

# Systems Analysis in the Americas

The power of Systems Analysis: *How the integrated approach of systems analysis increases efficiencies and effectiveness of government policies*

**Dr. Albert van Jaarsveld**  
**IIASA Director General and Chief Executive Officer**

September 2019

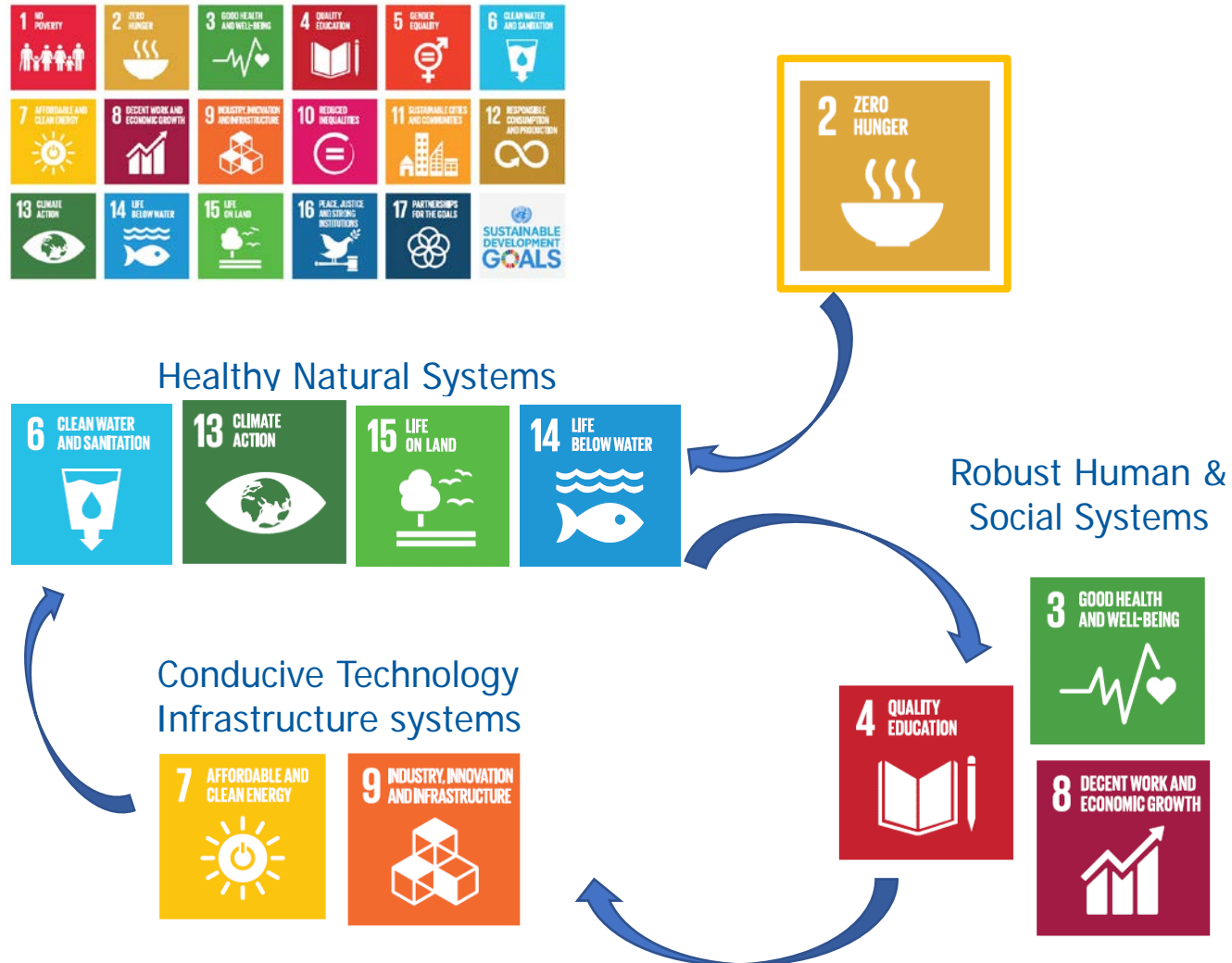


# IIASA

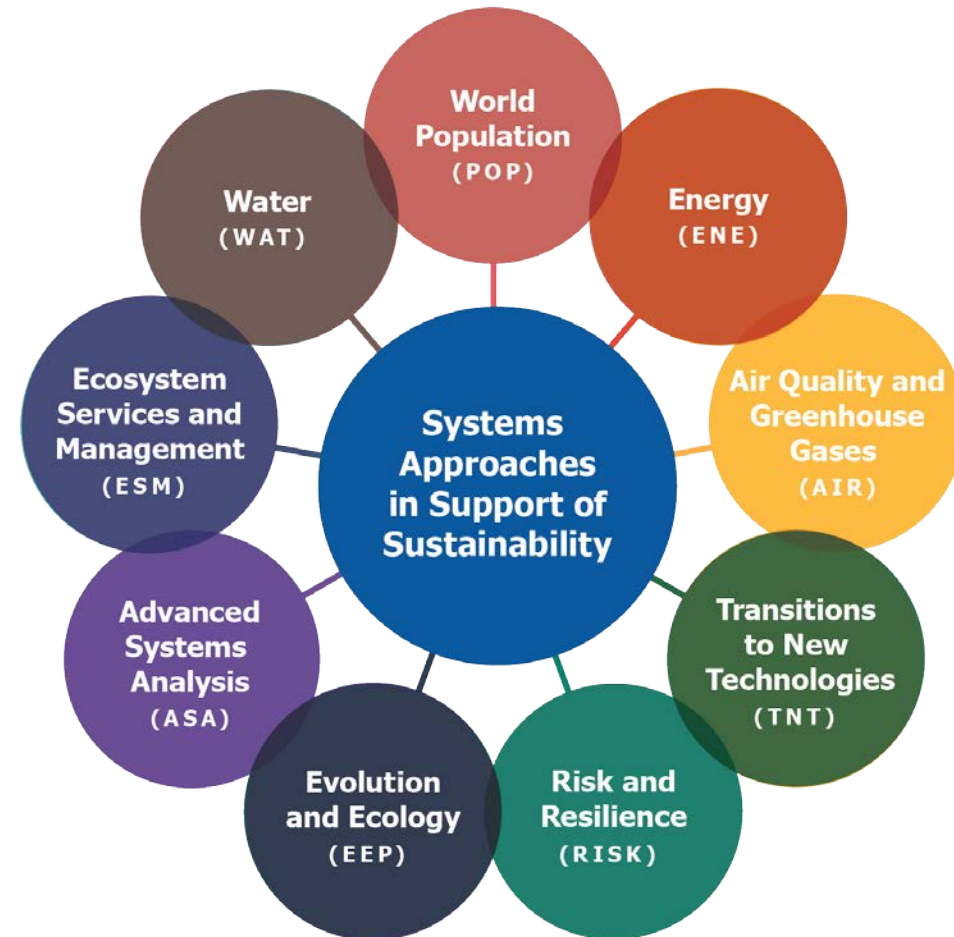
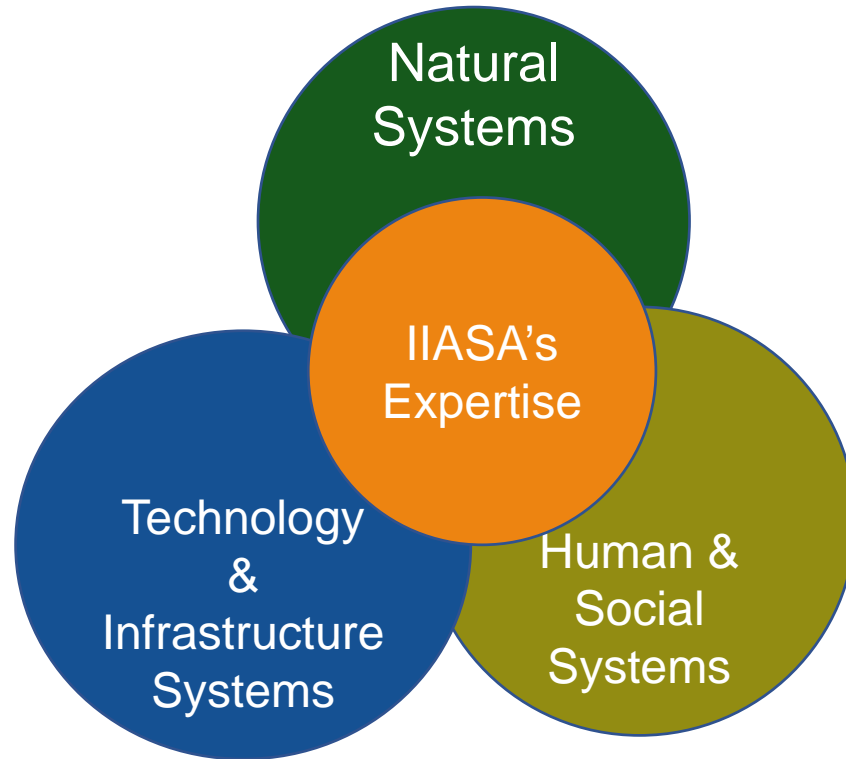


An international research institute that conducts multidisciplinary/transdisciplinary research to help policymakers find long-term solutions to global and universal challenges facing countries

# Systemic understanding?



# Solving global and universal challenges



# Improving the science policy interphase – addressing global and universal challenges through systems approaches

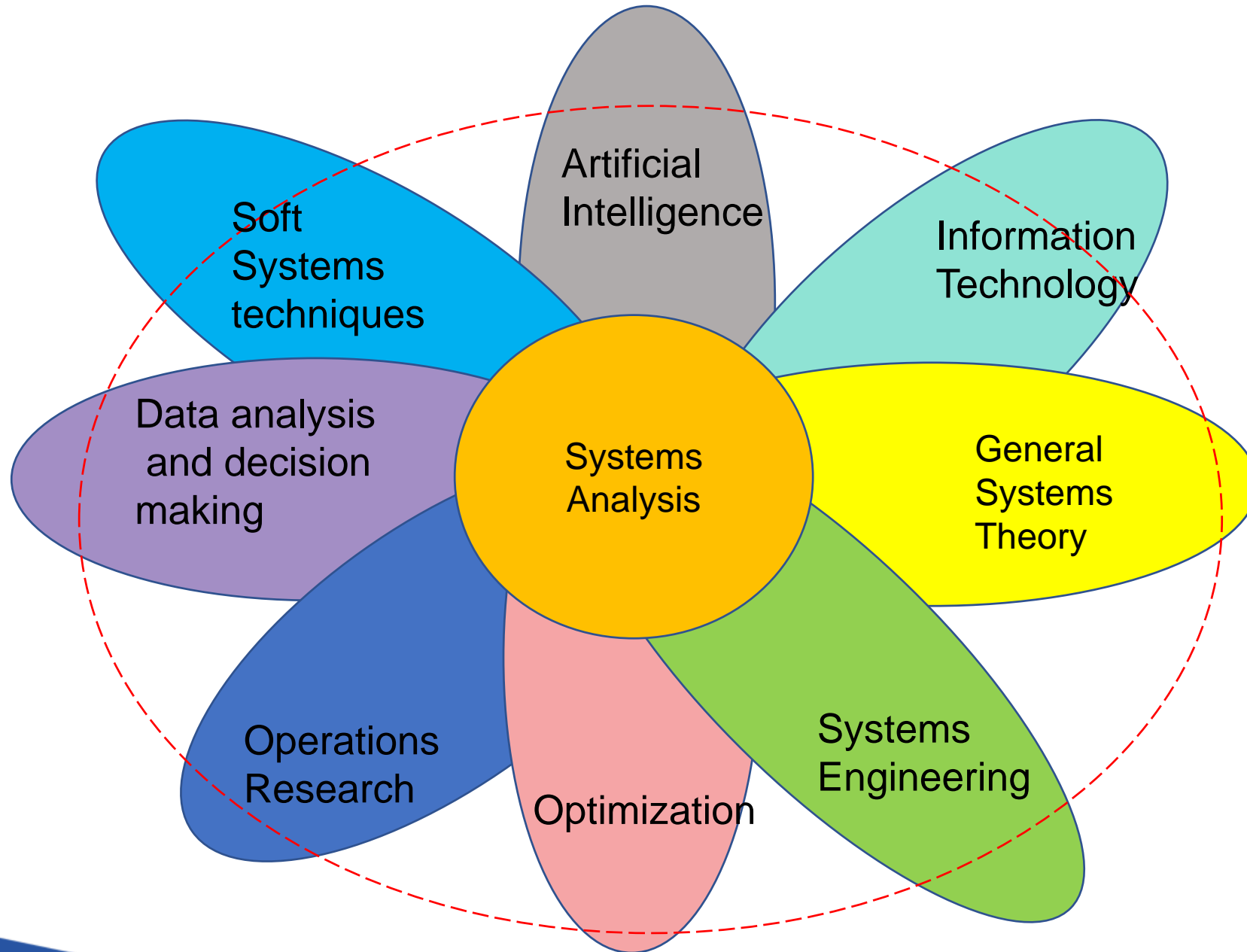
## **Role of Systems thinking**

- We live in a systems world
- Improved integration - economic, social, environmental and policy dimensions
- Inherent non-linearities
- Combination of scientific, policy and practical expertise – pursuit of sustainability
- Governance implications - design, management (institutions, organizations and social structures)
- Uncertainty towards resilience (risk)

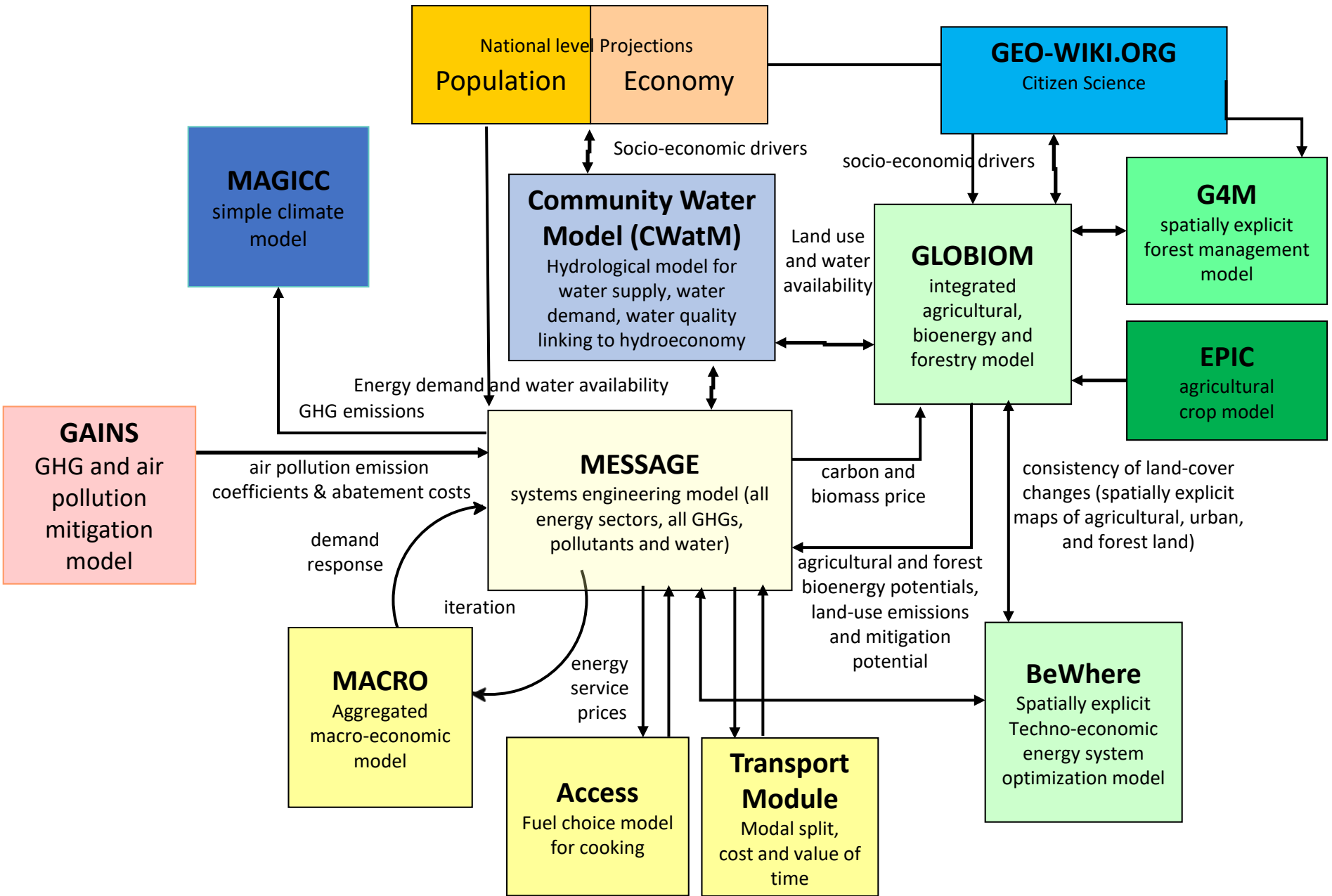
Today's problems are often yesterday's solutions

- Minimizing unintended consequences

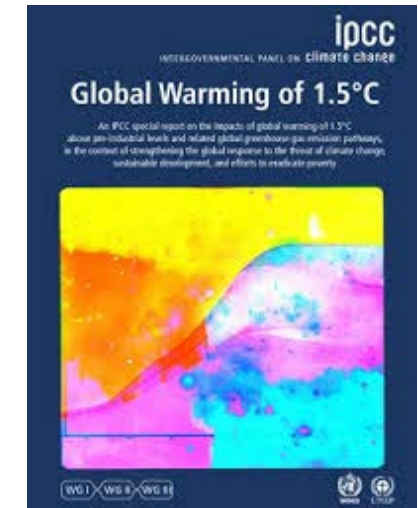
# Systems Analysis: Tools of the trade



# The pursuit of an integrated assessment framework



# Recent Policy Impact - IPCC Special Report on Global Warming of 1.5°C

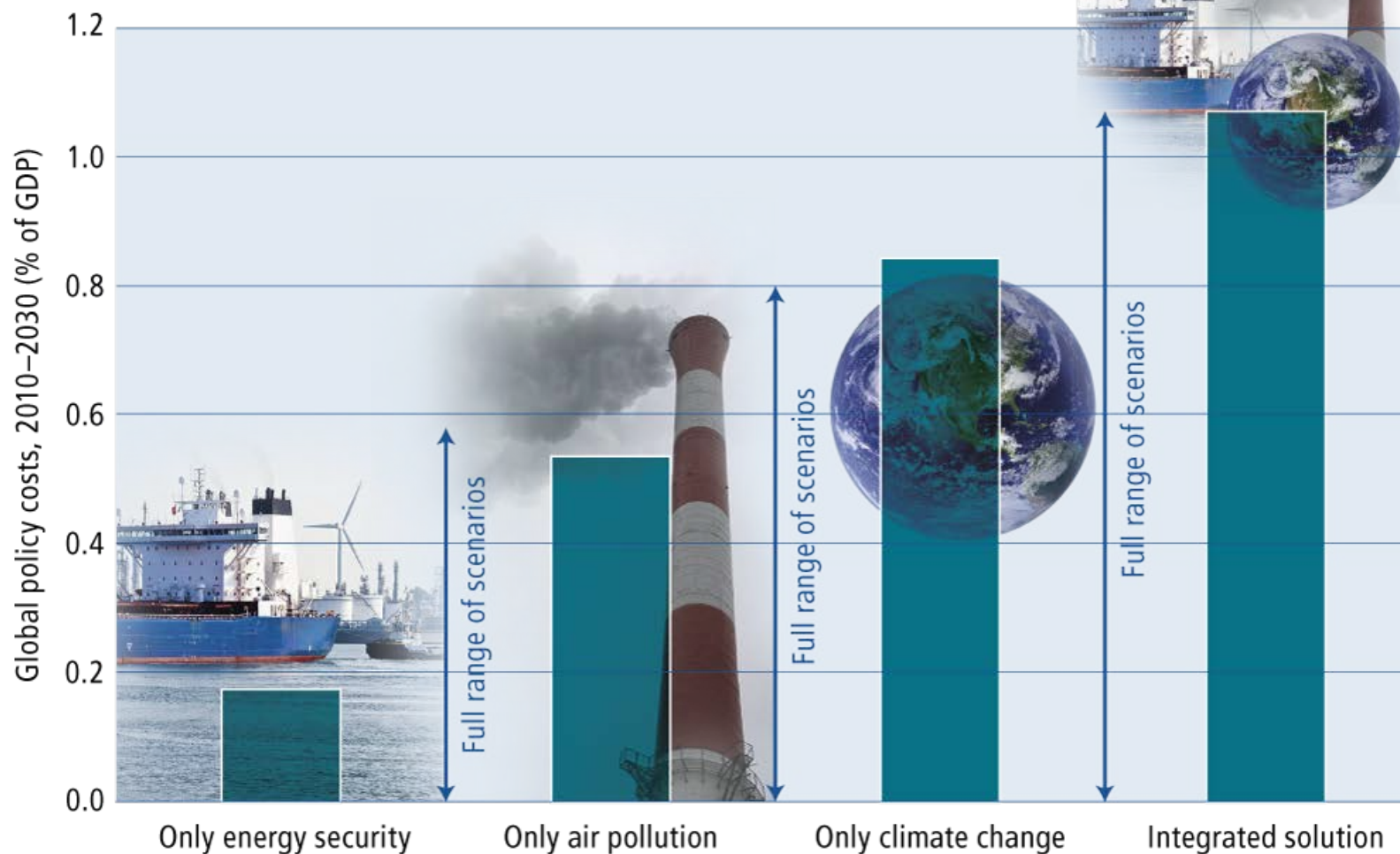


Paris climate change agreement aims for a global response to limit temperature increase to 1.5°C. At this time, December 2015, IIASA had one of the few research groups that had conducted analysis into how to achieve this target.

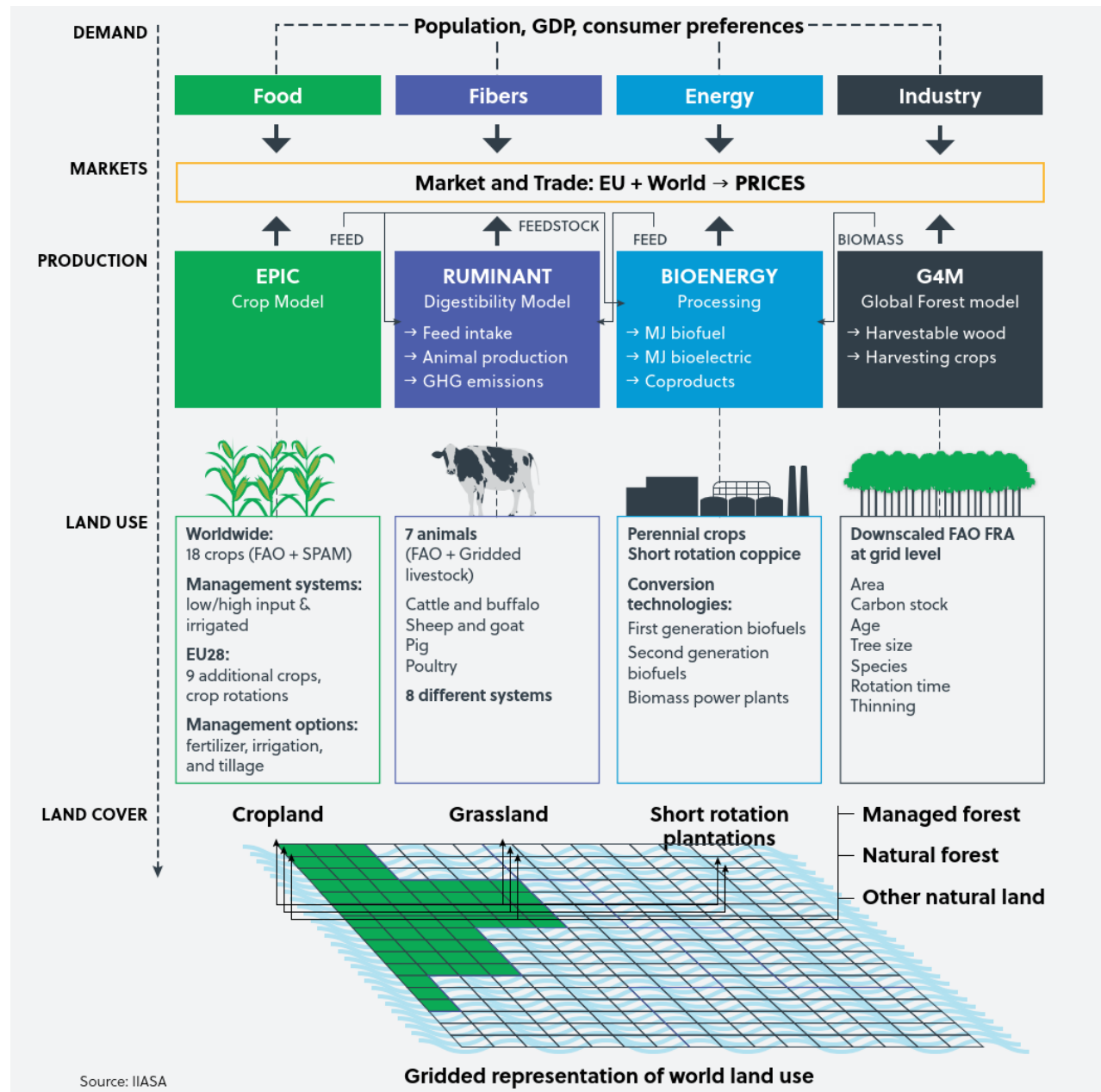
The European Commission adopted a long-term strategy, A Clean Planet for all, on how Europe can become climate neutral by 2050 and meet its Paris Agreement commitments. IIASA research contributed to the quantitative backbone



# Multiple benefits of integrated policies (harnessing synergies and trade-offs)



Source: McCollum, Krey, Riahi, 2012



GLOBIOM

Integrating disciplines

# CD-LINKS: Cutting edge science, integration of global and national perspective

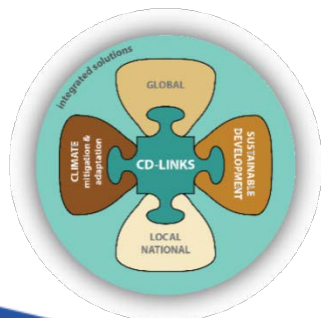
- low carbon development pathways, climate change and sustainable development linkages, policy, capacity

## GLOBAL transformation pathways



*Improved representation of national circumstances and policy priorities*

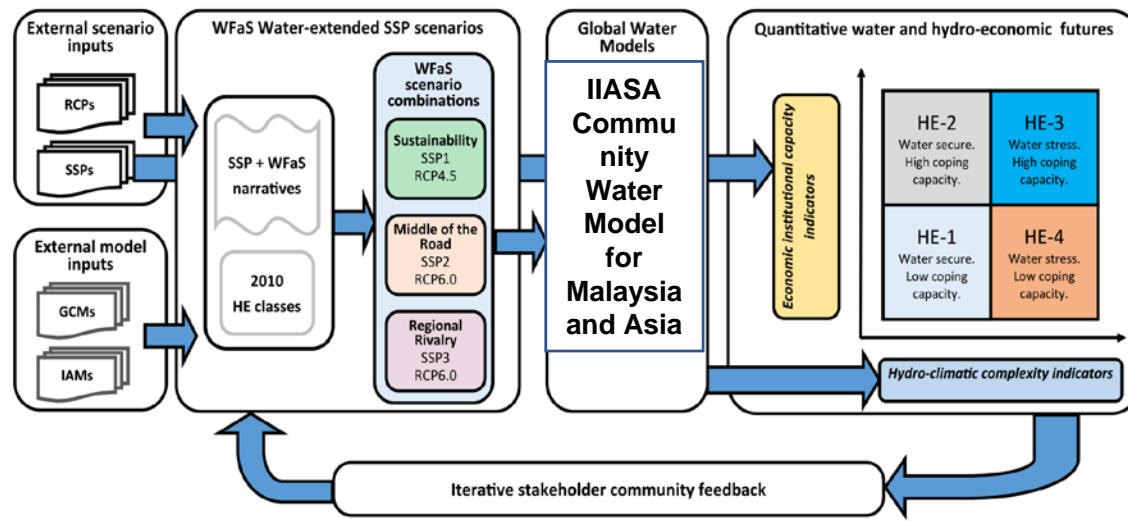
Integrating spatial scales



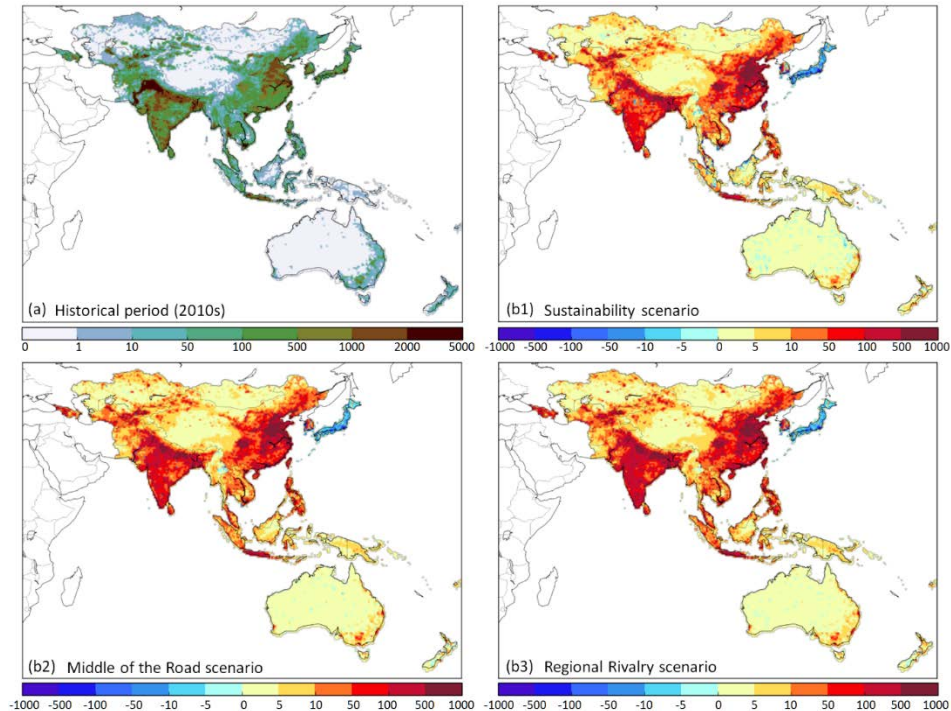
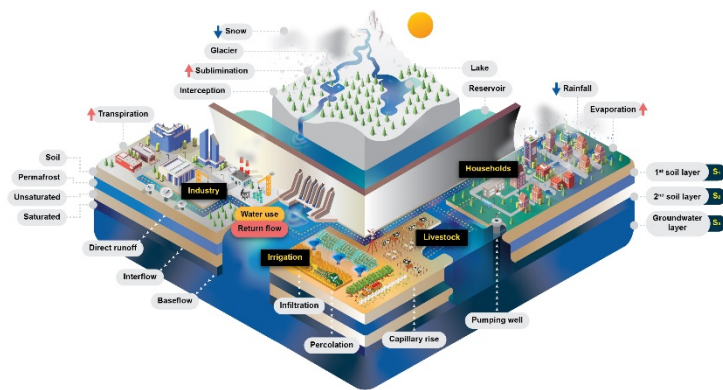
**NATIONAL mid-century strategies**

# Water Futures and Solutions (WFaS) Initiative and framework

\*Malaysia has seasonal water scarcity



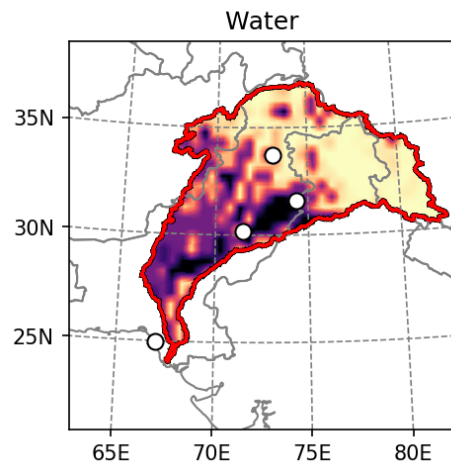
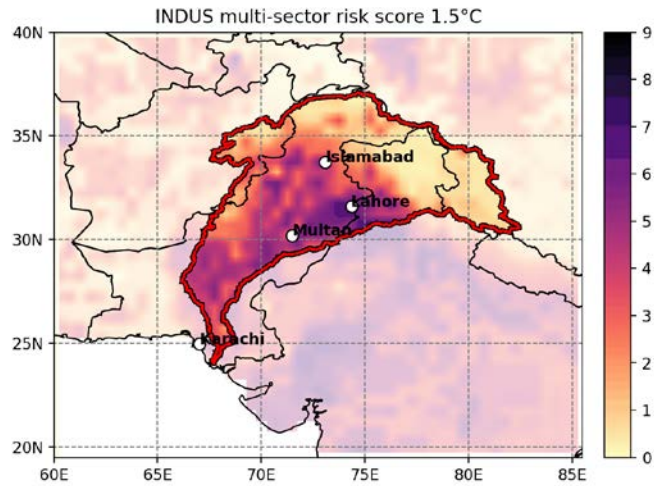
## Malaysia/Asia Future water demand for 3 SSP-RCP scenarios



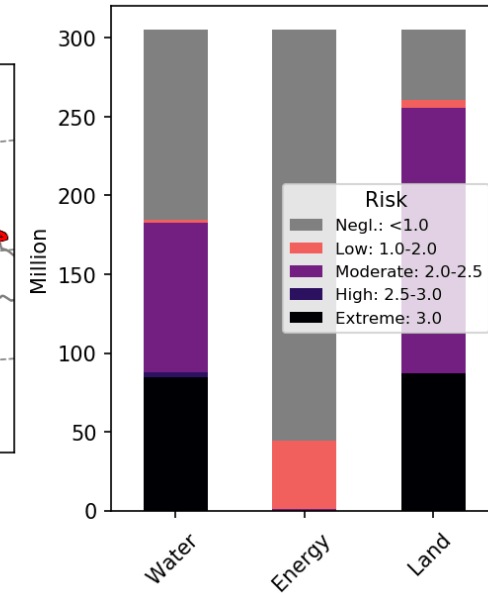
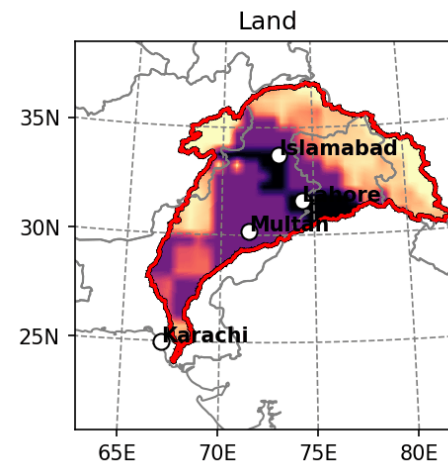
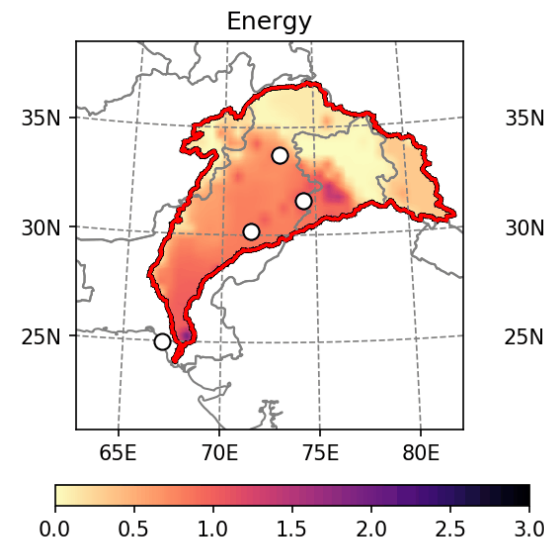
Integrating temporal scales

# Hotspot basin: *Indus – ISWEL project*

Current risks in water and land sectors  
With warmer temperatures  
– energy risks affect most regions



1.5°C



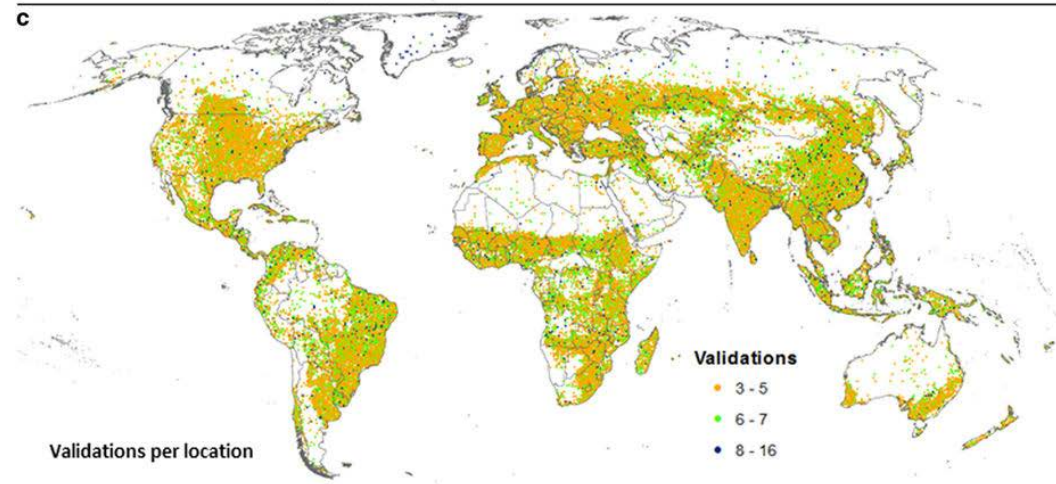
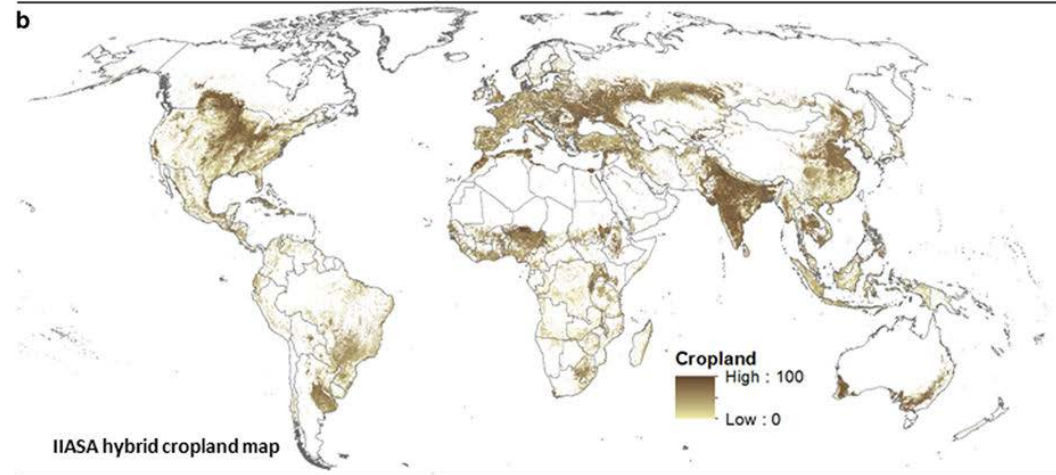
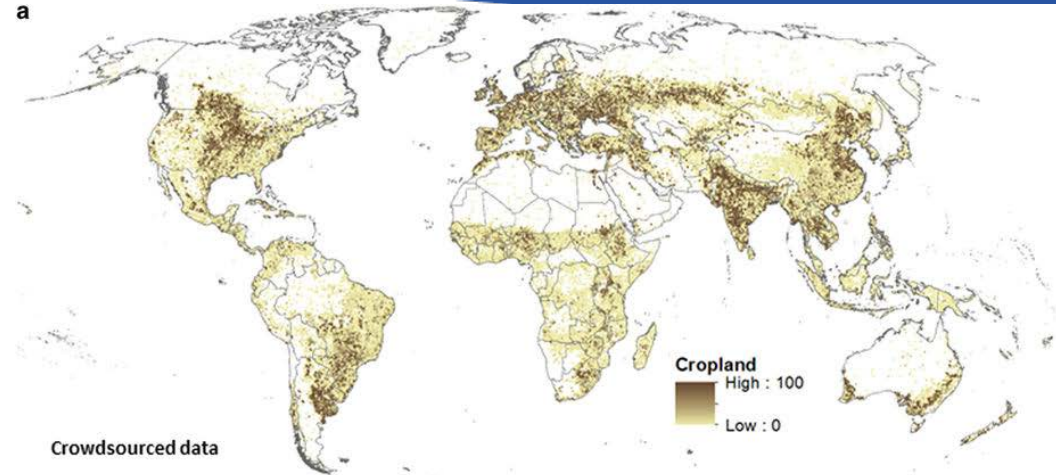
Integrating disciplines, temporal and spatial scales

# Citizen scientists and IIASA scientific network make three new data sets on forest cover, land use and cropland publicly available

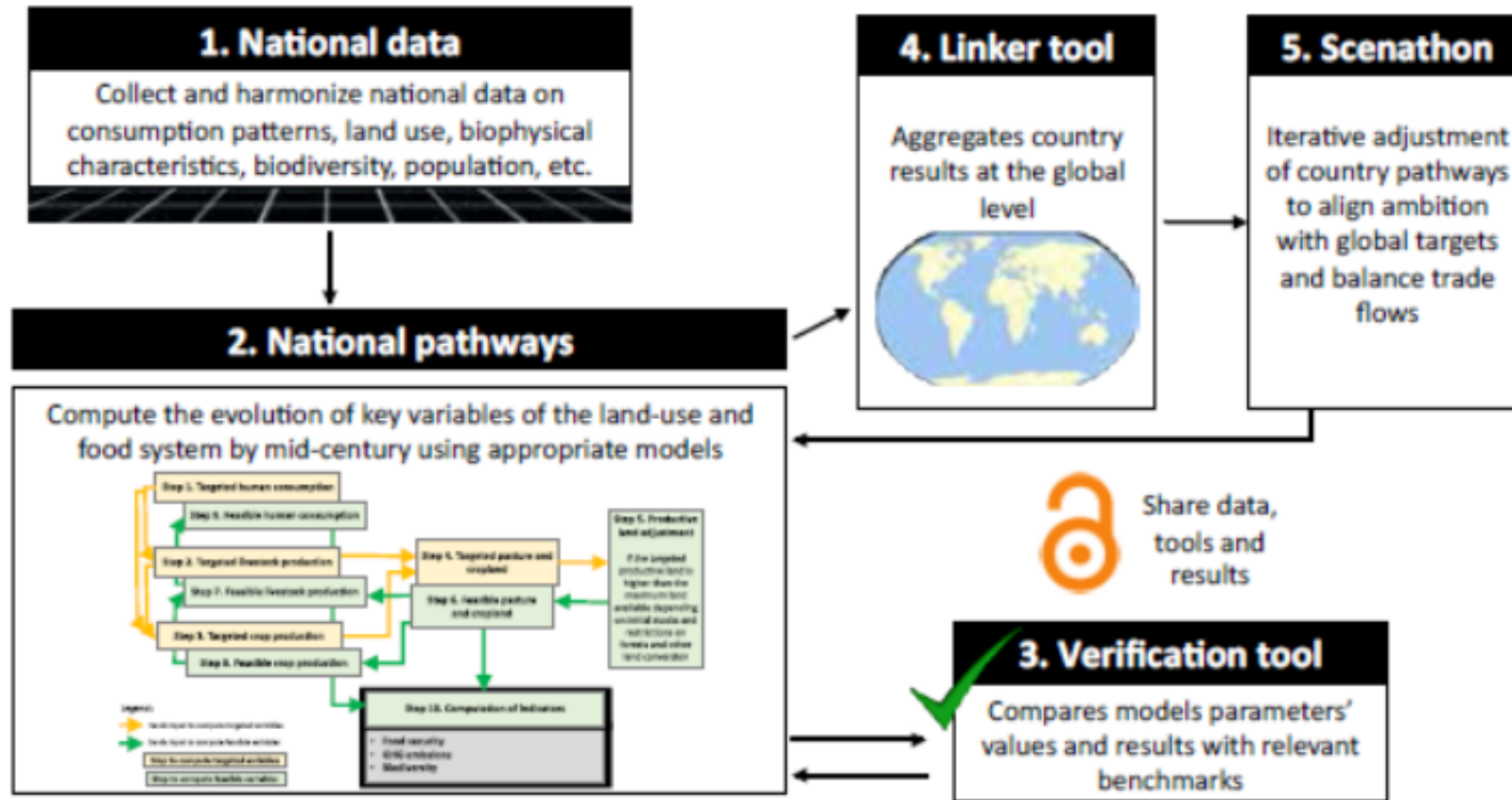
Laso Bayas JC, Lesiv M, Waldner F, Schucknecht A, Duerauer M, See L, Fritz S, Fraisl D, et al. (2017). A global reference database of crowdsourced cropland data collected using the **Geo-Wiki platform**. Scientific Data 4: e170136. DOI:10.1038/sdata.2017.136.



Citizen science

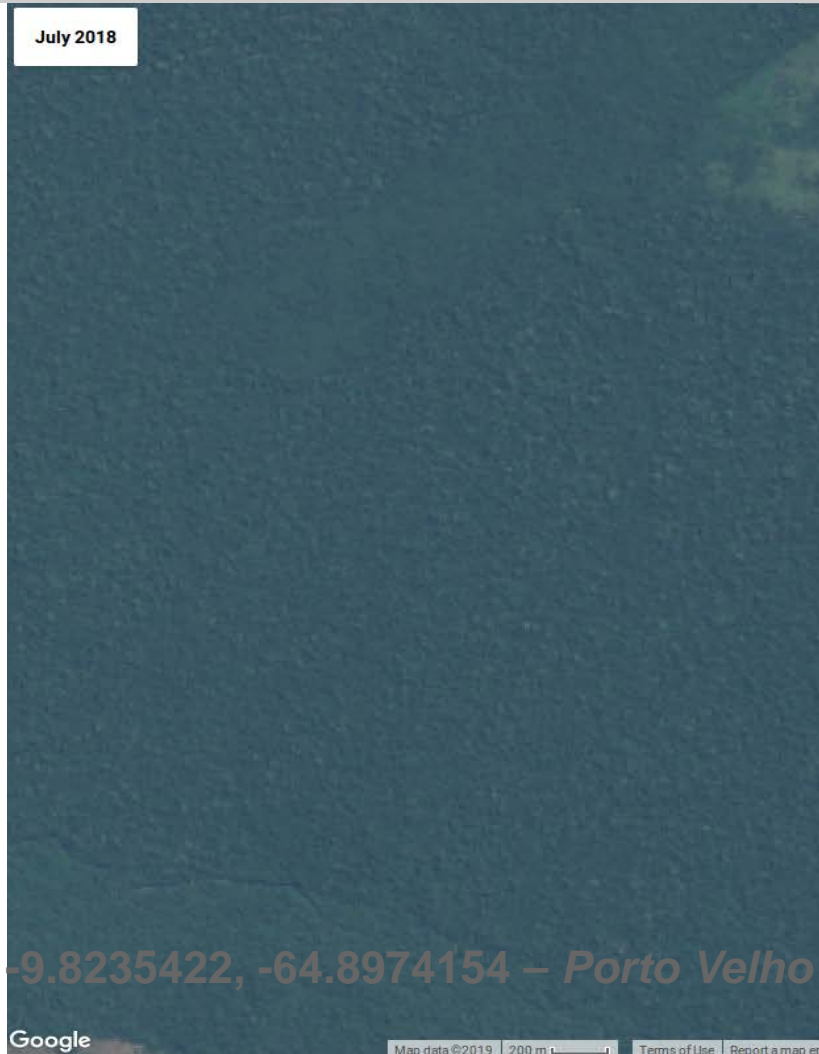


# Food, Agriculture, Biodiversity, Land, Energy (FABLE)



Co-design, co-production and co-implementation

## Forest cover



## Deforestation



## Automated deforestation detection using Sentinel 2



“A man who uses an imaginary map thinking that it is a true one, is likely to be worse off than someone with no map at all.”  
— Ernst Schumacher,



# Improved Human Development Index

## The Human Life Indicator

IIASA researchers have introduced a new, simple measure for human wellbeing across countries, called the Human Life Indicator (HLI), that takes inequality into account and could replace the commonly used but error-prone Human Development Index (HDI).



Huge crowds of people, Hong Kong © Tidusx | Dreamstime.com

Measuring the overall wellbeing of populations is crucial for evaluating the success of policies. The Human Life Indicator expresses wellbeing in terms of years of life, similar to life expectancy at birth. However, unlike any other current measure, it takes not only the mean value but also the inequality in longevity into account. The wide availability of mortality data means that the HLI can be used for reliable comparisons of wellbeing across countries, in the past as well as the present.

Figures in Table Re-Aging 4 includes the Human Life Indicator, the Human Development Index, and life expectancy at birth for all UN countries and regions.

The Human Life Indicator and life expectancy at birth

are based on the UN's 2017 revision of *World Population Prospects*. The Human Development Index is from 2016.

**New measures of human development are now available for downloading**

[DOWNLOAD DATA](#)

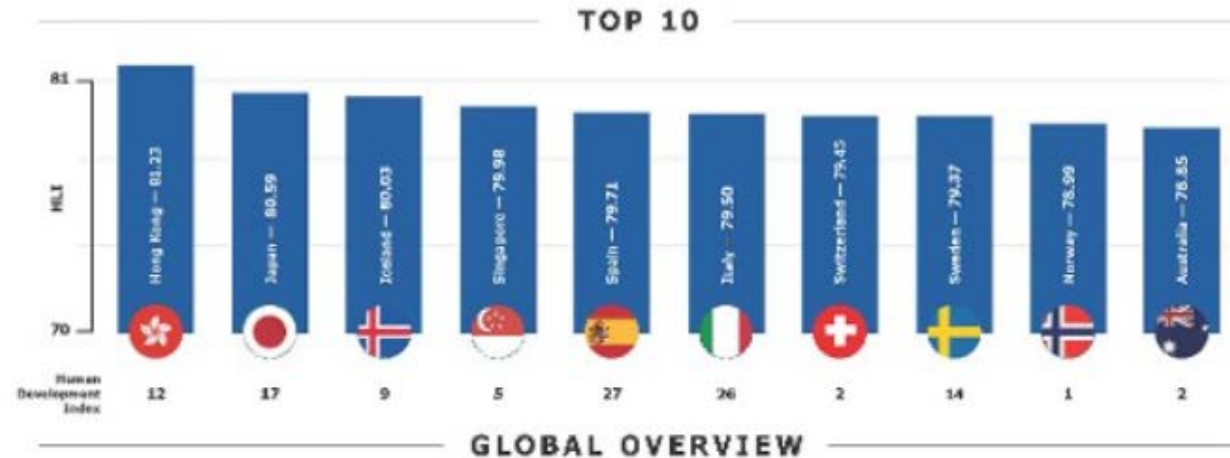
Data accompanying Ghislandi S, Sanderson WC, Scherbov S (2018), *A Simple Measure of Human Development: the Human Life Indicator Population and Development Review*.

The research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Programme (FP7/2007-2013) / ERC grant agreement no ERC2012-AdG 323947-Re-Ageing. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

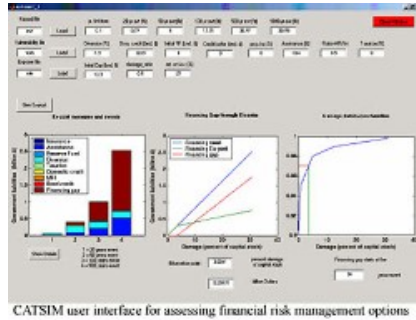


## Top 10 most developed countries according to the Human Life Indicator (HLI)\*

\* Based on 2010-15 LRI H's tables (2017 Korea ca)

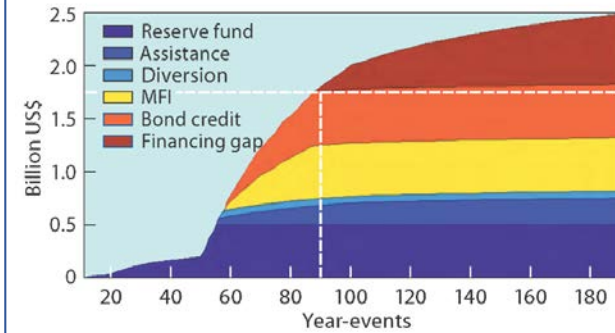


# Dealing with systemic risks under conditions of uncertainty



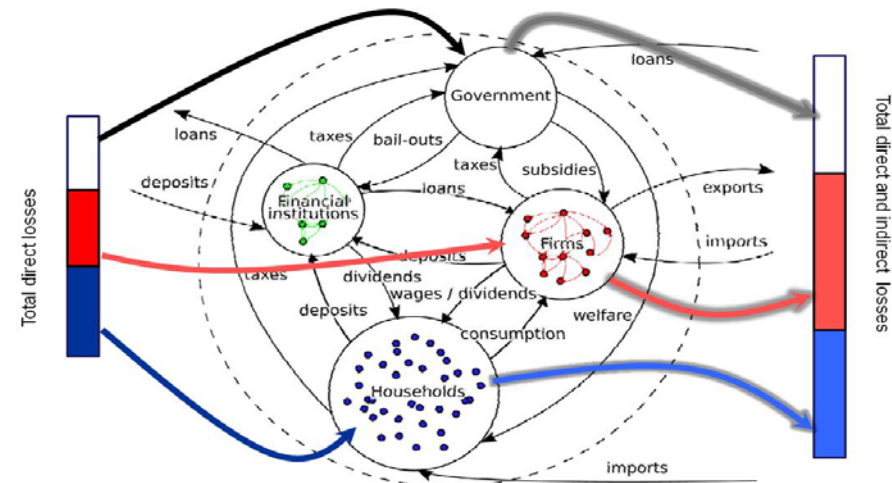
CATSIM user interface for assessing financial risk management options

1. CATSIM (catastrophe simulation) model for disaster mitigation and development planning – 25 Finance ministries (risk transfer mechanisms)



CATSIM: The Mexican government issued catastrophe bonds to cover the risk of a major earthquake or hurricane--risk transferred to the international reinsurance and capital markets.

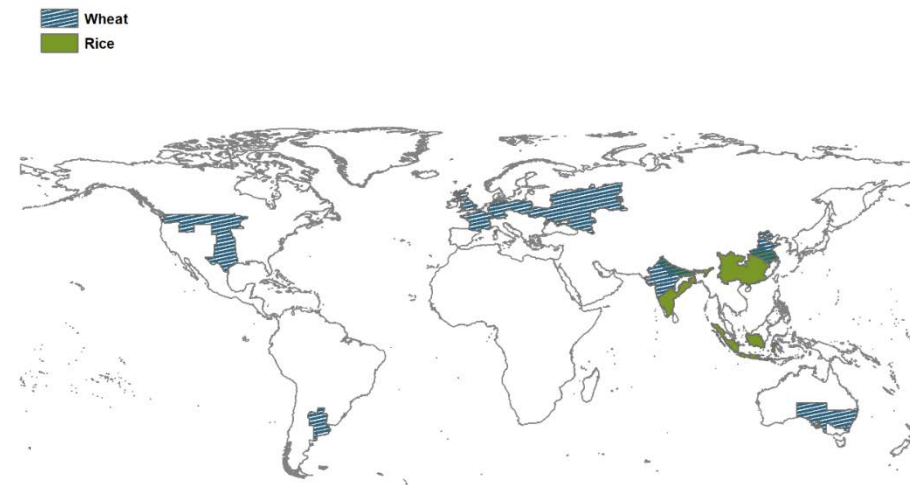
2. SHELscape - spatially-explicit agent-based model: post-natural disasters impacts on local economies with regional dependencies (100 000s).



3. Soft systems techniques - Participatory decision support systems, smart games and social simulations to tackle policy issues - overcome analysis paralysis (>15)



4. IIASA applies advanced methods (copula) that improve assessments of spatially diverse risks by accounting for their interdependencies



Risk of failure of multiple bread baskets

# Six Major Transformations (TWI2050.org)



# Attracting some of the best researchers



Prof. Tjalling Koopmans  
and Prof. Leonid Kantorovich  
Nobel Prize in **Economics** (1975)



Prof. Thomas C. Schelling  
Nobel Prize in **Economics**  
(2005)

Prof. Crutzen and  
Prof. Mario Molina  
Nobel Prize for **Chemistry**  
(1995)



Prof. Lawrence Klein  
Nobel Prize in **Economics**  
(1980)



Authors of the Intergovernmental Panel  
on Climate Change Reports  
Nobel **Peace Prize** (2007)



Prof. William Nordhaus  
Nobel Prize in **Economics**  
(2018)

# IIASA highly cites researchers, 2018

## - *Clarivate Analytics (top 1% 2006-2016)*



**Keywan Riahi**

Program Director, Energy Program

**Michael Obersteiner**

Program Director, Ecosystems and Management Program



**Zbigniew Klimont**

Research Scholar, Air Quality and Greenhouse Gases Program

**Andreas Richter**

Guest Research Scholar, Ecosystems and Management Program



**Petr Havlik**

ERD Center Head and Deputy Program Director, Ecosystems Services and Management Program

**Volker Krey**

Deputy Program Director, Energy Program



**Yoshihide Wada**

Acting Program Director, Water Program



# Thank you

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Systems solutions for  
today's complex problems

