



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



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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 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

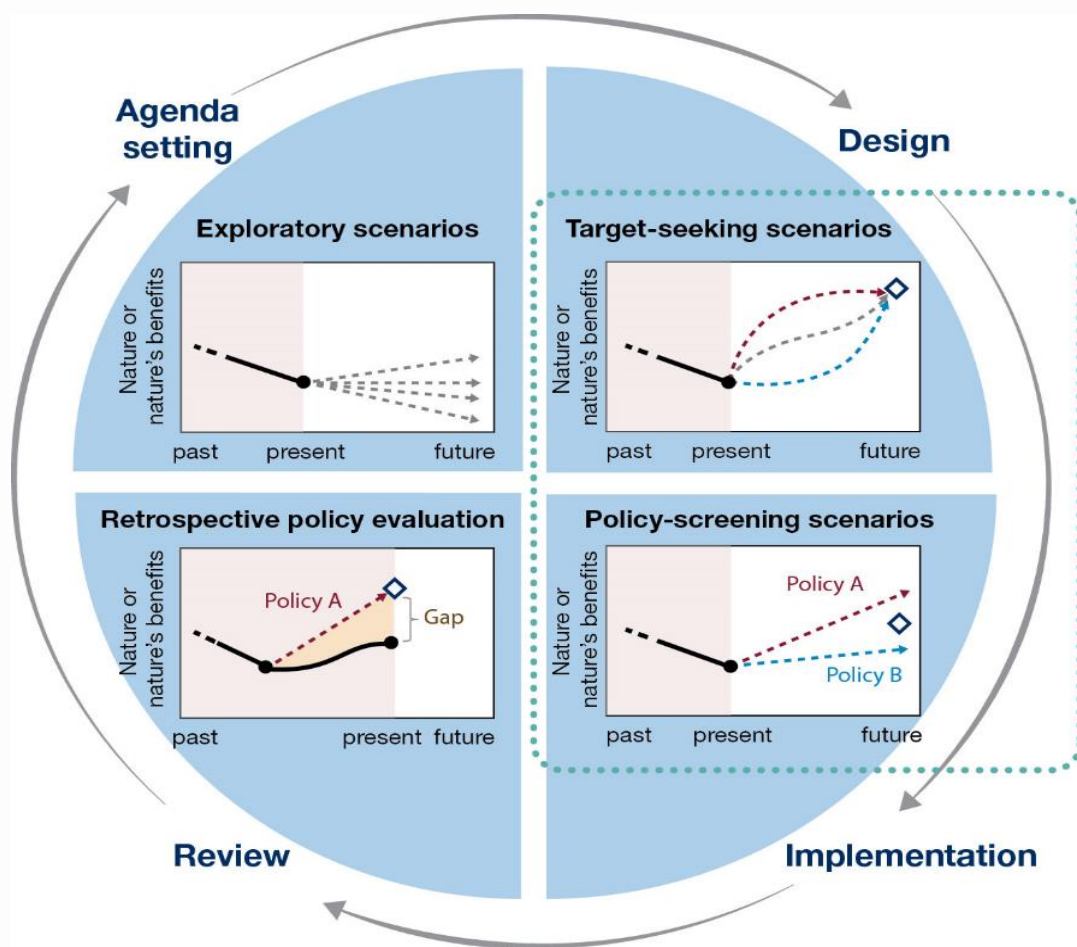
Definition of scenarios

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

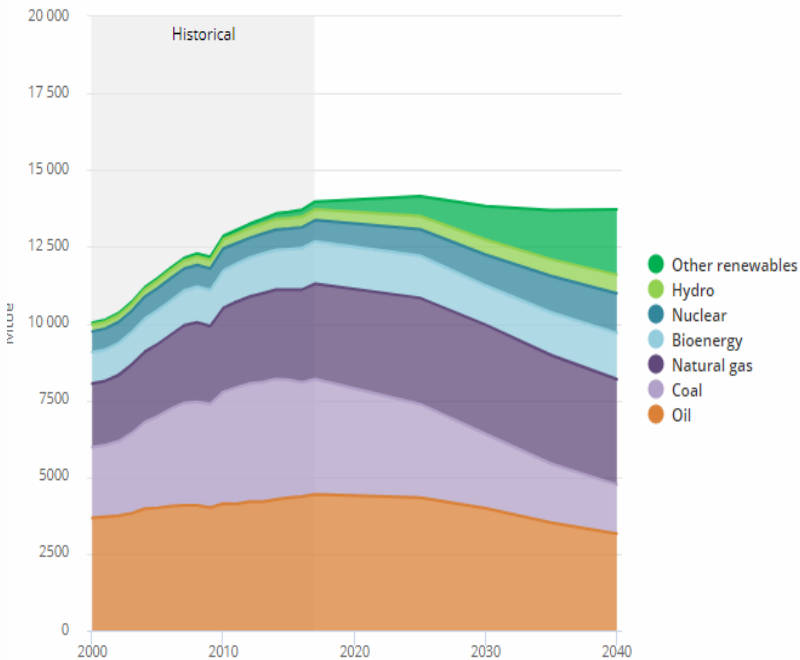
Intervention scenarios

www.ipbes.net

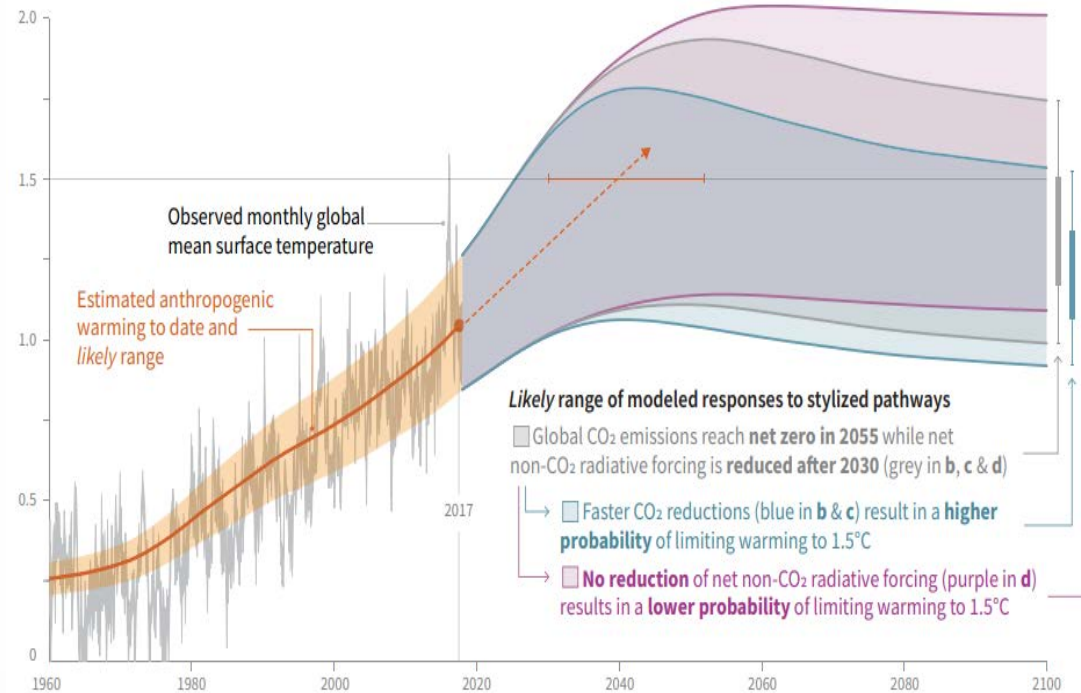
Credit: Conservation International

Scenarios in many contexts

Projections for Global Energy Demand



Global mean surface temperature: Stylized anthropogenic emission and forcing pathways





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...

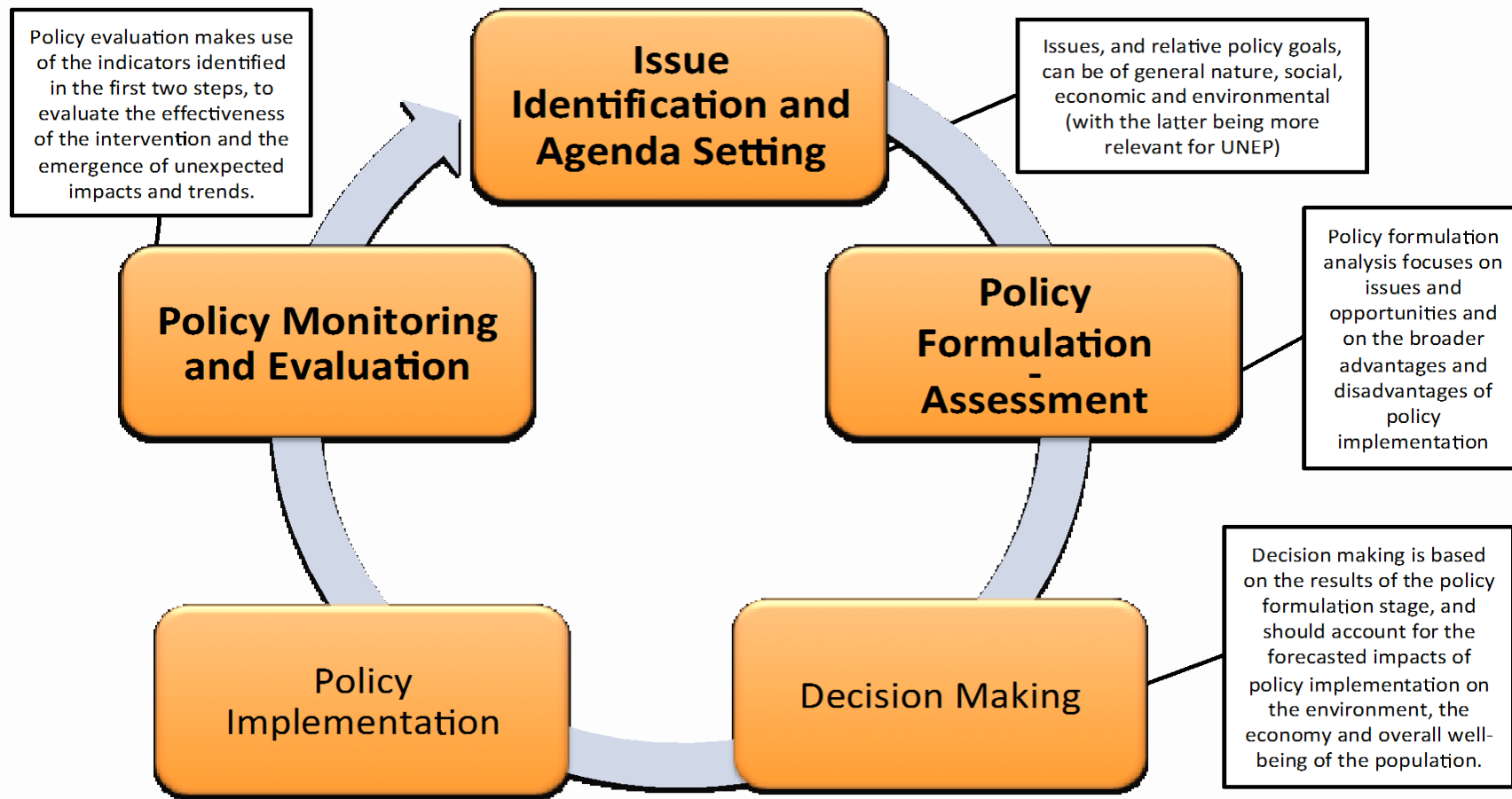


Figure source: A. Bassi.



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.



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

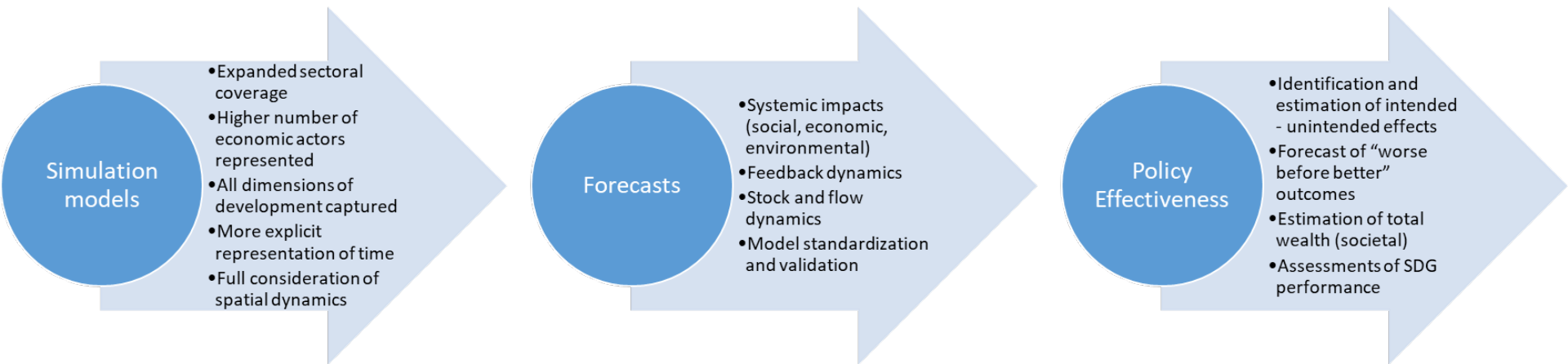


Figure source: A. Bassi.

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/)

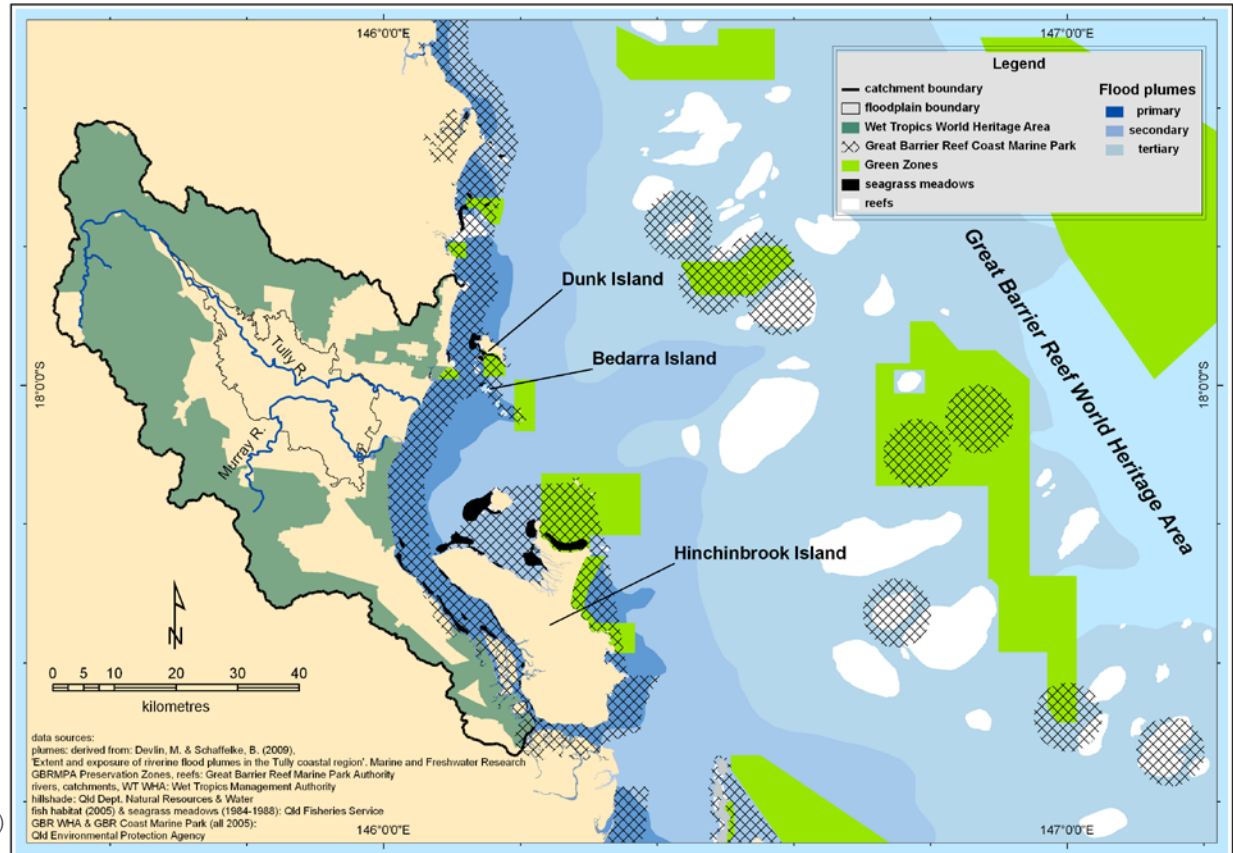
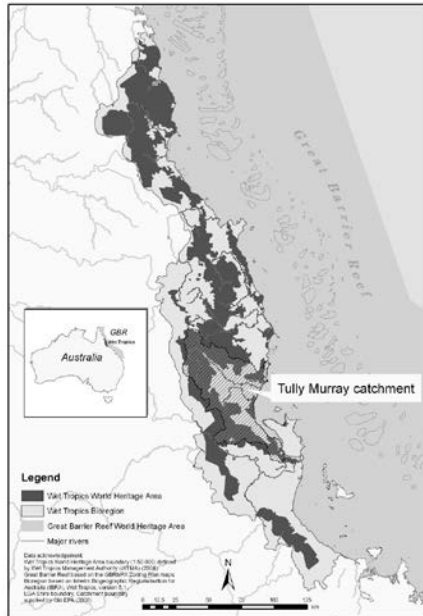
- A suite of free, open-source software models from the Natural Capital Project used to map and value the goods and services from nature. InVEST returns results in either biophysical or economic terms.

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

[See: \[http://aboutvalues.net/method_database/\]\(http://aboutvalues.net/method_database/\)](http://aboutvalues.net/method_database/)

Source: A. Bassi.

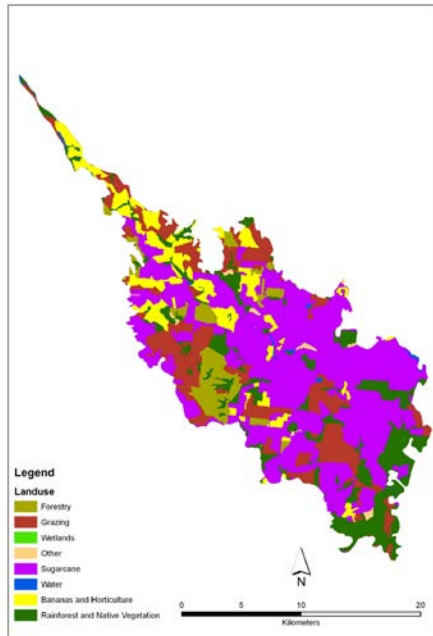
SCENARIO EXAMPLE OF FROM AUSTRALIA



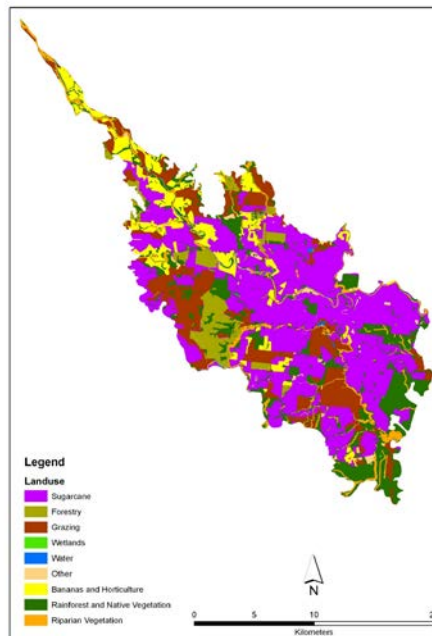
Butler et al. (2013)

LAND USE SCENARIOS

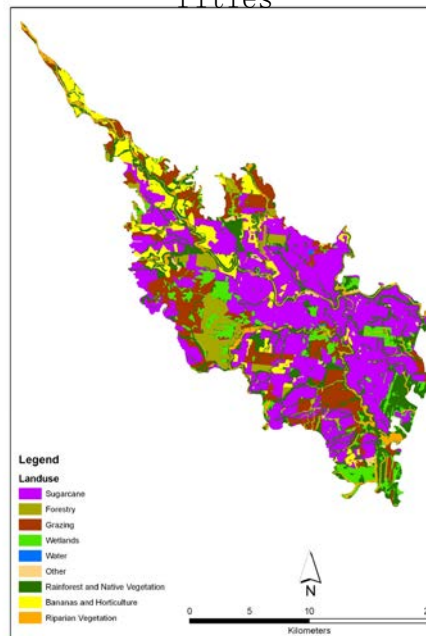
No Vegetation
Management Act



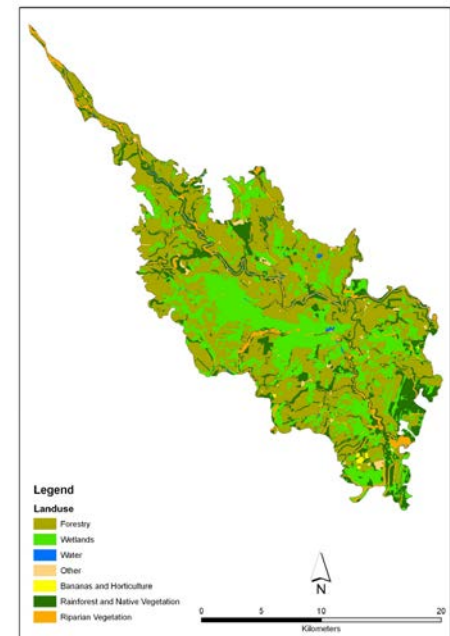
Present Day



De-nitrification
and sediment prio
rities



Native forestry



Credit: Conservation International



United Nations

ASSESSING SCENARIO TRADE-OFFS

Stage 1: Land use scenarios

Scenario 1: No Vegetation Management Act

- Sugarcane: 37,429 ha
- Bananas and horticulture: 7514 ha
- Forestry: 13,348 ha
- Grazing: 14,385 ha
- Riparian vegetation: 0 ha
- Wetlands: 0 ha

Scenario 2: Present Day

- Sugarcane: 35,282 ha
- Bananas and horticulture: 7010 ha
- Forestry: 13,053 ha
- Grazing: 13,734 ha
- Riparian vegetation: 2160 ha
- Wetlands: 9 ha

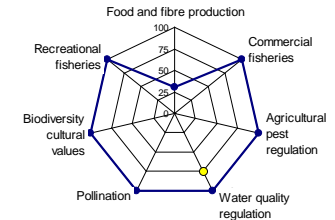
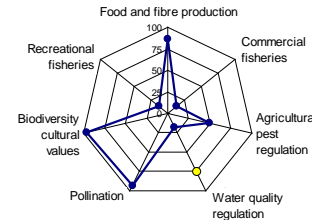
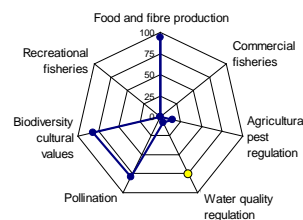
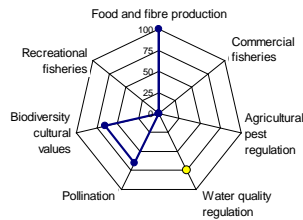
Scenario 3: De-nitrification and Sediment Priorities

- Sugarcane: 32,085 ha
- Bananas and horticulture: 6239 ha
- Forestry: 12,706 ha
- Grazing: 12,511 ha
- Riparian vegetation: 7180 ha
- Wetlands: 1650 ha

Scenario 4: Native Forestry

- 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

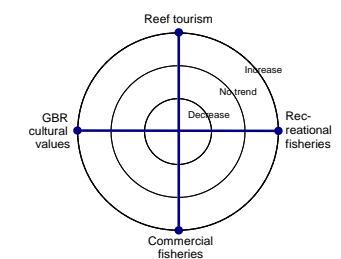
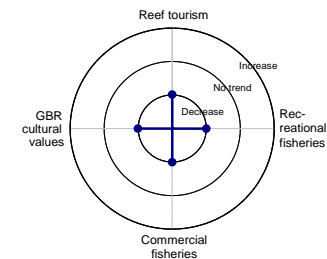
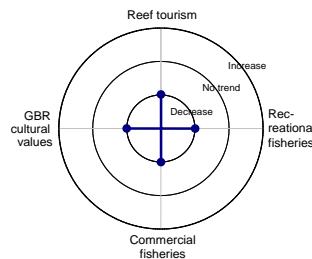
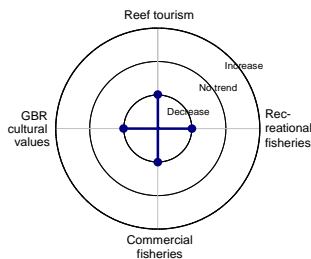
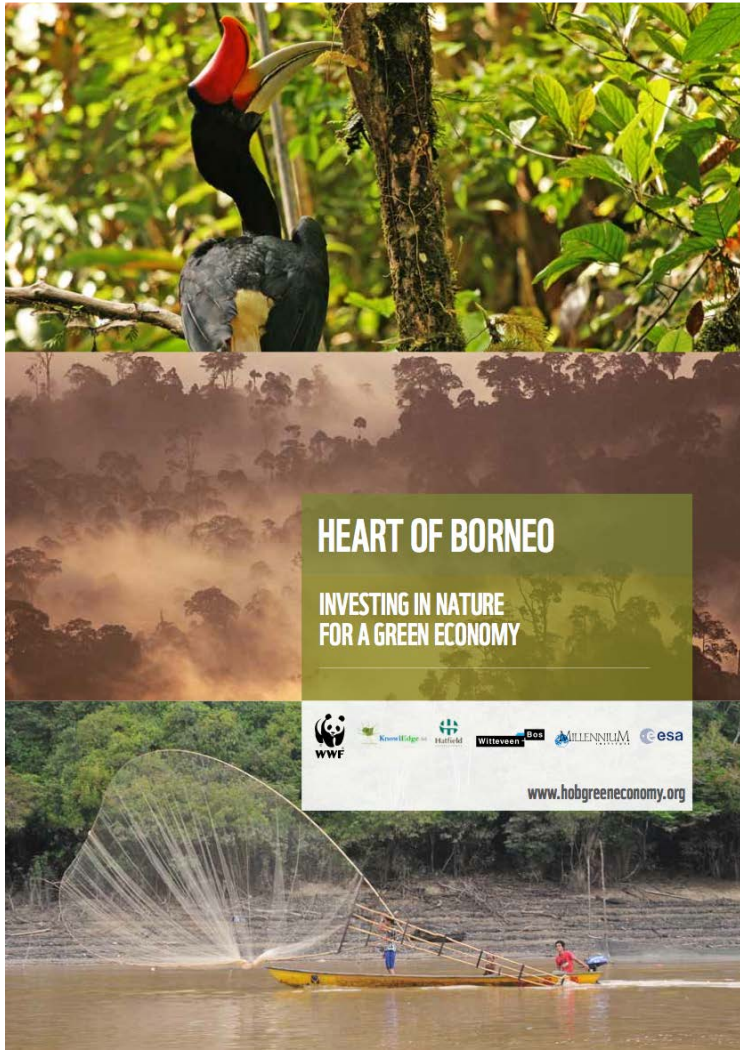
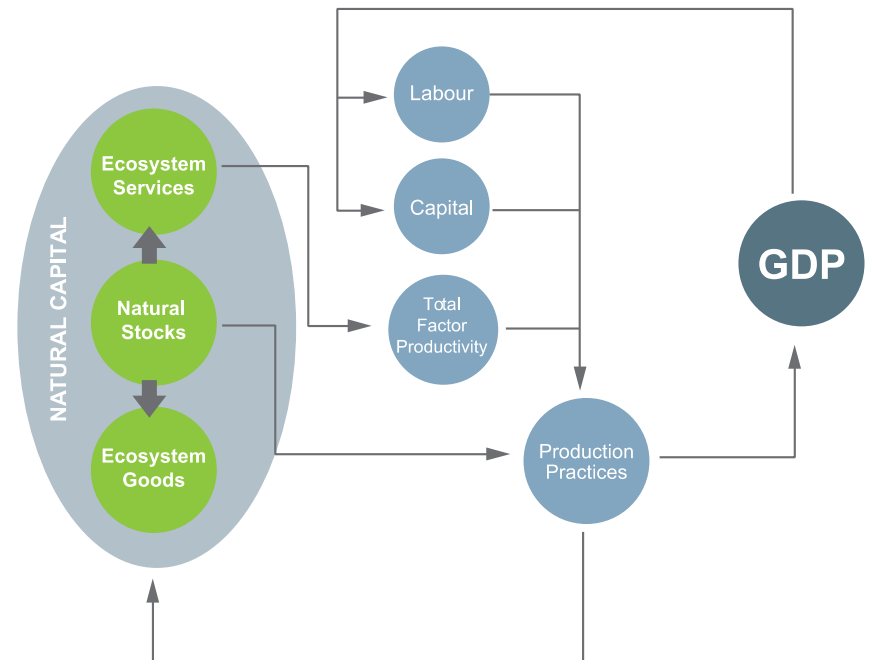


Figure 7. Results of the 3-stage analysis, showing land use scenarios, and resultant changes in floodplain ecosystem service status and linked trends in GBR

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

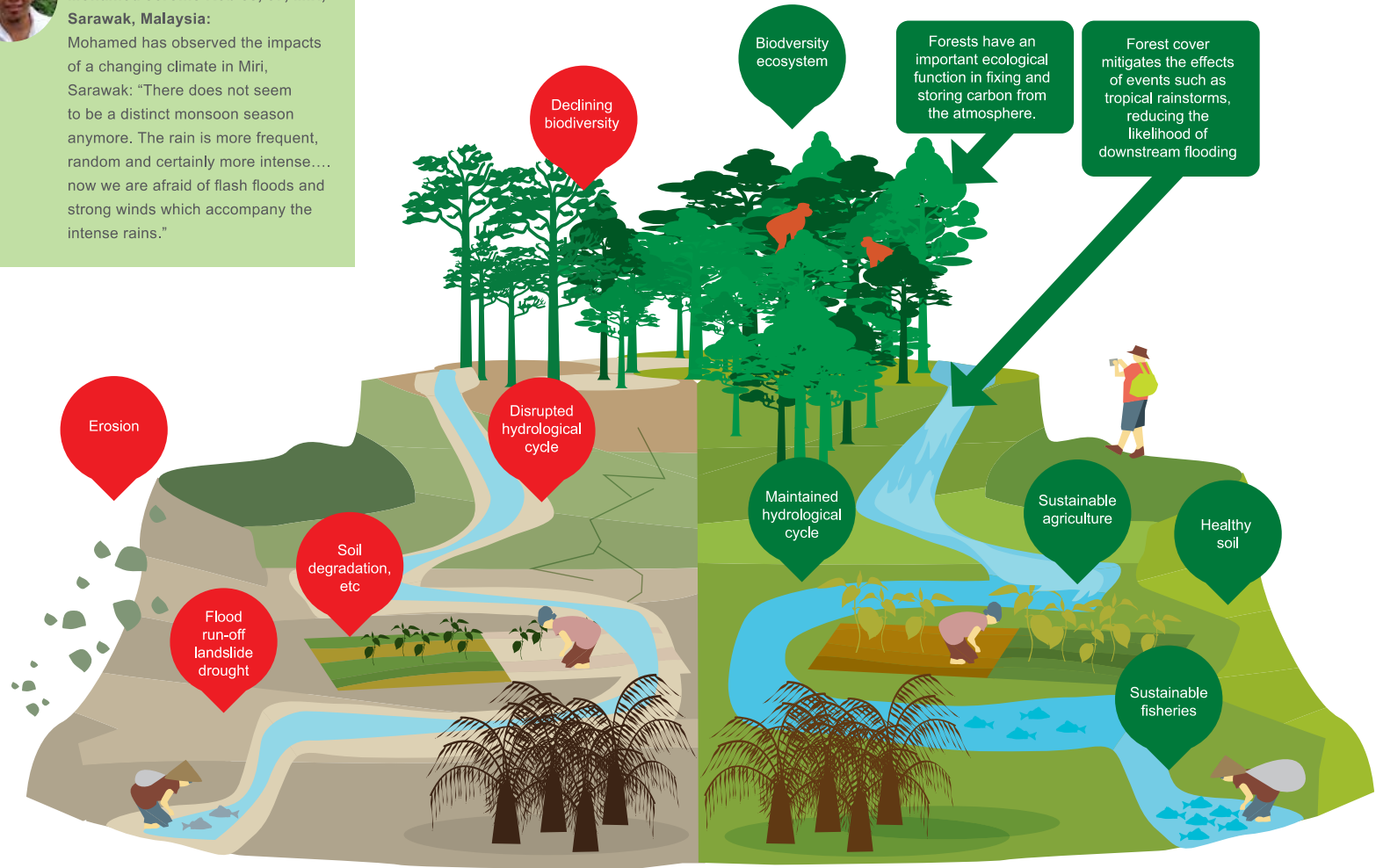
Credit: A. Bassi.

Example: Heart of Borneo



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."

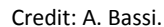


Credit: A. Bassi.

Example: Heart of Borneo

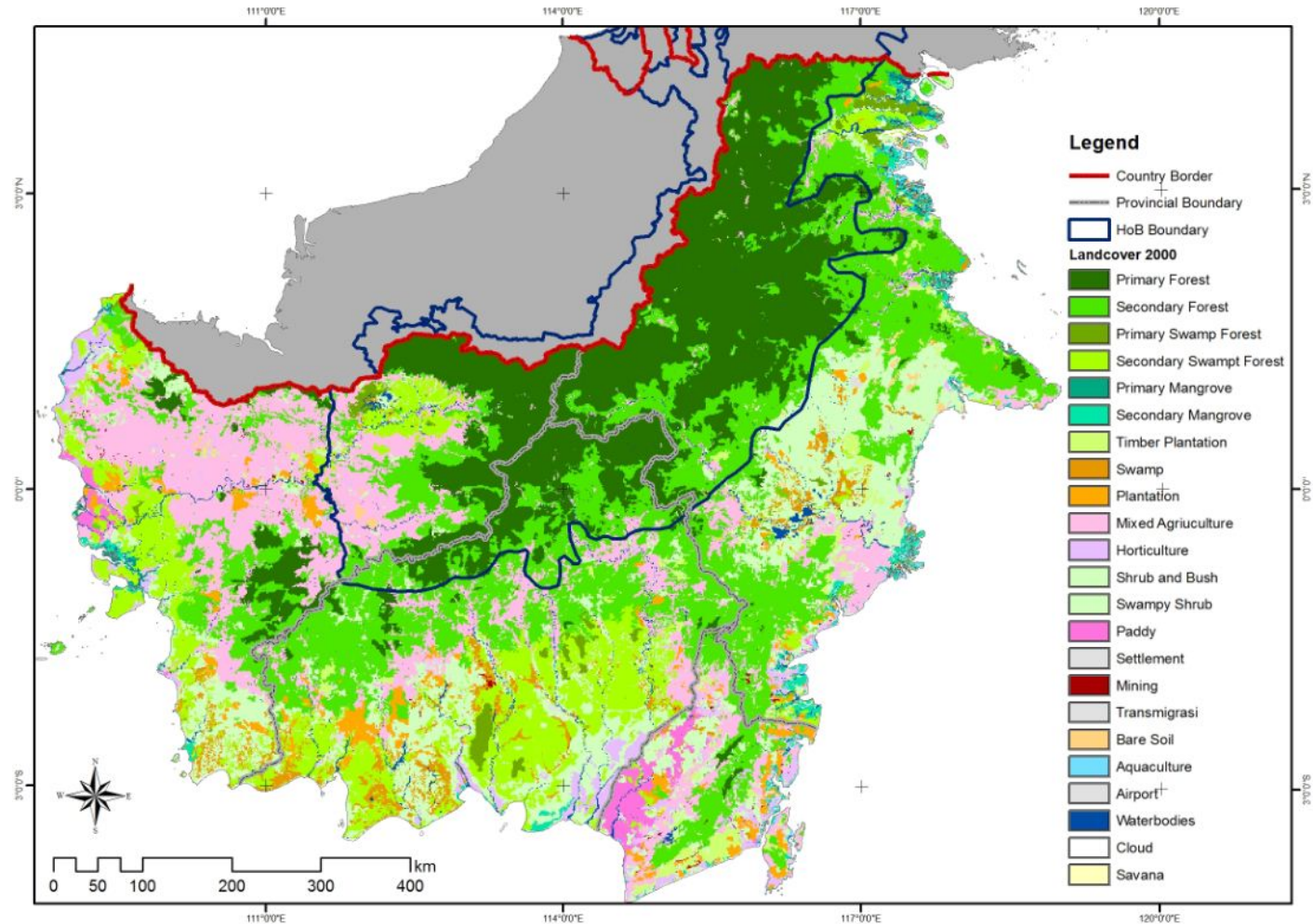
- Estimation of the **biophysical and economic value** of soil, forest, biodiversity, and carbon storage.
- Estimation of **the economic impact** of **natural resource stock utilization**.
 - For instance, industrial production is influenced by the usability of rivers for transport, which -in our model- 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.

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



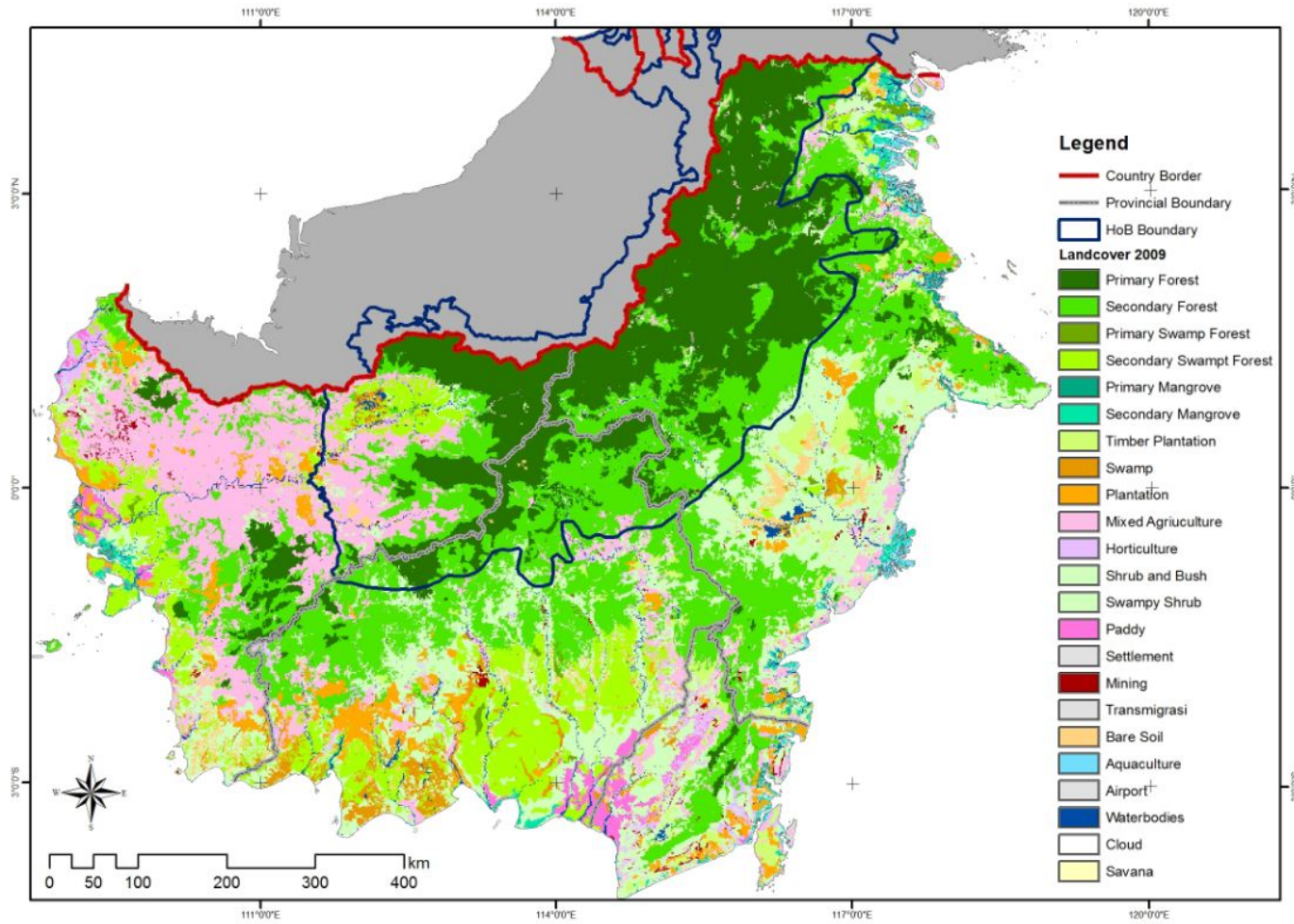
Example: Heart of Borneo

Simulation of Spatial Scenarios (2000)



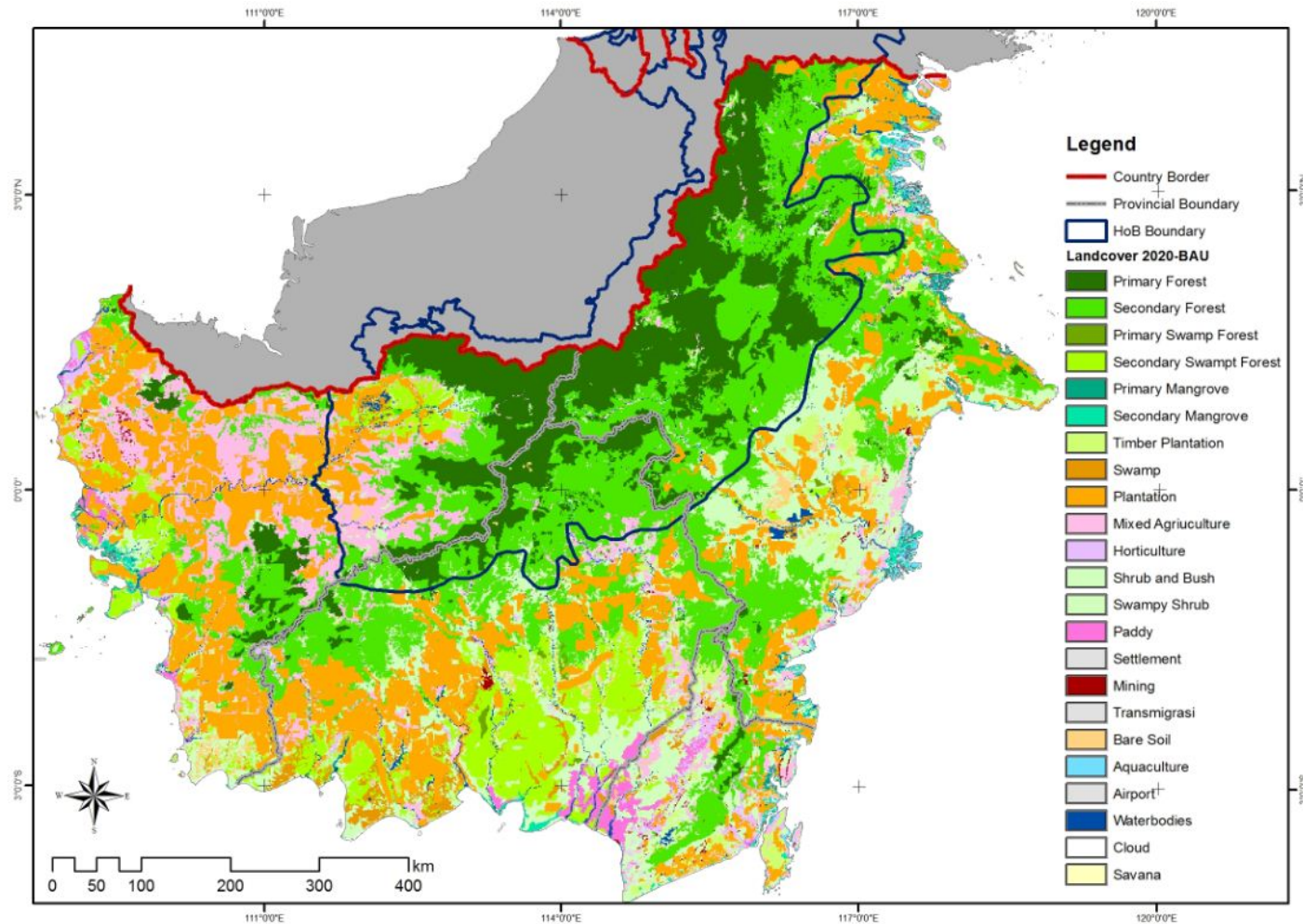
Example: Heart of Borneo

Simulation of Spatial Scenarios (2009)



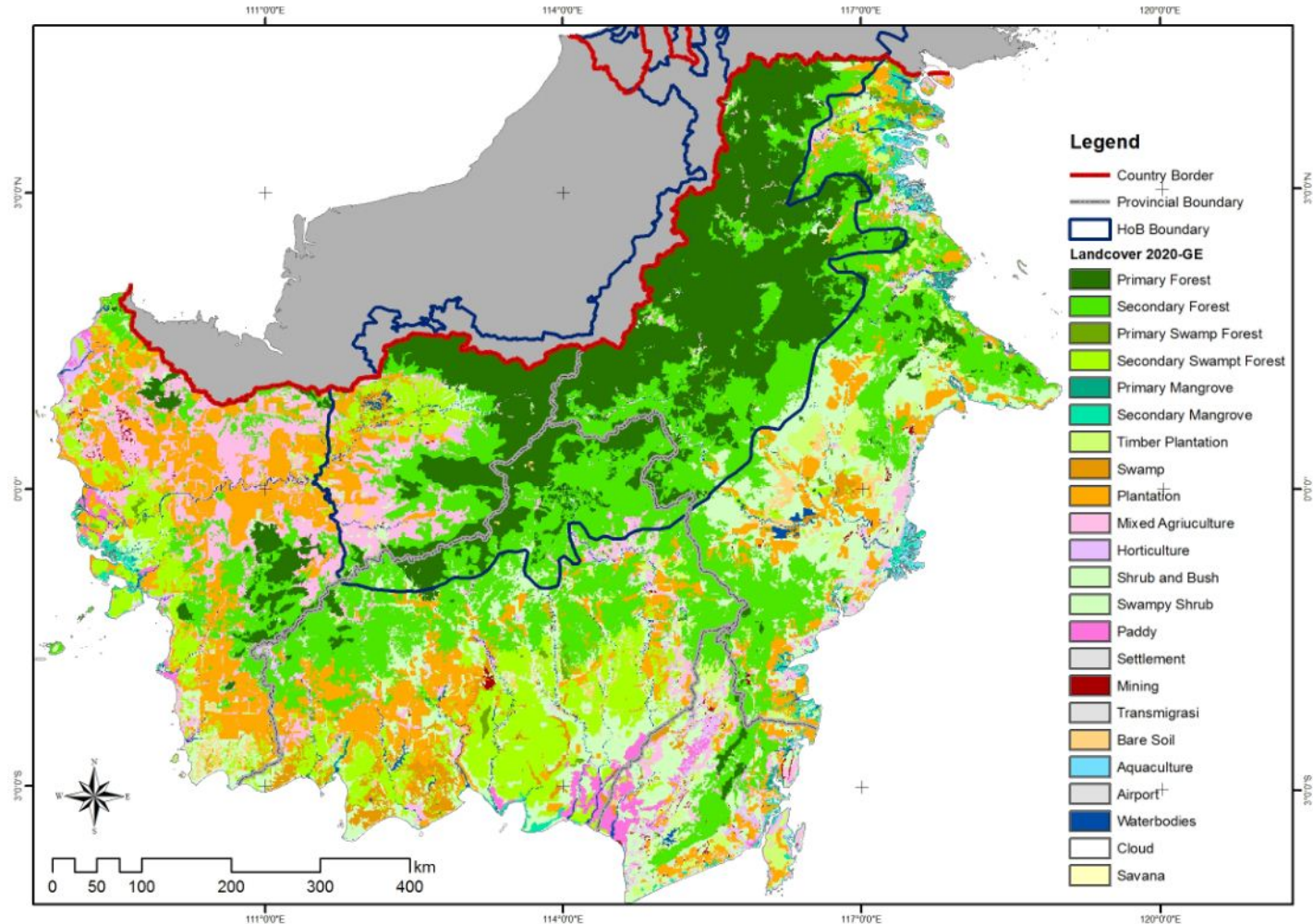
Example: Heart of Borneo

Simulation of Spatial Scenarios (2020)



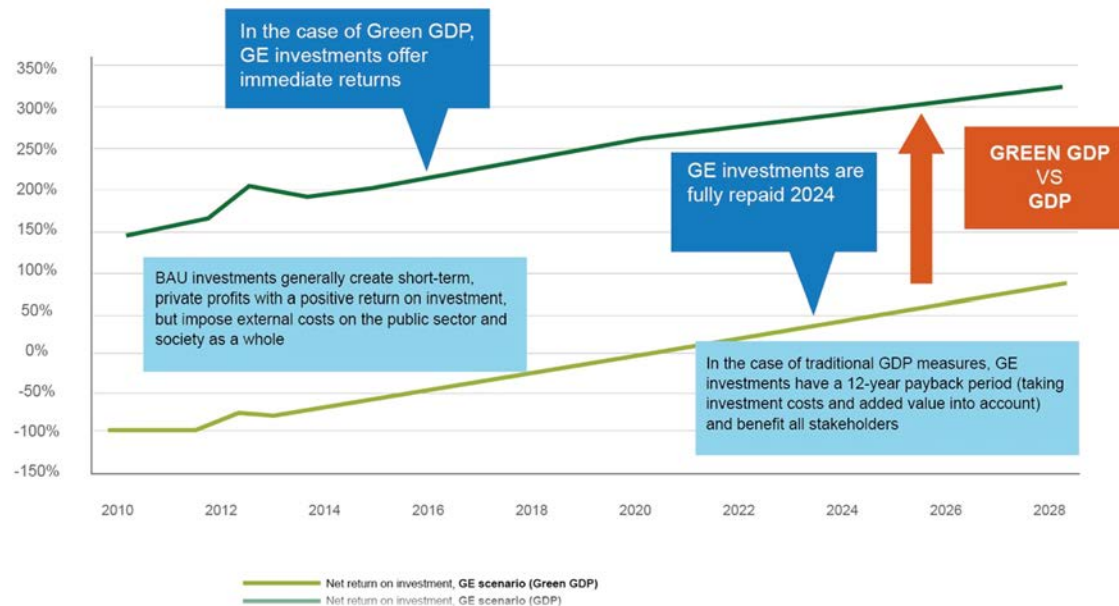
Example: Heart of Borneo

Simulation of Spatial Scenarios (GE 2020)



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.

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.

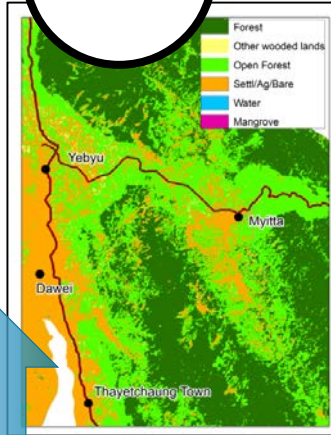
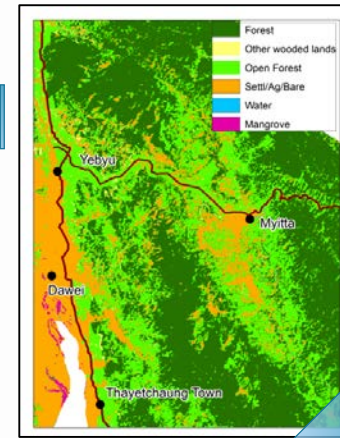
Relevant Example: WWF's 'Road to Dawei' Study

Three methodologies were used:

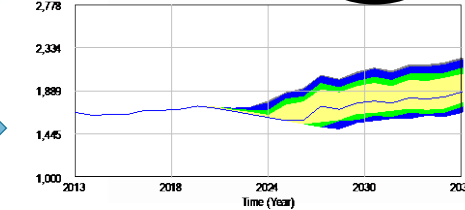
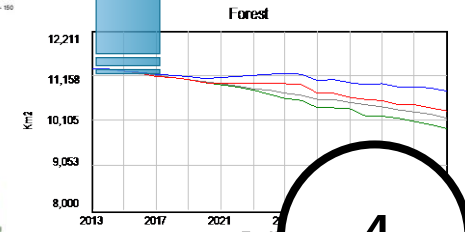
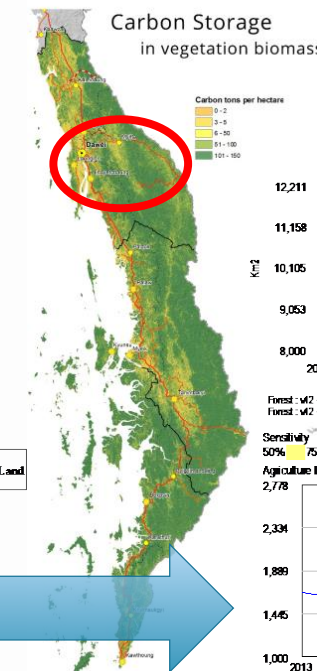
1. The **InVEST** tool to generate spatial information and estimate changes in natural capital stocks
2. **Causal Loop Diagram** to identify the main drivers and impacts of land use change in the DTL region.
3. The **Integrated Planning for Sustainability (IPS)** model was developed using the System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

Credit: A. Bassi.

Scenario 1



Scenario 2



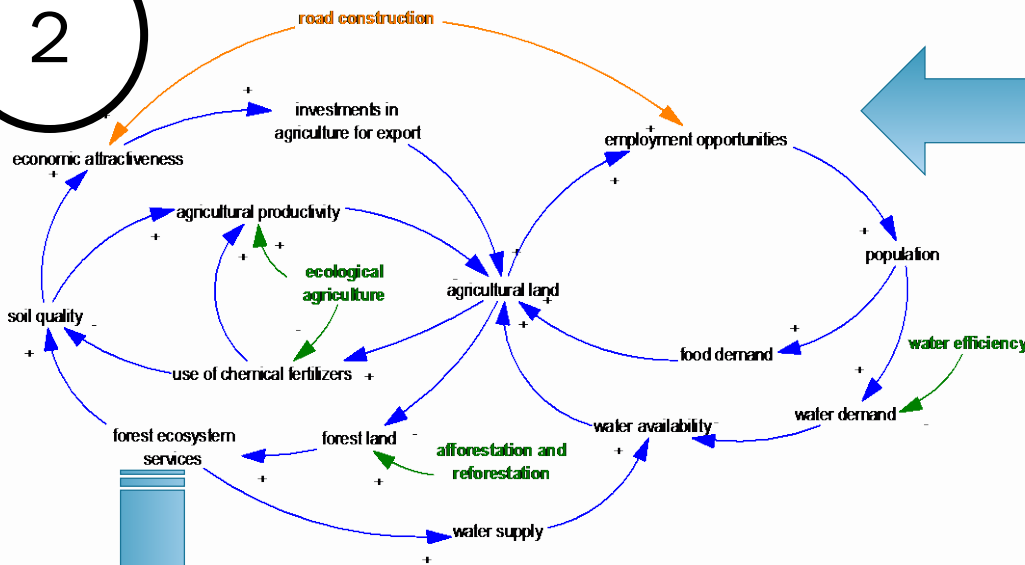
Time (Year) 2035

Cumulative Value Of NTFP (USD)

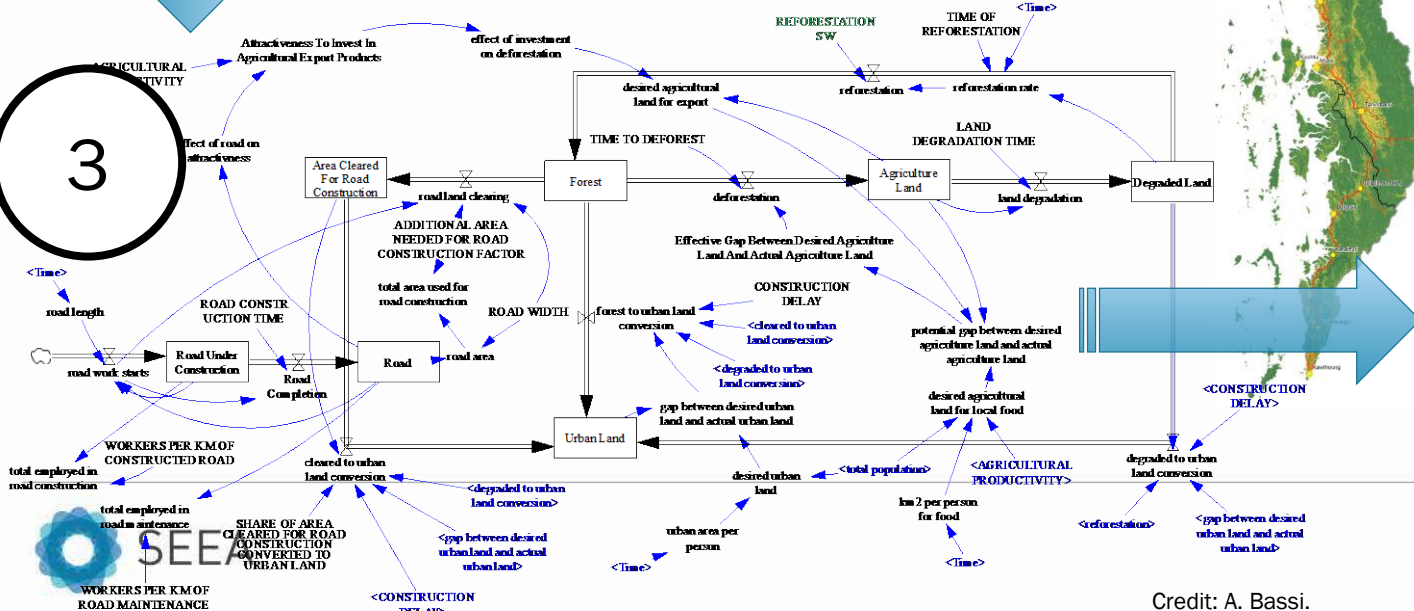
v12 + road + ag + ref	482.86 M
v12 + road + ag	473.17 M
v12 + road	464.82 M
v12 BAU	466.61 M

Credit: A. Bassi.

2



3



4

System mapping for the 'Road to Dawei'

Conserving natural capital in Tanintharyi Region, Myanmar
for the benefit of people and wildlife

Forest change 2000 - 2012

Percent forest cover loss 2000 - 2012

- 0 - 10
- 10 - 40
- 40 - 60
- 60 - 80
- 80 - 100

Forest change

- Forest gain
- Forest loss
- Forest gain and loss

Tanintharyi (DRC) forest change data was aggregated to match map scale of 1:1,000,000 by reducing the map to show an average value from the proximity of the area. This resulted in an aggregation at 30" resolution to 100m resolution.



Tanintharyi has some of the largest remaining expanses of forest in Myanmar, with a rich array of wildlife including elephants, tigers and other endangered species. These forests are also an important source of **natural capital**, providing vital **benefits to the people of Myanmar** and beyond.

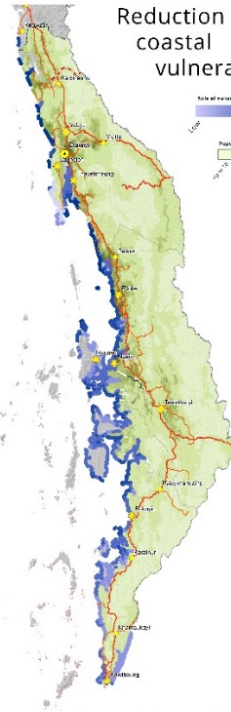
Reduction of coastal vulnerability

Scale of natural habitat reducing exposure

Low High

Population (no. km)

0-100 100-200 200-300 300-400 400-500



Natural features along the coastline, such as mangrove forests, reduce vulnerability of coastal populations to storm waves, particularly in the densely populated north.

Carbon Storage in vegetation biomass

Carbon tons per hectare

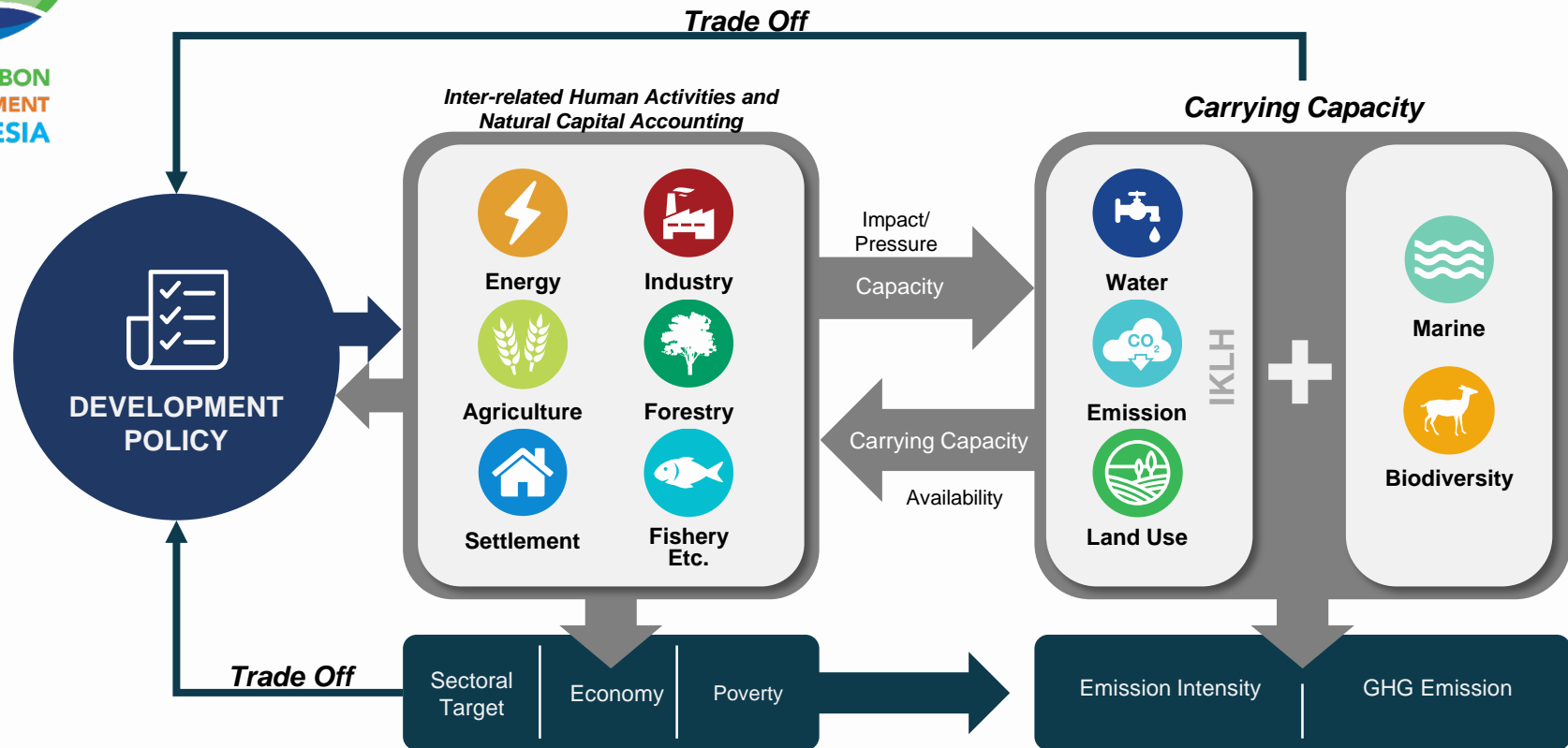
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276-278 278-280 280-282 282-284 284-286 286-288 288-290 290-292 292-294 294-296 296-298 298-300 300-302 302-304 304-306 306-308 308-310 310-312 312-314 314-316 316-318 318-320 320-322 322-324 324-326 326-328 328-330 330-332 332-334 334-336 336-338 338-340 340-342 342-344 344-346 346-348 348-350 350-352 352-354 354-356 356-358 358-360 360-362 362-364 364-366 366-368 368-370 370-372 372-374 374-376 376-378 378-380 380-382 382-384 384-386 386-388 388-390 390-392 392-394 394-396 396-398 398-400 400-402 402-404 404-406 406-408 408-410 410-412 412-414 414-416 416-418 418-420 420-422 422-424 424-426 426-428 428-430 430-432 432-434 434-436 436-438 438-440 440-442 442-444 444-446 446-448 448-450 450-452 452-454 454-456 456-458 458-460 460-462 462-464 464-466 466-468 468-470 470-472 472-474 474-476 476-478 478-480 480-482 482-484 484-486 486-488 488-490 490-492 492-494 494-496 496-498 498-500 500-502 502-504 504-506 506-508 508-510 510-512 512-514 514-516 516-518 518-520 520-522 522-524 524-526 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776-778 778-780 780-782 782-784 784-786 786-788 788-790 790-792 792-794 794-796 796-798 798-800 800-802 802-804 804-806 806-808 808-810 810-812 812-814 814-816 816-818 818-820 820-822 822-824 824-826 826-828 828-830 830-832 832-834 834-836 836-838 838-840 840-842 842-844 844-846 846-848 848-850 850-852 852-854 854-856 856-858 858-860 860-862 862-864 864-866 866-868 868-870 870-872 872-874 874-876 876-878 878-880 880-882 882-884 884-886 886-888 888-890 890-892 892-894 894-896 896-898 898-900 900-902 902-904 904-906 906-908 908-910 910-912 912-914 914-916 916-918 918-920 920-922 922-924 924-926 926-928 928-930 930-932 932-934 934-936 936-938 938-940 940-942 942-944 944-946 946-948 948-950 950-952 952-954 954-956 956-958 958-960 960-962 962-964 964-966 966-968 968-970 970-972 972-974 974-976 976-978 978-980 980-982 982-984 984-986 986-988 988-990 990-992 992-994 994-996 996-998 998-1000 1000-1002 1002-1004 1004-1006 1006-1008 1008-1010 1010-1012 1012-1014 1014-1016 1016-1018 1018-1020 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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



Credit: A. Bassi.

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).

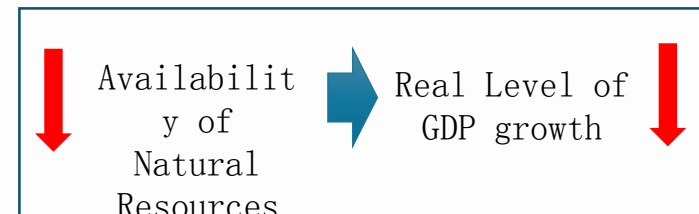
Credit: A. Bassi.

Indonesia case study

GDP growth rate - with resource constraint
(potential and actual)



→ 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**



Note: Temporary simulation results and validation will be carried out

Credit: A. Bassi.

Thank you!

谢谢!