



THE CHALLENGES OF THE ANTHROPOCENE FOR BIOSPHERE RESERVES

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ABSTRACT

This paper reviews how well Biosphere Reserves are prepared to respond to the challenges of the new era of the Anthropocene, including the expected breaching of some planetary boundaries. In this context, the endeavour of sustainable development requires critical re-examination and Biosphere Reserves should move further towards embracing more integrated and effective forms of sustainable livelihoods for their inhabitants. This means placing people even more at the heart of Biosphere Reserve policy and management, and enabling people to become pioneers and ambassadors for realizing effective sustainability in all Biosphere Reserves. This also means that Biosphere Reserves and related institutions have to work towards true integration of their ecological, social and economic potentials, and set up a framework of genuine sustainability governance. This paper widens the concept of Biosphere Reserves to provide creative transformation towards more liveable, sustainable landscapes as a global network. If this is achieved, it will be easier for Biosphere Reserves to pursue and nurture the implementation of the Sustainable Development Goals (SDGs) as their renewed central purpose.

Key words: Biosphere Reserves, Anthropocene, Sustainable Development Goals, Sustainable livelihoods, Planetary boundaries

THE CHALLENGES OF THE ANTHROPOCENE

This paper reviews the challenges of the new era of the Anthropocene, including its underlying causes and how Biosphere Reserves could develop further to better respond to them. A critical reflection of the concept of sustainable development is provided as a foundation for offering some ideas for a creative transformation away from quasi-independent collections of reserves towards more liveable, equitable and sustainable biosphere landscapes.

According to Steffen et al. (2007, p.614), “human activities have become so pervasive and profound that they now rival the great forces of nature and are pushing the Earth into planetary terra incognita”. Four out of nine planetary boundaries (Figure 1) have already been exceeded: climate change, impacts on biosphere integrity, land system change and bio-geochemical cycles (Steffen et al., 2015).

The challenge of managing the Anthropocene encompasses the urgent need for innovative ways in which to showcase sustainable living practices in the

light of dominating unsustainable patterns of human consumption (e.g. meat consumption, see Stoll-Kleemann & O’Riordan, 2015). Sustainable development is often described as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). This is so frequently quoted that readers’ eyes glaze over the familiar words in the same way as seasoned air travellers ignore the mandatory safety advice from the cabin crew. Although it is within our abilities to redefine the Anthropocene to enable future generations to flourish in a decent and habitable world (O’Riordan & Lenton, 2013), it remains very difficult in an environment driven primarily by the fortress mindsets promoting economic growth to meet all the criteria for real sustainability. Present patterns of growth are contradictory to all three dimensions of sustainability (Asara et al., 2015; Hueting, 2010; Kallis et al., 2015; Kothari et al., 2014; Muraca, 2012). Hueting (2010, p. 525) asserts, “our planet is threatened by a wrong belief in a wrongly formulated growth”. There is strong evidence of a tight correlation between GDP growth and environmental destruction (Muraca, 2012). The

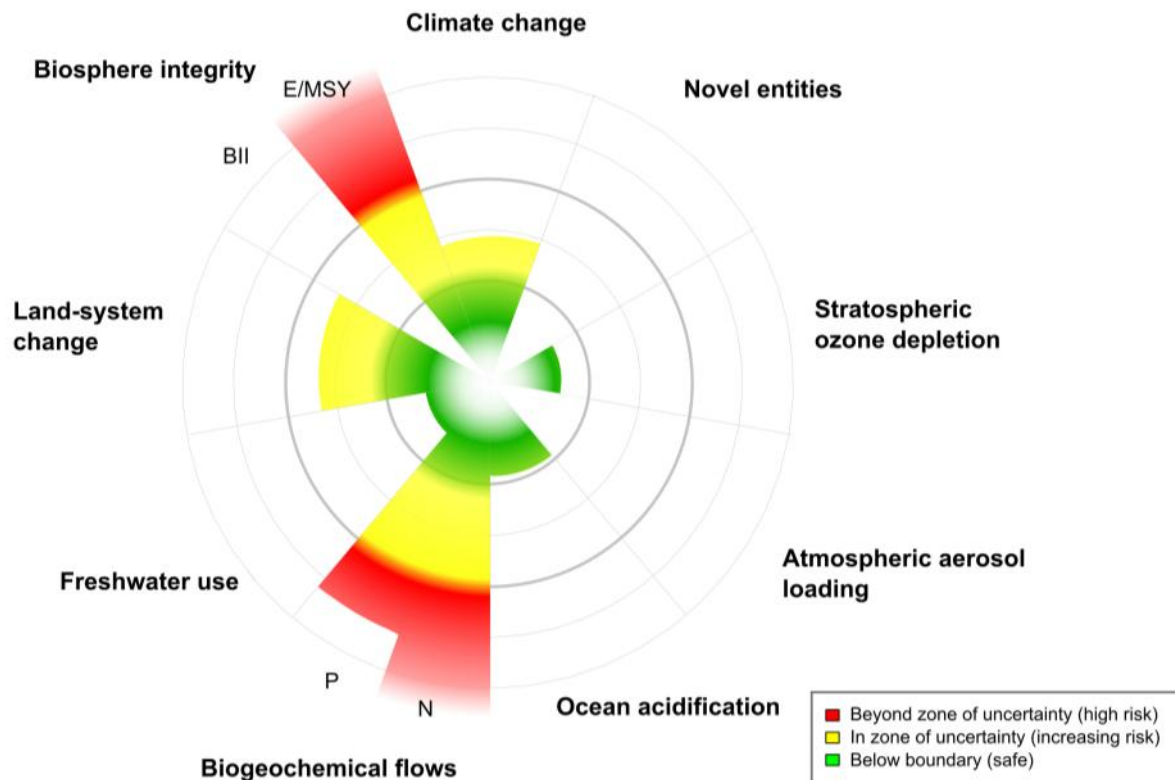


Figure 1. Current status of the control variables for seven of the planetary boundaries (from Steffen et al., 2015).

exploitation of resources at a rate that exceeds the regenerative capacity of ecosystems has been linked to the assumption of economic growth as the unique goal of economic activity (Muraca, 2012; Asara, 2015).

Yet there is still dispute aplenty about the role of economic growth and the social and economic dimensions of sustainability. Mainstream economists emphasize a constant rise in total GDP as the prime economic goal. They place less emphasis on the redistribution of income or of other wellbeing benefits of economic growth among all citizens. Others challenge this hegemony of wealth: "... the so-called 'trickle-down effect' by which the worst off in a society automatically would benefit from an overall increment in wealth does not seem to hold anymore even in terms of mere income" (Muraca, 2012, p.540). This widespread unjust distribution of wealth effects is difficult to change because of power relations: "Commodification, which is part and parcel of growth, is eroding sociality and mores. Care, hospitality, love, public duty, nature conservation, spiritual contemplation; traditionally, these relations or 'services' did not obey a logic of personal profit" (Kallis et al., 2015, p. 6; see also Kothari et al., 2014).

The sustainable way forward is the evolution of societies in which fewer natural resources are used and life is organized differently with "sharing, simplicity, care, and the commons as primary significations" (Kallis et al.,

2015, p.5). Equitable downscaling of production and consumption would engender the creation of a new set of local commons with innovative forms of living and producing, such as eco-communities, cooperatives, urban or rural gardens, and local currencies (Marshall, 2016).

One approach here would be to create landscapes that took care of the needs of both humans and the natural environment coupled in responsible cooperation. Such lived-in landscapes would correspond to large tracts of land where biodiversity conservation is practised in coherence with people living and working in the area and striving for sustainable livelihoods. Different models of living landscapes already exist, of which the Biosphere Reserve model is the best known (UNESCO, 1996; Batisse, 1997; Ishwaran et al., 2008, Coetzer et al., 2014; Bridgewater, 2016; Reed, 2016).

What does the dawn of the Anthropocene mean for Biosphere Reserves and protected areas as conceived by practitioners? Establishing and managing protected areas is still a common strategy for enhancing ecological integrity. Yet in the Anthropocene, the destructive activities of human beings can become so overwhelming that such protected areas are no longer a safeguard. Watson et al. (2014) have argued that protected areas are becoming ripe for declassification and vulnerable to resource extraction because governments in both developing and developed countries (such as Australia,

the United States and Canada) have heavily reduced their support towards protected areas “through disproportionate funding cuts, reductions in professional staff and by ignoring their own policies” (p.70). “This practice has been labelled protected area downgrading, downsizing and degazettement (PADDD), where downgrading is the legal authorization of an increase in the number, magnitude or extent of human activities within a protected area; downsizing is the decrease in size of a protected area through a legal boundary change; and degazettement is the loss of legal protection for an entire protected area” (Watson et al., 2014, p.70). All three forms of PADDD are increasing (Mascia et al., 2014). This analysis shows that the problems with the dominant role of economic growth are not prevented by even by the legal strength of protected areas because the choice by governments to ‘ignore their own policy’ is the apparent inevitable outcome of the growth diktat. It is important to note here that economic growth is not a necessary condition for sustainable development. In fact, the opposite appears to be true: a clear contradiction between sustainability and economic growth is evident, and the “pathway towards a sustainable future is to be found in a democratic and redistributive downscaling of the biophysical size of the global economy” (Asara et al., 2015, p.375; see also Kothari et al., 2014). It is clear that on the local level in areas adjacent to protected areas, such as Biosphere Reserves, it is desirable to have some economic growth from which local people directly profit.

While one part of the Biosphere Reserve concept still seeks to focus on managing core zones for biodiversity conservation, it also tries to respond creatively to the underlying causes of ecosystem destruction by piloting more sustainable land use and living options in all realms of life (hopefully, based on the sufficiency principle).

BIOSPHERE RESERVES AND THEIR ROLE IN IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS

Biosphere Reserves, launched by the Man and the Biosphere (MAB) Programme of UNESCO in 1970, form a worldwide network of representative landscapes, with 669 sites across 120 countries. Their primary goal is to serve as learning sites for information exchange on environmental policy, sustainable development, and appropriate management practices (UNESCO, 1996). Furthermore, they were explicitly designed to be experimental where environmental change could be monitored and remedial policies or practices could be ‘tested’ (UNESCO, 1996; Batisse, 1997; Köck & Arnberger, 2017; Price et al., 2010; Reed, 2016).

According to the Statutory Framework (UNESCO, 1996), Biosphere Reserves are expected to fulfil three main complementary functions: the conservation function of in situ conservation of natural and semi-natural ecosystems and landscapes; a development function to foster sustainable economic and human development; and the logistic function to support research, monitoring, environmental education and training. These functions are implemented through a zonation system, including one or more core areas (strict protection), buffer zones (sustainable management), and transition areas that can extend beyond the territory where cooperation with local people for sustainable development can be organized (UNESCO, 1996).

The Lima Action Plan (LAP) and the MAB Strategy (both valid until 2025) are founded on the continuity of the Seville Strategy and the Statutory Framework of the World Network of Biosphere Reserves (WNBR). The important new element within the LAP is the goal “to help Member States and stakeholders to urgently meet the SDGs through experiences from the WNBR, in particular through exploring and testing policies, technologies and innovations for the sustainable management of biodiversity and natural resources and mitigation and adaptation to climate change”(UNESCO, 2016, p. 2). Concerning climate change, the emphasis has changed: within the Madrid Action Plan (2008) a stronger focus was put on climate change, whereas in the LAP, the focus is much more on the implementation of the SDGs (of which climate change mitigation and adaptation is one of 17 goals) (UNESCO, 2008). The most recent and also most detailed summary of the development of UNESCO’s MAB Programme can be found in Köck and Arnberger (2017).

Coetzer et al. (2014, p.83) warn that, “conceptually the Biosphere Reserve model is attractive, yet the practical reality is likely to be challenging”. One reason is that Biosphere Reserves remain under the sovereignty and legislation of the country in which they are designated. Thus, the State can ignore the requirements of any designation, as well as the management objectives of the individual protected areas contained within the Biosphere Reserve. A further reason is that the implementation of the MAB Programme is struggling with horizontal integration at the local level, as well as vertical integration with national authorities (Pool-Stanvliet, 2014).

The result is a considerable gap between the Biosphere Reserve concept and reality worldwide (Bridgewater, 2016; Cuong et al., 2017a; Ishwaran et al., 2008; Price, 2002; Reed, 2016; Stoll-Kleemann & Welp, 2008). This

gap is mirrored in their heterogeneity. Although, theoretically, all Biosphere Reserves included in the WNBR share the same rationale, overall goals, and designation and assessment criteria, local contexts and multiple management approaches provide ample diversity and variation of management (Ishwaran et al., 2008).

One example is the South African Biosphere Reserve network, with its excellent conservation-related legislation and strategies addressing pressing topics such as sustainability and climate change. Yet South African Biosphere Reserves do not feature significantly in the national system of legislation and policies. In effect, each Biosphere Reserve is usually left to find its own ways to successfully make a difference through effective implementation of the MAB Programme (Coetzer et al., 2014; Pool-Stanvliet, 2014).

Further examples come from the Czech Republic, Hungary and Poland, where the MAB label is sometimes perceived as a “cosmetic add-on without content” (Schliep & Stoll-Kleemann, 2010). This can be ascribed to a number of causes, such as a perceived lack of effectively managed Biosphere Reserves; inadequate knowledge of the inherent opportunities for promoting the MAB Programme; visionary shortcomings with regard to the true nature of sustainable development; and the non-political nature of Biosphere Reserves (Pool-Stanvliet, 2014; Schliep & Stoll-Kleemann, 2010).

A survey of Vietnamese Biosphere Reserves showed that 55 per cent of respondents were concerned about the gap between theory and implementation, mainly because of the lack of legal status nationally (Cuong et al., 2017a). The traditional management practice in Vietnam is strongly based on laws and regulations, and the lack of a national framework might be a reason for delaying participation and collaboration under the Biosphere Reserve approach for most of the sector-based staff and managers. Lack of legal status can, however, provide a certain level of flexibility, allowing for adaptive interpretation and application of the central laws and regulations in order to fit local conditions (Cuong et al., 2017a). In Vietnam, nearly all the Biosphere Reserves are directly under the authority of the provincial government, which includes parks and protected area authorities, as well as other sectors such as agriculture, forestry, fisheries and tourism (Cuong et al., 2017a).

Generally, one of the most important purposes of Biosphere Reserves is to develop and initiate cooperation among authorities and other involved parties (UNESCO, 1996; Bouamrane, 2007; Schultz et al. 2011, UNESCO

2015, 2016). Strengthening Biosphere Reserves’ advisory bodies to serve better management boards by adding representatives from different interest groups and agencies is one way to institute better overall cooperation (UNESCO 2015, 2016, Köck & Arnberger, 2017). In cases where a Biosphere Reserve administration does not have a strong regulatory role, it could nevertheless become an initiator and mediator of efforts towards improved participation and cooperation. This would also bundle limited resources, which has been mentioned previously as an obstacle to effective participation (Stoll-Kleemann & Welp, 2008; Schultz et al. 2011; Pool-Stanvliet, 2014).

The task of effectively engaging communities in the governance and management of Biosphere Reserves is a complex one that involves many hurdles. Substantial long-term commitments of financial and human resources are needed to establish continuity, competence and trust. Power asymmetries between conservation institutions and local populations, and among local actors themselves, need to be better related and resolved. Parties capable of and willing to work for common conservation compromises need to be found, championed and negotiated with (Cuong et al., 2017b; Pool-Stanvliet, 2014; Stoll-Kleemann et al., 2010; Stoll-Kleemann & Welp, 2008).

These ideal conditions are rarely in place. In addition, factors beyond the control of the Biosphere Reserve communities and their management, such as structural poverty, corruption and weak governance may overwhelm even the best-designed programmes, with degradation and destruction of biodiversity as the final output of these failures (Cuong et al., 2017b; Stoll-Kleemann et al., 2010).

In cases where the Biosphere Reserve administration has a strong regulatory function in regard to land use and construction activities, such as in some areas of Germany, the administration might be too involved in promoting nature and landscape-protection interests to be acknowledged by all actors as a legitimate ‘neutral’ governing partner (Stoll-Kleemann & Welp, 2008). In most Biosphere Reserves a number of agencies are involved in management, requiring messy negotiation strategies. Many bodies still perceive the typical Biosphere Reserve administration primarily as an authority for promoting nature conservation to the point of single-mindedness (Stoll-Kleemann & Welp, 2008). The many advantages of the special status of Biosphere Reserves as model regions, as stated in the Statutory Framework and the Seville Strategy, should be better acknowledged and tested.



Village next to the Sontecomapan sand spit on the outlet of the Sontecomapan lagoon, Buffer Zone, Los Tuxtlas Biosphere Reserve, Veracruz, Mexico © Cristina de la Vega-Leinert

PROBLEMS AND POTENTIALS FOR SUSTAINABLE DEVELOPMENT IN BIOSPHERE RESERVES

Nevertheless, the question remains as to how Biosphere Reserves can fulfil their promise on innovative thinking towards inclusive environmental management and being laboratories for research and education. Sustainable development lies at the heart of Biosphere Reserves, yet it remains contested. Kothari et al. (2014) criticize the concept of sustainable development “as an oxymoron” because it offers an inadequate response to unsustainability and inequity. Kallis et al. (2015, p. 5) add that sustainable development expresses “the denial of any ultimate collective end as well as the denial of anything but ascent. Development becomes self-referential: development for the sake of development”.

It is necessary to examine carefully the SDGs themselves before they are implemented in Biosphere Reserves. Kothari et al. (2014) list nine points of critique of which three are relevant to the theme of this paper. This is because they should be considered in Biosphere Reserves much more than is currently the case. The first is that culture, ethics and spirituality are rarely considered, and the “importance of cultural diversity, and of ethical and spiritual values (especially towards fellow humans and the rest of nature) is greatly underplayed” (Kothari et al., 2014, p. 365). Secondly, “unbridled consumerism is not tackled head-on”. Without attending to this, “the majority of humankind will never have the space needed to become more secure and genuinely prosperous” (Kothari et al., 2014, p. 365). And thirdly,

and of particular importance for the evolution of a spatial concept such as that of Biosphere Reserves: “global relations built on localization and self-reliance are missing”. The authors argue that “there is little attention to the need to create relatively self-reliant communities” in which a degree of genuine democratic autonomy prevails (Kothari et al., 2014, p. 365). One interesting example of more self-reliance is the establishment of local currencies (such as the Brixton Pound, the Totnes Pound or the Bristol Pound) because this is a way to achieve a low-carbon society via more transparent economies based on local ownership. Supply chains can be shortened and dependence on fossil-fuel-intensive transport infrastructure reduced. It is an appealing idea to be applied in Biosphere Reserves because these kinds of local money schemes are among the most immediate and tangible manifestations of a transition that captures the spirit of the place where one lives⁴.

To be effective, “sustainable development [should] depoliticize genuine political antagonisms about the kind of future one wants to inhabit” (Kallis et al., 2015, p. 9). This suggests that Biosphere Reserves should follow the general vision of an ‘ecologizing society’ and demonstrate how it could work. This, in turn, means that they have to imagine and enact alternative visions to modern development instead of merely implementing better or greener development as an alternative.

Kothari et al. (2014) list and explain a range of various (cultural and social), more philosophical notions that

BOX 1: SUSTAINABLE DEVELOPMENT GOALS OF THE UNITED NATIONS

- 1) End poverty in all its forms everywhere
- 2) End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- 3) Ensure healthy lives and promote well-being for all at all ages
- 4) Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- 5) Achieve gender equality and empower all women and girls
- 6) Ensure availability and sustainable management of water and sanitation for all
- 7) Ensure access to affordable, reliable, sustainable and modern energy for all
- 8) Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all
- 9) Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- 10) Reduce inequality within and among countries
- 11) Make cities and human settlements inclusive, safe, resilient and sustainable
- 12) Ensure sustainable consumption and production patterns
- 13) Take urgent action to combat climate change and its impacts
- 14) Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- 15) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss
- 16) Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- 17) Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

Source: UN, 2015, p.14

have emerged in various regions of the world which seek to envision and achieve a more fundamental transformation. One example would be *Buen Vivir* (South America), a culture of life that encompasses harmony with nature; cultural diversity, and pluriculturalism; co-existence within and between communities; inseparability of all of life’s elements (material, social, spiritual); opposition to the concept of perpetual accumulation; return to use values; and collective governance even beyond the concept of value. Others are South Africa’s ethical concept of *Ubuntu* (and its analogues in other parts of the continent), with its emphasis on human mutuality; *Swaraj* in India, with its focus on self-reliance and self-governance; and from Europe, *degrowth*, the hypothesis that we can live well with less.

These more authentic worldviews and forms of life should be highly appreciated and fully incorporated within Biosphere Reserves, as they unify many of the principles promoted by the UNESCO MAB Programme. They are responses that are perfectly adapted to the encompassing environment and have evolved bottom-up from the grassroots level. Depending on the local, regional or national culture, different approaches can be adapted in different Biosphere Reserves.

SDGs *must* (not ‘should’) guide all development policies and strategies of all nations from now on as part of the 2030 Agenda on Sustainable Development. In 2015, the UN General Assembly agreed that progress towards reaching these 17 goals with their 167 targets will be assessed on a regular basis, with a major global stocktake set for 2030. These are outlined in Box 1. The concept beyond the agenda, with its new coherent way of thinking about how issues as diverse as poverty, education and climate change fit together and entwine economic, social and environmental targets in the 17 Sustainable Development Goals (SDGs) as an indivisible whole, is completely in line with that of Biosphere Reserves. The Biosphere Reserve concept sees them offering innovative thinking towards socially inclusive environmental management and being designed as laboratories for research and education. As Nilsson et al. (2016, p. 321) point out, it is important that countries interpret the SDGs according to “their national circumstances and levels of development” because “differences in geography, governance and technology make it dangerous to rely on generalized knowledge”. SDGs are frequently criticized for overlapping, for confusing targets and idealism, and for being seemingly irrelevant to the main drivers and power-broking processes of conventional diplomacy and economic policy.



Sustainable Tourism in the Spreewald Biosphere Reserve, Germany © Reynaldo Paganelli_fotolia

In the light of the general goals of Biosphere Reserves as described above and the requirements of the LAP in particular, Biosphere Reserves should contribute to the implementation of the SDGs. The links to SDGs 13, 14 and 15 are obvious and need no further explanation; SDG 11 is interesting for Biosphere Reserves with significant urban populations; and SDG 12 offers a solution to many of the above-mentioned problems related to economic growth. The worldwide network of Biosphere Reserves (as well as regional, national, and in some countries, even local Biosphere Reserve networks) is in itself an interesting opportunity to implement SDG 17, but it is too early to explore in detail here.

Nilsson et al. (2016, p.320f) explain what makes the task more complex and offer what should function as a warning for Biosphere Reserve managers: “Implicit in the SDG logic is that the goals depend on each other — but no one has specified exactly how. International negotiations gloss over tricky trade-offs. Still, balancing interests and priorities is what policymakers do — and the need will surface when the goals are being implemented. If countries ignore the overlaps and simply start trying to tick off targets one by one, they risk perverse outcomes. For example, using coal to improve energy access (goal 7) in Asian nations, say, would

accelerate climate change and acidify the oceans (undermining goals 13 and 14), as well as exacerbating other problems such as damage to health from air pollution (disrupting goal 3).”

For policy makers in general, as well as for Biosphere Reserve managers in particular, coherent policies and strategies demand: “a rubric for thinking systematically about the many interactions — beyond simply synergies and trade-offs — in order to quickly identify which groups could become their allies and which ones they will be negotiating with. And they need up-to-date empirical knowledge on how the goals and interventions of one sector affect another positively or negatively” (Nilsson et al., 2016 p. 321).

It follows that the discussion of the relevance of individual SDGs to Biosphere Reserves needs time and reflection, and in addition, the profound and thorough analysis of given projects and experiences in Biosphere Reserves.

Two specific examples have been picked to present here: SDG 11 stresses the role of cities and human settlements for sustainability. Indeed, urbanization is an important feature of the Anthropocene and among “the most critical



Cat Ba Biosphere Reserve, an archipelago of 366 limestone islands in northern Vietnam © Equilibrium Research

transformations that has had profound impacts on land use from local to global scale since the mid-twentieth century” (de la Vega-Leinert et al., 2012, p.26). More than half of the world’s population lives in cities; furthermore, urban growth is most rapid in developing countries. In both emerging and developed countries, it represents one of the greatest challenges to ensuring basic human welfare and the functioning of viable ecosystems. Whereas the poor people who inhabit them have only limited access to basic services, are deprived of meaningful participation in decision-making, and face extreme vulnerability to natural disasters, urban areas are also loci of concentrations of knowledge, innovation and productive resources that could be harnessed by Biosphere Reserves. Therefore, de la Vega-Leinert et al. (2012) argue for Biosphere Reserves as learning laboratories to foster sustainable initiatives and practice at urban–rural interfaces. They can be seen as priority areas and large-scale laboratories for observation of the effects of global change on ecosystems (e.g. significant warming and increased nitrogen deposition).

It is useful to include urban–rural interfaces, where major environmental and societal transformations are occurring, and which critically affect the availability of

and access to natural resources. This provides a welcome opportunity to found initiatives that adequately help to value and protect ecosystems for their own sake, as well as to improve local livelihoods (de la Vega-Leinert et al., 2012). Despite serious restraints due to a lack of powers and resources, Biosphere Reserve managers, by adjusting and revisiting their practices, have evolved power and responsibilities in actively supporting small but critical transformations at the local scale near large cities. In this respect, we suggest key areas in which Biosphere Reserve managers can make a difference. These include encouraging social learning, positive leadership, accountability and transparency, while recognizing and valuing the contribution local populations can make to shaping conservation action (de la Vega-Leinert et al., 2012).

Concerning SDG 12, while positive examples of sustainable consumption and production can be found (often at the micro-scale), in general, land scarcity is driving marginalized peasant farmers to convert forest to pasture or intensify cropping in and around Biosphere Reserves. This threatens the integrity of primary forest patches in core zones (de la Vega-Leinert et al., 2016; Tejeda-Cruz et al., 2010).

For example, pressure on agricultural land in the wake of the sharp increase in meat and dairy-product consumption, and the concomitant demand for huge swathes of terrain devoted to livestock feed cultivation (especially of soya and maize), constitute a major problem that is also detrimental to the implementation of sustainability in Biosphere Reserves worldwide (Foley et al., 2011; Garnett et al., 2013; Godfray et al., 2010). The consequences of the accompanying dramatic increase in the intensification of agriculture have not spared Biosphere Reserves from the land-grab that now affects protected areas around the world (European Green Party, 2013; Watson et al., 2014). Two recent papers in the magazine *Environment* attest to this destruction of Biosphere Reserves in the Brazilian Cerrado (Lahsen et al., 2014; Sawyer & Lahsen, 2016).

Even in Germany, where, according to the Federal Environment Agency (UBA), 60 per cent of agricultural land is used for the intensive production of feed for animal products (meat, dairy products and eggs), and a further 20 per cent for bioenergy plants (UBA, 2015), agricultural production is placing increasing pressure on Biosphere Reserves. Furthermore, the negative consequences of non-sustainable intensive land use are extending into Biosphere Reserves (see text and maps for Europe and Germany in Levers et al., 2016; Garnett et al., 2013; Stoll-Kleemann & Kettner, 2016). This makes it clear that the future of Biosphere Reserves depends less on classical nature conservation measures than on individual consumption patterns and the political and social pressures exerted by the true beneficiaries of this development: primarily, large-scale agri-businesses (Stoll-Kleemann & O’Riordan, 2015; Stoll-Kleemann & Kettner, 2016).

It is obvious that Biosphere Reserves face a number of challenges, both familiar and new, and that the issue of sustainable consumption will have to be more forcefully addressed – in practice and not merely in theory (e.g. through information centres or other environmental-education activities organized by Biosphere Reserve staff). In order to overcome these challenges, Biosphere Reserve management requires a political tailwind through the provision of human and financial resources that are adequate to meet the range of its tasks, combined with courageous political support, particularly vis-a-vis the agribusiness lobby (including fertilizer, pesticide and seed producers). In particular, the reduction of subsidies promoting environmentally destructive practices will reduce pressure on biodiversity and improve sustainability both inside and outside Biosphere Reserves.



Dyfi Biosphere, a biosphere reserve in mid-Wales, UK © Equilibrium Research

A search for new criteria for the establishment and transformation of Biosphere Reserves seems to be needed. These criteria should embrace both natural and human relationships and values. Here is where Biosphere Reserves should become showcases of the SDGs and beyond (including sustainable living patterns and consumption habits) and portals of the positive message of the Anthropocene.

CONCLUSIONS

The era of the Anthropocene is characterized by the breaching of planetary boundaries. Although some Biosphere Reserves have the potential to offer positive effects in terms of working through local economies with the long-term goal in mind to help strengthen fair-trade regimes and to deliver social fairness and justice for all of their inhabitants, Biosphere Reserves are not islands. The impacts of a globalized world, with a few big (and sadly often corrupt) players in the energy area, forestry and agricultural spheres, weigh heavily on what happens

within them. Tackling sustainability successfully goes against the grain of prevailing neoliberal economics and power politics. The overwhelming concern regarding the failure of both conventional government and of the markets to deliver fair sustainability has been universally regretted (Asara et al., 2015; Biermann et al., 2012; Kallis et al., 2015; Kothari et al., 2014; Marshall, 2016; Muraca, 2012). It is therefore a sign of the maturity of the Anthropocene that Biosphere Reserves are beginning to embrace decency, ecosystem care, and human well-being.

Hence, there is an urgent need to introduce innovative ways in which to showcase sustainable living practices in the light of dominating unsustainable patterns of growth and human consumption. The sustainability prize is the evolution of societies in which fewer natural resources are used and life is organized differently with “sharing, simplicity, care and the commons as primary significations” (Kallis et al., 2015, p.5).

The idea of widening the purpose of Biosphere Reserves offers an innovative way to combine sustainability with decent livelihoods. The global growth in the number and area of Biosphere Reserves, as well as their embrace of SDGs, are already positive developments.

In line with the current MAB Strategy and the LAP, Biosphere Reserves still need to build trust through real relationships with communities and other relevant stakeholders (UNESCO, 2015; UNESCO, 2016). To make this happen, they need to be conceived and then established through real local and community-led processes. Stakeholders need to be convinced of the added value of implementing the Biosphere Reserve model amidst a range of regional and national initiatives.

A range of public participation, moderation and conflict-management approaches, as well as statistical-survey methods, has been outlined in the relevant literature and handbooks (cf. e.g., Bouamrane, 2007; Creighton, 2005).

Biosphere Reserves can provide a dynamic framework for the establishment of valuable laboratories to address the challenges of the Anthropocene and contribute to a more sustainable world. In order to achieve this, some – or preferably all – of the visions described above, such as strengthening the urban–rural link and emphasizing the much needed critical assessment of the concepts of growth and sustainable development, and even the SDGs themselves, have to be taken more seriously. Only then will progress towards more responsible patterns of sustainable living based on sufficiency, such as Buen Vivir, be possible.

ENDNOTE

¹ transitionnetwork.org/stories/has-related-content

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REFERENCES

- Asara, V., Otero, L., Demaria, F. and Corbera, E. (2015). ‘Socially sustainable degrowth as a social–ecological transformation: repoliticizing sustainability’. *Sustainability Science* 10 (3): 375-384. DOI: 10.1007/s11625-015-0321-9.
- Batisse, M. (1997). ‘Biosphere Reserves: a challenge for biodiversity conservation & regional development’. *Environment* 39 (5): 7-33. DOI: 10.1080/00139159709603644.
- Biermann, F., Abbott, K., Andresen, S., Backstrand, K., Bernstein, S., Betsill, M.M., Bulkeley, H., Cashore, B., Clapp, J., Folke, C., Gupta, A., Gupta, J., Haas, P.M., Jordan, A., Kanie, N., Klavankova-Oravska, T., Lebel, L., Liverman, D., Meadowcroft, J., Mitchell, R.B., Newell, P., Oberthur, S., Olsson, L., Pattberg, P., Sanchez-Rodriguez, R., Schroeder, H., Underdal, A., Vieira, S.C., Vogel, C., Young, O.R., Brock, A. and Zondervan, R. (2012). ‘Navigating the Anthropocene: Improving Earth System Governance’. *Science* 335: 1306-1307. DOI: 10.1126/science.1217255.
- Bouamrane, M. (ed.) (2007). *Dialogue in biosphere reserves: references, practices and experiences*. Biosphere Reserves – Technical Notes 2. Paris: UNESCO.
- Bridgewater, P. (2016). ‘The man and biosphere programme of UNESCO: rambunctious child of the sixties, but was the promise fulfilled?’. *Current Opinion in Environmental Sustainability* 19: 1-6. DOI: 10.1016/j.cosust.2015.08.009.
- Coetzer, K.L., Witkowski, E.T.F. and Erasmus, B.F.N. (2014). ‘Reviewing biosphere reserves globally: effective conservation action or bureaucratic label?’. *Biological Reviews* 89: 82-104. DOI: 10.1111/brv.12044.

- Creighton, J. L. (2005). *The public participation handbook. Making better decisions through citizen involvement*. San Francisco: John Wiley & Sons.
- Cuong, C.V., Dart, P., Dudley, N. and Hockings, M. (2017a). 'Factors influencing successful implementation of Biosphere Reserves in Vietnam: Challenges, opportunities and lessons learnt'. *Environmental Science & Policy* 67: 16-26. DOI: 10.1016/j.envsci.2016.10.002.
- Cuong, C.V., Dart, P. and Hockings, M. (2017b). 'Biosphere Reserves: Attributes for success'. *Journal of Environmental Management* 188: 9-17. DOI: 10.1016/j.jenvman.2016.11.069.
- de la Vega-Leinert, A. C., Nolasco, M. A. and Stoll-Kleemann, S. (2012). 'UNESCO biosphere reserves in an urbanized world'. *Environment: Science and Policy for Sustainable Development* 54 (1): 26-37. DOI: 10.1080/00139157.2012.639603.
- de la Vega Leinert, A.C., Brenner, L. and Stoll-Kleemann, S. (2016). 'Peasant coffee in the Los Tuxtlas Biosphere Reserve, Mexico: A critical evaluation of sustainable intensification and market integration potential'. *Elementa: Science of the Anthropocene* 4: 1-22. DOI: 10.12952/journal.elementa.000139.
- European Green Party (2013). *On Land Grabs. Adopted Resolution of the 18th Council Meeting of the European Green Party*, Madrid, 10-12 May 2013.
- Foley, J.A., Ramankutty, N., Brauman, K.A., Cassidy, E.S., Gerber, J.S., Johnston, M., Mueller, N.D., O'Connell, C., Ray, D.K., West, P.C., Balzer, C., Bennett, E.M., Carpenter, S.R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., Tilman, D. and Zaks, D.P.M. (2011). 'Solutions for a cultivated planet'. *Nature* 478: 337-342. DOI: 10.1038/nature10452.
- Garnett, T., Appleby, M.C., Balmford, A., Bateman, I., Benton, T.G., Bloomer, P., Burlingame, B., Dawkins, M., Dolan, L., Fraser, D., Herrero, M., Hoffmann, I., Smith, P., Thornton, P.K., Toulmin, C., Vermeulen, S.J. and Godfray, H.C.J. (2013). 'Sustainable intensification in agriculture: premises and policies'. *Science* 341: 33-34. DOI: 10.1126/science.1234485.
- Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. and Toulmin, C. (2010). 'Food Security: The Challenge of Feeding 9 Billion People'. *Science* 327: 812-818. DOI: 10.1126/science.1185383.
- Hueting, R. (2010). 'Why environmental sustainability can most probably not be attained with growing production'. *Journal of Cleaner Production* 18: 525-530. DOI: 10.1016/j.jclepro.2009.04.003.
- Ishwaran, N., Persic, A. and Tri, N.H. (2008). 'Concept and practice: The case of UNESCO biosphere reserves'. *International Journal of Environment and Sustainable Development*. 7(7): 118-131. DOI: 10.1504/IJESD.2008.018358.
- Kallis, G., Demaria, F. and D'Alisa, G. (2015). 'Introduction: Degrowth'. In: G. d'Alisa, Demaria, F. and Kallis, G. (eds.) *Degrowth: A vocabulary for a new era*, pp. 1-17. London: Routledge.
- Köck, G. and Arnberger, A. (2017). 'The Austrian biosphere reserves in the light of changing MAB strategies'. *Management & Policy Issues* 9: 85-92. DOI: 0.1553/eco.mont-9-sis85.
- Kothari, A., Demaria F. and Acosta A. (2014). 'Buen Vivir, Degrowth and Ecological Swaraj: Alternatives to sustainable development and the Green Economy'. *Development* 57 (3-4): 362-375. DOI: 10.1057/dev.2015.24.
- Lahsen, M., Bustamante, M.M.C. and Dalla-Nova, E.L. (2014). 'Undervaluing and overexploiting the Brazilian Cerrado at our peril'. *Environment* 58 (6): 4-15. DOI: 10.1080/00139157.2016.1229537.
- Levers, C., Butsic, V., Verburg, P.H., Müller, D. and Kuemmerle, T. (2016). 'Drivers of changes in agricultural intensity in Europe'. *Land Use Policy* 58: 380-393. DOI: 10.1016/j.landusepol.2016.08.013.
- Marshall, A. (2016). *Ecotopia 2121: A vision for our green utopia*. London: Arcade Books.
- Mascia, M.B., Pailler, S., Krithivasan, R., Roshchanka, V., Burns, D., Mlotha, M.J., Murray, D.R. and Peng, N. (2014). 'Protected area downgrading, downsizing, and degazettement (PADDD) in Africa, Asia, and Latin America and the Caribbean, 1900-2010'. *Biological Conservation* 169: 355-361. DOI: 10.1016/j.biocon.2013.11.021.
- Meadows, D.H., Randers, J. and Meadows, D.L. (2005). *The Limits to Growth: The 30-year Update*. London: Earthscan.
- Muraca, B. (2012). 'Towards a fair degrowth-society: Justice and the right to a 'good life' beyond growth'. *Futures* 44: 535-545. DOI: 10.1016/j.futures.2012.03.014.
- Nilsson, M., Griggs, D. and Visbeck, M. (2016). 'Map the interactions between Sustainable Development Goals'. *Nature* 534: 302-302. DOI: 10.1038/534320a.
- O'Riordan, T. and Lenton, T. (eds.) (2013). *Addressing tipping points for a precarious future*. Oxford: Oxford University Press/British Academy.
- Pool-Stanvliet, R. (2014). 'The UNESCO MAB Programme in South Africa: Current challenges and future options relating to the implementation of biosphere reserves'. PhD thesis, Greifswald: Ernst-Moritz-Arndt-University Greifswald.
- Price, M.F. (2002). 'The periodic review of biosphere reserves: a mechanism to foster sites of excellence for conservation and sustainable development'. *Environmental Science and Policy* 5: 13-18. DOI: 10.1016/S1462-9011(02)00021-7.
- Price, M.F., Park, J.J. and Bouamrane, M. (2010). 'Reporting Progress on Internationally-designated Sites: The Periodic Review of Biosphere Reserves'. *Environmental Science and Policy* 13: 549-557. DOI: 10.1016/j.envsci.2010.06.005.
- Reed, M. G. (2016). 'Conservation (in)action: Renewing the relevance of UNESCO biosphere reserves'. *Conservation Letters* 9 (6): 448-456. DOI: 10.1111/conl.12275.
- Sawyer, D. and Lahsen, M. (2016). 'Civil society and environmental change in Brazil's Cerrado'. *Environment* 58 (6): 16-23. DOI: 10.1080/00139157.2016.1229541.
- Schliep, R. and Stoll-Kleemann, S. (2010). 'Assessing governance of biosphere reserves in Central Europe'. *Land Use Policy* 27: 917-927. DOI: 10.1016/j.landusepol.2009.12.005.
- Schultz, L., Duit, A. and Folke, C. (2011). 'Participation, Adaptive Co-management, and Management Performance in the World Network of Biosphere Reserves'. *World Development* 39 (4): 662-671. DOI: 10.1016/j.worlddev.2010.09.014.
- Steffen, W., Crutzen, P. J. and McNeill, J. R. (2007). 'The Anthropocene: Are humans now overwhelming the great forces of nature?'. *Ambio* 36 (8): 614-621.
- Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W., de Witt, C.A., Folke, C., Gerten, D., Heincke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B. and

- Sörlin, S. (2015). ‘Planetary boundaries: Guiding human development on a changing planet’. *Science* 347(6223): 1-17. DOI: 10.1126/science.1259855.
- Stoll-Kleemann, S. and Welp, M. (2008). ‘Participatory and integrated management of biosphere reserves: Lessons from case studies and a global survey’. *GAIA* 17/S1: 161-168.
- Stoll-Kleemann, S., de la Vega-Leinert, A. C. and Schultz, L. (2010). ‘The role of community participation in the effectiveness of UNESCO Biosphere Reserve management: Evidence and reflections from two parallel global surveys’. *Environmental Conservation* 37 (3): 227-238. DOI: 10.1017/S037689291000038X.
- Stoll-Kleemann, S. and O’Riordan, T. (2015). ‘The sustainability challenges of our meat and dairy diets’. *Environment: Science and Policy for Sustainable Development* 57 (3): 34-48. DOI: 10.1080/00139157.2015.1025644.
- Stoll-Kleemann, S. and Kettner, A. (2016). ‘Schutzgebiete’. In: K. Ott, Voget-Kleschin, L. and Dierks, J. (eds.) *Handbuch Umweltethik*, pp. 305-311. Stuttgart: Metzler Verlag.
- Tejeda-Cruz, C., Silva-Rivera, E., Barton, J.L. and Sutherland, W.J. (2010). ‘Why shade coffee does not guarantee biodiversity conservation’. *Ecology & Society* 15 (1): 13.
- UBA (2015). *Umweltprobleme der Landwirtschaft – eine Bilanz. 30 Jahre SRU-Sondergutachten. Texte 28/2015*. Dessau-Roßlau: Umweltbundesamt.
- UN (2015). *Resolution adopted by the General Assembly on 25 September 2015. 70th session*. New York: UN.
- UNESCO. (1996). *Biosphere reserves: The Seville Strategy and the Statutory Framework of the World Network*. Paris: UNESCO.
- UNESCO. (2008). *Madrid Action Plan for biosphere reserves (2008-2013)*. Paris: UNESCO Division of Ecological and Earth Sciences.

RESUMEN

Este artículo analiza la capacidad de las reservas de biosfera para responder ante los desafíos de la nueva Era Antropocena, incluyendo la vulneración prevista de algunos límites planetarios. En este contexto, el esfuerzo del desarrollo sostenible precisa de un reexamen crítico, y las reservas de biosfera deben avanzar hacia la adopción de formas más integradas y efectivas de medios de subsistencia sostenibles para sus habitantes. Ello implica situar a las personas aún más en el centro de la política y la gestión de las reservas de biosfera en procura de que se conviertan en pioneros y embajadores para alcanzar una verdadera sostenibilidad en todas las reservas de biosfera. Significa asimismo que las reservas de biosfera y las instituciones relacionadas tienen que trabajar en pro de una verdadera integración de sus potencialidades ecológicas, sociales y económicas, y establecer un marco de verdadera gobernanza de la sostenibilidad. Este documento amplía el concepto de reservas de biosfera para facilitar una transformación creativa hacia paisajes más habitables y sostenibles como una red global. Si esto se lograra, para las reservas de biosfera sería más fácil perseguir y fomentar la implementación de los Objetivos de Desarrollo Sostenible (ODS) como su finalidad primordial renovada.

RÉSUMÉ

Cet article examine comment les réserves de la biosphère se préparent à répondre aux défis de la nouvelle ère de l’anthropocène, y compris au dépassement prévu de certaines limites planétaires. Dans ce contexte, l’effort de développement durable nécessite un réexamen critique, et les réserves de biosphère se doivent de tendre vers l’adoption de moyens de subsistance durables plus intégrés et plus efficaces pour leurs habitants. Cela signifie placer les individus encore plus au cœur du programme d’administration de la réserve de la biosphère et leur permettre de devenir des pionniers et des ambassadeurs afin de réaliser une durabilité efficace dans toutes les réserves de biosphère. Cela signifie également que les réserves de la biosphère et les institutions connexes doivent œuvrer pour une véritable intégration de leurs potentiels écologiques, sociaux et économiques, et mettre en place un cadre de gouvernance réellement durable. Cet article vise à élargir le concept de réserves de biosphère afin de les orienter vers une transformation créatrice de paysages plus viables et durables en tant que réseau mondial. Si cela est réalisé, il sera plus facile pour les réserves de biosphère de poursuivre et de favoriser la mise en œuvre des Objectifs de Développement Durable (SDGs), ce qui est leur objectif fondamental.