Critical Review of Assessments

I. Introduction

1. The second session of the plenary meeting to determine modalities and institutional arrangements for an intergovernmental science-policy platform on biodiversity and ecosystem services held in Panama City from 16 to 21 April 2012 agreed on a programme of intersessional work to prepare for the first session of the Platform's Plenary.[1] Two activities were requested with respect to an "overview of assessments" as preparations for an initial work programme. Specifically:

> *(a) The secretariat was requested to prepare a catalogue of assessments, including relevant thematic and comprehensive assessments at the national, regional, subregional and global levels, building on existing initiatives and drawing on the Platform's gap analysis and other relevant information. The catalogue will be made available to the Platform's Plenary at its first meeting;*
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> *(b) In addition, the secretariat was requested to compile a critical review of the assessments in the catalogue and highlight the implementation of capacity-building activities, the use of conceptual frameworks, the scope of assessments, the experiences with the integration of knowledge systems, the use of scenarios and other tools, the lessons learned with respect to achievement of the policy impact of assessments, the gaps in knowledge and coverage of assessments and capacity-building needs.*

2. The catalogue of assessments has been developed as an online catalogue, with the intention that those involved in assessments can submit information on their assessments directly. All Governments and other stakeholders, including members of the Sub-Global Assessment Network and those involved in The Economics of Ecosystems and Biodiversity (TEEB) follow up are invited to make input to the catalogue, which can be found at http://catalogue.ipbes.net.

3. The critical review of assessments provides a synthesis of lessons learnt from existing assessments and assessment processes, with the aim of informing discussions at the IPBES Plenary on the future development of IPBES. This first draft has been prepared while the Catalogue of Assessments is still in the development stage, so does not yet take account of the full breadth of assessments and lessons learnt. This will be addressed in the second draft.

4. The intention of this review is not to repeat what has been said in earlier information documents, but to draw out key elements and lessons learnt in order to inform development of the Platform's work programme and associated processes. The review should therefore be considered together with relevant parts of the gap analysis prepared in 2009[2] (and in particular Annex Q) and the analysis of the assessment

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[1] UNEP/IPBES.MI/2/9 *Report of the second session of the plenary meeting to determine modalities and institutional arrangements for an intergovernmental science-policy platform on biodiversity and ecosystem services*

[2] UNEP/IPBES/2/INF/1 *Gap analysis for the purposes of facilitating the discussion on how to improve and strengthen the science policy interface on biodiversity and ecosystem services*

landscape prepared in 2010.[3] Attempts were also made to draw on the reports of the two scientific workshops on assessments jointly convened by the Governments of Japan and South Africa.[4,5]

5. This review also draws on the manual for assessment practitioners drawn up following the Millennium Ecosystem Assessment (MA)[6] and the 'Assessment of Assessments',[7] both of which reviewed a wide range of processes at different scales. The three documents prepared for the 2008 UNEP Governing Council meeting on the assessment landscape[8,9,10] also provide a useful review of the environmental assessment landscape.

6. Finally, in establishing the catalogue of assessments and developing this critical review it has been necessary to be guided by a working definition of assessments. The following has been used, based on modification of existing relevant definitions and guidance.

> Possible definition of an assessment in the context of IPBES: An assessment is a social process through which the findings of science and other knowledge systems concerning the causes of ecosystem change, their consequences for biodiversity, ecosystem services and human well-being, and management and policy options are brought to bear on the needs of decision-makers.[11] It provides the connection between environmental issues and people, considering both the ecosystems from which services are derived and the people who depend on and are affected by changes in the supply of services.[12]

II. Scope and coverage of assessments

> Key lesson 1: While many assessments exist or are under way, there remain substantial gaps in coverage both geographically and thematically, and in the extent to which assessments address the interests and needs of different sectors.

> Key lesson 2: Ensuring that assessments from different scales can be effectively aggregated together in meaningful ways requires further consideration, in particular with respect to development of the conceptual framework.

7. Assessments range in geographical coverage from the global to the regional, and on down to national and sub-national levels. They also include thematic assessments, and even the assessments covering specific geographical areas vary from one to another in their scope, and the extent to which they cover ecosystems functioning and ecosystem services. It is therefore quite clear that there is a very broad range of activities that people consider to be assessments, and, as can be seen from the catalogue of assessments, there is a similarly wide range of products delivered.

8. It is apparent that despite the relatively large number of assessments that have been undertaken or are under way, coverage is far from uniform either geographically or in terms of scope. For example there are good examples of sub-global assessments from both developed countries (e.g. the UK National Ecosystem Assessment and Japan Satoyama Assessment) and developing countries (e.g. Southen Africa Millennium Ecosystem Assessment), but there are many countries where no comparable assessments have been carried out. Similarly, while there are a number of thematic assessments covering particular themes of ecosystems,

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3 UNEP/IPBES/3/INF/1 *Analysis of the assessment landscape for biodiversity and ecosystem services*
4 UNEP/IPBES.MI/1/INF/12 *Report of an international science workshop on assessments for IPBES, held in Tokyo, 25-29 July 2011*
5 UNEP/IPBES.MI/2/INF/10 *Report of the scientific workshop on assessments for an IPBES*
6 Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf
7 See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20
8 UNEP/GC.25/4/Add.1 *Overview of the international enironmental assessment landscape and options for a future global assessment on environmental change*
9 UNEP/GC.24/INF/12 *Overview of the environmental assessment landscape at the global level*
10 UNEP/GC.25/INF/12/Add.1 *Overview of the environmental assessment landscape at national level: State of SOE reporting*
11 Addapted from the Millennium Ecosystem Assessment (2005) definition
12 Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

other themes and ecosystems have not been similarly addressed (noting for example the call by Ramsar for an assessment of the state of the world's wetlands).

9. While many assessments are one-off exercises, others are planned as ongoing periodically repeated exercises, and as such have the opportunity to repeatedly review the same issues and identify changes over time. However these assessment processes also have the opportunity to learn from the process and modify it over time. Such assessments include in particular thematic assessments such as the FAO Forest Resources Assessment (FRA) and Intergovernmental Panel on Climate Change (IPCC), which have adapted with each assessment cycle and would appear to remain effective tools.

10. Of particular interest in the development of IPBES is lessons learnt from attempting to bridge scales. The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), which comprised a global assessment with five contributing regional assessments, and the MA and associated sub-global assessments, both worked across scales using the conceptual frameworks developed during the early phases of the assessment process to help achieve this. The Global Environment Outlook (GEO) also contains a regional element, by including a chapter for each of the regions within the full technical report. In contrast the FRA is an example of a global assessment which bridges scales using a totally bottom-up approach, the global assessment building on the information collated from national reports. The Global International Waters Assessment (GIWA) identifies 66 regions which are grouped into nine mega regions, with regional assessment reports being produced and the final GIWA report providing a comprehensive review of the findings from these reports.

11. However it should be recognized that assessments carried out at different scales often have different purposes and different priorities, even where they are using similar approaches and conceptual frameworks. The primary purpose of a national assessment is to meet national needs, even if the results of that assessment are subsequently used in regional or global assessments and reports. This suggests that further consideration might be needed on which aspects of such assessment may be aggregated, and which aspects are contextual, so as to allow the appropriate integration of assessments at different scales.

III. Use of conceptual frameworks

> Key lesson 3: All the main assessments to date have used conceptual frameworks to guide and facilitate their work, supporting a common approach and language amongst the assessment practitioners and contributors and across scales, and underpinning both the work programmes of assessments, and also their communications.

> Key lesson 4: Conceptual frameworks also provide a valuable means of comparing one assessment process with another, allowing for both comparison, increased understanding of environmental issues, and sharing of findings.

12. Experiences from assessments at different scales and with different geographical coverage show that conceptual frameworks provide greater focus on key issues and relationships, and serve a useful role in synthesis and cross-site comparison.[13] Furthermore conceptual frameworks have proven useful as a means for engaging stakeholders who would not otherwise participate in an assessment process, leading to wider ownership and impact (e.g. California Agroecosystem Assessment, Peru Sub-global Assessment, Bajo Chirripo Assessment).

13. The MA conceptual framework has either been applied or been the point of departure for development of a conceptual framework in a range of recent ecosystem assessments. The original form of this conceptual framework was developed in the early stages of the MA to guide that assessment, and to provide the linking framework for other assessments associated with it, such as the 70+ sub-global assessments. The MA conceptual framework has since been further developed by recent assessments and studies, focusing in particular on the recognition of values of ecosystem services, which some felt to be a

[13] Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

weakness in the original framework. The MA conceptual framework provided part of the framework for The Economics of Ecosystems and Biodiversity Study (TEEB), which also included the total economic value framework, and also included all three components of biodiversity (genes, species and ecosystems). The recent UK National Ecosystem Assessment further built on the TEEB and MA framework by taking into consideration economic valuation of ecosystem services, focusing on final ecosystem services and goods developed in order to avoid the double counting of services which are part of a suite of primary processes, including supporting services.

14. The more usual causal framework approach (usually expressed as Drivers-Pressures-State-Impact-Responses or DPSIR) is used by the IPCC.[14] Originally based on determining the rates of climate change and possible anthropogenic cause of any of the observed changes, the conceptual framework for the IPCC developed further as more sophisticated models of climate change were produced and UNFCCC sought specific information.[15] The UNEP Global Environment Outlook (GEO) has used the DPSIR since 1997, and in its fourth edition combined the DPSIR and MA frameworks, condensing a large number of environmental issues into a complex diagram. It is expected that, unless special circumstances warrant another approach, the Regular Process for Global Reporting and Assessment of the State of the Marine Environment (Regular Process) will use the DPSIR framework in its analyses, and promote cross-sectoral ecosystem approaches to assessment.[16]

15. By contrast the FRA has a more simplified conceptual framework focusing on resource management, with seven elements related to sustainable forest management: extent; biological diversity; health and vitality; productive functions; protective functions; social and economic functions; and legal, policy and institutional framework. The FRA is dependent on country reports, and detailed guidelines exist to assist countries in understanding the conceptual framework and to collect the required information and data for the country reports. FAO has used a similar approach for the assessments which they lead on the state of the world's plant and animal genetic resources for food and agriculture, which are also based on national submissions.

16. In the case of the IAASTD, the primary focus of the assessment was agricultural knowledge, science and technology, and this was placed at the heart of the conceptual framework, looking at how this impacted and was impacted upon by development and sustainability goals, food systems, and direct and indirect drivers of change. This conceptual framework led to more attention being paid to the interests of small farmers, food security and the rural poor. The IAASTD conceptual framework includes the importance of capacity development, generation of knowledge and technology, exchange of information and technology, further development of science and technology planning, and broad participation of all relevant parties in the development of science and technology policy.[17]

17. At the sub-global level two assessments have developed innovative approaches that might provide valuable lessons.[18] The Tropical Forest Margins sub-global assessment adopted a standardized analytical framework to compile and summarise data on indicators from multiple sites with a comparative, multidisciplinary approach. A cross-cutting assessment, working across regions in the tropics, the framework set out key considerations from the outset and balanced flexibility and rigor enabling a 'dynamic learning' process. Plot level indicators were developed for each assessment topic, which reflected user needs and concerns regarding specific outcomes regarding land-use, land cover change and resource management. The matrix facilitated the assessment of trade-offs across land-uses. Meanwhile, the assessment in Northern Queensland (Australia) has developed an analytical framework which combines both scientific and local knowledge systems in an integrated framework capturing diverse concepts of well-being from different Aboriginal communities. An analytical framework synthesised socio-economic and ecological data together and identified links amongst diverse factors. The conceptual framework

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[14] Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

[15] UNEP/IPBES/3/INF/1 *Analysis of the assessment landscape for biodiversity and ecosystem services*

[16] See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20

[17] Section 1.2 of the IAASTD Global Report, available at www.agassessment.org/reports/IAASTD/EN/AgricultureataCrossroads_Global-Report(English).pdf

[18] From a paper on lessons learned from carrying out ecosystem assessments which is being drafted following the 3rd SGA Network meeting held in Bilbao, December 2011

enabling the inclusion of diverse values, while standardised methods helped to distil general messages, to scale-up and to implement assessment work at local and regional scales.

18. It is important to note that in almost all cases the conceptual frameworks, and the way that they have been used, have evolved over time and with experience. It has also been increasingly recognised that there is value in understanding how different assessments, including those that are different with respect to scope and/or scale, relate to each other, and the conceptual framework is an important starting point for such considerations.[19]

IV. Capacity building as part of the assessment process

> Key lesson 5: When capacity building is integrated into the assessment process it can broaden and enhance participation, as well as leading to development of capacity to perform assessments on an ongoing basis. Specific approaches include ensuring ability to participate, sharing experience and guidance, facilitating national level assessments that contribute to global and regional assessments as well as national needs, and effective involvement of regional centres of excellence.

19. Although capacity building has been a important element of many of the global assessments, it is often not an explicit part of the assessment process, nor referred to in the mandate for the assessment. However, review of a number of the recent global assessments[20] identifies a number of approaches to capacity building that are commonly followed and the Assessment of Assessments identified best practice for capacity building and networking. Although there are obvious variations between one assessment and another in both the activities they cover and the level of resourcing available. These can be grouped as follows:

a) Tools, standards and methods: Development and promulgation of tools, standards and methods is common to almost all assessment processes at global and regional levels, with the aim of helping to ensure that all participants use the most appropriate approaches, and learn from approaches previously employed. Examples include the Integrated Environmental Assessment Training Manual,[21] MA Methods Manual,[22] GIWA scaling, scoping and methodology guidelines,[23] and FRA remote sensing tools.[24]

b) Training and workshops: These range from face-to-face sessions led by experienced practitioners to online training opportunities (for example the e-learning associated with GEO for Integrated Environmental Assessment).[25]Training and workshops are important in ensuring contributors understand the processes and approaches being used, and can also be key to stakeholder engagement.

c) Technical support: Examples of this include the support provided for carrying out sub-global assessments as part of the MA and its follow up process, and the FAO support to national forest monitoring and assessment which forms the basis of national inputs to the FRA.[26]

d) Networks of assessment practitioners: These are predominately used as a means for sharing experience and information throughout the assessment process. For example, both the UNEP Global International Waters Assessment (GIWA) and GEO use networks of collaborators in developing assessments. The Sub-Global Assessment Network established as part of the MA follow-up process brings

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19 Capistrano *et al* (Eds) (2005). *Ecosystems and human well-being: Multiscale assessments: Findings of the Sub-global Assessments Working Group of the Millennium Ecosystem Assessment.* Islands Press. Available from www.millenniumassessment.org/en/Multiscale.html

20 See Annex 3 *Capacity building activities under different assessment process* available at www.dirnat.no/content/500041955/Working-documents

21 See www.unep.org/dewa/Docs/geo_resource.pdf

22 Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners, which can be downloaded from* www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

23 See www.unep.org/dewa/giwa/methodology/methodology.asp

24 See geonetwork4.fao.org/geonetwork/srv/en/fra.home

25 See www.unep.org/ieacp

26 See www.fao.org/forestry/nfma

together sub-global assessment practitioners from around the world to share experiences and lessons of the ecosystem assessment process.

e) Fellowship programmes: These programmes provide an opportunity for early career scientists to engage in the assessment process by working alongside scientists who are coordinating different parts of the assessment, such as principle authors and working group chairs. Such programmes therefore provide the opportunity for these young scientists to both learn about the assessment process and participate. We are not aware of these programmes being used for early career policymakers in the same way.

f) Encouraging meeting participation: One of the barriers for people and organisations, particularly from developing countries to be able to contribute actively to the assessment process is the cost of attending assessment working group meetings. Attendance of such meetings is vital as part of any capacity building exercises, as it contributes to understanding of the assessment and the underlying decision-making processes. For example, the MA, GEO and IAASTD all effectively used this form of capacity building to engage organisations and individuals from countries who would not otherwise have been able to engage.

20. The assessment of assessments[27] carried out in preparation for the marine Regular Process reviewed a substantial number of assessments and related activities at all levels, and concluded on capacity building that expert networks play a major role in strengthening capacity at the regional level, and in some cases between regions. They recognised that as expert networks develop, their linkage with regional and global policy-making bodies grows, fostering more effective communication between experts and policy-makers.

21. In a recent review of the IPCC by the InterAcademy Council, [28] a number of the comments and recommendations were made on capacity building which may well be of relevance to IPBES. While recognising the recent establishment of a fellowship programme with money received from the Nobel prize, the review also highlights three other ways in which scientific capacity could be expanded:

a) facilitating travel of developing-country scientists by funding mobility grants to and/or secondments (temporary placements) of developing country Lead Authors to enable them to spend time in Technical Support Units or other appropriate institutions in developed countries to facilitate interaction, cooperation, and further human capital development;

b) establishing university-to-university partnerships to strengthen developing country science; and

c) establishing regional facilities in developing countries where authors from the region could spend time interacting and writing.

22. With respect to support for meeting participation, it is worth noting that there is also increasing pressure for fewer meetings and the more effective use of information and communication technologies in getting people to work together effectively. This would clearly be a useful development, but still has a cost, and would still require improved capacity in many parts of the world to ensure full engagement.

23. While the focus above is largely is on capacity building within the confines of specific assessment processes there are obviously broader types of capacity that these activities can contribute to building, such as the capacity to take science and assessment findings into account in policy processes, capacity to manage environmental data and information, capacity to make environmental assessments and information accessible to stakeholders, national scientific capacity, and so on. Assessment processes at all levels are in a position to promote and facilitate such capacity building, but the extent to which they do so can vary quite significantly, and this is not usually considered as part of the assessment budget.

24. There is substantial capacity building associated with the FRA, focused on supporting national forest assessment and involving a range of activities of broader relevance including capacity building in data collection, management and use, remote sensing, and so on. Meanwhile, following the review of the State of the World's Plant Genetic Resources for Food and Agriculture, the establishment of an 'information

[27] See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20
[28] See http://reviewipcc.interacademycouncil.net/

sharing mechanism' on implementation specifically aims to build capacity (although not exclusively on the science-policy and assessments). Similarly GEO has a strong focus on developing capacity in its collaborating centres, and related capacity building activities are included in the assessment process budget.

25. While the above analysis was made based on review of a number of global assessments, the issues and potential solutions are essentially the same for sub-global assessments.

V. Experience with integrating input from diverse knowledge systems

> Key lesson 6: Integrating input from diverse knowledge systems is essential to understanding complex social-ecological issues, and knowledge holders from a diversity of knowledge systems should be included at all levels of the assessment process.

> Key lesson 7: Development of a 'dual evidence base' which has been validated in an appropriate way will help achieve integration of input from diverse knowledge systems in an effective manner.

26. Assessments are traditionally based on peer reviewed scientific information and the inclusion of qualitative information and input from alternative knowledge systems, much of which comes from non-scientists - for example local and indigenous peoples - in a systematic way has been a challenge for many assessment processes. This is a complex and multifaceted challenge and involves a number of practical and philosophical considerations.[29] Situations and priority concerns of alternative knowledge systems are not uniform across the world, and so care is needed to avoid generalisations or extrapolations that may overlook the significant regional differences or diversity, and potentially lead to inappropriate portrayal of knowledge, or certainty.

27. Effectively integrating alternative knowledge systems into an assessment process, is widely seen as being a key element to increasing and augmenting our understanding of complex socio-ecological issues. Traditional and other knowledge systems provide parallel sources of understanding that could be taken into account alongside science to provide a better understanding of the issues. Experts and advocates of all kinds of knowledge need to acknowledge the relative role of different knowledge systems, and explore ways to build synergies that fill gaps and enhance understanding, The relevance and usefulness of different knowledge systems may be influenced by the scale at which the assessment is carried out.[30]

28. There are a number of examples at different scales where assessment processes have acknowledged or attempted to integrate alternative knowledge systems. For example, the IPCC currently uses traditional knowledge within case studies looking at the impact of climate change on indigenous communities and how they are adapting to changes in the environment. Such case studies include the Arctic and Pacific Islands. Within the IAASTD the authors draw on both a significant amount of peer-reviewed literature and on traditional forms of knowledge, thereby giving the reports a perspective that is perhaps unique among the global assessments. GEO-5 is the most recent global assessment to attempt to address the use of alternative knowledge systems within the assessment, and issued guidelines to authors (which have been adapted from those used by the MA).[31] The guidelines focus on Intellectual Property Rights (IPR) issues, and set out six principles for the use of knowledge generated from alternative knowledge systems, including making metadata and information synthesis publicly available.

29. At a finer scale there are an increasing number of such initiatives integrating local ecological knowledge into processes of gaining greater understanding of ecological issues and influencing policy. Combining the knowledge of indigenous peoples such as the Inuvaluit, with modern scientific

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[29] UNEP/IPBES/2/INF/1 *Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science policy interface on biodiversity and ecosystem services*

[30] Reid WA *et al.* (2006). *Bridging scales and knowledge systems: concepts and applications in ecosystem assessment*. Available from: www.millenniumassessment.org/en/Bridging.html.

[31] See www.unep.org/geo/

understanding, was crucial to the 2004 Arctic Climate Impact Assessment.[32] Indigenous peoples are now conducting their own assessments in several regions of the world under the Indigenous Peoples Assessment of Climate Change process.[33] In initiating this process, the United Nations University noted that: "*Observations of ecosystem change by indigenous peoples are acting as a sentinel like warning system for climate change. More importantly, the long-term place-based adaptation approaches developed by indigenous peoples provide valuable examples for the global community of low-carbon sustainable lifestyle, critical to developing local adaptations strategies in the face of climate instability*."

30. The Southern African Millennium Ecosystem Assessment (SAfMA) also provides an illustration on how alternative knowledge systems can be recognised through the involvement of stakeholders and their knowledge at the local scale. The data used by the assessment came directly from the institutions involved and the peer-reviewed literature. In addition, other forms of knowledge were involved, collected from direct interviews with individuals living in the ecosystems being assessed. Generally speaking, as the scale of assessment moved from regional to local, the balance of information shifted from more scientific sources towards more contextual sources, with information often transmitted by oral tradition. This assessment is unique among those reviewed here in paying so much attention to participatory methods of data collection and analysis.[34]

31. A meeting of indigenous knowledge holders convened by IIFB and Stockholm Resilience Centre in April 2012 identified a number of potential future pathways which were communicated to the IPBES plenary session in Panama:[35]

a) Inclusion of representatives of knowledge holders from a diversity of knowledge systems at all stages in science-policy processes.

b) Going beyond ownership of knowledge. Knowledge on ecosystem management may be less contested in comparison to knowledge on genetic resources and biodiversity and thus less contentious to share and exchange.

c) Indigenous researchers and local databases. In many indigenous communities, researchers from within the communities develop and conduct research. This is one way of strengthening the control of the processes locally, and allowing for an endogenous interpretation of the knowledge.

d) 'Dual evidence base', a parallel approach for assessments such as IPBES, where key issues for ecosystem management are addressed in parallel by peer-reviewed academic work and local/indigenous/practitioners knowledge, using separate mechanisms for validation.

32. The dual evidence-based peer-review process takes into account that different criteria of validation should be applied to data and information originating from different knowledge systems. 'Dual evidence-base' means that in the assessments the different knowledge systems are viewed as generating equally valid evidence for interpreting change, trajectories, and causal relationships. Challenges to be resolved would be who determines the validation mechanisms for the parallel databases, and who controls the information stored, and ensuring the equal value of the knowledge system, both in the presentation of and in the actual applications the information. A further challenge is in ensuring that both evidence bases are integrated throughout the assessment in an appropriate manner.

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[32] ACIA. (2004). *Impacts of a Warming Arctic: Arctic Climate Impact Assessment.* Cambridge University Press, Cambridge.
[33] See www.unutki.org/default.php?doc_id=96
[34] UNEP/IPBES/3/INF/1 *Analysis of the assessment landscape for biodiversity and ecosystem services*
[35] UNEP/IPBES.MI/2/INF/9 *Knowledge for the twenty first century: indigenous knowledge, traditional knowledge, science and connecting diverse knowledge systems*

VI. Use of scenarios and other tools

A. *Scenarios*

Key lesson 8: Use of scenarios can be very effective in understanding and helping to communicate assessment outcomes, but there may be opportunities for greater dialogue between assessments and other processes developing and using scenarios.

Key lesson 9: Application of a combination of explorative and policy-orientated scenario approaches should be considered, together with full engagement of user groups and effective communication, as a means of strengthening scenarios exercises.

33. Assessment processes have regularly included consideration of the future through projections, extrapolations or other exploratory approaches under different scenarios alongside a picture of the current state of the environment. Scenarios are not predictions, but are approaches for exploring plausible futures and uncertainties, and are particularly useful for assessing the prospects of future development within complex and uncertain systems.

34. A recently published review of the use of scenarios in global assessments[36] (see table in Annex 1) identified the following key issues for consideration when developing a scenario:

a) Scenario versus forecast – forecasts, or predictions, can only be made in systems which are relatively well-known and well-defined. As uncertainty arises from complex systems such as socio-ecological systems, many global assessments use scenarios to explore the future

b) Deterministic versus probabilistic scenarios – probabilistic approach aims to specify the probability of different trends through linking probability-distribution functions to input parameters. With the possible exception of the IUCN Red List Assessment, this approach has not yet been used within global assessment processes, which have rather focussed on deterministic approaches.

c) Process versus product orientation – where scenarios support very specific decision making bodies or activities, the process of developing scenarios can be at least as important as results as the user can be directly involved and learn from the experience of scenario development. However, as most global assessments are communicated via reports to a rather diffuse audience of scientists and decision-makers, the product has typically been a more tangible outcome than the process.

d) Participatory approaches – when potential users work with scenario developers, scenarios can be targeted better to the user needs and use, and aid understanding of options and implications. The lack of participation has been mentioned as a weakness of a number of global assessment exercises.

e) Qualitative versus quantitative scenarios – storylines have proven to be useful to derive information at different scales (e.g. regional scenarios nested within global scenarios), however quantification using tools such as modelling can add scientific rigour to the storylines.

f) Explorative versus normative (or policy-oriented) scenarios – global assessments have used both approaches, with explorative scenarios exploring a wide range of possible futures, while normative scenarios focus more narrowly on the impacts of implementing a more narrowly defined set of policies and actions in relation to achieving desired goals or policy options (such as might pertain to the Aichi Biodiversity Targets, for example).

g) Forecasting versus backcasting – the forecasting approach is often combined with the explorative scenario approach referred to above, while the normative scenario approach can be more easily combined with backcasting (although other combinations are possible). The key point is you can look forward and

[36] van Vuuren *et al* (In press). Scenarios in Global Environmental Assessments: Key characteristics and lessons for future use. *Global Environ. Change*, http://dx.doi.org/10.1016/j.gloenvcha.2012.06.001

consider plausible futures, or identify a desired future and work backwards considering the actions that need to be taken.

35. The recently published review referred to above [37] identified five lessons from looking at the way in which scenarios were used within recent global assessments:

a) Consider whether existing scenario approaches can be used instead of developing new approaches and storylines, and, if developing new storylines, document how they relate to existing scenarios.

b) Broaden the expertise of those that input into scenarios to more fully include social scientists working in a number of different disciplines, while at the same time involving a broader range of stakeholders in the scenario process.

c) Improve the communication of scenarios by consideration of improved means of communication, increased engagement with user groups, and the wider involvement of stakeholders in the scenario process.

d) Given the pros and cons for explorative and policy-orientated scenario approaches, it might be useful to combine both approaches such as the IPCC have recently done.

e) Communication between the different assessment processes would help in avoiding overlap between scenario exercises.

B. Indicators and metrics

Key lesson 10: Indicators and metrics are widely used as a means for illustrating trends, and can be a powerful means for communication.

Key lesson 11: Given that indicators and metrics are already widely used, and that the CBD is actively reviewing indicators for assessing achievement of the Aichi Biodiversity Targets, it seems appropriate to collaborate rather than risk duplication and the potential for delivering mixed messages.

36. Indicators and metrics are widely used as a means for illustrating trends, and can be a powerful means for communication. For example the CBD Global Biodiversity Outlook (GBO) 3 made significant use of indicators in illustrating that the 2010 global biodiversity target had not been met, and, based on this experience the CBD has started much earlier in developing indicators for the Aichi Biodiversity Targets agreed in 2010. The FRA makes extensive use of metrics, as does GEO, and in both cases much of the data used has been collected over many years, is readily accessible. In a similar way, indicators and metrics are widely used in regional, thematic and sub-global assessments.

37. In fact similar indicators and metrics are used across a number of assessments at national, regional and global levels (for example coverage of protected areas), but there are often differences in the ways in which these are presented and used. Cooperation across assessment processes in the development and use of indicators, and collaboration with other organizations using such indicators, has the potential to deliver a stronger more coherent message, and to make the indicators more sustainable, given the broader interest in their maintenance. This was one of a number of recommendations made in the information document prepared earlier in the IPBES discussions.[38]

38. While there is wide acceptance of many of the available biodiversity indicators, work is still ongoing in trying to identify meaningful ecosystem service indicators. In a review of the use of ecosystem service indicators within the MA and 11 sub-global assessments associated with it, it was found that indicators of provisioning services were more well developed that those for other types of services, and that there were

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[37] van Vuuren *et al* (In press). Scenarios in Global Environmental Assessments: Key characteristics and lessons for future use. *Global Environ. Change*, http://dx.doi.org/10.1016/j.gloenvcha.2012.06.001

[38] UNEP/IPBES/3/INF/2 *Current and future status of biodiversity and ecosystem service indicators*

few measures of ecosystem functioning or sustainability of services.[39] This is clearly an area for further work, some of which is already ongoing in the context of developing indicators for tracking achievement of the Aichi Biodiversity Targets (and which will therefore be used in future editions of the GBO).[40]

C. Other tools

VII. Lessons learned with respect to achieving policy impacts

39. Academic review of the influence of assessments has identified three 'cardinal rules' for a successful assessment: their relevance to the needs of decision making processes (also referred to as saliency); the credibility of reports, the evidence, and the process of generating them; and the legitimacy or the perceived fairness, balance, degree of involvement of stakeholders, political acceptability and trust.[41,42] These key attributes were picked up in both the early discussions on IPBES,[43] and the report of the Assessment of Assessments,[44] and are now fairly well embedded in discussion on development and implementation of assessments. These three attributes are reflection in current efforts to identify the needs of Governments, to elaborate a scoping process, to put in place appropriate procedures, to develop a conceptual framework, and so on.

A. Authorising environment

> Key lesson 12: While assessments have obtained their authorising environments from a range of different bodies, those mandated by governments and/or intergovernmental processes are generally more closely aligned with the needs of decision makers, and thus have a 'receiving environment' for the findings.

40. The authorising environment for an assessment often indicates the level of support afforded to the process and products by stakeholders, and the likelihood that the outputs from assessment processes will be taken up. Developing a strong authorising environment for an assessment revolves around building mechanisms to ensure the credibility, legitimacy, and relevance of the process and its outcomes. How an appropriate authorising environment is established will depend on the context in which the assessment is taking place.

41. The authorising environment of the MA was based on a request by the UN Secretary-General. This was followed by an extensive review of the needs of the relevant multilateral environmental agreements (MEAs), and this formed the basis for designing the working group assessments and reports. While the assessment was not explicitly requested by any MEA, its Board included representatives of several key MEAs, in addition to national Governments, UN agencies, civil society (including indigenous peoples) and the private sector. Furthermore, through a range of decisions by its Conference of the Parties, the CBD invited the MA to work with its scientific advisory body, encouraged Parties to support the involvement of experts in the assessment's work, and subsequently took account of the assessment findings.

42. The authorising environment for both the IAASTD and the Regular Process comes from the 2002 World Summit on Sustainable Development, although they took different paths to further develop their own unique authorising environments. For the IAASTD relevant stakeholders met in Dublin in late 2002 to endorse guiding principles, and ten regional consultations followed before the steering committee prepared recommendations to the President of the World Bank and the heads of relevant UN bodies. At the end of

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[39] UNEP-WCMC (2011). *Developing ecosystem service indicators: Experiences and lessons learned from sub-global assessments and other initiatives.* CBD Technical Series No 58.

[40] UNEP/CBD/SBSTTA/15/INF/6 *Report of the Ad Hoc Technical Expert Group on Indicators for the Strategic Plan for Biodiversity 2011-2020*

[41] Cash *et al.* (2003). Knowledge systems for sustainable development. *Proc Natl Acad Sci USA* 100(14):806-91

[42] Mitchell *et al.* (2006). *Global Environmental Assessments: Information and influence.* MIT Press, Cambridge MA.

[43] UNEP/IPBES/2/INF/1 *Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services*

[44] See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20

2003, the UN Secretary-General expressed support for the initiative, and the following year participating Governments and other stakeholders agreed on the objectives, goals, scope, key questions, design, outputs, timetable, budget and governance structure. The authorising environment for the Regular Process was established by the UN General Assembly though resolution 57/141. Then in resolution 60/30 it called for the establishment of an ad hoc steering group to oversee the execution of the Assessment of Assessments and a group of experts to undertake the actual work of reviewing previous experience and making recommendations on how the Regular Process should be implemented.

43. A number of assessments have authorising environments that come directly from the governing bodies of the lead organization, and generally support them in addressing their organizational mandates. This is true, for example, for GEO, the FRA, and the GBO, with the authorising environment coming from the UNEP Governing Council, the FAO Constitution and the CBD Conference of the Parties respectively. By contrast, the IPCC mandate came originally from the UN General Assessment (resolution 43/53 of 6 December 1988), and although it has maintained its legitimacy by providing useful guidance to the Parties to the UN Framework Convention on Climate Change it still operates independently with its own governance arrangements. It is therefore the intergovernmental plenary of IPCC that provides the authorizing environment for IPCC assessments.

44. However, not all global assessment processes are initiated from within the UN or MEA environment. For the TEEB authorising environment came from the environment ministers of the Group of Eight and five major newly industrializing countries. In contrast the IUCN Red List assessment obtains its authorising environment from the IUCN Members Assembly, which is not solely government membership but consists of approximately 80 State members, 116 government agency members, 752 national members of non-governmental organizations and 92 international members of non-governmental organizations.

45. The authorising environment for regional assessments have largely come from governments within the region, such as the African Environment Outlook (AEO) which is supported by the African Ministerial Conference on the Environment, which first called for AEO at its eighth session in 2000 in Abuja. The Conference considers AEO to be a flagship report that tracks regional environmental status and trends in addition to emerging issues, thereby providing a strong authorizing environment.

D. Stakeholder involvement

Key lesson 13: The full and effective engagement of stakeholders at all stages in an assessment process helps to ensure the credibility, relevance and legitimacy of an assessment, and increases the extent to which assessment findings are reflected in decision making.

Key lesson 14: The stakeholder group on which the heaviest onus tends to fall is the experts from the scientific and other knowledge communities who provide the major input, contribute to and edit chapters, and review the resulting outputs. It is important to have the necessary incentives in place to ensure that they are able to engage.

46. A stakeholder is a person, group or organisation with a direct or indirect interest in the assessment process and its findings. Stakeholders are usually self legitimising, in that those who judge themselves to be stakeholders are stakeholders. However, not all stakeholders are equal. Stakeholders within an assessment process include scientists from different disciplines, different government departments (e.g. environment, treasury, health, water), land managers such as foresters and farmers, non-government organisations, companies from extractive industries, women, indigenous people and local communities.

47. The geographic and thematic scope of an assessment influences decisions about the participation of stakeholders in the process, however evaluations of assessment processes have concluded that when input is sought from those with a stake in the outcome, or when experts from these groups are directly engaged in assessments, they are more likely to reflect assessment findings in their decisions and in their work.[45,46]

[45] UNEP/GC.25/INF/12 *Overview of the environmental assessment landscape at the global level*

[46] Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

Consideration of which stakeholders to engage, and how they become involved, are essential elements of the planning and design phase, and may involve special considerations and/or arrangements for particular groups. The benefits of participation apply at all scales and can strengthen credibility, legitimacy and relevance. Benefits of participation in assessment process – including its design - include:

- fosters shared understanding about the objectives and process of an assessment;
- builds trust between governments and among all stakeholders;
- incorporates different disciplines and expertise;
- draws on a wide range of expert sources and schools of thought and opinion;
- promotes information sharing and networking;
- strengthens knowledge and capacity
- potentially narrowing areas of disagreement;
- fosters agreement on criteria and methods to be employed in analysis;
- generates full and open discussion, sharpens conclusions and avoids unsupported opinions;
- broadens interest in assessment findings, their implications and necessary responses;
- promotes a culture of responsibility among all participants;
- leads to wider awareness and distribution of findings through stakeholder networks.

48. Stakeholder involvement in an assessment process can happen at a number of different levels and is contextual. For example, within the GEO process a worldwide network of collaborating centres forms a strong assessment partnership at the core of the process and a focus for building capacity at various levels. More than 40 organizations take part at the global level, and many more participate at the sub-global level. In contrast, involvement in both GBO and TEEB has been rather narrower. In the case of the GBO input was drawn from a number of key organizations and processes (including other assessments), and from submissions by Governments in their national reports. Similarly, stakeholder involvement in TEEB has been relatively modest, with most of the several hundred contributors being primarily part of the scientific community. The case studies that formed the evidence base for TEEB, however, typically involved individuals directly benefiting from the economic dimensions of conserving biodiversity and ecosystem services. However in TEEB and GBO rather more stakeholders were involved at the review stage and in communicating the results. Stakeholder involvement in IPCC has also been fairly focused, involving primarily Governments and climate-related scientists.

49. While the Board for the MA had a broad stakeholder representation and included representatives for the UN agencies, MEAs and other key institutions, the assessment was prepared with stakeholder input focused on drawing primarily on the peer-reviewed scientific literature and the perspectives of contributors from Governments. In contrast the sub-global assessments were based much more on multi-stakeholder contributions, especially the local level assessments (SGAs), for example those of Kristianstad in Sweden, the Glomma River basin in Norway and local villages in India. With SAfMA, stakeholder involvement was an important element of the assessment, perhaps most dramatically in the Gariep livelihoods assessment, which derived its information directly from the people involved. A user advisory group was established for each component study, thereby giving a wide range of stakeholders a means of participating in the assessment. The UK NEA, also encouraged active stakeholder involvement through the establishment of a User Group who provided input into the questions asked by the assessment to the review of outputs to the communication of key messages. What the MA and the corresponding SGAs highlight is the scale and context of which the assessment takes place will help govern the level of stakeholder involvement that is appropriate and can indeed be managed.

50. Stakeholder involvement in FRA, while not explicitly engaging the scientific community, does focus on professional foresters. However FRA 2005 sought information from countries on social and economic functions that ideally would involve working directly with forest-dwelling peoples as stakeholders in forest management. Only 66 countries and territories, representing a little over half of the world's forest area, reported having forest areas designated for social services, but it is impossible to determine from FRA whether forest-dwelling people were actually involved in data collection. The IUCN Red List assessment is also confined largely to individuals who are experts in the species being assessed and are most often

field scientists, but many work with other stakeholders such as local people who have knowledge of the species being assessed.

51. The IAASTD included a wide range of stakeholders, from Governments, consumers, producers, NGOs, IGOs and the private sector, leading to active discussions and sometimes disagreements. The global summary for decision makers concluded that "*there are diverse and conflicting interpretations of past and current events, which need to be acknowledged and respected*". One member from the private sector withdrew from the Bureau, contending that the debates had been taken over by extreme views from civil society. Governments also had differences of opinion, underlining the difficulty in reaching consensus as the diversity of stakeholders increases. Civil society members from Greenpeace, Friends of the Earth and the Pesticide Action Network, on the other hand, may consider the report to be a much better reflection of the views of the small farmers whose interests they seek to represent.

52. In many assessments the stakeholder group on which the heaviest onus falls is the experts who provide the major input, contribute to and edit chapters, and review the resulting outputs. It is important to recognise that these experts are involved largely on a voluntary basis, which may restrict participation to those who can afford to devote their time to the work at hand, or who are assigned by their Governments or organizations to do so. It is important to recognise this, and to address it through appropriate incentives.[47]

E. Policy impact

Key lesson 15: While many assessments appear to have significant policy impact, this is not usually assessed in a systematic or critical manner. In developing IPBES assessments consideration needs to be given to how policy impacts will be assessed.

53. The policy impact of global assessments is not often assessed and if it is, the process can be difficult, and the true policy impact not known for many years following the completion of the assessment. In this regard impact is more often assessed and understood for those assessments that are periodically repeated[48] as this has been an essential step in securing the funds and in some cases the mandate for repeating the exercise. However to evaluate the achievement of policy impacts, goes beyond the assessment process itself and looks at why or why not there was a policy impact and whether this is due to lack of capacity. Often this is not feasible, especially as there are no standard criteria or guidance. The criteria that has been used to assess policy impacts for assessments has been unable to be obtained for this review.

54. Long running or repeated global assessment processes, such as GEO, have seen significant policy impact, with both the General Assembly and the UNEP Governing Council, taking decisions on the basis of the findings of the fourth assessment. The findings informed the development and subsequent adoption of UNEP's medium-term strategy 2010–2013, and were also used extensively in the preparation of the official reports of the UN Secretary-General to the Commission on Sustainable Development. GEO also has substantial public outreach. In part as a result of the GEO experience, over the past decade a number of regional ministerial environmental forums and local councils have adopted decisions on environment outlook reports to meet their own environmental policy objectives.

55. Another example of a repeated assessment process which appears to have significant policy impact is the IPCC. It provided the basis for the UN Framework Convention on Climate Change and remains the most respected source of information about the potential impacts of climate change on ecosystems and people. The decisions made by the UNFCCC COP draw heavily on the IPCC reports, making it arguably the world's most influential assessment process. The parties to the Convention, in turn, inform IPCC about the kinds of information that they require, thereby helping to ensure that the IPCC reports are relevant/salient to them.

56. The FRA has an impact at both national and global levels. At the national level it enables each country to see where it stands in relation to other countries, thereby supporting national efforts in sustainable forest management. FRA is also used to inform debates at the UN Forum on Forests, IPCC, the

[47] UNEP/IPBES.MI/2/INF/8 *Report of the workshop on the thematic content of the first work programme of IPBES*
[48] GEO-4 Terminal Report

International Tropical Timber Organization and the World Trade Organization. It also contributes to research on forest-related issues, much of which has policy relevance. FRA remains, however, essentially an assessment of data, with relatively little attention paid to direct policy implications. Other organizations, including multilateral environmental agreements and non-governmental organizations, are able to use FRA data in their own policy development.

57. Arguably the policy impact of the MA has yet to be fully assessed as the two assessments of impact that have been made came out relatively soon after the release of the reports, however, the findings have been presented at numerous meetings, including the CBD and Ramsar COPs, and have certainly had an influence on the increasing recognition of ecosystem services as a key issue in human well-being. It could also be argued that the impact of the MA has been through its conceptual framework leading to a discourse on ecosystem services with a move towards assessing the benefits of the environment, as well as the proliferation of sub-global assessments. Similarly the findings of TEEB have been well received by the MEAs but a potentially important factor of its policy impact could be the number of country-TEEB studies that have been initiated since 2011 by National Governments.

58. However, not all global assessments have a directly policy impact at the national level, as they are designed to inform specific global processes. This is certainly the case with the Global Biodiversity Outlook (GBO), which primarily relates to decisions of the CBD COP. However this in turn affects COP decisions, which themselves lead to changes in national action and policies so although there is no direct link, there is certainly an impact. Similarly the assessments of the state of the worlds plant and animal genetic resources for food and agriculture (which are based on national inputs) largely inform updating of a rolling global plan of action for conservation and utilisation of genetic resources.

59. The policy impact of the UK NEA was immediately seen upon release of its key findings. Commissioned by the UK Government, the UK NEA also contributed to the evidence base used to formulate the Government White Paper on the environment, which outlines priority actions for the government to take to ensure the sustainable management of the UK's environment. This was a key intention, and underlines the importance of having the correct authorising environment, and engaging closely with the key stakeholders.

60. Local scale assessments in Guatemala and Thailand supported by the UNDP-UNEP Poverty Environment Initiative (PEI) respond to a clearly articulated policy relevant question that reflects an important "need" or "problem" expressed by local decision-makers and interest groups. Responding to the needs of decision-makers increases the likelihood that the assessment process will be of interest and value to them, and in turn lead to an improved management of ecosystems services and associated benefits. [49]

61. In addition, it was recognized that developing an assessment with careful consideration of the wider policy context in which the findings can be used to inform a number of priorities. For example development of Target 2 of the EU Biodiversity Strategy to 2020, which provides a policy context for an Ecosystem Assessment for Europe, building on on-going activities at national, European and global levels, in particular the UK National Ecosystem Assessment and the CBD Strategic Plan for Biodiversity and the Aichi Biodiversity Targets. [50]

VIII. Identification of knowledge gaps and capacity building needs

> Key lesson 16: Identifying knowledge gaps and capacity needs are important elements of the assessment process, providing these gaps and needs are clearly communicated so that they can be addressed either as part of the assessment process or as a result of it.

62. Although assessments are essentially based on the available data, information and knowledge, with each assessment process (at whatever level) understanding increases of what is available and hence where

[49] From a paper on lessons learned from carrying out ecosystem assessments which is being drafted following the 3rd SGA Network meeting held in Bilbao, December 2011

[50] From a paper on lessons learned from carrying out ecosystem assessments which is being drafted following the 3rd SGA Network meeting held in Bilbao, December 2011

the key data, information and knowledge gaps are. It is important both to identify these gaps, and to communicate this information widely in order to help ensure that they are addressed. Similarly assessment processes will give an insight into the available capacities and where these might need strengthening, which will inevitably also include the need to improve access to data, information and knowledge. While identifying and proposing ways to address these gaps and the barriers they imply is an explicit part of a number of assessments, this is not always the case.

63. In preparation for the Regular Process, the Assessment of Assessments[51] reviewed a wide range of experience with assessments and research in order to make recommendations on how the Regular Process might be implemented. In doing so it recommended addressing capacity and knowledge needs as fundamental building blocks which should be addressed as initial steps in establishing the assessment process. In other words it is important at the start of the assessment process to review capacity and knowledge needs, and to find ways to address them either directly or indirectly. This is a key lesson for IPBES, but is perhaps not only relevant to IPBES as a whole, but also to the scoping process for each individual assessment carried out under the auspices of IPBES.

64. As part of the follow up to the MA, a high-level multidisciplinary group of experts led by ICSU, UNESCO and UNU identified key gaps in knowledge and data, and sought to influence research agendas and priorities of research funding agencies in addressing these gaps.[52,53] This was based on the experience with the MA and the barriers encountered in its development, but was not undertaken until after the MA had been completed. In particular this work recognised the need for:

a) Multidisciplinary approach: Bridging the gap between ecological and social scientists, and between scientists and other knowledge holders, in order to be able to more effectively address indirect drivers of ecosystem change.
b) Understanding relationships: Enhancing our understanding of the relationship between changes in human well-being and changes in ecosystems.
c) Predicting consequences: Developing our capabilities for predicting consequences of changes in drivers, to aid understanding of how ecosystems and human well being will be impacted.
d) Intervention options: Improving our understanding of how human actions could be modified to best achieve desired ecosystem and human well-being outcomes.

65. In addition, as part of the legacy of the MA and in order to promote the MA approach at sub-global levels, a manual outlining best practice for carrying out an ecosystem assessment was compiled as a tool for capacity building, drawing on lessons learnt from other global assessment processes.[54] Also, the Sub-global Assessment (SGA) network was established as a means for practitioners to share experiences and lessons learnt, and to continue to build capacity.[55]

66. Within those assessments which are expected to be repeated on a regular basis, such as the FRA or GEO, steps have been taken to address key gaps in data, information and knowledge, and capacity as the assessment cycle continues. In other words it becomes a part of the work programme of the organization responsible for the assessment. For example, FAO delivers a programme of capacity building on national forest assessments,[56] developed at least in part as a result of the difficulties Governments encountered in reporting during earlier FRA cycles. Meanwhile Chapter 8 of the latest GEO report[57] identifies limitations in the data currently available, specifically identifying:

a) time series monitoring and observation data to support evidence-based policies;
b) availability and quality of environmental statistics collected or compiled by Governments;
c) capacity development to support collection, management and use of environmental data; and
d) international cooperation and sharing of comparable environmental data.

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[51] See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20
[52] ICSU-UNESCO-UNU (2008). *Ecosystem Change and Human Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment.* International Council for Science.
[53] Carpenter *et al*, (2009). Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *Proceedings of the National Academy of Sciences* 106(5):1305-1312
[54] Ash *et al. (2010) Ecosystems and Human Well-Being – A Manual for Assessment Practitioners, which can be downloaded from* www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf
[55] See www.ecosystemassessments.net
[56] See for example www.fao.org/forestry/nfma/en/
[57] See www.unep.org/geo/geo5.asp

67. Typically the reports of the IPCC include within them identification of gaps in knowledge, which may refer to research needs, or areas where further monitoring or analysis is required. For example, in the Working Group II report as part of the IPCC Fourth Assessment,[58] there was identification of the advances in knowledge that had been made, and recognition that there had been little advance in four areas: impacts under different assumptions about how the world will evolve in future; the costs of climate change, both of the impacts and of response (adaptation and mitigation); proximity to thresholds and tipping points; and impacts resulting from interactions between climate change and other human-induced environmental changes. In fact these four areas map quite well to the knowledge gaps identified following the MA, with respect to understanding relationships, predicting consequences, and further exploring intervention options.

68. A central part of the purpose of the IAASTD was to review the status of agricultural knowledge, science and technology, and to make appropriate findings and recommendations. Therefore as a part of the assessment, gaps and needs relating both to data/information/knowledge and to capacity were identified, and recommendations made on how such gaps might be addressed both during the life of the assessment process and in the future. Within the main report,[59] the authors advised not only looking at investment options, but also at investment impacts, with the intention of:

a) providing better and more convincing advice on strategic decisions about investment in agricultural knowledge, science and technology;
b) making scientists and researchers aware of the broader implications of their research;
c) identifying weak links between research and actions based on it; and
d) providing better information on the complementarities and trade-offs between different activities within a research programme.

69. At the national level, following completion of the UK National Ecosystem Assessment a follow on project was designed and funded which attempts to bridge the gap between the assessment findings and the response to the findings by practitioners. The UK NEA Follow on project consists of 10 work packages, two of which focus on tools for practitioners, particularly decision-makers who manage land. It is envisaged that by engaging stakeholders within these work packages the tools will meet their requirements and assist in the over implementation of an ecosystems approach.

IX. Other reviews of lessons learnt

70. Both the MA methods manual[60] and the marine Assessment of Assessments [61] have drawn on experience from a range of assessment processes, and this material has been drawn on in the earlier sections. Similarly the earlier sections also drew on relevant parts of the gap analysis prepared in 2009[62] and the analysis of the assessment landscape prepared in 2010.[63] Two other recent meetings have drawn together lessons.

71. The following key lessons learnt were identified by members of the Sub-Global Assessment Network at the 3rd SGA Network Annual Meeting that took place in Bilbao in December 2011, drawing on their experience as practitioners in carrying out assessments and using the results.[64]

Lesson 1	**Policy relevance:** Define clear policy relevant questions in close consultation with key audiences and users

[58] Parry ML *et al.* (2007). *Contribution of Working Group II to the Fourth IPCC Assessment. Available at: www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html*

[59] See Chapter 8 of the IAASTD Report: *Agriculture at a Crossroads* released in 2009.

[60] Ash *et al.* (2010) *Ecosystems and Human Well-Being – A Manual for Assessment Practitioners,* which can be downloaded from www.unep-wcmc.org/eap/pdf/EcosystemsHumanWellbeing.pdf

[61] See www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20

[62] UNEP/IPBES/2/INF/1 *Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science policy interface on biodiversity and ecosystem services*

[63] UNEP/IPBES/3/INF/1 *Analysis of the assessment landscape for biodiversity and ecosystem services*

[64] From a paper on lessons learned from carrying out ecosystem assessments which is being drafted following the 3rd SGA Network meeting held in Bilbao, December 2011

Lesson 2	**Planning:** Carefully plan, including developing an appropriate conceptual framework, and setting clear boundaries on scope and scale
Lesson 3	**Balance:** Be inclusive, maintaining a balance between all components, and drawing on the interests and experience of all key players
Lesson 4	**Governance:** Apply a clear and well understood governance structure that helps to define roles, support balanced engagement and ensure legitimacy
Lesson 5	**Ownership:** Promote wide ownership of the assessment and its products from the outset, so that its value and purpose is clearly understood
Lesson 6	**Potential for impact:** Ensure understanding of the decision-making context within which the assessment and its products will be used
Lesson 7	**Involvement:** Ensure engagement of all key experts, including collaboration with centres of excellence and building capacity through South-South exchanges
Lesson 8	**Different types of information:** Appreciate the need to understand, use and present different types of information

72. Similarly, a group of scientists with significant experience of carrying out assessments met in Tokyo in July 2011 to consider the advice that they would give to IPBES on carrying out assessments based on their experience. [65] They set out six principles as follows.

Principle 1	**Saliency:** Assessments need to be policy relevant, addressing complex issues of societal concern (noting that in the literature the term relevance is often used)
Principle 2	**Scientific credibility:** Assessments need to be carried out by appropriately qualified and selected people, following well defined and rigorous processes
Principle 3	**Scientific independence:** Assessments need to be independent of any political and/or special interest process
Principle 4	**Discipline, region and gender balance:** Assessments need to be trans-disciplinary and appropriately balanced, using a comprehensive conceptual framework
Principle 5	**Legitimacy:** Assessments need ownership by both decision makers (preferably through formal mandates) and other stakeholder constituencies
Principle 6	**Equity:** Capacity building needs to be an integral part of any assessment process to ensure that regional imbalance in ability to carry out assessments is addressed

[65] UNEP/IPBES.MI/1/INF/12 *Report of an international science workshop on assessments for IPBES, held in Tokyo, 25-29 July 2011*

Annex 1: Overview of global scenario studies, extracted with permission from van Vuuren *et al* (in press)

	Key reference + website	Focus	Key issues focused at	Policy process in focus	Approach
Global Scenario Group	www.gsg.org (Raskin etal.,2002)	Sustainable development	Multiple	Not explicit	Strong focus on storyline, supported by quantitative accounting system
IPCC–SRES	www.ipcc.ch/ipccreports/sres/emission (Nakicenovic et al.,2000)	Greenhouse gas emissions	Energy, land use, emissions	UNFCCC and climate policies of national governments	Modeling supported by simple storylines. Multiple models elaborate the same storyline to map out uncertainties
IPCC-TAR AR4	www.ipcc.ch (IPCC, 2001, 2007)	Climate change, causes and impacts	Climate, energy, land use, emissions	UNFCCC and climate policies of national governments	Summary of scenario literature
UNEP GEO3/4	www.unep.org/geo (UNEP, 2002,2007)	Global environmental change	All international environmental issues	Environmental policies of national governments and UNEP	Storylines and modeling on the basis of linked models
MA	www.millenniumassessment.org (MA, 2005)	Ecosystem services	Ecosystems and drivers	Various international conventions, and national governments	Storylines and modeling; modeling on the basis of linked models
FAO AT 2030/2050	ftp.fao.org/docrep/fao/009/a0607e/a0607e00.pdf (FAO, 2006)	Agriculture	Agriculture trends and policies	Agricultural policies of national governments	Single projection, mostly based on expert judgment
CA	www.iwmi.cgiar.org/assessment (CA, 2007)	Water and agriculture	Water use, agriculture	Agricultural policies of national governments	Storylines and modeling; modeling on the basis of linked models
IAASTD	www.agassessment.org (Watson, 2008)	Agriculture	Development, R&D, agriculture	Agricultural policies of national governments	Baseline and alternative scenarios; modeling on the basis of linked models
IEA-WEO	www.worldenergyoutlook.org (IEA, 2008)	Energy	Energy, energy security, climate	Energy and climate policy of national governments	Baseline and alternative scenarios
World Water Development Report	www.unesco.org/water/wwap	Water, environmental problems and development	Drivers of change, use of resources, state of resources, options to respond to a changing world	All levels including non-governmental bodies	24 UN agencies; coordination by WWAP (UNESCO); input in writing teams from universities, individual experts, professional organisations, NGOs