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Research

Biosphere Futures: a database of social-ecological scenarios

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ABSTRACT. Biosphere Futures (https://biospherefutures.net/) is a new online database to collect and discover scenario studies from across the world, with a specific focus on scenarios that explicitly incorporate interdependencies between humans and their supporting ecosystems. It provides access to a globally diverse collection of case studies that includes most ecosystems and regions, enabling exploration of the multifaceted ways in which the future might unfold. Together, the case studies illuminate the diversity and plurality of people's expectations and aspirations for the future. The objective of Biosphere Futures is to promote the use of scenarios for sustainable development of the biosphere and to foster a community of practice around social-ecological scenarios. We do so by facilitating the assessment, synthesis, and comparative analysis of scenario case studies, pointing to relevant resources, and by helping practitioners and researchers to disseminate and showcase their own work. This article begins by outlining the rationale behind the creation of the database, followed by an introduction to its functionality and the criteria employed for selecting case studies. Subsequently, we present a synthesis of the first 100 case studies included in the scenarios database, highlighting emerging patterns and identifying potential avenues for further research. Finally, given that broader utilization and contributions to the database will enhance the achievement of Biosphere Futures' objectives, we invite the creators of social-ecological scenarios to contribute additional case studies. By expanding the database's breadth and depth, we can collectively foster a more nuanced understanding of the possible trajectories of our biosphere and enable better decision making for sustainable development.

Key Words: *biosphere-based sustainability; community of practice; futures; scenario planning; social-ecological systems*

INTRODUCTION

Humans have become a dominant force shaping the biosphere, the thin layer of the Earth that has conditions suitable to sustain life, resulting in unprecedented complexities, uncertainties, and risks, but also novel opportunities (Steffen et al. 2015, Keys et al. 2019, Jouffray et al. 2020). For societies to navigate toward sustainable futures, being able to explore and anticipate alternative futures is imperative (Peterson et al. 2003, Bai et al. 2016, IPBES 2016, Raudsepp-Hearne et al. 2020, Cork et al. 2023). Thus, scenario planning is an indispensable tool in the sustainable development toolbox.

Scenario planning has gained traction over the last decades in both science and practice (Varum and Melo 2010, Amer et al. 2013, IPBES 2016). Given that the Anthropocene is projected to grow increasingly complex, uncertain, and interconnected—as reflected in increased frequency and intensity of extreme events, species extinctions and habitat loss, changes in atmospheric, ocean, and soil composition, risks to food, energy, and water security, etc.—we argue that scenario planning has an even bigger role to play. Because the biosphere serves as the foundation upon which human prosperity and development ultimately rest, understanding how social-ecological interactions shape the future is key to designing effective strategies that promote biosphere-based sustainability (Folke et al. 2016). Therefore, we focus on social-ecological scenarios that explicitly incorporate interdependencies between humans and their supporting ecosystems in the biosphere (Rosa et al. 2017). In particular, we focus on place-based, participatory, scenario processes that aim to connect diverse knowledge, viewpoints, and interests, in order to enable change processes that are fair and just (after Oteros-Rozas et al. 2015).

Existing scenarios provide essential place-based insights from all around the world about how the future may unfold. Indeed, there have been multiple calls for a "bottom-up" development of global scenarios that leverages existing insights by integrating many local-scale scenarios (Seifert and Carpenter 2016, Kok et al. 2017, Pereira et al. 2021). Moreover, existing scenario studies provide lessons and experiences that can be useful for the creation of new scenarios (e.g., Wyatt et al. 2021). Access to examples of previous work may help researchers and practitioners navigate the complexities of social-ecological scenario planning, which requires integrating multiple types of knowledge, using diverse methods, and managing relationships with a variety of people (Oteros-Rozas et al. 2015). Furthermore, access to other researchers' experience and advice can reduce the difficulty of social-ecological scenario planning, access to scenario methods can improve the practice of scenario planning, and access to existing scenarios can reduce the time and resources required to build new scenarios (Biggs et al. 2007).

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Several barriers limit the accessibility to existing scenario work. As a popular tool in business, many methodologies have been developed by consultancy firms and remain trade secrets (Wilkinson 2009). Scenario studies commissioned by local authorities for spatial planning processes are disseminated primarily to study participants or the local community of study, but results and insights are often not shared with other researchers or practitioners. We also note that much published work on scenarios focuses on outputs rather than evaluating or comparing scenarios methods. Consequently, there is little systematic assessment and comparison of scenario methods, which means that it is difficult for scenario practitioners to discover appropriate methods for their situation. Curry and Schultz (2009) postulate that method choices in scenario work are often based on habit rather than any real evaluation or comparison of available approaches.

Another challenge is the fragmentation of the scenarios literature. Research on social-ecological scenarios is published across a wide variety of journals, often using inconsistent keywords and terminology. For example, scenario planning can also be termed scenario development or scenario analysis, or "scenario" may not be mentioned at all. Similar work can be called foresight exercises, visioning, imaginaries, or future studies. The lack of standard terminology, publishing place, or collection of shared methods can be expected to hinder learning across disciplines and slow development of new approaches (Oteros-Rozas et al. 2015, IPBES 2016).

In their review of environmental scenarios, Wiebe et al. (2018) argue that more research is needed to link and compare scenarios across cases. Similarly, the IPBES assessment report on models and scenarios (2016) argues that scenario research would benefit from more model integration and broader communities of practice that bridge multiple knowledge systems and improve access to tools and results. Recognizing the value of having access to existing scenario studies, Seifert and Carpenter (2016) called for "a global collection of local scenarios." Such a collection could "stimulate a groundswell of long-term thinking across the globe and populate the collective psyche with many, diverse stories about what kind of future we want to build together" (Seifert and Carpenter 2016). Practitioners and scholars would benefit from having a central platform to find scenarios work embedded in different fields and terminologies, access studies that are not available in the literature, and be inspired by the aims, methods, and outcomes of previous research. However, until recently, such a database did not exist.

In this paper, we present the Biosphere Futures database (https://biospherefutures.net/) that provides access to a rich collection of case studies from around the world. As of late 2023, there are over 100 scenario case studies to explore. Together, the case studies reveal the diversity and plurality of people's expectations and aspirations for the future, and help articulate sustainability in different social-ecological contexts. The utility of this database and its potential to foster a community of practice will increase as the number of cases in the database increases, and the ability of people to access and use resources contained in the database is improved. This paper introduces the aims of the Biosphere Futures project and outlines the structures of the website and the database, designed to achieve these aims. We also provide a descriptive overview of the first 100 scenario case studies, and conclude with a call for contributions from relevant scenario planning communities.

THE BIOSPHERE FUTURES DATABASE: PURPOSE AND FUNCTIONALITY

We created the Biosphere Futures database in 2019 to strengthen the community of practice for scenario planning by building a central commons. More specifically, the database aimed to:

1. Facilitate showcasing and dissemination of scenario planning case studies;
2. Inspire learning, synthesis, and assessment across a diverse variety of scenario case studies;
3. Connect communities of practice in the social-ecological futures space.

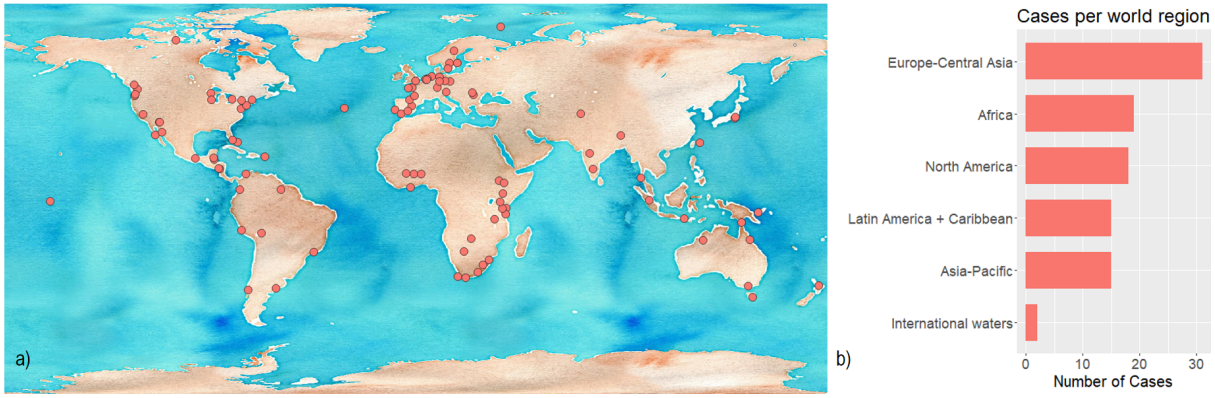
Website structure

The Biosphere Futures website is organized to facilitate user participation in the project's three aims. To showcase and disseminate their work (aim 1), contributors have easy access to the "Contribute" page, where they can complete a simple form to upload information about their case to the database. On the "Explore" page, readers can access all of the database's cases. A system of filters enables navigation by "Region," "Sustainable Development Goals (SDGs)," "Scale," "Ecosystem," or a keyword search. Case pages display information according to the database's simple data framework, which is designed to enable cross-case analysis and learning (aim 2). Cases can also be accessed through an interactive world map showing the geographic location of all the case studies. The "Thematic Collaborations" page is the landing page for initiatives intended to connect communities of practice (aim 3). Currently, visitors can find thematic pages made in collaboration with specifically focused research projects that collect cases about cities; food; mountains; Indigenous and local knowledge (ILK); the African continent; and the Nature Futures Framework. In the future, we hope the thematic pages will also showcase the results of analyses conducted by the Biosphere Futures team and the broader research community based on the website's data. Finally, there is a page where one can "Learn more," helping users to find a curated collection of useful resources on scenario planning, such as methodological guides and toolboxes.

Database structure

Biosphere Futures is a free online database that compiles scenario case studies. It aims to provide an entry point to a diverse set of scenario studies from all over the world, for the purposes of research, teaching, and practice. Based upon a previous review of 23 scenario studies (Oteros-Rozas et al. 2015), the Regime Shift DataBase (http://www.regimeshifts.org; Biggs et al. 2018) as well as scenario comparisons published by IPBES (2016) and experience reviewing scenario literature for IPBES assessments, we have developed a standardized framework to code each scenario study in a consistent way. The framework maps both social and ecological aspects of the case and balances detail with the time required for a case owner to submit their case. It was refined and simplified several times during the process of

Fig. 1. (a) World map showing the location and geographic distribution of the first 100 scenario cases in the Biosphere Futures database. An up-to-date and interactive version of the map is available on https://biospherefutures.net/. (b) A breakdown of the database by region. Map tiles by Stamen Design, under CC BY 3.0.



developing the initial versions of the database. Case information that is tracked by the framework includes location, spatial scale, the year in the future that the scenario portrays, ecosystem types in the study area, the methods used, and what groups of actors participated in the study. A variety of open-source materials such as images, links to peer reviewed scientific publications and gray literature reports, and contacts to learn more are also available. The key criteria for inclusion in the database are that (1) a scenario case considers a social-ecological system; (2) it includes some degree of connection to place or stakeholder involvement; and (3) more information on the project is available online in some type of report or publication (see Appendix 2 for the full contribution template). To ensure data quality, each scenario case study is checked by a Biosphere Futures project member to ensure that there is no missing data or broken hyperlinks. To facilitate use of the information in the database and to acknowledge the effort put into each scenario description, each published entry is given a citable reference.

EXPLORING BIOSPHERE FUTURES: AN OVERVIEW OF THE FIRST 100 CASES

What can a person expect to discover in the Biosphere Futures database? To demonstrate that the database can reveal different types of work and enable comparison, we provide a descriptive overview of the first 100 case studies, using the database's main variables: "region" (Fig. 1), "SDG" (Fig. 2), "scale/scope" (Fig. 3), and "ecosystem" (Fig. 4). We also present examples that illustrate the diversity of studies that can be found in the database (Table 1). We then use IPBES's scenario taxonomy (IPBES 2016) to illustrate how cases in the database relate to different stages of the policy cycle (Fig. 5a-d). Finally, we discuss case sources and references. Detailed information on all cases present in the database (at the time of writing) can be found in Appendix 1.

Global insights: geographical distribution of the case studies

Biosphere Futures includes case studies from across all continents except Antarctica (Fig. 1; Appendix 1). This distribution shows that Biosphere Futures provides a truly global collection of scenario case studies, however their distribution is geographically uneven and large regions lack any cases. Europe currently has more case studies represented in the database than other regions. Asian and boreal ecoregion case studies are particularly underrepresented. This pattern is due to a combination of where relevant scenario work has been conducted, and selection bias associated with the authors' research communities and languages.

Fig. 2. Number of cases as categorized by focal Sustainable Development Goal (SDG). Each case may focus on more than one element of any category. Case contributors are asked to pick 5 SDGs or fewer. We note that more than 5 SDGs may be of direct relevance for scenario planning studies on sustainable development. It is therefore advised to look only at the broader patterns emerging in the distribution of SDGs across cases, rather than focusing on a single or few selected cases.

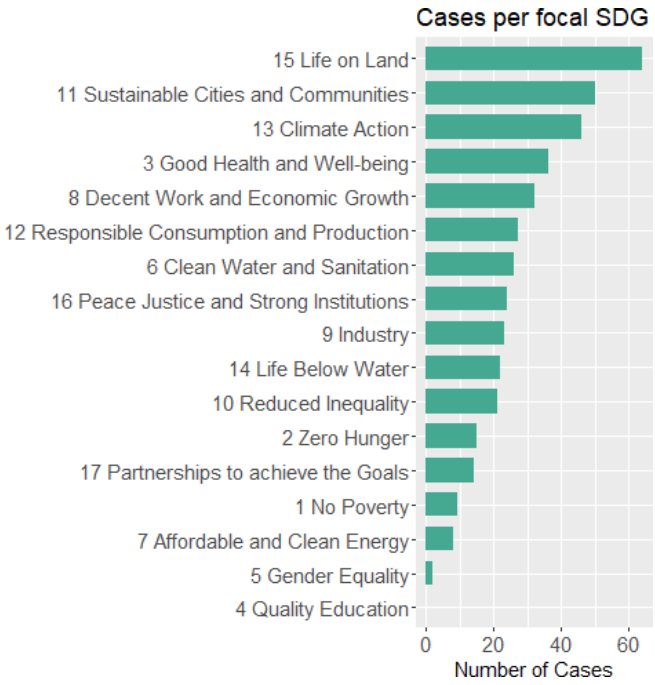


Fig. 3. Number of cases as categorized by spatial scale. Each case may focus on more than one element of any category. The ranges for the spatial scales are: a small area of a landscape: < 100 ha or < 1km on edge; a small landscape or city scape: e.g., city center, < 19 km on edge; a large landscape or city scape: e.g., Sao Paulo < 50 km on edge; small country: e.g., Trinidad or Taiwan 50–200 km on edge; Medium country: e.g., Zimbabwe or Germany 201–2000 km; international region: e.g., Western Europe or Africa > 2000 km on edge.

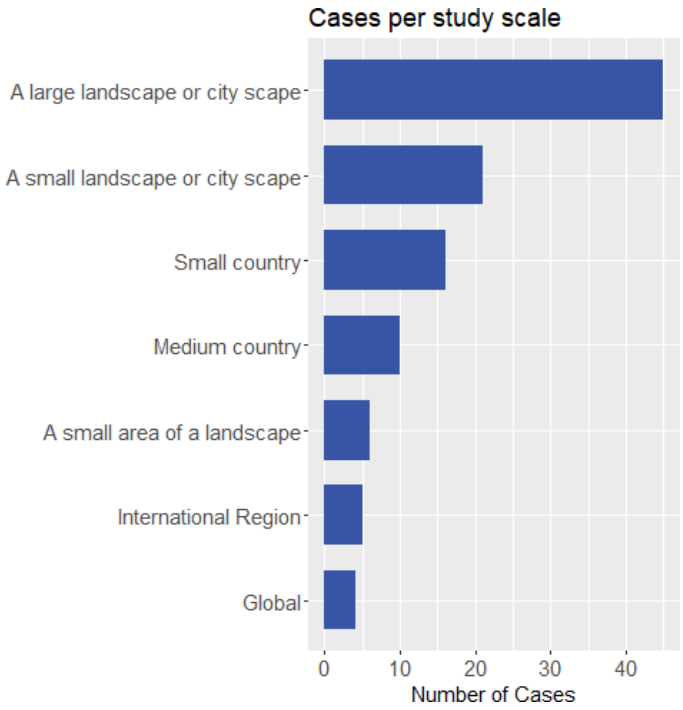
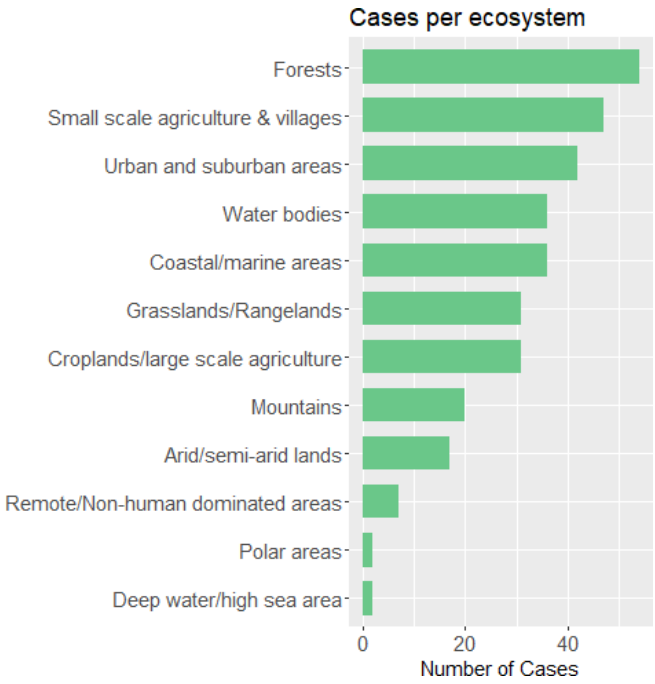


Fig. 4. Number of cases as categorized by focal ecosystems. Each case may focus on more than one element of any category. Ecosystems are divided into broad categories that include human dominated ecosystems, such as small-scale agriculture and villages as well as large scale croplands, in addition to arid lands, mountains, and polar regions.



Diversity along SDGs, spatial scale, and ecosystem type

The Biosphere Futures database framework includes several variables aiming to capture cases' focal problems and strategies, including key SDG, main ecosystem types in the study region, and spatial scale (Figs. 2–4). The database's first 100 cases include a wide range of values across each category, indicating a great variety of cases, however there are some notable over- and under-representations. Many studies focus on terrestrial ecosystems (SDG 15), which might be expected from the website's focus on place-based, social-ecological scenarios, as people mostly live on land (Fig. 2). Relatively few studies focused on energy (SDG2) and gender equity (SDG5) while no studies focused on quality education (SDG4). We further see that almost half of the cases focus on large landscapes or city-scapes (Fig. 3). A large number of studies at sub-national scales is expected because of the project's focus on place-based work, but an outsized representation of large landscapes specifically may indicate some priorities of scientific practice. Most ecosystems are relatively equally represented, with the notable exception of studies investigating the high seas and polar areas, which are underrepresented in the database (Fig. 4).

Exemplifying diversity: a showcase of examples

Futures methods should vary across decision contexts (IPBES 2016), and the cases in the Biosphere Futures database use a wide variety of futures methods to address a range of questions across a wide range of contexts. Table 1 illustrates this diversity, by presenting some of the differences among a selection of cases from each geographic region. Each case addresses different environmental and societal challenges using a unique blend of methods tailored to their specific goals. Goals vary substantially, from balancing between biodiversity preservation and modernization in Romania, to a focus on climate justice in northern Manhattan in New York City, USA. Approaches range from the PANCES project in Japan's use of the Delphi method and modeling future ecosystem services, to iterative collaborative mapping with local stakeholders for coastal and marine planning in Belize. Although each case adopts a unique mix of methods, common methods include workshops, deliberation, modeling, and art-based practices, combined in different ways to address different contexts and goals. The cases in the biosphere futures database vary substantially in their goals, however this complexity can be usefully organized in how they connect to policy. The IPBES methodological assessment of models and scenarios (2016) presents four categories tracking the different ways in which scenario studies can support and interact with the policy

Table 1. A selection of cases showing the diversity of the database.

Case title	Area of study	Overview	Main approach	Reference
Predicting and Assessing Natural Capital and Ecosystem Services (PANCES) scenarios	Japan	Using three focus areas, the study mapped how key uncertainties —population development and natural capital use—could affect the ecosystem services and human well-being of Japan in 2050.	Surveys and interviews; workshops and deliberation; mapping; modeling	(Saito et al. 2019, Hashimoto 2021)
Belize Integrated Coastal Zone Management Plan	Belize	Scenarios were developed in close collaboration with local stakeholders to inform coastal and marine spatial planning decisions in Belize. Through the concept of ecosystem services, a diverse set of interests could be acknowledged in the policy process.	Mapping; workshops and deliberation; modeling	(Arkema et al. 2015, Arkema 2019)
The Future of People and Nature in Southern Transylvania	Romania	Central Romania is faced with the challenge of balancing its rich biodiversity and unique agricultural heritage with EU agricultural policy and local calls for modernization. The transdisciplinary scenario process identified leverage points for enabling sustainable land use in the region.	Mapping; workshops and deliberation; modeling	(Hanspach et al. 2014, Hanspach 2019)
Visioning Climate Justice in Northern Manhattan	USA	With WE ACT's vision as a starting point, over 50 community members, researchers, and city representatives developed four scenarios for a future Northern Manhattan that is more just, equitable, resilient, and sustainable by 2080. Synthetic outputs included future land use modeling, renderings, narratives, and qualitative resilience assessment.	Workshops and deliberation; mapping	(Green 2020)
Scenarios of Good Anthropocenes in southern Africa	South Africa	Starting with "seeds," existing initiatives and projects that aim to enhance social-ecological sustainability, the transdisciplinary project developed four positive visions for the future of southern Africa.	Workshops and deliberation; art-based practices	(Hamann 2020, Hamann et al. 2020)
Using Transformative Scenario Planning to think critically about the future of water in rural Jalna, India	India	Combining an explorative and target-seeking approach the project brought together local stakeholders to share knowledge about the local watershed and build a shared vision and roadmap for the management of water in 2030.	Workshops and deliberation; art-based practices	(Kale 2021)

cycle. Scenarios can be used for setting policy agendas (exploratory scenarios), policy design (target-seeking scenarios), policy implementation (policy-screening scenarios), or as part of policy review and evaluation (retrospective policy evaluation). Example cases illustrating each of four categories are represented in the database (Fig. 5a-d).

Connecting dispersed scenario literature

The database allows us to compare where cases are published, because the database asks case contributors to list up to three references that website visitors can use to find more information about their cases. Together, the first 100 cases of Biosphere Futures identified 196 references, including articles in peer-reviewed journals, workshop reports, book chapters, thesis reports, and miscellaneous gray literature. The majority of the references were publications in scientific journals (110 references; see Appendix 3 for a bibliography).

The 110 scholarly articles appeared in 62 different peer-reviewed journals, spanning a wide range of thematic areas (e.g., *Cities*, *Fish and Fisheries*), geographies (e.g., *Australian Geographer*, *Scandinavian Journal of Forest Research*), and methodological approaches (e.g., *Ecological Modelling*, *International Journal of Multicriteria Decision Making*), though many appeared in broad environmental science, management, or planning journals. The most represented journal is *Ecology and Society* with 24 articles (22%), followed by *Sustainability Science*, with 7 articles (6%). However, the distribution is skewed with an extremely long tail; almost three quarters of the journals (46) were represented with only a single article (42% of the articles). This provides clear indication that the scenario literature is widely scattered, and shows that Biosphere Futures serves as a central place to bridge different literatures and traditions.

About a quarter of the cases did not list any peer-reviewed journal articles as references, indicating that their methods and findings may not have been previously reported in the academic literature. Thus, the website offers its users a simple way to locate studies that would not otherwise be easily located, and it offers case contributors an easy way to share their work with an audience of scenario practitioners who are likely to be interested in their work.

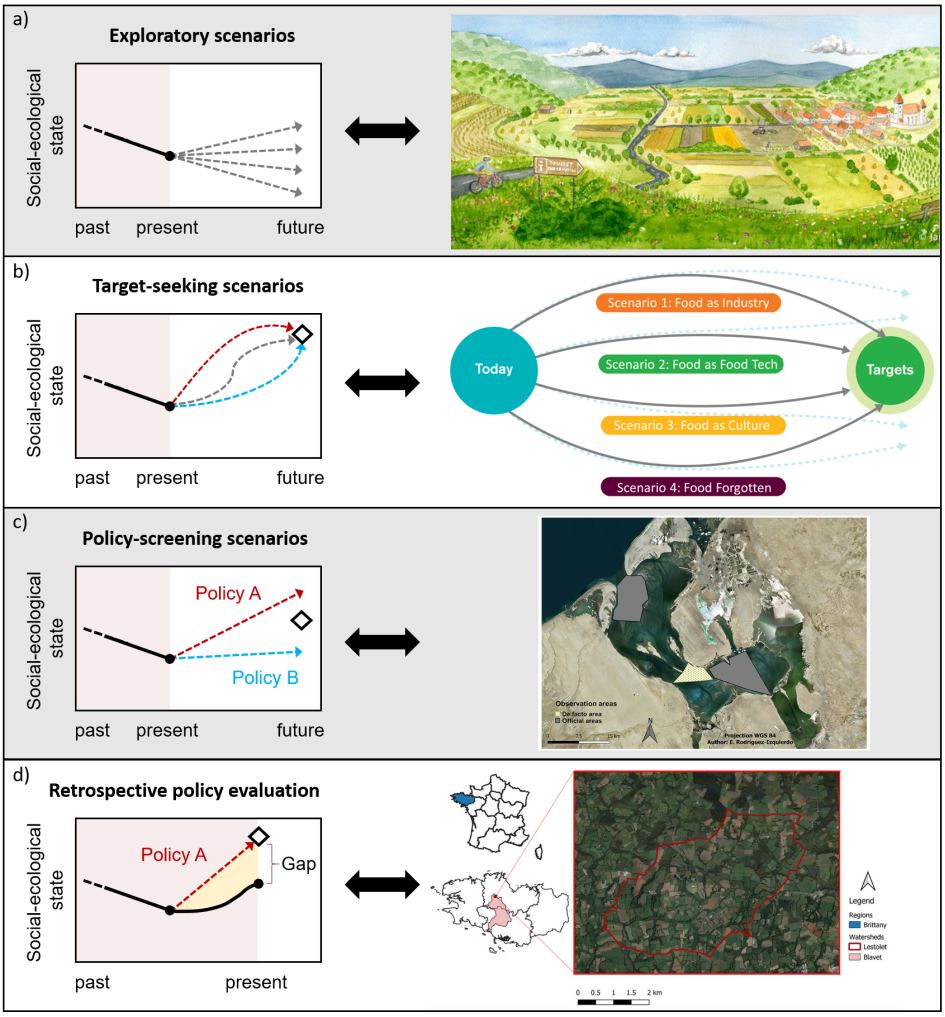
EMPOWERING COLLABORATION: FROM DATABASE TO COMMUNITY PLATFORM

Achieving our project goals requires more than an online infrastructure. Here we outline our strategy to engage a diverse audience of practitioners and researchers in sharing, learning, and strengthening their community of practice. We also present how we envision Biosphere Futures to evolve as a hub for social-ecological scenarios.

Communication and engagement strategy

We developed a communication plan based on a use-case analysis, to clarify who our target users are and how to best connect with them. The plan combines a social media strategy with more personal outreach. Twitter (@biosphereFutures) initially played a key role in connecting with scenario communities, researchers, and practitioners, and to spotlight new case studies, but because of the decline in scientific Twitter in 2023 (Valero 2023), exploration of alternative social media platforms is underway. Additionally, we use YouTube to share short videos with explainers and lectures for new scenario users (https://www.youtube.com/@biospherefutures1838). Project members of Biosphere Futures are actively connecting with different communities by giving talks at specific conferences (e.g., Anticipation 2022), workshops (e.g., workshop of the IPBES task

Fig. 5. A selection of cases illustrating the different categories of the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) taxonomy on how scenarios relate to the policy cycle (IPBES 2016). (a) In "The Future of People and Nature in Southern Transylvania," the project team used the Intuitive Logics approach to create four exploratory scenarios. The scenarios explored the interaction between national-scale policy emphasis (which ranged from pro-economy to pro-environment) and the ability of locals to capitalize on opportunities. One scenario emerged as preferable for all local actors, indicating the project's success in helping actors find consensus (Hanspach et al. 2014, Hanspach 2019). (b) In "Transformative Food Futures for Sweden," four scenarios of future Swedish food systems are presented that achieve climate, health, and biodiversity goals in different ways. These scenarios are Food as Industry, Food as Food Tech, Food as Culture, and Food Forgotten. They are built on existing narratives about transformations both inside and outside the Swedish food system. The project articulates a few ways those transformations might shape how the food system achieves Sweden's sustainability goals. The scenarios have been built on a background of years of consultation, and are part of a large transdisciplinary project that involves a wide variety of academics, food system actors, and food organizations (Peterson 2023). (c) In "Whale watching in Ojo de Liebre, Mexico," the project team used system dynamics modeling and an exploratory modeling approach to compare the impacts of two management approaches to tourism in the Ojo de Liebre Biosphere Reserve. The first approach, in which the government takes no action to limit the number of whale watching boats, was shown to lead to a collapse of gray whales in the simulation after a few decades. The second approach, in which the government set a maximum of 60 whale watching boats, significantly reduced the risk of collapse. This study helped policy actors justify government intervention (Rodriquez-Izquierdo et al. 2019, Rodriquez-Izquierdo 2021). (d) In "Land-Use and Land-Cover Change (LUCC) scenarios and a long-term ex-post evaluation: The case of Lestolet watershed," the project team followed up on a 2006 scenario planning study after the end of its scenarios' time span. The 2006 study used participatory backcasting to analyze water-quality and biodiversity dynamics, and participatory forecasting to analyze adaptation strategies for local farmers. In this follow-up study, researchers interviewed local stakeholders to understand the original study's impact, and compared predicted LUCC to empirically observed LUCC. The assessment "verified that the scenarios supported definition of a local water management strategy," and offered practical recommendations to other scenario practitioners (Rigo 2022, Rigo et al. 2022:1).



force on scenarios and models; PBL 2020) as well as online communities (e.g., http://www.anticipatorygovernance.community). A snowball approach is used to personally contact authors of scenario papers and reports for database contributions, focusing on improving geographic and methodological coverage.

The website, through the collected cases, thematic pages, and resources, serves as the main vehicle for connecting with user groups and communities. The pages under "Thematic Collaborations" include curated collections of cases in the database, which may help to bring together actors who are thinking about the future of specific research areas. For instance, we have developed a set of thematic pages highlighting specific topics of interest, regions, methods, and challenges. Each page is linked to an existing project or initiative, to encourage interactions and raise awareness. Currently, we include thematic pages on Food Futures (in collaboration with MISTRA Food Futures; http://www.mistrafoodfutures.se), Mountain Futures (with the Mountain Research Initiative; http://www.mountainresearchinitiative.org), African Futures (with the African Futures research project at the Stockholm Resilience Centre), and Urban Futures (with the Urban Resilience to Extreme Events Sustainability Research Network https://sustainability-innovation.asu.edu/urbanresilience/). We also have pages on Indigenous and Local Knowledge and Scenarios, to support IPBES' Task Force on Indigenous and Local Knowledge, and on the Nature Futures Framework, to support IPBES' Task Force on Scenarios and Models (Pereira et al. 2020).

Similarly, in the section "Resources for Practitioners" we provide links to existing projects and tool boxes, as well as relevant communities and projects such as the Seeds of Good Anthropocenes website (https://goodanthropocenes.net/). The project welcomes ideas for other pages and collaborations, in particular from projects that would be willing to act as curators and managers for their page.

Looking forward: ambitions and plans for the future

Our ambition extends beyond the database. We envision Biosphere Futures as a thriving community platform. Although the website enables users to identify and reach out to relevant people and communities, the extent to which the website strengthens connections across various scenarios communities is still limited. This stems from an initial focus on building up the functionality around the database and iteratively improving that functionality with different types of cases being added. To fully achieve our goals, particularly the one on strengthening communities of practice in the social-ecological futures space, we hope to develop Biosphere Futures into an actual "meeting place." Our current plans include a news section that reports on funding opportunities and summarizes recent scenario literature; a blog by scenario experts; and a synthetic analysis of the cases in the database to show the latest trends in the social-ecological scenarios literature. Longer term plans are to host a scenario user forum and to invite researchers and practitioners to develop personal pages summarizing their expertise and contact information.

To connect to a wider community of scenario practitioners, one limiting factor is language. The website is presented in English, which is the dominant language in international science (> 95% of papers are in English). However, there are many scenario practitioners who do not work in English. Automated translation by Google Translate provides a temporary solution. Over the longer term, we plan to translate the main pages of the website into widely spoken, global languages in which there is substantial work on people and nature, such as Chinese and Spanish, as well as provide access to scenario tools or guides that are available in those languages.

CALL FOR CONTRIBUTIONS

Biosphere Futures has been produced by the efforts and contributions of many people, and we hope that it can continue to grow from its current state. To meet its goals the Biosphere Futures database relies on continued contributions from scenario creators from around the world.

What type of cases is Biosphere Futures looking for?

Biosphere Futures is looking for social-ecological scenarios that explicitly incorporate interdependencies between humans and their supporting ecosystems in the biosphere. Although the database welcomes all types of cases, we are particularly eager to expand our database with studies that delve into areas, methods, and topics that are currently underrepresented, as illustrated in Figures 1–4. We would like more cases that address under-represented SDGs, such as quality education and gender equality, and more cases from currently under-represented countries or regions. For example, while there is a large active community of social-ecological researchers in China there are currently no studies from that country.

What could you gain from contributing a case to Biosphere Futures?

By contributing a case to the Biosphere Futures scenario database, a scenario practitioner can enhance the visibility of their work within a specialized community dedicated to social-ecological scenario planning. Furthermore, contributing a case can help people discover related works from their peers, and stay abreast of new methodologies and topics emerging in the field. By creating new thematic pages or conducting database analyses, participants can help build or strengthen networks focused on specific topics as well potentially unveil otherwise hard-to-discover related research.

What does the social-ecological scenario community gain from having more cases available?

There is not currently a coherent community of social-ecological scenario practitioners, however we believe that Biosphere Futures could help develop such a community. The practice of collaborative or participatory scenario planning would be improved by building a community of practice that uses a portfolio of common methods, addresses shared issues, shares results, methods, and challenges in a comparative way to improve the ability of scenario processes to adapt and connect different cases, scales, and geographies. By working together, the quality of the scenario planning can become better. Sharing methods, results, and challenges can help everyone. When people share their work in a way that is easy to understand and use, it provides everyone access to useful tools and new ideas, and catalyzes new approaches, methods, and ideas.

CONCLUSION

Scenario planning is an essential tool when navigating change and uncertainty. Biosphere Futures is an online database that collects place-based social-ecological scenario case studies. It offers a platform for practitioners and researchers to learn from practical experiences, find resources, and showcase their own work. With > 100 case studies from various social-ecological contexts, Biosphere Futures provides a unique perspective on the future of the biosphere, as seen through the eyes of communities around the world. We hope that it will advance the analysis and practice of social-ecological scenarios, and facilitate the creation of a community of practice by bridging fractured literature traditions and offering a central location to discover scenario studies. We invite practitioners and researchers to contribute to the database to showcase their own work, and use it to explore case studies from around the world. Only by sharing and working together can we fully unlock the potential of scenario planning for sustainable development of the biosphere.

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Data Availability:

The dataset with the first 100 cases is presented as online supplementary information. The dataset may have been updated since the publication of this article. To obtain the most recent version of the database, please contact the corresponding author.

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Appendix 1. Excel spreadsheet with 100 cases of Biosphere Futures. For the most up-to-date version of the database, contact the corresponding author.

Please click here to download file 'appendix1.xlsx'.

Appendix 2 – The input field and its (sub-)categories used to collect information of each case study. The actual online form can be found on the Biosphere Futures website: https://biospherefutures.net/contribute/

General case information												
Case study title												
Short title for case URL (50 ch max)												
Name contributor												
Email												
Social media handle (optional)												
Role of contributor in the project	Project leader	Project member	Project client	Project participant	Other							
Case Description												
Short introduction - max 200 ch												
Brief description of the goals of the scenario project - max 600 ch												
When were the scenarios developed?												
What year do the scenarios portray?												
Country												
Name of the sub-national region (State/Province/Prefecture)												
Region	Africa	Asia-Pacific	Europe-Central Asia	International waters	Latin America + Caribbean	North America						
Latitude												
Longitude												
Tick the main ecosystems that make up a significant part of the scenario regions	Arid/semi-arid lands	Coastal/ marine areas	Croplands/large agriculture	Deep water/high sea area	Forests	Grasslands/Rangelands	Mountains	Polar areas	Remote/ Non-human dominated areas	Small scale agriculture & villages	Urban and suburban	Water bodies (lakes/rivers/wetlands)

Wat spatial scale did you address during the scenario building process?	A large landscape or city scape (e.g. Sao Paulo <50 km on edge)	A small area of a landscape (<100 ha or <1 km on edge)	A small landscape or city scape (e.g. city center < 10 km on edge)	Global	International Region (e.g. Western Europe or Africa >2000 km on edge)	Medium country (e.g. Zimbabwe or Germany 201-2000 km on edge)	Small country (e.g. Trinidad or Taiwan 50-200 km on edge)									
Key references that link to published products of the scenario project	Link to website															
Add up to three references to publications	1. Reference to publication, report + link (e.g. doi.org or website)	2. Reference to publication, report + link (e.g. doi.org or website)	3. Reference to publication, report + link (e.g. doi.org or website)													
Please add at least one good photo or illustration (We don't recommend using logos or text for your featured image).	Photographer name															
Upload photo or illustration to be used as main images	1. Photographer name	2. Photographer name	3. Photographer name													
Which Sustainable Development Goals (SDGs) did the scenario building process address most directly? (Please pick 5 or fewer).	1 No Poverty	2 Zero Hunger	3 Good Health and Well-being	5 Gender Equality	6 Clean Water and Sanitation	7 Affordable and Clean Energy	8 Decent Work and Economic Growth	9 Industry	10 Reduced Inequality	11 Sustainable Cities and Communities	12 Responsible Consumption and Production	13 Climate Action	14 Life Below Water	15 Life on Land	16 Peace Justice and Strong Institutions	17 Partnerships to achieve the Goals
What approach to scenario development did you use? Tick all that apply:	Art-based practices	Desktop study	Games	Mapping	Modelling	Surveys & interviews	Workshops & deliberation									

Who substantially contributed to the study? Mark all that apply.	Artists	Business representatives	Civil society organizations	Farmers/foresters/fisherfolk	Indigenous groups	Political readers	Public policy decision-makers	Researchers	Residents	Youth/children					
What types of results were produced? (check all that apply)	Booklet/ other publication(s)	Collage(s)	Drawing(s)/diagram(s)	Map(s)	Oral presentation(s)	Poster(s)	Quantitative analyses	Quantitative changes in key variables	Radio play/ podcast(s)	Scientific publication(s)	Storyline(s)	Technical report(s)	Theater(s)	Video(s)	Videogame(s) /Interactive model(s)
Using the policy cycle as employed by IPBES (link), what purpose best fit the scenario exercise? (Tick all that apply)	Exploratory scenarios	Policy screening scenarios	Retrospective policy evaluation scenarios	Target seeking/ Normative scenarios											
Did the study focus on any of these themes?	Africa	Biodiversity	Climate change	Disaster risk reduction	Environmental justice and equity	Food	Mountains	Nature's contributions to people	NFF	Transformative change	Urban	Value plurality			
What impact did the study have? (max 400 ch)															
I certify that all information and images submitted by me can be used by the Biopshere Futures project, and published on this website, without restrictions.	Checkbox														

Appendix 3 - List of all peer-reviewed journal articles referenced by the first 100 cases in Biosphere Futures

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