Swiss Re Foundation

Biodiversity and Ecosystem Services Scenarios Modelling Challenge: Call for submissions

EY Building a better working world

WWF

AXA Research Fund

Project outline

Biodiversity is at risk – calling all stakeholders to action

Biodiversity and ecosystem services (BES) play a foundational role for the resilience of our societies, economies and quality of life. In the face of demographic growth and behavioural changes leading to increased consumption, our societies depend on the supply of natural resources more than ever before, imposing high costs on the biosphere and causing an unprecedented global decline in biodiversity. According to IPBES scientists, nearly one million species face extinction, ecosystems are being degraded and ecosystem services are declining. This is particularly the case for services such as the provision of clean water, local air and climate regulation, risk and disease protection, inspiration and a sense of place.

Scientists keep warning about biodiversity loss. If societies continue current production and consumption patterns, it's expected that 30 percent to 50 percent of all species may be extinct by the middle of the 21st century. More than half of global GDP moderately or highly depends on biodiversity and ecosystem services. With the ongoing decline, large fractions of the global economy will become more and more at risk.

A call for BES scenarios to develop targeted risk solutions

The Swiss Re Foundation, EY, Axa Research Fund and WWF call for BES scenarios which aim to be scientifically robust and at the same time practically implementable by governments and can s upport identifying expected hot spots of negative impacts of BES loss. The scenarios should also be usable for corporate and business risk identification and risk assessment.

Robust biodiversity data and granular scenarios essentially support the formation of evidence and data-based, biodiversity-respecting pathways towards resilience and sustainability. Basically, the ambition relates to the different IPCC RCPs (Representative Concentration Pathways) and SSPs (Shared Socioeconomic Pathways) global warming scenarios, IPCC emission scenarios and IPBES SSPs.

For BES, scenarios that model the expected development of the drivers which lead to BES loss and display the resulting consequences for the state of BES on different spatial, temporal and economic value chain levels – depending on expectations regarding the respective loss drivers – do not exist. Just as climate reacts sensitively to different levels of increased greenhouse gas concentration in the atmosphere, so does BES react sensitively to different levels of the activities that lead to BES decline, especially locally, but also globally, depending on the ecosystem one is looking at. BES is influenced by land and sea use and changes in use, overexploitation, pollution, invasive species and climate change. Integrated assessment models are needed to simulate socio-economic activities that impact these main BES drivers.

Such scenarios would make a huge difference to the global community's efforts to anticipate, evaluate and reformulate policies and socio-economic activities to keep biodiversity evolving and to explore multifaceted development options (ie maintain and increase socio-economic resilience). These scenarios would also support the foundation of risk models that are needed as 'first-kind' input to build resilience solutions for municipalities or corporates across the value chain, because the future states of ecosystem services that are to be modelled will provide insights about expected decline of services. Such decline may lead to scarcities up to potential tipping points, which will be used to derive measures of protection.

Furthermore, BES scenarios may help the international community better explore where investments in biodiversity will increase resilience towards nature-based protection against natural catastrophes. They would be especially beneficial for low- and middle-income economies, which depend more on biodiversity and ecosystem services than more diversified, service-sector, high-income economies.[1]

[1] See Swiss Re Institute 2020. Biodiversity and Ecosystem Services – a business case for Re/insurance. Retsa, A, Schelske O, Wilke B, Rutherford G, de Jong R, Zurich.

A grant programme that invites academic teams to model BES scenarios

Groups from academia will be invited to respond to the challenge presented here and to work on BES scenarios. The expected use of the scientific work is to build the BES scenarios to be globally and locally relevant for livelihood management, regional and national policy-making and corporate strategic and operational planning (license to operate, reputational license).

With the call for grant proposals for BES scenarios , the Swiss Re Foundation and EY, Axa Research Fund and WWF will call for BES scenarios which identify the expected hot spots of negative impacts of BES loss and are:

- scientifically outstanding,
- practically implementable by governments,
- usable for risk identification and risk assessment by corporates and
- sources of guidance as where to invest in nature in an ecologically friendly and economically efficient way.

Project components and key success factors

As a basis for the modelling, the call follows all IPBES nature's contributions to people (NCP) and is based on, but not limited, to the SRI BES index (which has applied 10 of the 17 NCPs). We can cluster the NCPs into four groups: Agriculture & Forestry (food provision, timber production, soil fertility, pollination, habitat intactness), Nature & Health (habitat intactness, local air & climate regulation), Natural Catastrophes (coastal protection, erosion control, inland flood control) and Water as a stand-alone (quality, security).

BES scenario models

BES underpin all SDGs. The aim of the BES scenarios is to make a significant, highly meaningful contribution to increasing the world's resilience, based on the modelling expertise of the groups expected to be funded.

BES loss and BES state forecasting together pose a complex problem that requires multiparty collaboration to be undertaken. IPCC scientists have also produced different climate scenarios applicable to certain regions (RCP scenarios, ie what will happen given increases of 2°C, 4.5°C or 8.5°C). BES scenarios do not exist at a globally comparable but also high level of granularity. The call for proposals will allow researchers and the global community to access new data and analytic resources and to grow a network of partners.

The state of BES, at a local level, is the result of an ecological baseline and more than 20 drivers, such as socio-economic activities like land use, pollution and climate change, that positively and/or negatively impact biodiversity. Conceptually meaningful and comparable scenarios need to include expectations about the drivers' local development as well. If such scenarios were available, they would help governments, planners and company strategists incorporate expected biodiversity

futures into decision-making, mitigate actions that lead to a negative impact on biodiversity and adapt where natural scarcities are not influenceable.

The scenarios will help support governments, eg by identifying early on where biodiversity decline can cause a substantial decrease in GDP, and will provide further risk insights to corporates. Since low- and low-middle income economies are less diversified, some of them depend more on biodiversity. Consequently, scenarios with the future look on biodiversity will help steer economic policy and BES loss adaptation and mitigation policy. This will support monitoring of geographies where economic activity heavily depends on BES and, for example, enable early identification of potential supply chain interruptions that may arise due to BES shortages.

Modelling scope

- Three periods: ca. 5–7 years (by 2030), ca. 7–15 years (by 2040), >15 years (by 2050)
- Scenarios narrative proposed by Swiss Re Institute Explorative R&D (for applicants' aspiration):
  - BAU, or business as usual (existing patterns extrapolated), with some green leaders (who have narrow power to change)
  - GGT, or green global transition, and widescale transitional change
  - IST, or critical infrastructure supply and security go first
  - IRP, or ignorant regress and populism
  - wild cards, or extreme consequences of above, eg simulate if climate change impact is stronger and faster than expected and then interacts with other environmental, socio-economic and technological drivers
- Fit key data points to the four scenarios; develop data for wild cards
- Audience-specific opportunity and threat development: what emerges within which future for whom. Whom means:
  - local to regional to national governments: strategy and planning authorities, policy-making
  - rural/urban inhabitants classified by socio-economic variables
  - most important corporates active at the location in any sector (importance: size in relation to revenue => tax and number of workers)
  - transmission mechanism facilitation: financial sector
- Shared Socioeconomic Pathways:
  - with the vision of reversing the decline of nature under the assumption that threat drivers lead to scenarios; strategic questions and activities to be developed to mitigate the detrimental effects
  - strategic actions to be taken within the current situation to lead from scenario A to scenario B

Methodological lenses

- Purpose :
  - Knowledge generation (enhance knowledge about impacts of gradual decline and up to forward-looking views on potential local to regional tipping points)
  - Input into decision support (for livelihoods, planners, businesses)
  - Develop an open access / global common data set to use the findings as well as to allow other stakeholders to contribute to the scenario thinking (trigger productive and critical dialogue essential for decision-making and transparency)
- Address multiple agendas (Paris agreement, COP 15 Montreal, SDGs)
- Carve out consequences of the scenarios and their impact on nature and economics for BES loss mitigation and adaptation
- Consider high spatial granularity needs
- Carve out technology shift points in a sector, also to have actionable items (more in the style of for example the sector specific scenarios of the International Energy Agency scenarios than in the style of for example macro prudential, country wide scenarios of the Network of Greening the Financial System
- Simulate spatially explicit changes in threat drivers in an inter-sectoral impact model comparison framework – eg changes in food production to cope with decarbonisation requirements; changes in land use to cope with bioenergy demand; dam construction for hydro – and how these changes affect the state of the NCP ecosystem services to look at (ie BES), yields, water situation, vegetation, contribution to human and animal health, etc
- Allow for enabling livelihoods and business to make use of methodologies developed and data generated to access, apply and generate own data and to conduct BES loss stress tests

- Produce useful and policy-relevant narratives
- Better understand dependencies and impacts of sector-specific economic activity on nature that are active or happening in selected case study regions that apply in the scenario construction
- Consider large uncertainties, eg impact of climate change as a threat driver on BES loss

Criteria for selection

We aim to fund a minimum of three to a maximum of five institutions globally for two years with a grant of maximum USD 100000 each, all of which will be considered award-winning. The proposals will be reviewed by an independent jury that will propose to the steering committee, comprised of one representative from each funding partner, whom to fund. **Deadline for submission is 14th of May 2023. Grant decision will be made by 30th of June 2023.**

All the proposals will be evaluated based on selection criteria that is open to be refined but sure to include:

- Geographic coverage
- Thematic coverage (type of natural assets, range of key drivers covered)
- Granularity of the model
- Modelling scope (see above, all three periods should be covered)
- Skills in the team (from population biology to macroeconomics, from methodological strength to policy design)

Jury members

- Professor Dr. Florian Altermatt, University of Zurich / Eawag: Swiss Federal Institute of Aquatic Science and Technology
- Corli Pretorius, UNEP-WCMC, UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
- Professor Dr. Josef Settele, Helmholtz Centre for Environmental Research - UFZ; German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig

For the submission development, the teams will not be supported by donors, Swiss Re or the jury members, apart from what is described in the call for proposals. Submitting teams may address questions to the project management office (EY) or the Swiss Re Institute, which will try to clarify – if needed with the involvement of donors.

The award is to be used to employ (or continue to employ) senior scientists at postdoctoral or higher level to perform the case study scenarios as outlined in the call for proposals and in the expected submitted input, in accordance with the local salaries where the position is hosted. Ideally, the staff should be employed within teams that already work on BES loss scenarios such that high-quality output can be expected.

Project work

Communication about progress of the scientific work will be directed and fostered through workshops that the project management office and Swiss Re Foundation will organise.

Workshops will follow a standard agenda known to scientists from conferences. Award-winning teams will present first the state of their work (from applying their developed methodology through data generation to insight generation, scenario modelling, proposals for application / usage of data, outlook and further research needs). All workshop participants are audience members in that they are invited to ask questions for understanding and to learn from each other in an open, progressive scientific debate.

Workshops will not produce workshop publications; however, short executive summaries of what has been discussed (in bullet point style) will be provided to all participants.
We may open attendance of these workshops to a limited number of researchers who also work on BES scenarios, but who are not funded by this award. We will decide about their participation. To enrich the scientific exchange, they will only be allowed to attend if they also present their work.

Regarding communication of the award-winning teams' findings during and toward the end of the project, scientists shall to submit any work to publicly peer-reviewed scientific journals (rather than grey literature).

We will make the findings and data globally available, so that they can benefit any interested organisation or individual. Also, we envisage the award-winning

scientists presenting their interim and nearly final findings at the World Biodiversity Forum in June 2024 and the World Economic Forum in January 2025, respectively. Finally, we aim to publish a book together with all donors (co-branded) which features the key findings from each award-winning team individually and includes an overarching chapter that puts all the different scenarios into perspective.

Note on intellectual property

Applications are distributed to an award jury consisting of external experts, all of whom signed a confidentiality agreement in advance.

All ideas submitted remain the property of the applicant.

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If you have questions, please contact us at biodiversity_challenge@swissre.com

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