

Lessons Learned and Next Steps

As the previous chapters demonstrate, it is possible to compile maps of Kenya that show patterns of ecosystem service availability and use, and explore the relationships that these services have with human well-being and poverty. Kenya has made substantial investments to map many of its most important natural resources using wildlife and resource survey data. Much of this information is available to the public for use in monitoring, assessing, and managing the country's ecosystems.

At the same time, Kenya's technical institutions have established a good track record of providing maps that show the extent of poverty across the country and at various scales. The establishment of the Poverty Analysis and Research Unit at the Central Bureau of Statistics in the Ministry of Planning and National Development and its steady release of maps showing the geographic dimensions of well-being is evidence of the country's commitment to timely and accurate poverty mapping. Kenya thus has the capacity and information to map poverty and other dimensions of well-being across the country and at a scale that allows meaningful examination of its location, the ecosystem services that are nearby, and some indication of how those services influence life in Kenya.

As a result, the country has established a good foundation for analysts to use to examine the spatial relationships between poverty and selected ecosystem services, and for decision-makers to increase their understanding of poverty-environment linkages in specific locations.

LESSONS LEARNED

The following conclusions constitute general findings on the use of the maps presented in this atlas for sociogeographic analysis. More specific observations about selected ecosystem services and poverty can be found in the 'Summing Up' section at the end of the previous chapters.

1. By combining existing maps and data on ecosystem services and human well-being, analysts can create new ecosystem-development indicators.

For example, Chapters 3 through 7 present poverty and demographic profiles for the upper watersheds of Kenya's 'water towers'; the communities within 25 kilometers of the most visited national parks; and croplands with high shares of food crops or woodlots in five Provinces. Each of these indicators captures a certain relationship between resources and residents that can shed light on development in these regions. This approach can now be used to analyze many other ecosystem-development relationships such as: communities within a certain distance of rivers, lakes, and reservoirs; high poverty areas and access to intensively managed cropland; or physical infrastructure, poverty, and major ecosystem services.

2. Decision-makers can examine the spatial relationships among different ecosystem services to shed light on possible competition (i.e., tradeoffs) and synergies among various ecosystem services.

The maps in Chapter 8 overlay different indicators of ecosystem services such as surface water as a dominant source for drinking water, water used for small-scale irrigation, food crop production, milk output, crop diversity, and woodlot densities. These overlays suggest how analysts and policymakers can compare the spatial patterns of various ecosystem-related indicators. This is the first step to more closely examine potential synergies and tradeoffs among different ecosystem services.

3. Decision-makers can examine the spatial relationships between poverty and combinations of ecosystem services.

The overlay of poverty and selected ecosystem services, shown in Chapter 8, highlights whether spatial patterns of selected ecosystem services parallel those of poverty. Decision-makers and analysts can begin to ask questions, such as: Do areas with high poverty rates coincide with areas of low food cropping? Where are the exceptions? For example, in which parts of the upper Tana River watershed is there high milk output but still relatively poor communities?

4. In spite of the usefulness of overlaying maps of ecosystem services and poverty, there are limitations to this approach.

These include:

► *Lack of data to map a comprehensive set of ecosystem services for all of Kenya.*

Data collection systems for natural resources generally focus on sectors and commodities with high economic value or important political constituencies. They typically concentrate on the provisioning aspect of ecosystems such as the supply of food and non-food crops, timber, and fish. Data that capture non-timber forest products or reflect the local use of wetlands or mangrove-coral ecosystems, for example, could correct for some of the bias in the available data. Information on regulating services would also be useful, such as spatial data delineating groundwater recharge zones or areas where rapid changes in vegetation would greatly affect hydrological flows.

► *Inherent limitations of spatial analyses (i.e. map overlays).*

Analysts often lack scientifically valid models with which to link human behavior, ecosystem services, and human welfare. This means that even though they may be able to identify spatial correlations, they may not always be able to pinpoint the cause of poverty or the threats to ecosystem sustainability.

- ▶ *Limitations in the fundamental knowledge of ecosystems and their value.*
Some of the shortcomings in mapping ecosystem services are a result of important gaps in basic ecological science and economics. The current understanding of how various ecosystem processes interact with human interventions is still limited, as is a comprehensive estimation of the economic value of ecosystem services in Kenya.
 - ▶ *Complexity of measuring and monitoring poverty and livelihoods.*
Kenya's poverty maps, based on combining household expenditure information with census data, can only capture certain aspects of human well-being and a limited set of poverty dimensions. Likewise, even though this atlas maps—for the first time—important livelihood components such as hunting, wood gathering, and charcoal production, it cannot adequately represent the variability and complexity of the livelihoods of poor families.
- 5. There are important institutional barriers to measuring and mapping poverty-ecosystem relationships and using this information to inform national policies and decision-making.** These barriers include:
- ▶ *Lack of awareness about ecosystems and ecosystem processes.*
The findings of the Millennium Ecosystem Assessment, a global effort to assess ecosystem conditions and the links to human well-being, were released in 2005. The southern African component of this assessment demonstrated that ecosystems can be examined at various scales (including multiple countries, a large river basin, the area surrounding a protected area, and local communities), and that the resulting information can be linked to national development goals (Scholes and Biggs 2004; Biggs et al. 2005). In spite of this success, most

countries have not fully adopted the ecosystem-oriented approach whose usefulness the Millennium Ecosystem Assessment proved. This is true in Kenya as well, where ecosystem thinking is still vying with a traditional sectoral focus.

- ▶ *A sectoral mandate among government institutions that works against cross-cutting analysis involving multiple ecosystem services and poverty.*
Mapping a set of ecosystem services and examining the links between these services and poverty requires data and expertise from a number of institutions within and outside government. However, the mandate of many government institutions focuses narrowly on sectors in the economy such as agriculture, fisheries, urban affairs, transportation, water, forests, etc. Central government budgets are designed to support these mandates, generally leaving a relatively small amount of funds and staff support for more integrated cross-sectoral work, such as environmental reporting and ecosystem mapping.
- ▶ *Insufficient promotion of interdisciplinary analysis.*
Mapping poverty and ecosystem services and analyzing the linkages between them requires an interdisciplinary approach, since no single individual generally has the wide range of expertise needed. Currently, the commitment to such an approach—in training and resources—is often lacking.

NEXT STEPS

Using the data and concepts demonstrated in this atlas, analysts and decision-makers in Kenyan institutions can initiate a comprehensive accounting of ecosystem services for the country. They can continue to develop new approaches to better integrate poverty-ecosystem relationships in national policies and decision-making. They can foster a better understanding among legislators of these poverty-ecosystem links. And they can apply ecosystem principles and the approach taken by the Millennium Ecosystem Assessment to national and local environmental reporting.

Accomplishing this would result in programs for poverty reduction that take into account where the poor live and what ecosystem services they depend upon, how these are changing and what opportunities exist to invest in enhancing ecosystem services to support sustainable rural livelihoods. It would improve the targeting of social expenditures and ecosystem interventions so that they reach the areas of greatest need. And it would make available to decision-makers—both in the public and private sectors—an array of spatial information that could inform their decisions on a range of resource and social issues.

Achieving such outcomes will require leadership by the Ministry of Planning and National Development and the Ministry of Environment and Natural Resources, as well as creative contributions from actors outside of government. It will require actions in four areas:

1. Use and communicate the atlas.

Many organizations can use this atlas and its underlying data. The following activities would help to create a network of users:

- ▶ *Make the underlying spatial data in this atlas publicly available.*
Making these data available at no cost can create opportunities for developing new products, conducting new analyses, and exploring other opportunities for integrating poverty and ecosystem data. The collaborating institutions have agreed to make the core spatial data sets available on the Internet once the atlas has been published.

- ▶ *Encourage development and dissemination of additional products.*
Presentation slides of key maps can increase their use by senior decision-makers. Incorporating maps and articles into newspapers, magazines, and television and radio programs will enhance the communication of key messages to selected target audiences and the public. The collaborating institutions have agreed to seek opportunities to widen the use of the atlas.
- ▶ *Incorporate maps and information on ecosystem services in Kenya's next state of the environment report and other environmental reporting efforts.*
Periodic reports on the state of the environment can benefit from the use and application of the spatial information contained herein. Furthermore, environmental profiles of Districts and other subnational administrative assessments can adapt poverty and ecosystem maps using the GIS files from this project.
- ▶ *Introduce poverty and ecosystem services maps into sectoral reporting.*
Sector assessments on agriculture, water resources, biodiversity, wildlife, forestry, and others can take advantage of the data and analyses to highlight poverty-ecosystem relationships in considerably more detail.
- ▶ *Inject maps and information on ecosystem services into future poverty analyses.*
The second volume on the geographic dimensions of well-being in Kenya (CBS 2005) examined relationships between education levels and poverty, and between gender-specific variables and levels of poverty. The Poverty Analysis and Research Unit could take the lead and work with other government agencies to

better integrate maps and information on ecosystem services in their future work. Research organizations such as the Kenya Institute for Public Policy Research and Analysis, World Agroforestry Centre, and International Livestock Research Institute could draw on some of the underlying environmental data and use them to investigate to what degree geographic factors (e.g., remoteness and agroecological endowment) determine poverty patterns in Kenya (i.e., studies on the spatial determinants of poverty).

► *Integrate maps and information on ecosystem services into coursework.*

Professors and lecturers can use the data and materials from this atlas in courses on environment, development, and planning. These and other public data can help students to improve the relevance of their research projects to various sectoral areas.

► *Prepare guidance and training materials to enable other countries to develop their own maps.*

Encourage development cooperation partners to coordinate funding for such materials and mapping efforts.

2. Build the knowledge base for mapping ecosystem services and for examining the relationships between poverty and ecosystem services.

There are numerous ways to improve upon this atlas and expand into new areas of research and analysis. Some of the efforts proposed below are directly applicable to ongoing government planning and decision-making. Others are more fundamental and long term, requiring leadership from universities and national and international research centers. They include the following activities:

► *Expand mapping and spatial analyses to include more ecosystem services.*

Mapping an expanded range of ecosystem services (e.g., areas important for water regulation, water purification, or climate mitigation; important supply areas of wild plants for food security) could directly contribute to several government programs now under way. For example, a few of the six Regional Development Authorities under the Ministry of Regional Development Authorities have begun implementing catchment conservation programs or have mapped resource availability and use for long-range, integrated regional development master plans (RoK 2006). Additional information on which areas are important for hydrological services or other important regulating services could greatly enhance these plans. Similarly, the National Environment Management Authority could commission studies to map some of these services and present a more comprehensive picture of ecosystem accounting in Kenya's next state of the environment report.

► *Integrate ecological processes into future mapping of ecosystem services and use more sophisticated tools to analyze patterns and spatial relationships.*

It is clear that maps reflecting a deeper understanding of ecological processes such as soil erosion, nutrient flows, and hydrological processes can provide an enhanced picture of whether ecosystems can continue to produce food, fiber, and other services. Similarly, analysts can adopt tools such as spatial econometrics to understand the complex interactions between resource use and well-being. Such efforts go beyond the mandate, resources, and skills of most government agencies, but several international research organizations, such as the World Agroforestry Centre and the International Livestock Research Institute in collaboration with national partners, are already carrying out work in these areas. These research organizations could continue to refine and extend the mapping and spatial analysis undertaken here in order to clarify the role of

environmental resources in reducing poverty and creating economic opportunities.

3. Use geospatial information to inform policy, planning, and implementation.

The maps in this atlas provide insights into national development patterns and can be used to plan and implement policies and programs aimed at locations that have high poverty rates. The text boxes titled 'Linking the Maps to Decision-Making' in Chapters 3–7 include suggestions on how maps and spatial analyses could be used to address broad national strategies and plans (see the chapters on water, food, and tourism) or to address issues such as wildlife management, preservation of biodiversity, or the charcoal industry (see the chapters on biodiversity and wood).

While there are numerous opportunities to adapt the underlying spatial data and ideas to specific policy and planning processes, efforts in three general areas would particularly benefit from the approach used in this atlas:

► *Shaping national strategies and plans such as the Economic Recovery Strategy and the Millennium Development Goals (MDGs).*

A follow-up to Kenya's *Economic Recovery Strategy* (GoK 2003) will need to be developed in 2007. The report on *Millennium Development Goals in Kenya, Needs & Costs* has already pointed out the investments required to close the country's information gap regarding ecosystem services (MoPND et al. 2005). Plans to implement the MDGs could benefit from a more systematic examination of the linkages between different MDG targets. For example, are the planned investments to promote higher food production, increased water use, and income generation through growth in the agriculture and tourism sectors in line with the capacity of ecosystems to provide these services? The Millennium Ecosystem Assessment

carried out such an examination, finding that at least four of the eight MDGs (i.e., reducing hunger, lowering child mortality, combating diseases, and ensuring environmental sustainability) could not be met unless action was taken to stabilize the supply of ecosystem services (MA 2005). It is recommended that ecosystem services mapping take on a greater role in the process of determining what actions might be effective in stabilizing ecosystem services and balancing needed growth in agriculture, energy production, and tourism.

► *Formulating cross-sectoral policies.*

Developing and implementing food security policies and formulating a new wildlife policy are examples of cross-sectoral policymaking. Such cross-cutting decisions require consideration of a range of resource and social issues. For example, to formulate a new wildlife policy, issues of land tenure, land use and zoning, forest management, water use and water quality, poverty reduction, and pastoralism have to be taken into account. Such policies also require integration with other related ones, such as the Forest Bill of 2005, the draft Livestock Policy, the Arid and Semi-Arid Lands Policy, the Environmental Policy, and the Land Policy. In addition, they must be aligned with national strategies like the *Economic Recovery Strategy* and plans outlined in the National Session Papers. To support such cross-cutting work, it is recommended that the policymakers and technical agencies involved take advantage of already existing spatial information on ecosystem services and poverty. With the help of additional analysis and information products that could be derived from these maps, these actors will be able to move to more fact- and evidence-based policy processes.

► *Improving local land use planning, zoning, and management plans.*

The idea of mapping key supply areas for ecosystem services and the use of spatial overlays to link poverty and environmental issues can

be adapted to the local level, although many local planning activities will require more detailed data in addition to what is provided in this atlas. It is recommended that local actors responsible for these planning efforts look carefully at some of the ideas and examples in this publication.

4. Strengthen institutions to research and study poverty-ecosystem relationships.

Enhancing the research and analytical skills needed to examine poverty-ecosystem relationships will require the following efforts:

- ▶ *Continue to develop technical and analytical skills for spatial analysis within Kenyan institutions.* Building technical capacity to collect data, compile maps, and carry out further analyses of poverty-environment linkages will be valuable for sectoral planning and reporting. Strengthening institutions such as Kenya Wildlife Services, Department of Resource Surveys and Remote Sensing, National Environment Management Authority, Forest Department, Kenya Agriculture Research Institute, and other national research centers will advance the analyses and understanding of poverty-ecosystem relationships.

It is equally important to expand the use of the ecosystem service approach in ministries mandated to promote industrial, transport, housing, and urban development. It is these agencies (and the private sector) that will have the greatest impact on the extent and condition of ecosystems. This will not only help in formulating sector-specific policies, but will also assist with better implementation, and will be useful for cross-sectoral work.

It is recommended that the chief executives of the above-mentioned institutions continue to invest in developing GIS data and spatial analytical skills to support more effective and efficient natural resource use and better integration of poverty-environment issues. These individual sectoral investments need to be well coordinated to avoid duplication in GIS data collection and to fit within Kenya's overall effort to build its national spatial data infrastructure.

- ▶ *Establish a technical working group to promote integrated spatial analyses for implementing the MDG needs assessment and the Economic Recovery Strategy (and its successor strategy).*

Such a technical working group would include key data providers and research centers. The technical staff and the chief executives of the institutions contributing to this atlas could form the nucleus of such a team. This group could foster data exchange and promote integrated analysis to better understand the relationships between poverty and ecosystem services. They could also be a catalyst for enabling easier and more direct data sharing and for formulating a national data and information policy supporting this objective.

- ▶ *Establish a new technical unit that could spearhead more integrated and cross-cutting work involving multiple ecosystem services and poverty.*

Experience shows that investments in collecting census and household survey data, building technical skills to produce poverty maps, and funding and staffing a poverty analysis unit within the Ministry of Planning and National Development can produce information that is useful far beyond the financial or macroeconomic sector. These investments have led to a much better understanding of the prevalence and severity of poverty in the country. And they have led to improved national planning for resource allocation to the poor, for

example, by putting forward 'objective' criteria to allocate funds under the Constituency Development Funds. These criteria can now be debated and modified, thus making the process more transparent and more effective.

Kenya's successful development and use of poverty maps should serve as an incentive to create maps of ecosystem services and poverty-environment overlays. However, this will require institutional changes and resources that foster cross-sectoral collaboration.

It is recommended that high-level decision-makers actively search for opportunities to establish a cross-cutting unit or expand and better coordinate the mandates of existing units. The latter include: the Poverty Analysis and Research Unit at the Central Bureau of Statistics in the Ministry of Planning and National Development; the Geo-Information Unit of the Department of Resource Surveys and Remote Sensing in the Ministry of Environment and Natural Resources; the Agricultural Sector Coordination Unit; the Agricultural Information Resource Center; and the Arid Lands Resource Management Project.

- ▶ *Seek better integration of spatial information in monitoring and evaluation efforts.*

Various institutions responsible for activities in the agriculture and rural development sector have indicated that they are having difficulty establishing effective monitoring and evaluation systems for their programs (RoK 2006). These institutions could examine how investing in more compatible monitoring efforts and additional data collection can help to address some of these constraints.

In the same way, national monitoring and evaluation efforts can become the driver for better-integrated spatial information that would enhance analysis of poverty-environment relationships. Selected monitoring and evaluation activities led by the Ministry of Planning and National Development are covering a broad set of ecosystem and human well-being indicators. For example, a new Monitoring and Evaluation Department has been established to assess progress toward the MDGs (MoPND 2005). Similarly, the Central Bureau of Statistics collects data for MDG-related indicators, provides statistical support to measure progress on the *Economic Recovery Strategy*, and produces regular statistics on the spatial patterns of poverty and well-being in Kenya.

It is recommended that policymakers and technical agencies responsible for establishing national monitoring and evaluation systems reassess the role of spatial information in these efforts and identify opportunities where better integration of spatial information would strengthen these systems.