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Item 5 (b) of the provisional agenda*

**Work programme of the Platform: scenario analysis and
modelling of biodiversity and ecosystem services:
methodological assessment and proposal on the further
development of tools and methodologies****Outcome of a workshop on participatory scenarios financed by
the Ministry of the Environment of Japan and co-organized by
the United Nations Educational, Scientific and Cultural
Organization and the United Nations University****Note by the Secretariat**

In June 2015, the United Nations Educational, Scientific and Cultural Organization (UNESCO) convened a workshop on participatory scenarios, financed by the Ministry of the Environment of Japan. The workshop, co-organized by UNESCO and the United Nations University, was held at United Nations University headquarters in Tokyo from 13 to 15 June 2015. The workshop brought together 32 experts from all regions, including some involved in various deliverables of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services, in particular, deliverable 3 (c), on scenario analysis and models, and some that contributed to the fourth and fifth assessment reports of the Intergovernmental Panel on Climate Change.

The broad objective of the workshop was to outline a strategy for the inclusion of participatory scenario building throughout the deliverables of the Platform. At the workshop, experts discussed ways to better incorporate participatory scenarios into regional and global assessments, focusing in particular on issues of spatial and temporal scale (e.g., scaling up from local studies to regional and global scales) and explored the potential for developing socio-economic scenarios on the regional and global scales using participatory processes in support of Platform objectives.

The annex to the present note, which is presented without formal editing, provides recommendations from workshop participants on how to integrate participatory scenarios and modelling into Platform assessments based on the document developed during the meeting. The annex to the present note was also submitted for information at the third author meeting of the methodological assessment of scenario analysis and modelling of biodiversity and ecosystem services, held from 27 to 31 July 2015 in Beijing, and at the sixth meeting of the Multidisciplinary Expert Panel and the sixth meeting of the Bureau, held from 8 to 12 October 2015 in Bonn, Germany.

* IPBES/4/1

Annex

I. Key Messages

1. The use of participatory scenarios in (biodiversity and ecosystem) assessments allows for the integration of diverse views and knowledge systems, contributes to the understanding of trade-offs between alternative policy options, builds trust and mutual understanding between stakeholders and institutions, and contributes to the promotion of effective policy advice. Moreover, participatory scenarios are important in ensuring the credibility and transparency of the assessments, and contribute to the incorporation of indigenous and local knowledge into assessments. They also provide a qualitative modelling approach that allows understanding of biodiversity and ecosystem services that is not available in quantitative models to be integrated with quantitative models in assessments of possible futures of ecosystem services and biodiversity.
2. Participatory scenario development contributes to all four functions of IPBES by complementing existing scenario and model building approaches, enhancing identification of relevant knowledge and knowledge generation by integrating experiential and experimental knowledge, improving policy relevance of assessments, and facilitating capacity building across knowledge systems.
3. Participatory scenarios can be integrated into IPBES *assessments* in the following ways:
 - Regional Assessments
 - Chapter 5 of the regional and subregional assessments will rely heavily on scenarios and model for the analysis (IPBES/3/14), and participatory scenarios should be incorporated in this analysis;
 - Participatory scenarios will create opportunities for chapter authors and key stakeholders interact (in workshops) to help identify and prioritise “the key issues that society is expected to face over the next forty years” (IPBES/3/14);
 - Chapter authors engage with key stakeholders (in workshops) to explore/analyse policy options and assessment of the effectiveness of options and considerations of the distribution of costs and benefits for the targeted stakeholders;
 - Chapter authors use participatory scenarios to bridge diverse quantitative and qualitative data and understanding in a way that is open to uncertainty and diverse perspectives.
 - Thematic Assessments
 - Use of participatory scenarios ensures that the development of the required scenarios (e.g. land degradation scenarios) involves participatory processes that allow diverse local knowledge systems and perspectives to be fed into larger scale regional assessments.
 - Further steps of assessments (including global, and the thematic ones currently being scoped, and future rounds of assessments)
 - The use of participatory scenarios ensures engagement of a wide range of actors, identifies key policy relevant uncertainties, and increases engages a broader community in bridging multiple knowledge systems and perspectives relative to IPBES;
 - Development of participatory scenarios contributes to addressing specific issues, particular places, or targeting specific sectors to integrate & bridge knowledge;
 - Participatory scenarios also allow for future assessments in a way that identifies key areas of clarity, uncertainty, and conflict; and assists in the development of scenarios reflecting the shared vision of multiple stakeholders;
 - Development of participatory approaches allows for analysis of the alternatives and identification of policy options, potentially also with pathways to implementation.

In regards to **capacity building**, there is a need to increase the understanding among IPBES delegates of the role of participatory scenarios and their use in assessments, to allow them to disseminate this information to their constituencies. There is also a need for capacity building on the use, operation,

and analysis of participatory scenarios within the scientific and practitioner communities, and for means to diffuse this knowledge through other networks (i.e. social learning) that may use participatory scenario and modelling.

In terms of **identification of relevant knowledge and catalysing knowledge generation**, the use of participatory scenarios contributes to systematising and linking existing approaches and methodologies. They also assist with further synthesis, and are important tools in addressing gaps including bridging different disciplines, knowledge systems and epistemologies. In particular,

- Approaches, methods and tools that are available from different knowledge systems and addressing different needs are to be more widely integrated. Furthermore, there needs to be systematic guidance for how to apply and analyse participatory scenarios in different types of social, ecological, and geographic contexts;
- Fragmented knowledge and sources need to be coordinated and linked through the analysis of participatory scenarios, made accessible, and different knowledge systems need to be bridged, especially different worldviews, including those of local and indigenous peoples;
- New knowledge creation processes, approaches and tools for dealing with the specific complexity embedded in the current and future assessments of biodiversity and ecosystem services need to be developed.

To support **Policy Tools**, participatory scenario and modelling approaches should be designed with explicit policy support in mind, and should be easily accessible by a wide range of stakeholders, including policy and decision makers. Potential options include:

- Use of participatory scenarios to “projecting” future scenarios/conditions resulting from different policy options using tools such as games, 3-D landscape models, maps, and others;
- Catalogue of existing projects, courses and institutional resources, including guidance on the strengths and weaknesses of these approaches for different social-ecological contexts.
- Making use of existing networks, such as the IPBES Stakeholder network;
- Training workshops and guidelines to provide guidance and information on how to use these tools;
- A toolbox that contains description of success stories and best practice or standards in this field together along a list of strategies and methods that work well in different contexts.

Participatory Scenario development enhances **communication** by providing an opportunity not only to develop and use scenarios with different stakeholders not only to feed directly into policy, but also to feed back into scenarios themselves.

II. Full Report

A. Introduction

As defined in IPBES deliverable 3(c) on scenario analysis and modeling, scenarios are plausible representations of possible futures for one or more components of a system, and/or as alternative policy, governance or management options intended to alter the future state of these components. *Participatory* scenario development is a process that involves multiple stakeholder groups who have different perceptions, knowledge, and objectives, to co-create future scenarios and build a shared understanding of complex problems. Participatory modelling using a range of tools that vary in complexity, their time investment, their data intensiveness, and the diversity of perspectives and uncertainty represented. These approaches include games, 3-D landscape models, rich pictures, causal loop diagrams, fuzzy cognitive maps, “throw-away” models, diagrams, maps, paintings and collages. Most participatory scenarios approaches combine multiple methods, and often include iteration through multiple system and problem definitions. Participatory scenario processes could use information from IPBES assessments to help participants identify trade-offs and synergies between aspirations and expectations of target groups, and potentially contribute to conflict resolution, they can also be used to identify key policy relevant uncertainties, as well as identifying key gaps or conflicts in scientific or local understanding and data.

Co-production of knowledge using diverse participatory processes and involving a wide variety of stakeholders is key to assessing biodiversity and ecosystem services. Stakeholder engagement has been identified by IPBES as an important element to ensure the relevance, effectiveness, credibility and overall success of the platform, with the stakeholder engagement strategy focusing on encouraging the participation of scientists and other knowledge holders in the platform's work and on facilitating the use of the Platform's products, such as its policy support tools (IPBES/3/15). IPBES has recognised that, in addition to expert contributions to assessments, the other three functions of the Platform require input from and participation by a diverse mix of stakeholders (IPBES/3/15). Participatory scenarios are a tool well suited to address these goals.

Participatory approaches to scenario development can provide immense saliency and richness to scenario storylines, complement analysis of quantitative models, and enhance the legitimacy of the resulting scenarios in the eyes of participating stakeholder groups (Rounsevell and Metzger 2010). In line with the IPBES framework, participatory scenario development can contribute to mapping out diverse views, understanding trade-offs, building trust between stakeholders and institutions, and effectively advising policy. It may also enhance the credibility, diversity, inclusivity, transparency and legitimacy of the assessment, and provides a way to incorporate traditional and local knowledge in the assessment process. It also allows qualitative and complex knowledge that is not encoded in quantitative models to be included in the IPBES assessment processes.

Challenges of participatory scenario development include the challenge of integrating diverse, uncoordinated and conflicting knowledge and data, the identification and mobilization of knowledgeable, representative and legitimate stakeholders, representation of knowledge held by stakeholders, monitoring and evaluation of learning processes, and logistical and economic constraints of participatory workshops. At the regional level, participatory scenarios have been used to bring together stakeholders (including decision makers) to integrate knowledge, as well as screen & develop policy options for biodiversity and ecosystem services. At the local level, participatory scenarios have been used to take an integrated to fragmented discussions, for example of land use planning, invasive species impacts, recreation, and adaptation to climate change.

No participatory scenario development is planned for IPBES and it remains unclear how existing participatory work will be incorporated in the assessment reports. Here, we thus outline how participatory scenario development may contribute to the four main functions of the platform; and how assessments can make use of any opportunities for participatory scenarios. Making this body of work visible will illustrate IPBES relevance to stakeholder needs. We also suggest that participatory scenario development should be included in the work programme for the next IPBES assessment cycle to better integrate local and indigenous knowledge, as well as to further increase IPBES assessment legitimacy and stakeholder engagement.

In particular, participatory scenario development may contribute to the four main functions of the platform in the following ways:

1. *Conducting biodiversity & ecosystem services assessments:* The use of participatory scenarios in IPBES assessments (global, regional and thematic) could complement currently available scenarios and models that identify the implications of trends in biodiversity and ecosystem services. A participatory scenario development would involve stakeholders in the envisioning process, which is likely to incorporate knowledge that will be missed no participatory assessments, and lead to greater ownership of the recommendations and decisions reached.
2. *Knowledge identification, generation, governance and management:* Participatory scenario development can play a crucial role in knowledge generation, identification and sharing by providing broader, and possibly more creative, perspectives on complex problems, including the incorporation of indigenous and local knowledge. The process of building potential visions of the future encourages participants to think about uncertainties and anticipate future change. This enhances their adaptive capacity and allows for proactive, potentially more hopeful, attitudes towards addressing these changes, and helps to mobilize action. In addition, participatory scenarios enable stakeholders to categorize knowledge into that which can and cannot be known with existing resources, and knowledge that cannot (yet) be known due to uncertainties beyond human knowledge and control.
3. *Identification of policy tools:* Participatory scenarios can contribute to improving policy relevance and implementation through exploration of policy instruments, market tools, governance and management practices relevant to target groups. Participatory scenarios can also be used to explore diverse pathways towards identification and implementation of policies.
4. *Capacity building:* Including multi-stakeholder participation in scenario development can enhance stakeholder capacity to understand the connections among various aspects of human

development, ecosystem services, and biodiversity. In addition, scenario building facilitates co-learning and knowledge exchange among all participants in the process, thus promoting understanding by providing a platform that bridges multiple knowledge systems.

B. Options for use of participatory scenarios in the current regional assessments:

The outline of the Regional assessments includes an “integrated and cross-scale analysis of interactions of the natural world and human society” (IPBES/3/6/add.1). This analysis focuses on “key issues that society is expected to face over the next 40 years” (IPBES/3/14). Participatory scenarios are designed to analyse interactions between the natural world and human society, and engage diverse views and perspectives on these interactions (Peterson et al. 2003). Results derived from existing participatory scenarios will be an important source for the ongoing IPBES regional and sub-regional assessments. A literature review and compilation of case studies, where participatory scenarios were developed for biodiversity or ecosystem services, would help to ensure that relevant material is identified through the assessment. Relevant case studies may be collated and analysed with guidance of an analytical framework co-developed with the expert group on scenarios and modelling (deliverable 3c).

The authors assigned to the chapter that includes the assessment of “the key issues that society is expected to face over the next forty years” (chapter 5) are recommended to engage with key stakeholders (preferably in a workshop) to help identify and prioritise these key issues. The advantage of participatory tools for building the “salience, credibility and legitimacy” (Cash et al. 2003) (p. 8086) of science and technology ensures their use will increase the quality and policy impact of the assessments.

Engagement is recommended between the authors of the chapter on “options for governance, institutional arrangements, etc.” (chapter 6) and key stakeholders (preferably in a workshop) to explore/analyse policy options and assessment of the effectiveness of options and considerations of the distribution of costs and benefits. This will help with the “policy relevance”, “creative solutions” and “resolving conflicts” advantage of participatory scenarios.

These recommendations imply the need for additional resources and additional work for co-authors, but it does not mean revisiting the work program. Additional resources may be available through specific donors. An example is the contribution of the Japanese Government to this current work.

C. Options for use of participatory scenarios in the current thematic assessments:

The outline of the thematic assessment on land degradation and restoration will explore a range of plausible development scenarios (Chapter 7) (IPBES/3/7). This may include the development of new scenarios aiming at revealing “the variation in plausible land degradation and restoration futures that depend on choices (with associated social and economic implications) made at the national, regional and international scales”. The use of participatory approaches for developing these land degradation and restoration scenarios will increase, among other advantages, the legitimacy, credibility and the ability to discover creative solutions. Building participatory scenarios is, however, a time and resource intensive process, and may not be realised in the timeframes available, therefore the thematic assessment may also draw on case studies as recommended for the regional assessments.

D. Options for use of participatory scenarios in further assessments (including global, and the thematic ones currently being scoped, and future rounds of assessments)

In further assessments, participatory scenario work should be visible and attract engagement from a wide range of global actors from the beginning of the process. Although global scenarios are needed, but there is no need to re-visit the Shared Socio-economic Pathways (SSPs), developed for the IPCC AR5. Instead, biodiversity and ecosystem services are issues that are more locally defined by local and social dynamics than climate change, and adequately capturing these dynamics requires new scenario approaches. We recommend IPBES should develop participatory global scenarios that target specific global dynamics that are important to IPBES issues, such as

- The infrastructure sector, other sectors, from exploratory stage and ongoing ;
- Tele-coupling and tele-connections are often important for biodiversity and ecosystem services could be explored and assessed, e.g.

- Interactions between the sources and recipients of “virtual water” (at multiple scales such as nations, irrigators, farmers), other traded commodities (e.g. biomass), areas with out-migration and in-migration of people. For example, the UK sources approximately one third of its annual biomass consumption, and two thirds of its water demand, from overseas (UK National Ecosystem Assessment 2011); building participatory scenarios between the UK networks of consumers and overseas suppliers can help identify vulnerabilities and impacts of future policy options on both. Such understanding would hold implications for a wide array of other interactions.
- Process and system knowledge used to identify where stakeholders are part of global interactions that are critical to the thematic focus (e.g. land degradation) (example of how the future price of fish in British Columbia depends on many other places where fish are sourced).
- How migration and remittances shape ecosystem and management between rural areas and cities around the world
- How wildlife trade networks influence populations of species, as demand for products such as bush meat or rhino, has impacts on biodiversity across the world.

In addition, participatory global modelling approaches should be developed to interact with the scenarios, adapting well-known participatory modelling processes and methods such as

- Use of experimental games to study behaviour and decision-making in different scenarios as it relates to biodiversity and ecosystem services in our case (i.e., participatory economic game theory);
- agent-based modelling, companion modelling, fuzzy logic;
- participatory modelling with Indigenous and local knowledge-holders to support inclusion of their knowledge into participatory scenarios is a critical foundation for explorations of future scenarios

Bringing together knowledge systems under diverse epistemologies and validity claims requires tools that can navigate and mediate boundaries to arrive at something common: variously termed “actionable knowledge” (Kirchhoff et al. 2013); “working knowledge” (Barber et al. 2014); “situated knowledge” (Nygren 1999) “multiple evidence basis” (Tengö et al. 2014) and “usable knowledge” (Robinson et al. 2015). There are many participatory tools to help bridge diverse knowledge systems, such as participatory mapping tools that enable individuals and groups to represent their ideas in diverse visual (e.g. through painting and drawing) (Robinson et al. 2015), spatial (through participatory GIS systems) (Pert et al. 2013). Also more learning focused approaches such as participatory modeling, and adaptive management allow people to connect fragmented understanding to address a particular problem. Many other types of participatory processes provide essential tools to construct a platform of common understanding from which to build explorations of the future (Pert et al. 2010).

Furthermore, participatory approaches should be developed that focus on identification and analysis of alternatives and policy options, potentially including pathways to implementation. An exploratory part of the scenarios work for IPBES could also come from existing work through the IPCC’s SSPs, but this does not exclude participation in the exploratory part of scenario development.

E. Role and use of participatory scenarios and modelling in IPBES functions (capacity building, knowledge identification and generation, policy support tool development and communication)

There is a need to differentiate the procedures for capacity building, knowledge creation and policy tools development over the short-term (e.g. a span of up to 5 years) and long-term (e.g. up to 10 years periods).

1. Capacity building

IPBES delegates need to better understand the relevance of participatory scenarios and modelling in further assessment cycles of biodiversity and ecosystem services in order to more effectively disseminate their usefulness to their constituencies. Guidance is also required for representatives from countries who want to do their own assessments. It is suggested that a scenario workshop with delegates be run prior to the fourth meeting of the IPBES Plenary.

Stakeholders¹ can play an essential role in facilitating the understanding of the relevance of participatory processes in scenario and modelling adopted in the thematic, regional and global assessments of biodiversity and ecosystem services, and their engagement is needed in further assessment cycles. The stakeholders are currently organising themselves in a network with a wide reach and broad constituency, and can be engaged over the long term in capacity building, knowledge identification and generation activities and policy support tool development.

An ongoing process of capacity building might be suggested in the long term to create a broader network of practitioners using participatory scenarios and modelling, which would be self-sustaining and not necessarily IPBES-led. This would include involving and iteratively receiving feedback from an extended peer community and communicating with the broader public.

Furthermore, there is a need for capacity building within the scientific and practitioner communities to support the potential of participatory scenarios as a useful tool for working with multiple knowledge systems in the context of IPBES assessments. As a capacity building tool, participatory scenarios could help to improve: understanding of knowledge boundaries and brokering, participatory modelling and mapping, visualisation techniques to display information and data in novel, easily understood ways, effective participatory workshops using diverse approaches, and easy-to-grasp modelling tools that draw on diverse epistemologies and cross multiple scales and levels. There is also a need for a means to diffuse this knowledge through other networks (i.e. social learning) that may use participatory scenario development and modelling.

2. Knowledge identification and catalysing knowledge generation

A solid understanding of participatory scenario and modelling approaches and methods already exists, but it needs to be better systematized and linked across disciplines. Further synthesis and the creation of new knowledge and methods are required to address gaps, including bridging different disciplines, knowledge systems and epistemologies. A key aim of this process would be to create a community of practice or knowledge-sharing network that operates across different regions and sub-communities.

There is a three-tiered approach to identification and prioritisation of existing knowledge, and dialogue with relevant groups to catalyse new knowledge around participatory scenarios and modelling:

1- Approaches, methods and tools are available from different groups, e.g. academia, NGOs, private sector, etc. This current knowledge, however, needs to be more widely shared. There is also an opportunity for learning from previous participatory scenarios and modelling work (e.g. Millennium Ecosystem Assessment, experiences of participatory scenario at local and regional level).

2- Linking and synthesising fragmented knowledge and bridging of different knowledge systems. There is a strong potential benefit to IPBES from conducting an assessment of existing participatory scenarios effects that links, evaluate, and synthesise fragmented knowledge and bridge different knowledge systems. In particular there is substantial scenario expertise in consultancies and practitioners that is often unavailable to others due to consultancies protecting their 'trade secrets' or the lack of publication of methods. Access to such knowledge, especially in easily accessible forms and languages is especially important for linking different worldviews and for including local and indigenous knowledge. New knowledge is thus expected to be created around developing new approaches for linking different knowledge systems, e.g. ILK with scenario/modelling epistemologies, art and science, etc.

There are a variety of options for organising the synthesised knowledge that is generated through the above process. These could include a catalogue (i.e. successful and unsuccessful) stories, best practices) and/or a sourcebook, a curriculum, a course (e.g. on social-ecological scenario generation) that would be facilitated through a series of smaller workshops bringing together the people who have been working on this, as well as the task force of ILK. In addition to technical workshops bringing various experts together to generate these outputs, it would also be necessary to run training workshops with users of the new knowledge to be applied in and beyond the IPBES assessment cycles.

¹ IPBES definition of stakeholders (IPBES/3/15, article V.8):

In the context of the work programme, stakeholders will act both as contributors to and end users of the Platform and will be individual scientists or knowledge holders, and also institutions, organisations or groups working in the field of biodiversity and ecosystem services that could

- (a) contribute to the activities of the work programme through their experience, expertise, knowledge, data, information and capacity-building expertise
- (b) use or benefit from the outcomes of the work programme
- (c) encourage and support the participation of scientists and knowledge holders in the work of the Platform

A possible strategy could be to organize workshops with people who can become instructors in the future to promote, thus promoting a multiplier effect.

3- Finally, we need to develop new knowledge creation processes, approaches and tools for dealing with the specific complexity embedded in the current and future assessments of biodiversity and ecosystem services (e.g. complex systems and cross-scale interactions; non-linear feedbacks between drivers and effects; trade-off supply-supply between scales of biodiversity and ecosystem services, trade-offs demand-demand; novelty of unexpected ES, etc.). This requires the development of new tools and methods. Such research is ongoing, but fragmented and not necessarily aligned with IPBESs needs. We recommend that IPBES take a leadership role in coordinating and focussing these efforts. Potential working strategies include engagement with ongoing academic and research programs such as CIFOR-CGIAR; Man and Biosphere Programme – UNESCO; Collective Action and Property Rights Program (CAPRI/IPFRI-CGIAR) as well as postgraduate programs, ICRAF-CGIAR)

3. Policy Tools

Participatory scenario development and modelling as methods applied to assess nature-society changes can be designed to explicitly be policy relevant. The wide range of knowledge and tools that are already available, as well as new knowledge and tools created, need to be organised and institutionalised into a structure that is easily accessible by a wide range of stakeholders, including policy and decision makers.

Policy tools could be developed in partnership with universities, multilateral agreements, NGOs and professional associations like consultancies. These must be context specific to be relevant at different levels and across different sectors and should also be purpose-specific. The development of tools should also be coupled with training courses, ensuring the appropriate use of the policy tools by providing guidance on when to use particular tools and for what purposes. Policy support tools and their application need to be monitored and evaluated on a regular basis, and adapted and replaced, when and where necessary.

Options for policy tools

1. Catalogue of existing projects, courses and institutional resources (data, places, people, institutions, tools, methods) etc. that are already available. This knowledge would be more useful if evaluation of strengths of weaknesses of approaches in different contexts is provided.
2. Provide governments with existing examples of networks that already exist that they can draw from in order to do their own scenario development process, but at a reduced possible least cost. Although delegates do not necessarily engage directly on the local level, such a catalogue can provide them with useful tools for the dissemination of this knowledge. Universities and advocacy NGOs may also benefit from access to such networks and may be more proactive to disseminate them than government officials whose mandate is not directly related with knowledge generation;
3. Training guidelines and workshops to provide guidance and information on how to use these tools; The catalogue of existing projects could also as well as workshops can be used to build new knowledge via collaborations, support PhD dissertations, or send researchers to get trained. A spin-off of this could be the development of new curricula and courses;
4. A toolbox that contains descriptions of success stories and best practice or standards in this field together with list of strategies and methods.

Policy support tool development is one of the four functions of IPBES, and the opportunity to contribute to this function provides an incentive for researchers/entrepreneurs, etc. to synthesise existing knowledge, and define proposals where new tools and knowledge generation is required. Suggestions to funders (e.g. Belmont Forum/NORAD) can be made for a research call on this topic to provide incentives to researchers to contribute to these tasks.

4. Communication

A participatory process provides an opportunity to use the scenarios with different stakeholders, such as policymakers, in order to feed directly into policy (e.g. IPCC, national development plans), but also to feed back into the scenarios themselves. It is therefore important not only to communicate with politicians, bureaucrats and civil servants, as well as civic society and business people who are directly working on these issues. There is also a need for some mechanisms for informing public opinion. This can be done through engaging with organisations (e.g. civil organisations) working in this. The development and dissemination of policy briefs at key international events like the COP in Paris is one suggestion for this. Web-based tools for scenario exploration and user-friendly modelling adoption are another way of engaging the public in further thematic, regional and global assessments. The approach

used by the Rio + 20 organizing committee, via the internet, to involve global citizens in deciding the world's top 10 topics to include in the Rio + 20 Dialogues (<http://vote.riodialogues.org/>) could be employed in participatory scenario building.

F. References

- Barber, M., S. Jackson, J. Shellberg, and V. Sinnamon. 2014. Working Knowledge: characterising collective indigenous, scientific, and local knowledge about the ecology, hydrology and geomorphology of Oriners Station, Cape York Peninsula, Australia. *Rangeland Journal* 36 (1):53-66.
- Cash, D.W., W.C. Clark, F. Alcock, N.M. Dickson, N. Eckley, D.H. Guston, J. Jager, and R.B. Mitchell. 2003. Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences of the United States of America* 100 (14):8086-8091.
- IPBES/3/6/add.1 (2015) Report on the regional scoping process for a set of regional and subregional assessments (deliverable 2 (b)). Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
- IPBES/3/7 (2015) Scoping for a thematic assessment of land degradation and restoration (deliverable 3 (b) (i)) Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
- Kirchhoff, C.J., M.C. Lemos, and S. Dessai. 2013. Actionable Knowledge for Environmental Decision Making: Broadening the Usability of Climate Science. *Annual Review of Environment and Resources*, Vol 38 38:393-414.
- Nygren, A. 1999. Local knowledge in the environment-development - Discourse from dichotomies to situated knowledges. *Critique of Anthropology* 19 (3):267-288.
- Pert, P.L., R. Hill, K.J. Williams, E.K. Harding, T. O'Malley, R.A. Grace, A.P. Dale, I. Bohnet, and J.R.A. Butler. 2010. Scenarios for community-based approaches to biodiversity conservation: A Case Study from the Wet Tropics, Queensland, Australia. *Australian Geographer* 41 (3):285-306.
- Pert, P.L., S.N. Lieske, and R. Hill. 2013. Participatory development of a new interactive tool for capturing social and ecological dynamism in conservation prioritization. *Landscape and Urban Planning* 114:80-91.
- Peterson, G.D., G.S. Cumming, and S.R. Carpenter. 2003. Scenario planning: a tool for conservation in an uncertain world. *Conservation Biology* 17 (2):358-366. Rounsevell M.D.A., Metzger M.J. (2010) Developing qualitative scenario storylines for environmental change assessment. Wiley Interdisciplinary Reviews: Climate Change 1: 606-619.
- Rounsevell M.D.A., Metzger M.J. (2010) Developing qualitative scenario storylines for environmental change assessment. Wiley Interdisciplinary Reviews: Climate Change 1: 606-619.
- Robinson, C., K. Maclean, R. Hill, E. Bock, and P. Rist. 2015. Participatory mapping to negotiate indigenous knowledge used to assess environmental risk. *Sustainability Science*:1-12. DOI 10.1007/s11625-015-0292-x.
- Tengö, M., E. Brondizio, T. Elmqvist, P. Malmer, and M. Spierenburg. 2014. Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach. *Ambio*:1-13.
- UK National Ecosystem Assessment. 2011. The UK National Ecosystem Assessment: Synthesis of Key Findings. Cambridge: UNEP-WCMC.

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