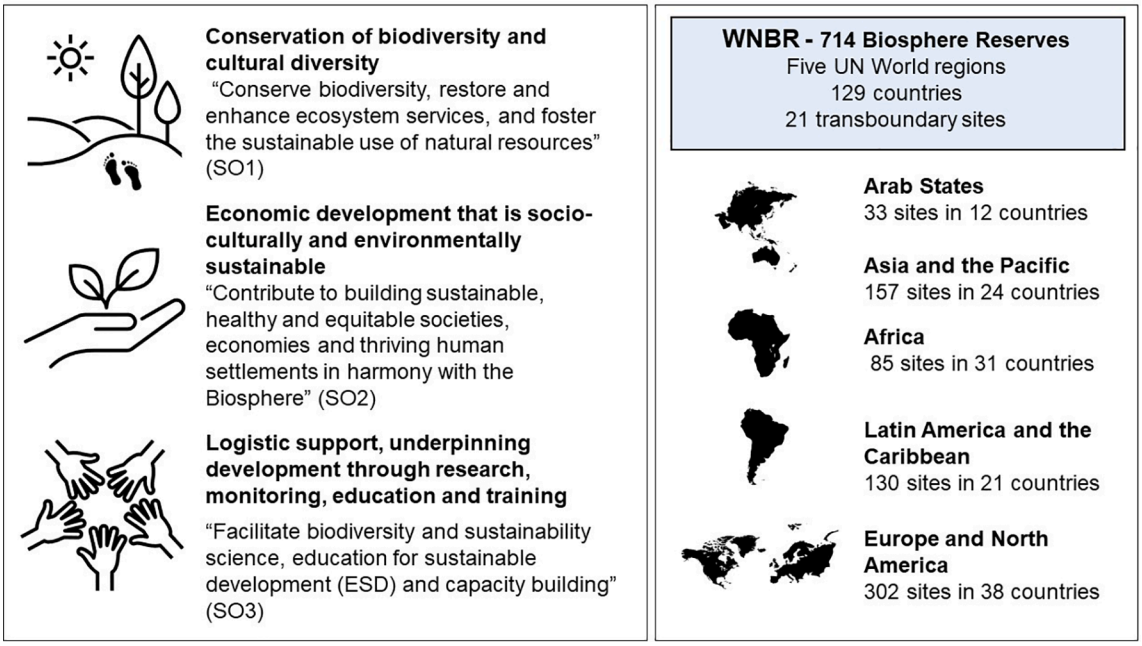

Fig. 1. UNESCO's Man and the Biosphere (MAB) programme combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable. This is reflected in the three functions of Biosphere Reserves (Conservation, Development and Logistic Support) and their associated strategic objectives (SO) in the MAB Strategy (2015–2025) (UNESCO, 2016). The World Network of Biosphere Reserves (WNBR) is as of 2020 comprised of over 714 BRs, organised in five world regions as categorized by the United Nations (UN).

weaknesses going forward.

2. Materials and methods

This research adopted a mixed-methods approach (Bazeley, 2018) under the paradigm of methodological pluralism (Norgaard, 1989), with an empiricist approach to the data analysis but acknowledging interpretive integration necessary for contextualization of results (Schultz et al., 2018). We integrated information from two surveys and a series of participatory workshops, conducting both quantitative and qualitative analyses of the data and complementing findings with consultation with grey literature.

2.1. Tools employed and data collection

Data collection was conducted as a part of the 2019 MAB Youth Forum in Changbaishan Biosphere Reserve, China. The Forum was attended by 173 youth delegates from 74 Biosphere Reserves, 3 MAB National Committees and other related units in 83 countries. United Nations World regions (Fig. 1) were represented by participants as follows: Africa (19), Arab States (4), Europe and North America (29), Latin America and the Caribbean (15), Asian and Pacific region (106, of which 87 were from China). Only a small subset of Chinese participants took active part in the workshops where data was collected. International participants had been nominated by their respective national MAB committees because they were active participants within their BRs, and a final list of attendees was drawn up by the MAB Secretariat in Paris and the Beijing Office. The participants' ages ranged from 18 to 35 years.

The workshop was a day-long exercise where the 90 participants were allocated to 13 different groups which contained a balanced mix of Global South and Global North participants (See Supplementary Material). A "Strengths, Weaknesses, Opportunities and Threats" (SWOT) analysis was employed, a tool originally developed as a strategic planning method to identify internal and external factors affecting the success of a project (Dealtry, 1992). The SWOT consisted of asking each group the open-ended question "What are the strengths, weaknesses, opportunities and threats relevant to your BRs, related to all three MAB goals (Conservation, Development and Logistic support)" (Fig. 1). The facilitator guided the session by asking participants to consider strengths, and each participant contributed their perspective individually, writing ideas on small pieces of paper which were then handed to the group facilitator who grouped and arranged all ideas on a board for a group discussion, before moving on to weaknesses, opportunities and threats, respectively. All statements written on post-it notes and paper boards were retained and transcribed for analysis.

The first survey was offered as a voluntary individual-level follow-up immediately after the workshop (post-workshop survey, 25 survey participants, 30% response rate). The survey was predominantly composed of open questions, the overarching themes of which were: individual's level of involvement within BRs, evaluation of their BR's success in reaching its goals, a more detailed SWOT analysis and questions regarding the background of their BRs. The second follow-up survey was conducted by the UNESCO MAB Beijing office four weeks after the event (post-event survey, 53 participants, 62% response rate). This second survey included closed questions on participant background and relationship to their BR, and open questions inviting participants to suggest key actions and ways forward in which they were helping address challenges faced in BRs and how youth do or can contribute through concrete actions (Supplementary Material).

Lastly, we collected and reviewed grey literature reports published by the organizers of various MAB Youth Forums and meetings, and submitted to the MAB International Coordination Council, including analytical reports which included a summary of workshop and survey results (Pypaert et al., 2019) and the "MAB Youth Declaration" documents which were published collectively by the participants at the end of these meetings (MAB Youth, 2019). Grey literature was not coded or analysed, but was used as referencing material in the discussion.

3. Analyses

Results from workshops, both surveys and UNESCO post-event report were entered into NVIVO Qualitative Data Analysis Software (NVIVO 2020). A total of 550 statements were analysed for the SWOT analysis (439 from workshops and 111 from the first survey). The second survey resulted in a total of 161 statements from 48 participants' open questions on key action areas on youth participation. We employed a hybrid inductive-deductive approach to thematic analysis, starting with a set of pre-existing themes of interest and deriving subthemes deductively and inductively from the texts (Miles and Huberman, 1994), via an iterative process which included interpretive reading of the text, memo writing, literature consultation and the query tools in NVIVO.

A first reading of all texts from the SWOT produced an initial set of codes which we then classified into broader "first level nodes". First level nodes were in some cases established inductively and other times deductively via consultation with relevant literature. This iterative process allowed the initial set of codes to be refined and classified into first, second and third level nodes, some codes were combined or removed, additional codes created, hierarchies established, and subcategories added or removed. For example, due to our interest in the effects of global change drivers on BR implementation, we deductively established the first level node "Processes, drivers and phenomena" of global change and corresponding second level nodes classes ("Governance and institutional drivers", "Economic and technological processes", "Socio-cultural processes", "Direct global change drivers", "Science and Knowledge generation" and "Conflicts"), based on consultation with the (Díaz and Settele, 2019) IPBES (2019) and the MEA (2005) reports. We then populated these categories with inductive third level nodes (for complete list of codes and subcodes and their justification see Supplementary Material). Other first level nodes we considered were "Natural capital" (containing "Natural Resources" and Biodiversity"), "Actors", "Practices", "Goals of BR" and "Aspect" (strength, weakness, opportunity or threat) (see Supplementary Material for full description of codes and subcodes). Second survey result themes related to young actors' action arenas were established inductively. Resulting codes included "Thematic areas of action" (with 20 subcodes), "Means and approaches" (with six subcodes) and "Actors" (six subcodes).

All coding was performed at least two times after the final set of codes was produced to ensure uniform coding throughout texts. We plotted and qualitatively analysed the number of coded references for each individual theme and theme groups across workshops and surveys.

4. Results

4.1. General

The average age of workshop participants was 27 years (youngest 18, oldest 35 years), for the post-workshop survey 29 years (22, 35), and for the post-event survey it was 28 years (19, 35). Participants were either strongly or very strongly involved with their BRs, with 62% of event participants saying they were regularly in contact with their BR governing bodies (n = 53). The subset of participants who completed the post-workshop survey scored their personal contributions to their BR's goals as 5 out of 7 (1 = "Contribute not at all", 7 = "Contribute a lot", n = 25, sd = 1.1). These participants also scored the success of their BRs in achieving all three functions of conservation, development and logistics as 5 out of 7 (1 = "Not successful", 7 = "Highly Successful", n = 25, sd = 1).

4.2. The SWOT analysis

The most common topics identified as important phenomena and

drivers of change were those related to Governance (297 statements), Economic and technological issues (187 statements), Sociocultural phenomena (178 statements), Direct global change drivers (99 statements), Research and knowledge generation (91 statements), Natural resources (71 statements), Biodiversity (42 statements) and Conflict (16 statements), in addition to those referring to Actors (224 statements) and Goals of BRs (431 statements). For full list of all codes, subcodes and number of coding references please see the Supplementary Material (Table 2). We found no significant difference in the frequency of code occurrence between workshops and the individual survey ($p \leq 0.05$). More strengths and weaknesses were recorded than opportunities and threats across all texts (Supplementary Material, Table 3).

4.2.1. Strengths

The most mentioned single topic when discussing BR strengths was the capacity of BRs to offer increased options for local community livelihoods and business (30) (Figs. 2 & 3). Many people saw their BR's capacity to create a "*good business climate*" as a strength, with opportunities for branding and entrepreneurship. In addition, livelihood opportunities for local communities were presented often through the development of sustainable agriculture projects and products, and tourism (12). The second and third most common topics were BRs capacity to be beds of knowledge generation (30) and education and capacity building (29) (Figs. 2 & 3), via the establishment of research, knowledge, education and capacity building initiatives and networks within BRs, such as nature schools and associated universities. Thus, collaboration (13) with outside actors, namely academic institutions and environmental organizations, was mentioned as important for sharing knowledge and increasing access to research by local institutions and communities, thus facilitating capacity building, local job creation and income diversification. Other good practices included outdoor and environmental education programs, and integration of the BR's heritage and culture within local education systems. Policy and management related strengths were the fourth most common types of statements (26) (Figs. 2 & 3). Participants mentioned supportive national legislation frameworks and regulations which aided the implementation of all the BR functions, experience in protected area management, and strong local level governance. BR management plans with long term visions and strategies were also considered an asset, as well as the success of management plans which accounted for different needs of BR zoning. Inclusion of local communities within the development and implementation of management plans and regulations was also specifically referred to as positive.

Other important topics included examples of local participation (20) within broader governance and positive institutional arrangements (19), as well as the capacity of the BRs to act as a bridge between different institutions, organizations and stakeholder groups (15) (Fig. 2). Participants mentioned the importance of strong well-respected institutions and stable bonds across governance scales from international to local. Successful audience-adapted outreach programs together with increased awareness of BR objectives by stakeholders and institutions were also considered important (15). In addition, participants mentioned the benefits of having infrastructure (11) and financial resources (10) to support BR activities. Biodiversity was specifically mentioned as a strength (21), citing both successful biodiversity conservation efforts in BRs and richness in native biodiversity as a BR asset. Having endemic, threatened or rare species within BRs was considered positive, as well as having successful biodiversity monitoring and management plans which

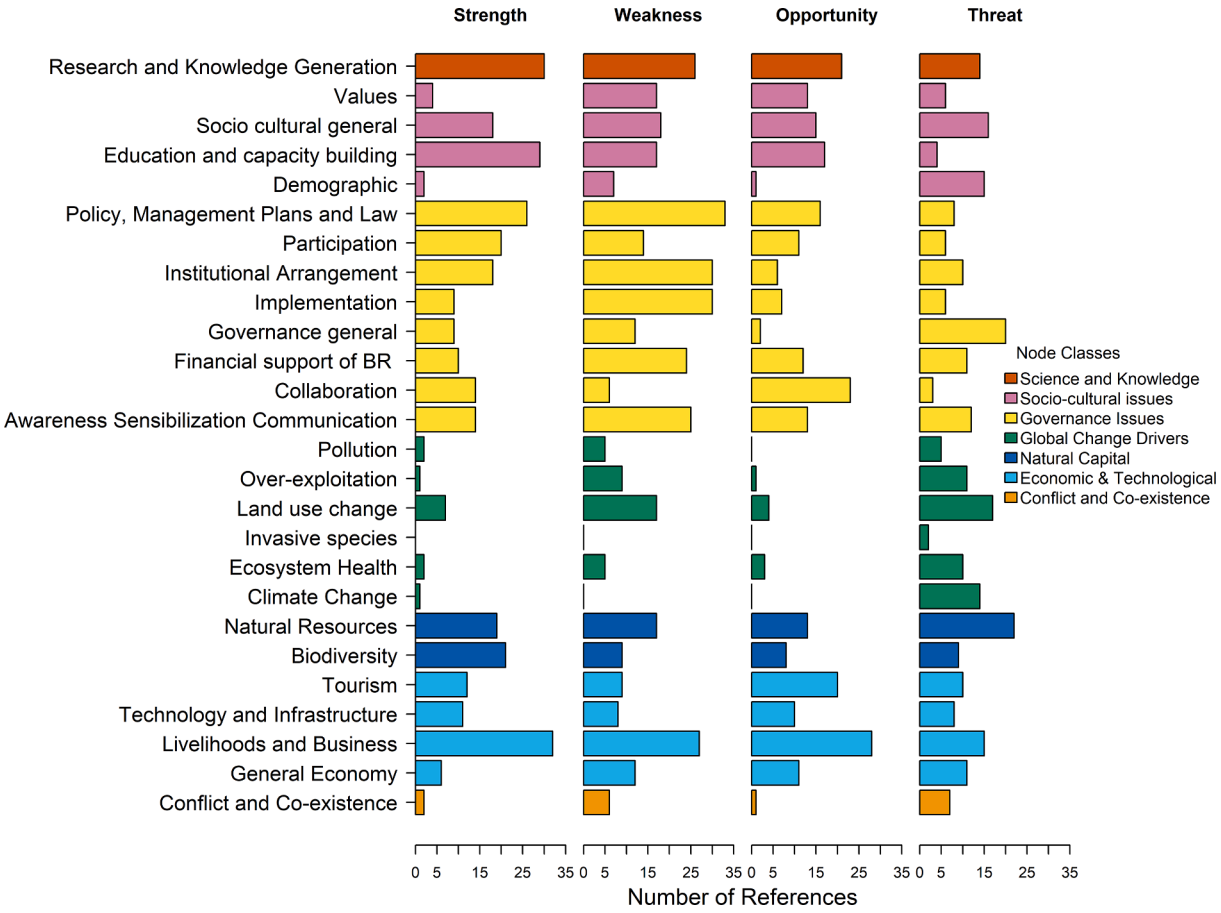

Fig. 2. Key themes resulting from workshop and post-workshop survey SWOT analysis. Bars represent themes that belong to the first level node "Drivers of Change". Themes represented by the bars were derived inductively from the second level nodes stated in the legend ("Node Classes") and represented by the different bar colours.

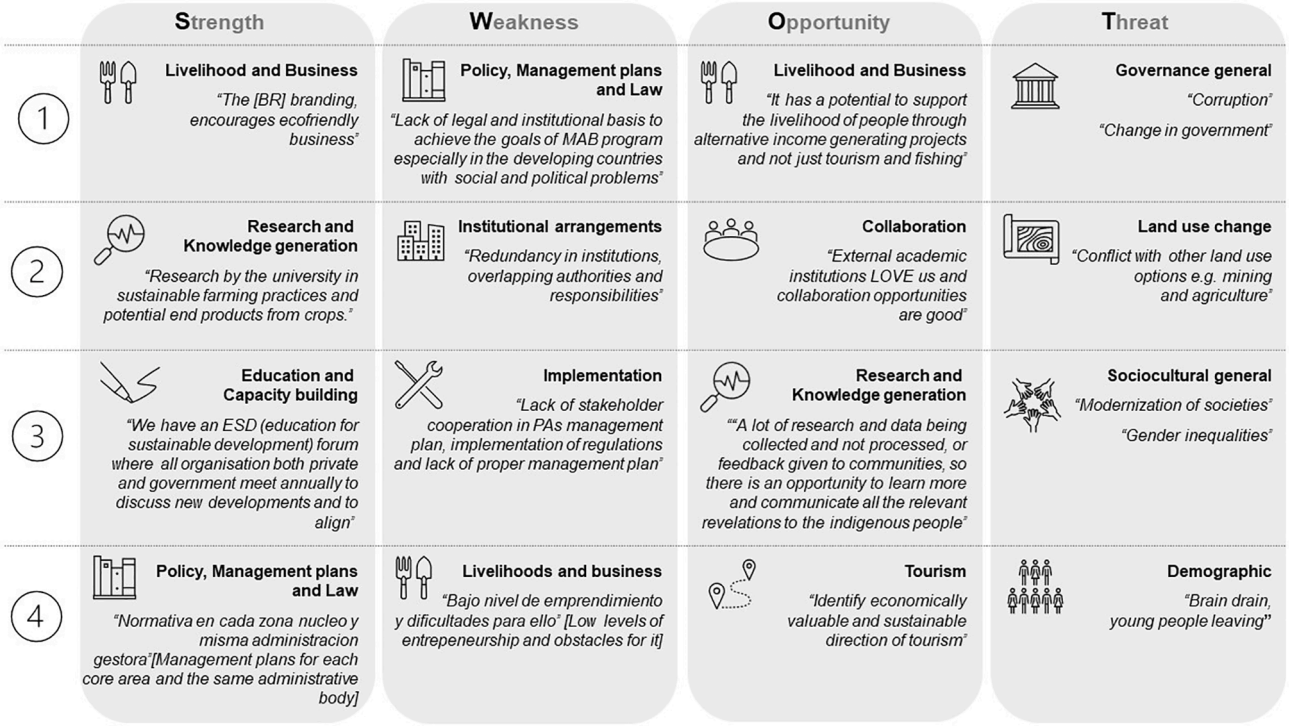

Fig. 3. Summary of the top four themes raised by respondents in the SWOT (strengths, weaknesses, opportunities and threats) analysis on Biosphere Reserve (BR) functioning (workshops and surveys). Themes presented here are nodes within the category of "Processes, drivers and phenomena" which include direct global change drivers, socio-cultural drivers, economic and technological phenomena, governance issues, and science and knowledge drivers.

involved local communities. Other forms of natural resources (19) considered important included productive land (e.g. agricultural or forested land) and several provisioning ecosystem services which benefited local livelihoods and economies (e.g. fish, honey, and tea). Other strengths included socio-cultural references (19) about local empowerment, cultural revival and increased sense of belonging that facilitated BR goal implementation. A small number of statements also invoked the values of caring and opportunities for coexistence and stewardship offered by BRs (4) (Fig. 2).

4.2.2. *Weaknessess*

Participants perceived challenges related to law, policy and management plans (33), institutional arrangements (30), implementation gaps (30), and livelihood and business (27) (Figs. 2 & 3). In this sense, a lack of legal frameworks, policy, and regulations required to implement BR objectives was considered problematic, as well as lack of coherence between overlapping institutions, legal instruments, and conflicting regulations. Lack of clear institutional mandates and the existence of inefficient governance arrangements and/or coordination was a prevalent theme, together with difficulties in connecting local level community governance to higher level institutions. Some BRs lacked a governance organization to coordinate and implement BR objectives, which was considered a weakness. Other BRs had no or only short-term management plans and often lacked the resources required to implement or enforce them. Thus, lack of government support and political will, corruption and limited financial support (24) were considered weaknesses, although excessive government interference was also considered problematic. Additional implementation problems were low participation in governance of all relevant stakeholders (14), difficulties in adapting, enacting and communicating the MAB values (17) were also noted, together with difficulties in accessing or disseminating information on BR objectives to local communities (25) (Fig. 2).

Livelihoods and business-related issues were discussed in terms of a lack of livelihood opportunities for local communities, with many residents engaged in what were considered as "unsustainable practices" due to limited available options and low economic returns of BR activities. Thus, many livelihood topics overlapped with refences to direct global change drivers such as land use change, habitat loss and encroachment on protected land area (17), loss of biodiversity (9), poaching (9) and pollution (5). In addition, communities were considered to be negatively dependent on single activities, such as tourism, and other economic practices thought to negatively affect social welfare and cultural diversity. Lack of jobs was also linked to youth leaving BR communities (7), thus resulting in local demographic issues. Other general economic (12) issues were poor national or regional economic contexts (poverty), and technological and infrastructure challenges (7) related to limited access to resources (Fig. 2).

Research and knowledge driven weaknesses (26) which emerged were lack of implementation of research results and their integration into the development of management plans. Many mentioned the lack of connections between research questions and local community needs, poor evaluation of the impacts of research and ineffective sharing of study results with local communities. Many BRs experienced a lack of research infrastructure, and the financial, technological and human resources necessary to ensure continuity of research or monitoring activities. Educational and capacity building issues (17) revolved around low levels of education, lack of qualified and skilled staff to support educational activities and limited resources to offer capacity building opportunities to local communities and BR staff (Fig. 2).

4.2.3. *Opportunities*

Livelihood and business-related opportunities (28) included an increase in job diversity, the possibility of income diversification, ecolabelling and branding, development of new local products and sustainable production practices (Figs. 2 & 3). The opportunity to improve the economic outlook of the region (11) and of developing a more sustainable direction for tourism and ecotourism were also mentioned (20). Some participants discussed the possibility of livelihood opportunities resulting in increased benefit sharing and local cultural revival (15), positive changes in values (13) and the chance of

offering alternatives to tourism (6) (Fig. 2). Legislation, policy and management opportunities (16) included avenues to develop new regulation and policy, most notably mainstreaming of biodiversity conservation, and introducing new regulations which support BR goals, as well as developing systems to increase local participation (11) within governance and management, and policy and regulation development. Opportunities to improve biodiversity conservation (8) were also present, as well as to make sustainable use of natural capital (13) to support local livelihoods (Fig. 2).

The potential of BRs to constitute a platform for collaboration opportunities was important (23), with the possibility to establish networks of knowledge and experience exchange with other BRs, stakeholder groups, and local, national, and international bodies. These possibilities were closely tied to research and knowledge generation themes (21), where BRs could be part of producing valuable knowledge applicable across a variety of sectors, from BR management plans to agricultural production schemes. Thus, many participants referred to the possibility of attracting partnerships with universities and academic institutions, helping to generate applied knowledge and closing a perceived research-implementation gap. BRs were thought to offer great potential for establishing educational activities and capacity building with local communities (18), complementing traditional education, especially in collaboration with schools and higher education institutions. In this sense, the importance of opportunities to improve communication and dissemination (18) about BRs was noted, with the chance to increase understanding and engagement on issues related to sustainability and biodiversity, helping a shift towards sustainability supportive values (13). Opportunities related to making the most of new media channels to engage a diversity of stakeholders, including youth, were also highlighted (Figs. 2 & 3).

4.2.4. Threats

Most common topics related to threats were general governance challenges (20), such as political instability, political changes, politization of BR activities, unreliable central support systems and corruption (Fig. 3). A similar threat was posed by unfavourable future shifts in law, policy and management approaches (8), and loss of funding sources (11) to implement BR activities. Participants also identified awareness and communication (12), and participation gaps (6) caused by the loss of interest and decreased participation of local communities if communication was not adequate or BR activities were not obviously successful (Fig. 2).

Global change drivers posed an important threat to the future of BRs and their natural capital (22) and biodiversity (9). Participants mentioned land-use change (17) as the biggest threat, citing deforestation, urbanization and mining. Land-use change was followed by climate change (14) and over-exploitation (11), in the latter case particularly poaching, illegal fishing and wildlife trade. Pollution (5) and invasive species (2) were the least commonly mentioned global change drivers. General mentions of degradation of ecosystem health (10) and biodiversity loss (9) were also present. Socio-cultural concerns (16) included exacerbation of social inequalities, particularly gender inequality and loss of cultural identity due to modernization. Demographic changes (15) were also an issue, with some BRs confronting excessive population pressure due to population growth, whilst others feared depopulation, ageing population and exodus of young people due to lack of opportunities and loss of capacity due to the "brain-drain" phenomenon (3). Threats to research and knowledge production (14) included the continuity of monitoring programs, loss of gathered knowledge, waning support for research programs and loss of interest from researchers and academic institutions (Figs. 2 & 3).

General economic concerns (11) included threats posed to BR communities by an unstable economy, increased inequalities and fears that the economic system itself would drive unsustainable changes in the BRs. Livelihood concerns (15) were that a continued lack of options could result in an increase of unsustainable practices, such as unsustainable agriculture, resource extraction and property development. In this context, an overreliance on tourism (10) was also considered a threat (Figs. 2 & 3).

4.2.5. Key actors and youth-specific mentions

During SWOT discussions, participants mentioned different actor/stakeholder groups within their BRs connected to each discussion topic. The most mentioned groups by far were local communities (89) and governments (51), followed by the BR governing organization (34), young stakeholders (31), education and academia-related actors (24), inter-governmental institutions (17), NGOs (13), "foreigners" (10), the private sector (8) and military groups (2) (Supplementary Material).

Here we present only topics connected to mentions of young actors as the rest is beyond the scope of the paper. Young stakeholders and children were mentioned often in connection to the logistic (19) and development (14) goals of BR, particularly in reference to education/capacity building (9), and awareness/sensibilization (8). Participants discussed the importance of having young stakeholders engaged with the BR's vision from an early stage, for example through educational programs in collaboration with local institutions. In addition, access to information, knowledge, and skill sharing was considered relevant to securing sustainable livelihoods for young actors so they could remain within their BR territories (5), avoiding "brain-drain". This topic was closely linked to discussions on participation (9), highlighting the importance of building ties and increasing young stakeholders' capacity to participate in management and decision making in their BRs.

4.3. Young stakeholder participation and moving forward with key action areas

We found participants were involved in different aspects of their BRs ("Thematic Areas of Action") through various means ("Means and Approaches) (Supplementary Material, Table 4). The principal avenues and means through which young people were active in their BRs was through awareness raising, promotion and advocacy actions (22), education, capacity building and knowledge sharing projects (20), establishing opportunities for networking and collaboration (18), research and academic related activities (12) and implementing practical projects or other activities which met BR objectives.

Action areas of youth participation were connected to BR management (15), where youth were contributing to the management of different aspects of their BR (from environmental to social), helping improve BR outcomes and governance. Many participants were involved in youth-centred actions (14), involving increasing youth representation (15) and facilitating youth involvement in decision making (7), for example through capacity building, both in BRs and the MAB programme more broadly. Conservation (16) was also a central area of action, and it involved participation in research, education, dissemination and participatory projects on biodiversity and nature's benefits to people in BRs. Young people were involved or were intending to be involved with restoration projects (6), in addition to climate change related actions (2). Many activities and projects were also aimed at teaching, promoting and implementing sustainable development practices (10) that integrate local livelihoods and biodiversity conservation. Land use practices (5), like agroforestry, and projects contributing to local livelihoods and business (6) was a common area of action, in addition to involvement with tourism development (5). Young stakeholders also participated in other general environmental (10) oriented projects such as creating plastic free BRs, tackling pollution, and environmental education more broadly. Some actions aimed to share the BR concept and best practices (7), as well as facilitating creation of shared values and understandings based around BRs core vision.

5. Discussion

The study of people's perceptions can support evidence-based

decision making and can provide important insights into stakeholders' understandings and interpretations of the social impacts, and ecological outcomes of conservation and sustainable development initiatives like the MAB programme (Bennett, 2016). In this study we show that an analysis of young stakeholders perceptions of BR implementation provides a comprehensive overview of both novel and previously documented factors influencing the strengths and weaknesses in achieving the goals that BRs stand for (Van Cuong et al., 2017; Schultz et al., 2018). Not only do we provide evidence that young stakeholders' understandings capture the multi-faceted social-ecological complexity in which BRs are embedded, our work also helps fill a gap in the sustainability literature in which investigation of young stakeholder understandings and roles as biosphere stewards is notably absent (Donnellan-Barraclough et al., 2021).

5.1. Change and resilience in BRs

The fourth strategic objective of the MAB programme (UNESCO, 2016) is to "Support mitigation and adaptation to climate change and other aspects of global environmental change", and our work shows that this concern is at the forefront of young stakeholders' minds. Our results align with previous findings on the complex interplay between local capacity to govern and adapt to the larger scale of changing environmental, social and economic global change realities (Cumming et al., 2006, 2015; Folke et al., 2007; Bodin et al., 2014). Participants reflected on cases of "scale-mismatch", where the main threats to BRs, from direct global change drivers to corruption in political systems and economic globalization (Fig. 3), were perceived to be beyond local BR control. Direct global change drivers (land-use change, over-exploitation, climate change, pollution, and invasive species) were perceived as one of the biggest threats to BRs. Participants' ranking of major direct global change drivers coincided with the known level of impact these drivers have on biodiversity and ecosystem services (IPBES 2019), except in the case of future threats, where climate change came second, although it is ranked third in the global assessment (after land-use change and over-exploitation) (IPBES 2019). This could reflect the increasing prominence of climate change in the global conversation, especially amongst young actors (Walker, 2020; Han and Ahn, 2020; Donnellan-Barraclough et al., 2021), and the expectation that climate change impacts will increase in the future (Sanson et al., 2019).

Livelihood diversification is a pathway towards enabling communities and individuals to increase their resilience and adapt to changing social-ecological realities (Ellis, 2000). Indeed, our work shows that one of the most valued aspects of BRs by youth is a capacity to diversify economies and generate additional livelihood options, and these thoughts were strongly linked to the importance of capacity building and the possibility of growing social, cultural or financial capital (Fig. 3). We find that this topic particularly affects young stakeholders, with participants expressing how important it is that BRs should offer young actors the possibility of remaining within their territories and highlighting the high vulnerability of young stakeholders to unemployment, displacement and the risks of unfavourable demographic shifts (Ruesga-Benito et al., 2018). Access to different resources and financial, social, and cultural capital, also shape the capabilities and agency of communities to access additional livelihood resources and thus make more sustainable land-use decisions, as proposed by the "theory of access" (Meyfroidt et al., 2018). This was reflected in the connection we found between mentions of livelihoods and mentions of direct global change drivers, and participants' emphasis on the importance of BRs offering livelihood alternatives to unsustainable practices.

In connection to livelihoods, tourism was discussed equally as a strength and a weakness (Fig. 2). Some participants considered tourism as a positive opportunity to provide jobs and shift local communities away from unsustainable practices, while others considered over-reliance on tourism to negatively reduce livelihood options, negatively impact social and cultural wellbeing, and make the region vulnerable to sudden change. Our results reflect the central and shifting role ecotourism has played in conservation initiatives like PAs (West et al., 2006), where it is seen to offer a significant employment and enterprise opportunity for local communities, but can also have undesirable impacts such as shifting Indigenous People and Local Communities (IPLC) relationships to their environment, cause conflict and changes in land-use rights, fail to deliver promises of community-level benefits, and increase pressure on environments and resources (West et al., 2006 *and references therein*). At present, the potential impacts on BR communities of a drastic reduction in tourism and international travel has become even more palpable during the Sars-COV-2 crisis in 2020, and is currently being investigated by UNESCO (Pypaert, pers. Comm.).

5.2. People AND nature: Finding the middle way in BR governance and management

Biosphere reserve governance and management was one of the most common themes throughout this study, seen especially as a BR challenge (Fig. 3), evidence that young stakeholders see the complexity involved in BR implementation and governance. Implementation of BRs depends on the development of national, regional and local frameworks adapted to each context, a characteristic of the MAB program model which in itself is only a designation and does not come with a predetermined set of legislation, unlike membership to PA schemes (Schliep and Stoll-Kleemann, 2010; Schultz et al., 2011, 2018; UNESCO, 2016; Winkler, 2019). This diversity of interpretations of the BR concept and institutional designs used to implement it make BRs valuable spaces of learning for social-ecological complexity and sustainability, as they are adapted to diverse contexts in order to be locally relevant (Plummer et al., 2017; Schultz et al., 2018; Milne et al., 2019; Reed, 2019). However, our study also highlights that this flexibility carries challenges in translating and implementing the BR concept across governance scales, ensuring national, regional, and local coordination of institutions, organizations and legal instruments, and developing and implementing management plans which can accommodate the multiple dimensions of conservation and development BR objectives (Fig. 3).

Thus, our results show that young stakeholders thought it key that BRs are supported by legislation that can reflect the multiple functions of BRs, which in many cases extend beyond traditional conservation approaches (like those represented by PAs), aiming instead to foster a broader landscape multifunctionality which integrates people and nature (UNESCO, 2016; Van Cuong et al., 2017; Winkler, 2019). The difference in the conservation focus of PAs and BRs reflects a shift in the broader conservation discourse over the last 60 years (Mace, 2014; Reed, 2019; Reed and Price, 2020). The PA model is thought to follow the "Nature for itself"/"Nature despite people" paradigms, popularized in the 1960s and based on the exclusion of people from conservation areas in order to minimize threats to vulnerable species and habitats (Mace, 2014). The BR model however, is more closely linked to the "Nature for people"/"People AND nature" paradigms, based on an understanding of humans as an integral part of social-ecological systems, and with a stronger focus on biocultural diversity (Sterling et al., 2017), and the flow of benefits and relational values between people and nature (Peterson et al., 2018; West et al., 2018; Winkler, 2019). In this sense, the inherent multidimensionality of the BR model has the potential to overcome problems associated with PAs, such their potential to negatively impact IPLCs (Ostrom and Nagendra, 2006; West et al., 2006; Cumming, 2016). Although the "Nature AND people" paradigm appears as the predominant narrative upheld by young stakeholders in our work, as expressed through their concern with the social dimensions of BRs, both understandings of conservation were present throughout our study (Fig. 3). Thus, our results show that young participants' understandings of BRs are still a highly diverse spectrum between both views, likely reflecting the diversity of BR contexts in their home territories.

Our results show that young participants positively valued traits associated to adaptive co-management (ACM), such as BRs with shared

and long term visions, successful combination of conservation and development objectives, BRs as brokers in collaborative networks of actors working together, and high levels of IPLCs and stakeholder participation (Allen and Garmestani, 2015). Moving towards these more polycentric forms of governance is part of the paradigm shift in conservation, from prohibitive top-down approaches towards arrangements that enable participation and learning by multiple stakeholders in all levels of governance, management and implementation (Ostrom, 2005; Biggs et al., 2012, 2015; Tengö et al., 2014). In fact, BRs have been shown to be shifting towards ACM arrangements (Schultz et al., 2011, 2015; Plummer et al., 2017; Milne et al., 2019; Mohedano Roldán et al., 2019), for example by becoming "bridging organizations" (Odom Green et al., 2015). These more polycentric governance systems with high diversity and redundancy of participating bodies can help improve connectivity and learning in governance (Biggs et al., 2015 *and references therein*). However, our work also shows that young stakeholders were aware of the difficulties posed by polycentric and participatory governance systems, such increased stakeholder conflict, conflicting and/or overlapping institutions and frameworks, resulting in unclear mandates or inefficient operation. Importantly, young actors also valued stable, strong and trustworthy institutions. Thus, political instability and corruption were considered a significant threat to BR objectives, supporting evidence of the coupling between political and economic turmoil, loss of trust in institutions with a decrease in social welfare and an increase in environmental degradation (Robbins, 2020).

5.3. Participation as a requisite for success

There is an increasing body of research on participation as a key to increasing resilience of social-ecological systems and as a key aspect of ACM approaches to environmental governance, and more specifically, as a pathway to increase BR legitimacy and success (Biggs et al., 2012; Schultz et al., 2011; Mohedano Roldán et al., 2019). Our study shows young stakeholders consider participation and involvement of local communities a key sign of successful implementation of BR objectives. Lack of participation was discussed both from the side of local stakeholders, in terms of low community involvement due to lack of interest, shared understanding or common vision, and from the side of governance and management bodies' failure to adequately include local communities. Our results align with the work of Schultz et al. (Schultz et al., 2011) who showed that increased participation of local stakeholders in BRs, and thus higher scores in adaptive co-management metrics, improved perceived conservation, and social and economic success of BRs. Our work also reflects the threat to a BR of waning stakeholder support if anticipated goals are not openly achieved, coinciding with research showing that achieving outcomes valued by stakeholders is crucial for legitimacy (Birnbaum et al., 2015) and can increase acceptance of environmental governance (Kochskämper et al., 2016).

Several levels of "Arnstein's ladder" of participation (Arnstein, 1969) were present throughout our results, mainly: IPLCs access to information, involvement in implementation of management plans, involvement in the development and crafting of such plans and being represented within governance bodies. In almost all cases, an increase of participation within any rung of the ladder was considered positive and a lack negative, and only few mentions considered participation as negative "interference" that derailed BR objectives or increased conflict. However, although the assumption that participation would increase overall BR success was present throughout responses, research has also shown that there is not a linear relationship between increased participation and legitimacy (Kochskämper et al., 2016; Mohedano Roldán et al., 2019). For example outreach and education, which was one of the most discussed forms of stakeholder involvement in our research, can help increase legitimacy equally strongly as deeper forms of participation, such as increased representation (Kochskämper et al., 2016).

5.4. Learning for sustainability: Knowledge generation and sharing as a key aspect of BRs

BRs are, since their inception, intended to be "learning sites for sustainability" (Bridgewater, 2015). The MAB programme thus, aligns very strongly with the emphasis of sustainability science on learning (Schultz et al., 2018; Reed, 2019), understood as the process of creating new knowledge and constantly re-evaluating our understandings of a system (Reed et al., 2010). This broader understanding of social-ecological learning was present throughout participant responses, including references to processes of experimentation, involving of local communities in monitoring activities, processes that facilitated knowledge co-production, and collaboration. Young stakeholders recognize the importance of establishing networks of knowledge exchange across a diversity of sectors and actors, including but not limited to, integrating knowledge generated in BRs in local education systems, capacity building projects and experience sharing networks, which are already a part of many BR projects (Herrero, 2017). Young stakeholders also perceived the well-known "research-implementation" gap (Knight et al., 2008; Biggs et al., 2011), commenting on the importance of research and academic activities feeding back into local community lives and management plans, and feeling that the link between academic work conducted in BRs and on-the-ground BR goal implementation had not reached its full potential. Thus, although young actors thought knowledge generation and exchange was important, our findings point towards the need for a deeper inquiry into what is meant when BRs are presented as "learning sites", and *who* is learning *what* from *whom*.

In sum, our results confirm the value placed by young BR stakeholders on activities and practices pertaining to ACM, in this case, the importance of fostering capacity building, learning, monitoring and collaboration as an acknowledgement that our understanding of a system is incomplete, and that uncertainty and change are a part of managing resilient SES (Chapin et al., 2010). It is also important to say that, due to the large range of geographical and socio-cultural contexts represented by our participants, understandings of education and capacity building were probably quite diverse, and that a lack of resources to facilitate even basic foundational education for BR stakeholders was a reality expressed by many of the study participants.

5.5. Stewardship is action

Action is one of the three pillars of environmental stewardship (Peçanha Enqvist et al., 2018), and ACM specifically is realized through activities, understood as what is being done "on the ground" (Plummer et al., 2017). Little work has been done on how young stakeholders contribute and participate in environmental governance initiatives in their native territories (but see Treude et al., 2017; Ruesga-Benito et al., 2018), and our results constitute a unique and highly novel contribution to this field. We show that young stakeholders are active participants and therefore stewards of their BRs, involved in initiatives spanning multiple arenas of BR objective implementation. We found a prevalence of youth involvement in the organization of awareness raising activities, advocacy, educational programmes, and research, matching our findings on the importance young people ascribe to the information sharing and educational capabilities of BRs, as well as BRs role as platforms for networking and collaboration. Young stakeholders in our study also showed a strong involvement in BR management, for example as staff members of a BR organization, evidence that young stakeholders are not only "passive actors" within environmental governance (Han and Ahn, 2020; Donnellan-Barraclough et al., 2021). Action arenas they were involved in included youth-related issues, but also went beyond them to include activities that contributed to conservation and the creation of local business and sustainable livelihoods via, for example, agroforestry or restoration initiatives.

In addition, we also show young stakeholders' concern with forming part of BR governance bodies and encouraging deeper levels of

participation (Arnstein, 1969) through advocacy, with many of their activities centred around promoting young people's involvement with decision making and youth representation within decision making bodies through for example, lobbying for youth seats at both BR and MAB coordinating bodies. Our findings thus highlight that the lack of youth representation in governance bodies, which occurs across political and governanve institutions worldwide, also affects BRs, pointing towards the need for these institutions to ensure fair youth representation within their bodies (Stockemer and Sundström, 2018; Sundström and Stockemer, 2020). Thus, we conclude that young stakeholders' protagonism in capacity building, education and advocacy initiatives highlights young actors concern with processes of exclusion and disenfranchisement, by which young people are prone to higher levels of unemployment and social exclusion (Ruesga-Benito et al., 2018), are strongly underrespresented in governance bodies (Sundström and Stockemer, 2020) and can untimately be pushed to leave their native territories, resulting in "brain-drain" phenomenon.

6. Conclusions

Youth around the world are meaningfully involved in environmental governance, sustainable development initiatives and conservation, but their perspectives and roles are notably absent in the sustainability science literature. Our study provides evidence of the breadth of young stakeholders' understandings of the social-ecological complexity in which the sustainable development and conservation objectives of BRs are embedded. We show that young stakeholders provide novel perspectives of BRs' resilience and vulnerability to global change by emphasizing the importance of providing sustainable livelihood opportunities to help both avoid environmental degradation and an unfavourable demographic shift in young actors' home territories. Our results confirm previous findings on the diversity of ways in which the BR concept is implemented, and we highlight the key importance to youth of ACM approaches to environmental governance – with larger focus on intragenerational justice (Thew, 2020) through a focus on local community involvement and wellbeing in addition to biodiversity conservation. Furthermore, we highlight the diverse ways in which youth engage in biosphere stewardship – spanning all levels of participation, from engaging in governing bodies and management planning, to working with ecosystem restoration, entrepreneurship and education. Our work also coincides with recent calls on the need to investigate pathways for effective involvement of young stakeholders, not just in environmental governance, but in political life more broadly (Stockemer, 2018). Finally, we conclude on the need for more research on how sustainable development and conservation initiatives affect young stakeholders and, more specifically, how this might differ by world regions and socio-economic contexts.

CRediT authorship contribution statement

Alicia Donnellan Barraclough: Conceptualization, Data curation, Formal analysis, Funding acquisition, Writing - original draft, Writing - review & editing. **Lisen Schultz:** Conceptualization, Methodology, Writing - review & editing. **Inger Elisabeth Måren:** Conceptualization, Funding acquisition, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to thank the whole MAB Youth Forum 2019 team, including organizers, facilitators and most especially all the young participants from all across the world who partook in the workshops and surveys. We are also grateful to the Changbaishan Mountain Biosphere Reserve, China, for hosting the workshops and to UNESCO Beijing Office for financing participants. A very special thanks to UNESCO Beijing Office staff, especially Philippe Pypaert for his thoughtful comments on the manuscript and for providing the post-event survey results, and his team members Junfei Qian and Vincent Van Ryssegem for facilitating event participant details. Martin Price provided valuable comments to initial versions of this manuscript. Thanks also to the two anonymous reviewers who helped improve the manuscript. This work was funded by the UNESCO Chair at the University of Bergen and travel to China by first author was funded by UNESCO Beijing office.

Disclaimer.

All views expressed are those of the authors, and not necessarily their respective or related organisations.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloenvcha.2021.102273.

References

Allen, C.R., Garmestani, A.S., 2015. Adaptive Management of Social-Ecological Systems. Springer Netherlands, Dordrecht.
Arnstein, S.R., 1969. A ladder of citizen participation. JAIP 35 (4), 216–224.
Bazeley, P. 2018. Integrating Analyses in Mixed Methods Research. 55 City Road, London.
Bennett, N.J., 2016. Using perceptions as evidence to improve conservation and environmental management. Conserv. Biol. 30 (3), 582–592.
Bennett, N.J., Whitty, T.S., Finkbeiner, E., Pittman, J., Bassett, H., Gelcich, S., Allison, E. H., 2018. Environmental stewardship: A conceptual review and analytical framework. Environ. Manage. 61 (4), 597–614.
Biggs, D., Abel, N., Knight, A.T., Leitch, A., Langston, A., Ban, N.C., 2011. The implementation crisis in conservation planning: Could "mental models" help? Conserv. Lett. 4 (3), 169–183.
Biggs, R., Schlüter, M., Biggs, D., Bohensky, E.L., BurnSilver, S., Cundill, G., Dakos, V., Daw, T.M., Evans, L.S., Kotschy, K., Leitch, A.M., Meek, C., Quinlan, A., Raudsepp-Hearne, C., Robards, M.D., Schoon, M.L., Schultz, L., West, P.C., 2012. Toward Principles for Enhancing the Resilience of Ecosystem Services. Annu. Rev. Environ. Resour. 37 (1), 421–448.
Biggs, R., Schlüter, M., Schoon, M.L., 2015. Principles for Building Resilience. Cambridge University Press.
Birnbaum, S., Bodin, Ö., Sandström, A., 2015. Tracing the sources of legitimacy: the impact of deliberation in participatory natural resource management. Policy Sci. 48 (4), 443–461.
Bodin, Ö., Crona, B., Thyresson, M., Golz, A.-L., Tengö, M., 2014. Conservation success as a function of good alignment of social and ecological structures and processes. Conserv. Biol. 28 (5), 1371–1379.
Bridgewater, P., 2015. The Man and Biosphere programme of UNESCO : rambunctious child of the sixties, but was the promise fulfilled ? Curr. Opin. Environ. Sustain. 19, 1–6.
CBD. 2012. COP 11 Decision XI/6 XI/6.Cooperation with other conventions, international organizations, and initiatives.
Chapin, F.S., Carpenter, S.R., Kofinas, G.P., Folke, C., Abel, N., Clark, W.C., Olsson, P., Smith, D.M.S., Walker, B., Young, O.R., Berkes, F., Biggs, R., Grove, J.M., Naylor, R. L., Pinkerton, E., Steffen, W., Swanson, F.J., 2010. Ecosystem stewardship: sustainability strategies for a rapidly changing planet. Trends Ecol. Evol. 25 (4), 241–249.
Herrero, C., 2017. Biosphere reserves: learning spaces for sustainability. Int. J. UNESCO Biosph. Reser. 1 (2), 77–84.
Cumming, G.S., 2016. The relevance and resilience of protected areas in the Anthropocene. Anthropocene 13, 46–56.
Cumming, G.S., Allen, C.R., Ban, N.C., Biggs, D., Biggs, H.C., Cumming, D.H.M., De Vos, A., Epstein, G., Etienne, M., Maciejewski, K., Mathevet, R., Moore, C., Nenadovic, M., Schoon, M., 2015. Understanding protected area resilience: a multi-scale, social-ecological approach. Ecol. Appl. 25 (2), 299–319.
Cumming, G. S., D. H. M. Cumming, and C. L. Redman. 2006. Scale Mismatches in Social-Ecological Systems : Causes , Consequences , and Solutions 11(1).
Van Cuong, C., Dart, P., Hockings, M., 2017. Biosphere reserves: Attributes for success. J. Environ. Manage. 188, 9–17.
Dealtry, T.R., 1992. Dynamic SWOT Analysis. Developer's Guide. Dynamic SWOT Associates, Birmingham, UK.
Donnellan-Barraclough, A., Sakiyama, M., Schultz, L., Måren, I.E., 2021. Stewards of the future: accompanying the rising tide of young voices by setting youth-inclusive research agendas in sustainability research. Sustainable Earth 4 (2). https://doi.org/10.1186/s42055-021-00041-w.
Ellis, F., 2000. Rural Livelihoods And Diversity In Developing Countries. Oxford University Press, Oxford, UK.

Ferreira, A.F., 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 (Switzerland) 10 (10), 1–26.
Folke, C., Pritchard, L., Berkes, F., Colding, J., Svedin, U., 2007. The Problem of Fit between Ecosystems and Institutions. Ten Years Later 12 (1).
Gallay, E., Pykett, A., Smallwood, M., Flanagan, C., 2020. Urban youth preserving the environmental commons: student learning in place-based stewardship education as citizen scientists. Sustainable Earth 3 (1), 3.
Han, H., and S. W. Ahn. 2020. Youth Mobilization to Stop Global Climate Change: Narratives and Impact.
Ishwaran, N., Persic, A., Tri, N.H., 2008. Concept and practice: the case of UNESCO biosphere reserves. Int. J. Environ. Sustain. Dev. 7 (2), 118. https://doi.org/10.1504/IJESD.2008.018358.
Knight, A.T., Cowling, R.M., Rouget, M., Balmford, A., Lombard, A.T., Campbell, B.M., 2008. Knowing but Not Doing: Selecting Priority Conservation Areas and the Research-Implementation Gap. Conserv. Biol. 22 (3), 610–617.
Kochskämper, E., Challies, E., Newig, J., Jager, N.W., 2016. Participation for effective environmental governance? Evidence from Water Framework Directive implementation in Germany, Spain and the United Kingdom. J. Environ. Manage. 181, 737–748.
MAB Youth 2019. MAB Youth Declaration https://en.unesco.org/mab-youth/2019forum.
Mace, G.M., 2014. Whose conservation? Science 345 (6204), 1558–1560.
Meyfroidt, P., Roy Chowdhury, R., de Bremond, A., Ellis, E.C., Erb, K.H., Filatova, T., Garrett, R.D., Grove, J.M., Heinimann, A., Kuemmerle, T., Kull, C.A., Lambin, E.F., Landon, Y., le Polain de Waroux, Y., Messerli, P., Müller, D., Nielsen, J., Peterson, G. D., Rodriguez García, V., Schlüter, M., Turner, B.L., Verburg, P.H., 2018. Middle-range theories of land system change. Global Environ. Change 53 (September), 52–67.
Miles, and Huberman., 1994. Qualitative data analysis: an expanded sourcebook. Sage Publications, Thousand Oaks, California, USA.
Milne, S., S. Mahanty, P. To, W. Dressler, and P. Kanowski. 2019. Linked references are available on JSTOR for this article : Learning From ' Actually Existing ' REDD + : A Synthesis of Ethnographic Findings 17(1):84–95.
Mitrofanenko, T., Snajdr, J., Muhar, A., Penker, M., Schauppenlehner-Kloyber, E., 2018. Biosphere Reserve for All: Potentials for Involving Underrepresented Age Groups in the Development of a Biosphere Reserve through Intergenerational Practice. Environ. Manage. 62 (3), 429–445.
Mohedano Roldán, A., Duit, A., Schultz, L., 2019. Does stakeholder participation increase the legitimacy of nature reserves in local communities? Evidence from 92 Biosphere Reserves in 36 countries. J. Environ. Plann. Policy Manage. 21 (2), 188–203.
Norgaard, R.B., 1989. The Case for Methodological Pluralism. Ecol. Econ. 1 (1), 37–57.
Odom Green, O., Schultz, L., Nekoro, M., Garmestani, A.S., 2015. The Role of Bridging Organizations in Enhancing Ecosystem Services and Facilitating Adaptive Management of Social-Ecological Systems. In: Allen, C.R., Garmestani, A.S. (Eds.), Adaptive Management of Social-Ecological Systems. Springer, Netherlands, Dordrecht, pp. 107–122.
Ostrom, E., 2005. Understanding institutional diversity. Princeton University Press, Princeton NJ.
Ostrom, E., Nagendra, H., 2006. Insights on linking forests, trees, and people from the air, on the ground, and in the laboratory. Proc. Natl. Acad. Sci. 103 (51), 19224–19231.
Peçanha Enqvist, J., West, S., Masterson, V.A., Haider, L.J., Svedin, U., Tengö, M., 2018. Stewardship as a boundary object for sustainability research: Linking care, knowledge and agency. Landscape Urban Plann. 179, 17–37.
Peterson, G.D., Harmáčková, Z.V., Meacham, M., Queiroz, C., Jiménez-Aceituno, A., Kuiper, J.J., Malmborg, K., Sitas, N., Bennett, E.M., 2018. Welcoming different perspectives in IPBES. Ecol. Soc. 23(1):art39.
Plummer, R., Baird, J., Dzyundzyak, A., Armitage, D., Bodin, Örjan, Schultz, L., 2017. Is Adaptive Co-management Delivering? Examining Relationships Between Collaboration, Learning and Outcomes in UNESCO Biosphere Reserves. Ecol. Econ. 140, 79–88.
Preiser, R., Biggs, R., De Vos, A., Folke, C., 2018. Social-ecological systems as complex adaptive systems: Organizing principles for advancing research methods and approaches. Ecol. Soc. 23 (4).
Price, M.F., Park, J.J., Bouamrane, M., 2010. Reporting progress on internationally designated sites: The periodic review of biosphere reserves. Environ. Sci. Policy 13 (6), 549–557.
Pypaert, P., Qian, J., Van Ryssegem, V., Kim, J.R., Wang, R., 2019. 2019 MAB Youth Forum Post-event Survey Report. UNESCO Beijing Office.
Reed, M.G., 2016. Conservation (In)Action: Renewing the Relevance of UNESCO Biosphere Reserves. Conservation Letters 9 (6), 448–456.
Reed, M.G., 2019. The contributions of UNESCO Man and Biosphere Programme and biosphere reserves to the practice of sustainability science. Sustain. Sci. 14 (3), 809–821.
Reed, M., Price, M., 2020. UNESCO Biosphere Reserves. Routledge, London.
Reed, M.S., Evely, A.C., Cundill, G., Fazey, I., Glass, J., Laing, A., Newig, J., Parrish, B., Prell, C., Raymond, C., Stringer, L.C., 2010. What is social learning? Ecol. Soc. 15 (4).
Robbins, P., 2020. Political ecology: a critical introduction. Blackwell Pub, Malden, MA.
Ruesga-Benito, S.M., González-Laxe, F., Picatoste, X., 2018. Sustainable development, poverty, and risk of exclusion for young people in the European Union: The case of NEETs. Sustainability (Switzerland) 10 (12), 1–15.
S. Díaz, J. Settele, E. S. Brondizio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, and C. N. Z. (eds. . 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn, Germany.
Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., Rockström, J., 2019. Six Transformations to achieve the Sustainable Development Goals. Nat. Sustainability 2 (9), 805–814.
Sanson, A.V., Van Hoorn, J., Burke, S.E.L., 2019. Responding to the Impacts of the Climate Crisis on Children and Youth. Child Development Perspectives 13 (4), 201–207.
Schliep, R., Stoll-Kleemann, S., 2010. Assessing governance of biosphere reserves in Central Europe. Land Use Policy 27 (3), 917–927.
Schultz, L., Duit, A., Folke, C., 2011. Participation, Adaptive Co-management, and Management Performance in the World Network of Biosphere Reserves. World Dev. 39 (4), 662–671.
Schultz, L., C. Folke, H. Österblom, and P. Olsson. 2015. Adaptive governance, ecosystem management, and natural capital: Fig. 1. Proceedings of the National Academy of Sciences 112(24):7369–7374.
Schultz, L., West, S., Bourke, A.J., d'Armengol, L., Torrents, P., Hardardottir, H., Jansson, A., Roldán, A.M., 2018. Learning to live with social-ecological complexity: An interpretive analysis of learning in 11 UNESCO Biosphere Reserves. Global Environ. Change 50 (February), 75–87.
Sterling, E.J., Filardi, C., Toomey, A., Sigouin, A., Betley, E., Gazit, N., Newell, J., Albert, S., Alvira, D., Bergamini, N., Blair, M., Boseto, D., Burrows, K., Bynum, N., Caillon, S., Caselle, J.E., Claudet, J., Cullman, G., Dacks, R., Eyzaguirre, P.B., Gray, S., Herrera, J., Kenilorea, P., Kinney, K., Kurashima, N., Macey, S., Malone, C., Mauli, S., McCarter, J., McMillen, H., Pascua, P., Pikacha, P., Porzecanski, A.L., de Robert, P., Salpeteur, M., Sirikolo, M., Stege, M.H., Stege, K., Ticktin, T., Vave, R., Wali, A., West, P., Winter, K.B., Jupiter, S.D., 2017. Biocultural approaches to well-being and sustainability indicators across scales. Nat. Ecol. Evol. 1 (12), 1798–1806.
Stockemer, D., Sundström, A., 2018. Age representation in parliaments: Can institutions pave the way for the young? European Political Science Review 10 (3), 467–490.
Sundström, A., Stockemer, D., 2020. Conceptualizing, Measuring, and Explaining Youths' Relative Absence in Legislatures. PS: Political Science & Politics:1–7.
Tengö, M., Brondizio, E.S., Elmqvist, T., Malmer, P., Spierenburg, M., 2014. Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence base approach. Ambio 43 (5), 579–591.
Thew, H., Middlemiss, L., Paavola, J., 2020. "Youth is not a political position": Exploring justice claims-making in the UN Climate Change Negotiations. Global Environ. Change 61, 102036. https://doi.org/10.1016/j.gloenvcha.2020.102036.
Treude, M., Schostok, D., Reutter, O., Fischedick, M., 2017. The future of North Rhine-Westphalia-participation of the youth as part of a social transformation towards sustainable development. Sustainability 9 (6).
UNESCO. 2016. A New Roadmap for the Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves. place de Fontenoy, 75352 Paris 07 SP, France.
UNESCO 2019 General conference see 40 C/INF. 22 - 26 November 2019.
United Nations, 2019. Annex: Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development. Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development:1–21.
United Nations Technology and Innovation Labs. 2019. No Title. https://until.un.org/reboottheearth.
Walker, C., 2020. Uneven solidarity: the school strikes for climate in global and intergenerational perspective. Sustainable Earth 3 (1), 5.
West, P., Igoe, J., Brockington, D., 2006. Parks and peoples: the social impact of protected areas. Ann. Rev. Anthropol. 35 (1), 251–277.
West, S., Haider, L.J., Masterson, V., Enqvist, J.P., Svedin, U., Tengö, M., 2018. Stewardship, care and relational values. Curr. Opin. Environ. Sustain. 35, 30–38.
Winkler, K.J., 2019. The implementation of the conceptual shift in conservation: pathways of three German UNESCO biosphere reserves. Ecosyst. People 15 (1), 173–180.