INTRO TO SPATIAL PLANNING AND SCENARIOS

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Pretoria
October 2019

CONSERVATION INTERNATIONAL

OUTLINE

- A brief background to spatial planning
- Methods and examples of spatial planning in landscapes
- Introduction and an example of landscape scenarios modeling
- Conclusions

INTRO TO SPATIAL PLANNING

- In the modern era spatial planning and human development are inexpiably linked; we live in a world where human influence on the Earth's biosphere is omnipresent.
- However, objectives of human development have changed over time and this has led to changes in the way that people plan and allocate land now and into the future.
- Spatial planning and scenarios development methods provide a framework that allows for experts and stakeholders to achieve their planning objectives.
- Ecosystem accounting outputs are spatially explicit and therefore well suited for spatial planning and scenarios development from the national to sub-national (landscape) scales.

LANDSCAPES

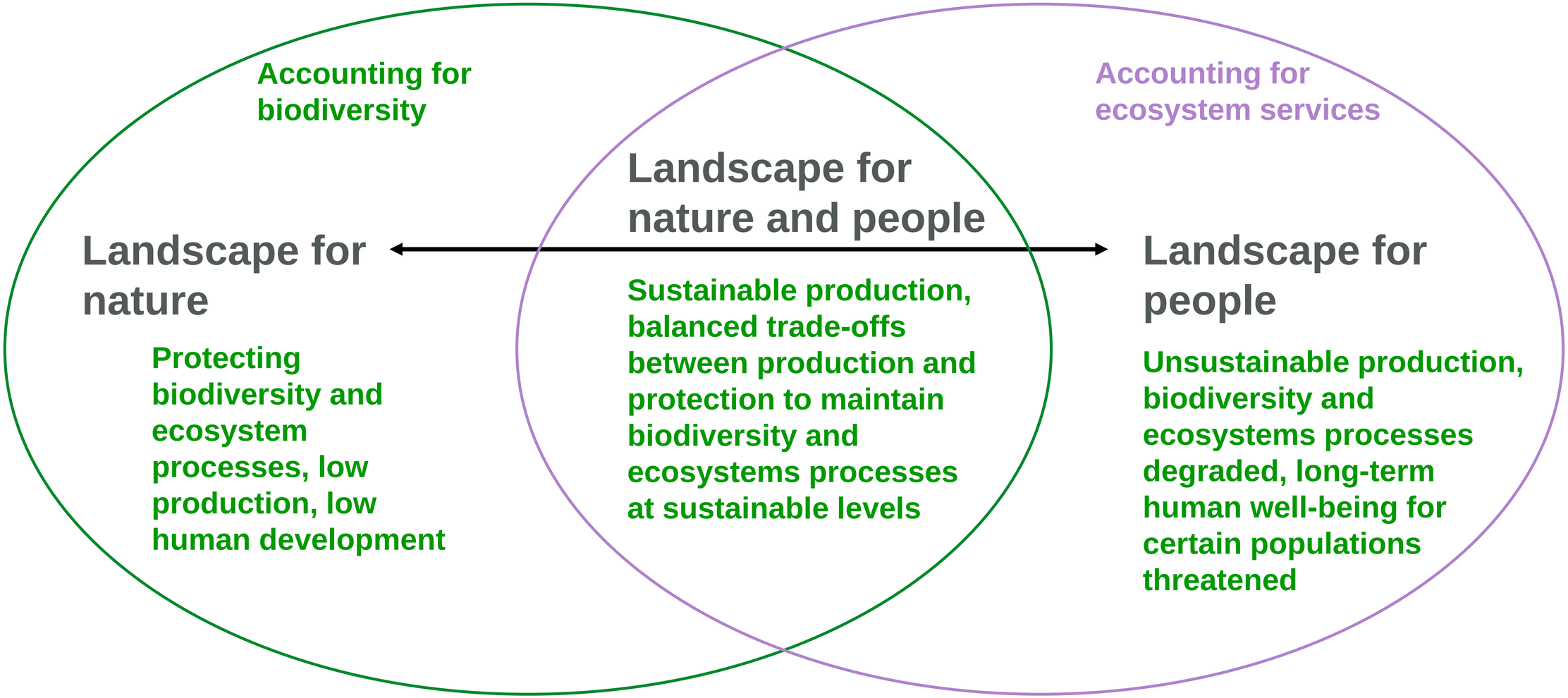
A context for spatial planning

WHAT IS A LANDSCAPE?

A LANDSCAPE IS A SOCIO-ECOLOGICAL SYSTEM THAT CONSISTS OF A MOSAIC OF NATURAL AND/OR HUMAN-MODIFIED ECOSYSTEMS, CHARACTERIZED BY SPECIFIC TERRAIN, VEGETATION, LAND USE AND GOVERNANCE.

LANDSCAPE CONTINUUM

LANDSCAPE SPATIAL PLANNING

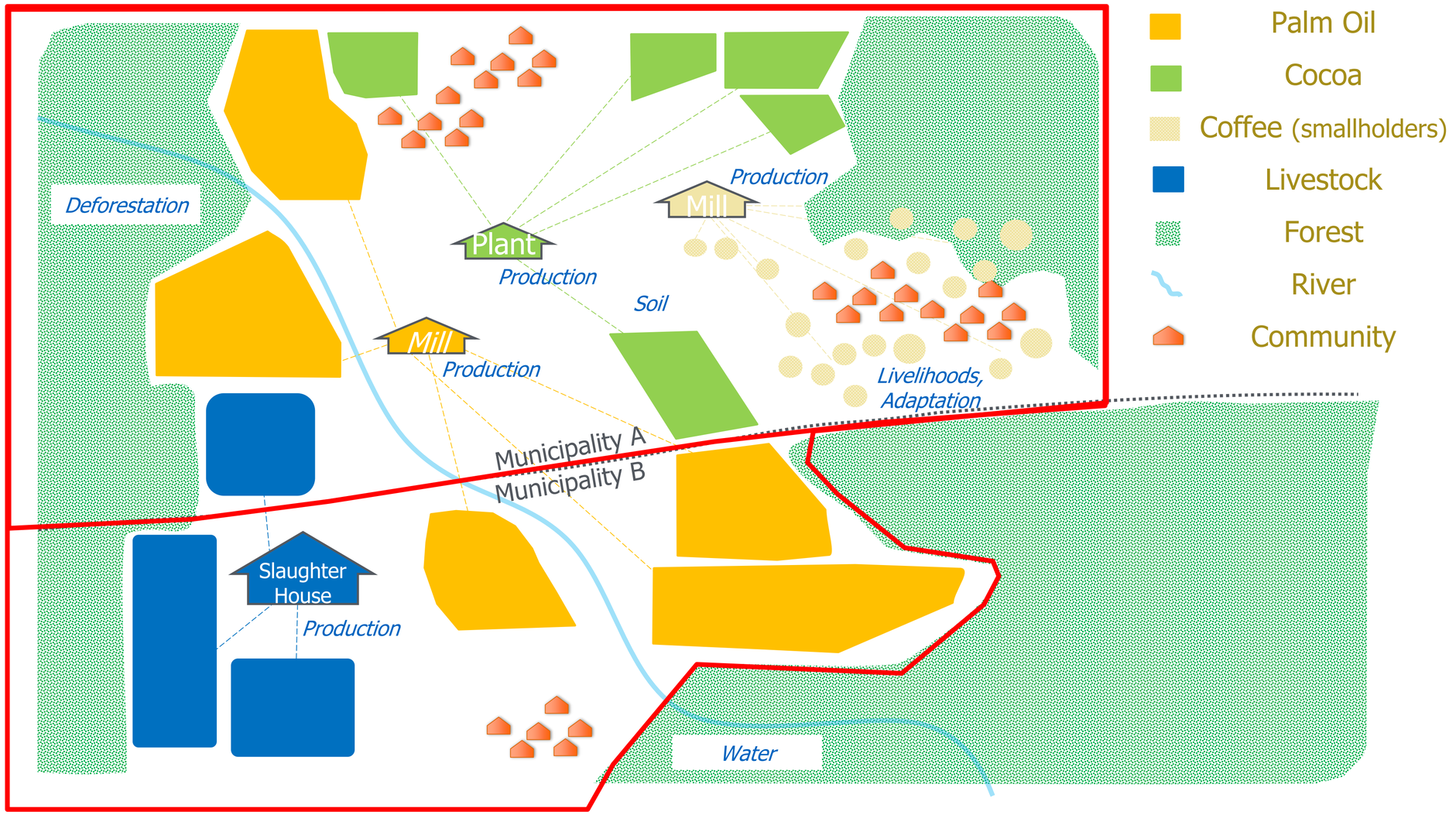


LANDSCAPE BOUNDARIES?

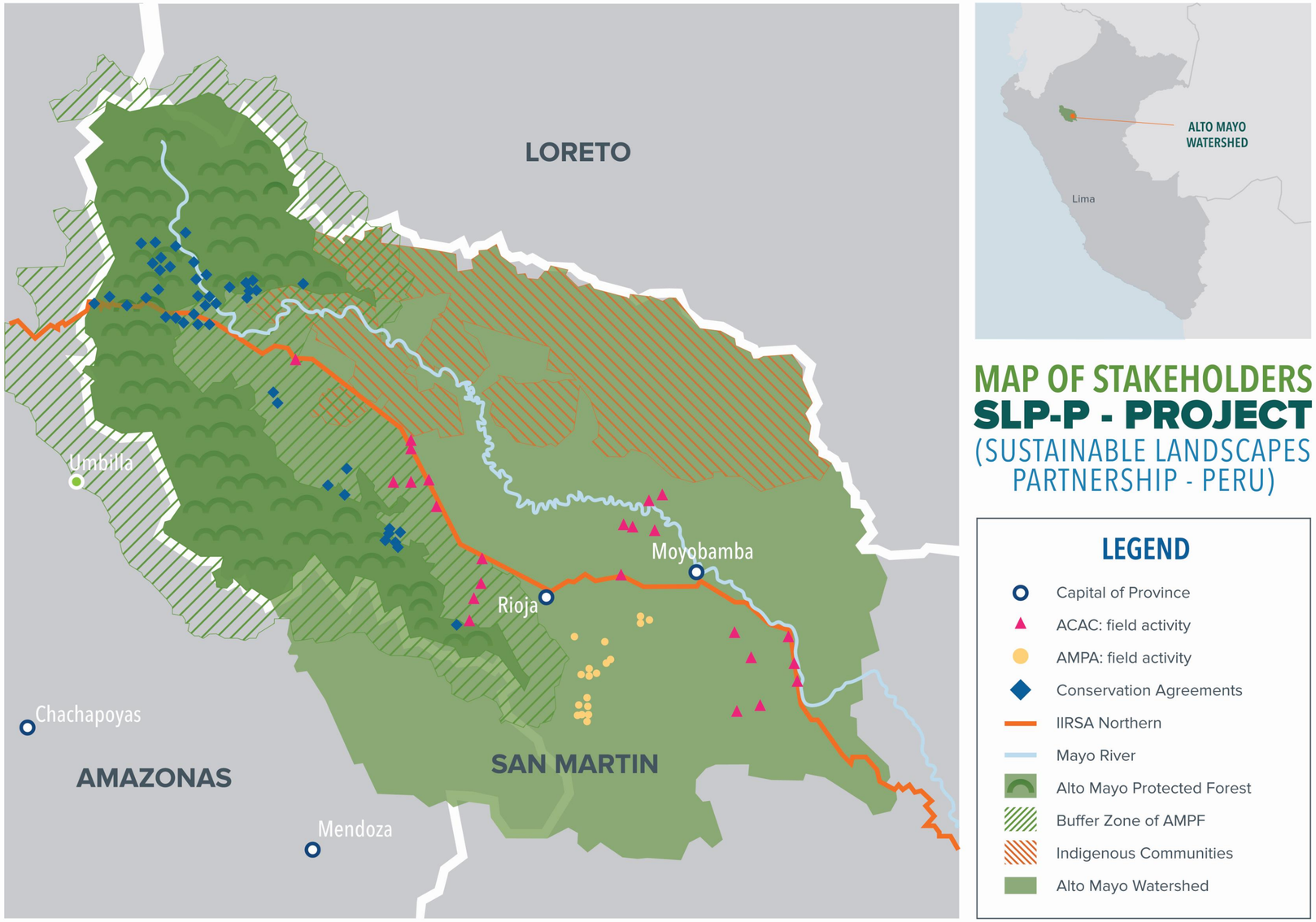
- Depending on the management objectives of the stakeholders, landscape **boundaries may be discrete or fuzzy**, and may correspond to watershed boundaries, distinct land features, and/or jurisdictional boundaries, or cross-cut such demarcations.

- Due to the broad range of factors a landscape may encompass areas from tens to hundreds of thousands of square kilometers at the national to sub-national scales.

LANDSCAPE BOUNDARIES ILLUSTRATED



AN EXAMPLE OF A LANDSCAPE



MAP OF STAKEHOLDERS
SLP-P - PROJECT
(SUSTAINABLE LANDSCAPES PARTNERSHIP - PERU)

LEGEND

- Capital of Province
- ACAC: field activity
- AMPA: field activity
- Conservation Agreements
- IIRSA Northern
- Mayo River
- Alto Mayo Protected Forest
- Buffer Zone of AMPF
- Indigenous Communities
- Alto Mayo Watershed

Alto Mayo Landscape

APPROACHES TO LANDSCAPE PLANNING

An overview of the methods

PLANNING FOR BIODIVERSITY

"Nature for nature"

PLANNING FOR BIODIVERSITY

- Seeks to maximize biodiversity values in their own rights
- Does not consider the feasibility of interventions or the impact of human behavior
- Biological factors are the primary driver
- Usually results in the creation of protected areas

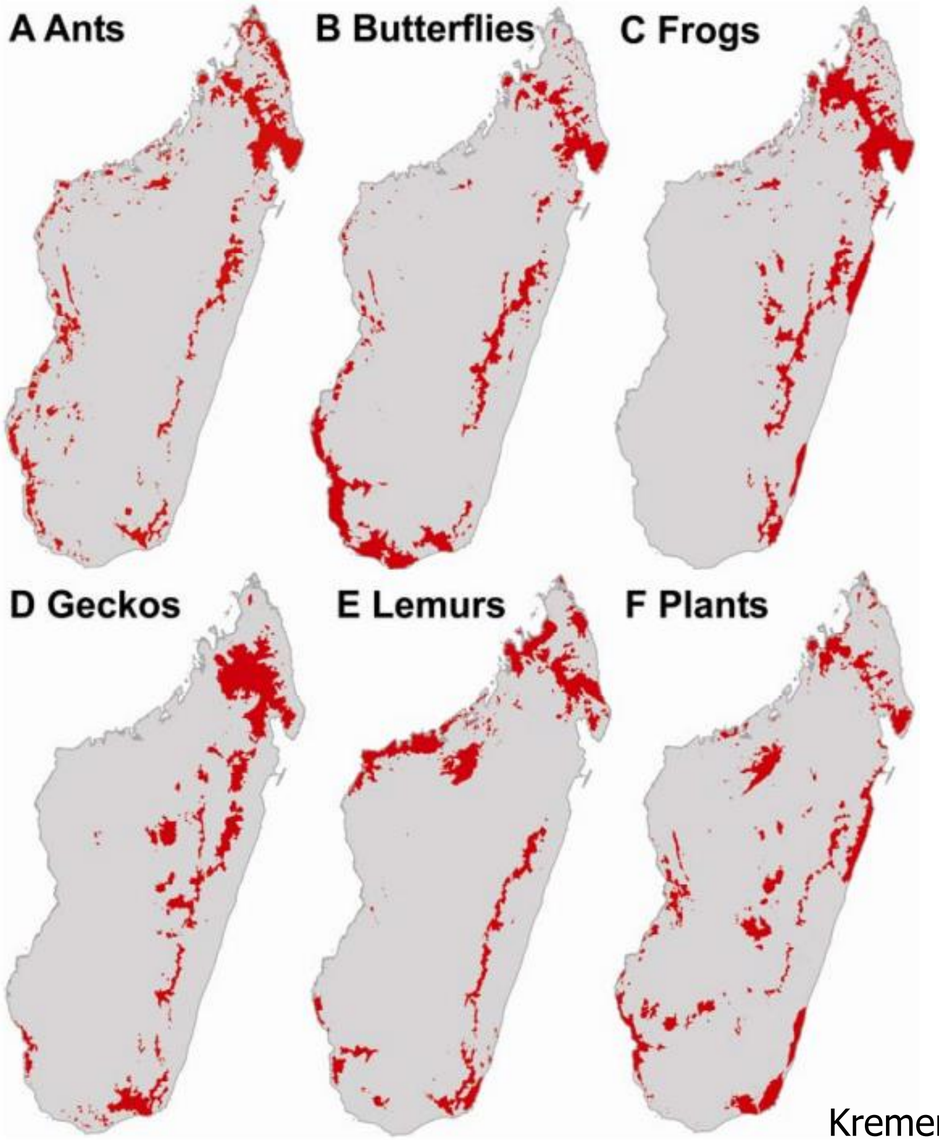
AN EXAMPLE: ZONATION ALGORITHM

In 2008 Kremen et al. published the first quantitative conservation prioritization for Madagascar using Zonation algorithm using data for endemic species in six major taxonomic groups – **ants, butterflies, frogs, geckos, lemurs, and plants**

ZONATION EXAMPLE (CONT.)

- Modeled conservation priority zones in Madagascar, showing the top 10% prioritized area for six single taxon solutions

- Each taxon prioritizes principally different zones, reflecting differences in patterns of micro-endemism, species richness, and the ecological requirements of each group



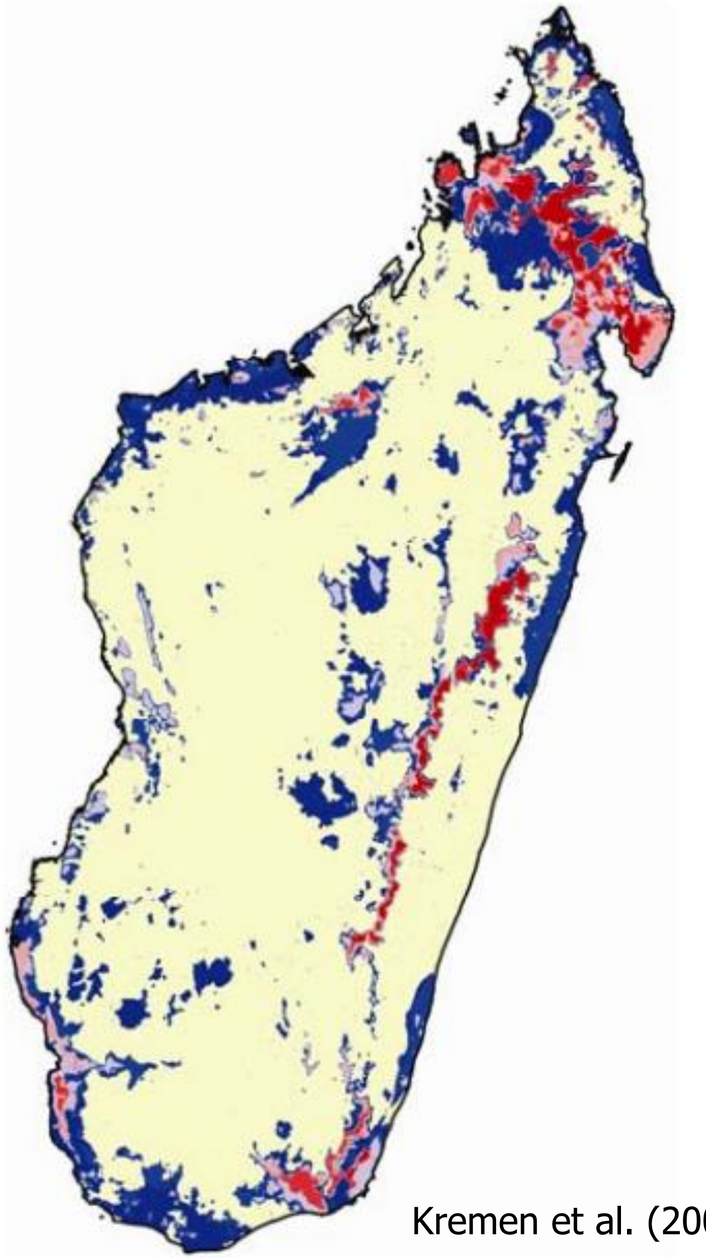
Kremen et al. (2008)

ZONATION EXAMPLE: IDEAL RESULT

- Agreements and disagreements between the six single taxon solutions from the previous slide.

- Dark red shows agreement between all six single taxon solutions. Dark blue indicates areas important for only one taxon. Intermediate colors show 2-6 single-taxa in agreement.

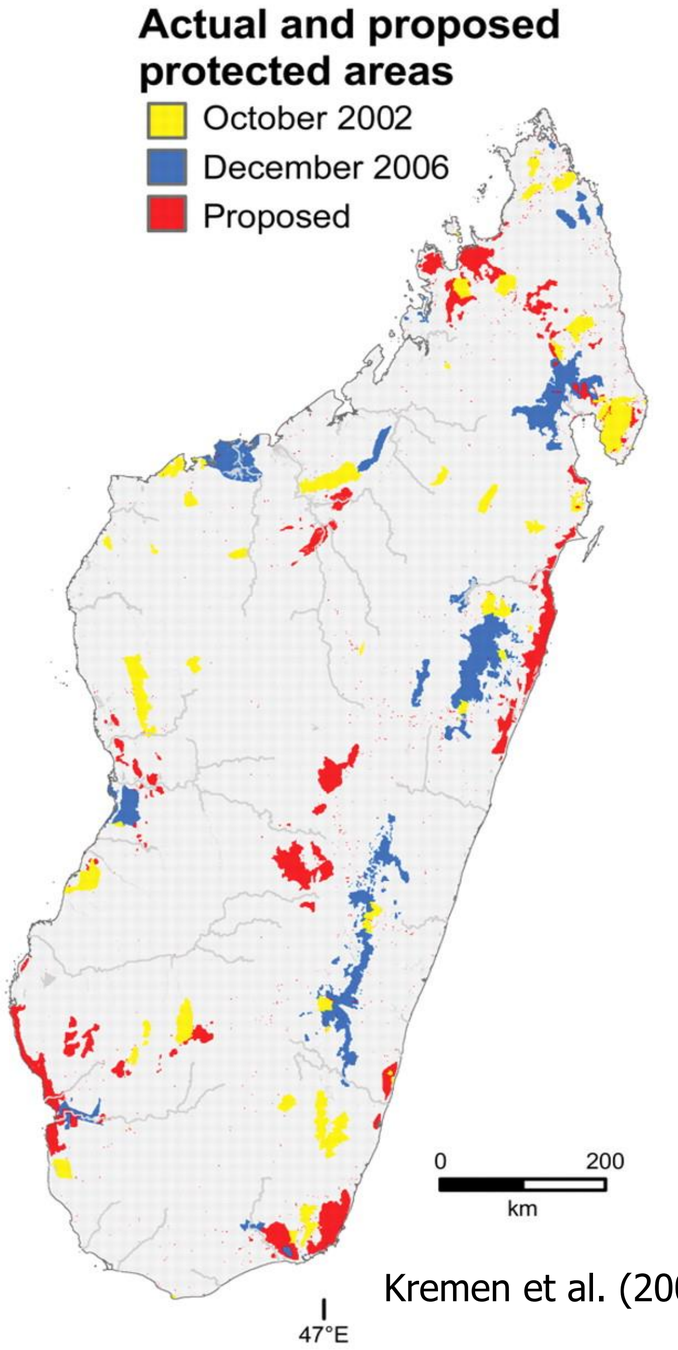
- Because of the low overlap between solutions, the area covers 26.4% of the country.



Kremen et al. (2008)

ZONATION EXAMPLE: FINAL SOLUTION

- The Zonal analysis solution for Madagascar for expanding the current reserve network (yellow/blue) from 6.3% of area to the **10% conservation target** (yellow/blue/red).



Kremen et al. (2008)

PLANNING FOR HUMAN BENEFIT

"Nature for people"

PLANNING FOR HUMAN BENEFIT

- The concept of ecosystem services, the services that nature provide for people and the economy, are foundational to the spatial planning for human benefit

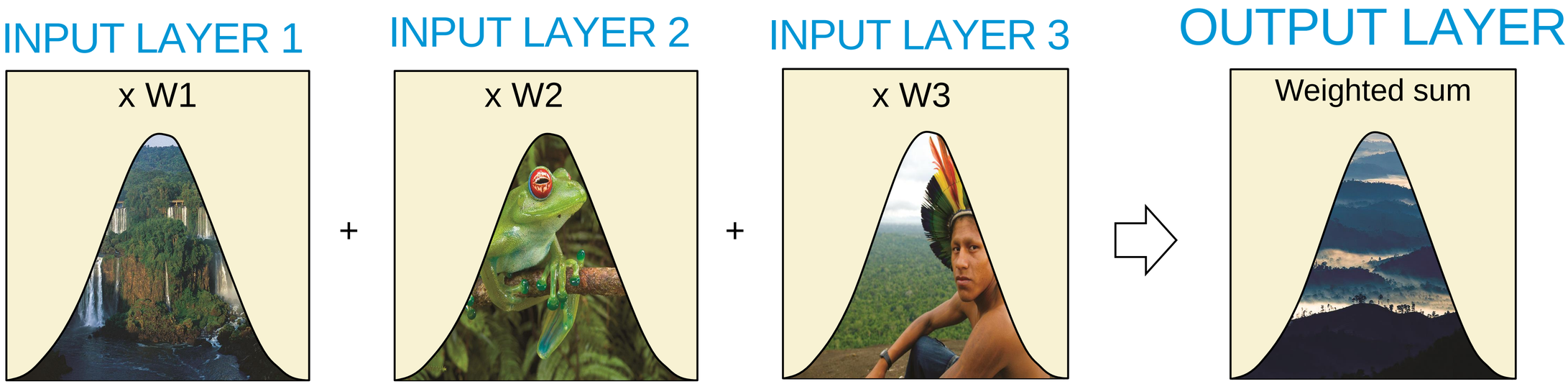
- This type of spatial planning seeks to identify the nature that people need and protect it; water provision, climate regulation, pollination, etc.

- Although utilitarian the approach allows for the inclusion of conservation co-benefits that are difficult to quantify, such as biodiversity and cultural services

MULTI-CRITERIA ANALYSIS

- Multi-criteria analysis is also known as **Multi-Criteria Evaluation** is one method that can be used to combine many factors, such as ecosystem service benefits, to one summary output

- **Weighted Sum Model** is one of the methods used for performing Multi-Criteria Analysis implemented in GIS and used for ‘bundling’ input layers.



EXAMPLE FROM MADAGASCAR

Objective:

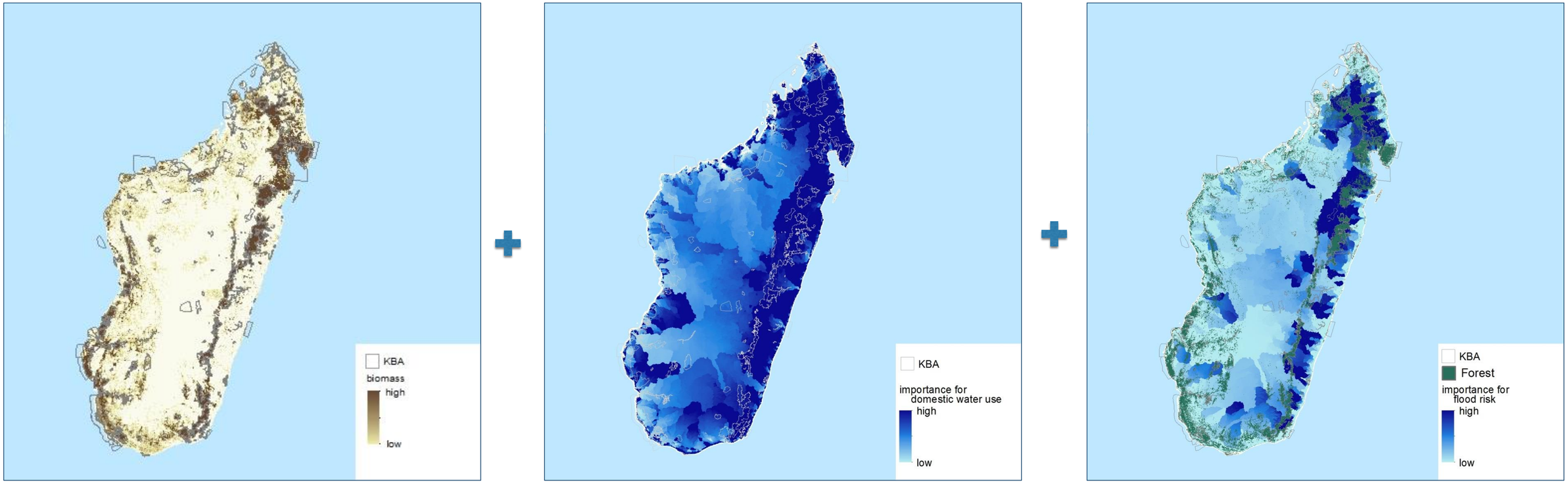
- Develop and pilot a framework (aka KBA+) for assessing **ecosystem service values* of KBAs**

  *non-monetary values (e.g., conservation values)

- Provide guidance for **incorporating ecosystem service value** considerations into the Critical Ecosystem Partnership Fund's (CEPF) KBA assessments

CRITICAL ECOSYSTEM PARTNERSHIP FUND

EXAMPLE FROM MADAGASCAR

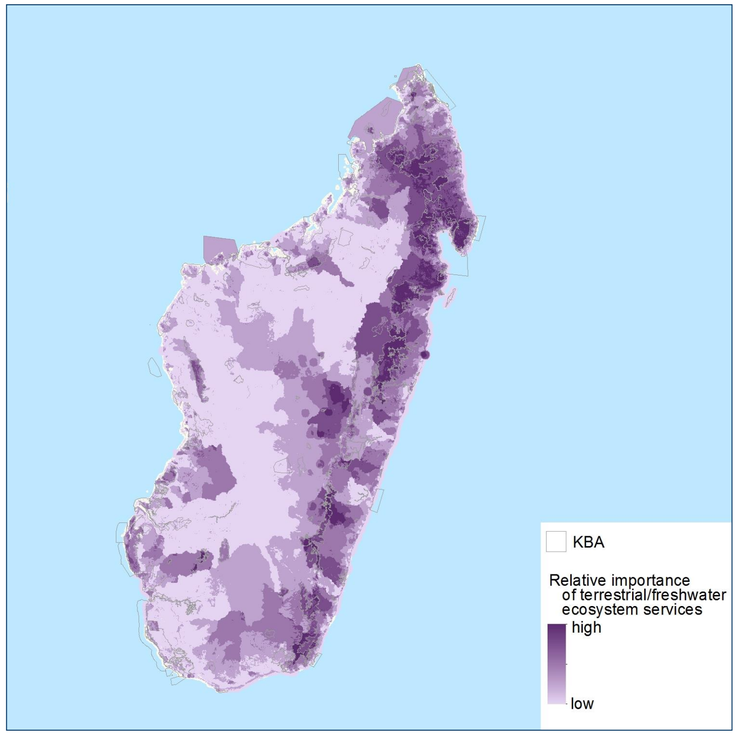


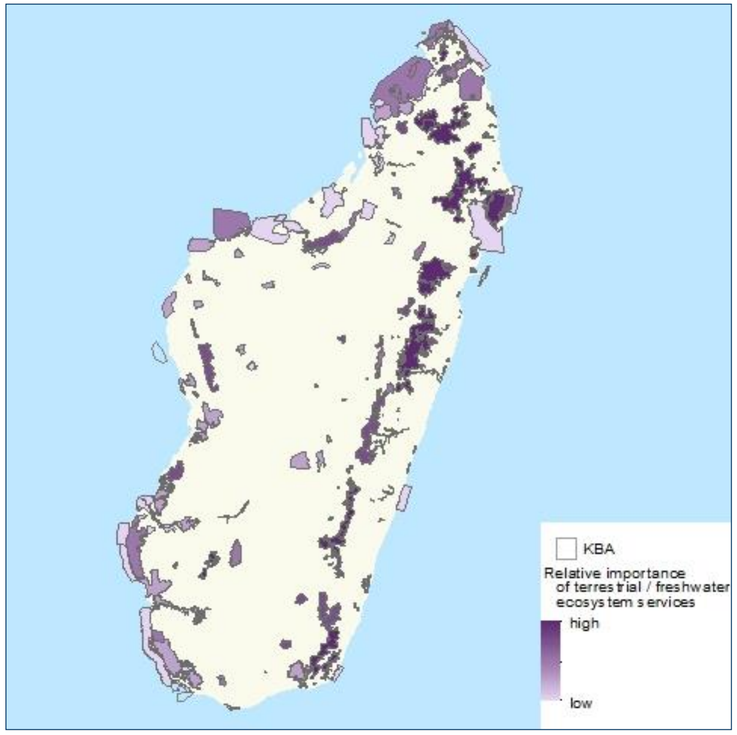
- Multiple ecosystem services, such as carbon, water use, flood mitigation, and others were used to assess the impact of Key Biodiversity Areas (KBAs) in delivering services to people

CRITICAL ECOSYSTEM PARTNERSHIP FUND

EXAMPLE FROM MADAGASCAR

Ecosystem services and proxies	Weight
Carbon density (tC/km2)	0.3
Food provision (# of food insecure people within 10 km of unprotected terrestrial & freshwater ecosystems)	0.3
Ecotourism (# of visitors to Madagascar National Parks in 2012)	0.1
Relative importance for **freshwater regulation**	0.3





After the CEPF profiling process took place in 2014, the number of KBAs Madagascar **increased by 30%**, from 164 to 213.

PLANNING FOR PEOPLE AND NATURE

"People and nature"

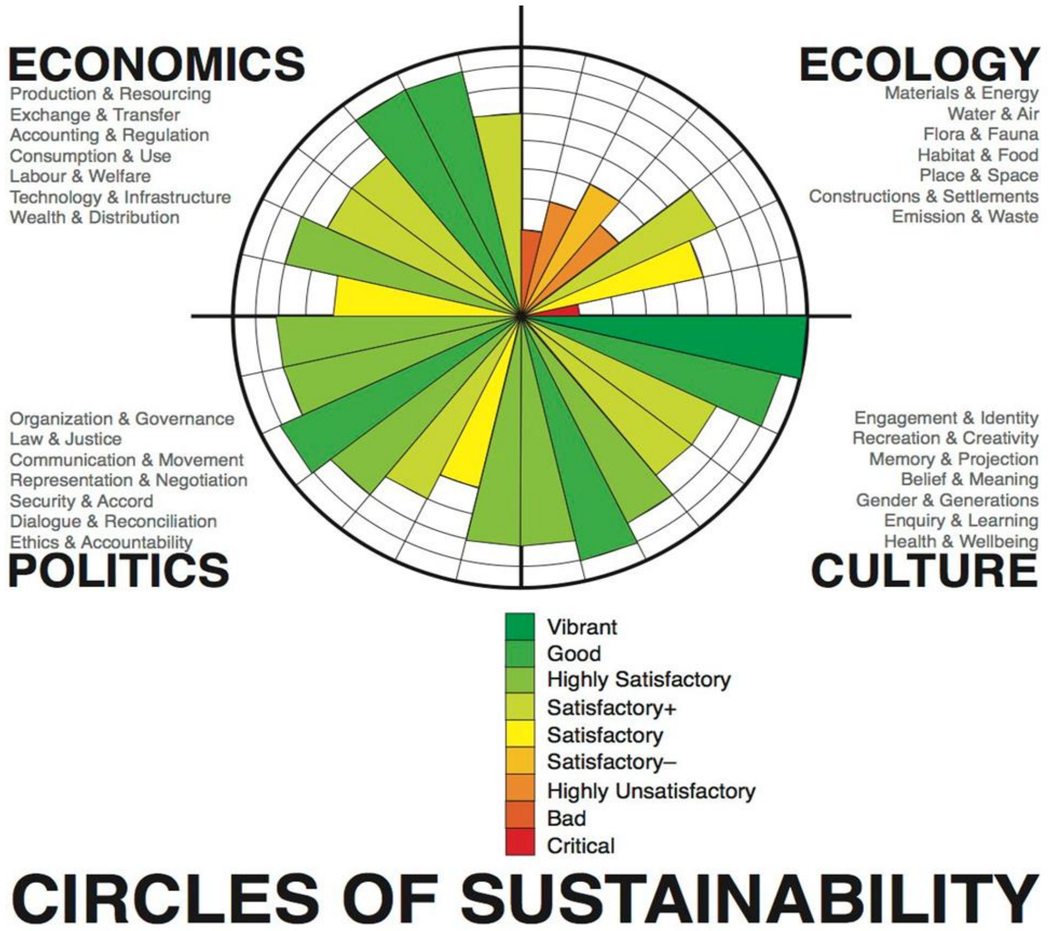
PLANNING FOR PEOPLE AND NATURE

- Planning is as much a social venture as a biological one
- Seeks to develop systems that allow for both people and nature to thrive
- Highly multi-disciplinary and often encompasses elements of other paradigms in achieving objectives
- Collaboration, stake holder engagement, and adaptive managements are hallmarks of the people and nature paradigm

MEASURING SUSTAINABILITY

- Many institutions, including NGOs, multi-laterals, research institutions, and government bodies, have developed frameworks to assess landscape sustainability

- These frameworks consists of indicators and sub-indicators designed to measure sustainability across several dimensions

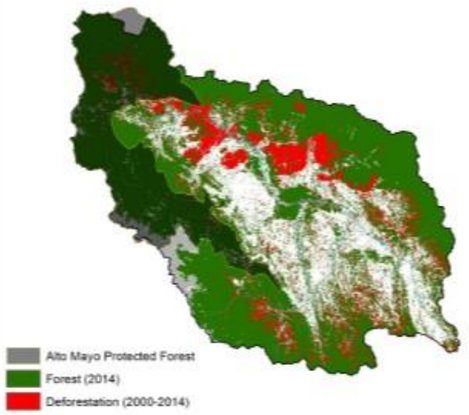


Source: RMIT University's Global Cities Research Institute

EXAMPLE OF SUSTAINABILITY INDICATORS

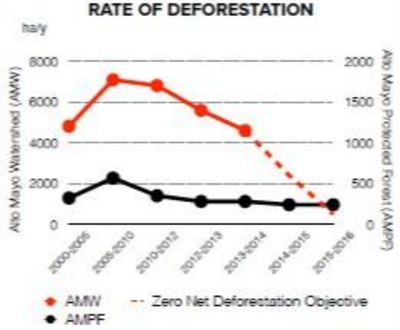
ALTO MAYO WATERSHED

The Alto Mayo River Basin of San Martin covers approximately 780,000 ha and is home to approximately 222,000 inhabitants.



NATURAL CAPITAL

RATE OF DEFORESTATION

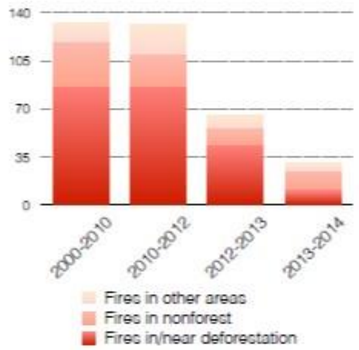


14% of the forest cover lost since 2000

19% of deforestation from 2000-2014 due to coffee

30% actual decrease in deforestation inside the AMPF since the start of the REDD+ implementation

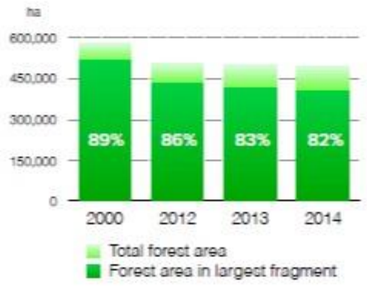
FIRES PER YEAR



The majority of fires occurred in agricultural fields. Although illegal in the Alto Mayo Watershed, fires are commonly used to clear fallow land.

Source: NASA MODIS Active Fires

FRAGMENTATION



Deforestation can lead to forest fragmentation which decreases habitat connectivity.

The forests of the AMW are being affected by frontier deforestation, which does not lead to extensive fragmentation. Deforestation mainly occurs along the eastern boundary of the forest extent as agricultural areas expand north and west.

Source: PNCBMCC-MINAM

KEY SPECIES

% of primary habitat lost since 2000 in the AMW

The following subsection of species were selected for the region based on their category of threat, endemism, and importance to conservation targets of the AMPF.

Night Monkey 8%

Titi Monkey 16%

Yellow-tailed Wooly Monkey 11%

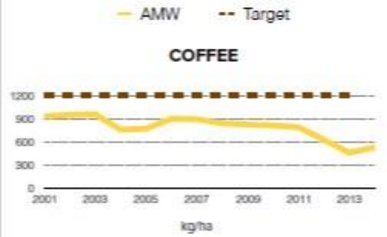
Spectacled Bear 4%

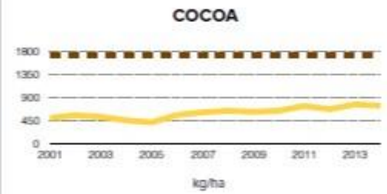
Source: IUCN/Global Mammal Assessment/Rondinini

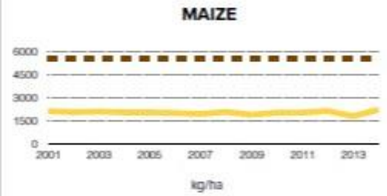
PRODUCTION

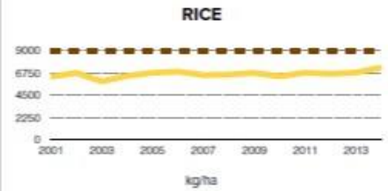
AGRICULTURAL COMMODITIES

The following represents the yields of major agricultural crops of the Alto Mayo Watershed since 2001. A threshold indicating the sustainable scenario is also shown.









Source: Direccion Regional Agraria San Martin (2001–2014)

LAND USE

In a set of sample points randomly distributed across areas of deforestation, 39% of points fell on land converted to coffee farms.

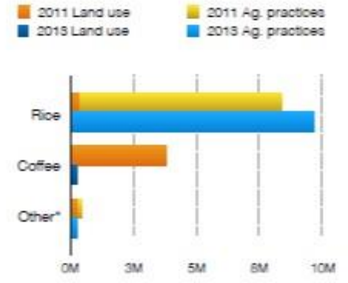
Although coffee represents the top agricultural product of the AMW region, particularly in the provinces of Moyobamba and Rioja, yields have been steadily decreasing since 2000 due to adverse weather conditions and diseases.

Source: Conservation International

GHG EMISSIONS

The following presents the GHG emissions calculated from the major income sectors of the AMW for the years 2011 and 2013.

The majority of GHG emissions are attributed to rice production, which releases methane gas (CH_4) from wetland paddies, considered to have approximately 25x greater impact to global warming than carbon dioxide (CO_2). The second largest contributor to GHG emissions is coffee, primarily due to the deforestation activities associated with preparing cropland.

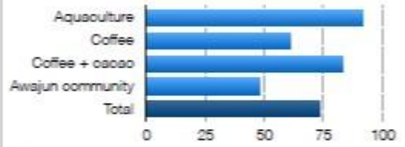


* Includes: cocoa, maize, pasture, timber, and brick making
Source: Conservation International

HUMAN WELL-BEING

PROGRESS OUT OF POVERTY

The Progress out of Poverty Index (PPI) is a poverty measurement tool used to determine the likelihood that a household is susceptible to poverty, or is currently living below a national or international poverty line. The following represents the percentage of beneficiaries, per SLP pilot project, who live above the national poverty line.

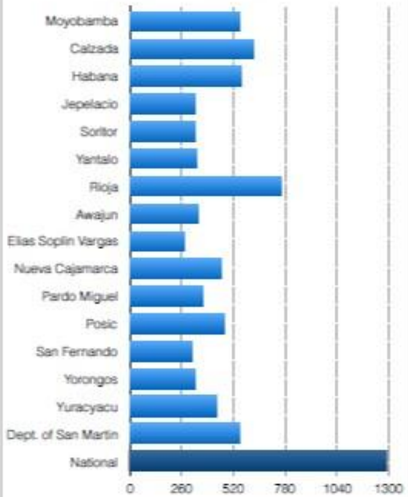


Approximately 26% of beneficiaries of the SLP currently live below the national poverty line.

Source: Progress out of Poverty, Grameen Foundation

National v.s. regional average monthly income (N.S./month)

The following represents the average monthly income of the districts in the AMW.



* Exchange rate for December 2012: 1 USD = 2.55 NS
Sources: Conservation International, exchangerates.org.uk

USAID FROM THE AMERICAN PEOPLE

CONSERVATION INTERNATIONAL Peru

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Director of the Sustainable Landscape Partnership for Peru
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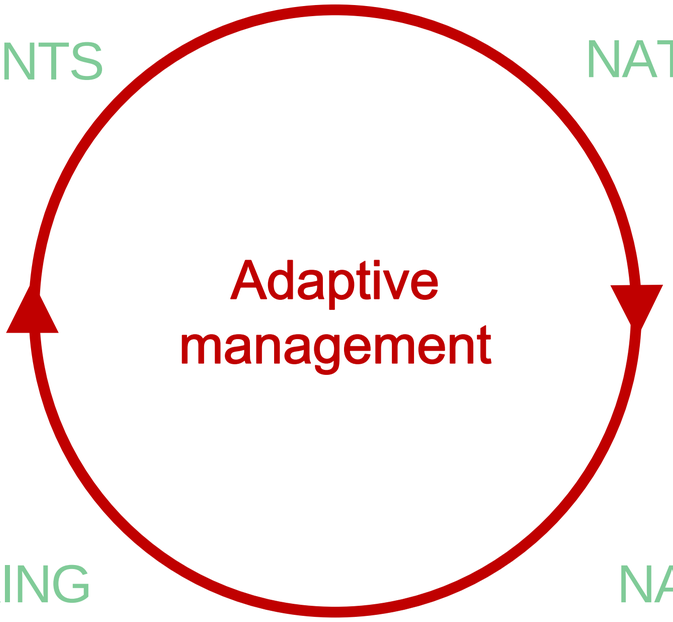
ADAPTIVE MANAGEMENT



TARGETED INVESTMENTS

POLICY DEVELOPMENT

SPATIAL PLANNING/ ZONING

NATURAL CAPITAL ACCOUNTING

SPECIES MONITORING

ECOSYSTEM MAPPING

ENSURE EQUITABLE DECISION-MAKING

ENHANCED LIVELIHOODS AND WELL-BEING

NATURAL ECOSYSTEMS CONSERVED

PRODUCTIVE/SUSTAINABLE AGRICULTURE

LIMITATIONS WITH THESE APPROACHES

- Existing indicators are usually designed to assess sustainability in a **static time frame** (past and present).
- This does not allow for an assessment of impacts of current and future policies and investments.
- To overcome this limitation, predicting landscape sustainability under the future conditions is desirable → **development of scenarios**.

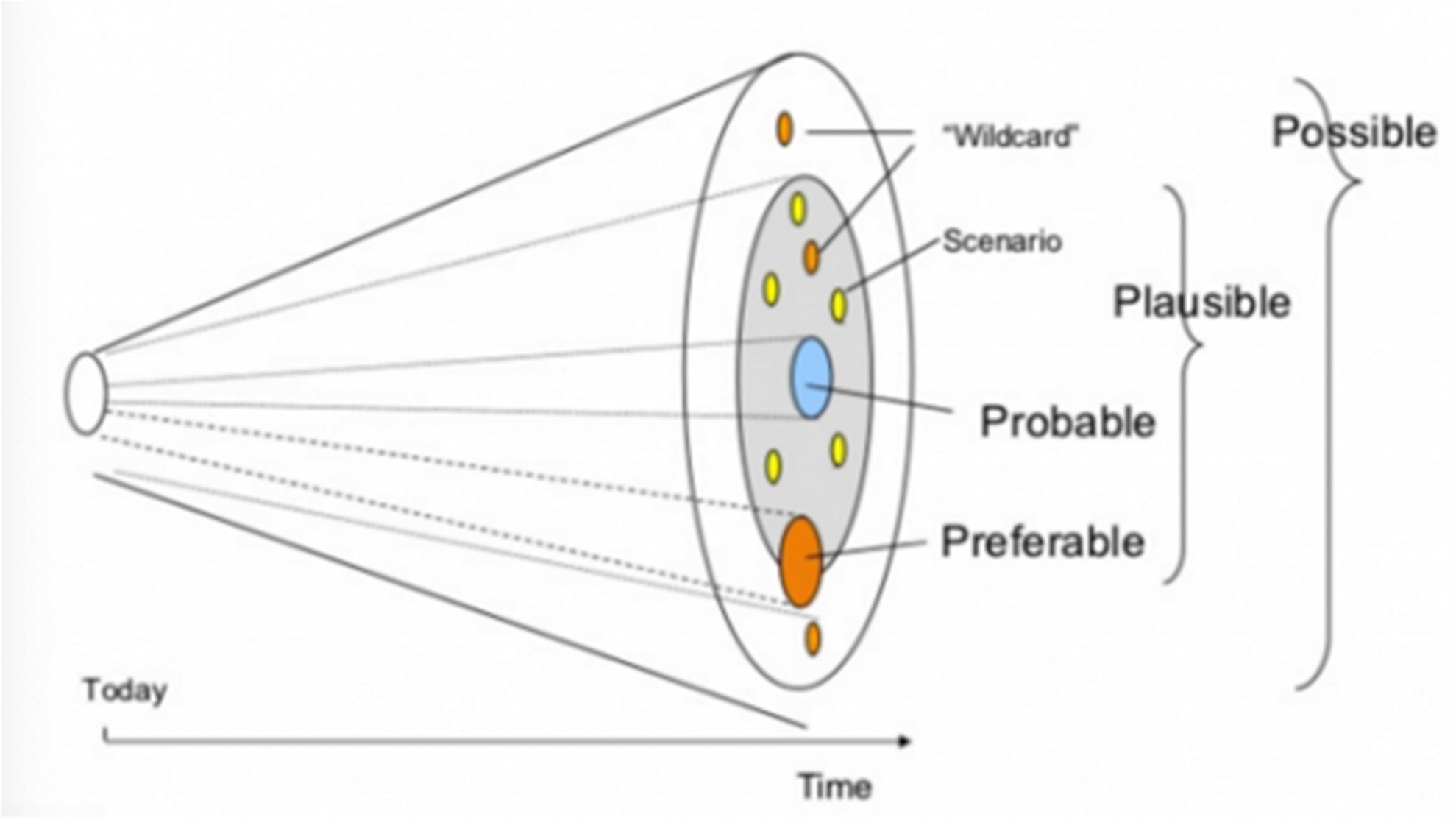

INTRODUCTION TO
SCENARIOS

DEFINITION OF SCENARIOS

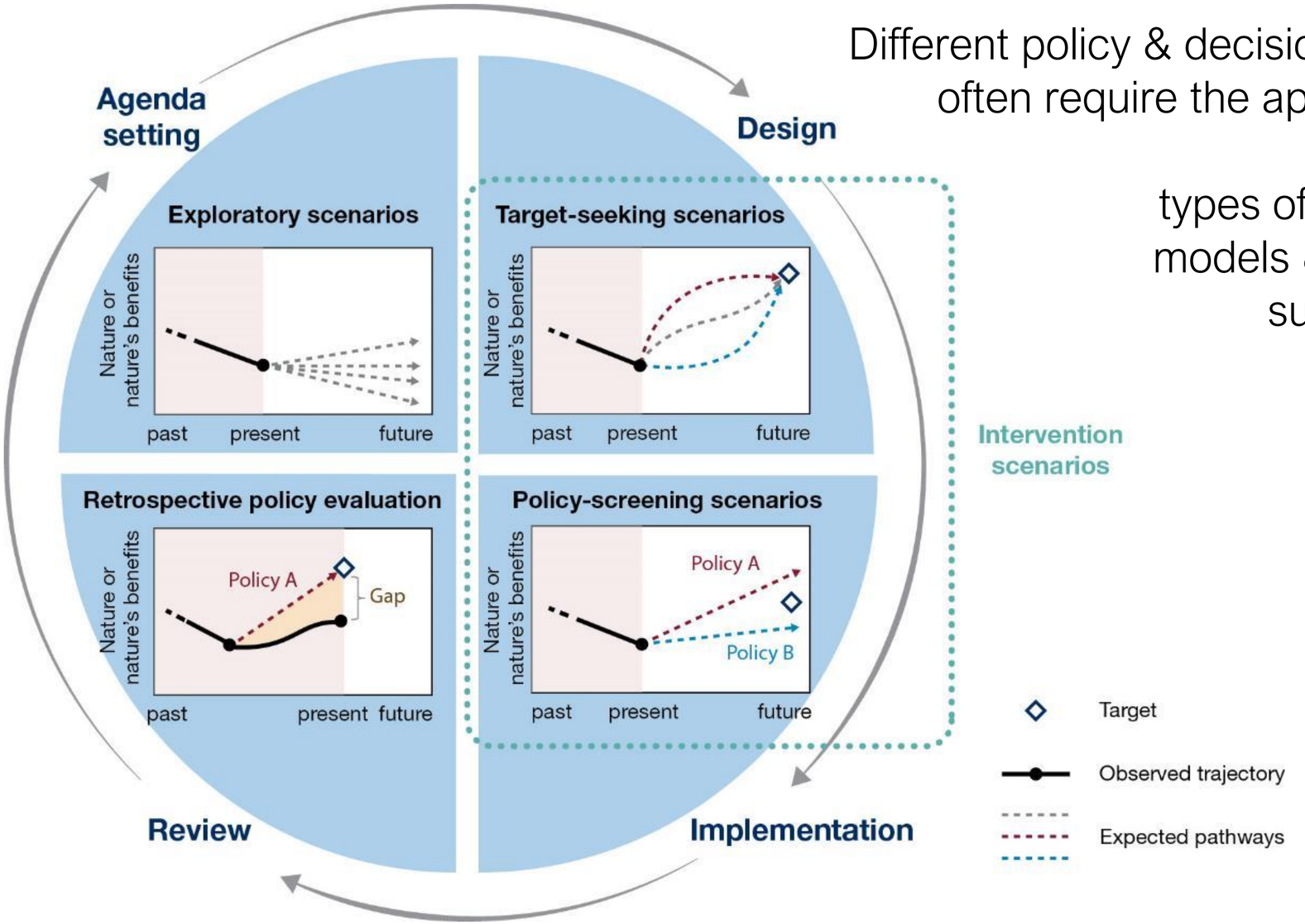
- In general terms, "scenarios" can be defined as: "*consistent and coherent* ***descriptions of alternative hypothetical futures*** *that reflect different perspectives on past, present, and future developments, which can serve as a basis for action*“ Van Notten (2005)

- In the landscape context, scenarios reflect different perspectives in terms of future configuration of **land uses, production, governance,** etc. (e.g., green vs. grey infrastructure)

RANGE OF SCENARIOS

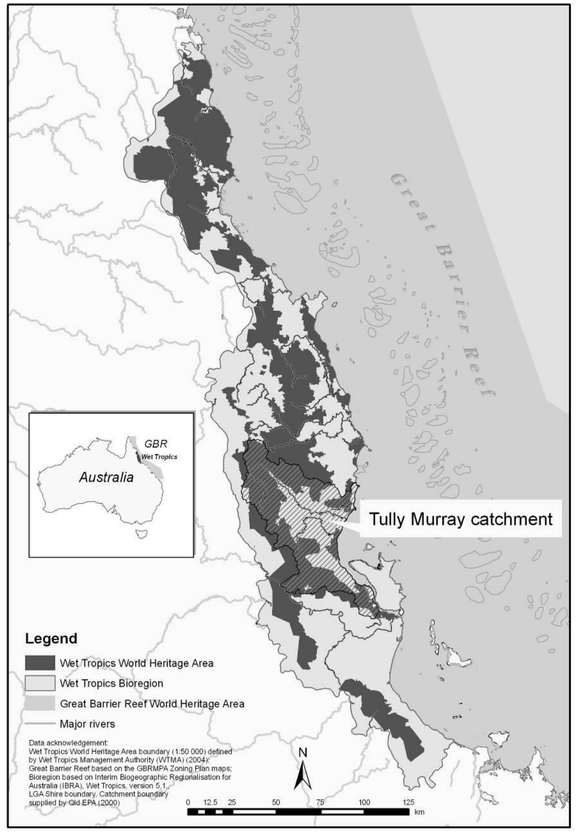


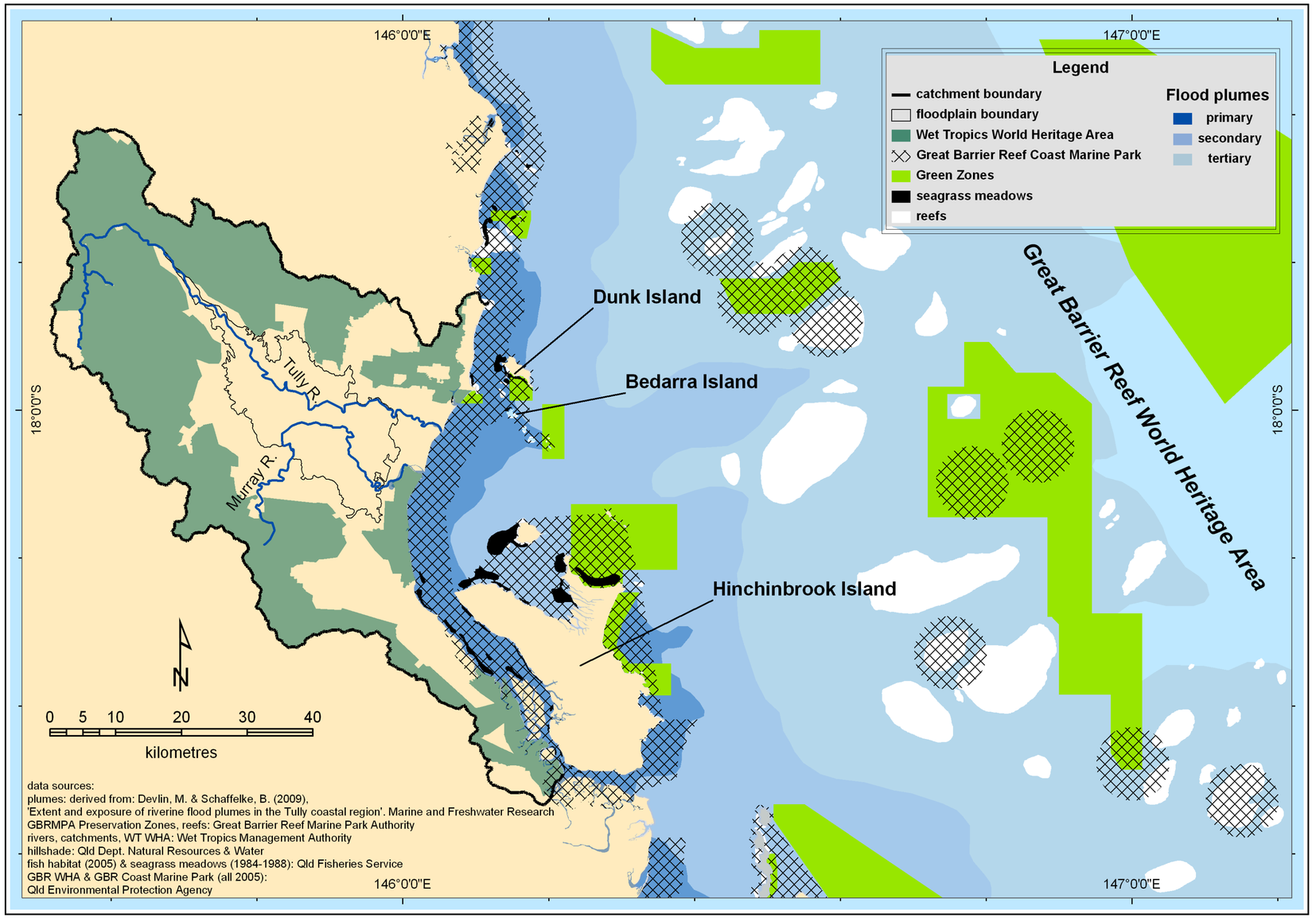
BASIC TYPES OF SCENARIOS



Different policy & decision contexts often require the application of different types of scenarios, models & decision-support tools

SCENARIO EXAMPLE OF FROM AUSTRALIA

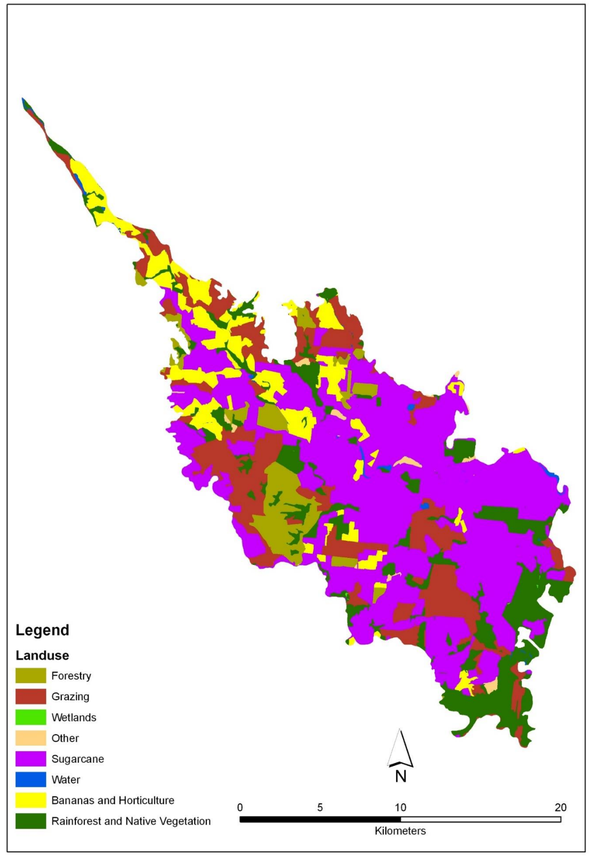




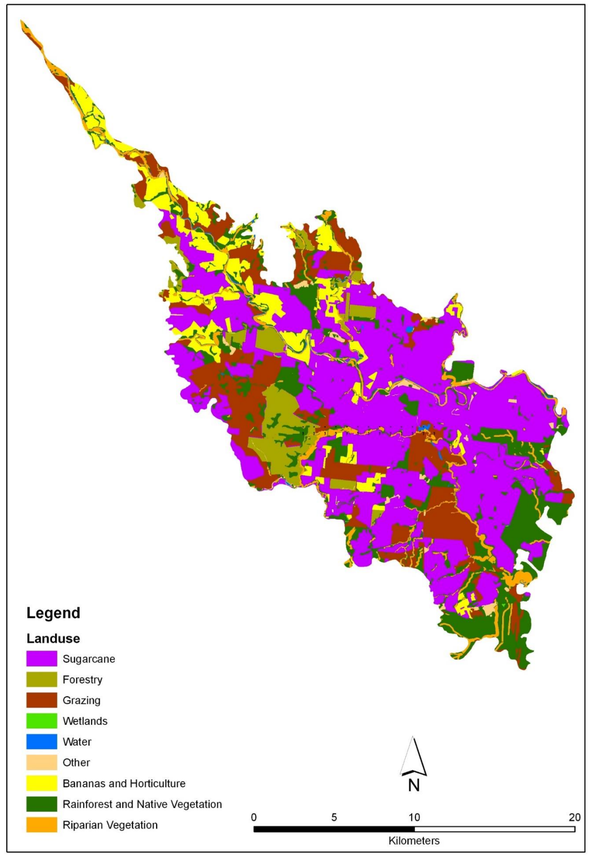
Butler et al. (2013)

LAND USE SCENARIOS

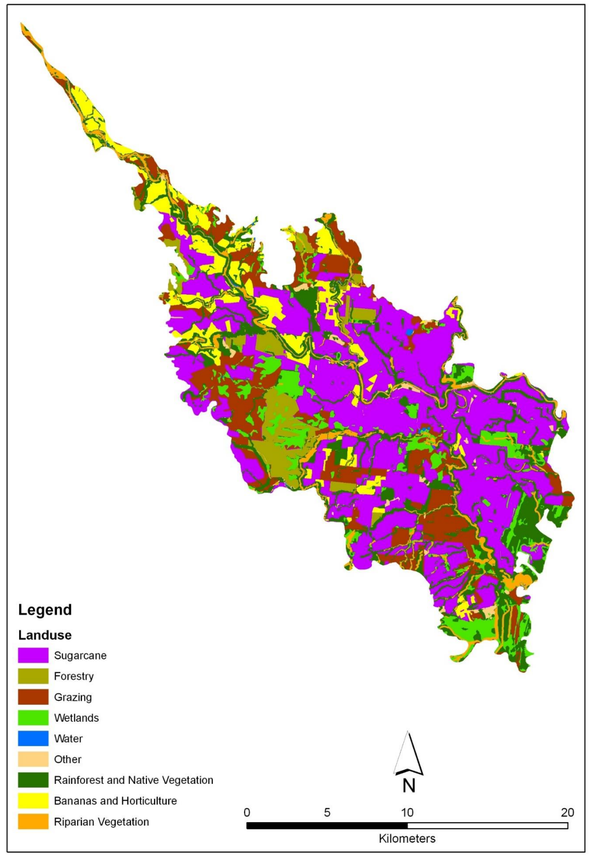
No Vegetation Management Act



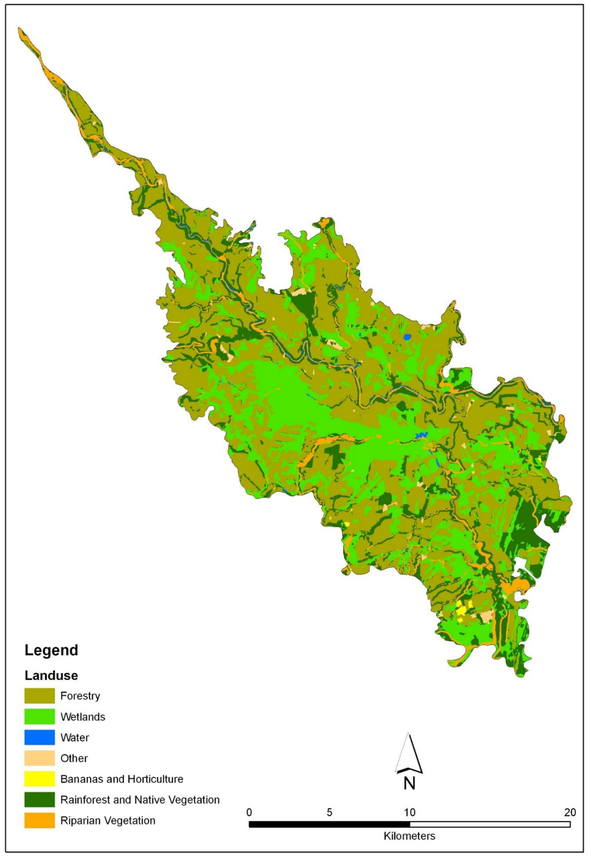
Present Day



De-nitrification and sediment priorities



Native forestry



ASSESSING SCENARIO TRADE-OFFS

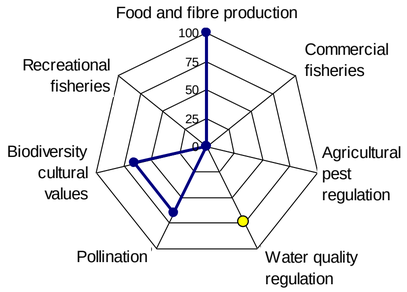
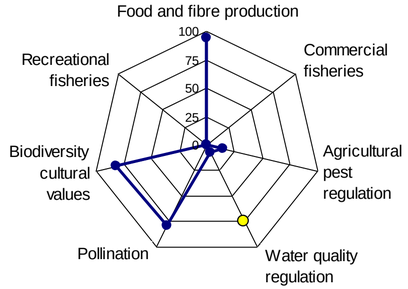
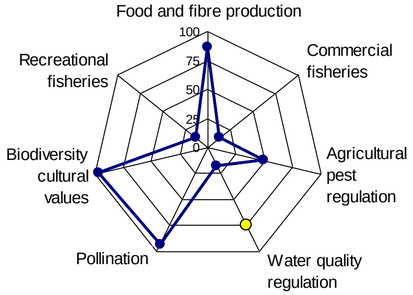
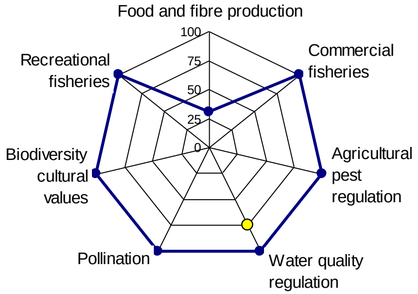
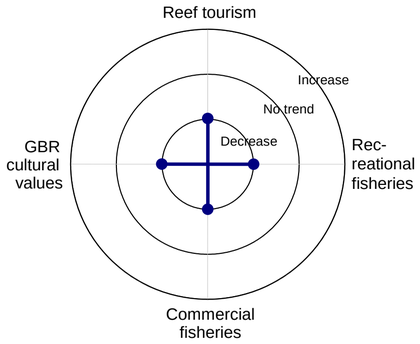
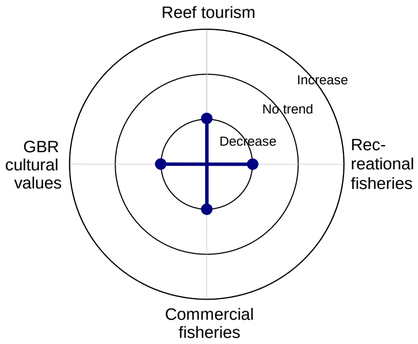
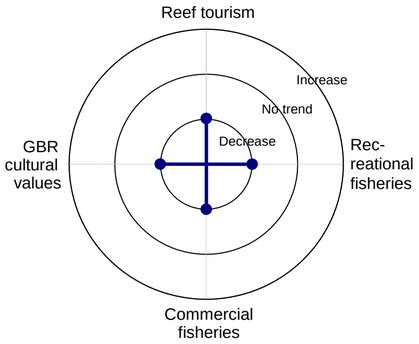
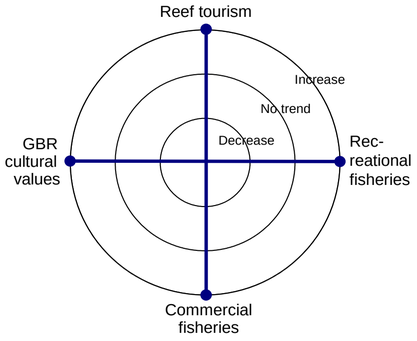
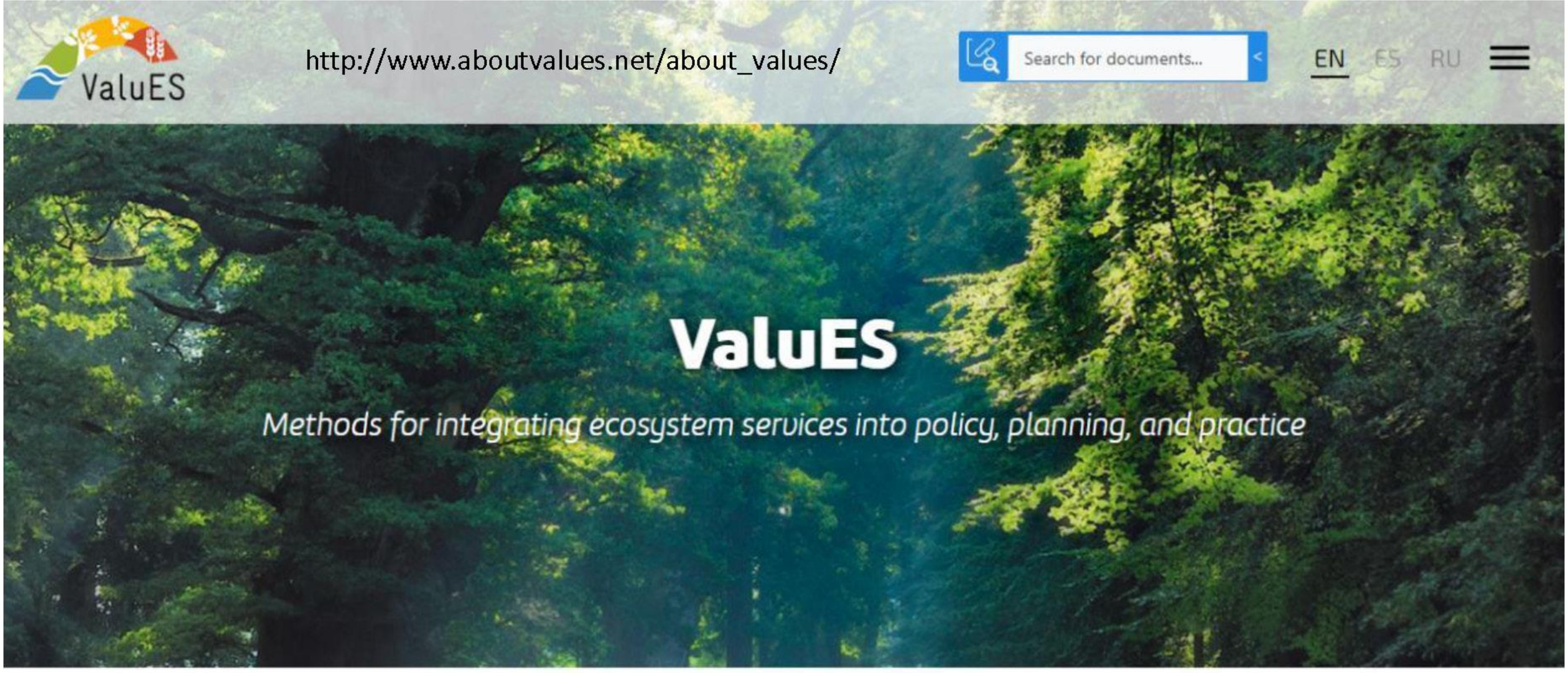
Stage 1: Land use scenarios	Scenario 1: No Vegetation Management Act	Scenario 2: Present Day	Scenario 3: De-nitrification and Sediment Priorities	Scenario 4: Native Forestry
	• Sugarcane: 37,429 ha • Bananas and horticulture: 7514 ha • Forestry: 13,348 ha • Grazing: 14,385 ha • Riparian vegetation: 0 ha • Wetlands: 0 ha	• Sugarcane: 35,282 ha • Bananas and horticulture: 7010 ha • Forestry: 13,053 ha • Grazing: 13,734 ha • Riparian vegetation: 2160 ha • Wetlands: 9 ha	• Sugarcane: 32,085 ha • Bananas and horticulture: 6239 ha • Forestry: 12,706 ha • Grazing: 12,511 ha • Riparian vegetation: 7180 ha • Wetlands: 1650 ha	• Sugarcane: 0 ha • Bananas and horticulture: 0 ha • Forestry: 45,899 ha • Grazing: 0 ha • Riparian vegetation: 14,724 ha • Wetlands: 11,837 ha
Stage 2: Change in status of floodplain ecosystem services				
Stage 3: Change in trends of GBR ecosystem services				

Figure 7. Results of the 3-stage analysis, showing land use scenarios, and resultant changes in floodplain ecosystem service status and linked trends in GBR

ADDITIONAL RESOURCES

http://www.aboutvalues.net/about_values/



ValuES is a global project that aids decision-makers in our partner countries in recognizing and integrating ecosystem services into policy making, planning and implementation of specific projects. We do this by developing instruments and training courses, providing technical advice and facilitating planning and decision-making processes. We also promote knowledge-sharing via regional workshops and participation in global discussion forums.

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EN ES RU

Purposes | Type of Method | Ecosystem Services | Reset Filters

Acting on Ecosystem Service Opportunities

ARIES - Artificial Intelligence for ES

Assessing flood prevention potential of wetlands

Assessing various forms of vulnerability

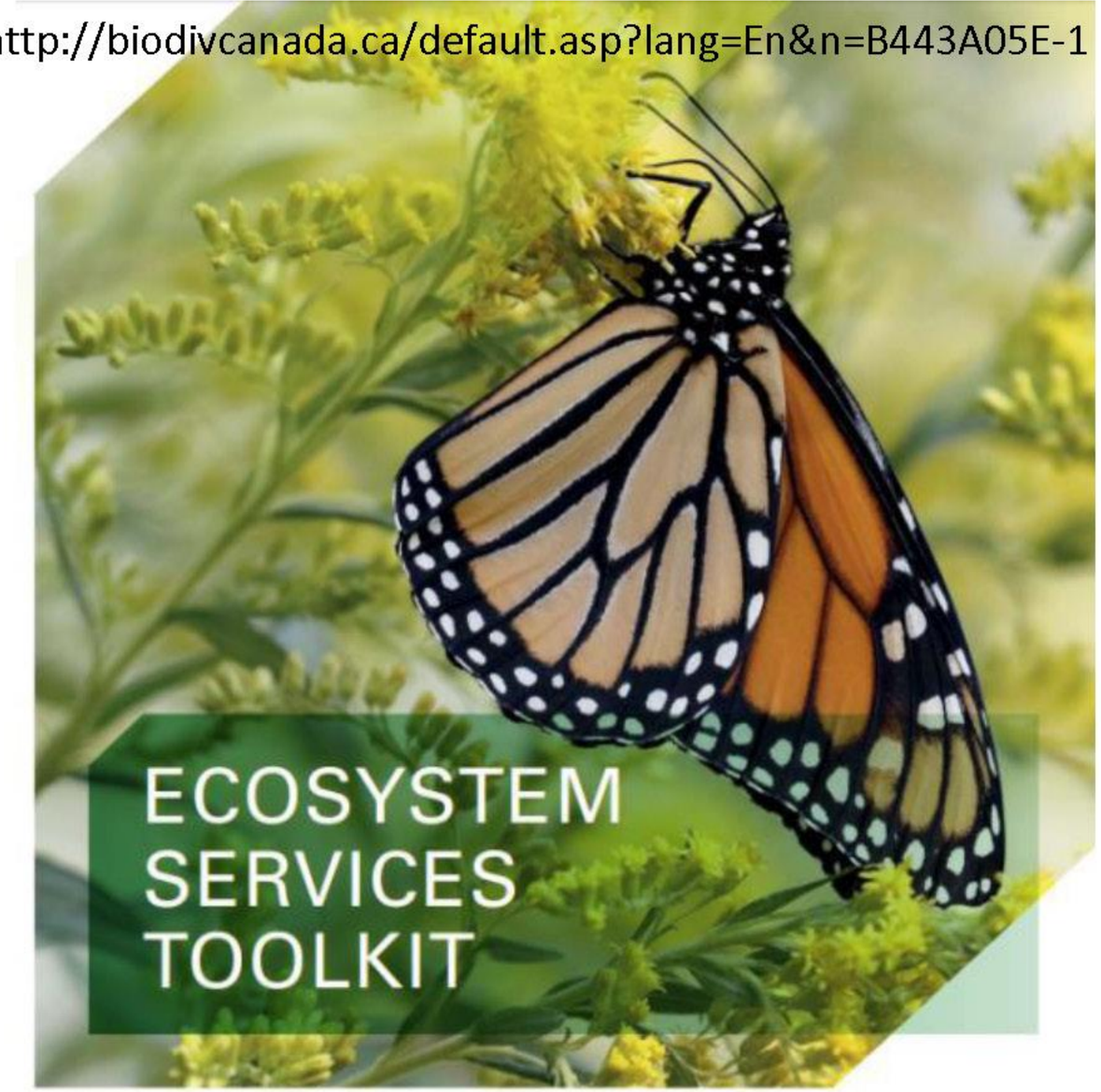
Assessment methods for carbon certification

Benefits transfer method

CBA - Cost-Benefit Analysis

CEA - Cost-Effectiveness Analysis

http://biodivcanada.ca/default.asp?lang=En&n=B443A05E-1



ECOSYSTEM SERVICES TOOLKIT

Completing and Using Ecosystem Service Assessment for Decision-Making: An Interdisciplinary Toolkit for Managers and Analysts

Value of Nature to Canadians Study Taskforce
Federal, Provincial, and Territorial Governments of Canada

CONCLUSIONS

- The three concepts presented here only provide context for spatial planning, in reality there is significant overlap between them
- Understanding the objective of a spatial planning exercise is key to determining the most appropriate tools and methods for implementation
- Achieving sustainability is a socio-ecological endeavor; stakeholder engagement, adaptive management and scenarios development are key for success

NEXT STEPS

- Deeper dive into multi-criterion analysis and methods
- Case study: ecosystem benefit index (EBI) in Peru
- Hands-on exercise: developing scenarios with the EBI