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Institute

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TO ACTION



Linked Indicators for Vital Ecosystem Services:

Actionable indicators for food-energy-water ecosystem services

Dr. Louise Gallagher, Research Lead,
Luc Hoffmann Institute, July 2015

OUTLINE

- 1. Introducing the Luc Hoffmann Institute and ecosystem services at WWF**
- 2. LIVES project on actionable indicators for food-energy-water ecosystem services**

Introduction

Methods

Preliminary Results

Next steps

- 3. Discussion**



THE LUC HOFFMANN INSTITUTE IS AN INDEPENDENT RESEARCH HUB AT WWF

Our aim is to explore complex conservation
research questions and work with the WWF
global network and partners to bring
SCIENCE TO ACTION.



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OUR RESEARCH



**PLACE-BASED CONSERVATION
EFFECTIVENESS**

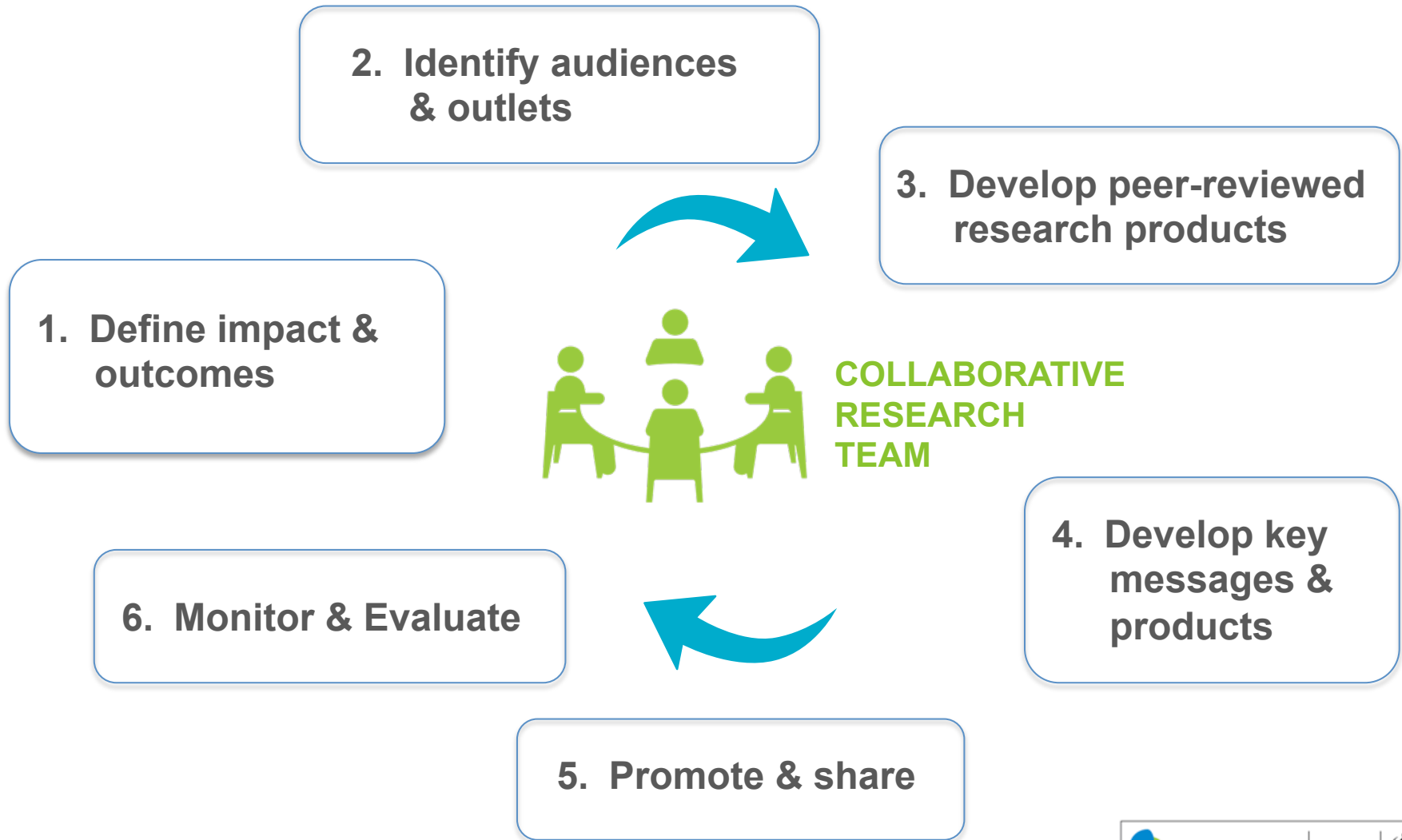


**NATURAL CAPITAL AND
ECOSYSTEM SERVICES**



**SUSTAINABLE CONSUMPTION AND
PRODUCTION**

COMMUNICATION & ENGAGEMENT IN RESEARCH



CAPACITY BUILDING IN CONSERVATION SCIENCE



David Gill PhD
Barbados



Nyeema Harris PhD
USA



Kien van Nguyen PhD
Vietnam



Fouad Khan PhD
Pakistan



Taro Mieno PhD
Japan



William Harris PhD
USA

OUR RESEARCH IS UNDERPINNED BY 4 KEY CRITERIA

- **It is credible.**
- **It is salient.**
- **It is legitimate.**
- **It is transformative.**



NATURAL CAPITAL AND ECOSYSTEM SERVICES

RESEARCH PROJECT LOCATIONS

Louise Gallagher PhD – Research Lead



Food Energy Water Indicators

LINKED INDICATORS OF VITAL ECOSYSTEM SERVICES (LIVES) THEME 1



FEW Policy Analysis in Cambodia

LINKED INDICATORS OF VITAL ECOSYSTEM SERVICES (LIVES) THEME 3



Greater Mekong FEW Nexus

LINKED INDICATORS OF VITAL ECOSYSTEM SERVICES (LIVES) THEME 2



China National Parks for People

Global

>30

applications of natural capital approaches to sustainable development decisions



NATURAL CAPITAL PROJECT

Advance science of
ecosystem services

Create user-friendly
approaches & tools

Build capacity
and tell success
stories



Get information about natural
capital into decisions



Make decisions with better
outcomes for people and nature



**Coastal
Protection**



**Nutrient
Retention**



**Habitat risk
assessment**



Scenic Views

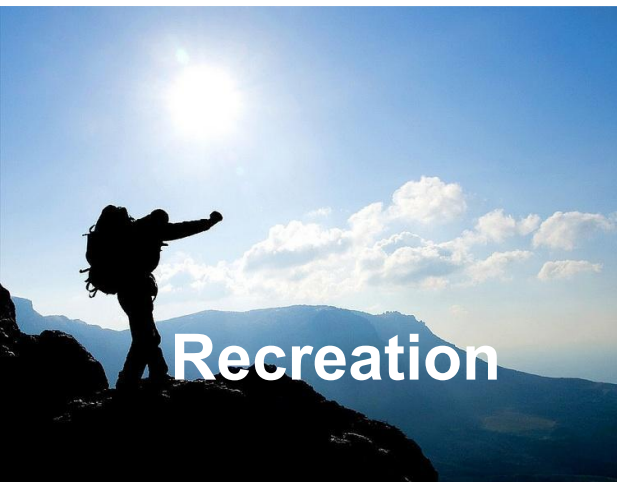


**Sediment
Retention**

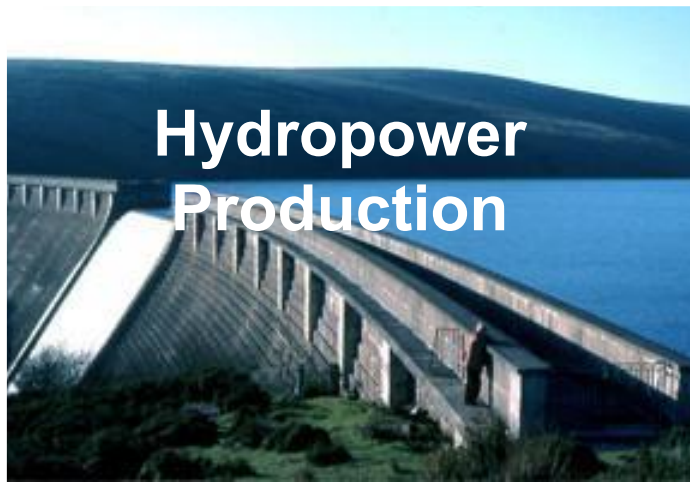


InVEST

integrated valuation of
environmental services
and tradeoffs



Recreation



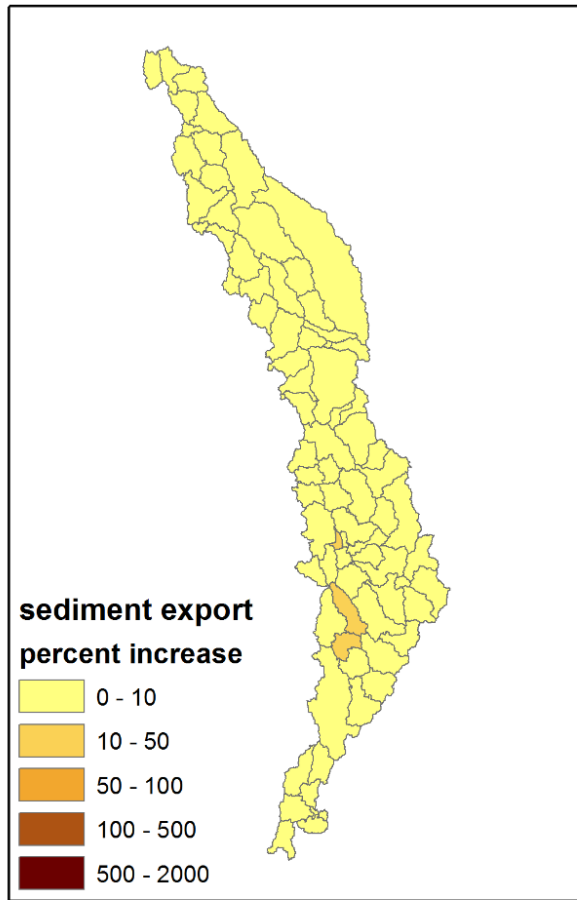
**Hydropower
Production**



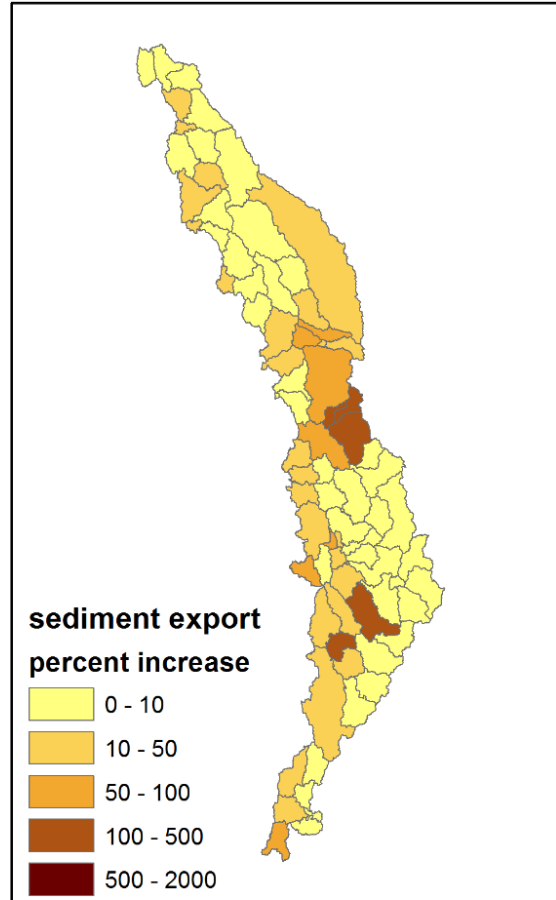
**Marine Water
Quality**

InVEST Example Output

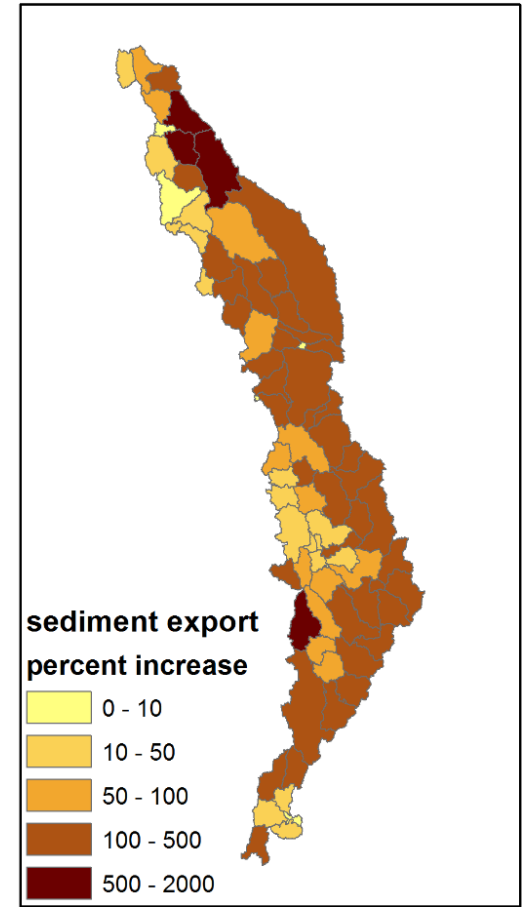
Loss of sediment with increasing deforestation in the DT Landscape, Myanmar and Thailand



Limited deforestation



Some deforestation



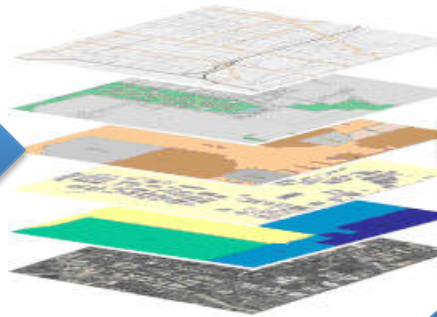
More deforestation

Approach, challenges and limitations

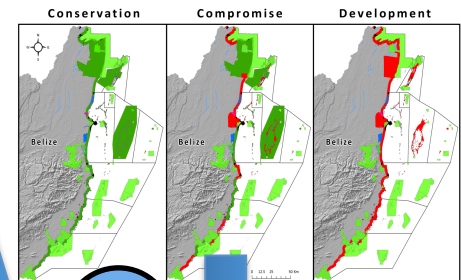
1 Define Partnerships, Roles & Objectives



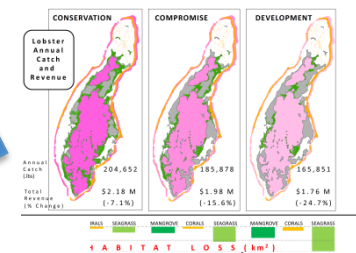
2 Compile Data



3 Generate Baseline & Scenarios



4 Assess Outcomes

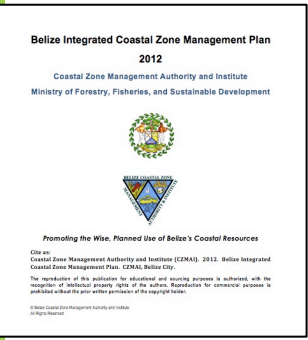
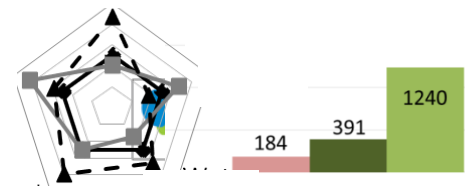


Iterate & Build Capacity

6

7 Inform Decisions

5 Synthesize Results



LINKED INDICATORS FOR VITAL ECOSYSTEM SERVICES (LIVES)

Phase I



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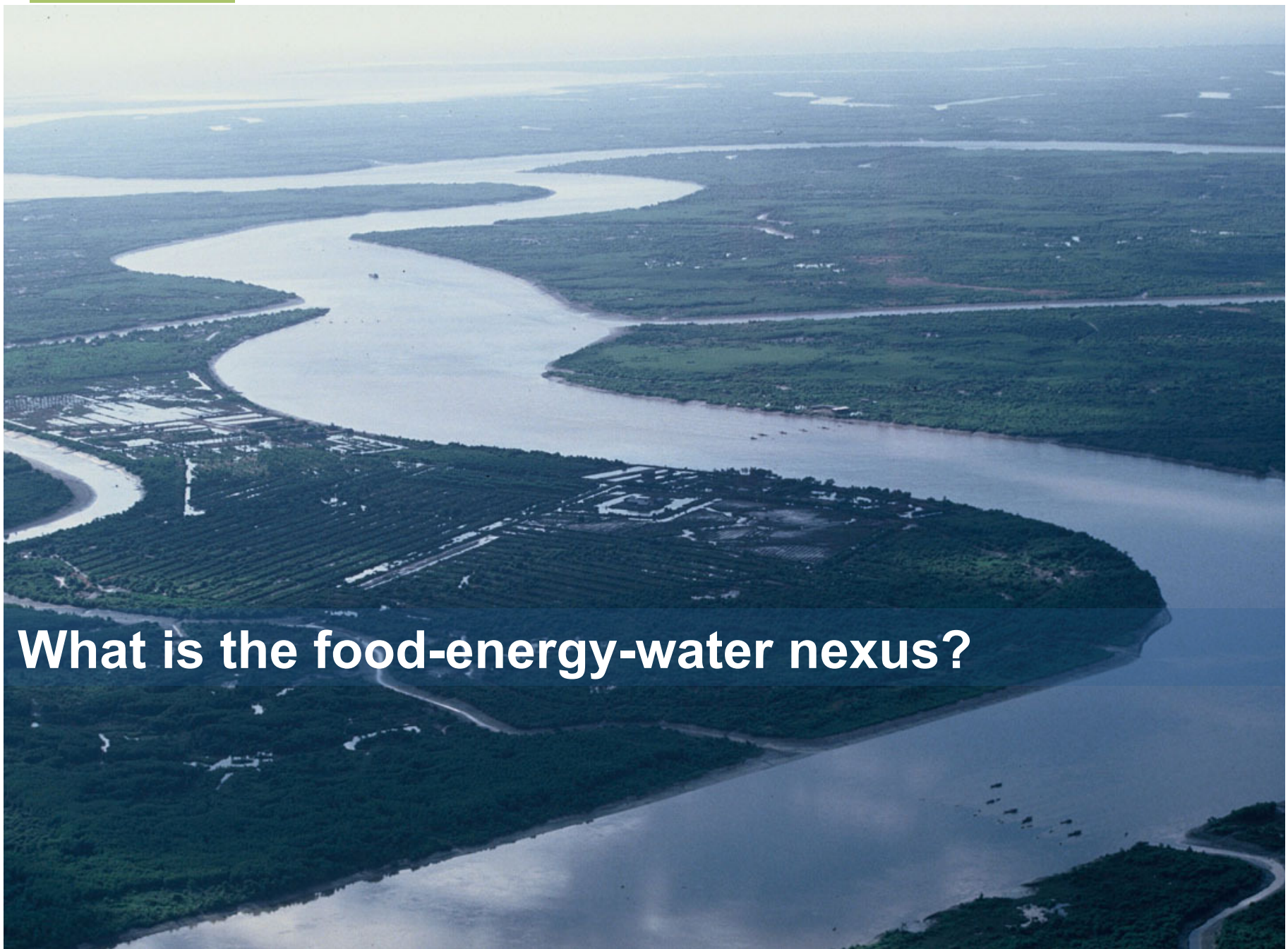
IMPACT GOAL

By 2017, decision-making at the food-water-energy nexus is supported through research and capacity on connections between natural systems, economic systems and human well-being.

PARTNERS

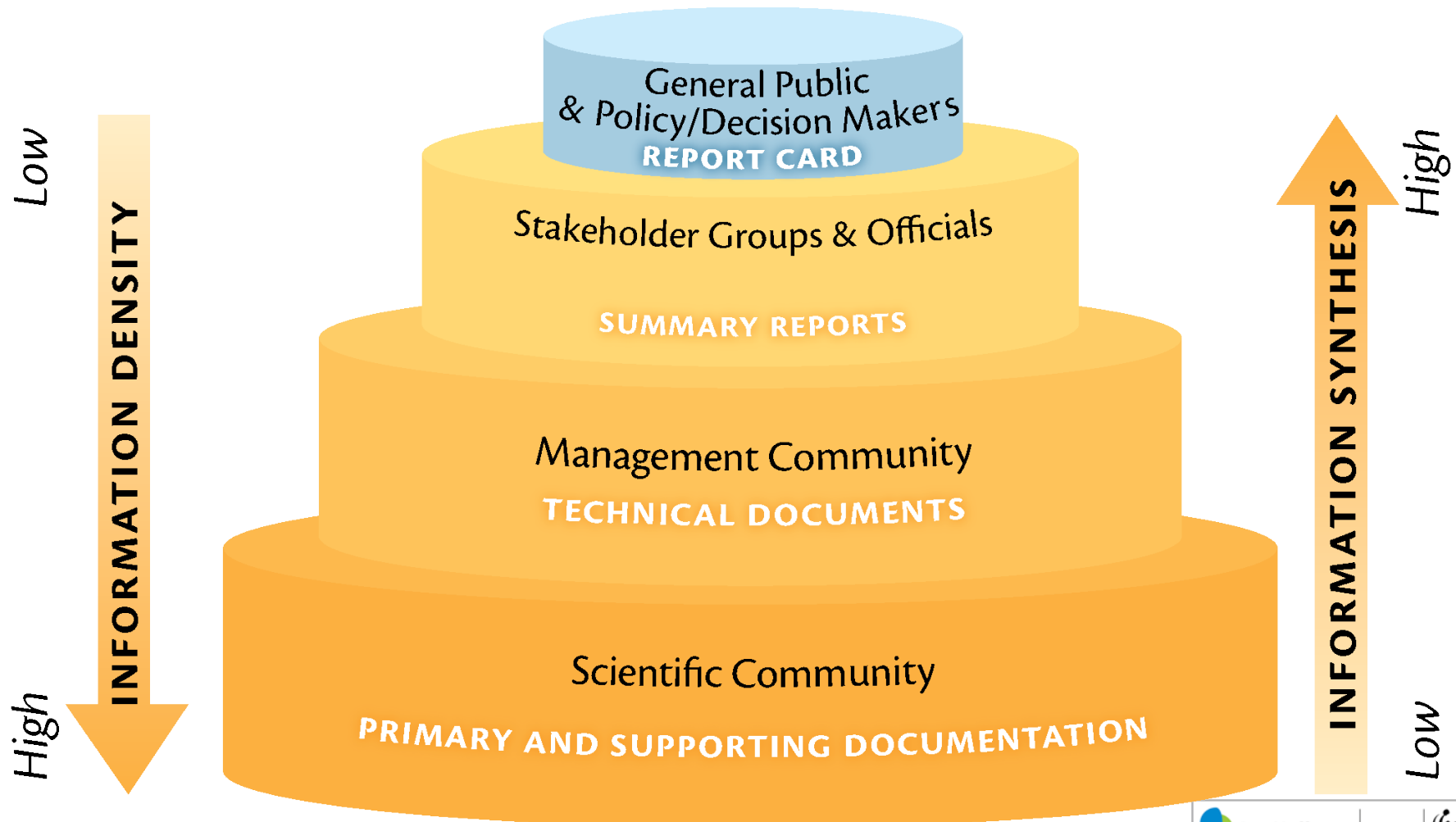


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What is the food-energy-water nexus?

The challenge of data density and synthesis for ecosystem service information and decision-making



LIVES Project theory of change

Enabling decision makers to understand linkages across economic, environmental, and social sectors and make sustainable resource allocations means food, energy and water risks must be measured consistently at multiple scales and with strong integration

Key assumption!

Early participation is essential for

- 1) Identifying relevant risks
- 2) Deciding how to measure risks
- 3) Uptake of linked indicator systems

Objective

Phase I: Prototype and test a methodology for developing actionable indicators for food, energy, water ecosystem services

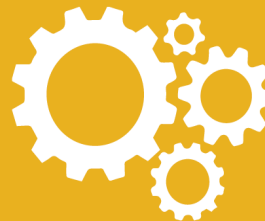
Phase II: Build a global database of management-level information for the WWF Priority River Basins globally.

1. Status



Report Card

2. Function



System Dynamics Model

3. Response



Scenario Builder

Contribution at three scales

Planning/policy for economic growth, sustainable development, resilience

- *Process for integrated, evidence-based policy and indicator development in context of SDG implementation*
- *How to link indicators on ecosystem services and economic and social outcomes. How to make ecosystem service indicators actionable.*

Operationalisation of the food, energy and water nexus

- *Indicators for the ‘wicked problem’ of food-energy-water interdependencies*
- *Process for developing river basin management indicator systems that are ‘fit for purpose’*

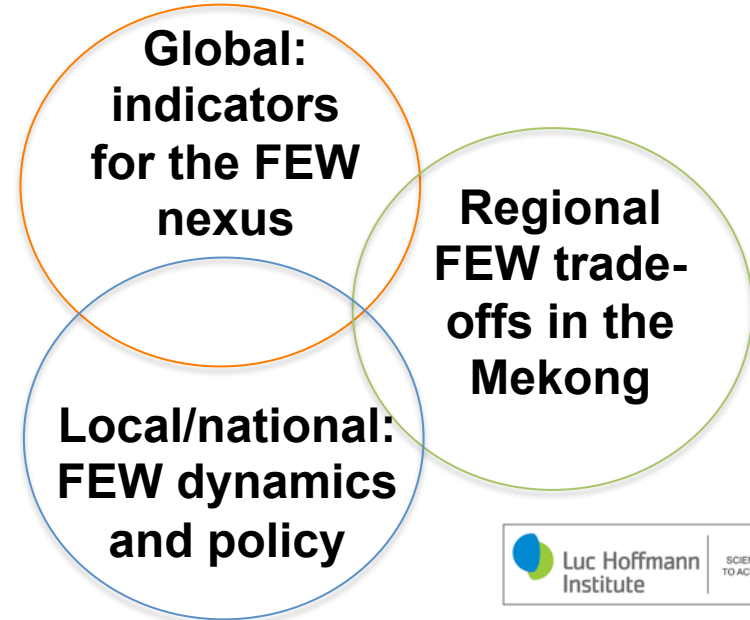
Sustainable development in the Mekong River Basin

- *Regional trade off analysis on hydropower development in the Mekong Basin to inform indicator systems*
- *Pilot for integrated planning for sustainability in Cambodia*

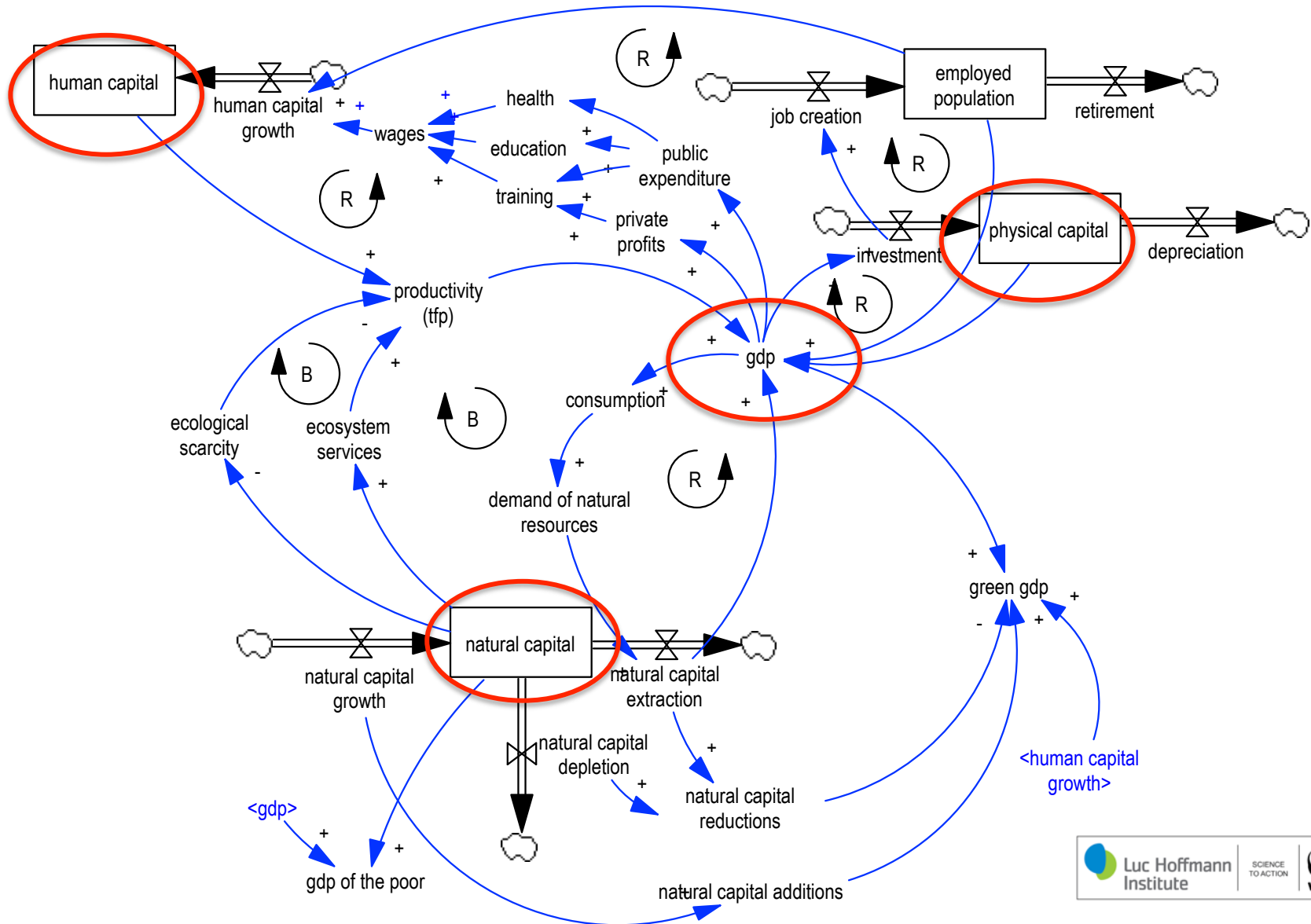
Collaborative Research Teams

Meeting 1, November 2014

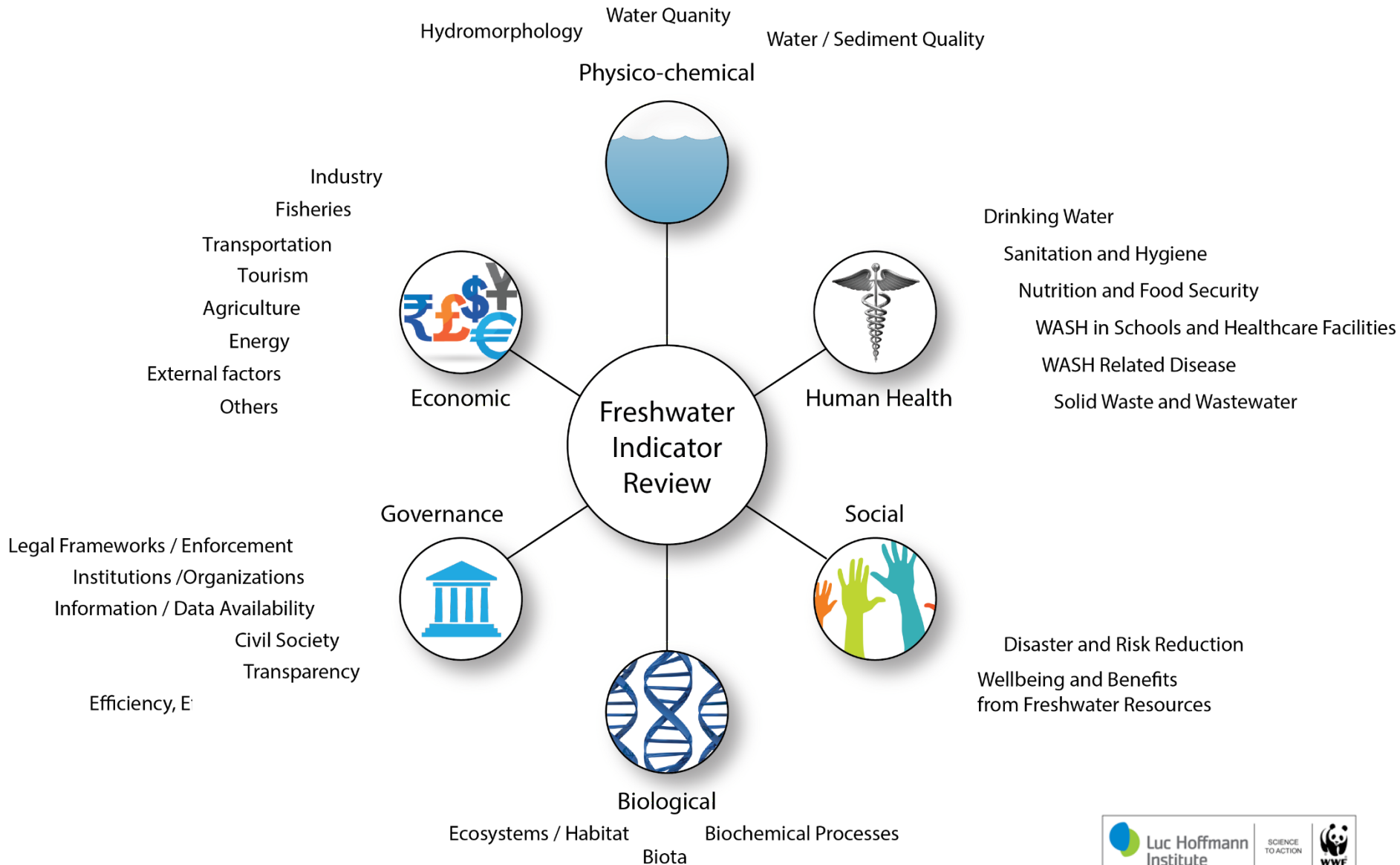
Meeting 2, May 2015



Systems thinking for facilitating a shared understanding the social-ecological system



Indicator review and metadata synthesis



Scenario building using system dynamics modelling for support to policy decisions

Risk mapping (present and future, no action)

Issue Identification

- framework identifies key indicators
- CLD highlights relationships among indicators

Opportunity mapping (alternative futures)

Policy Formulation

- Score card highlights areas that need to be improved
- CLD highlights entry point for intervention (key levers)

System Optimization (for sustainable development)

Policy Assessment

- Score card identifies key indicators of performance
- System model projects impact of policies on key indicators

Decision Making

- Key results inform decision making

Policy Implementation

- Key results inform coordination across actors

Policy M&E

- System model allows to compare scenarios against reality



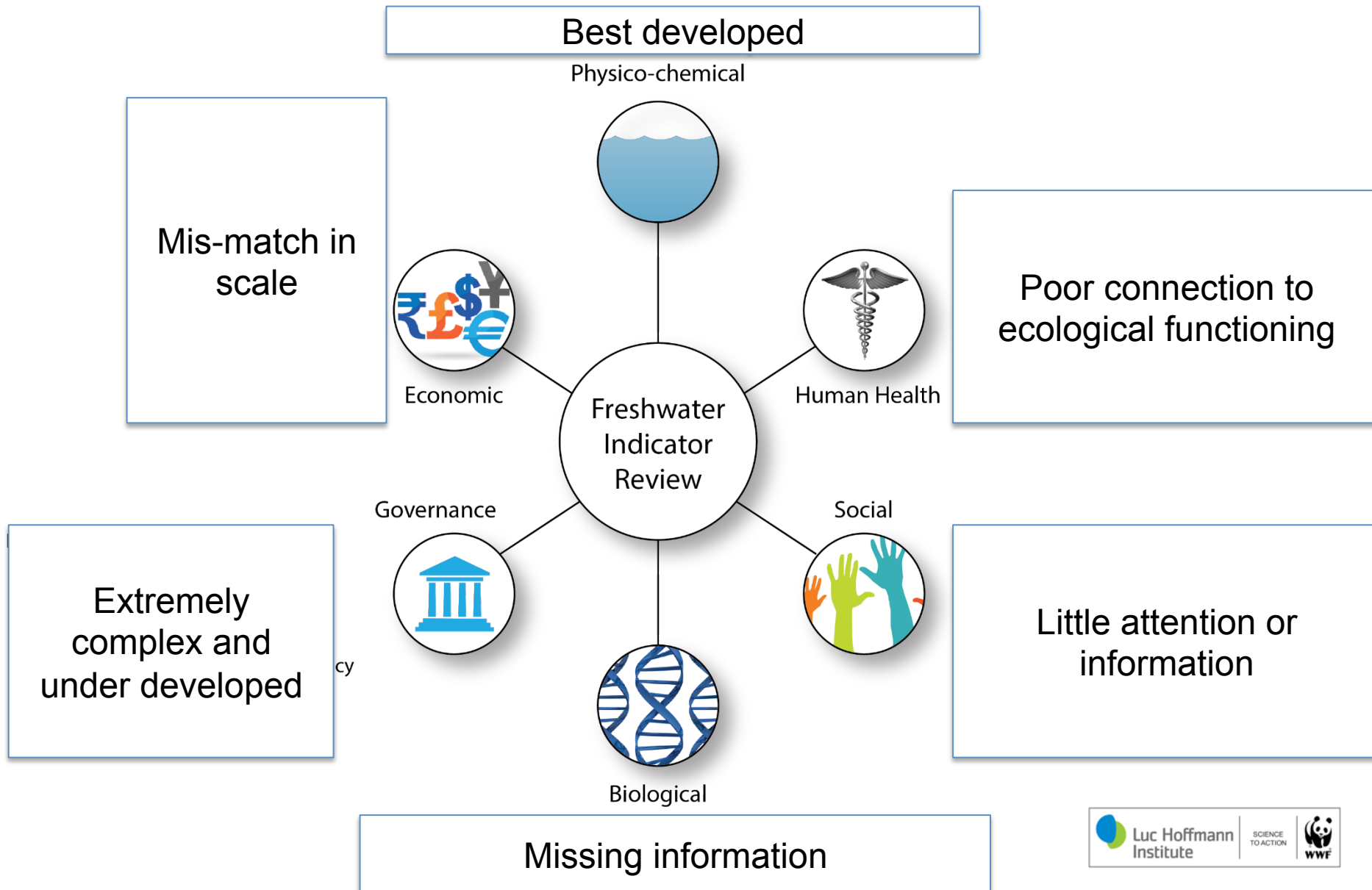
The Greater Mekong Subregion (GMS) is a natural economic area bound together by the Mekong River



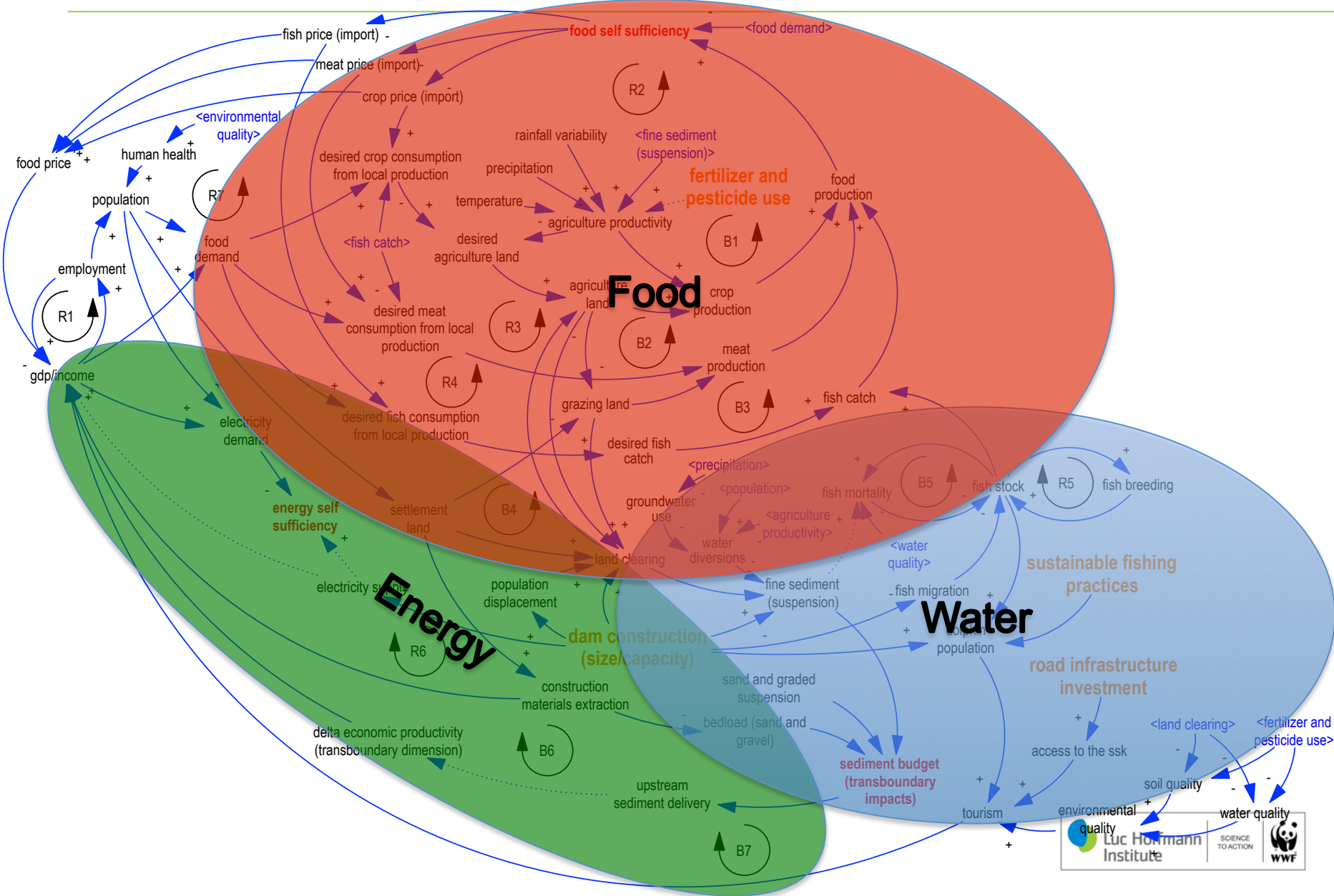


Watch [this video](#) for more information on energy production and consumption in the Mekong region

Review findings



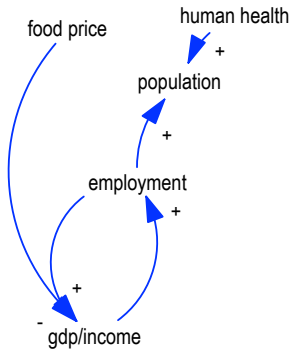
Model for Mekong Flooded Forest Landscape (Cambodia)

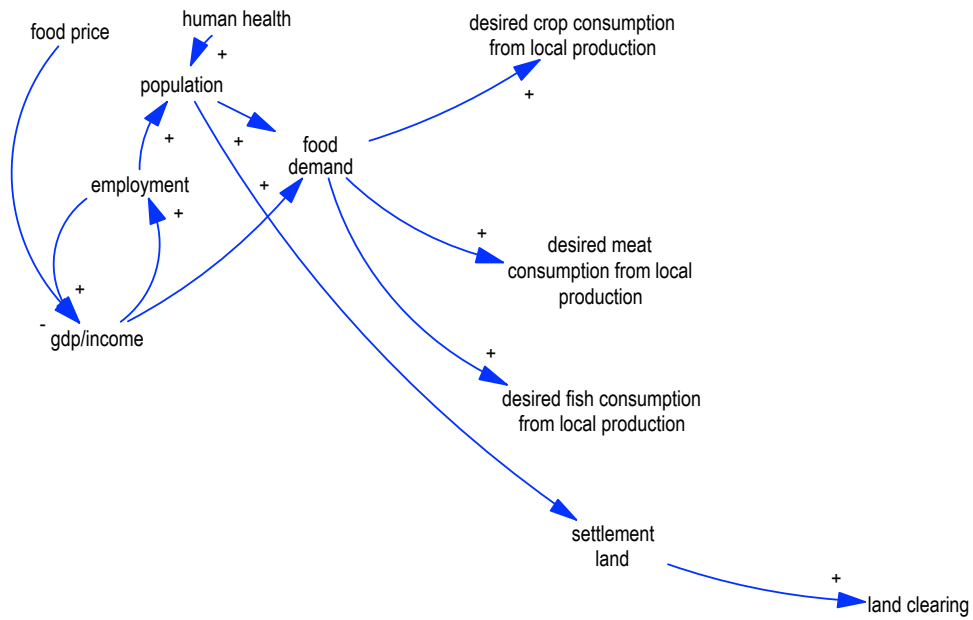


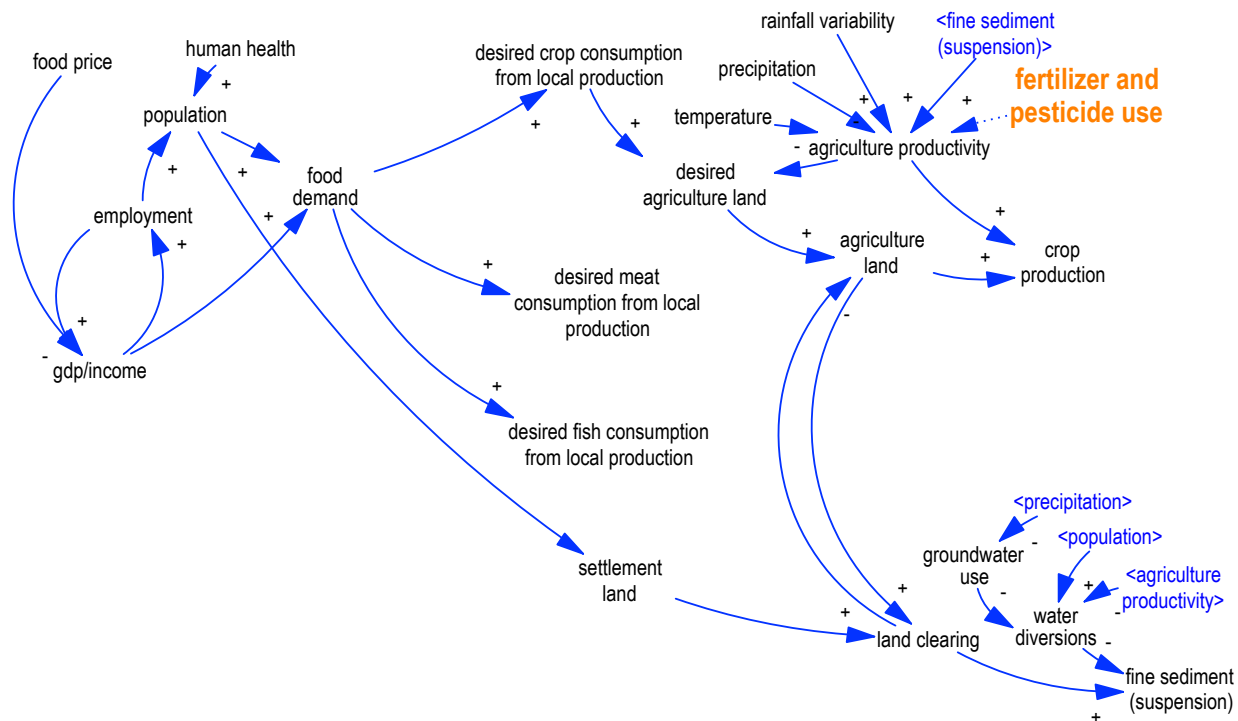
Indicators of 'things' that matter in the system

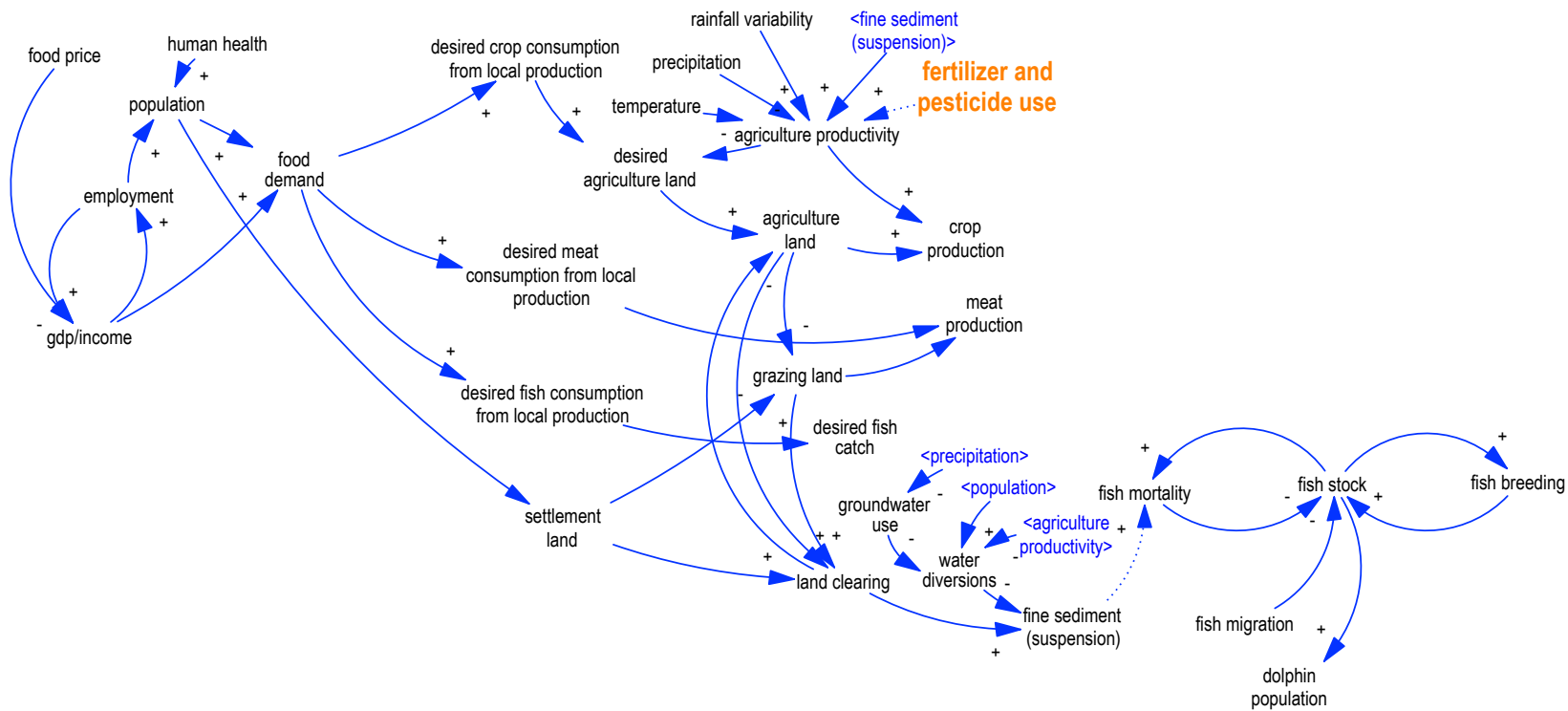
population

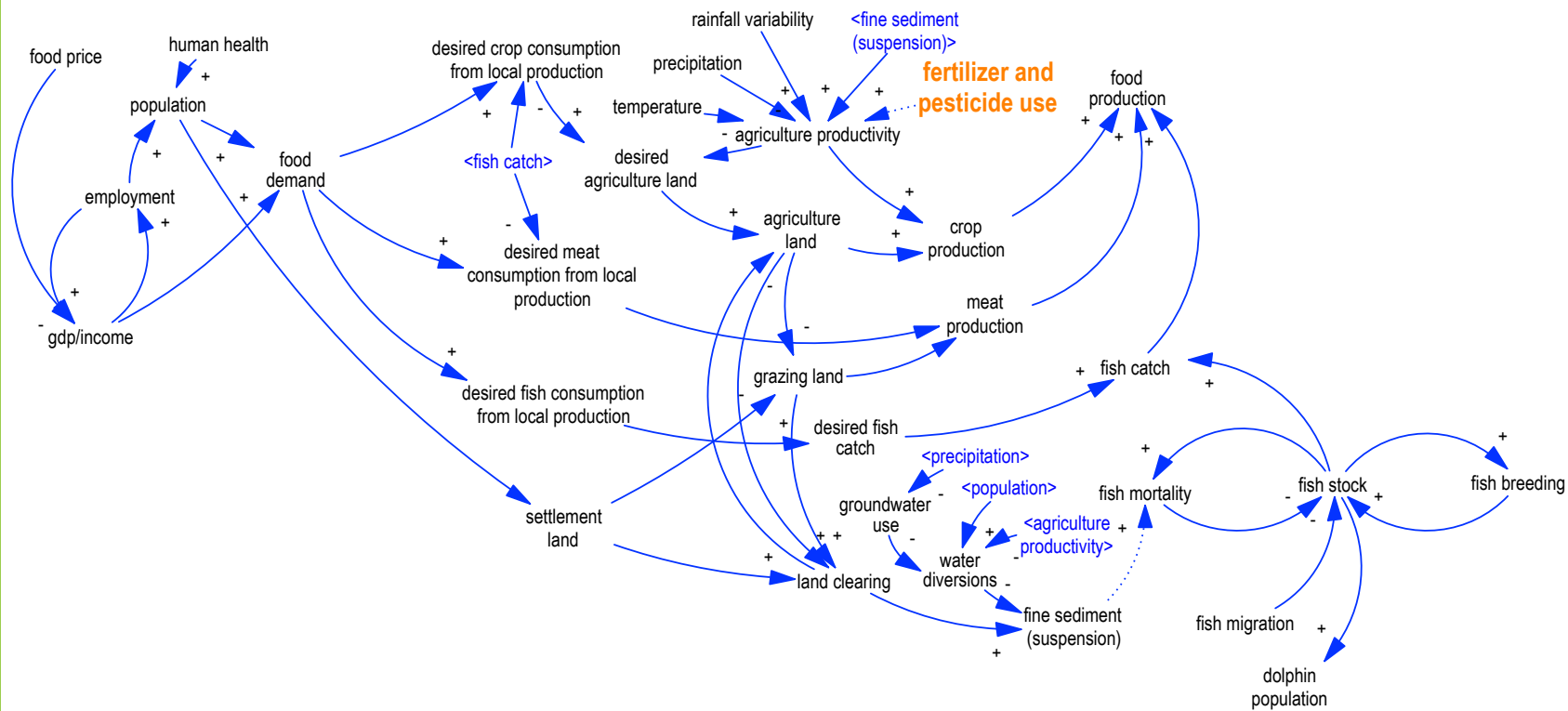




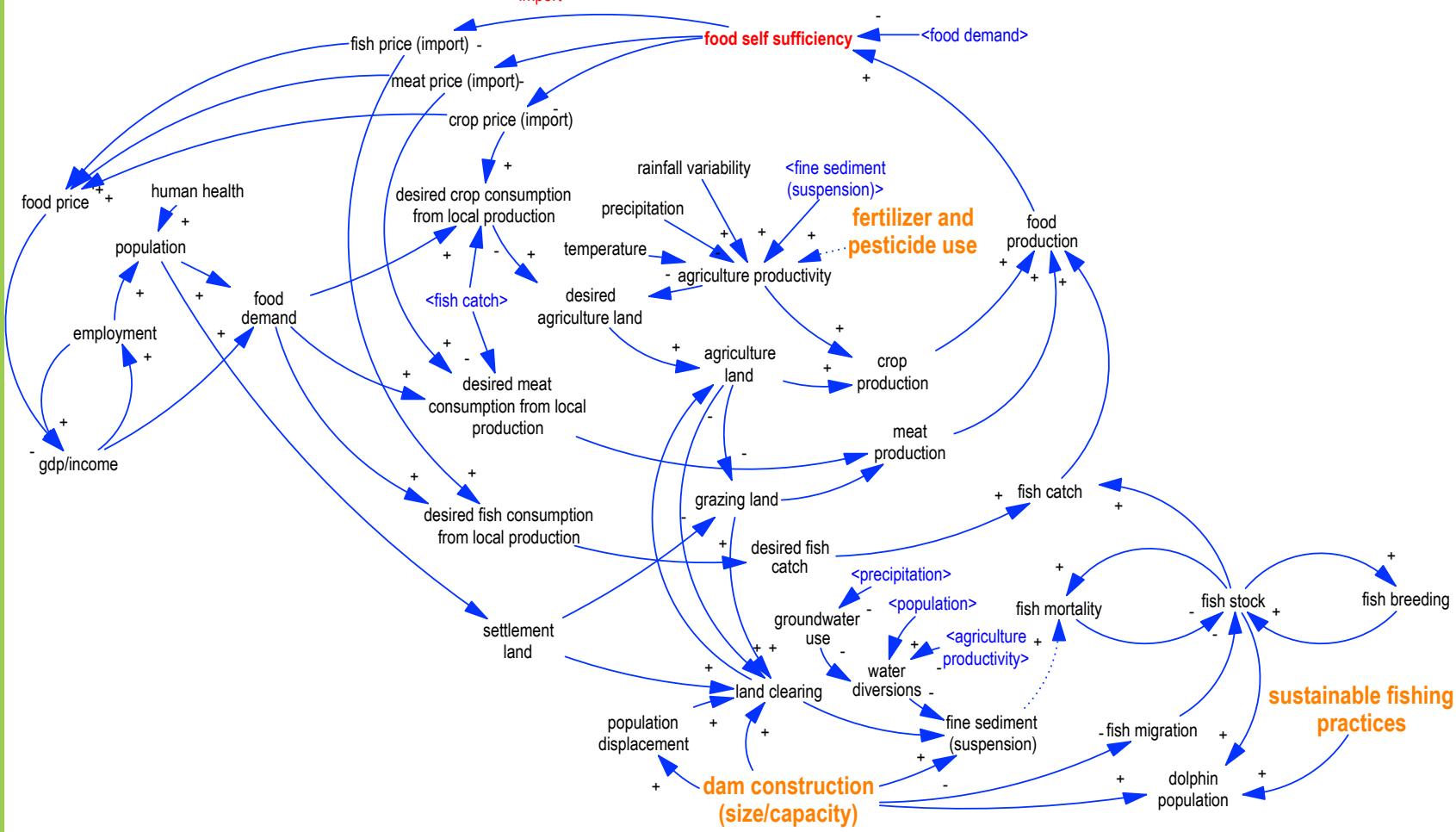


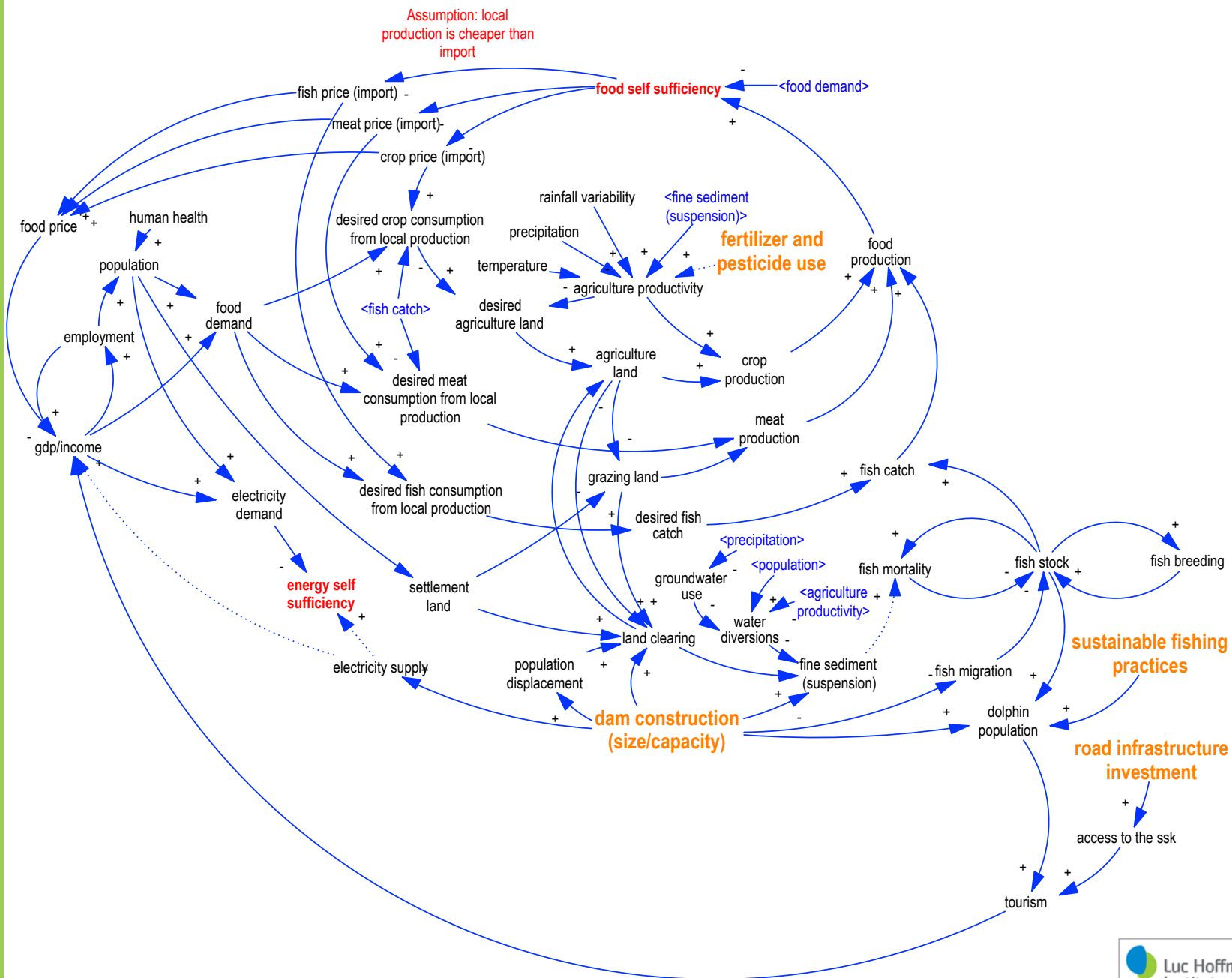


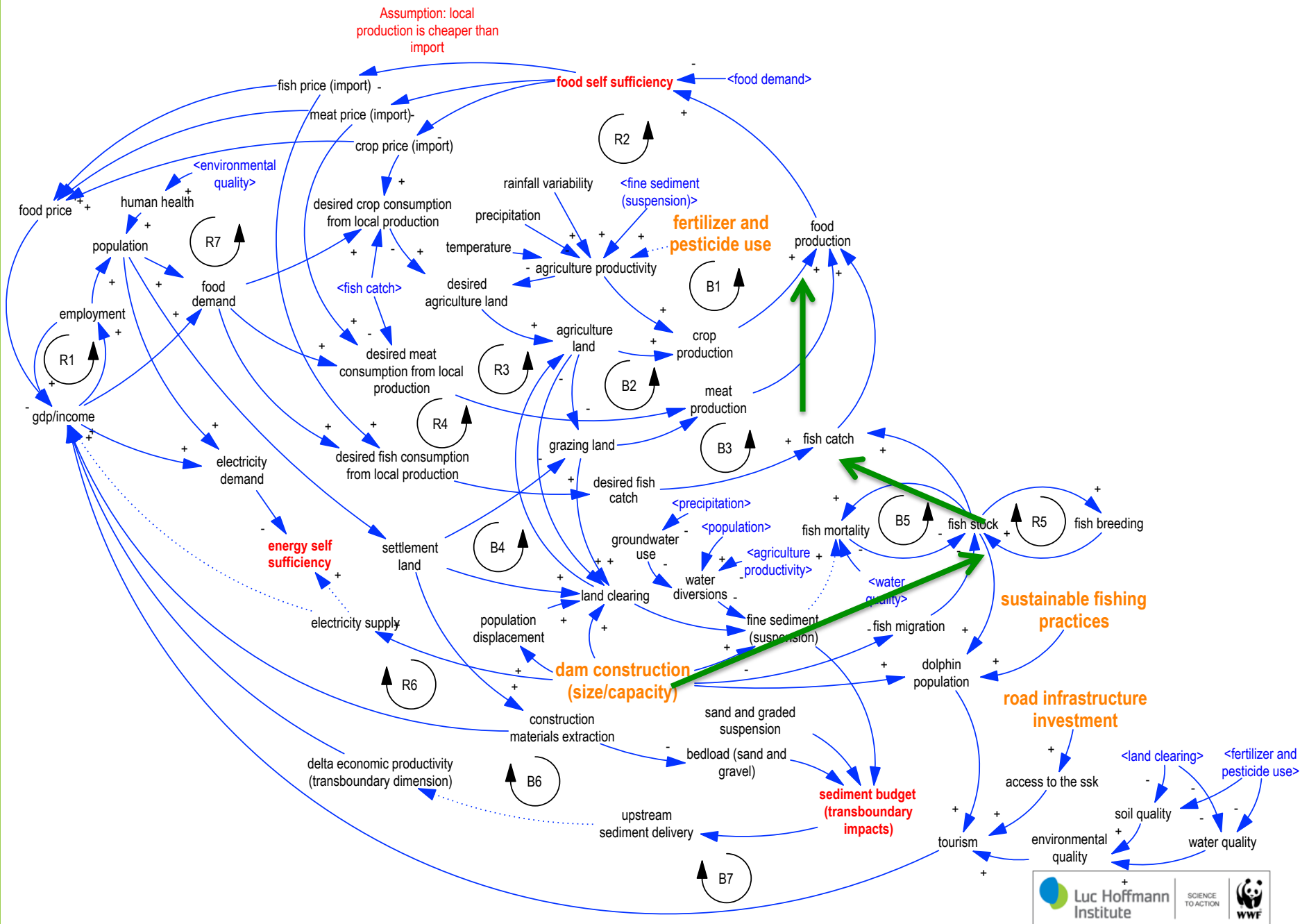




Assumption: local production is cheaper than import

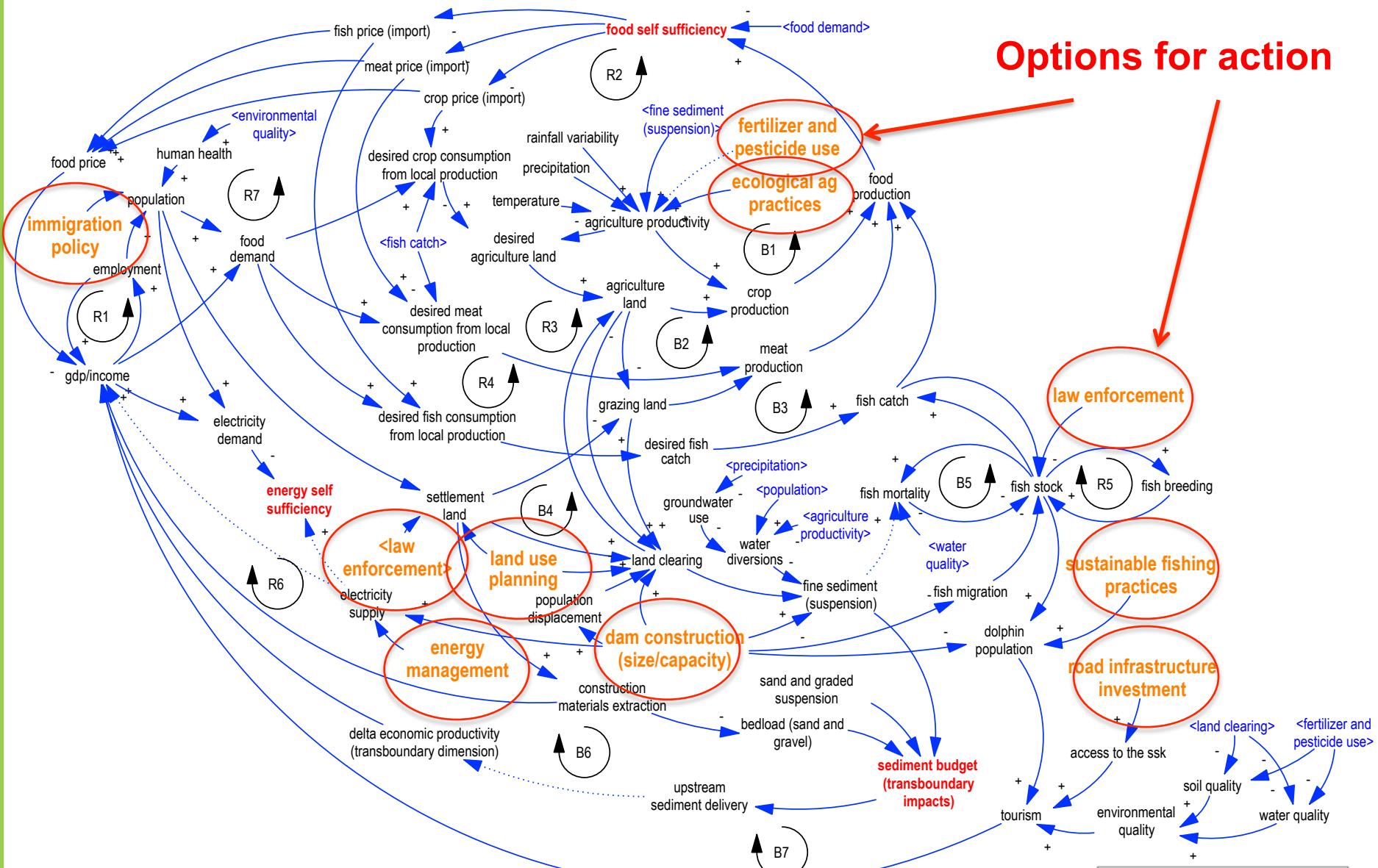




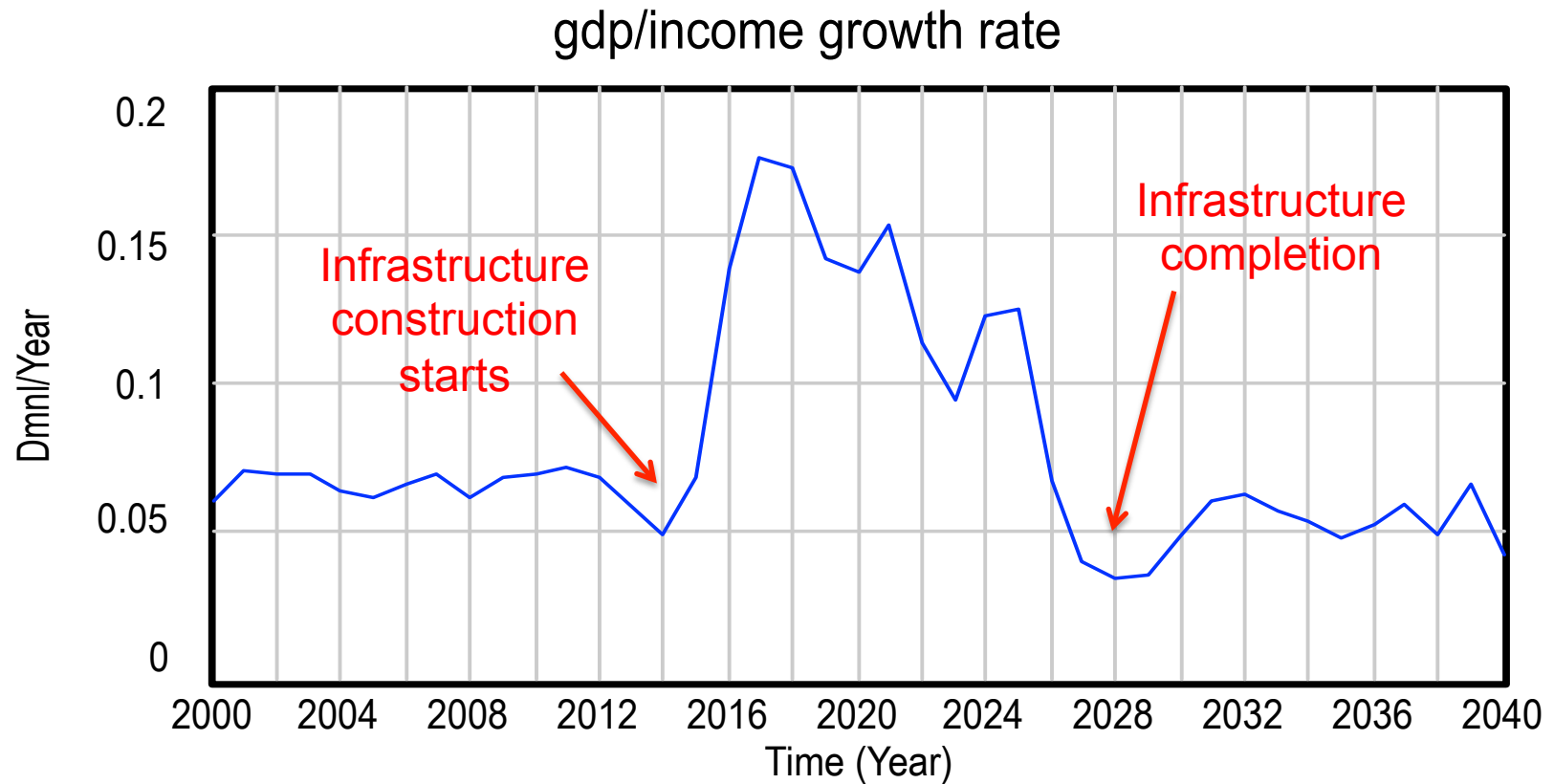


Assumption: local production is cheaper than import

Options for action

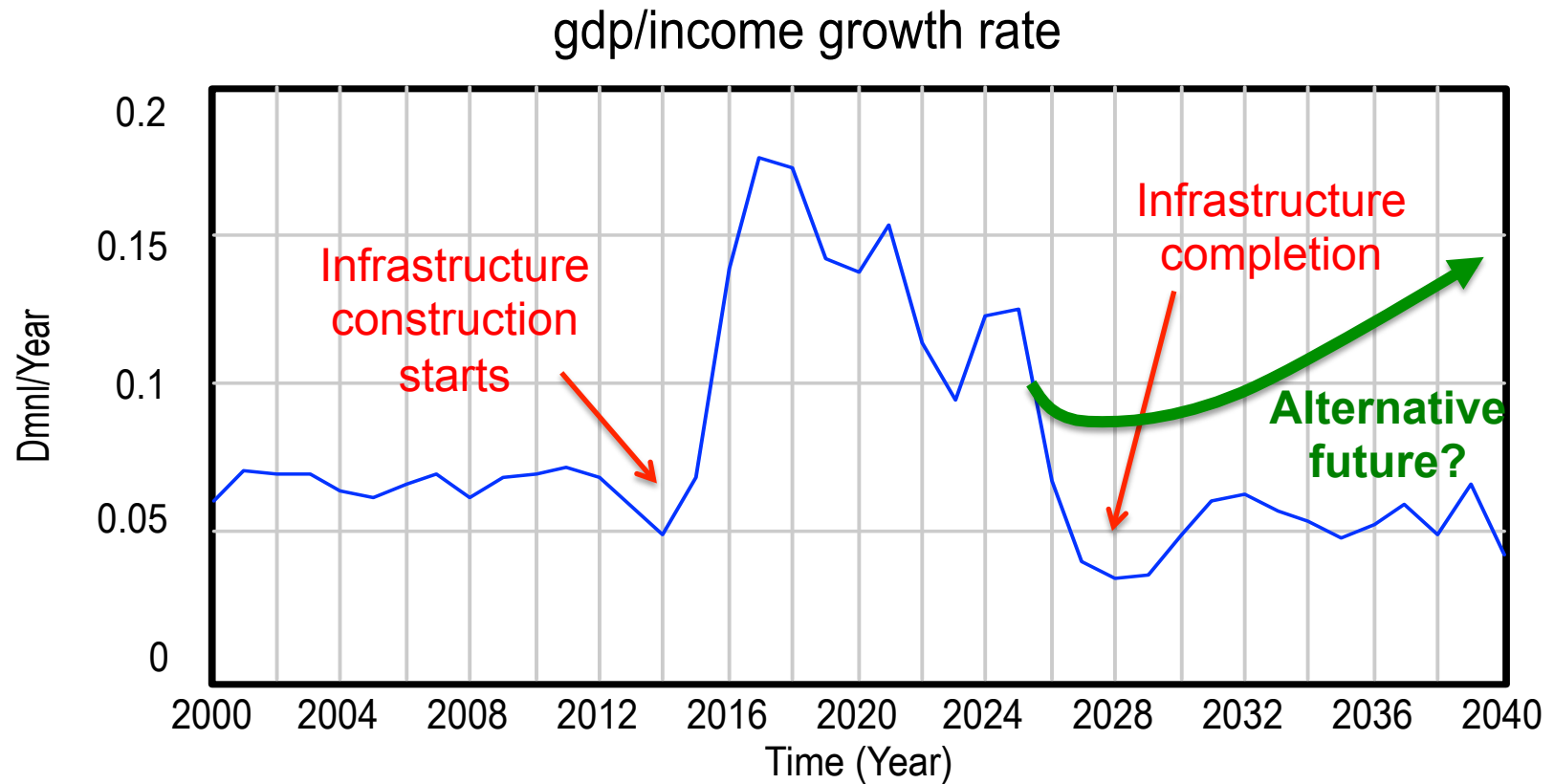


Using the results will depend on customisation but it looks promising



"gdp/income growth rate" : BAU v3

Using the results will depend on customisation but it looks promising



"gdp/income growth rate" : BAU v3

Prototype user interface

Windows XP - Parallels Desktop

LECB

Scenario Setup

Assumptions

Policies Sector 1 Sector 2 Sector 3 Sector 4

Hydropower investment

Hydropower investment

Road infrastructure investment

Road Infrastructure investment

Sustainable fishing practices

Activate sustainable fishing practices

Scenario 1 Reset

Run Scenario Clear Runs

Show CLD

SSK Food-Energy-Water (FEW) model

Economy

Relative electricity price GDP GDP growth rate

Tourism GDP Productivity

0,2
0,15
0,1
0,05
0

2000 2005 2010 2015 2020 2025 2030 2035 2040

Time (Year)

—BAU

Society

Average food price Energy self sufficiency Population

Per capita food consumption (day) Food self sufficiency

1,5
1,25
1
0,75
0,5
0,25
0

2000 2005 2010 2015 2020 2025 2030 2035 2040

Time (Year)

—BAU

Environment

Fallow/forest land Crop self sufficiency Fish stock

Fish self sufficiency Dolphin population

150.000
125.000
100.000
75.000
50.000
25.000
0

2000 2005 2010 2015 2020 2025 2030 2035 2040

Time (Year)

—BAU

Implemented by:

Luc Hoffmann Institute WWF KnowlEdge Srl

More Outputs

Continuing the testing and sharing the work

August 2015:

- World Water Week 2015, 'Water Management for Green Growth' session, 26 August

September 2015:

- Linked indicators developed with stakeholders in Cambodia
- Training of Trainers for Cambodia Ministry of Environment staff, to facilitate systems perspective discussions in the context of sustainable development implementation

October 2015:

- Submission of academic manuscripts

January 2016:

- Replication in Lao PDR portion of Mekong Flooded Forest Landscape

February 2016: End Phase I

Publications and communications



PROMOTE KEY MESSAGES ACROSS DIFFERENT MEDIA

Pathways forward in LIVES Phase II 2016-2020

1. Further improvement of the model in the landscape in Cambodia and Laos
2. Further improvement of model in other parts of Greater Mekong with a Luc Hoffmann Institute Fellow
3. Replicate the modelling in other river basins, and other FEW contexts
4. Nexus data repository for broad access by decision makers
5. Embedding integrated planning for sustainability into WWF's landscape and valuing nature approaches



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11 Projects currently active

3 in development





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REFRAMING
CONSERVATION SCIENCE
FOR THE 21ST CENTURY

