



Biosphere reserve governance and the impact of the Science-Policy-Practice interface: a case of the Magaliesberg Biosphere, South Africa

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Introduction

Reconciling the needs of people and the need to conserve the environment and biological diversity is a pressing contemporary challenge. In recent decades, Earth has been increasingly transformed by human activities (Folke et al., 2021; Williams et al., 2015), with human driven drivers of change accelerating, and humanity's effect on nature becoming increasingly negative (Fletcher et al., 2024; Folke et al., 2021; IPBES, 2019; Rockström et al., 2023). Nature, considered broadly, and its contributions are, however, essential to human survival and well-being (Folke et al., 2016; IPBES, 2019), and many fundamental issues that humanity is grappling with are dependent on the capacity and resilience of nature (Folke et al., 2016; Rockström et al., 2023). Considering this, there is an urgent need to consider how complex sustainability challenges can be addressed. The United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Man and Biosphere (MAB) Programme and biosphere reserves are considered to be one potential mechanism to do so.

UNESCO's Man and Biosphere (MAB) Programme was launched in 1971 to address the relationship between humans and the natural environment from a scientific perspective (UNESCO, 2015, 2017). The MAB programme is practically implemented through the use of biosphere reserves which can be defined as, "areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognised within the framework of UNESCO's programme on Man and the Biosphere (MAB)" (UNESCO, 1996, p.16). Biosphere reserves are structured into a zonation pattern of differential levels of human activity (Fig. 1). The core area is designated for the purpose of conservation and often made up of legally constituted protected areas. The buffer zone buffers the core area and is where activities that are not harmful to conservation would take place while the transition area is where sustainable development practices should occur (Pool-Stanvliet & Coetzer, 2020; UNESCO, 1996). The triple function of biosphere reserves to promote conservation, sustainable development and provide logistic support to research, monitoring and training position biosphere reserves as sites to test and learn about how sustainability challenges can be addressed (UNESCO, 1996). This, however, requires the successful implementation of the biosphere reserve concept.

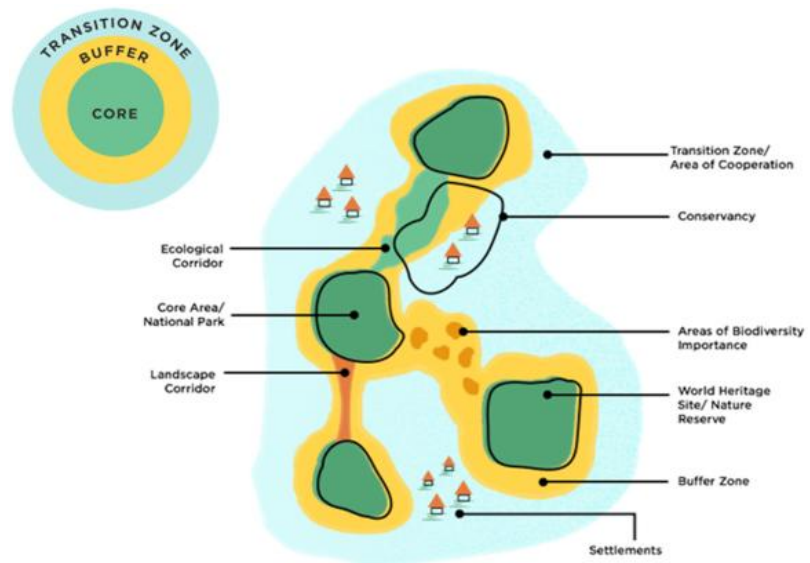


Figure 1 - Diagrammatic representation of a typical biosphere reserve zonation structure (Pool-Stanvliet & Coetzer, 2020)

Critically, good governance is considered to be one of the key factors influencing the success of biosphere reserves (Barracough et al., 2021; Cuong et al., 2017; Van Cuong et al., 2017). While UNESCO does not prescribe any specific governance model for biosphere reserves to allow for flexible, locally suitable implementation of the concept; the MAB Programme places significant importance on effective governance of biosphere reserves (UNESCO, 2016, 2021). Only a small minority of biosphere reserves have, however, had in-depth studies on 'management effectiveness' (a broad term which, in this instance,

includes governance) conducted on them, with a particular underrepresentation of African biosphere reserves (Ferreira et al., 2020). Furthermore, management and governance needs of biosphere reserves can be supported by research (Špulerová et al., 2023; UNESCO, 2015). The link between research institutions and biosphere reserves, and the science-policy-practice interface in relation to biosphere reserves has, however, been rarely studied despite the positioning of biosphere reserves as “living laboratories” and their function to provide logistical support to research.

This research, therefore, aims to understand governance and the impact of the science-policy-practice interface in enhancing governance in biosphere reserves by making use of the Magaliesberg Biosphere (MBR) as a case study. This was done through the following two research objectives:

1. Extract and assess the governance model of the MBR.
2. Examine the interface between researchers, specifically from the University of Pretoria, and the MBR with a focus on actions that allows research to be better translated into practice in the context of the MBR and its governance approach.

Methodology

Data were collected through semi-structured interviews utilising purposive sampling with subsequent snowball sampling of individuals who would, at the time of the research (2024), be most familiar with the management and governance of the MBR as well as individuals working in the tertiary education sector who have significant experience in academia and have worked in management roles. Interviews were, therefore, conducted with the board members and coordinator of the MBR (n=8) and with University of Pretoria academics who have or currently hold management positions in relevant departments/faculties (n=5). MBR board members and the coordinator were presented with two interview guides; the first being a common interview guide utilised in a number of other similar research studies (see: <https://researchbiosphere.org/>, initially funded by the National Research Foundation’s Global Change Social Sciences Research Programme (GCSSRPv2) 2021-2023) addressing research objective one and the second being a unique guide addressing research objective two. University of Pretoria academics were presented with a separate, unique interview guide to address research objective two (Fig. 2). The data were analysed using qualitative thematic coding utilising the process described by Braun & Clarke (2006) and Atlas.ti software (Atlas.ti, 2024).

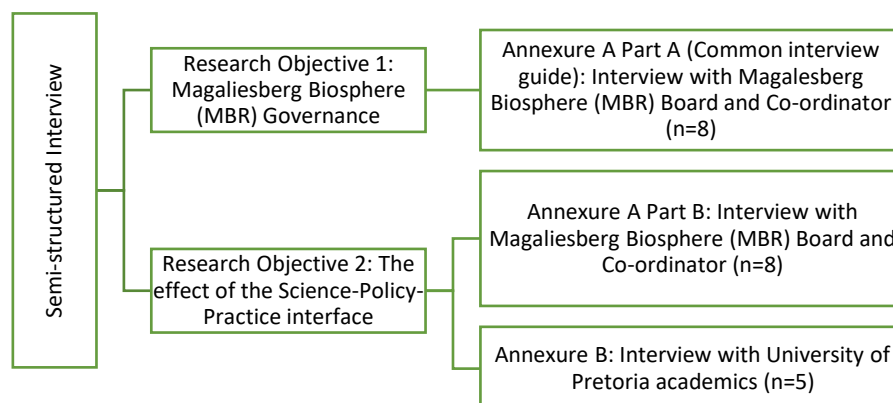


Figure 2 - Diagrammatic representation of interview participants

Magaliesberg Biosphere Governance

The MBR is governed through what the Technical Guidelines on Biosphere Reserves describe as a form of the NGO model where the governance and management are comprised of several different institutions, which can be both private and public, as opposed to through a government authority (UNESCO, 2021). In this case, this is through a registered non-profit company (NPC) without members, the MBR NPC. The MBR relies on implementation of the biosphere reserve concept through a 'soft law' approach as there is no national legislation specifically regulating biosphere reserves. The MBR governance and management is made up of a board of directors and a single employee, namely the coordinator (Fig. 3). The MBR makes use of a management plan that was developed during the biosphere reserve nomination process that outlines a proposed governance structure for the MBR (Fig. 4). The current structure, however, differs considerably from this, suggesting there may be a need to update it.

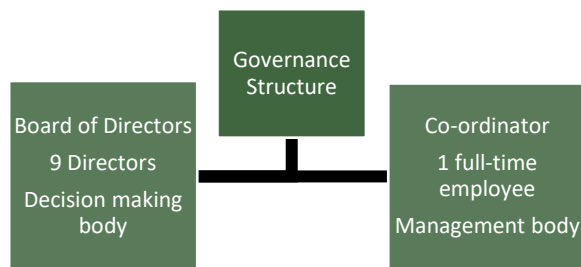


Figure 2 - Diagrammatic representation of MBR governance structure

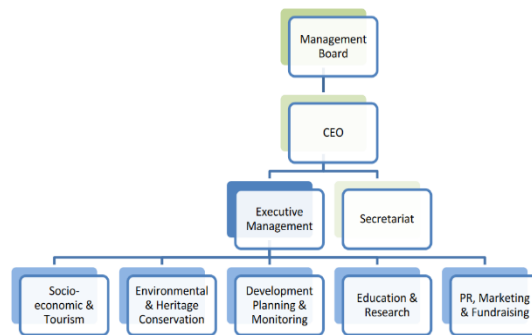


Figure 3 - Diagrammatic representation of governance structure proposed by MBR management plan

Board members were initially elected to the board to represent various stakeholder groups, however, subsequent to the initial election; board members have been selected for the expertise they can provide through recommendations by other board members or persons associated with the MBR. The role of the coordinator and board chairperson were expressed as critical to the MBR with participants indicating there is a need for additional roles such as a separate CEO and administrative assistance in fundraising and marketing. Board members involvement in the MBR is motivated by a number of different reasons namely concern for the environment, desire to contribute to positive societal impact, utilising the MBR as a means to collectively make a positive difference and appreciation and passion for the Magaliesberg. Concern for the environment emerged as the most frequently mentioned reason.

The diverse expertise of board members and positive relationships between board members are considered to be governance strengths of the MBR. Diverse expertise can be beneficial in driving problem solving in an organisation and connecting to larger networks and other organisations (Edge & McAllister, 2009; Horwitz & Horwitz, 2007). Bias towards environmental expertise, however, may be a challenge in the case of the MBR (George & Reed, 2017). Further challenges and areas requiring improvement include barriers to participation for some board members, a subset of board members that are able to be fully engaged and a need for greater representation of local communities and greater diversity on the board.

Although disagreements occur, decision making is largely through consensus. This can be considered to be beneficial as seeking consensus is valuable in effective decision making and balancing competing interests (Brenner, 2019) while disagreements indicate that "groupthink" is being avoided (Petrovic, 2008). Despite

this, considering some of the previously mentioned governance challenges, it is important to also consider which perspectives are represented in these discussions and which are not (George & Reed, 2017).

The MBR's envisioned role in the landscape is largely centred around conservation of the natural environment, protection of culture heritage and enabling sustainable development. Conservation of the natural environment was most frequently mentioned and considered by some to be the MBR's primary role. Combined with concern for the environment being the most frequent motivation for involvement in the MBR, this suggests a slight over emphasis on the conservation function of the MBR in comparison to its other functions. Participants indicated that some stakeholders have been supportive of the vision of the MBR, however, they believe most or all have not yet bought into the vision. Furthermore, participants indicated that the MBR's current role was largely in line with its envisioned role, however, the MBR could only focus on small spatial areas, often got caught up in preventing inappropriate developments and was not yet doing enough to promote sustainable livelihoods.

The MBR's main challenges in fulfilling its intended role can be categorised as funding constraints, human resource constraints, inappropriate land use developments and activities within the MBR landscape and weak government enforcement. Human resource and financial constraints are commonly identified contributors to biosphere reserve failure (Van Cuong et al., 2017) and are a challenge identified in a number of other biosphere reserves (e.g., Cuong et al., 2017; Edge & McAllister, 2009; George & Reed, 2016; Klaver et al., 2024b, 2024a). Securing sustainable financing and resources is, therefore, key to the MBR's success (Cuong et al., 2017), and seeking funding from a diversity of sources is recommended (Amer et al., 2015). Similarly, the literature supports the importance of the relationship with government (Coetzer et al., 2014; Cuong et al., 2017), as well as the commonly observed challenges in the relationship between governments and biosphere reserves (Klaver et al., 2024b, 2024a; Stoll-Kleemann & Welp, 2008). Considering this, some biosphere reserves have included government representatives in their governance structures (Hedden-Dunkhorst & Schmitt, 2020; Klaver et al., 2024b, 2024a; Reed & Egunyu, 2013). It is, however, important to note that this does not always directly translate into a good relationship with- and participation by- government (George & Reed, 2017; Klaver et al., 2024b, 2024a).

A number of the MBR's projects, namely the Majakaneng Hiking Trail, the online Magaliesberg Heritage Map and educational initiatives such as the 'Be the Change' project are considered instrumental to the success and growth of the MBR. Considering the resource constraints of the MBR, participants generally considered the MBR to be successful. Good project management and a developed board structure are considered to be important to this success.

Stakeholder participation is largely conducted on an ad-hoc, initiative-centred basis. Stakeholder participation is considered to be valuable in including different perspectives; however; identifying stakeholders, resource constraints of both stakeholders and the MBR, and disagreements amongst stakeholders are considered to be challenges. Furthermore, participants believe there is a need for greater involvement of local communities, greater demographic diversity and more involvement from the mining and tourism sector in decision making. Additionally, some participants believe that the MBR needs to improve stakeholder participation in general. Good stakeholder participation is considered to be important to effective biosphere reserve governance, particularly as it can increase support and acceptance of a biosphere reserve and its vision (Mohedano Roldán et al., 2019; Stoll-Kleemann et al., 2010; Stoll-Kleemann & Welp, 2008; Van Cuong et al., 2017). This suggests that improved stakeholder participation would be valuable to the MBR's governance.

While some participants believe the MBR's role overlaps with other entities in the landscape, others indicated otherwise citing that the MBR should not be responsible for implementing projects, rather it should play an oversight and coordination role. This links to the idea that biosphere reserves can serve as platforms known as "relational hubs" to bring different stakeholders together to coordinate collective sustainability action which has been observed in other biosphere reserves (Barracough et al., 2023; Cockburn et al., 2020; Klaver et al., 2024b, 2024a).

The MBR has several long-term key partners which includes various NGOs, Bakwena, academia, government and various funders. As described previously, the relationship with government is considered to be critical to the MBR's success, however, a challenging relationship exists. The relationship with other NGOs/NPOs, however, is generally seen positively. Partnering and collaborating with other local organisations that have overlapping mandates can be valuable in maximising benefits with constrained resources (Hedden-Dunkhorst & Schmitt, 2020). This, therefore, represents an opportunity for the MBR.

The Science-Policy-Practice Interface

While the MBR does not have a formal relationship with any research institution, many informal, positive relationships exist between the MBR and individual academics and departments. These relationships are often based on personal connections rather than formalised agreements which can be valuable in creating strong partnerships (Blye et al., 2020; Lister, 2000) and building trust (Reed et al., 2014). This, in turn, can be leveraged to build strong formal partnerships. Challenges in the relationship with academia are considered to be minor, however, lack of control over research conducted in the MBR was raised as a difficulty. Similarly, the University of Pretoria does not have a formal relationship with any biosphere reserves, however, participants were aware of substantial ongoing research being conducted in the footprint of the Waterberg Biosphere Reserve and Kruger to Canyons Biosphere Region.

Research in the MBR is largely driven by individual academics' interest as opposed to the MBR's research needs. Although the MBR has a research agenda, it has not formally been communicated with any research institutions. This suggests an underutilised opportunity as the communication of information needs can facilitate greater research into these gaps to help address misalignments between research needs and outputs (Roux et al., 2006). While notable research in certain social sciences fields is occurring in the MBR, there is a strong focus on natural sciences research. This mirrors observations elsewhere, despite the focus of biosphere reserves including socio-ecologically and socio-culturally sustainable development as an equal mandate to conservation (Alonso-Yanez & Davidsen, 2014; Blye et al., 2020; Kratzer, 2018a; Reed & Price, 2020). Furthermore, as observed in a number of other biosphere reserves (Barracough et al., 2023; Dabard et al., 2024; Kratzer, 2018b; Pool-Stanvliet & Coetzer, 2020; Reed & Price, 2020), research also largely utilises the MBR as a study site as oppose to considering the MBR as a system or studying the MBR itself. Although this is beneficial, this supports the view that biosphere reserves are underutilised in attempts to address complex sustainability problems (Barracough et al., 2023; Ferreira et al., 2020; Reed, 2016). Research conducted by research institutions is valuable to the MBR for commenting on environmental impact assessments, identifying and protecting cultural and heritage sites and compiling information for visitors, however, there is no formal process to include research in MBR decision making.

MBR participants suggested that more contact and collaboration between the MBR and research institutions is a way in which the research interface could be improved. Specifically, through more contact initiated by the MBR including through communication of the MBR's research agenda. Funding for projects

that involved a research component and/or projects to conduct research on the MBR was also identified as an area where the research interface could be strengthened. Academic participants, on the other hand, indicated that improved ease of doing research could encourage research in the MBR. Furthermore, greater formalisation of the relationship between research institutions and the MBR was suggested by both MBR and academic participants. This may be valuable in addressing some of the challenges expressed by participants as close cooperation between research institutions and biosphere reserve management can allow biosphere reserves to influence research direction (Špulerová et al., 2023) and allow for joint framing of research objectives (Young et al., 2014).

MBR participants indicated that, from their perception, academics generally have limited knowledge regarding the biosphere reserve concept. This is supported by responses from the academic participants. In considering the role academia can play in biosphere reserves, academics believe their expertise could aid in decision making. Furthermore, they indicated that academics can study biosphere reserves from a systems perspective and utilise them as “testing or training grounds” for community engagement in applied sciences, transdisciplinary research impact and training early career academics. This presents an opportunity considering the results which indicate the MBR has rarely been studied from a systems perspective and is underutilised in considering complex sustainability problems.

Beyond the questions that relate specifically to the MBR in relation to the science-policy-practice interface, academics were also prompted with questions on cross-disciplinary research¹, community engagement and research dissemination beyond scientific articles given the relevance of these topics to the science-policy-practice interface.

Academics recognise cross-disciplinary research as valuable in addressing complex problems and societal challenges, a view supported by existing literature (Caniglia et al., 2020). Engagement in cross-disciplinary research, however, is hindered by incentive structures, funding and psychological factors. High publication output and publication in high-impact journals is beneficial to academic career progression and is encouraged by university strategies and policies. Participants indicated that this often discourages cross-disciplinary research as it tends to be more time-consuming. Additionally, research into locally relevant fields is explicitly or implicitly discouraged, as such research is often not suitable for high-impact journals that require a globally relevant focus. This is considered to be especially the case for transdisciplinary research as it is associated with lower publication output (Brandt et al., 2013; Jahn et al., 2022; Newig et al., 2019; Ruppert-Winkel et al., 2015). Similarly, participants expressed that funding for cross-disciplinary research was insufficient and often unsuitable. Finally, psychological factors are also considered to be a barrier as cross-disciplinary research often requires academics to step out of their comfort zone. This supports arguments that certain personal characteristics and personality traits are important in an individual’s willingness and ability to engage in cross-disciplinary research (e.g., Augsburg, 2014; Guimarães et al., 2019; Jacobs & Nienaber, 2011; Katoh et al., 2021). On the other hand, in considering mechanisms which can improve engagement in cross-disciplinary research, participants suggested creating opportunities for academics in different fields to engage with one another, different academic indicators of success and greater availability of appropriate research funding.

¹ The term cross-disciplinary research is, hereafter, utilised to collectively refer to interdisciplinary, transdisciplinary and multidisciplinary research. The term cross-disciplinary may be defined in several different ways but for the purpose of this report, the utilisation by authors Hall *et al.* (2012) and Heitzmann *et al.* (2021) is drawn upon.

Community engagement at the University of Pretoria is largely driven by academics with interest in it and funding requirements for community engagement. While acknowledging that there are a number of beneficial community engagement projects, participants also highlighted that inadequate feedback to involved communities was a problem. A good relationship with community partners and inclusion of community engagement requirements by funders serve to encourage community engagement. Community engagement is also included in the University of Pretoria's promotion criteria, however, participants indicated that insufficient emphasis was placed on it. Furthermore, poor understanding of what community engagement entails, unfulfilled community expectations and human resource constraints hinder community engagement. Greater incentivisation and recognition, appointment of persons who could serve as boundary spanners between academia and communities and a more focused approach to community engagement was suggested as ways to encourage participation in community engagement. Both the suggestion that greater incentivisation and recognition is required to promote community engagement and that changes in academic success indicators can encourage cross-disciplinary research suggest there is a need for broader institutional change, particularly regarding incentive structures, to create a more enabling environment for the kind of research, engagements and practices that are required to address complex problems (Cornell et al., 2013). This, however, is recognised as a global challenge in academia and not one that is specifically associated with the University of Pretoria, thereby reflecting a deeper structural challenge that requires much broader change than at the level of individual research institutions.

Research dissemination by academics outside of publication of scientific articles largely occurs through social media and popular articles. While research dissemination is considered in promotion criteria, it is not strongly emphasised. A lack of skills and human resource constraints are considered to be factors hindering research dissemination. Similarly to cross-disciplinary research, participants indicated that personality traits can also serve as a barrier in some instances as some academics find communication with non-academic audiences to be challenging. In order to promote research dissemination, appointment of people responsible for research dissemination, communications training and developing relationships with individuals working in media was suggested.

Although not always referred to by the specific term, the use of boundary spanners, also known by other terms such as intermediaries and knowledge brokers, was suggested as a way to improve research dissemination and participation in community engagement. Boundary spanners are individuals who act as intermediaries between different organisations/people to facilitate the transfer of knowledge and information and enable the building of relationships (Neal et al., 2022). They are recognised in the literature as having a valuable role to play in bridging the science-policy-practice divide by playing the role of intermediaries to link academic and non-academic actors (Cvitanovic et al., 2015; Goodrich et al., 2020; Young et al., 2014). It is, however, important for boundary spanners to be sufficiently supported in this role and for boundary spanning to be recognised as a distinct profession (Roux et al., 2006; Young et al., 2014) (Goodrich et al., 2020; Karcher et al., 2024). In the context of this research, there may be scope for boundary spanners to bridge gaps between research institutions and the MBR and for the MBR itself to serve as a boundary organisation between research institutions and other stakeholders in the landscape.

A number of the responses by both academic and MBR participants suggest that the "linear model" of science-policy-practice communication is being utilised in the case of the MBR and University of Pretoria. This is where academics, as presumed experts, create relevant knowledge which policy makers and practitioners use to develop solutions (Young et al., 2014). This, however, is often an ineffective approach to bridging the divide between science and practice. Rather, a shift of direction to more interactive, bidirectional engagement and knowledge sharing between academics and, in this case, biosphere reserve

management is recommended (Roux et al., 2006) (Fig. 5). Although not explicitly mentioned, several of the suggestions by both MBR and academic participants provide the basis of what would be required for more interfacing and knowledge sharing (Bogatinoska et al., 2024; Roux et al., 2006; Young et al., 2014).

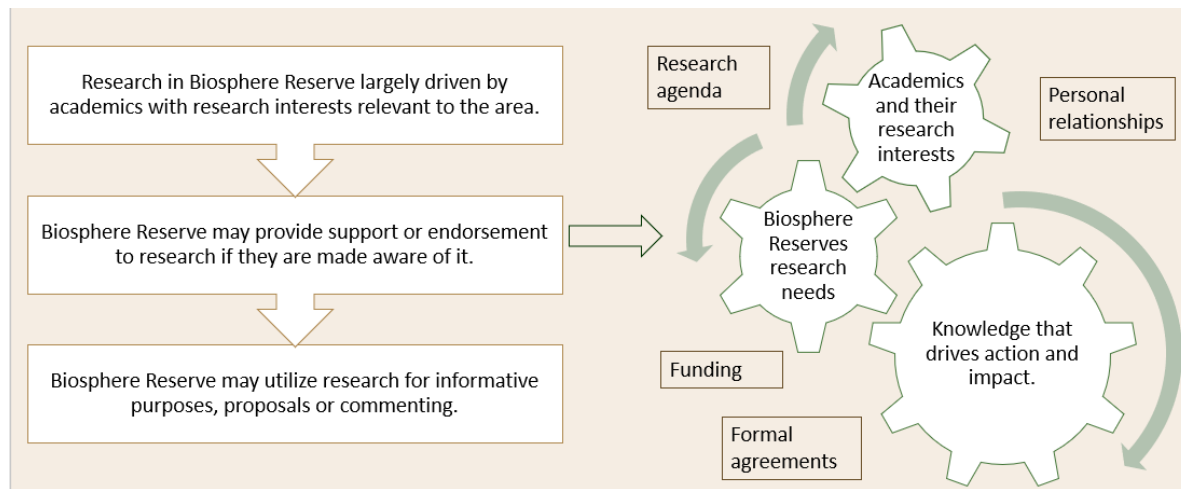


Figure 5 - Diagrammatic representation of linear versus bidirectional model of engagement between academia and biosphere reserves

Similarly, funding emerged as a recurring theme across several different questions. Funding and funders' requirements significantly influence the type of research conducted and outputs produced, which can play a crucial role in their adoption (Jahn et al., 2022; Newig et al., 2019). For example, the inclusion by funders of requirements that research direction be jointly determined between academics and knowledge users may be valuable in promoting more bidirectional engagement between academic and non-academic partners, a key opportunity identified in this research (Cvitanovic et al., 2015; Young et al., 2014). Funding must, however, be fit for purpose. This is specifically important when considering the time frame allocated for research and the evaluation of outcomes as cross-disciplinary research and engagement with non-academic partners often requires longer funding periods (Lawrence et al., 2022; Ruppert-Winkel et al., 2015). Requirements by funders and active engagement with funders on research needs can, therefore, play an important role in bridging the science-policy-practice divide.

Conclusion

The MBR, like many other South African biosphere reserves, utilises an NGO model of governance. Funding constraints, human resources constraints and a challenging relationship with government were identified as governance challenges while the inclusion of diverse expertise on the board, decision making through consensus and successful implementation of projects are recognised as governance strengths. Although stakeholder engagement is conducted on an initiative-specific basis, there is potential for this to be broadened and for stakeholders to be better represented in the MBR's governance structure. Finally, positive relationships with other entities in the landscape is considered to be advantageous and can be utilised to build mutually beneficial partnerships.

Although the MBR does not have any formal relationships with research institutions, personal relationships with academics and university departments have been beneficial to the MBR and are regarded positively. Similarly, although the University of Pretoria does not have a formal relationship with any biosphere

reserve, research is being conducted in the Waterberg Biosphere Reserve and Kruger to Canyons Biosphere Region. Research currently conducted in the MBR has a strong focus on natural sciences fields and is largely coincidental, utilising parts of the MBR as study sites as opposed to studying the MBR as a system. Although the MBR occasionally makes use of scientific research, utilisation for decision making is rare. Academic participants recognise cross-disciplinary research, community engagement and research dissemination outside of scientific articles as important to bridging the science-policy-practice divide, however, academic progression structures, funding and psychological attributes are barriers to their utilisation. More bidirectional engagement between biosphere reserves and research institutions, changes in academic performance indicators and funding criteria and the use of boundary spanners were identified as ways in which the science-policy-practice divide between biosphere reserves and research institutions could be bridged.

Suggested Citation

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