How can local and traditional knowledge be effectively incorporated into international assessments?

WILLIAM J. SUTHERLAND, TOBY A. GARDNER, L. JAMILA HAIDER and LYNN V. DICKS

There have been persistent calls for greater use of local and traditional or indigenous knowledge alongside conventional scientific knowledge in making decisions about biodiversity and natural resources (Fazey et al., 2006; Raymond et al., 2010). Yet such calls are rarely reflected in practice. Different types of knowledge have not been well integrated into national and international assessment exercises, including the Intergovernmental Panel on Climate Change, Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity (Turnhout, 2012), all of which focus almost exclusively on conventional scientific knowledge. The newly formed Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), charged with strengthening the knowledge base for decision-makers concerned with biodiversity conservation and the importance of the environment for human well-being, aspires to do better. Its operating principle is to 'Recognize and respect the contribution of indigenous and local knowledge to the conservation and sustainable use of biodiversity and ecosystems'. There is an urgent need to establish processes to achieve this if such aspirations are to be translated into good practice (Tengö et al., 2013; Sutherland, 2013; Thaman et al., 2013).

Here we outline why we believe an explicit set of processes is needed, including within IPBES, to recognize and integrate information from conventional science and local and traditional knowledge systems. We identify key features of such processes and propose a specific mechanism that could help integrate information from different, parallel knowledge systems into international knowledge assessments.

There are clear benefits of incorporating local and traditional knowledge alongside conventional scientific knowledge when assessing current understanding to guide decision-making (Tengö et al., 2013). Local and traditional knowledge can provide complementary perspectives, borne from long periods of shared observation and experimentation that are often lacking in conventional scientific knowledge. The latter commonly depends on sets of observations or experiments conducted over relatively short time-scales by groups of people disconnected from the environmental context. Local knowledge, for example, has been repeatedly shown to extend our understanding of the spatial and temporal dynamics of biodiversity, including for individual species (e.g. the Arctic fox *Alopex lagopus*; Gagnon & Berteaux, 2009). In the case of provisioning ecosystem services, so integral to human well-being, local people often hold knowledge that is vital to the cultivation and use of locally adapted crop varieties. This information is rarely collected by scientific studies and is not held by seed banks (e.g. in the Pamir mountains; van Oudenhoven & Haider, 2012).

Limiting the collation of information to conventional science could also mean that science conducted in more developed countries (with larger scientific budgets) may dictate decision-making elsewhere. This situation is unlikely to be either politically acceptable or appropriate. There is often a mismatch between the needs of decision-makers and the conventional scientific knowledge available (Amano & Sutherland, 2013). This mismatch is important, as illustrated by considering pollinators, a topic of considerable current interest and favoured for the first IPBES assessment. In a global review of conventional scientific evidence for the effects of interventions to maintain or restore wild bee populations (Dicks et al., 2010) 30 of the 163 studies identified were outside Europe and North America. With evidence for effectiveness based largely in temperate regions, interventions only relevant to the tropics are poorly understood and may even be overlooked. In such contexts, local and traditional knowledge are particularly necessary to enable assessments that are tailored to local understanding and needs.

So how can information from traditional and conventional scientific knowledge be effectively combined in the context of national and international assessments? We suggest there are at least three parts to the addressing of this problem. The first step is to recognize that there are fundamentally different types of knowledge, each associated with different needs for different stakeholder groups (Fazey et al., 2006). Here, it is important to distinguish information (whether drawn from observations or experiment, or from a scientific study or experience, information can be tested in some way) from values (i.e. preferences relating to priorities for action or particular outcomes) and associated mental models (i.e. the cognitive frameworks that people use to interpret and understand the world). Values and mental models must be made explicit to ensure that collaboration amongst stakeholders involved in an assessment is

WILLIAM J. SUTHERLAND (Corresponding author), TOBY A. GARDNER* and LYNN V. DICKS Conservation Science Group, Department of Zoology, University of Cambridge, Cambridge, CB2 3EJ, UK

L. JAMILA HAIDER Stockholm Resilience Center, Stockholm University, Stockholm, Sweden

*Also at: International Institute for Sustainability, Rio de Janeiro, Brazil

© 2013 Fauna & Flora International, *Oryx*, 48(1), 1–2 doi:10.1017/S0030605313001543

transparent, fair and effective (Biggs et al., 2011). The second stage is to collate and validate information from both local and traditional knowledge and conventional scientific knowledge. Finally, information from different sources needs to be combined in a transparent and defensible manner to support joint decision-making.

We support the proposal of Tengö et al. (2013) that IPBES creates a Multiple Evidence Base to collate and integrate parallel knowledge systems relevant to collaboratively defined problems, and to support joint analysis and evaluation. Interpreting information derived from local and traditional knowledge requires tailored validation mechanisms (Raymond et al., 2010; Tengö et al., 2013) analogous to those already established for conventional scientific knowledge, with supplementary information providing details of independence, consistency and extent, as well as the saliency and legitimacy of individual and group experiences. Particular challenges lie in collating and validating more implicit and tacit forms of local and experiential knowledge for which there is no observational support (Fazey et al., 2006).

Once information from local and traditional knowledge is collated and validated it can then be partly combined with available information from conventional scientific knowledge, using formal consensus methods such as the Delphi technique (an iterative and participatory process for assessing multiple lines of evidence). This entails confidential voting, which can be interspersed with a process for participants to see recommendations made by others and openly discuss reasons for differences (e.g. Dicks et al., 2013). Although formal consensus methods are increasingly being used to elicit local or traditional knowledge about the environment from groups of stakeholders (e.g. Leite & Gasalla, 2013), their potential to assess and integrate information from multiple sources by multi-stakeholder groups to support joint decision-making has, to our knowledge, been poorly explored in environmental management. In medicine formal consensus methods are highly valued for developing Clinical Practice Guidelines based on evidence. They always involve mixed groups of experts, practitioners and patients, and sometimes members of the public (Graham et al., 2011).

One particular challenge of this approach is in ensuring the appropriate and fair participation of various stakeholder groups. An advantage of formal consensus methods specifically for national, regional and international assessments is that they provide documentation of the knowledge sources used, so that other groups, who may hold different values and mental models, can appraise the process to arrive at different (yet comparable) conclusions. Collaborative assessments of the current understanding of a particular problem (e.g. decline of pollinators) also provide the necessary platform from which to identify priorities for the co-production of new knowledge.

We believe it is possible for IPBES to improve substantially on earlier assessment processes by collating and integrating conventional scientific, local and traditional knowledge. A process such as the one we outline would help enable decision-makers to draw on available knowledge to meet the challenge of conserving biodiversity and ecosystem services whilst improving human well-being. A concerted effort is needed to create the institutional structures and capacity required for such knowledge integration and co-production across local and global scales. It may be challenging but it is vital to retain the respect and participation of the various communities involved in IPBES.

References

Amano, T. & Sutherland, W.J. (2013) Four barriers to the global understanding of biodiversity conservation: wealth, language, geographical location and security. *Proceedings of the Royal Society B*, 280, 20122649.

Biggs, D., Abel, N., Knight, A.T., Leitch, A., Langston, A. & Ban, N. (2011) The implementation crisis in conservation planning: could 'mental models' help? *Conservation Letters*, 4, 169–183.

Dicks, L.V., Hodge, I., Randall, N., Scharlemann, J.P.W., Siriwardena, G.M., Smith, H.G. et al. (2013) A transparent process for 'evidence-informed' policy making. *Conservation Letters*, doi 10.1111/conl.12046

Dicks, L.J., Showler, D.A. & Sutherland, W.J. (2010) Bee Conservation: Evidence for the Effectiveness of Interventions. Pelagic Publishing, Exeter, UK.

Fazey, I., Fazey, J.A., Salisbury, J.G., Lindenmayer, D.B. & Dovers, S. (2006) The nature and role of experiential knowledge for environmental conservation. *Environmental Conservation*, 33, 1–10.

Gagnon, C. A. & Berteaux., D. (2009) Integrating traditional ecological knowledge and ecological science: a question of scale. *Ecology and Society*, 14, 19.

Graham, R., Mancher, M., Wolman, D.M., Greenfield, S. & Steinberg, E. (eds) (2011) *Clinical Practice Guidelines We Can Trust*. National Academic Press, Washington, DC, USA.

Leite, M.C.F. & Gasalla, M.A. (2013) A method for assessing fishers' ecological knowledge as a practical tool for ecosystem-based fisheries management: seeking consensus in Southeastern Brazil. *Fisheries Research*, 145, 43–53.

Raymond, C.M., Fazey, I., Reed, M.S., Stringer, L.C., Robinson, G.M. & Evely, A.C. (2010) Integrating local and scientific knowledge for environmental management. *Journal of Environmental Management*, 91, 1766–1777.

Sutherland, W.J. (2013) Review by quality not quantity for better policy. *Nature*, 503, 167.

Tengö, M., Malmer, P., Brondizio, E., Elmqvist, T. & Spierenburg, M. (2013) *The Multiple Evidence Base as a Framework for Connecting Diverse Knowledge Systems in the IPBES*. Discussion paper 2012004. Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden.

Thaman, R., Lyver, P., Mpande, R., Perez, E., Cariño, J. & Takeuchi, K. (eds) (2013) *The Contribution of Indigenous and Local Knowledge Systems to IPBES: Building Synergies with Science*. IPBES Expert Meeting Report, UNESCO/UNU. UNESCO, Paris, France.

Turnhout, E., Bloomfield, B., Hulme, M., Vogel, J. & Wynne, B. (2012) Listen to the voices of experience. *Nature*, 488, 454–455.

Van Oudenhoven, F.J.W. & L.J. Haider (2012) Imagining alternative futures through the lens of food: the Afghan and Tajik Pamir Mountains. *La Revue d'Ethnoecologie*, 2, doi 10.4000/ethnoecologie.970