Chapter 12

Reflections and Lessons Learned

Coordinating Lead Authors: Doris Capistrano and Cristián Samper
Contributing Authors: Marcus J. Lee, Ciara Raudsepp-Hearne, and Walter V. Reid
Review Editors: Robert Kates, Thomas Wilbanks

Main Messages

The sub-global assessments were one of the most innovative features of the MA. They have provided useful insights on the influence of scale and knowledge systems on the relationship between ecosystems and human well-being. Local assessments highlighted the importance of key relationships between ecosystem services and drivers of ecosystem change that were often not perceived at global scales, especially those related to cultural services.

The MA conceptual framework proved to be useful for many sub-global assessments. As the relative importance of ecosystem services and drivers varied across assessments, the conceptual framework had to be adapted as appropriate to individual assessments. The MA conceptual framework and guidelines for sub-global assessments could be applied broadly in a variety of locations and circumstances around the world, but were used to varying extents depending on the particular context of each sub-global assessment.

Assessments that were led primarily by indigenous communities developed alternative frameworks. Two sub-global assessments used such alternative frameworks, which better reflected the communities' views on the relationship between people and ecosystems, were less centered on purely human needs, and placed greater emphasis on cultural services and the spiritual aspects of human well-being. These modifications and adaptations of the MA conceptual framework are an important outcome of the MA.

Most assessments faced similar practical constraints. The main constraints included limited funding, short time frames to deliver results within the timing of the global MA process, limited capacity to conduct the assessment, and lack of data and information. Some of these constraints were overcome by adopting innovative approaches and sharing lessons across sub-global assessments, which was facilitated by the design and mode of implementation of the MA.

Most sub-global assessments were carried out at a single spatial scale. However, even those assessments conducted only at a single scale considered driving forces, trends, and information from other scales. Nevertheless, since multiscale assessments were not uniformly conducted as originally intended, there may have been missed opportunities to test the importance of cross-scale interactions.

The sub-global assessment process generated a range of products and outcomes, one of which is this volume. Individual sub-global assessments and their separate reports are an important source of information, with products meeting the needs of users of those assessments. Outcomes also include the building of assessment capacity, the development and testing of participatory methodologies for undertaking assessments, as well as the formation of a network of sub-global assessments across the globe. The sub-global assessments are already yielding important results and outputs. Most of their results and impacts, however, will come to fruition in the longer term as on-going assessments are completed and influence future decisions relating to ecosystems and human well-being.

12.1 Introduction

The MA is arguably the most ambitious effort to date that aims to assess the state of knowledge on the complex relationship between ecosystems and human well-being. The process has involved over two thousand natural and social scientists and decision-makers from over 90 countries around the world. Serving as authors, reviewers, and members of assessment teams, these large and growing networks of experts and practitioners have contributed their time and intellectual energies largely on a voluntary basis to this collective enterprise.

From the standpoint of the overall MA process, adopting a multiscale approach through the sub-global assessments offered important benefits. First, it was expected that the overall assessment findings would be strengthened by the sub-global assessments, which would add value to the global understanding of the dynamics between ecosystems and human well-being by reflecting views from different spatial scales. Sub-global assessments provide a grounded perspective on the interactions of ecosystems and social systems at finer scales, while also offering different frames of reference from which global dynamics may be viewed. The expectation was that the view from below would indeed be distinct and more nuanced than the global view. Second, sub-global assessments were also intended to enhance the relevance, usefulness, and outreach efforts of the overall MA process, helping to build wide political support for the MA.

The multiscale approach of the MA was likewise intended to benefit those involved in the sub-global assessments. The MA capacity-building objectives included improving capacity to undertake sub-global assessments in as many countries as possible and improving the use of information from assessments in decision-making. Because the sub-global assessments encompassed some key experimental aspects of the MA, they provided a rich and varied learning experience for those involved. The sub-global assessments tested the application of the MA conceptual framework, to gauge its usefulness for assessments at finer scales in different parts of the world. Along the way, many tools and methods needed to be adapted or developed, posing the challenge of learning-by-doing. Synthesizing and learning from the experiences of other sub-global assessments outside the MA provided substantial additional benefits.

Proceeding from a common conceptual framework, the sub-global assessments set out to find answers to the MA's five overarching questions (see MA Objectives, Focus, and Approach at the beginning of this volume). All sub-global assessments were meant to examine these questions in their particular settings, to adapt them as appropriate, and then to report on the outcomes. It was expected that the answers would differ depending on the diversity of perspectives and knowledge that different users, stakeholder groups, and decision-makers brought to the sub-global assessment process. It was also expected that the answers would vary to some degree depending on the scope and coverage of the assessments—from local, national, regional, and other sub-global scales—when compared to MA findings at the global level.

The initial MA working assumptions or hypotheses included the following:

- The MA conceptual framework and guidelines for sub-global assessments could be applied broadly in a variety of locations and circumstances around the world.
- Findings from the global assessment would inform the sub-global assessments, and vice-versa, for an improved set of assessment findings overall.

- The involvement of different systems of knowledge in an integrated assessment framework is important and feasible and provides significant benefits;
- Funding for sub-global assessments could be secured from a variety of sources, which would strengthen user involvement in each location.
- Engagement with multiple stakeholders/users in each sub-global assessment location defines and drives the assessment process.
- Sub-global assessments can learn from one another and benefit from exchanges on methodologies and lessons learned.

At the start of the MA process, only a small number of sub-global assessments was envisioned. However, at the time this report was being finalized (early 2005), a total of 18 approved assessments, and another 16 associated assessments, were involved in the MA process. These assessments were interested in being part of an internationally prominent undertaking, in using the MA conceptual framework, and in learning from other similar experiences. At the time of writing, only three sub-global assessments were fully completed, with many continuing beyond the timeframe of the core MA process. Nevertheless, the experiences from the sub-global assessments to date already offer many important lessons, and suggest promising directions for future assessments. There remains a high level of interest in undertaking sub-global assessments, even without the possibility of funding from the MA, and even as the MA process draws to a close.

This chapter reflects on these experiences and the lessons learned so far. We revisit the process employed in conducting the sub-global assessments in light of the initial assumptions and the MA conceptual framework. We then examine two of the most innovative features of the MA design, namely, the treatment of scale and different knowledge systems in the assessments. In this chapter, we also take stock of what has been achieved thus far, and offer suggestions for how similar assessments may be designed and implemented in the future.

12.2 Sub-global Assessment Process Revisited

In mostly adopting a ''view from below'' or ''bottom-up'' approach to the selection and implementation of sub-global assessments, the domain and scope of individual sub-global assessments were left to the teams involved in their execution, in consultation with their users and stakeholders. This process generally involved the consideration and congruence of institutional (for example, political governance boundaries) and biophysical factors (for example, the extent of a river basin), and the needs of users and stakeholders of each assessment. All sub-global assessments were asked to use the MA conceptual framework as a starting point, and to assess conditions and trends, scenarios, and response options with respect to the ecosystem services they chose to analyze.

The bottom-up approach led to an uneven distribution of assessments across ecosystems around the globe. For example, there was limited representation of island and marine ecosystems and also few assessments in industrial countries and urban areas. Ideally, the MA Sub-Global Working Group would have designed a set of assessments that would have resulted in better representation of ecosystems and regions, but this was not possible due to funding limitations, time constraints, and variable levels of capacity of assessment teams. (See Chapter 6.) Instead, the Working Group often had to rely on existing initiatives or institutions that were undertaking processes relevant to the MA, which in most cases were then responsible for raising their own funding and conducting the assessments. Since sub-global assessments sought to respond to their users' needs and to their specific contexts, no two assessments were alike, making comparisons across sub-global assessments more difficult, but potentially also more rewarding.

12.2.1 Practical Constraints, Adaptive Solutions

Each assessment was confronted with practical implementation constraints. Common constraints included: insufficient funding; lack of data and information; limited time; and gaps in available capacity to conduct the assessment, including tools and methods with which to undertake specific components of the assessment process.

Keeping users interested and engaged, as well as countering user fatigue, were common challenges. Ensuring that the assessment was shaped around questions and issues of relevance and interest to diverse users, rather than only to scientists, was also critical to maintaining user interest. It is important to recognize that there are real transaction costs, notably in terms of time invested in consultations, in pursuing greater inclusiveness and user participation. For those assessments lacking data and information and technical capacities, however, efforts to include a broader range of perspectives and greater user participation proved to be a logical strategy. In this way, several sub-global assessments were able to generate information, and raise additional resources, while ensuring the relevance of assessment findings.

By necessity, sub-global assessments had to be creative and opportunistic in making the best use of the mix of resources available to them. In most cases, the assessments built on on-going or planned processes, with the MA providing some seed funding and a coherent framework for analysis. But in most instances, the financial contribution of the MA represented a very small percentage of overall funds. Most sub-global assessments started late in the overall MA process because of lack of available funding. A notable exception was the Southern Africa assessment; SAfMA obtained a substantial amount of funds from the MA and was one of the first assessments to get started, led by a team of experienced natural and social scientists.

The need to bring together human, financial, material, and other resources over a short time period encouraged most sub-global assessments to be creative and to employ strategies and methods that addressed different resource needs simultaneously. Many institutions provided in-kind contributions of staff time or office resources, while the activities and outputs of related projects also fed into planned assessment activities.

12.2.2 Users, Stakeholders, and Reviewers

The definitions of stakeholders and users of an assessment can take on different meanings across scales. The MA conceptual framework defined ''stakeholder'' as ''an actor having a stake or interest in a physical resource, ecosystem service, institution or social system, or who is or may be affected by a public policy'' (MA 2003, p. 215). In the MA parlance, ''users'' refers to those decision-makers who will use information from an assessment as they make decisions relating to ecosystems and human well-being. User groups naturally vary across the sub-global assessments, depending on contexts and circumstances. Among some sub-global assessments, the terms ''user'' and ''stakeholder'' tended to be used interchangeably.

Like most global assessment processes, the global MA process was largely driven by groups of individuals linked to academic and research institutions, with the findings targeted primarily at users in governments, international conventions, and multilateral processes. In contrast, while groups from academic and research institutions were active in sub-global assessments, many local-level assessments relied on local users to provide information, with the result that these users were often more directly involved in the assessment process than they would have been otherwise. Furthermore, the definition of users and stakeholders tended to expand or evolve in the course of an assessment, as better understanding of the dynamics of the ecosystems being assessed uncovered new or different sets of users and stakeholders. Therefore user identification and engagement, critical steps in the prescribed MA assessment process, had to be viewed and implemented as an iterative, adaptive process.

Implicit in the MA conceptual framework and assessment guidelines is the assumption that the users, stakeholders, and peer reviewers of the assessment are distinct groups. While users and stakeholders can be more readily distinguished at the global level, at finer scales of assessment, the distinction among them becomes much less clear. In some fine scale assessments, the users, stakeholders, and reviewers could turn out to be from the same group of persons. With regular interaction and involvement of users, stakeholders, and reviewers in the assessment process, the feedback, peer review, and learning loops tended to be considerably shortened. This not only enhanced the credibility and relevance of sub-global assessments, but also fostered a sense of ownership of the assessment results and appeared to help increase commitment to follow-up action.

Teams based in academic or research institutions led many sub-global assessments; examples include the assessments in southern Africa, India, Portugal, and Sweden. These teams were responsible for identifying and involving other local and regional users, who in turn became important providers of knowledge and reviewers of the results. An interesting variation was the Vilcanota assessment in Peru, designed and led by Quechua-Aymara indigenous peoples with little or no involvement from academic institutions. A local NGO provided a bridging mechanism between the MA and local communities, facilitating assessment design and building capacity to undertake the assessment work.

12.2.3 Assessment versus Research

From the outset, the MA was careful to clarify the definition of what an assessment is, noting the difference between research and assessment. The MA defined a scientific assessment to be ''a social process to bring the findings of science to bear on the needs of decision-makers.'' Scientific research, on the other hand, was viewed as a distinct process of data-gathering and hypothesis-testing to advance human knowledge that does not necessarily meet the information needs of decision-makers in direct ways. In the case of the global MA, the assessment process was not meant to generate new data or research findings.

Among the sub-global assessments, however, the lines between research and assessment were blurred in a number of cases. The primary reason for this was the need to fill data gaps, leading a number of sub-global assessments to undertake some research and primary data collection. The lack of historic and comprehensive data was particularly problematic at local scales. In many cases, relevant information was not published, or had not been validated through some form of peer review process. Thus for those instances where primary information was generated through research as part of the assessment process, the MA documentation itself became an important reference for the process.

These efforts to fill in gaps through primary data collection contributed to delays in the assessment timelines and cut into the time needed to do other analysis. As a result, sub-global assessments took longer to complete the full cycle of activities than the time frame originally envisioned in the MA process design.

Nevertheless, the research and primary data collection, as well as collation of existing data, generated important baseline information for many of the assessment sites. For many users and stakeholders, this information base is already an important contribution of the MA to user needs, in addition to other benefits derived from the assessment itself. The baseline information will facilitate future assessments by providing an important benchmark against which future changes in ecosystems services and human well-being can be assessed.

12.2.4 Learning, Networking, and Capacity-building

The common constraints and challenges faced by all sub-global assessments encouraged a spirit of collective learning and mutual support. Learning across sub-global assessments was designed as part of the MA process, including through a series of face-to-face and virtual meetings, opportunities for peer mentoring, facilitated information sharing, and exchange visits. Working group meetings were designed to be not only occasions to exchange information, report on progress, develop products and drafts, but also to build capacity and to cement social and professional networks.

In order to ensure constant exchanges and mutual learning between the global and sub-global assessment compo-

nents of the MA, these activities included members of the global assessment team as well. The formation and meetings of ''cross-cutting'' teams, members of which were drawn from global assessment authors, sub-global assessment teams, and the technical staff of the MA secretariat, meant that information and insights from sub-global assessments were available to the global assessment through these individuals. The cross-cutting approach was meant to help alleviate practical difficulties arising from the fact that the global and sub-global assessments were being conducted in parallel, with most sub-global assessments having started later. In addition, a global–sub-global linkages team was created to further facilitate the inclusion of sub-global material in the global assessment; the team familiarized itself with both the global and sub-global reports, and provided material directly to global and sub-global authors.

Through these mechanisms, even while still on-going, sub-global assessments were able to contribute to the global assessment. For example, the sub-global assessments provided case studies to illustrate the global scenario storylines and helped to define and improve understanding of driving forces and responses considered in the global assessment. At the same time, training workshops and technical assistance provided by the global team, especially in the use of scenarios, were important capacity-building opportunities for the sub-global assessment teams. Despite these mechanisms, however, because of the tight MA timeline, most sub-global assessment results became available too late for the global assessment to make good use of them.

New tools and techniques such as ''knowledge markets'' (see Box 2.1 in Chapter 2) were developed to facilitate faster transmission and sharing of information and insights in the context of conducting an analysis of experiences across all 34 sub-global assessments. Knowledge markets facilitated the efficient exchange of information with the authors of this volume, and newer assessments participating in the exchanges could learn from the experiences of the more advanced assessments. Links among sub-global assessments and between global and sub-global assessment teams were further facilitated by the provision of modest funding for travel, periodic meetings, and telephone conference calls. The considerable technical capacity-building, professional development, and networking that resulted from these activities are among the immediate visible outcomes of the MA. This was especially important for strengthening assessment capacity in developing countries, where 28 out of the 34 sub-global assessments are located.

12.3 Conceptual Framework Reexamined

Agreement to use the MA conceptual framework was a criterion for selection as a sub-global assessment, in order to facilitate comparisons across regions and to ensure that the sub-global assessments contributed to the overall MA process. The conceptual framework proved to be a useful tool for communicating the complex interactions between ecosystems and human well-being, and possible response options, to many different audiences. The MA sub-global assessments used the conceptual framework to different extents, depending on their particular circumstances and contexts. Beyond the MA and its sub-global assessments, the conceptual framework was also used in academic institutions and by teaching professionals. The opportunity to learn from and apply the MA conceptual framework was among the commonly cited reasons for wanting to join the MA process.

12.3.1 Ecosystems and Human Well-being

The MA conceptual framework is deliberately centered on humans, and was designed to explore the links between ecosystems and human well-being. The underlying premises are that ecological and social systems are coupled, and that the flow of ecosystem services and human well-being are linked and interact in complex ways. Human well-being—which consists of environmental security, basic materials for a viable livelihood, freedoms and choice, health and good social–cultural relations—critically depends on, and at the same time affects, ecosystem services. The relationship of ecosystems and their services (provisioning, regulating, supporting, and cultural) to human well-being varies over space and time. However, human well-being includes many aspects not directly based on ecosystem services, and the constituents of well-being are experienced and perceived differently across cultures and socioeconomic levels.

Among the ecosystem services, sub-global assessments tended to focus on provisioning services. Among the dimensions of well-being, freedoms and choices (the ability to influence decisions regarding ecosystem services and human well-being) were the least explicitly addressed in the assessments. This was partly due to the difficulty of assessing the link between freedoms and choice and ecosystem services, given data constraints and the lack of technical skills and analytical tools to conduct this analysis.

However, the consideration of freedoms and choice did come into play in many assessments that sought to enable certain groups to manage their own resources and make important decisions. This was the case, for example, with the Vilcanota, Bajo Chirripó, San Pedro de Atacama, and two Indian assessments. In fact, in any assessment that had strong and broad user engagement, the reconfiguration of freedoms and choice for different stakeholder groups was a theme in the overall process. This highlights a difference between the sub-global and global components of the MA; while the global assessment could only assess aspects like freedoms and choice, the sub-global assessments could actually help to broaden the range of freedoms and choice, for some stakeholder groups at least, through the design and implementation of the assessment process itself.

Among ecosystem services, cultural services also proved difficult to assess. Recognizing and evaluating the condition of the cultural services of ecosystems was a novel feature of the MA. Cultural services are defined in the MA framework as the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences (MA 2003). These experiences include cultural diversity, spiritual and

religious values, knowledge systems, social relations, sense of place, recreation and ecotourism, as well as educational and aesthetic values. Given how varied cultural services are, perceptions of these services will vary across individuals and communities.

Except for tourism, which was one of the easier cultural services to quantify, cultural services were generally underrepresented in the sub-global assessments. The definitions of cultural services, the sub-categories of these services, and the boundaries between these services were unclear. For example, the Vilcanota assessment could not relegate the worldview and cultural practices of the Quechua people to the category of "cultural service" and sought instead to center the assessment on culture and spirituality. Apart from the uncertainty associated with the definition of various cultural services, there is a general lack of appropriate data, indicators, and tools with which to assess them. Most of the assessments of these services relied on qualitative descriptions and expert opinion. These forms of knowledge were also somewhat difficult to fit into the assessment.

12.3.2 Drivers and Controls

The characterization of drivers of ecosystem change as being either direct or indirect, and at the same time either exogenous or endogenous, is one indication of the conscious attempt within the MA to bridge disciplinary divides between natural and the social sciences. Ecologists and biophysical scientists in the assessment teams tended to view drivers or driving forces for change as being either direct or indirect, while social scientists, particularly economists, tended to view them as endogenous or exogenous to the decision-making context.

Identification of drivers was challenging because of the complexity of the many factors that together interact to bring about ecosystem change. Sorting through direct and indirect drivers requires both a good understanding of the dynamics of ecosystem change, and a great deal of data and information. Important drivers may be omitted or overlooked simply because the data are not available. One clear lesson is that the identification of driving forces requires an iterative learning approach. As the assessments progressed, the specific driving forces, how they interact, and how they change over time, became clearer to the assessment teams. Hence the understanding and identification of direct and indirect drivers tended to evolve in the course of the assessment.

Likewise, the classification of drivers as being exogenous or endogenous is not always straightforward, since the scales and boundaries of analysis determine what is endogenous and what is exogenous. The degree of controllability of a driver from the standpoint of actors or decision-makers, and hence their capacity to effectively respond to the driver, also influences the endogenous/exogenous classification. Thus in certain assessments, some drivers were classified as being both endogenous and exogenous, indicating that the decision-maker at the given scale only had partial control over those drivers. However, the controllability of drivers from the point of view of decision-makers and those participating in the assessment can be changed. Capacity-building, networking, and alliances can strengthen the capacity of actors and decision-makers to exercise control and to more effectively respond over time.

12.3.3 Use of Scenarios

Scenarios can provide a way of making structured comparisons of management and development strategy options for ecosystem services. Scenarios can also be, and were used as, multi-purpose tools in the sub-global assessments. In some assessments, scenarios were treated as a tool for communication with local decision-makers. Few sub-global assessments conducted scenarios in the sense of a comparison of alternative futures, and those that did adopted a range of methods for doing so.

Most sub-global scenarios were not linked to the global MA scenario storylines. Though aware of the scenarios developed for the MA global assessment, most sub-global assessment teams explicitly opted to focus first on the needs and issues in their assessments, rather than to be overly bound by the directions taken by the global scenarios. In some cases, the long-term hopes and expectations expressed by users and stakeholders, and embodied in their scenarios, did not necessarily proceed from current short-term trends observed at those levels. The sub-global assessments had limited capacity and experience to undertake scenarios; they also had little opportunity to benefit from the scenarios methodology at the global level, because the global scenarios methodology was evolving at the same time.

12.3.4 Challenges in Applying the Framework: Adaptation and Modification

All the sub-global assessments found the MA conceptual framework to be useful as an initial reference point and guide. Nonetheless, sub-global assessments faced several difficulties in applying the framework in their work. Many assessments, including SAfMA, found it difficult to communicate the concepts at the local level without adapting them to local terms and conditions. Furthermore, language proved to be a barrier in some cases, and the role of institutions and people able to understand the framework and translate it to the local context became important.

Despite having the common conceptual framework and broad guidance on the core elements of the MA process, the sub-global assessments employed a wide variety of approaches and methods, which generated a vast and richly textured information and knowledge base of relevance to assessment users. However, this also limited the comparability of findings across the sub-global assessments, and between sub-global and global components of the MA, or at least made comparison more difficult than it would have been with strict compliance with a common framework and methods.

In conducting their assessments, only a handful of sub-global assessments were able to comprehensively address the elements identified in the MA conceptual framework. For example, most assessments measured the condition of the

subset of services they focused on, but not all of them analyzed direct and indirect drivers of ecosystem change.

One of the most interesting results was the adaptation of the MA conceptual framework in two assessments led and implemented by indigenous peoples in Vilcanota, Peru, and Bajo Chirripó, Costa Rica. In both cases, the MA framework was considered to be overly human-centered, in contrast to the cosmovision of these indigenous people, where the concept of reciprocity between humans and other elements of the environment has traditionally promoted the sustainable use of resources within communities. The resulting adaptations, presented in their reports and discussed earlier in this volume, are an important contribution and provide a useful counterpoint to the MA conceptual framework.

12.4 Issues of Scale and Knowledge Systems

The MA process differed from other scientific assessments in that it set out to assess interactions between ecosystems and human well-being at different scales through the inclusion of sub-global assessments. Another notable feature of the MA was its attempt to incorporate different systems of knowledge into the assessment process.

12.4.1 Cross-scale Interactions

The MA was designed as a multiscale assessment from the beginning, but this proved harder than expected to implement, as it entailed not only undertaking assessments at different scales, from local to global, but also examining the importance of cross-scale interactions on changes in ecosystem services and human well-being.

Except for SAfMA and Portugal, the other sub-global assessments were carried out at single spatial scales, such as that of a single city or region of a country. Except for the two mentioned, conducting nested assessments as initially envisioned in the MA design was not possible because of time and funding constraints, the lack of preparedness to undertake assessments in initial focal regions, and the opportunistic approach most sub-global assessments had to take. From the outset, the MA design recognized that methodologies for conducting multiscale assessments had to be developed further by the sub-global assessments, which proved to be a challenge for these assessments in practice. Nonetheless, each sub-global assessment factored in information and views from other scales as part of their assessment. In that sense, even those assessments conducted at a single scale had multiscale interactions embedded in their analyses. The role of individuals and organizations that functioned as ''sense-makers'' and translators of information from one scale to another proved to be an important link across different scales. (See the discussion on bridging organizations in Chapter 9.)

Through the incorporation of selected information from other scales, it was possible to consider driving forces and information emanating from multiple scales, and to derive useful results for sub-global assessment users and stakeholders. However, the lack of actual ''nesting'' of the assessments did not allow for explicit analysis of cross-scale interactions among some elements of the MA framework, which some global-level audiences had expected the sub-global assessments would deliver. In this case, there was clearly a mismatch not only between user needs and expectations at the global and sub-global levels, but also between the global MA expectations and the resources (funds, time, capacities, data) made available to the sub-global assessments.

One notable exception was the southern Africa assessment, which had an early start and the fewest resource constraints compared to other sub-global assessments. SAfMA included analysis for an entire region covering several countries, two river basins, and some local assessments within these basins. This type of comparison proved to be invaluable and enabled the assessment of the relative importance of services and drivers as a function of scale. Analysis of cross-scale interactions in SAfMA highlighted important implications for decisions and management in the region.

12.4.2 Spatial and Temporal Scales

Another key element of the MA conceptual framework was the consideration of both spatial and temporal scales in the analysis. Drivers and their impacts on ecosystems and human well-being operate at different time scales, from a few days to decades, or even longer. (See Chapter 7.) The conceptual framework also presented a hypothesis regarding the possible relationship between spatial scale and temporal scale. (See Chapter 4.) However, most sub-global assessments focused on spatial scales, devoting comparatively little effort to the explicit analysis of different time scales. This was largely due to the lack of time series data available to most sub-global assessments.

12.4.3 Knowledge Systems

The MA recognized from the outset that taking account of different knowledge systems is important in carrying out an assessment of ecosystems and human well-being. This is easier said than done, and proved to be quite challenging. There were at least two different dimensions of bridging knowledge systems that the sub-global process attempted to address: bridging social and natural sciences, and bridging ''scientific'' knowledge and local and traditional knowledge.

The MA sought to bring together natural and social scientists from the outset. The MA Assessment Panel and MA Working Groups were established with deliberate attention to ensuring disciplinary balance, and most sub-global assessments adequately took into account both the natural and social science perspectives throughout the process. The different disciplines involved contributed a variety of approaches, where the debates, common understandings and workable solutions developed fostered significant cross-disciplinary learning and enriched the process overall. The outcomes of the MA are stronger as a result.

The MA also attempted to bring together local and traditional ecological knowledge and scientific knowledge. The challenge was to try and combine these different types of knowledge in ways that could yield the best possible as-

sessment. One important outcome of the MA, particularly in the Vilcanota, Bajo Chirripó, and Indian assessments, is the documentation and review among the communities of their own knowledge, which has been largely transmitted orally and not recorded.

Local and traditional knowledge added significant insight to the sub-global assessments. There was also no doubt that using local knowledge in local assessments enhanced the credibility of the assessments at the local level. However, the extent to which local and traditional ecological knowledge contributed to the assessments was variable due to local contexts, predisposition and expertise of the assessment teams, and the resources allocated to understanding and using such knowledge. Moreover, incorporating these systems of knowledge into the MA proved challenging because of differences in data, methods and processes for expression, documentation, and validation among knowledge systems.

One of the important steps taken by the MA as an input to the sub-global assessments was the organization of a conference on Bridging Scales and Epistemologies in Alexandria, Egypt, in 2004. The conference brought together many sub-global assessments and other people and initiatives working on issues of scale and knowledge systems at both practical and conceptual levels. Many on-going assessments benefited from the conference discussions that ideally would have been held as the sub-global assessments commenced their work, but the conference had been postponed due to the SARS outbreak in China, where it was originally scheduled to be held. Nonetheless, it was helpful in catalyzing new thinking and reflection and brought added expertise to the MA through new reviewers identified through the conference.

12.5 The View from Below

The view from below is not just a microcosm of the global view, nor is it necessarily framed relative to the global perspective. We found that most sub-global assessments were carried out taking into account their particular scale, issues, stakeholders, and final users, with relatively little input from the global process. Indeed, our findings indicate, as expected, that sub-global perspectives provide markedly different ways of framing and understanding the dynamics between ecosystems and human well-being. Sub-global perspectives also open up myriad opportunities for more finely crafted and better-targeted ways of addressing issues.

12.5.1 People in Patchy Landscapes

There is a significant degree of heterogeneity and patchiness in landscapes, in the conditions of their component ecosystem services, in the driving forces of ecosystem change, and in the possible responses and envisioned futures of people in these landscapes. This heterogeneity can depend on the scale of the assessment, with greater heterogeneity expected in coarser scale assessments. However, even community assessments exhibit this heterogeneity.

Heterogeneity is generally found in the assessment of ecosystem service conditions when viewed at sub-global levels, but much detail on this patchiness can disappear once aggregated at the global level. When the condition of services is averaged across an entire assessment area, there is a tendency to get intermediate values implying similar conditions over the entire area. In most cases, the variance in services may be as important, if not more important, than the average values.

In some cases, ecosystem services that are in critical condition at the local level are missed at the global level because of the process of averaging. The localized scale of the assessment of condition may be too fine for it to show up at the global scale. Similarly, the lack of data on particular threats and drivers (such as degradation, alien invasive species, climate change) often serves to underestimate threats in the region, resulting in overly positive assessments of the conditions of ecosystem services, which may in fact be under critical threat or undergoing rapid change.

12.5.2 Finely Crafted Responses

There has been a tendency to tailor policy responses to the ''average'' assessment, often leading to inappropriate prescriptions and actions. The findings from the sub-global assessments suggest that responses must recognize spatial heterogeneity in the landscape and be crafted at the finest appropriate scale. In reality, people using and managing ecosystems in these landscapes have varying degrees of capacity to exploit the patchiness and variation across their landscape, and to develop adaptive responses and coping mechanisms to meet their needs. Hence from the standpoint of local ecosystem service users, especially in the short term, the conditions of some ecosystem services may not be as critical as the global assessment may indicate.

Responses to changes in ecosystems and human well-being at the sub-global level are somewhat different from responses observed at the global level. While economic incentives provide the context for responses at regional or national levels, they are rarely used in isolation. Considerations such as security can be more important than economic incentives, and intangible benefits can be just as powerful as tangible benefits in motivating responses. The most common responses observed in the sub-global assessments employed organizational and institutional devices, that is, formal and informal measures based on multi-actor collaboration. Examples of this include responses based on collaboration between different levels of government and local actors. Indeed, vertical collaboration among different actors and stakeholders tends to characterize effective responses. (See Chapter 9.) This is because there are many stakeholders with legitimate claims to manage ecosystems, and they tend to have different objectives. Unless they reach a workable agreement (through top-down or bottom-up processes), conflicts are likely to impede actions and come in the way of effective responses.

Responses employed or favored at the sub-global level tend to be calibrated to account for what can be decided and controlled by actors at the level considered. Individual responses themselves also tend to be finely crafted and tuned to specific conditions and driving forces in specific locations

and contexts. There is a marked tendency for actors initiating a response to match their actions with the geographic reach of the drivers they seek to address. Where decision-makers at a given scale only have partial control over the drivers, concerted responses involving actors at different scales tend to be the more effective option.

It is inappropriate to make generalizations about the dynamics and driving forces of ecosystem change, and to intervene on the basis of these generalizations. Drivers are scale-dependent; they operate differently at different scales. To be able to construct effective responses, drivers must be understood. If the goal of an assessment is to formulate global policy, then it is essential to do the assessment at the global scale. There are also multiple channels through which the influence of exogenous drivers is transmitted to the local level. Some global-scale driving forces can cause changes directly at the local scale. Others interact with national-level drivers and together cause local ecosystem change. National-level drivers can also cause local ecosystem change independently of global drivers.

Our findings indicate that the dynamics and driving forces of ecosystem change differ across assessments. Drivers act and interact in very distinct, often synergistic ways in different regions and locales. In the sub-global assessments, individual drivers were rarely identified as important in isolation, nor was any single driver of equal relevance across the assessments. Some driving forces take a long time to unfold, or only become apparent at a coarser scale. The trends in these slow drivers may not be readily apparent at local scales, and therefore may not be factored into local responses. On the other hand, even when drivers are well-understood, actors may still not put in place effective responses. This typically occurs in the absence of actors or organizations that perform the function of linking and coordination of different stakeholders' actions (see Chapter 9) to achieve some degree of collaboration.

12.5.3 Trade-offs and Substitution Possibilities

Trade-offs and substitution possibilities become visible at the local level. The sub-global assessments provided many examples of trade-offs among ecosystem services. Enhancements in some services often came at the expense of other services. In particular, increasing provisioning services from ecosystems typically meant a reduction in the ecosystem's regulating and supporting services. Examples include the adverse impacts of agricultural intensification on water provisioning and soil regulation services, such as in the Mekong delta of Viet Nam (Downstream Mekong), and the loss of supporting services due to mining and the use of mangroves for building materials and fuel, such as in Papua New Guinea (PNG).

These trade-offs among ecosystem services, however, may not necessarily translate directly into impacts on human well-being, because of the possibility of substitution. General improvements in well-being can occur despite decreases in ecosystem services, at least at the local scale. This is because of the possibility, within certain limits, of substitution among ecosystem services and among components of well-being. The widening geographical reach of communities that often accompanies increases in well-being enables them to obtain the services they need from non-local sources. The globalization of trade has facilitated this and has progressively increased the spatial disconnect between human well-being benefits and ecosystem impacts.

However, substitution is possible only within certain limits in time and space; while possible for individuals, it is not always possible across all individuals at higher levels of social aggregation. Improvements in the well-being of particular individuals or communities may involve declines in the well-being of others.

Different communities and societies are organized in different ways to decide what is acceptable and to manage trade-offs among elements of human well-being, with significant consequences for ecosystems. While it may be possible for communities and societies to substitute and trade off elements of well-being, it is not certain to what extent and for how long ecosystem services are substitutable. The degree of equity in access to ecosystem services, and the systems of knowledge that are brought to bear on their management, can have profound impacts on ecosystems and their services. How these play out are integrally linked to the issue of who gains and who loses access to ecosystem services, and how these gains and losses are distributed over time and space in the process of both ecosystem and social change.

12.6 Products, Outcomes, and Lessons Learned

The sub-global assessment process was an important innovation of the MA, and a number of adjustments had to be made in the course of its implementation. A variety of products and outcomes have been generated, and more are expected in the coming years. In the process, we have learned some important lessons relevant for individual assessments, for the organization of sub-global assessments as a group, and for the overall design of future assessments similar to the MA.

12.6.1 Products and Outcomes

Most global assessments, including the global component of the MA, have focused on producing synthesis reports, with their findings as their main outcome. In this regard, the reports from the individual sub-global assessments, which are summarized as individual 30-page peer-reviewed reports, are a comparable result. Each of these reports contains a wealth of information regarding the condition of ecosystem services, scenarios, and response options, focused on their particular setting. This volume, aimed at providing an overview of the sub-global process and lessons learned, together with some comparisons and emerging patterns observed to date, is another significant product. In addition, an edited volume, consisting of selected papers from the 2004 MA conference on Bridging Scales and Epistemologies, is forthcoming.

The sub-global assessment process has led to the development of new tools and methodologies and the collection and generation of baseline information. It has also moti-

vated and facilitated the establishment of governance mechanisms for sub-global assessments that have contributed to the empowerment of stakeholders and users.

The sub-global assessments have yielded a number of other tangible and intangible outcomes. Some of the most important results are less tangible, but no less observable. The capacities that have been developed to lead and undertake MA-type assessments are expected to enhance the potential for further impacts in the future, beyond the completion of the MA sub-global assessments. These capacities are likely to be reinforced by the networks of institutions and professionals that have been developed in the course of the MA.

12.6.2 Lessons for Individual Sub-global Assessments

The sub-global assessment process was a rewarding experience that involved a broad range of stakeholders from different parts of the world. This volume reflects the final results of the completed sub-global assessments and some of the preliminary results from the other on-going assessments. Since many sub-global assessments have yet to be completed, it is clear that most of the substantive results and long-term impacts are yet to come. Nonetheless, there are already clear lessons for future assessments.

Some of the important recommendations for institutions and individuals interested in starting sub-global assessments include the following:

- Securing adequate funding early in the process is essential. The MA provided seed funding for many assessments, but many subsequently had difficulties securing additional funds to undertake complete assessments.
- Significant effort is necessary for engaging with users and stakeholders, and this needs to be an iterative process that may bring in new actors in the course of the assessment.
- Strong leadership with adequate institutional support is important for a successful assessment.
- Learning from other past and on-going assessments can be very useful, as they may have developed innovative tools and methodologies. Reports can be helpful, but can never fully replace personal interaction, especially in the assessment sites.
- Sub-global assessments take time to complete, as they need broad consultations with a range of stakeholders, and in many cases also need to document or generate additional information.
- Extra care should be taken to avoid raising unrealistic expectations. Assessments are important exercises that can reveal many gaps in knowledge and identify a range of possible response options; but they cannot offer magical solutions to local problems.

12.6.3 Lessons for Multiscale Assessments

The substantive findings from the sub-global assessments provide different, more nuanced perspectives on ecosystem services and human well-being interactions than global studies. Sub-global findings also indicate that ecosystem services, drivers, and response options can change with the scale of analysis. It is at local scales that many of the impacts of drivers of ecosystem change are seen and have the most direct effect on livelihoods.

Some lessons for organizing and implementing groups of multiscale assessments, such as the MA sub-global assessments, include:

- A more rigorous approach to selecting assessments could ensure better geographical coverage and representation of ecosystems, but should be balanced with the opportunities for creativity and innovation arising from a more open and ''bottom up'' selection process.
- Focusing on a smaller set of services across assessments would enable better comparative analysis, but must also recognize the particular needs of user groups in each assessment.
- Training and capacity-building in tools and methodologies (ideally provided early in the assessment process) is essential, especially in the development of scenarios and the conduct of multiscale assessments.
- Whereas a more rigid methodology and protocol may better meet analytical needs for multiscale analyses, a more flexible approach is often necessary to accommodate or adapt to different stakeholders from different scales.
- Conducting full multiscale assessments can improve the overall assessment findings, but is resource- and time-intensive. Depending on the goals of the assessment, full multiscale assessments may or may not be warranted.

Few sub-global assessments were full multiscale assessments. Most were conducted at one or two scales, but accounted for and analyzed cross-scale effects. Nevertheless, the use of approaches and analytical tools to account for cross-scale interactions and comparisons could have been strengthened. Some of the more interesting questions relate to the use of variables across scales and the impacts of external drivers on scenarios and response options. Specifically, cross-scale analysis and comparisons can be strengthened by:

- defining and adopting clear methodologies for cross-scale comparisons, and
- including a larger number of regional (intermediate) scale assessments that can bridge local and global processes.

12.6.4 Lessons for the Overall Design of the MA

The inclusion of sub-global assessments no doubt enriched the MA. Future global assessments should continue to feature sub-global components, as appropriate to the goals of the assessment and with some modifications based on lessons learned.

A key lesson is that a clearly articulated and well-understood conceptual framework is important as a common starting point. However, while strict adherence to the conceptual framework would have facilitated analysis and synthesis of results across sub-global assessments, it would have prevented the expression of alternative frameworks that can more appropriately represent the perspectives of local assessment users and stakeholders. Strict adherence to the MA

conceptual framework and implementation guidelines would also have meant giving up the richness of the information and insights generated from adaptations and modifications to the framework.

In retrospect, the sub-global assessments could have been strictly used by the MA to analyze the interactions between components of the MA conceptual framework in different sociopolitical and ecological contexts. In order to do this, the procedural criteria of the Sub-global Working Group would have had to be more strictly followed, and the assessment sites selected in a ''top-down'' manner to ensure a multiscale, nested assessment design. Assessments could also have been chosen for the specific analysis of particular components of the MA conceptual framework. For example, areas that are strongly affected by specific indirect drivers (such as rapid demographic changes in Southeast Asia, sociopolitical changes in the former Soviet Union, or changes in cultural and religious values in Bhutan) could have been selected in order to link these indirect drivers to direct drivers of change. While this more directed, top-down approach would have facilitated comparison and input to the global MA process, it would have constrained the ability of the sub-global assessments to respond to the needs of their users and stakeholders, where these were not congruent with the needs of the MA. It would also have weakened the prospect of securing local support and contributions to the assessment.

Another important lesson is the need to carefully design the sequence of global and sub-global assessments, and to adopt realistic timelines for implementation. For reasons already discussed, most sub-global assessments took longer than expected to get started and will yield many important results only after the main findings and reports of the MA are published. On hindsight, the parallel implementation of global and sub-global assessments was a structural weakness in the MA design that limited the scope of sub-global assessments to deliver on their potential to substantively and qualitatively improve global assessment results. In this regard, it would have been better to stagger the operations of the MA sub-global and global assessments by a couple of years, so that the global assessment could have benefited from the outcomes of the sub-global assessments.

12.7 Conclusion

The inclusion of the sub-global assessments in the MA design engendered a sense of excitement and mobilized stakeholders that would otherwise have been disengaged from international scientific assessments. In the process, it broadened the range of stakeholders involved in the MA, and enhanced the credibility and relevance of the MA itself. The MA has served an important function in bringing together a disparate group of institutions and people from across the globe to focus on ecosystem services and human well-being. The networking and the interdisciplinary professional connections that have been forged across different regions of the world in the course of the MA represent major social capital formation in the international scientific community. It is important to highlight the high level of participation of scientists and professionals from developing countries, where ecosystems and their services are especially critical for advancing human well-being and development. The significant human and institutional capacity-building that has resulted from this process is expected to continue to lead to further advances in thinking and understanding of interactions between ecosystems and human well-being, and in the design and conduct of future assessments. This will continue beyond the life of the MA, and is already stimulating new initiatives and spin-off activities around the globe.

In closing, we would like to thank all the participants in the sub-global assessment process for their contributions and active engagement in this experiment. We have developed and tested new concepts and ways of working, compared ideas, shared lessons, and learned from one another. The diverse array of places, human activities, institutions, ecosystems, ecosystem services, and development issues analyzed as part of this process are a microcosm of the complex realities, trade-offs, and choices we face. We trust that the sub-global assessments initiated as part of this experiment will have begun in some way—and will continue—to contribute to improving decisions and actions affecting ecosystems and the well-being and livelihoods of people into the future.