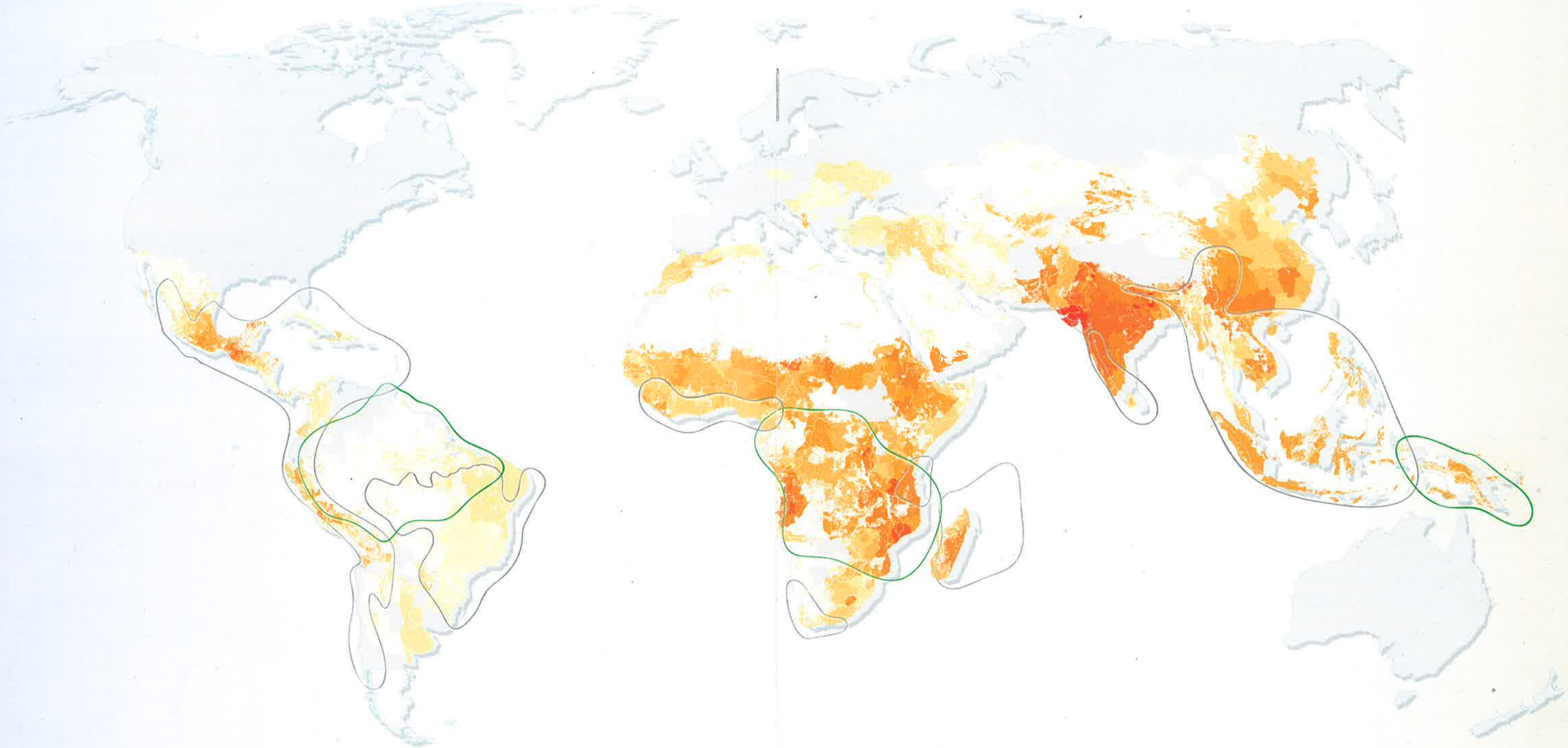
Poverty-Conservation Mapping

The geography of poverty and biodiversity



Prevalence of stunting among children under five, in areas of >2 inhabitants/sq km

0 — 100

Selected major wilderness areas

Selected terrestrial biodiversity hotspots

No data Low population density

Sources: FAO 2004, Landscan 2002, Conservation International 2003

GRID Arendal

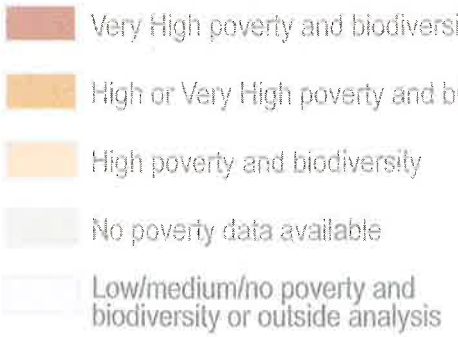
ADB

COOPERAZIONE ITALIANA ITALIAN COOPERATION

IUCN The World Conservation Union

Contents

Attached to the back cover of this publication is a CD-ROM containing the presentations, posters and documents pertaining to the workshop entitled Mapping Poverty & Conservation Linkages: Using Decision-Support-System Tools to Help Implement the MDGs, which took place during the 3rd IUCN World Conservation Congress held in Bangkok in November 2004.



Photos:

Covers, Contents, p19: UNEP/GRID-Arendal • p3 top, from left: Jorge Herrera, CI, CI • p3 bottom, from left: IUCN/WWRP/Lucas Chambers, Angela Martin, IUCN/Wendy Strahm, Angela Martin • p7, from top: Anthea Stephens, E.G. Barrow, Anthea Stephens, Anthea Stephens, IUCN/Lucas Chambers • p8, from left: IUCN, Anthea Stephens • p10, CI • p14, from top: CI, IUCN/WWRP/Hans Friederich • P15, from top: IUCN/WWRP/Elroy Bos, IUCN/WWRP/Hans Friederich, Somjai Srimongkontip, IUCN • p18, from left: IUCN/Eric Meusch, IUCN/Jim Thorsell, Angela Martin

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with grateful acknowledgement to all contributors from IUCN, its members and partners as follows:
Italian Cooperation
Asian Development Bank
Conservation International
World Resources Institute
UNEP
UNDP
University of Bergamo, Italy
with special thanks to:
UNEP/GRID-Arendal
for the document they prepared on Poverty-Conservation Mapping Applications (included on CD-ROM) written by Mathilde Snel, reviewed by Hugo Ahlenius, Marianne Fernagut and Otto Simonett

Printed by:
Ropress, Zürich, Switzerland, on RePrint FSC® paper
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Introduction

IUCN with its vision of a "just world that values and conserves nature" believes that poverty-focused conservation has both ethical and practical perspectives that need to be addressed. Ethically speaking, it is unacceptable to conduct conservation activities in areas of poverty while neglecting the socio-economic and political needs of the people who live there, and who depend on some of the natural resources conservationists are trying to protect. Practically speaking, conservation activities in such areas are generally more effective if they are based on socially responsible practices that can secure and sustain wide public support.

Poverty-environment mapping offers a valuable tool to support poverty-focused conservation. Maps of poverty and environmental conditions can pinpoint opportunities for development and are useful to donors and development agencies in allocating investment and targeting activities. Several international institutions have been doing very important work on mapping poverty related indicators and exploring their links with environmental factors.

This publication aims to communicate and illustrate the poverty-environment mapping efforts of several of these organizations in order to enhance and improve knowledge of the methodologies and indicators being employed.

The initiatives described in this booklet are the work of the institutions that presented at the 3rd IUCN World Conservation Congress held in Bangkok in November 2004, at a workshop entitled *Mapping Poverty & Conservation Linkages: Using Decision-Support-System Tools to Help Implement the MDGs.*

Poverty-Conservation Mapping Applications

Why? Objectives

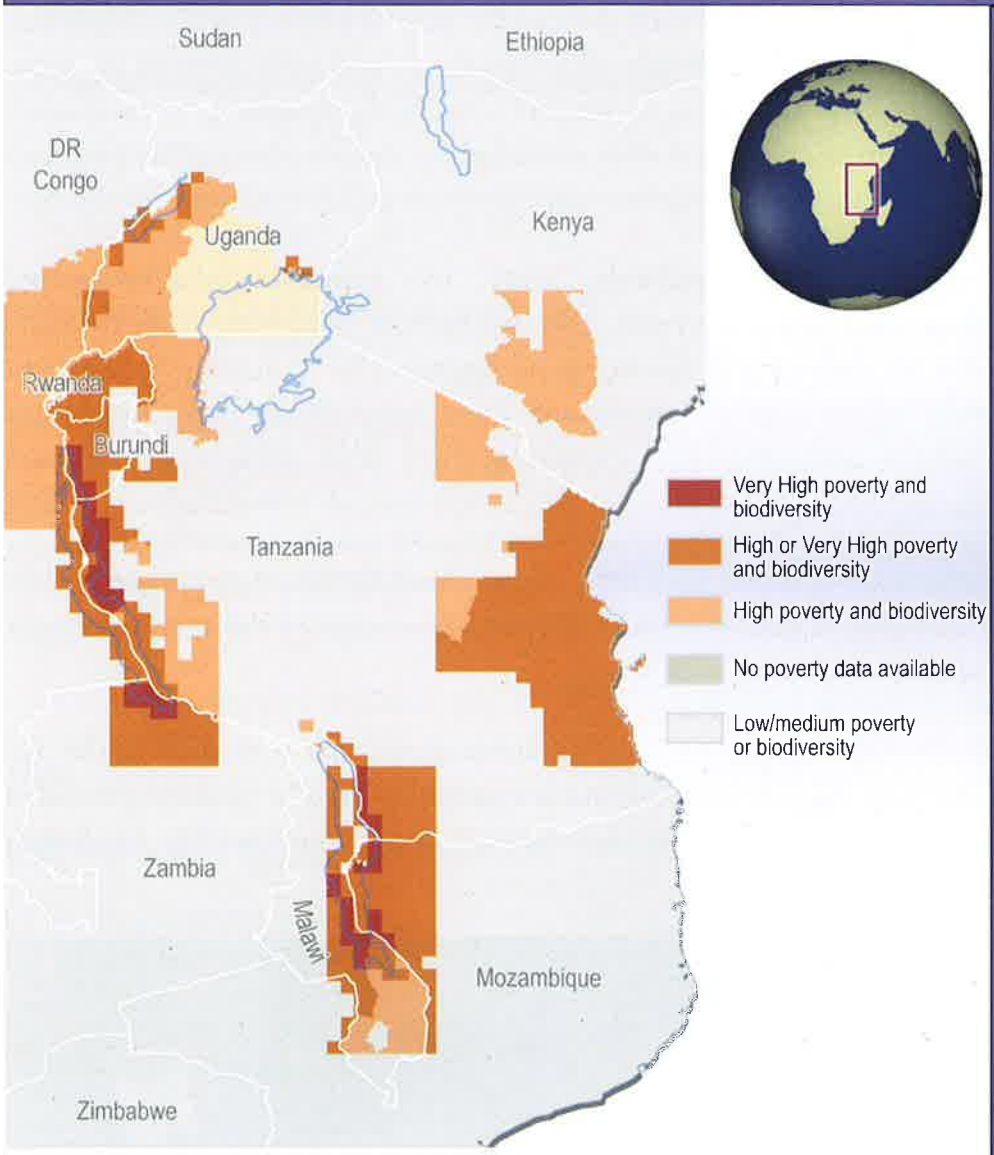
Mapping applications as they pertain to the four themes of the IUCN World Conservation Forum, Bangkok, Thailand, 18-20 November 2004:

Ecosystem Management
- Identification of opportunities for pro-poor ecosystem management;
- Substantiating that biological resources play a key role in food security;
- Indicating the role of small-scale farmers in preserving biological diversity;
- Substantiating that biologically rich areas are in developing countries;
- Integrating poverty-conservation maps in poverty reduction strategies.

Health, Poverty and Conservation
- Identifying areas that are vulnerable to infectious disease outbreaks;
- Substantiating that biological resources are a critical substitute for health care services in rural areas.

Biodiversity Loss and Species Extinction
- Identifying biodiversity threats due to environmental changes and shocks;
- Evaluating the impacts of biological invasive alien species.

Markets, Business and the Environment
- Identifying municipalities and districts for pro-poor conservation royalties.

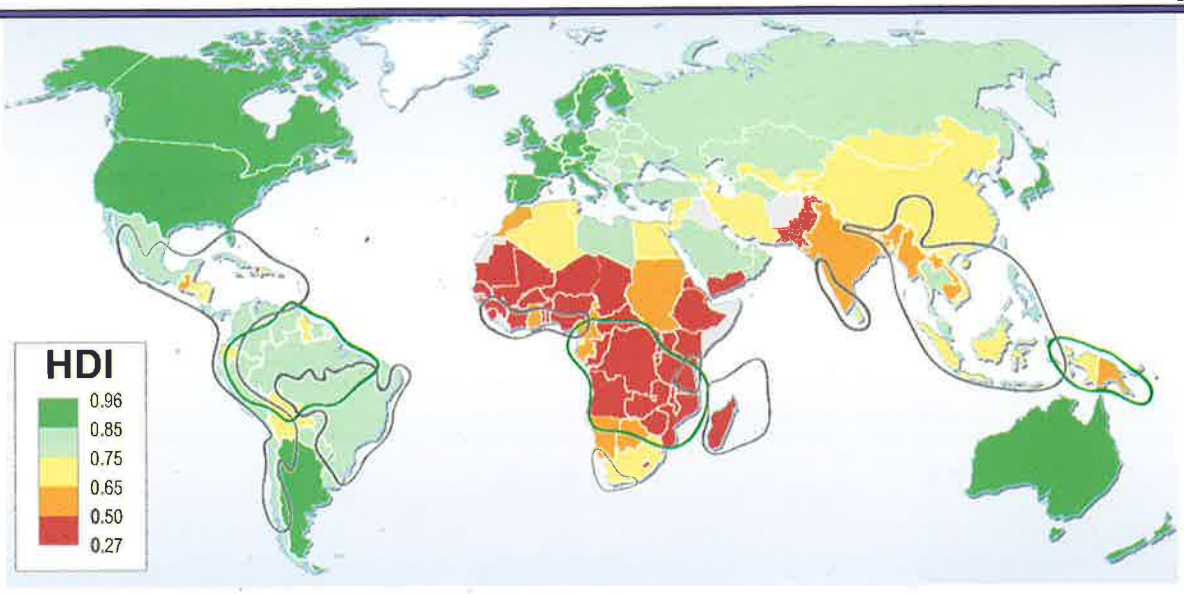


Sources: FAO 2004, IUCN 2004

Poverty proxy calculated as areas with very high (50-74%) and high (40-50%) percentage of children with stunted growth, with data collected per administrative unit.
Biodiversity proxy as a composite index averaged from normalized freshwater species density grids (molluscs, fish, odonata, crabs). The data was further classified as very high (0.4 - 0.7) and high (0.1 - 0.4).

Looking Forward

There are numerous potential poverty-conservation mapping applications of interest to IUCN and its members. Such applications include substantiating biodiversity's role in food security to geographically targeting areas for pro-poor conservation management. Although maps and mapping applications offer an important tool to improve understanding of the relationship between poverty and conservation, their use is not a panacea for solving poverty-conservation problems. Mapping applications need to be used together, not in lieu of, other approaches, such as multi-level socio-economic assessments, traditional and community-based knowledge, and statistical analyses.



Sources: UNDP 2004, Conservation International 2004

Developing countries and areas of high ecological significance. *An overview of the development status of developing countries and areas of high ecological significance show that some of the World's least developed countries are located in tropical hotspots and wilderness areas, especially in Africa, the Caribbean, and South Asia. Note that the HDI (Human Development Index) is a composite index based on education, health and economy.*

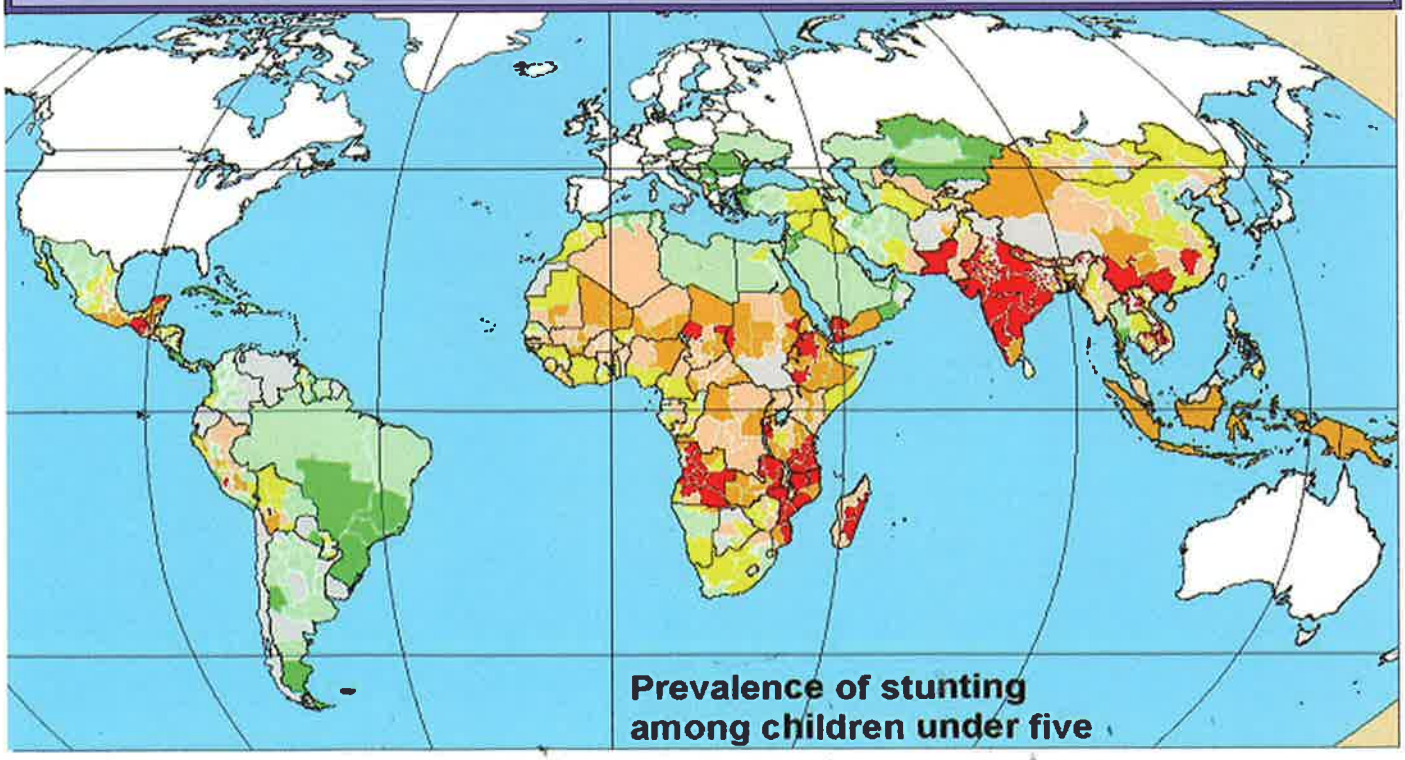
Strengths and Weaknesses of Maps and Mapping Applications

Strengths

- Effective in presenting information and communicating findings;
- Maps can be extremely powerful communication tools and convey information and patterns that are difficult to express verbally;
- Can be used to identify and investigate spatial patterns;
- Are an effective means of recording and storing information.

Weaknesses

- Most maps represent only a snapshot of the situation;
- Maps can quickly become out-dated;
- Work intensive and costly;
- Gaining access to spatially referenced information is often difficult;
- Not all people readily relate to information in a two-dimensional spatial format; different cultures place different importance or meaning on symbols and colours;
- High cost and rapidly changing technologies.



World Resources Institute (WRI) - Janet Ranganathan, Norbert Henninger & Janet Nackoney

Mapping Ecosystem Services and Poverty in Kenya

How? Methodology

Linkages between poverty, ecosystems, governance and accountability can be made by answering the following questions:

- Where are the poor?
- Which areas provide what amount of ecosystem goods & services?
- How does the location of poverty relate to the distribution of ecosystem services?
- Who has access to ecosystem services, who benefits, who bears the costs and how can policy-makers improve the situation?

WRI used the approach of mapping major ecosystems to answer these questions.

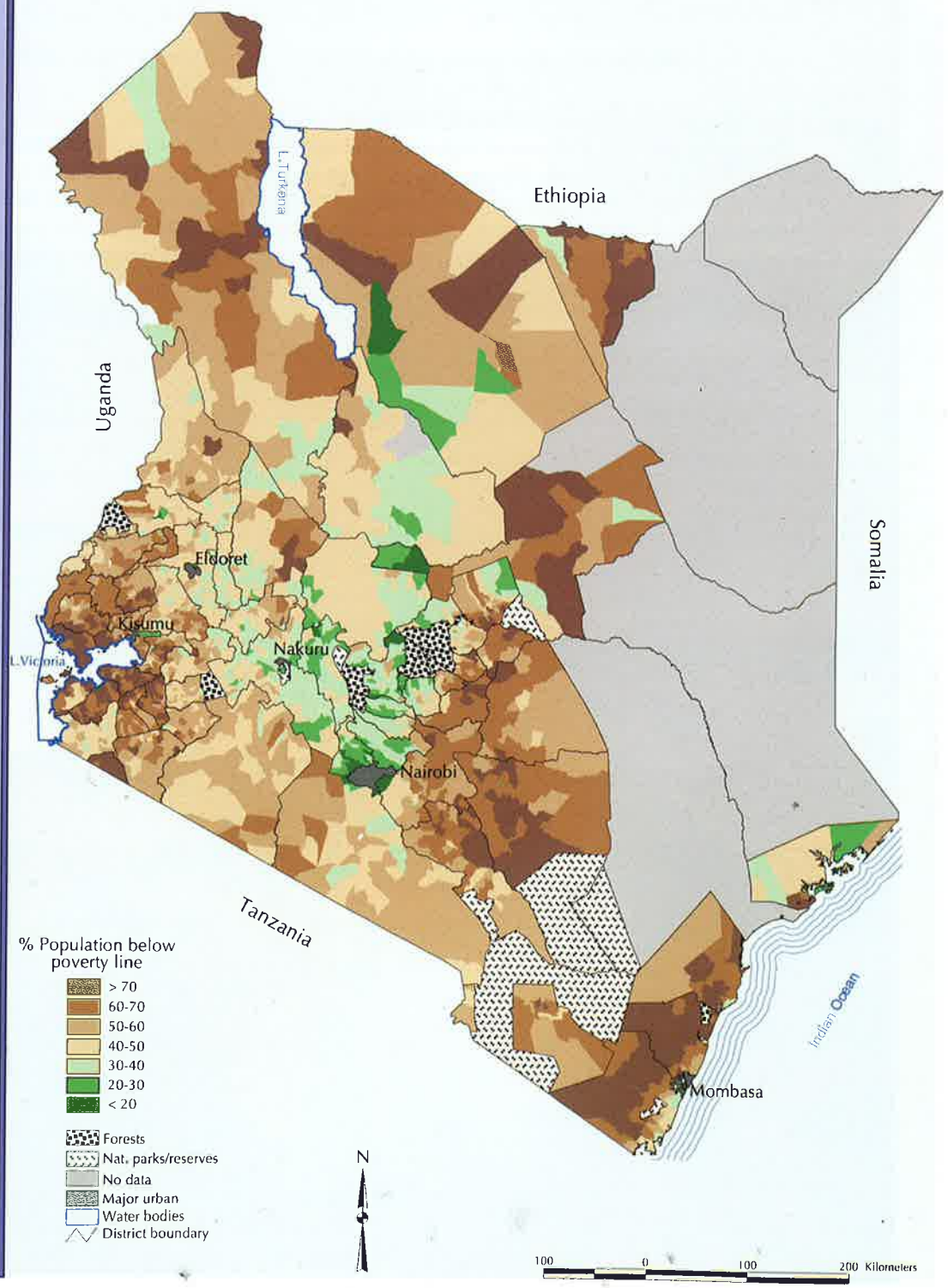
What they found

Where are the poor?
A new supply of high-resolution and reliable poverty estimates for Kenya and Uganda made it possible for the project leaders to map poverty. This map indicates the Percentage of the Rural Population Living below the Poverty Line by Location. They also mapped the number of poor persons per square kilometer by location (see presentation in enclosed CD-ROM).

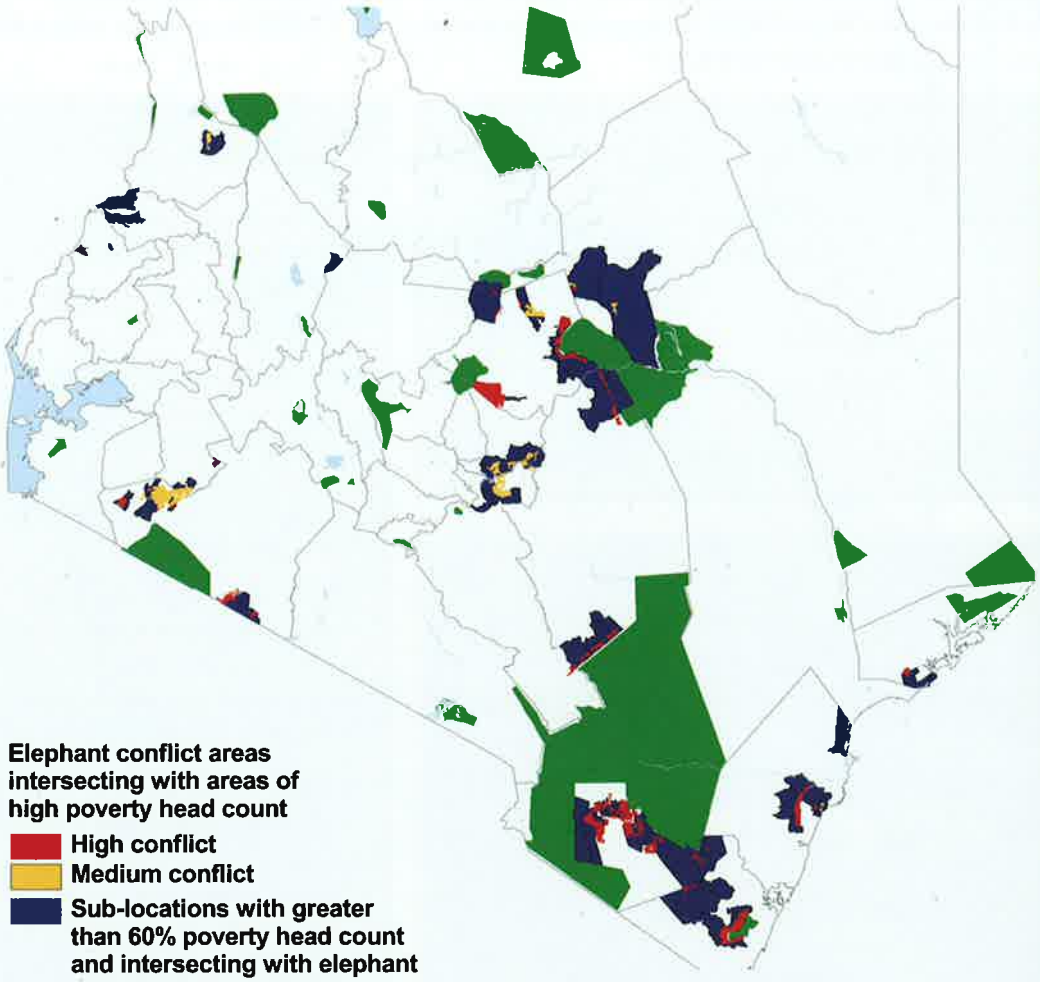
Which areas provide ecosystem services and in what quantity?
They illustrated the areas providing ecosystem services such as food from crops, livestock, fish, wildlife, water (quantity, quality, flood control), biodiversity, tourism and recreation, fuel and energy, timber and housing material.

Finally, they combined these layers to highlight relationships and produced maps of Ecosystem Disservices such as intersecting poverty with elephant conflict areas. (see map on page 7)

Kenya: Percent of Rural Population below Poverty Line - Location Level



Administrative Districts with High Poverty Rates Intersecting with Elephant Conflict Areas in Kenya



Data Source: World Conservation Union (IUCN), World Conservation Monitoring Centre, and FAO Africover.

Why? Key Objectives

The chosen approach stemmed from the following key objectives:

- To break down sectoral parochialism and improve the effectiveness of poverty reduction efforts;
- To provide civil society groups with the tools required to push for poverty reduction efforts that take into account the provision of ecosystem services;
- To increase environmental reporting and the status of environmental management authorities in poverty reduction efforts.

Looking Forward

Future efforts will focus on:

- working with government and civil society to integrate findings into policy processes;
- raising funds to do similar work in Uganda (2006);
- exploring options to replicate methods and experiences in other countries.

The goal of these initiatives is to transform thinking in ministries of planning, finance and development in such a way that ecosystem stewardship is perceived as a key foundation of national development.

Mapping Ecosystem Services and Poverty in Rwanda

Charles McNeill presented a case study on the links between poverty and the environment in Rwanda and described UNDP's efforts to use Poverty-Environment Maps (PEM) to support the formulation of a UNDP program on sustainable livelihoods and the Millennium Development Goals (MDGs).

How? Methodology

The methodology included identification of key poverty-environment relationships, review of information sources, collection, processing and integration of data.

The key Poverty-Environment indicators were identified as follows:

- soil degradation, agriculture, livestock, demography
- water access ↔ human settlements
- deforestation and ecosystem degradation ↔ agriculture, energy, population

What they found

In Rwanda, the topology of the Poverty-Environment connection shows two main relationships:

- **Good water availability + Good agricultural conditions + High demographic pressures + High level of threats on ecosystems**

The intervention in this zone should lead to control of growth of population, moderation of immigration and development of activities in other regions.

- **Degraded zones with low population density**

In this zone resettlement and development of non-agricultural activities is required.

Why? Key Objectives

The objective of the PEM was to link poverty indicators to indicators of natural resources, specifically status, pressures, access to and potential of environmental resources. This would help develop a knowledge base on the poverty-environment nexus in Rwanda, providing policy-makers with timely information to develop supportive strategies for addressing solutions to the poverty-environment concerns of poor people.

For the UNDP, Poverty-Environment Mapping is an informational tool providing quantification and spatial representation of Poverty-Environment linkages in support of transparency of information, negotiation, and policy decision-making.

PEM provides a broad picture of the situation (challenges and potential). It's a simple tool, though not the only one to support decision-making. It builds national expertise, national "product" and focuses on water, land and related poverty issues.

Looking Forward

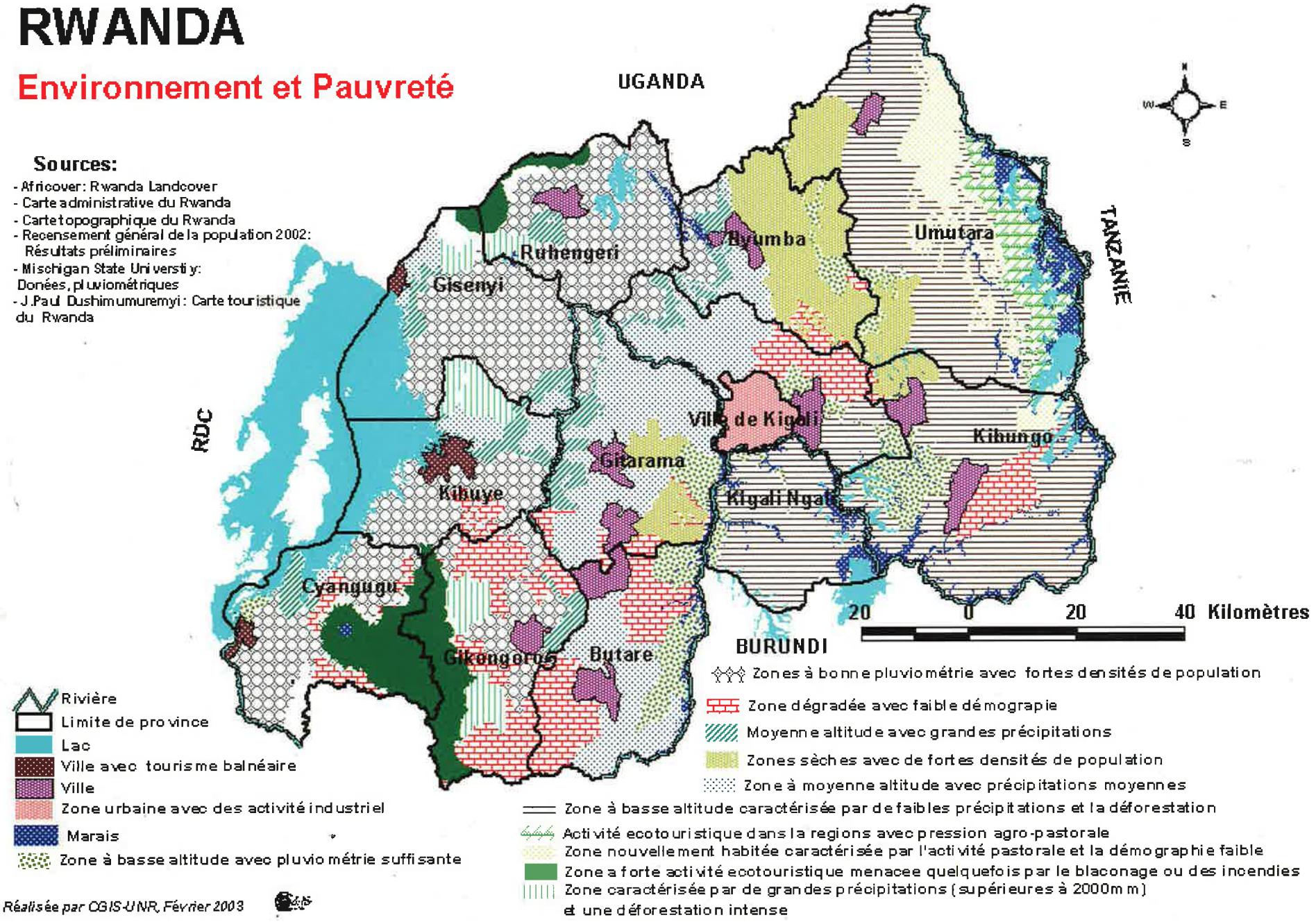
UNDP will now focus on filling the gaps in data, methodology, participation and capacity development.

Next steps:

- Incorporation of PEM into national policy processes (PRSPs, food security, sectoral programmes, national MDG Reports, etc.);
- Focus on other key areas: health, vulnerability;
- Develop an information system for environment, building on PEM;
- Data/GIS refinements: the scaling issue, the quality of data;
- Desegregation of data: urban/rural, gender.

RWANDA

Environnement et Pauvreté



Sources:

- Africover: Rwanda Landcover
- Carte administrative du Rwanda
- Carte topographique du Rwanda
- Recensement général de la population 2002: Résultats préliminaires
- Mischigan State Universtiy: Donées, pluviométriques
- J.Paul Dushimumuremyi: Carte touristique du Rwanda

Rivière
Limite de province
Lac
Ville avec tourisme balnéaire
Ville
Zone urbaine avec des activité industriel
Marais
Zone à basse altitude avec pluviométrie suffisante

Zones à bonne pluviométrie avec fortes densités de population
Zone dégradée avec faible démograpie
Moyenne altitude avec grandes précipitations
Zones sèches avec de fortes densités de population
Zone à moyenne altitude avec précipitations moyennes
Zone à basse altitude caractérisée par de faibles précipitations et la déforestation
Activité ecotouristique dans la regions avec pression agro-pastorale
Zone nouvellement habitée caractérisée par l'activité pastorale et la démographie faible
Zone a forte activité ecotouristique menacee quelquefois par le blaconage ou des incendies
Zone caractérisée par de grandes précipitations (supérieures à 2000mm) et une déforestation intense

Réalisée par CGIS-UNR, Février 2003

Focusing on Biodiversity Conservation and Supporting Poverty Reduction

CI's Mission is to conserve Earth's living heritage, its global biodiversity & to demonstrate that human societies can live harmoniously with nature.

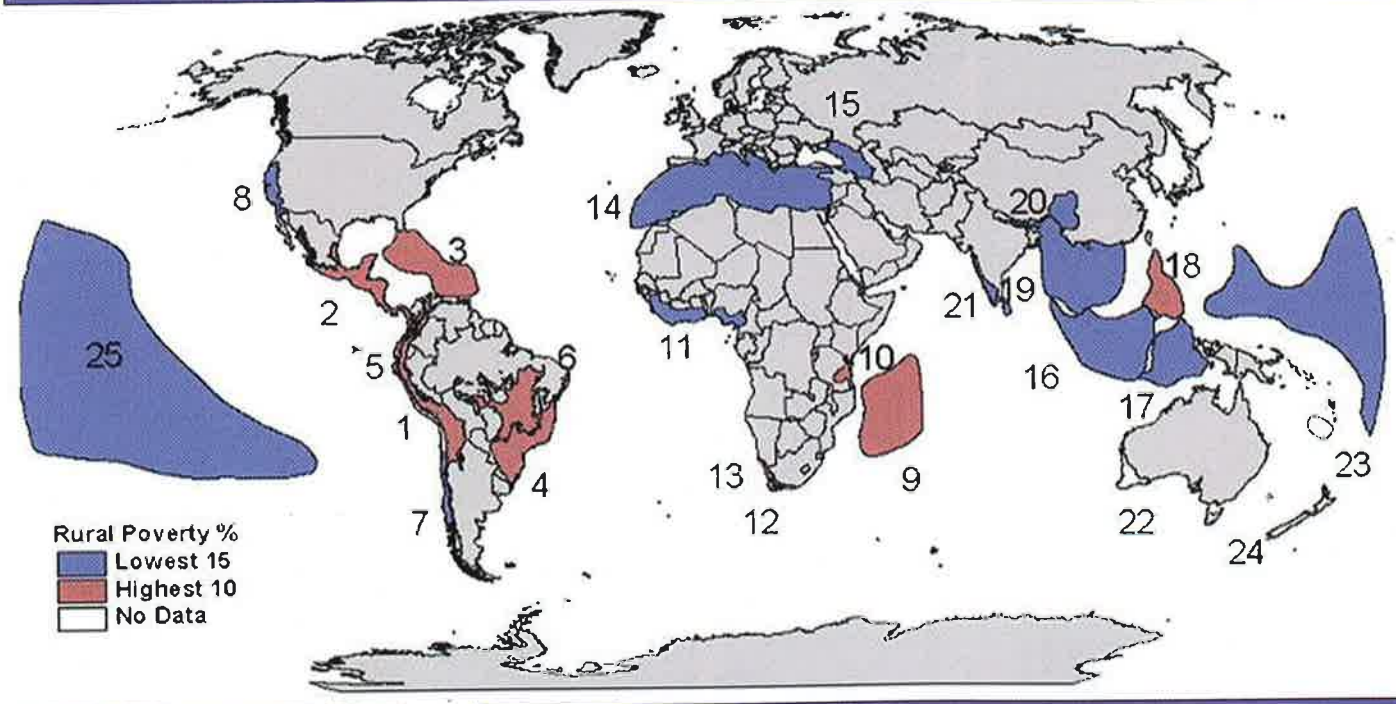
How? Methodology

Biodiversity Conservation & Poverty Reduction have multiple links. Some of these links can be understood by spatial representation and further addressed by:

- Facilitating empowerment of the poor through smallholder farmers; landless; women-headed households; indigenous, ethnic, mobile, traditional, or other populations;
- Building income or assets for the poor through management of biological and natural resource assets, improved human resource assets;
- Reducing vulnerability and/or enhancing poor people's security through:
  - Reduction of resource depletion (e.g. overfishing, bushmeat hunting);
  - Reduction of resource degradation (e.g. soil erosion, water contamination, habitat fragmentation, knowledge and genetic losses);
  - Reduction of shocks or disasters (e.g. from flooding, fire, or drought).

Poverty-environment links can vary at different scales, from global to hotspots, to national planning, to corridors and sites.

An analysis was conducted at the hotspot level and included indicators such as percentage of HIV in the hotspot, percentage of rural poor in the hotspot, rural population density, total population density, etc. All of these indicators were combined and given a ranking score.

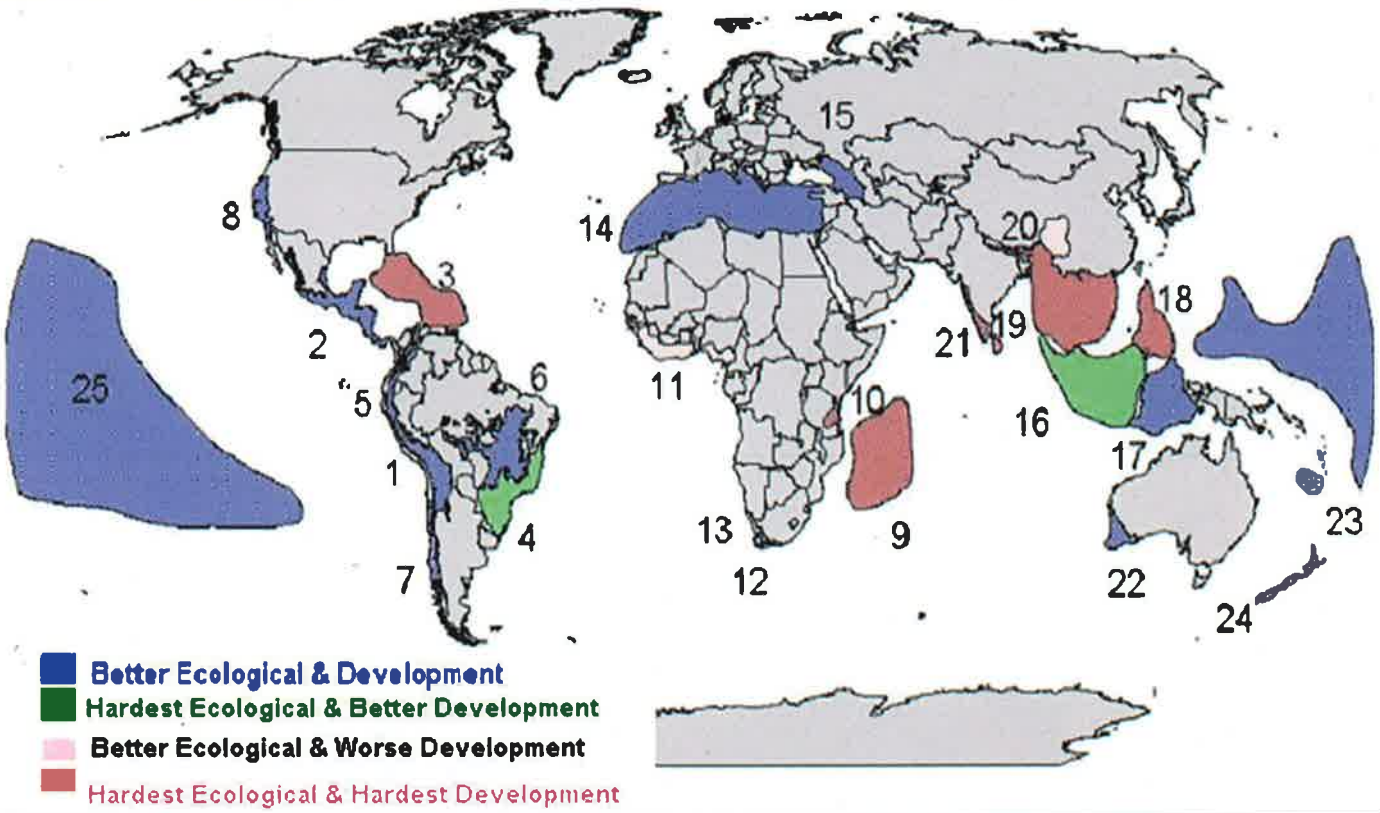


What they found

The outcomes of this exercise are maps of hotspots with a development context.
The hotspots were categorized into 4 classes:

- better ecological and better development
- harder ecological and better development
- harder ecological and harder development
- better ecological and harder development

The opportunity of cost of conservation indicates where investment is needed.



Why? Application

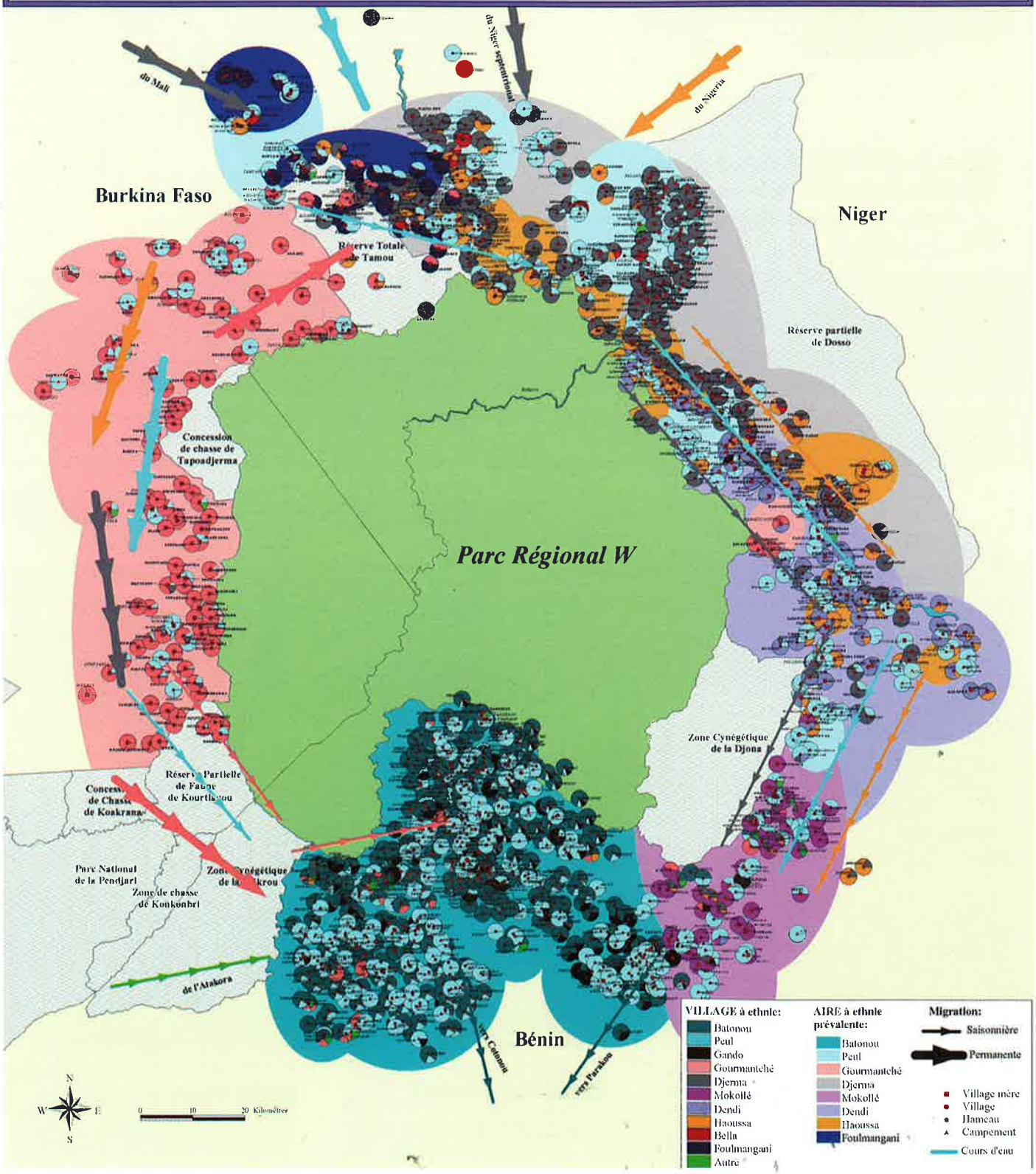
Principles can be identified for ecosystem management such as in the example below, how to create small-scale corridors that link different kinds of areas. In particular, restoration is needed in many places in the Atlantic Forest of Brazil, and is providing a potential way to create employment while supporting biodiversity. Development can be directed to places appropriate for agroforestry and intensive agriculture.

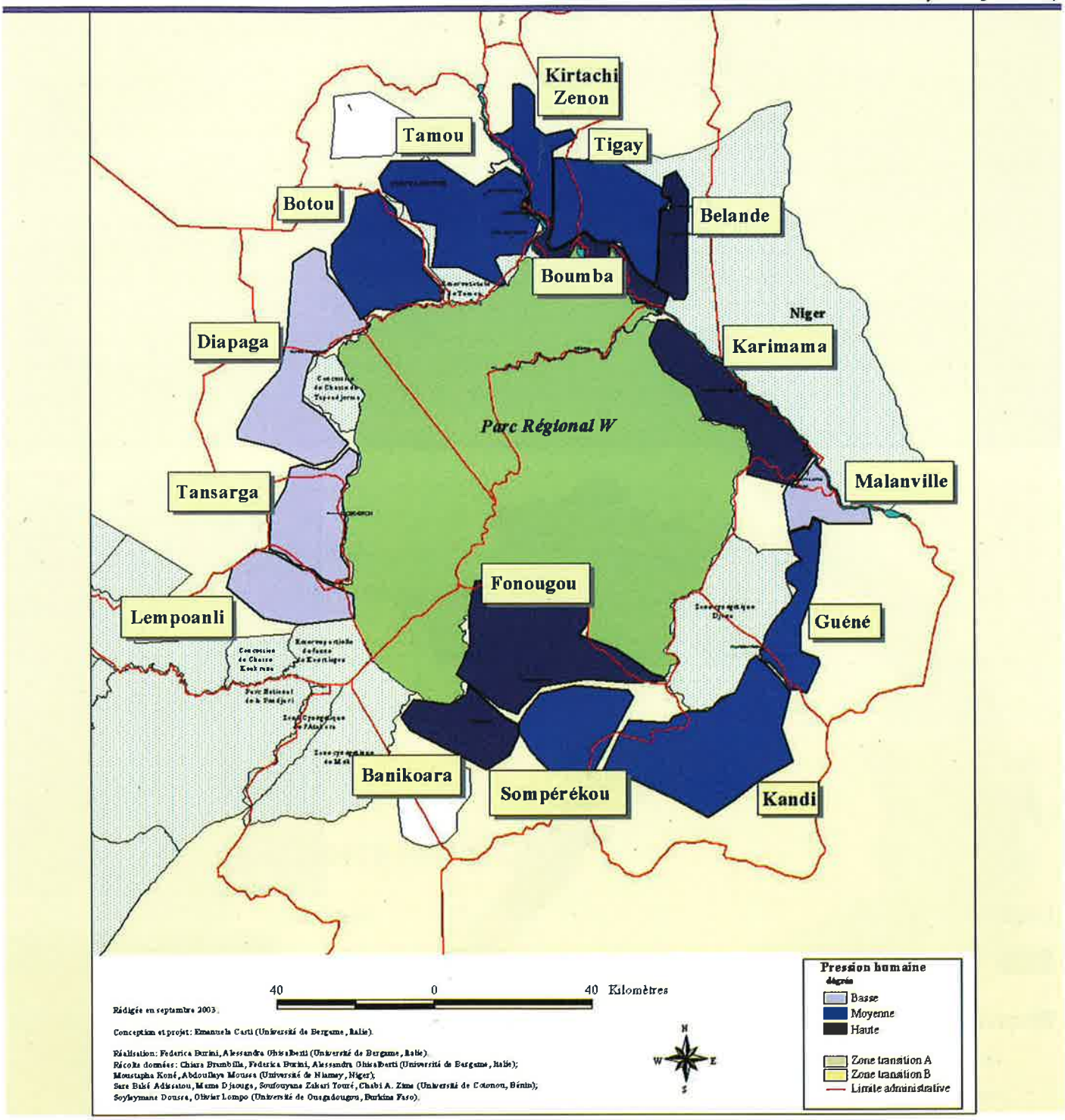
Agriculture-Intensive
Reforestation
Protected Area
Corridor
Agroforestry System

A Thoughtful Cartography for Poverty: A Model for Participatory Zoning

How? Methodology

The exercise involved mapping the area at regional and local scales. At the regional scale this included mapping of the traditional status of the peripheral villages of the W Park, networking and dependence amongst villages, ethnic distribution, population movement in the periphery of the park, economic activities and resource exploitation in the neighbouring villages surrounding W Park. At the local scale cartography involved mapping the social value of places in the villages, including religious and cult spaces.





What they found

The outcomes of this exercise were GIS-based maps resulting from the integration of the findings of field campaigns that were rigorously implemented to collect both data and traditional knowledge.

A strong relationship was revealed between the identity of a people and the area in which they live. This is important both for environmental protection and local participation.

Why? Applications

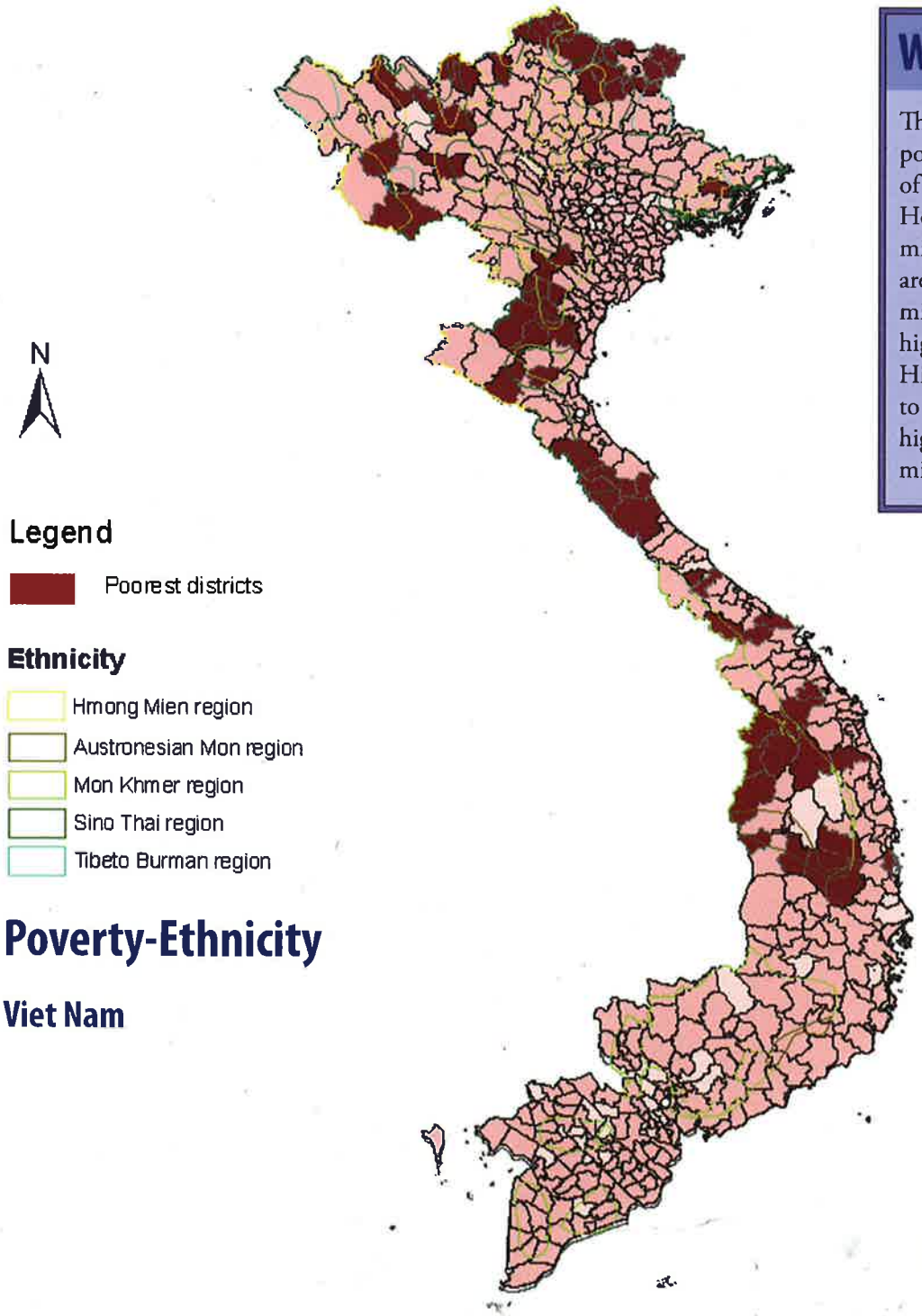
These days mapping is no longer considered an objective and neutral exercise: it is commonly recognized as a powerful tool, intellectually driven, aimed at managing a territory. With this as a starting point, two main streams of research were tested through the W Regional Park project: maps as a social product that allow for tracing the way a given society has developed its relationship with the territory, and maps as a communication tool to influence end-users. By developing these two dimensions firstly one can recover, through the mapping process, the historical identity of poor people and secondly, thanks to the important role played by maps in development cooperation and planning activities, one can see the social component more adequately represented and taken into account in these key processes. It is important to realize the potential of this tool in supporting the identification, organization and management of information related to poverty, as well as its role in involving poor people more actively in land management. The study aims to carry out participatory zoning leading to environmental protection by representing territorial organization of population, resource use, tradition and modernity elements. The outcome was a zoned map that could be used to develop participatory zoning. This methodology takes into consideration aspects such as the hidden value of the territory, establishes the way the territory needs to be managed and allows local communities to participate in the decision-making process.

Poverty-Environment Decision Support Systems

How? Methodology

ADB is creating an application called Map View which aims to integrate isolated data sources into one web application. This application will improve analysis and decision-making by providing the spatial context – geographically referenced information. The main objective of the database is access and sharing of data. This database will contain GIS layers, remote sensing images, digital photographs, environment and social statistics metadata and other relevant topics.

ADB did a case study on Viet Nam where they mapped and overlayed forest cover with ethnicity since impoverished regions of Viet Nam coincide with regions of high ethnic population and biodiversity. In their analysis they used district-level poverty ranking (2004), satellite images of forest cover (2002) and linguistic polygons (1998) for the overlays.



What they found

Their analysis showed that poverty occurs both in areas of high and low forest cover. However, not all ethnic minorities live in the poorest areas and not all ethnic minorities live in areas of high forest cover. The Central Highlands of Viet Nam appears to be one region where poverty, high forest cover, and ethnic minorities coincide.

Poverty-Ethnicity

Viet Nam

Poverty-Forest Cover

Viet Nam

Why? Applications

Under the Strategic Environment Framework for the Greater Mekong Subregion (GMS), ADB would like to ensure that investments are not only environmentally but also socially sustainable. To make sure that environmental and social aspects, as well cumulative impacts, are considered at an early stage in the planning process, they developed an environmental and social database and an Early Warning Information System (EWIS) designed to support decision-making on infrastructure investments in GMS.

Looking Forward

The drawback of this exercise was that the datasets available were not sufficient. For future mapping initiatives the following datasets will be sought: district-level population density, ethnic population density, sources of household income, mortality statistics and a comprehensive set of satellite images.

Species Information Service/Workshop Closing

Stuart Salter opened with an emphasis on speaking the same language as that of decision-makers in development cooperation by providing information which can be understood and used by them.

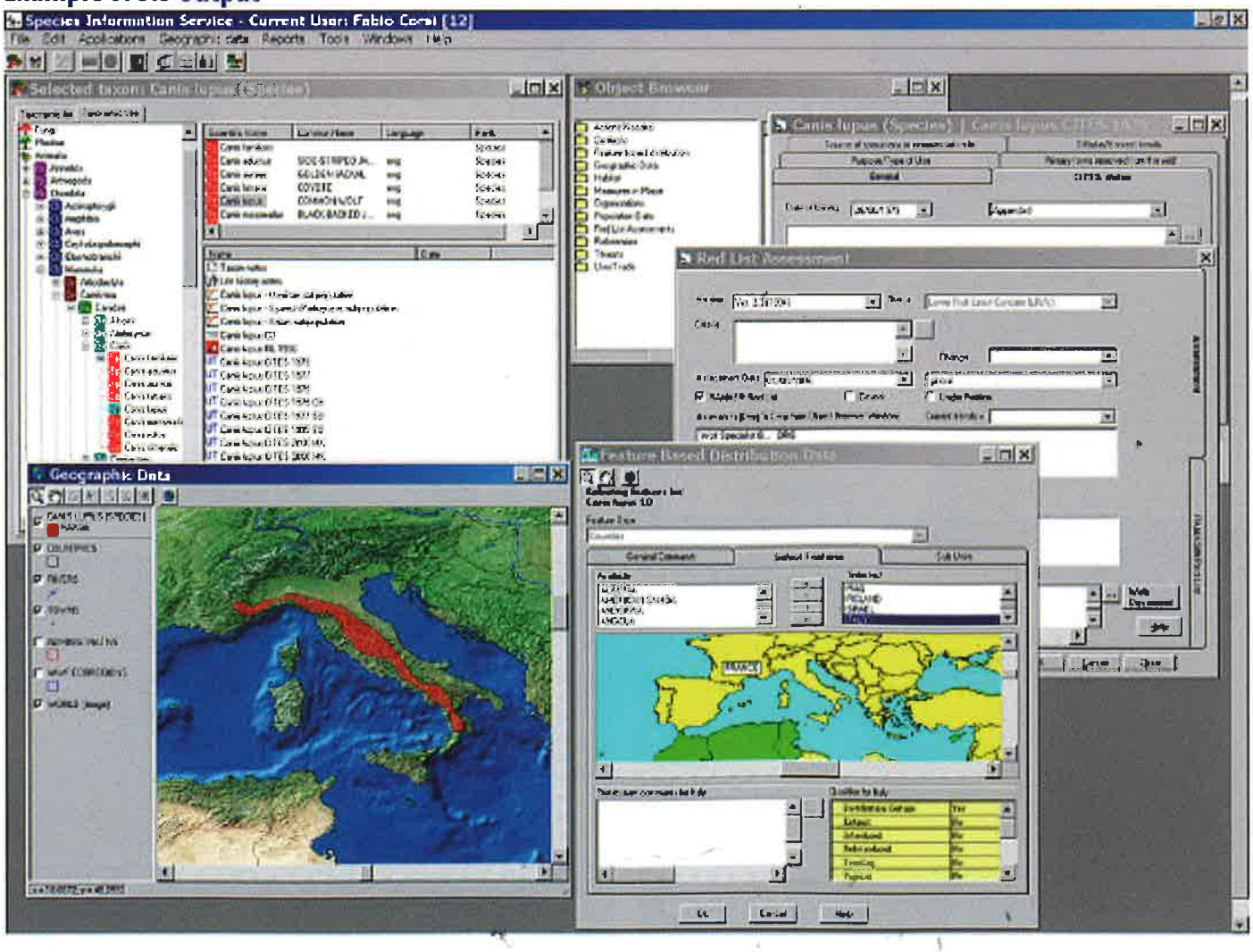
International development has been successful in a number of domains over the last 20 to 30 years in areas such as health and education, but often at a high cost to the environment. Although development cooperations do not intend to harm the environment, this often happens due to a lack of scientific data or conflicting data. In fact, IUCN and CIDA have the same desire and drive for better conservation. Environment is an area where progress has been inconsistent over the years. There has been some good legislative progress on environment, but implementation is difficult because of lack scientific and consistent information. Information that is available is patchy, sometimes contradictory, and often buried in a variety of non-compatible sources.

Poverty maps can be used with the environmental assessment activities of development agencies like CIDA. The challenge is making good environmental and socio-economic data available.

IUCN's Species Information Service

IUCN's Species Information Service is a Biodiversity Conservation Information System that links materials from biological, economic, legal, and other realms to inform conservation actions, studies, and policy-making. The powerful and unique features of SIS include the currency of its data and its analytical capacities that provide information at a variety of levels and for multiple purposes. The SIS also makes information readily accessible to policy-makers and establishes linkages among diverse groups. It allows for analyses at different geographical scales, and is adaptable to each user's needs.

Example of SIS Output



Where does the IUCN SIS and Red List approach fit?

- Builds on a credible, established, information knowledge network of IUCN's Species Survival Commission (8,000 experts, 180 countries) that produces the well known and authoritative Red List;
- SIS fosters this network, adds technology as an enabling factor, and puts the Red List, peer reviewed information in a digital, spatial format that can be accessed globally.

Vision for SIS

- To be a globally accessible, "gold standard" of biodiversity and conservation information from a species perspective;
- To link species and their habitats to ecosystems;
- Scalable – global, regional and project scales;
- To show changes over time – and be used to measure and track outcomes;
- SIS is not so much an analytical tool, but rather a decision support tool that will provide the "species" building block.

ALL PHOTOS ON THIS PAGE: IUCN/JIM THORSELL

Conclusion

The various examples described in this booklet illustrate the different kinds of Poverty-Environment (PE) indicators and methodologies utilized by organizations at various scales, from global to local.

One of the major challenges facing poverty mapping is poor data access and compatibility, especially at the sub-national level. Identification of Poverty-Environment indicators are another issue of concern. Several international organizations are focusing on these issues. A brief description of the research being done on PE indicators and poverty data modelling techniques is given below.

Indicators

Development of PE indicators has received considerable impetus in recent times. Many international organizations like the World Bank and DFID (UK's Department for International Development) have worked on developing PE indicators specifically related to their development projects.

The World Bank has developed indicators that can be applied from local to global levels and that can also be used to monitor changes globally, through cross-country comparisons. The indicators cover two distinct fields. The first category addresses the relationship between environmental conditions and human health, such as quality of water supply and levels of pollution and wastes. The second category of PE indicators monitors the impact of resource loss as a determinant of poverty, measuring how the loss of access to resources affects the well-being of the poor. Examples of these indicators are deforestation, water scarcity, overfishing, and land degradation.

DFID has identified the following priority areas to be covered by their PE indicators. These include environment and health, forest cover, soil degradation, water quality and quantity, fisheries, natural disasters, tenure and property rights and sanitation. Under each of these priority areas, multiple indicators have been developed, such as proportion of poor with secure land use rights for farming (tenure and property rights), hours spent collecting water by rural women and children (water quality and quantity), and percentage of population living in areas prone to flooding (natural disasters).

Both of these organizations have tried to develop a generic set of indicators, which are valuable if used to conduct cross country analysis, however, their applications at the micro level are limited.

WWF's Macroeconomics Programme Office has been working on developing PE indicators at the local level. These include:

- Environmental indicators like resource quantity and quality – indicators that reflect the physical extent, condition, and productivity of resources (for example, size of fish stocks, soil organic matter levels, biochemical oxygen demand of rivers);
- Rate of resource degradation or improvement – indicators relating to the rate of loss or gain or lowering or improvement of quality (for example, rate of forest land conversion, topsoil erosion rates);
- Poverty-environment indicators like access to resources – per capita availability of resources (for example, freshwater, fuel wood), distance and time to collect forest products, percentage of income derived from non-timber forest products;
- Level of vulnerability – exposure to and impact of natural disasters and declining or improving environmental quality (for example, number of individuals affected by flood and drought, incidence of acute respiratory illnesses).

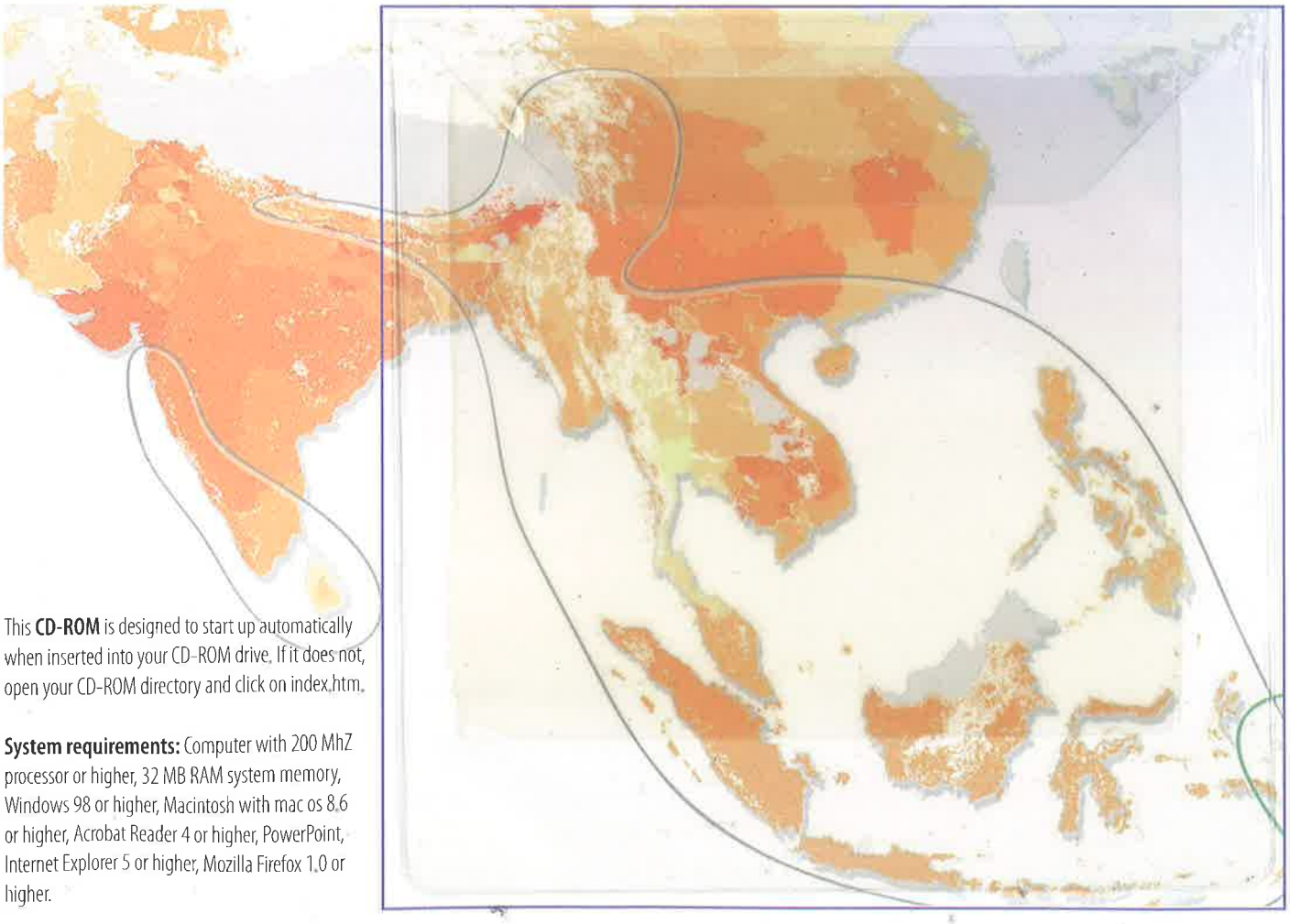
Poverty Data

Although poverty maps have been used in various applications their effective use continues to be challenged by poor data access, lack of data compatibility, and analytical constraints. Several studies have been conducted to come up with effective modelling techniques to measure poverty at the sub-national level. Some of the studies are described below.

Small area estimation technique: Poverty maps based on the small area estimation technique use sophisticated econometric techniques to combine a set of identical variables in both the census (national coverage) and surveys (a representative sample of the population). In doing so, this method takes advantage of the universal coverage of the census and the wealth of detail in the household survey. More specifically, household characteristics that are found in both the household survey and the census are identified. Regression models are subsequently used on the detailed household survey data to predict the relationship between poverty (the dependent variable) and other variables (independent variables). Lastly, the regression parameters are applied to the census data to predict poverty measure at national level. The poverty measure is usually an expenditure-based indicator of welfare, such as the proportion of households that are below a specified expenditure level.

Composite indicators: This technique relies on combining a range of variables to capture the multidimensional nature of human well-being. Variables are initially selected, subsequently standardized (for example, between a range of 0 and 1), weighted, and combined. Examples of composite indexes include the United Nations Development Programme's Human Development Index (HDI) and various basic needs measures.

Modelling the distribution of income per capita at the sub-national level using night-time light imagery: The World Heath organization in collaboration with Harvard University and the National Geophysical Data Center has developed a method that utilizes spatially distributed information, including night-time light imagery and population to model the distribution of income per capita, as a proxy for wealth, at the country and sub-national level.



This **CD-ROM** is designed to start up automatically when inserted into your CD-ROM drive. If it does not, open your CD-ROM directory and click on index.htm.

System requirements: Computer with 200 MhZ processor or higher, 32 MB RAM system memory, Windows 98 or higher, Macintosh with mac os 8.6 or higher, Acrobat Reader 4 or higher, PowerPoint, Internet Explorer 5 or higher, Mozilla Firefox 1.0 or higher.