System of Environmental Economic Accounting

Mainstreaming the SEEA EEA Through Policy Scenario Modelling

International Seminar on Natural Capital Accounting

12-14 November, Beijing, China

United Nations

Outline

1. Define policy scenario analysis, in the context of the SEEA-EEA
2. Objectives of policy scenario analysis
3. The contribution of SEEA-EEA to policy scenario analysis
4. Types of models
5. Examples

Policy Objectives of NCA&VES Project

Policy Mainstreaming

- Overall broad objectives of the project to:
  - raise awareness of SEEA-EEA among key stakeholders and users of data
  - integrate use of accounts it into decision-making frameworks, processes etc.

Policy Scenario Analysis

- Specific deliverables of the project that:
  - influence specific live policy decisions
  - test and advance scenario analysis methodologies
  - contribute to policy mainstreaming

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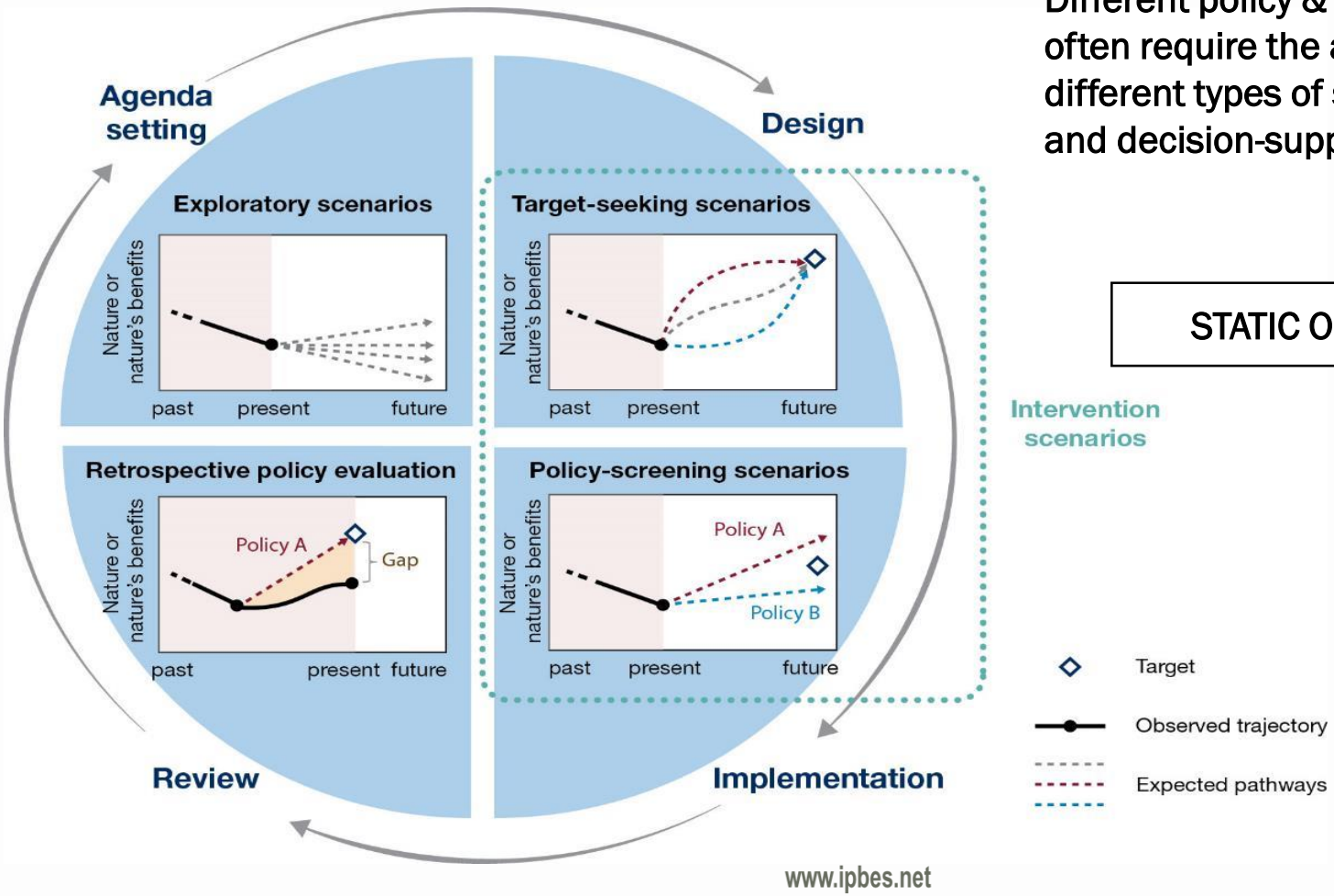
Definition of scenarios

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)

Scenario analysis is:

- An exercise in which several future development alternatives are identified, explained, and analyzed.
- Designed to improve decision making, allowing it to embrace uncertainty and risk.
- Used to explore the impacts of planned interventions and unexpected events, increasing the general readiness to unforeseen external impacts.

Basic types of scenarios



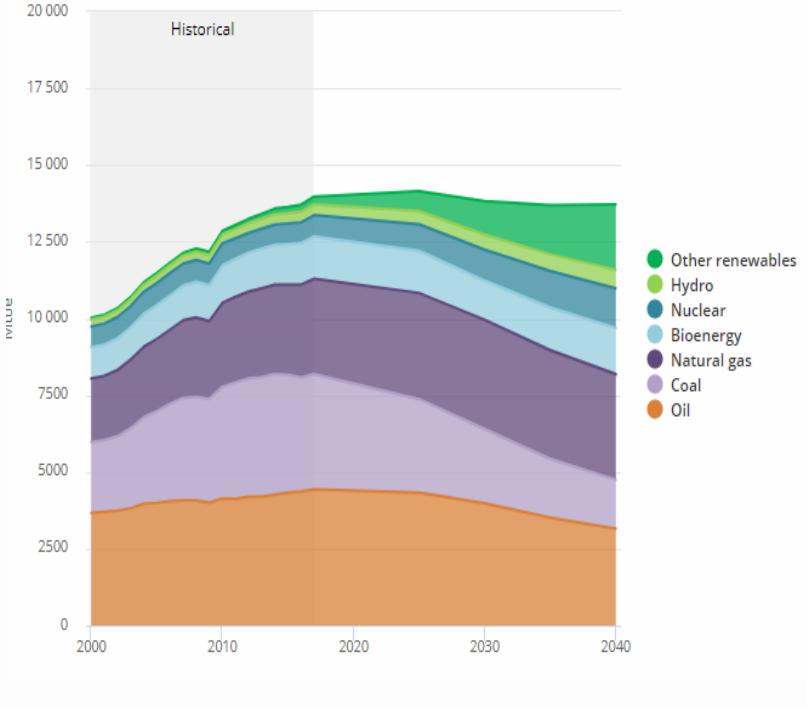
Different policy & decision contexts often require the application of different types of scenarios, models and decision-support tools

STATIC OR DYNAMIC

Credit: Conservation International

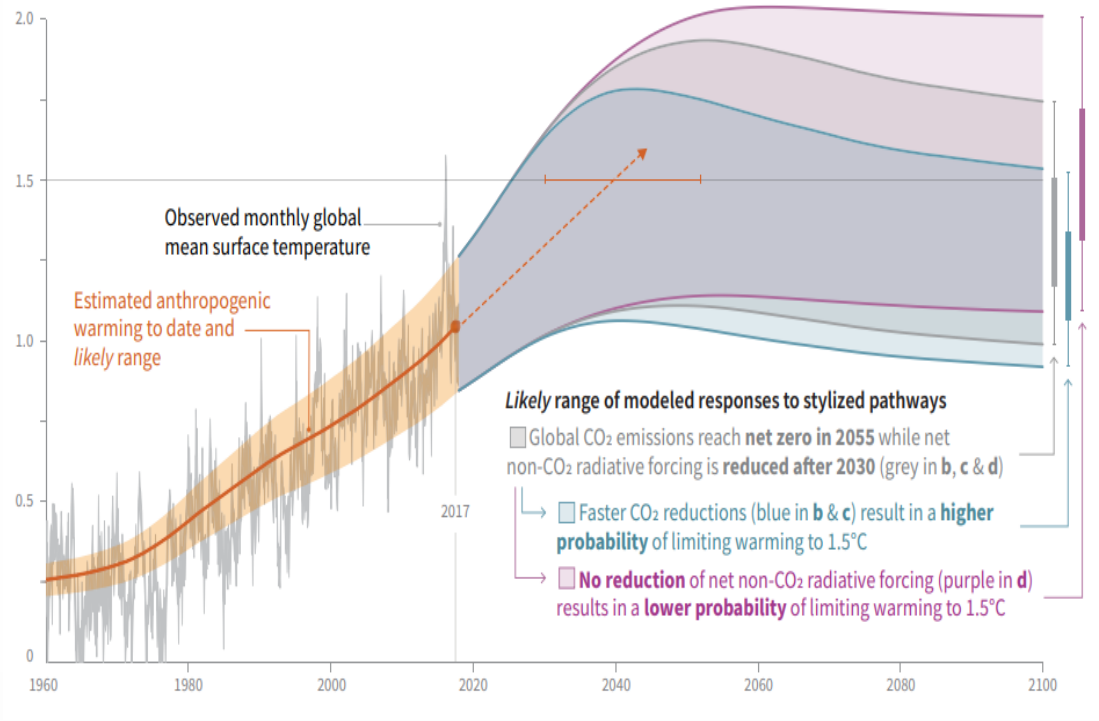
Scenarios in many contexts

Projections for Global Energy Demand



Source: World Energy Outlook, 2018

Global mean surface temperature: Stylized anthropogenic emission and forcing pathways



Source: IPCC, 2018

Objectives of policy scenario analysis, in the context of the SEEA EEA

- Inform or influence the selection or adaptation of an environmental policy
- Demonstrate the usefulness of the SEEA-EEA accounts
- Demonstrate the applicability of different modelling techniques for policy scenario analysis, drawing on the accounts
- Contribute to the mainstreaming of the use of environmental and ecosystem accounts in local/provincial/national level policy-planning and implementation
- **Improve the effectiveness of decisions for sustainable development through a better understanding of the interconnections between society, economy and environment.**

Policy scenario analysis informs various stages of decision making…

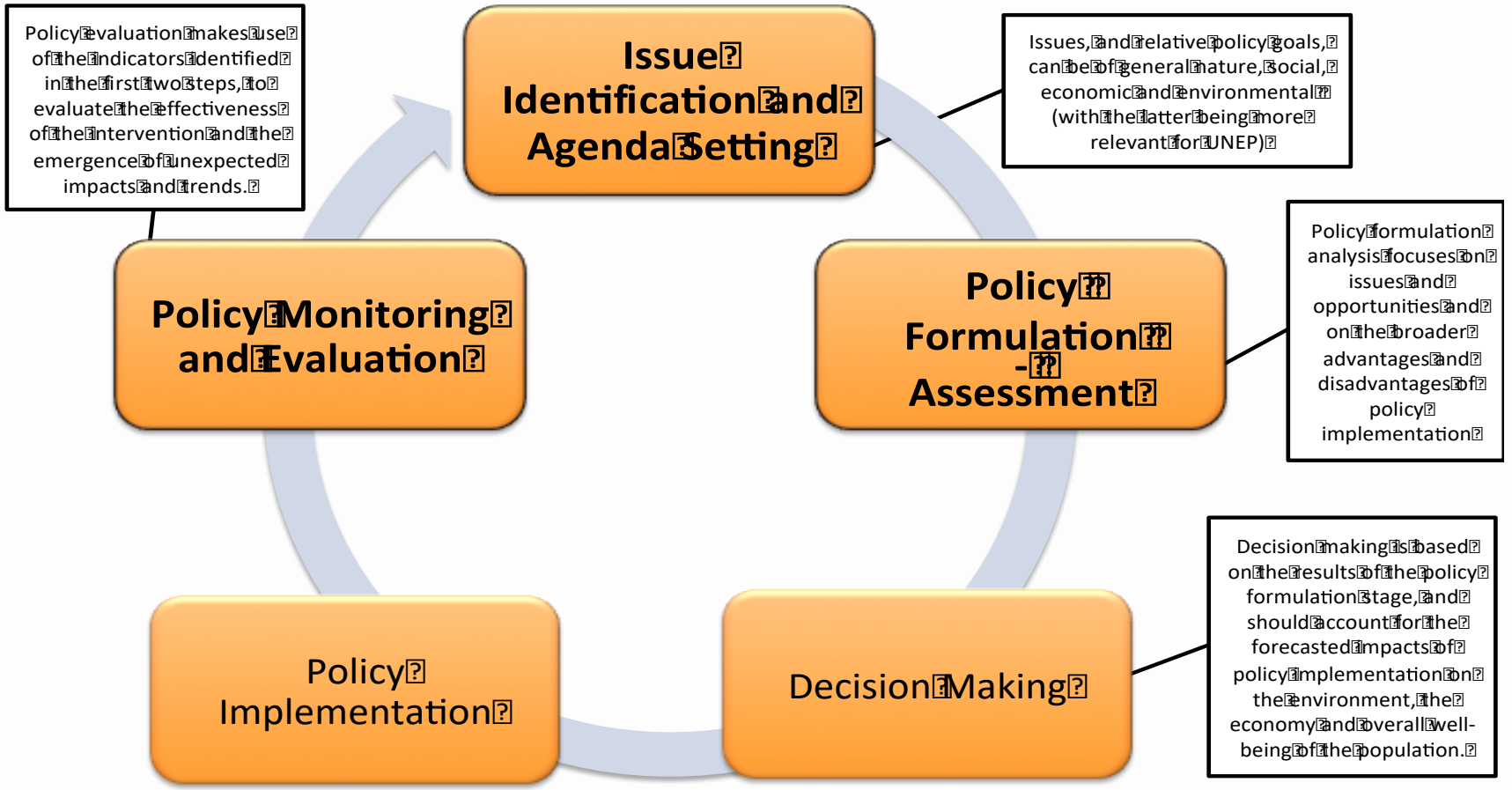


Figure source: A. Bassi.

Contribution of the SEEA-EEA

- Provide better data with a standardised approach to collection, interpretation and use
- Provide an improved understanding to quantify the interlinkages between society, the economy and the environment that can inform policy formulation
- Develop new indicators to expand the boundaries of analysis
- Allow for better interpretation of results of simulation models currently being used
- Improve and expand existing models with SEEA EEA data to allow stronger forecasting exercises

Contribution of the SEEA-EEA

NEW AND STANDARDIZED DATA INPUTS

IMPROVED EQUATIONS (UNDERSTANDING OF DYNAMICS)

NEW INDICATORS

SPATIAL DISAGGREGATION/ INTERPRETATION

The SEEA-EEA can contribute to model creation and customization, and to the interpretation of model results, thereby improving information for policy scenario analysis.

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Types of Models and Approaches

Scenario creation tools (qualitative)	• Systems maps (causal loops) • Tree diagrams • Dynamic pathways
Scenario forecasting tools (quantitative)	• Computable general/partial equilibrium models of economy or sectors • Systems engineering models of infrastructure • Spatially explicit land use models
Presentation or evaluation of scenario results	• Cost Benefit Analysis • Multi Criteria Analysis • Life Cycle Analysis

SEEA-EEA contribution to types of Models and Approaches

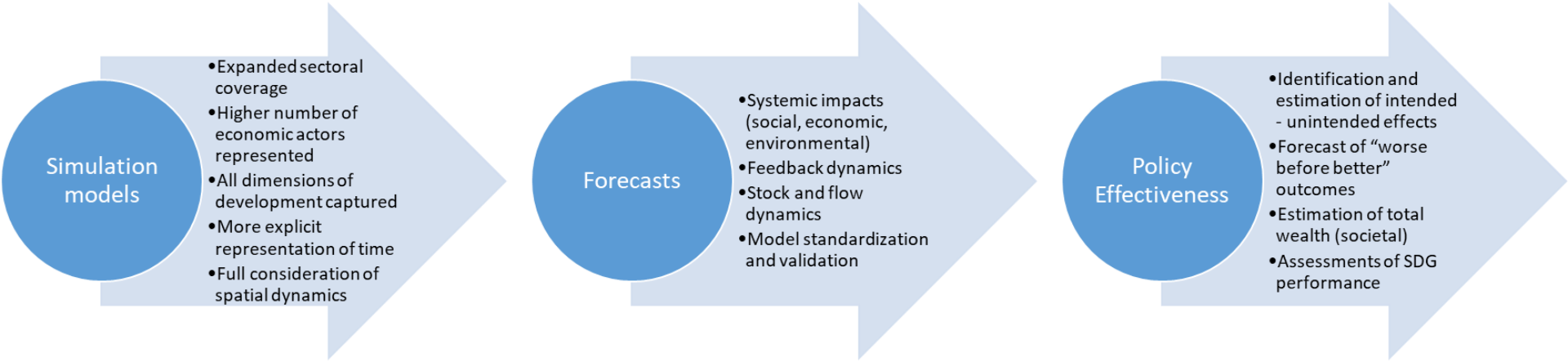


Figure source: A. Bassi.

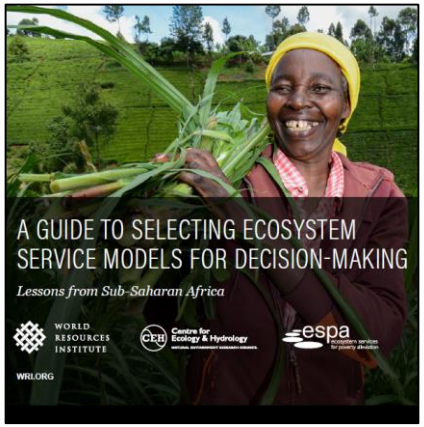
Ecosystems service models

- Models, and hence a simplified representations of reality
- Represent the processes in ecosystems that result in services
- These processes can be captured by sets of equations or proxy variables
- In most cases focused on creating spatial outputs to produce maps of ecosystem services.
- Various spatially-defined datasets can be used (e.g. remote sensing images, thematic maps, surveys for specific administrative or ecological units, and point data from specific studies).

Ecosystems service models

- Two main approaches:
  - *Simple*: “Look-up Tables” approach or “proxy-based”, based on multipliers and statistical approaches.
  - *Complex* (static or dynamics): process-based models. Represent ecological processes to estimate ecosystem service provision based on a specific land cover / land use map and other data inputs (e.g. topography).
- Forecast values for a specified ecosystem service based on how one or more environmental variables affect the value of that service.
- “Value” can be a measure of a relevant environmental variable (e.g., tons of carbon or liters of water), the monetary or nonmonetary value to humans, or a measure of use of the service by people.

Examples



ARIES (aries.integratedmodelling.org)

- An open-source technology that can select and run models to quantify and map ecosystem services, including physical generation, flow, and extraction by beneficiaries.

Co$ting Nature (http://www.policysupport.org/costingnature)

- A web-based series of interactive maps that defines the contribution of ecosystems to the global reservoir of a particular ecosystem service and its realizable value (based on flows to beneficiaries of that service).

InVEST (www.naturalcapitalproject.org/invest/)

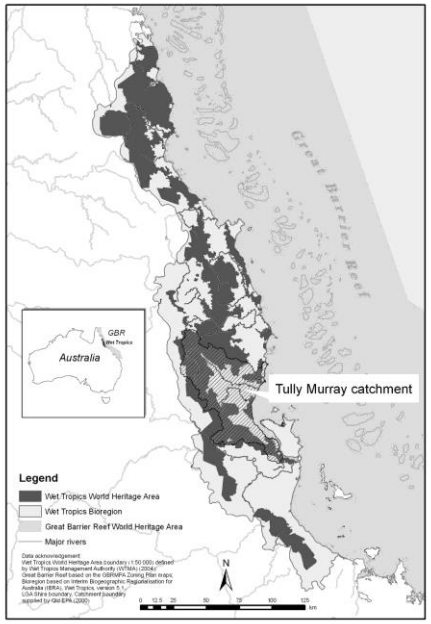
- A suite of free, open-source software models from the Natural Capital Project used to map and value the goods and services from nature. InVEST returns results in either biophysical or economic terms.

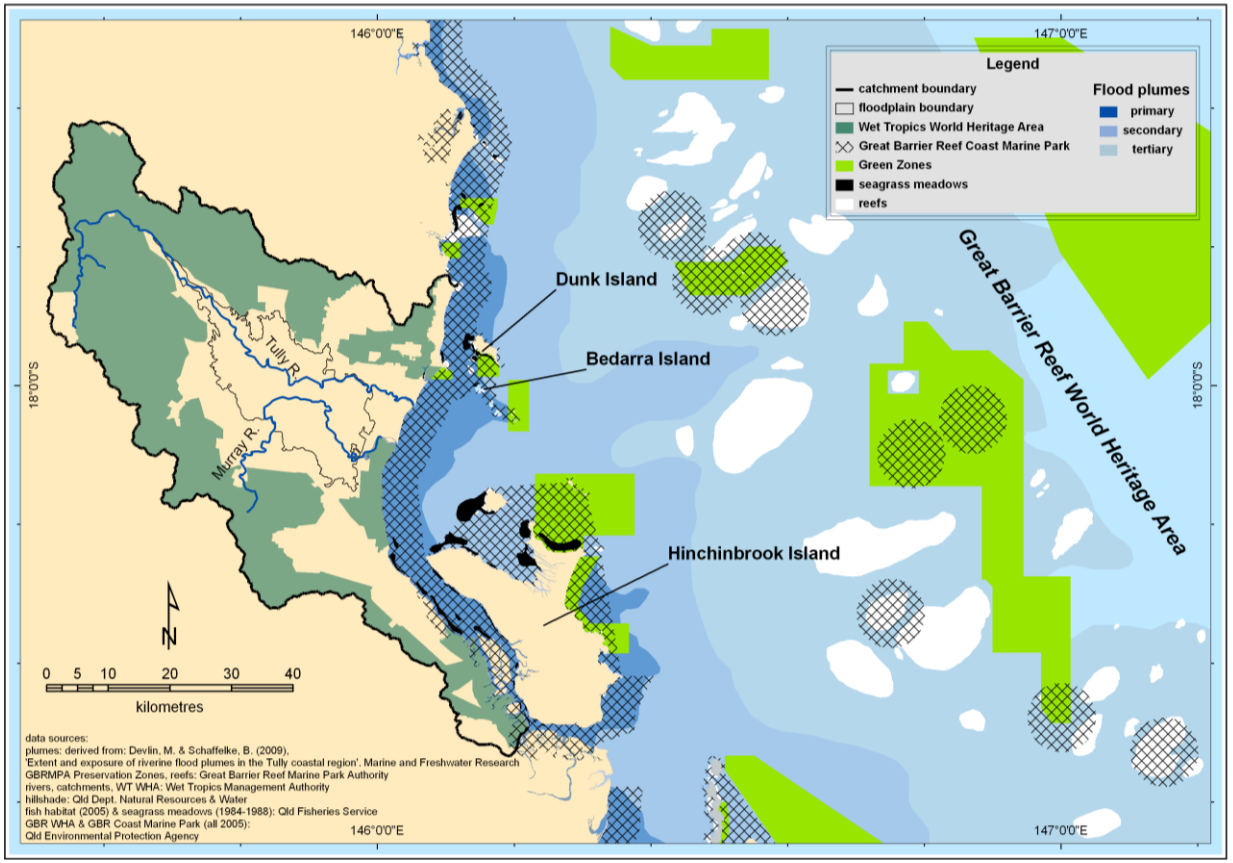
Many other models are available, e.g. Multiscale Integrated models for Ecosystem Services (**MIMES**), Social Value for Ecosystem Services (**SolVES**), Land Utilization and Capability Indicators (**LUCI**).

See: http://aboutvalues.net/method_database/

Source: A. Bassi.

SCENARIO EXAMPLE OF FROM AUSTRALIA





Butler et al. (2013)

Credit: Conservation International

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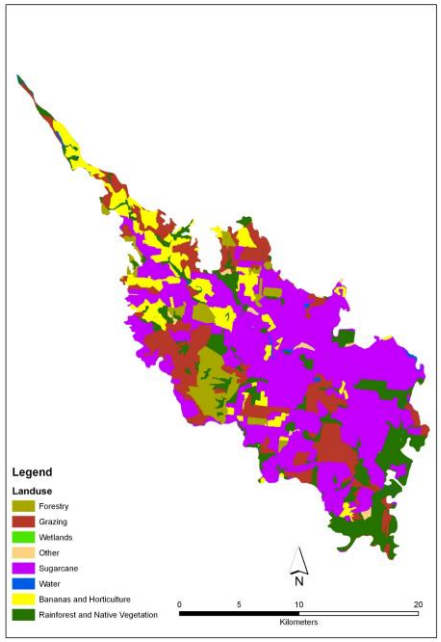
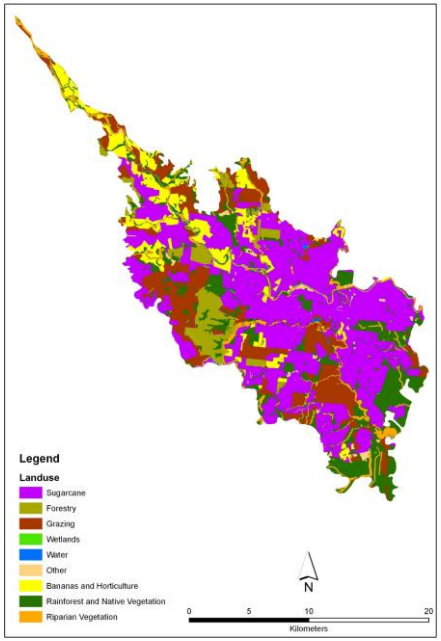
LAND USE SCENARIOS

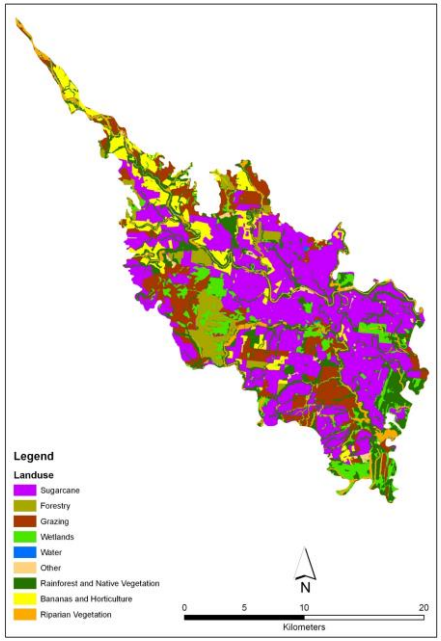
No Vegetation Management Act



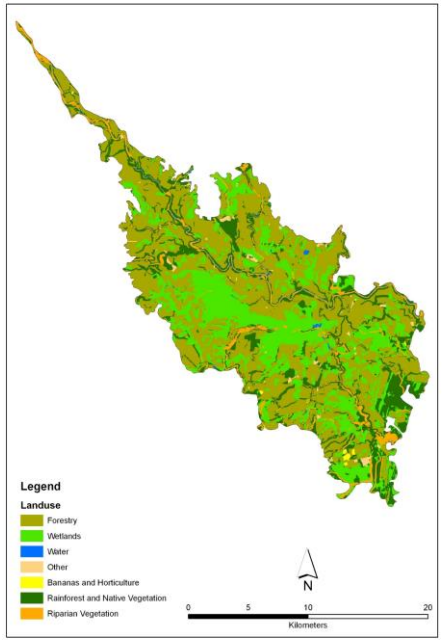
Present Day



De-nitrification and sediment priorities



Native forestry



Credit: Conservation International

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ASSESSING SCENARIO TRADE-OFFS

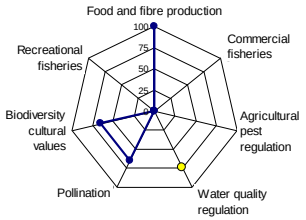
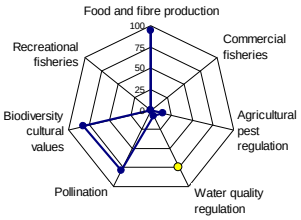
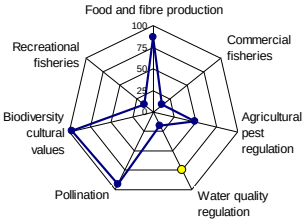
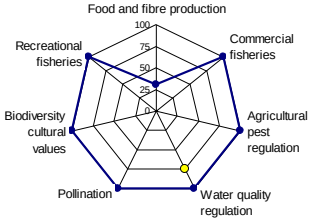
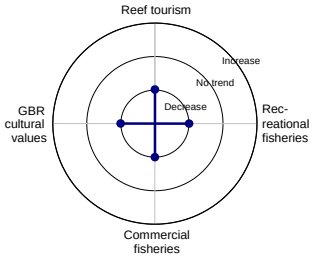
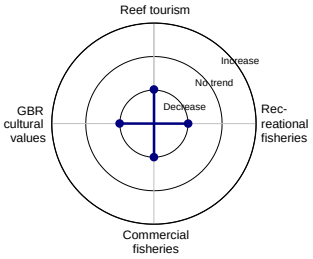
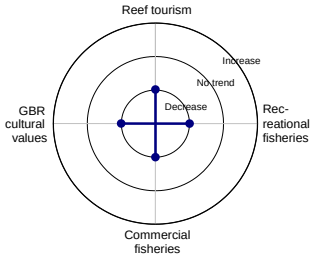
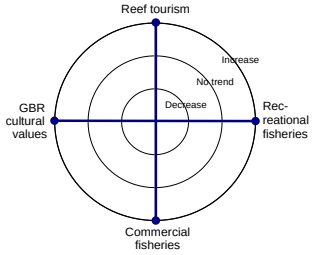
	Scenario 1: No Vegetation Management Act	Scenario 2: Present Day	Scenario 3: De-nitrification and Sediment Priorities	Scenario 4: Native Forestry
Stage 1: Land use scenarios	• Sugarcane: 37,429 ha • Bananas and horticulture: 7514 ha • Forestry: 13,348 ha • Grazing: 14,385 ha • Riparian vegetation: 0 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

Credit: Conservation International

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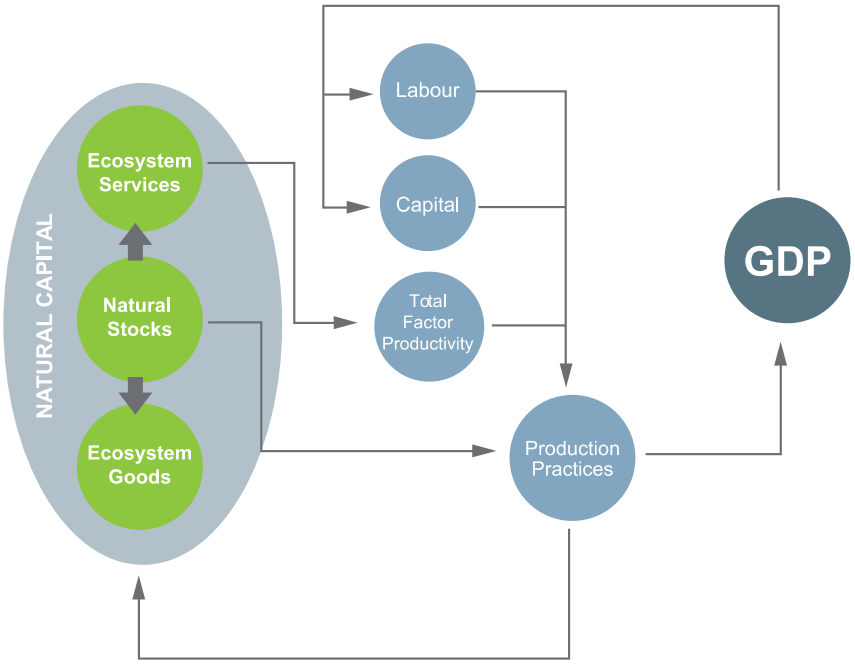
Example: Heart of Borneo

An integrated economic valuation of environmental stocks and services



Conceptual model of the conventional economy which externalizes natural capital from production

Credit: A. Bassi.

Example: Heart of Borneo

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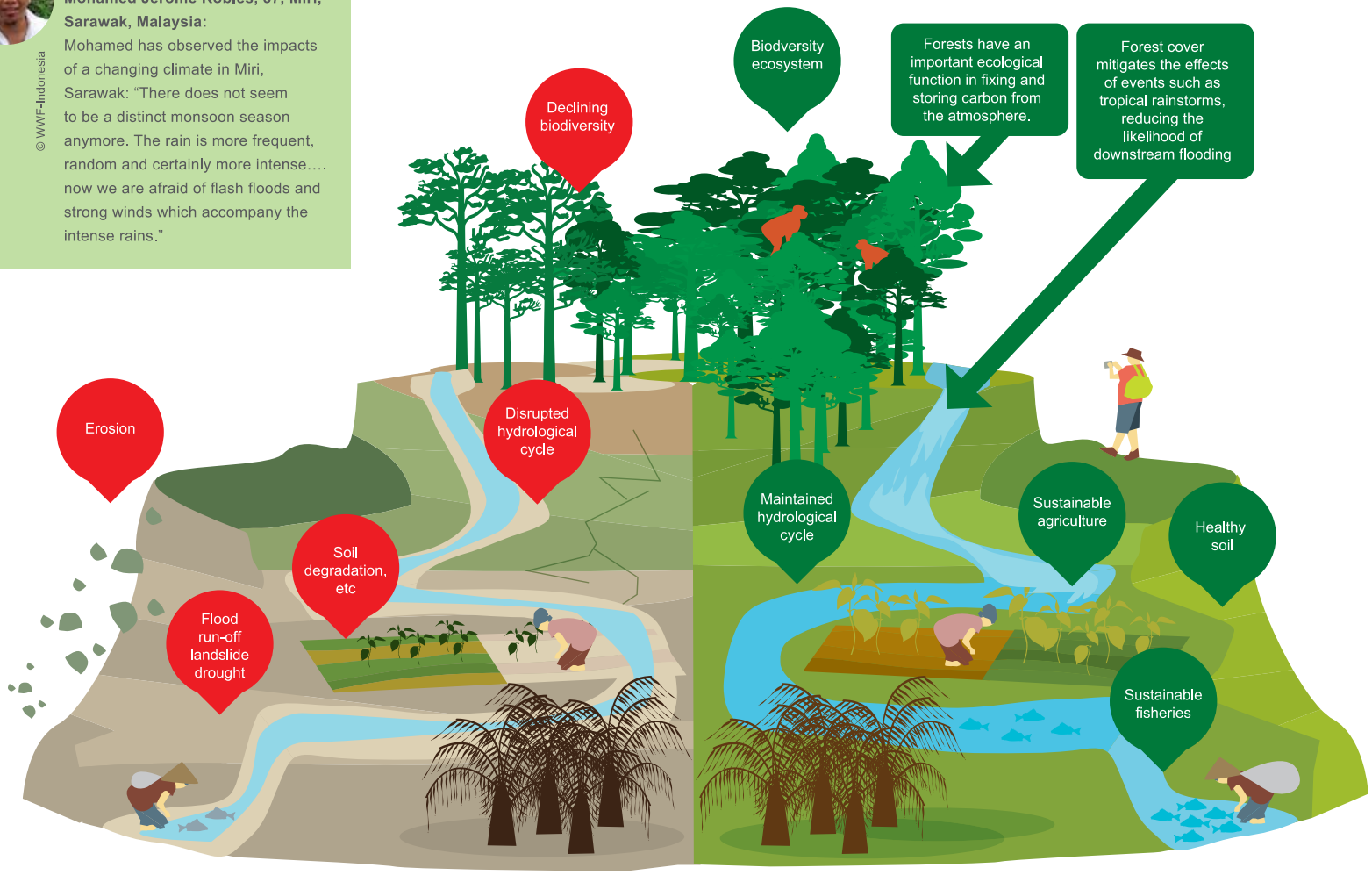
Mohamed Jerome Robles, 37, Miri, Sarawak, Malaysia:
Mohamed has observed the impacts of a changing climate in Miri, Sarawak: "There does not seem to be a distinct monsoon season anymore. The rain is more frequent, random and certainly more intense.... now we are afraid of flash floods and strong winds which accompany the intense rains."



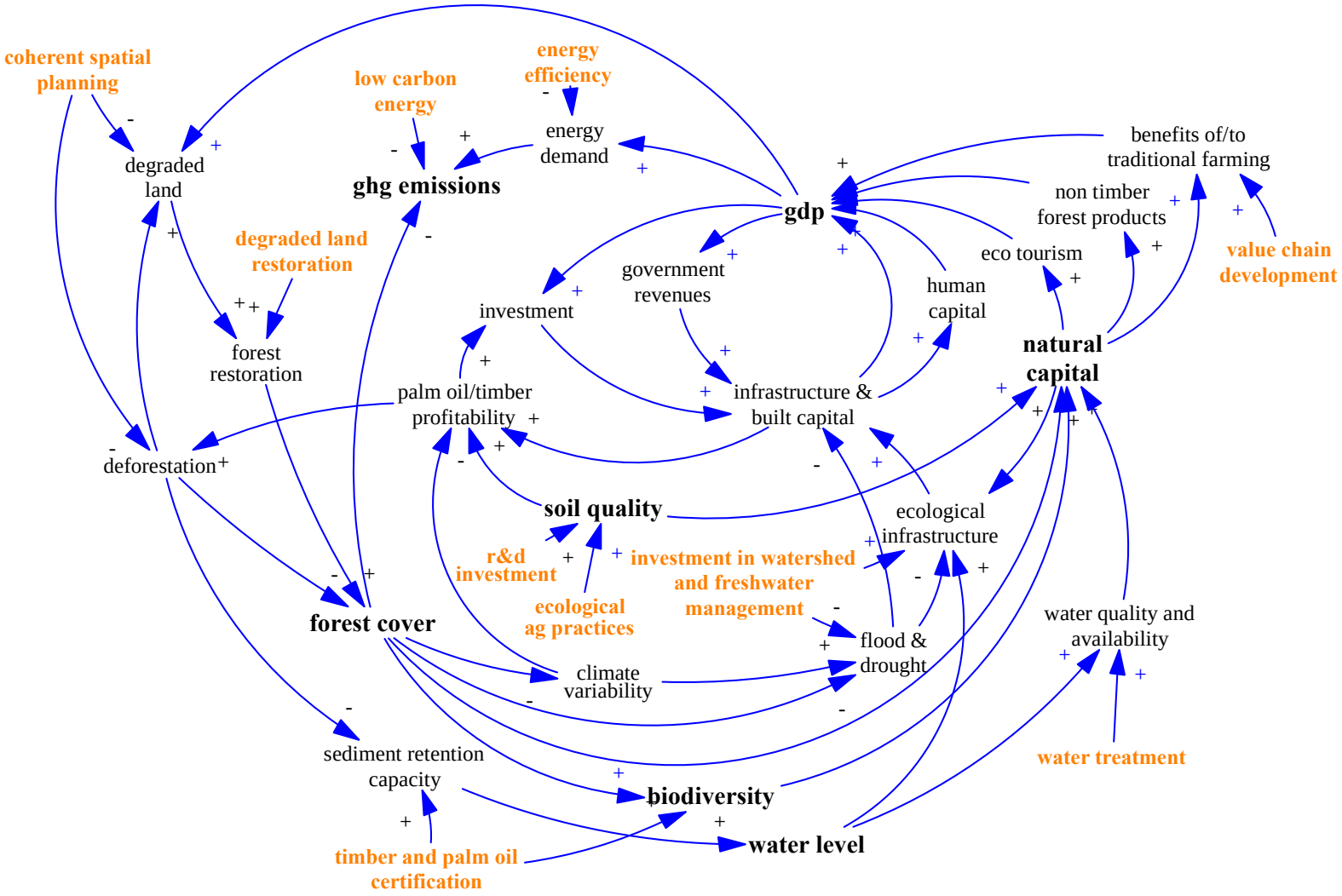
Credit: A. Bassi.

Example: Heart of Borneo

- Estimation of the **biophysical and economic value** of soil, forest, biodiversity, and carbon storage.
- Estimation of the **economic impact** of **natural resource stock utilization**.
  - For instance, industrial production is influenced by the usability of rivers for transport, which -in our model- is affected by the average level of water, siltation, and extreme events (such as floods and droughts), which are generally driven by precipitation and forest cover.

Credit: A. Bassi.

Example: Heart of Borneo



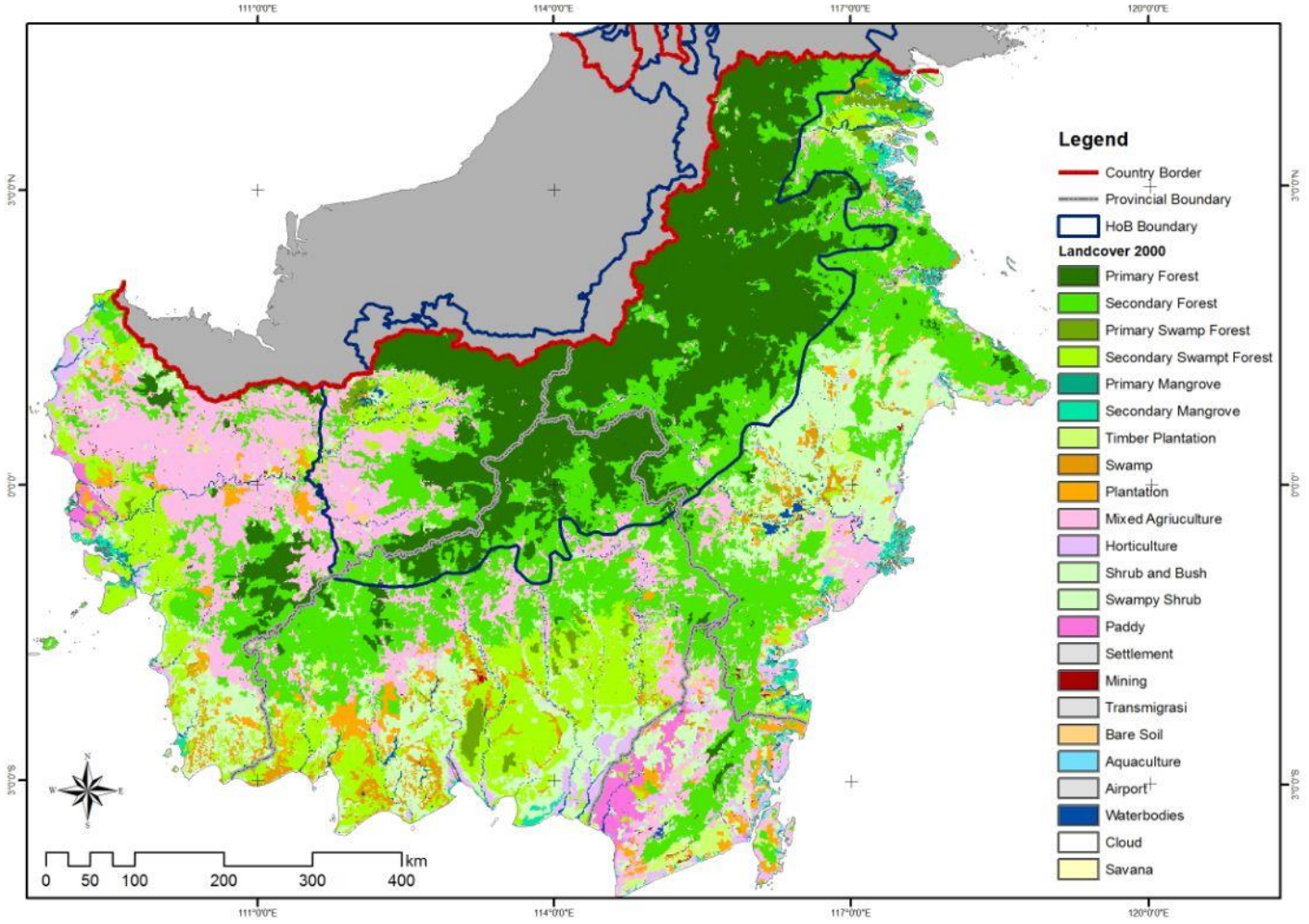
THE NEW CLIMATE ECONOMY
The Global Commission on the Economy and Climate

Credit: A. Bassi.

United Nations

Example: Heart of Borneo

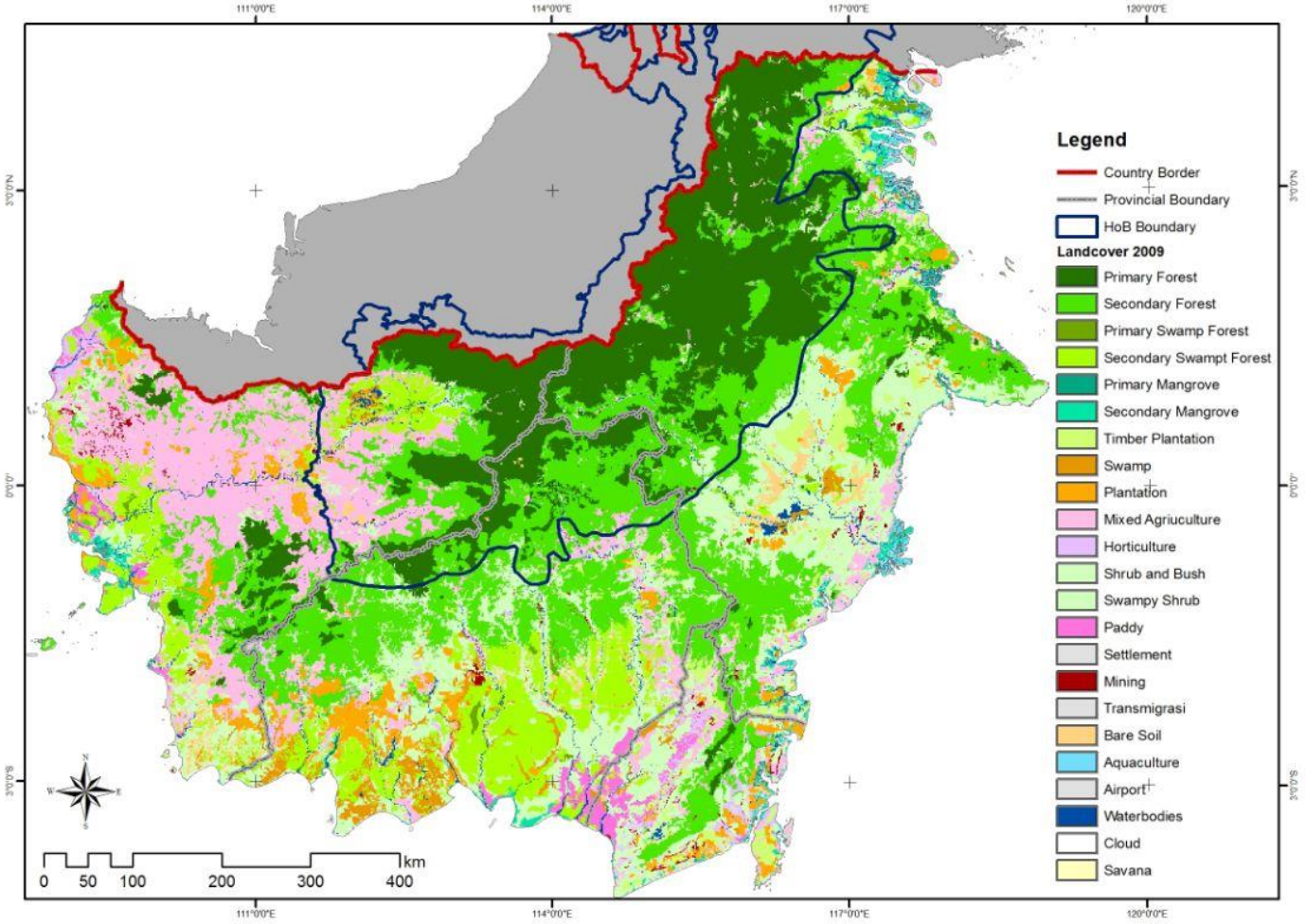
Simulation of Spatial Scenarios (2000)



Credit: A. Bassi.

Example: Heart of Borneo

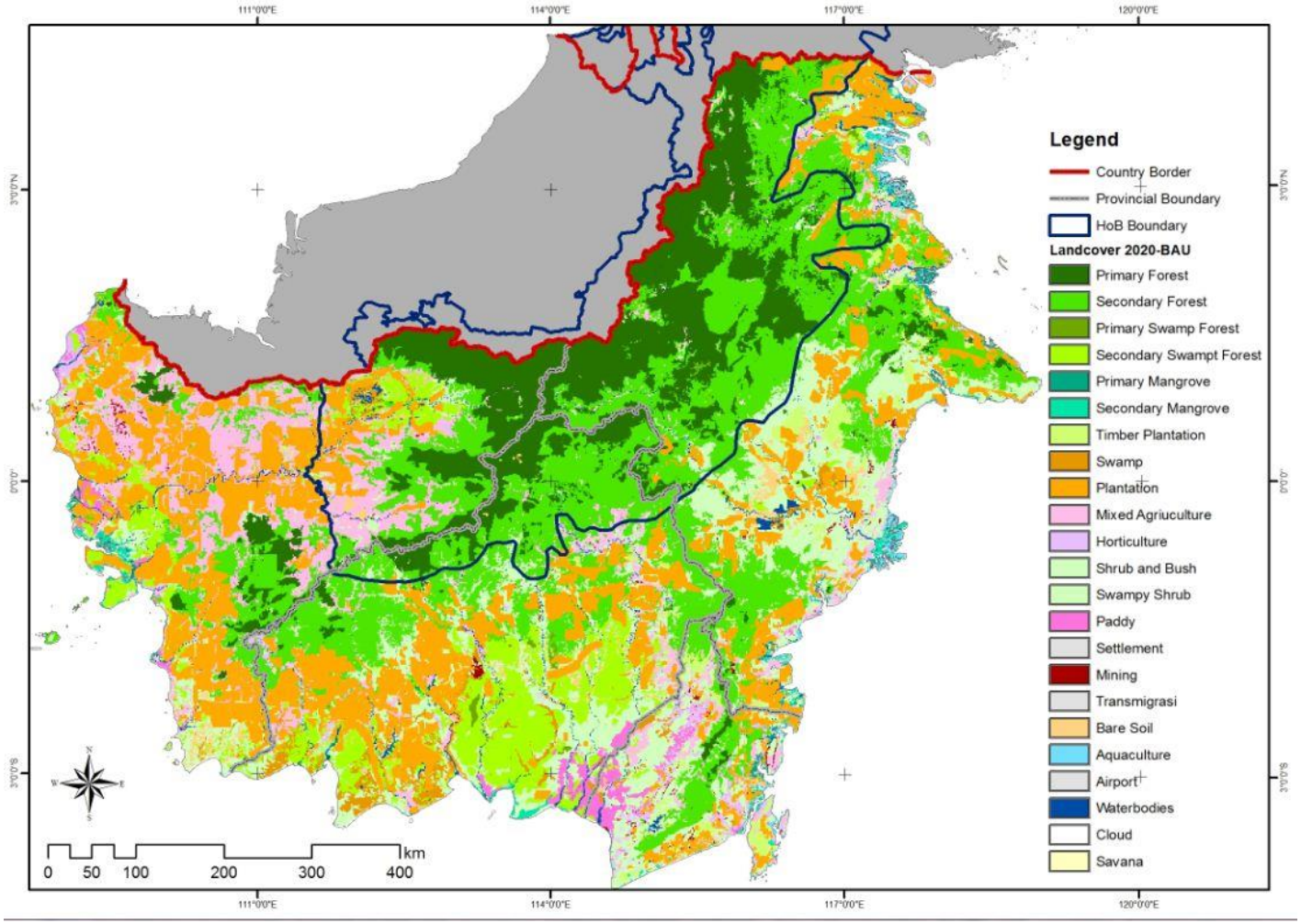
Simulation of Spatial Scenarios (2009)



Credit: A. Bassi.

Example: Heart of Borneo

Simulation of Spatial Scenarios (2020)



THE NEW CLIMATE ECONOMY
The Global Commission on the Economy and Climate

Credit: A. Bassi.

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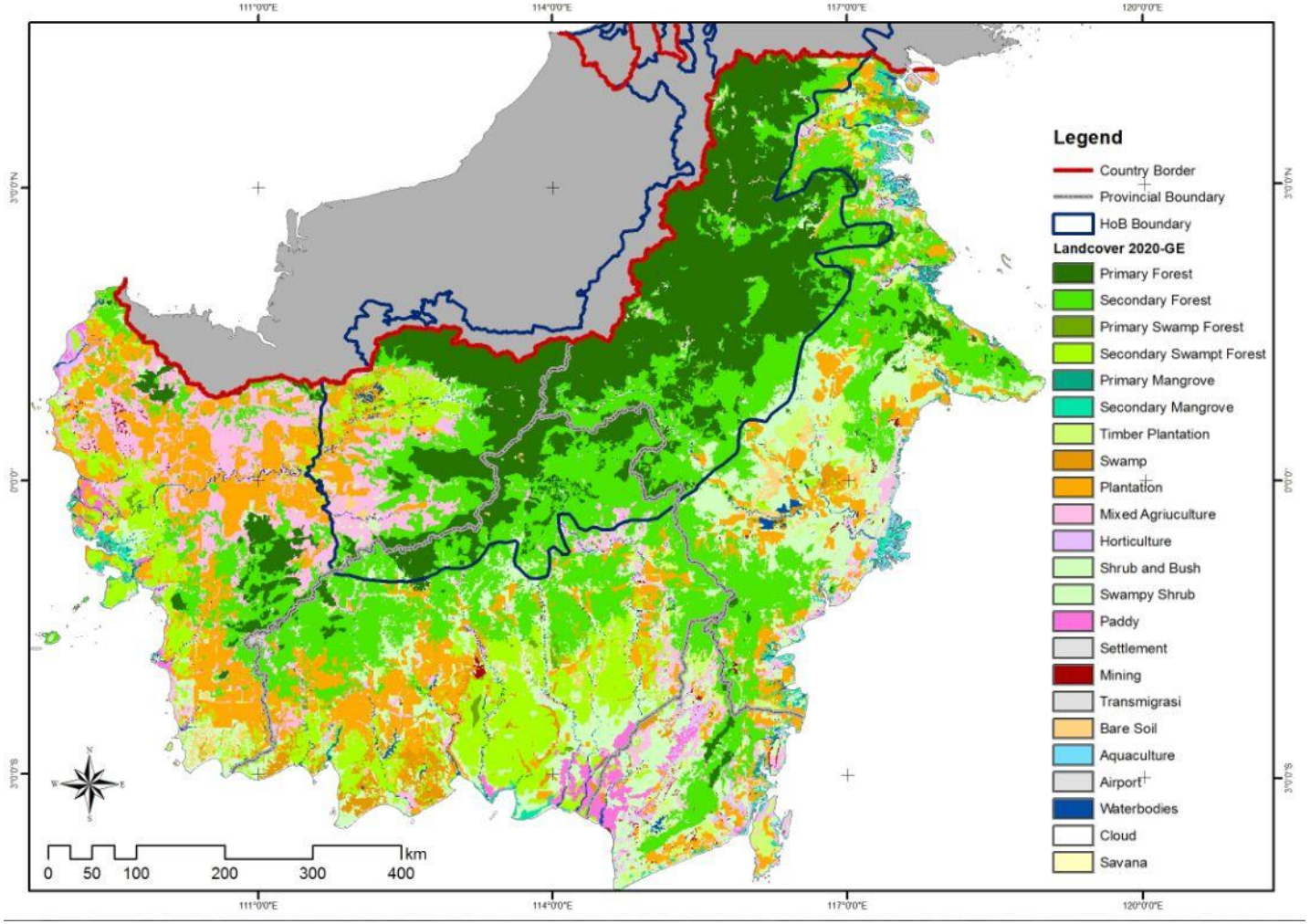
Example: Heart of Borneo

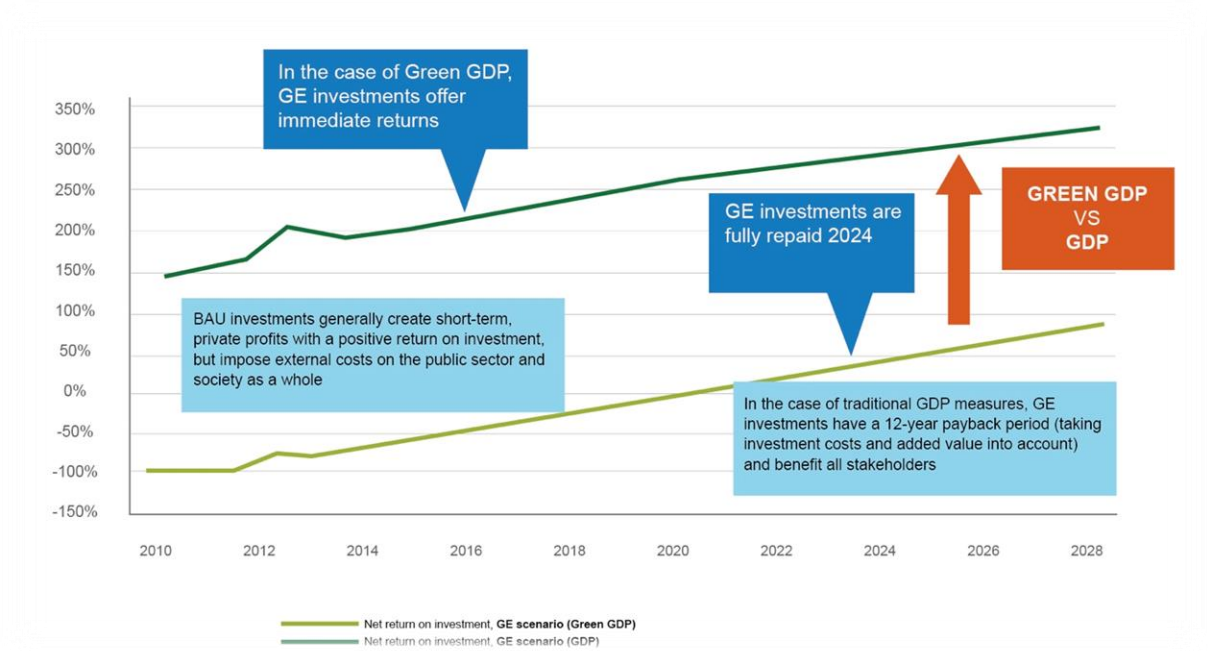
Simulation of Spatial Scenarios (GE 2020)



Credit: A. Bassi.

Example: Heart of Borneo

Simulation of Spatial Scenarios: Impacts on Growth



GE projections show higher GDP growth than BAU (up to 0.2% of growth per year)
Rural poverty reduces (5% increased rural income)
Higher employment (especially in energy and agriculture),
Reduction in GHG emission intensity of about 30% on average
Under BAU scenario value of natural capital will decline, turning from a source of revenue to a cost, with estimated turning point shortly after 2020.

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The Global Commission on the Economy and Climate

Credit: A. Bassi.

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Example: WWF's 'Road to Dawei' Study

The "Road to Dawei" project involves the construction of a road link from Bangkok (Thailand) to Dawei (Myanmar), across the highly biodiverse Dawna Tenasserim Landscape (DTL), and it was conceived under the framework of the "Dawei deep-sea port" project.

Credit: A. Bassi.

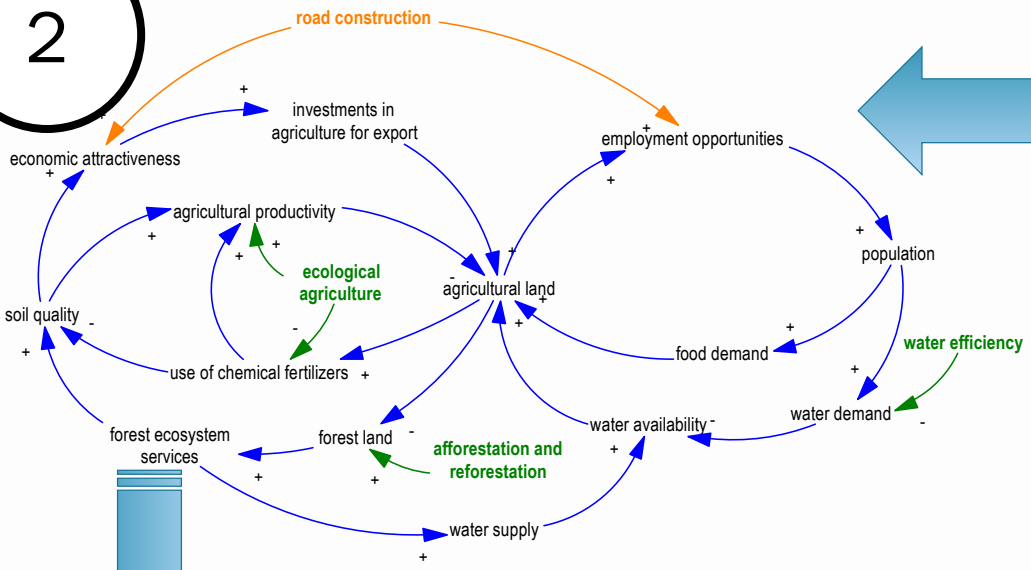
Relevant Example: WWF's 'Road to Dawei' Study

Three methodologies were used:

1. The **InVEST** tool to generate spatial information and estimate changes in natural capital stocks
2. **Causal Loop Diagram** to identify the main drivers and impacts of land use change in the DTL region.
3. The **Integrated Planning for Sustainability (IPS) model** was developed using the System Dynamics methodology, and incorporating the key drivers of land use change and impacts.

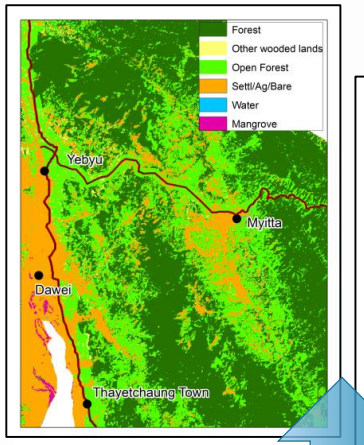
Credit: A. Bassi.

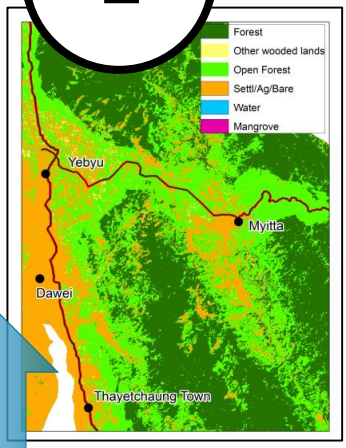
2



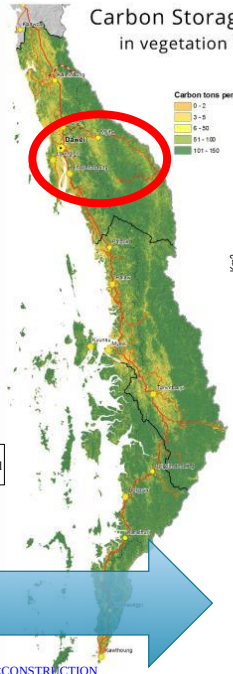
Scenario 1

1





Scenario 2



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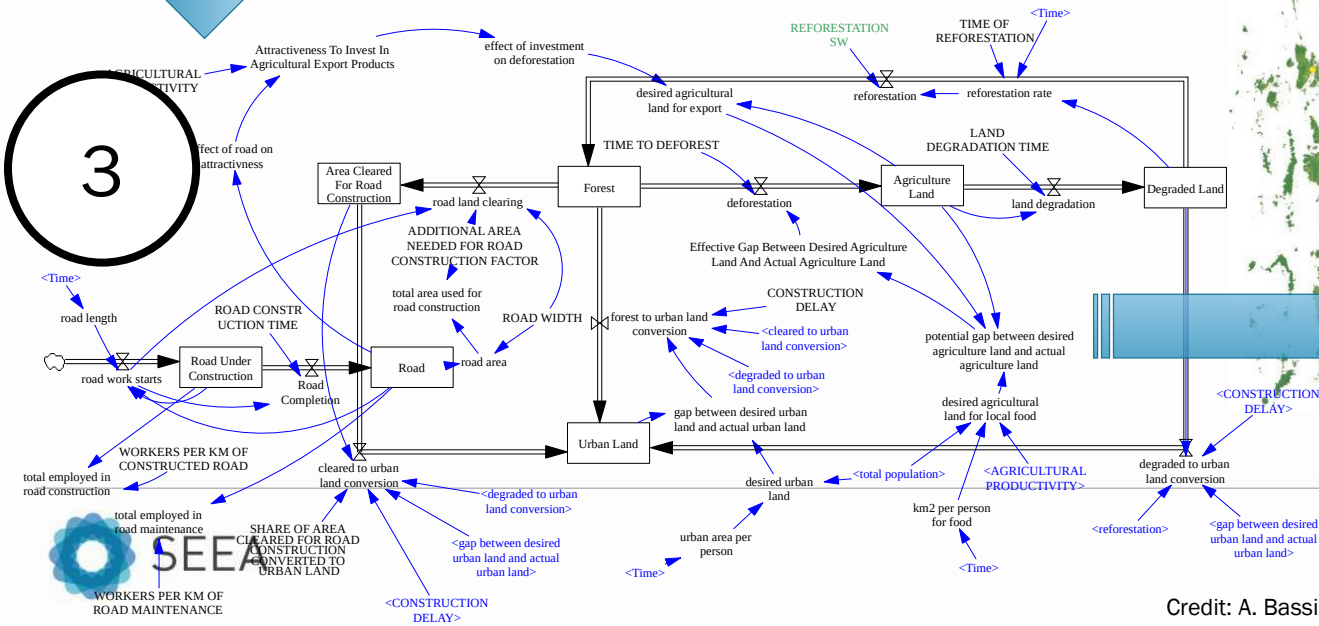

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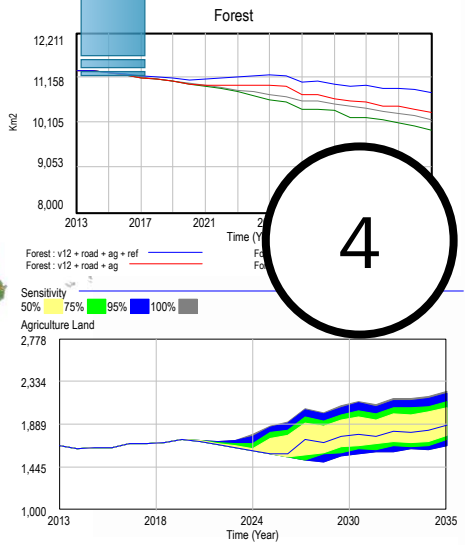
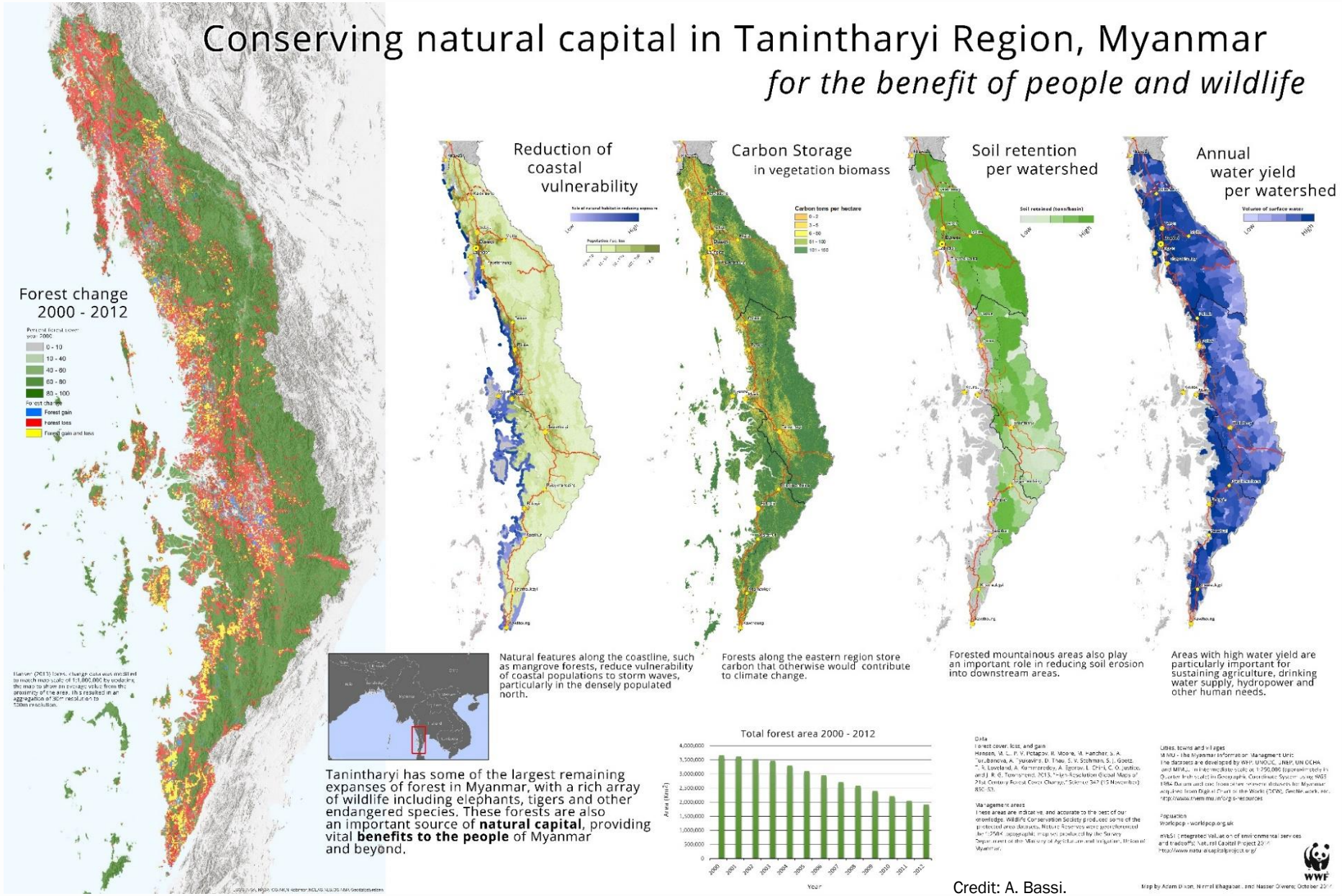


Time (Year)	2035
Cumulative Value Of NTFP (USD)	
v12 + road + ag + ref	482.86 M
v12 + road + ag	473.17 M
v12 + road	464.82 M
v12 BAU	466.61 M

Credit: A. Bassi.

System mapping for the ‘Road to Dawei’



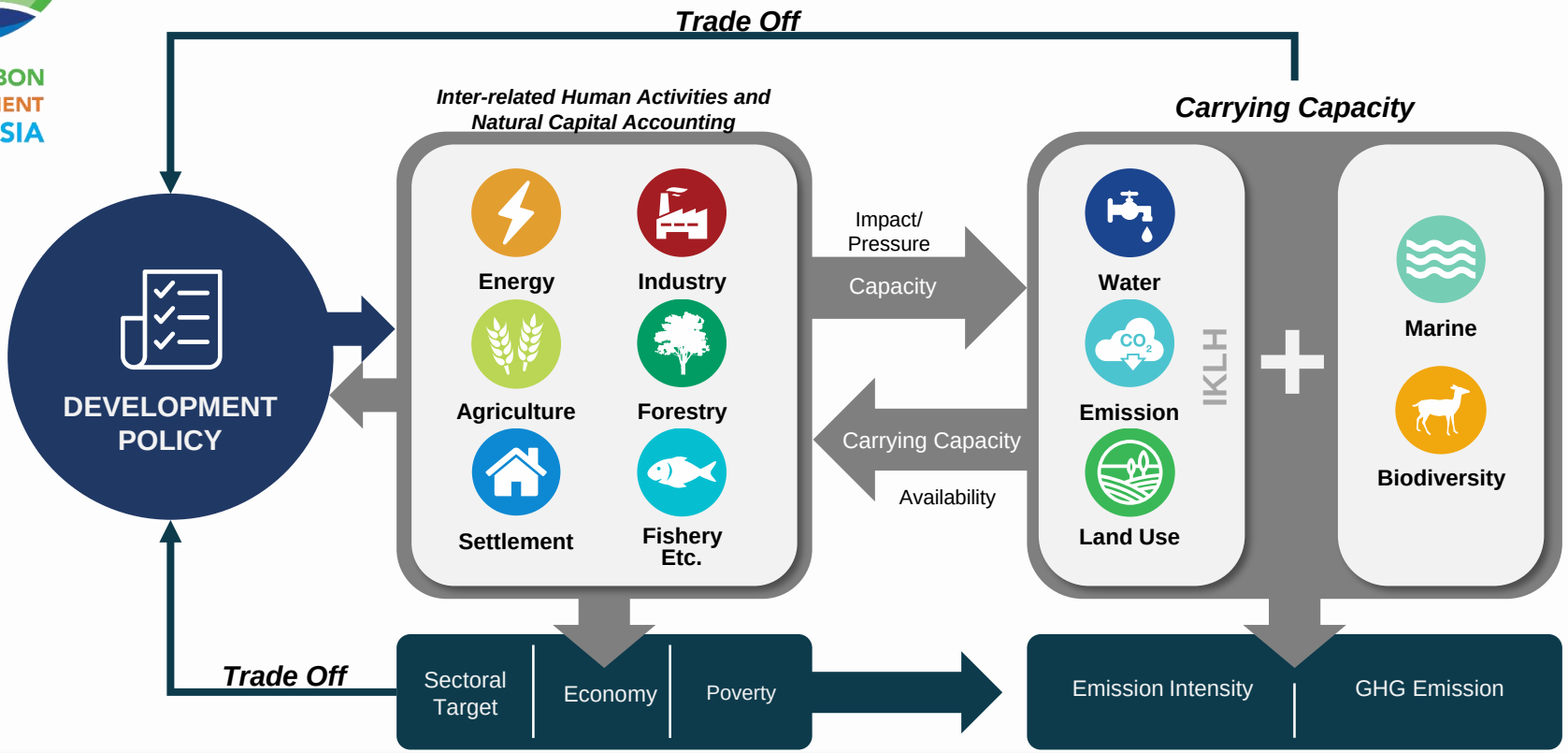
Credit: A. Bassi.

Indonesia case study

LOW CARBON DEVELOPMENT INDONESIA

***Low Carbon Development** plan is a set of inclusive development planning policies and low-carbon investment strategies for the RPJMN 2020-2024 and the Roadmap of SDG 2030 that encourage Indonesia to reduce the intensity of emissions and GHG Emissions*

Kementerian PPN/ Bappenas



Credit: A. Bassi.

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Indonesia case study

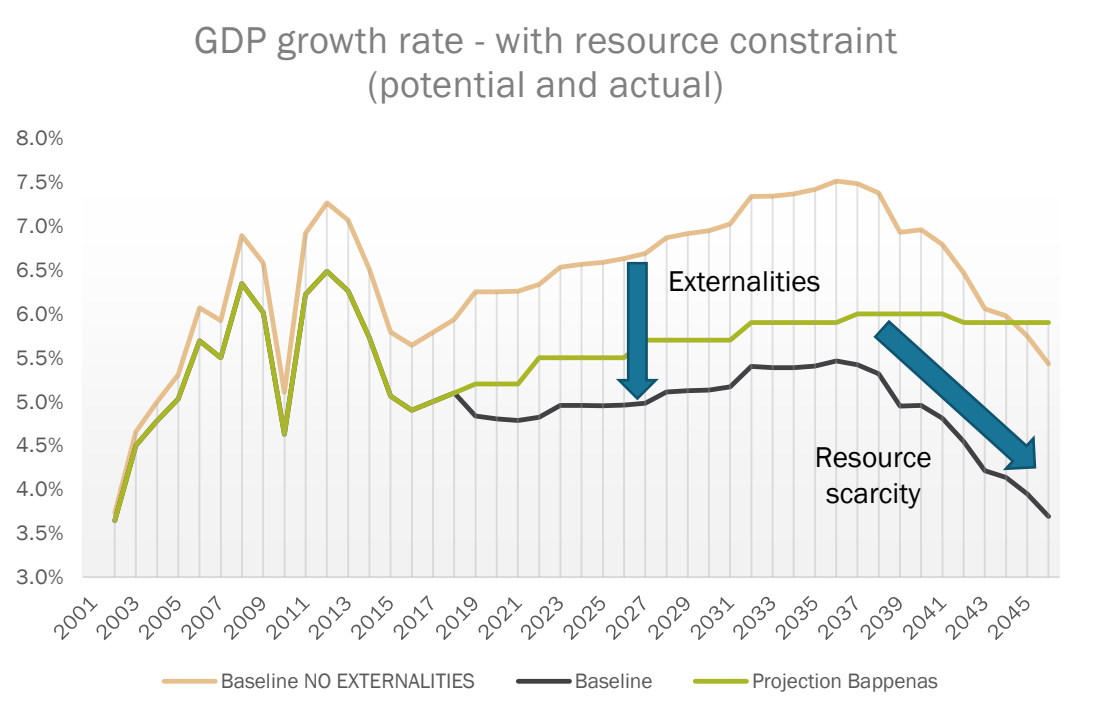
Carrying capacity is embedded in the model using two main dynamics:

- **Ecosystem services:** water and air quality have a negative impact on productivity and therefore on economic performance.
- **Ecological scarcity:** the use of natural resources is essential for production. The decline of the stock of available natural resources leads to price increases (e.g. imports are generally more expensive than domestic production, and fossil fuels become more and more expensive to extract as depletion increases).

Credit: A. Bassi.

Indonesia case study

Kementerian PPN/ Bappenas



The limitations of natural resources (depletion of Water, Energy and Forests) are projected to **hamper economic growth** if there is no intervention in development policies that **pro-carrying capacity**

Availability of Natural Resources → Real Level of GDP growth

Projection: Projection of Deputy of Economy Bappenas
Potential No Externality: Indonesian Simulation of IV2045 with unlimited resources
Baseline No Externality: Indonesian Simulation of IV2045 no externalities, with resource scarcity

Note: Temporary simulation results and validation will be carried out

Credit: A. Bassi.

SEEA

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Thank you!

谢谢!