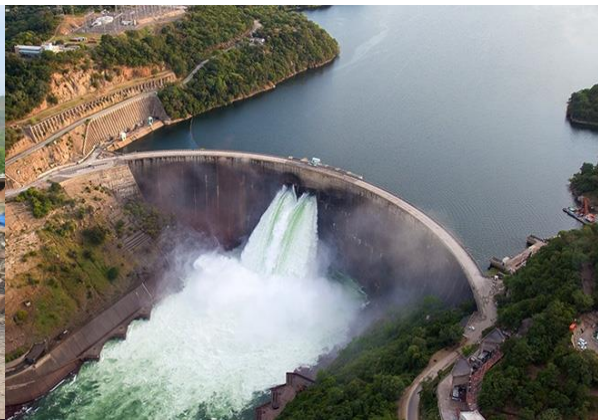


III Stakeholder Workshop Indus Basin, 21-22 August 2019, Kathmandu, Nepal

Integrated Solutions for Water, Energy, and Land Project overview

Barbara Willaarts, PhD
International Institute for Applied Systems Analysis
Research Scholar and Project Manager
Water Program



Purpose

Develop tools and capacities that can support the management of the water-energy-land nexus at different scales and for different users

Partners:



Duration Oct 2016-Nov 2019

GEF Contract Agreement: 6993

Project components

1. Global

- a) Diagnostic assessment (including pop vulnerability/exposure): Hotspots analysis
- b) Solution oriented assessment: Global transformation pathways

2. Basin

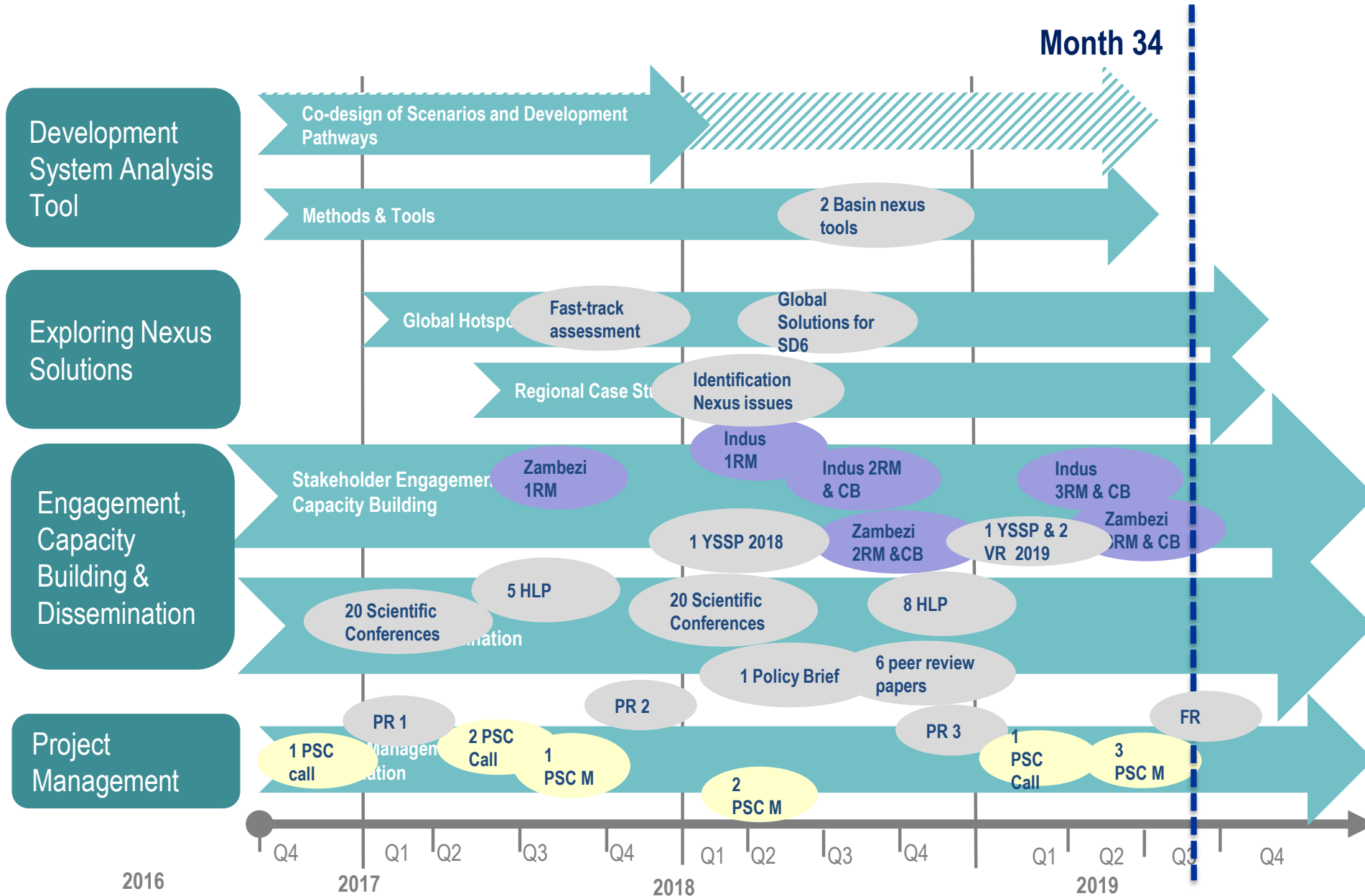
- a) Development of quantitative and qualitative nexus tools
- b) Assessment of nexus solutions
- c) Stakeholder engagement

3. Capacity Enhancement and dissemination

- a) Trainings (models, and scenario tool)
- b) Research collaborations (joint papers)

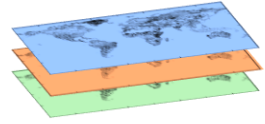
Project timeline

Abbreviations:
 RM: Stakeholder regional meeting
 CB: Capacity Building
 PSC M: PSC meeting

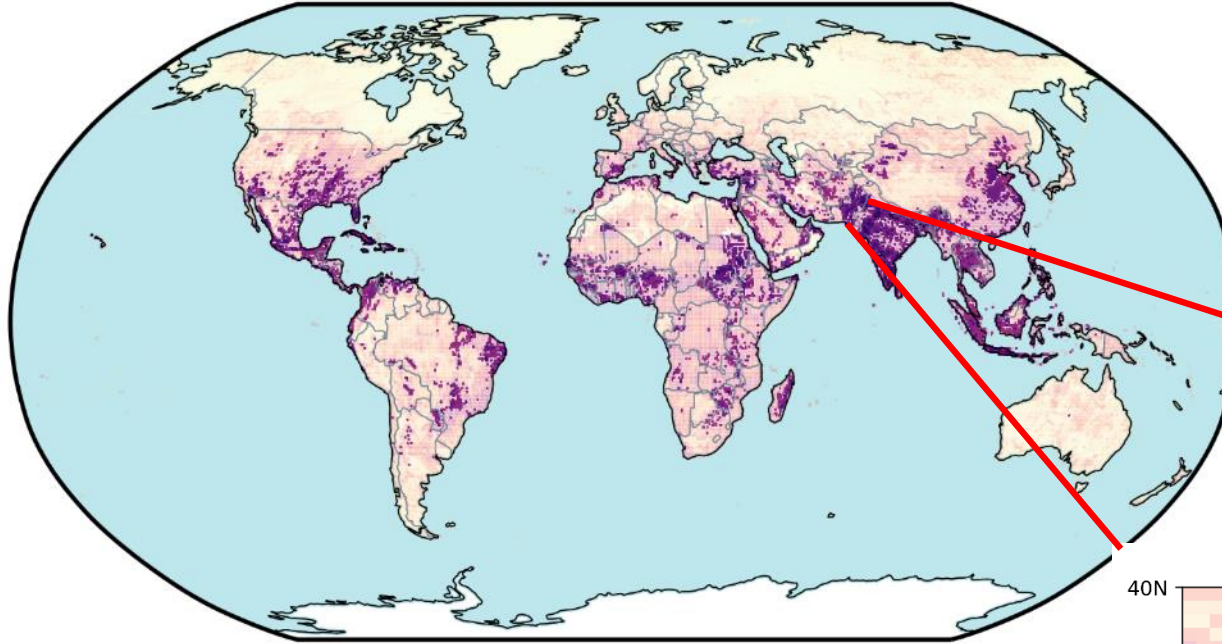


Global hotspots assessment and explorer tool

ISWEL: Global analysis of vulnerability hotspots



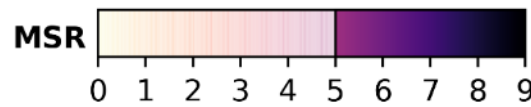
3.0°C



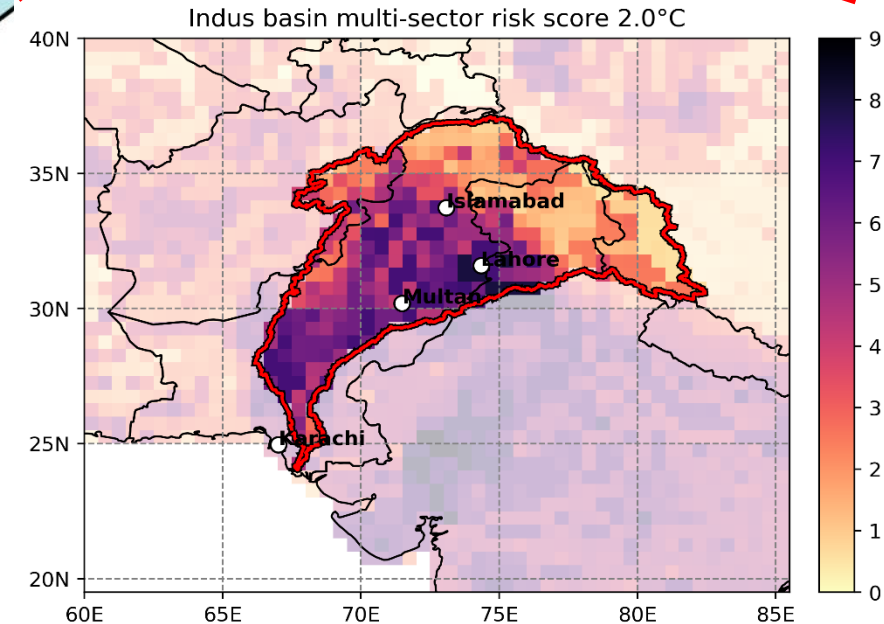
Need 1.5°C to minimize risks to all

Need targeted poverty reduction to reduce vulnerability

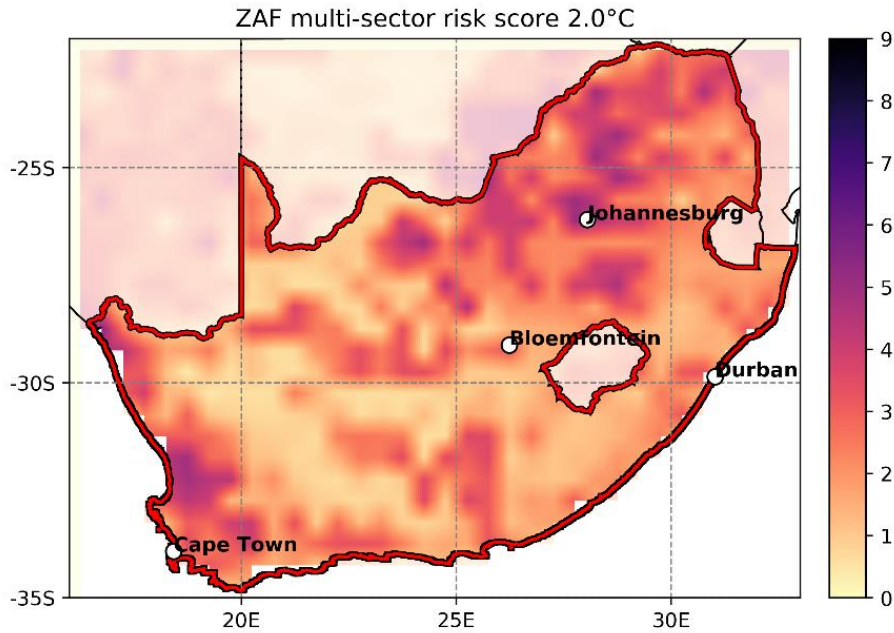
Byers et al. (2018, ERL)
IPCC (2018, Ch3.)



Water	Energy	Land	Socioeconomics
Water stress index	Clean cooking access	Crop yield change	Population density
Non-renewable GW abstraction	Heat event exposure	Environmental flow exploitation	Income levels
Drought intensity	Cooling demand growth	Habitat degradation	
Peak flows risk	Hydroclimate risk to power	Nitrogen leaching	
Seasonality			
Inter-annual variability			



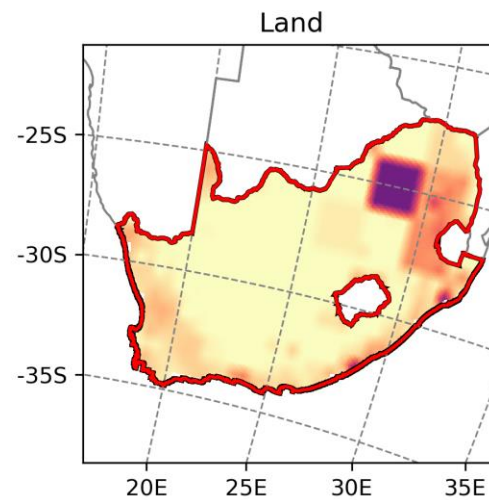
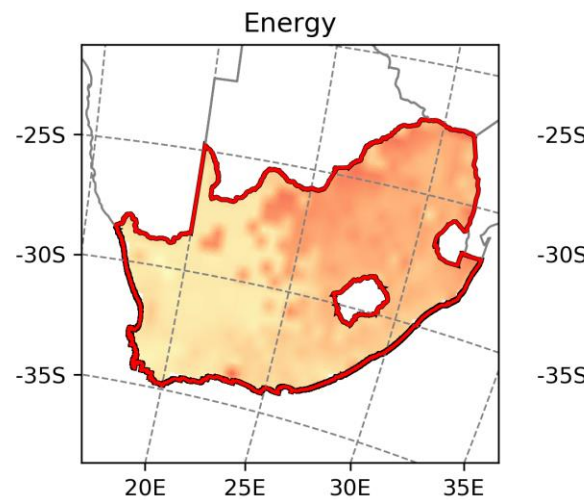
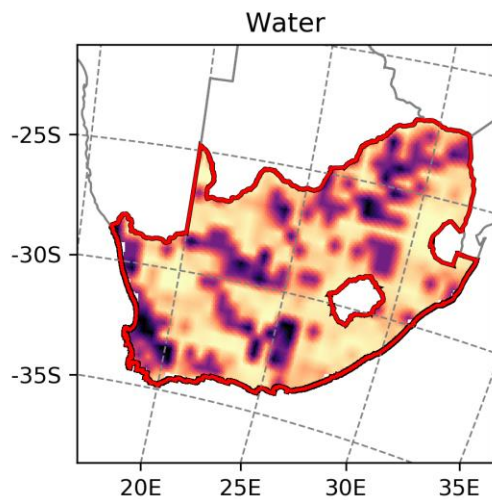
Country example: South Africa



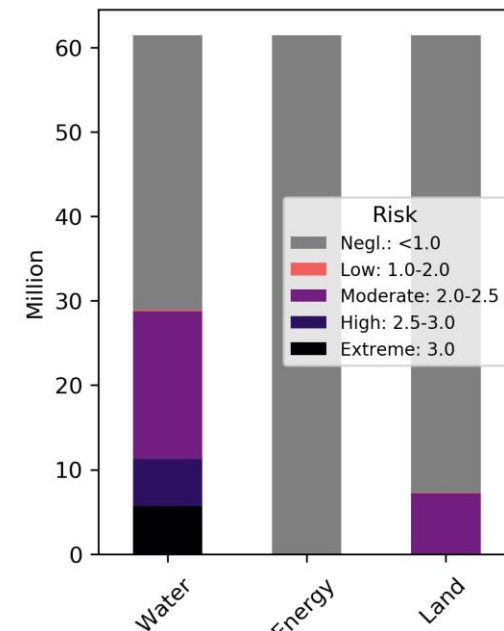
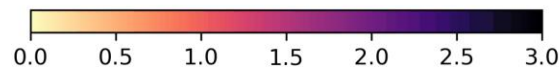
Water risks already prominent (1/3rd of population)

Higher global warming:

- exposes most of the population to energy risks (cooling & heat stress)
- Up to 2/3^{rds} population exposed to water risks



1.5°C



Global hotspots explorer

Global vulnerability hotspots explorer and dashboard - International Institute for Applied Systems Analysis

http://www.hotspots.com

Global hotspots explorer

Stories Explorer Dashboards News & Resources About My profile

Scenario selection

Climate change

- 1.5 °C
- 2.0 °C
- 3.0 °C
- 3.4 °C - Paris NDC pledge
- 2.0 vs. 1.5 °C
- 3.4 vs. 2.0 °C
- 3.4 vs. 1.5 °C

Socioeconomics

- Sustainability (SSP1)
- Middle of the road (SSP2)
- Rocky road (SSP3)

Vulnerability threshold

- None (whole population)
- less than \$2 / day
- less than \$5 / day
- less than \$10 / day
- less than \$20 / day

Socioeconomic year

Indicators Visualization Mapping workspace

Back Next Apply

Type Scenario Indicators Region Visualization View

I want to...

- Visualize one scenario
- Compare multiple scenarios in the same figure

Figure type

- Map
- Line plot
- Histogram
- Bar chart
- Cumulative distrib.

or pick a template from o

Click here to add

Explorer view primarily defined by only being able to see one scenario at a time....

Global hotspots explorer

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Water sector

Climate change

- 1.5 °C
- 2.0 °C
- 3.0 °C
- 3.4 °C - Paris NDC pledge
- 2.0 vs. 1.5 °C
- 3.4 vs. 2.0 °C
- 3.4 vs. 1.5 °C

Socioeconomics

- Sustainability (SSP1)
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Vulnerability threshold

- None (whole population)
- less than \$2 / day
- less than \$5 / day
- less than \$10 / day
- less than \$20 / day

Socioeconomic year

Water risks are projected to be higher in locations where future water availability is unlikely to meet demand and hydro-climate variability is growing. Surface and groundwater stress are in part demand driven and tend to be concentrated in population centers and intense water demand regions. More intense droughts and variability in water supply affect larger areas of land, including upland.

Areas of particular concern include:

- Central and South Asia,
- the Mediterranean,
- the Middle East,
- southwest of North America,
- south of Latin America,
- North Africa.

Indicators of water risk

- Water stress index
- Unsustainable groundwater use
- Drought intensity change
- Change in peak flows

Global hotspots explorer

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Mapping and projecting climate hotspots to prioritize action

The Vulnerability Hotspots Explorer maps and presents complex information about future risks and vulnerabilities in crop, water, and energy sectors, climate change and change in the water-energy-land sectors. [LEARN MORE](#)

Get started!

Featured Stories

Explorer

Custom dashboards

Stories are great for understanding in more detail a theme, sector or region, presenting information sequentially, through a series of photos, text and interactive graphs and maps.

Explore the datasets interactively on a map and develop your customized maps, available to use as you wish.

Work through the data yourself and build your own custom maps and graphs for the indicators and regions of your choice - all presented on your custom dashboard that you can export, save and share.

Learn about the work behind the Vulnerability Hotspots Explorer and its development through a unique collaboration between IIASA, the team and experts in the project integrated locations for Water, Energy and Land. [LEARN MORE](#)

Access and download the underlying data for your own use.

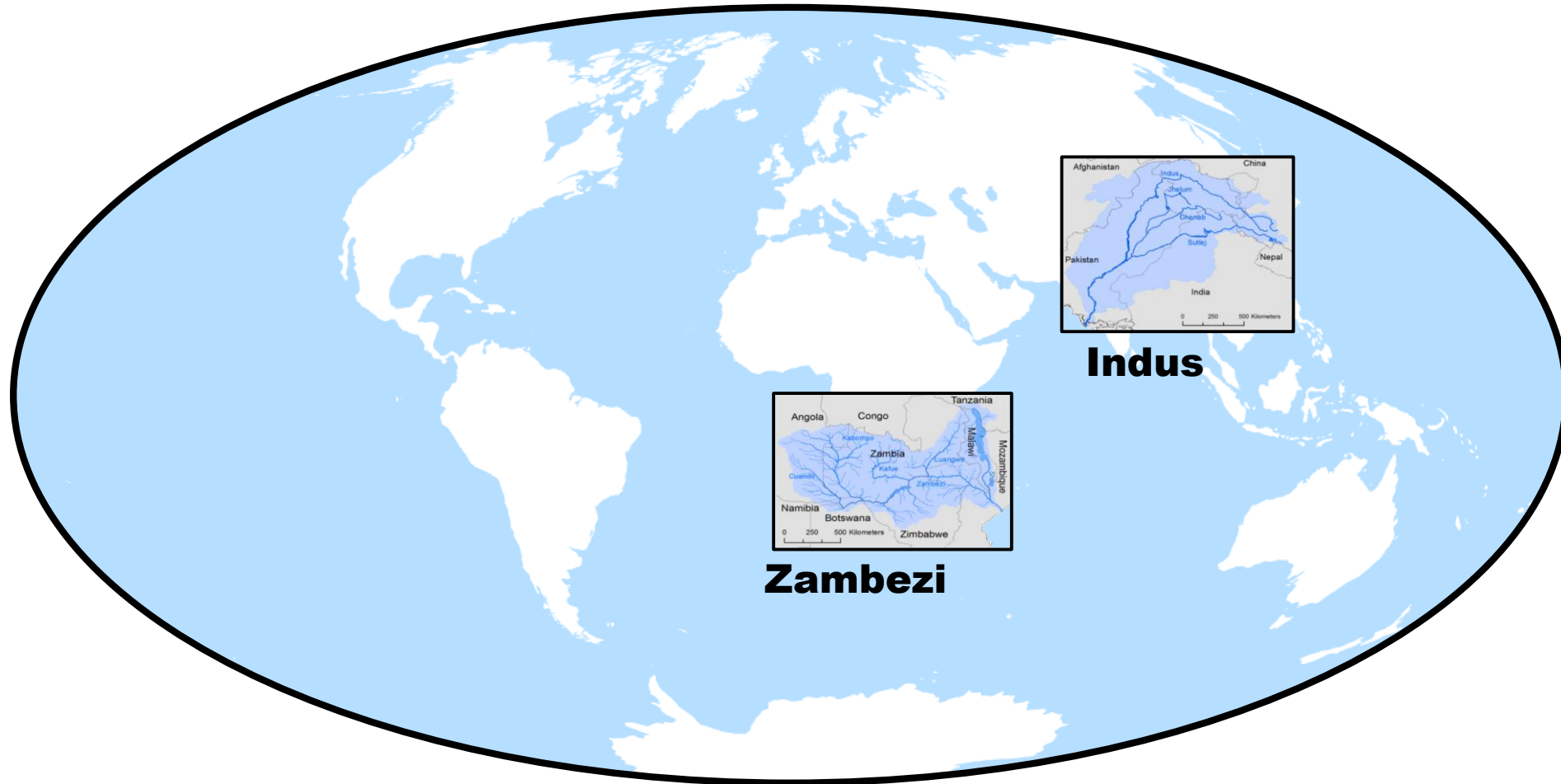
This project was developed by the International Institute for Applied Systems Analysis, with funding and support from the Global Environment Facility and the United Nations Industrial Development Organization.

International Institute for Applied Systems Analysis
IIASA 1996-1000, VIENNA, AUSTRIA

gef

UNEP

Basin Assessment



Basin Outputs

1. Different tools intended for different users

Quantitative (researchers and planners)

1. Regional basin planning model (policy optimization IAM)
2. Visualization tool with datasets and scenario results

Qualitative (researchers and decision makers)

3. Qualitative scenario tool
4. Nexus Game

Semi-quantitative (decision makers)

5. Simulation tool with quantitative constraints (prototype)

2. Stakeholder informed scenarios

Basin-wide modeling tool

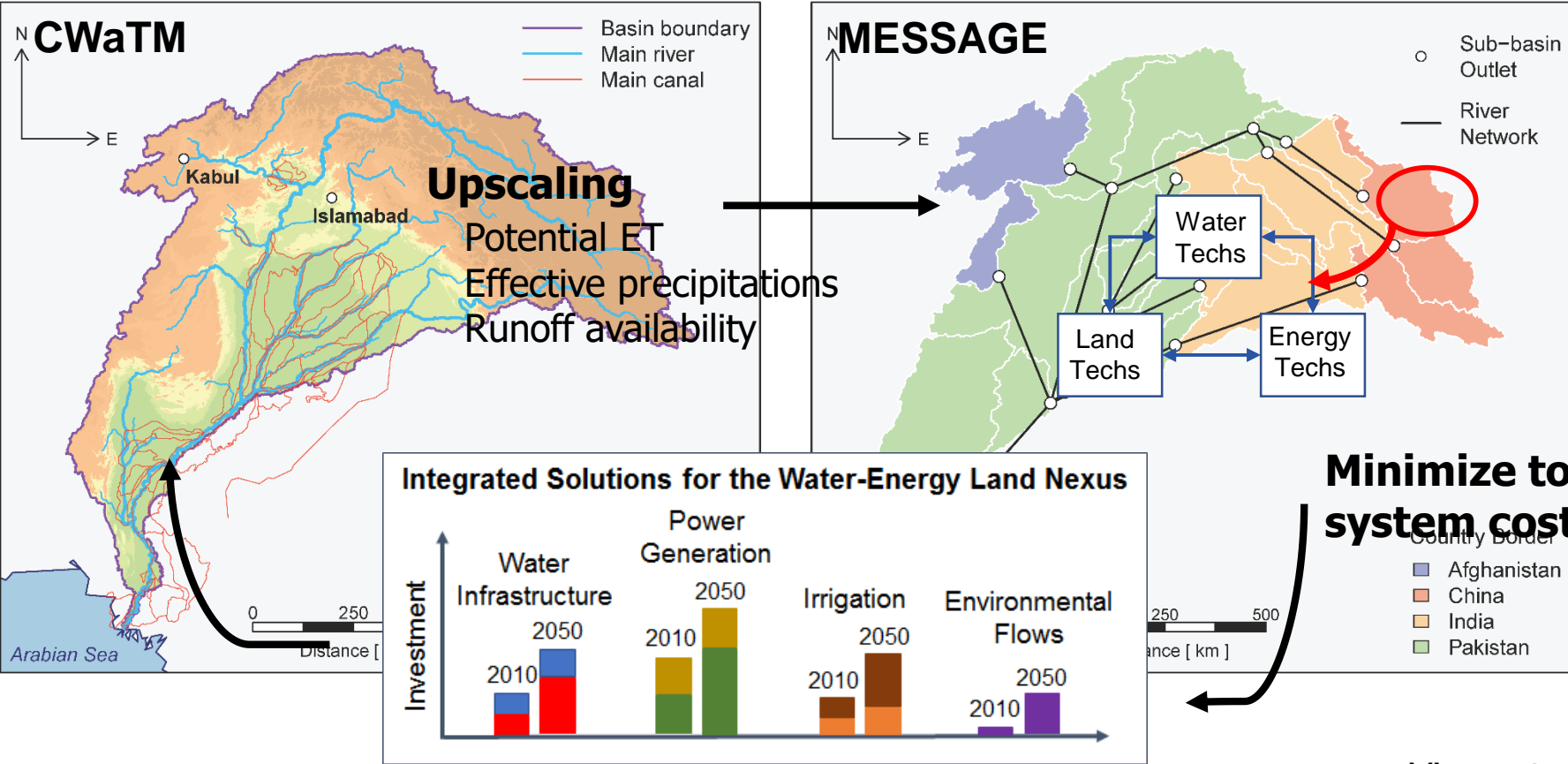
NEXus Solutions Tools (NEST)

Distributed Hydrology

Community Water Model (CWaTM)
(Burek et al., 2018)

Infrastructure Planning

MESSAGEix
(Huppmann et al., 2018)

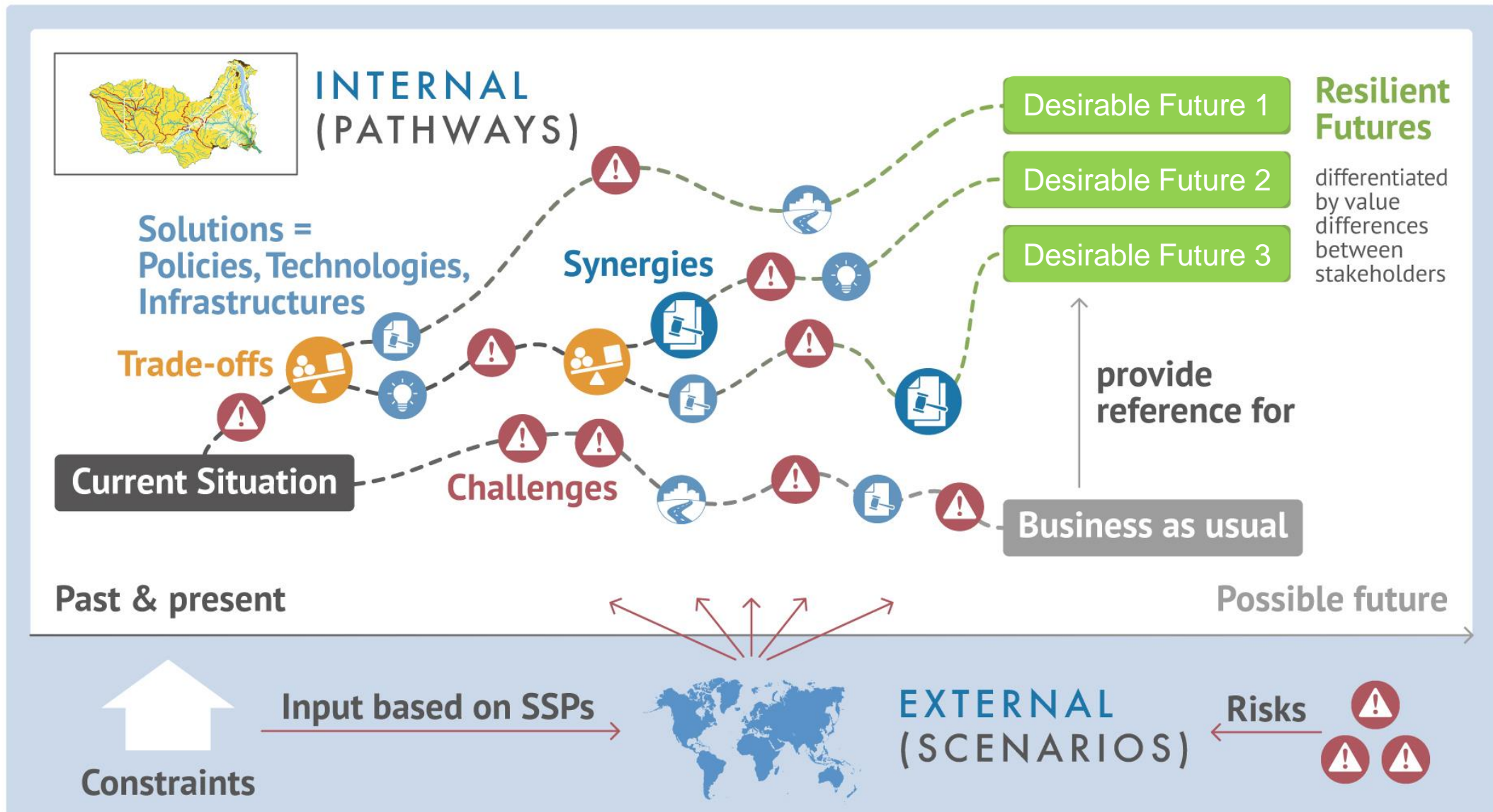


Downscaling
Water and land-use



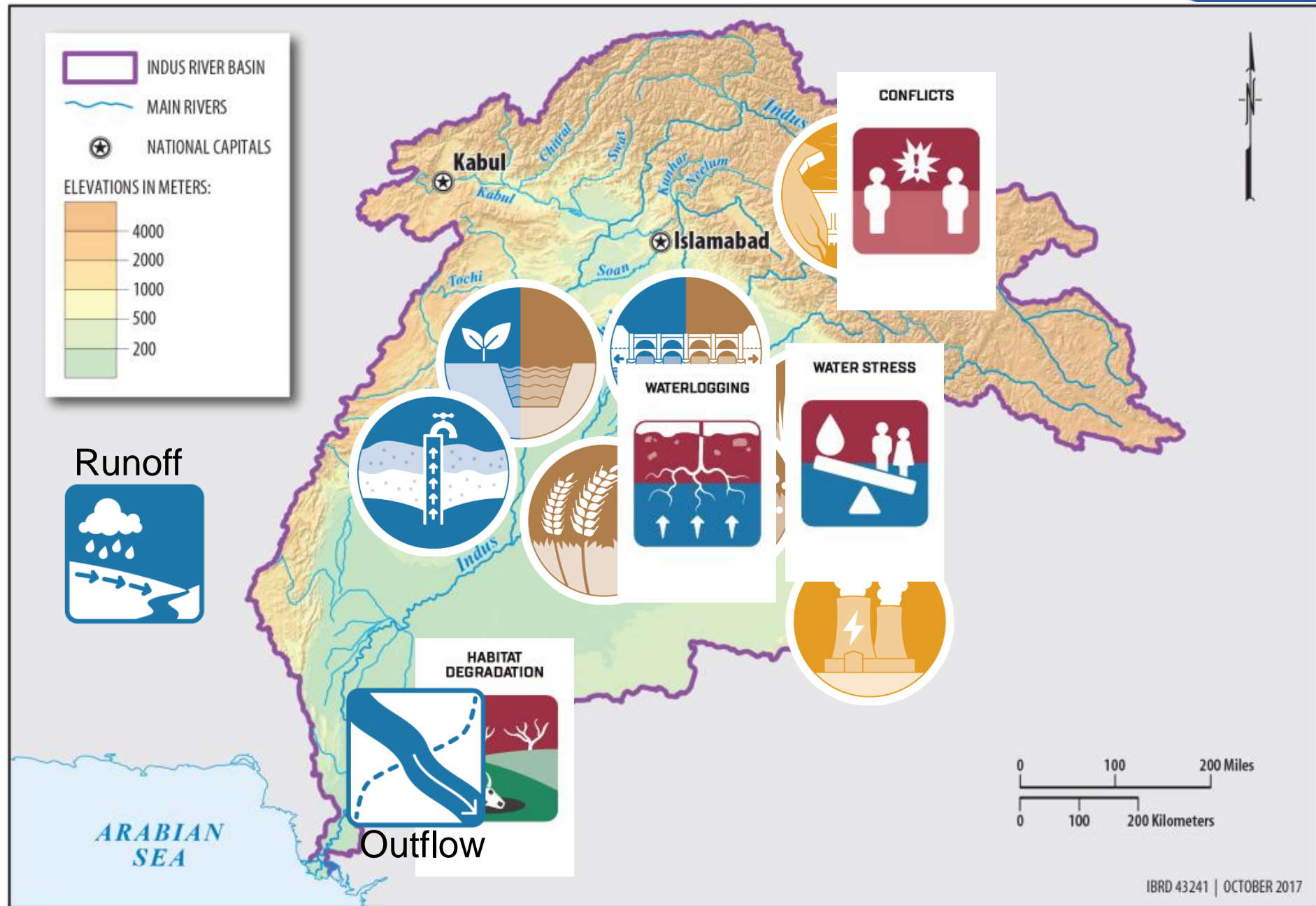
Participatory Scenario tool

Stakeholder visions and pathways



STEP 1

Current Situation

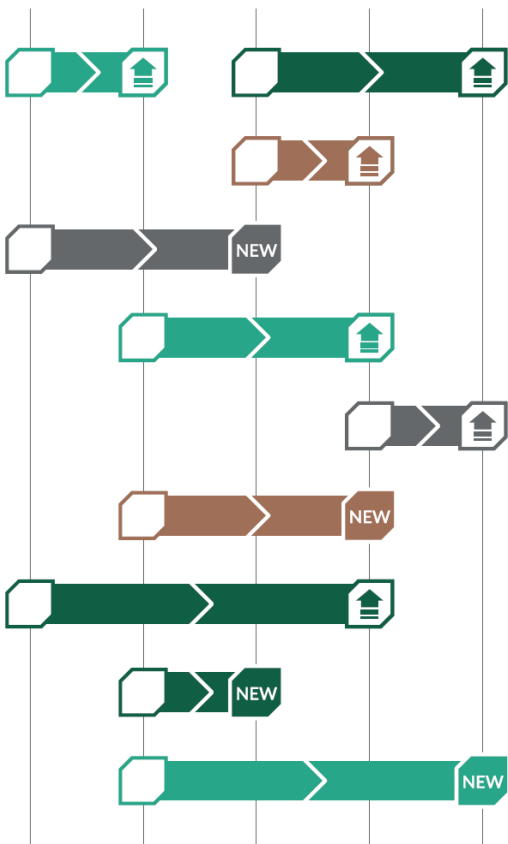
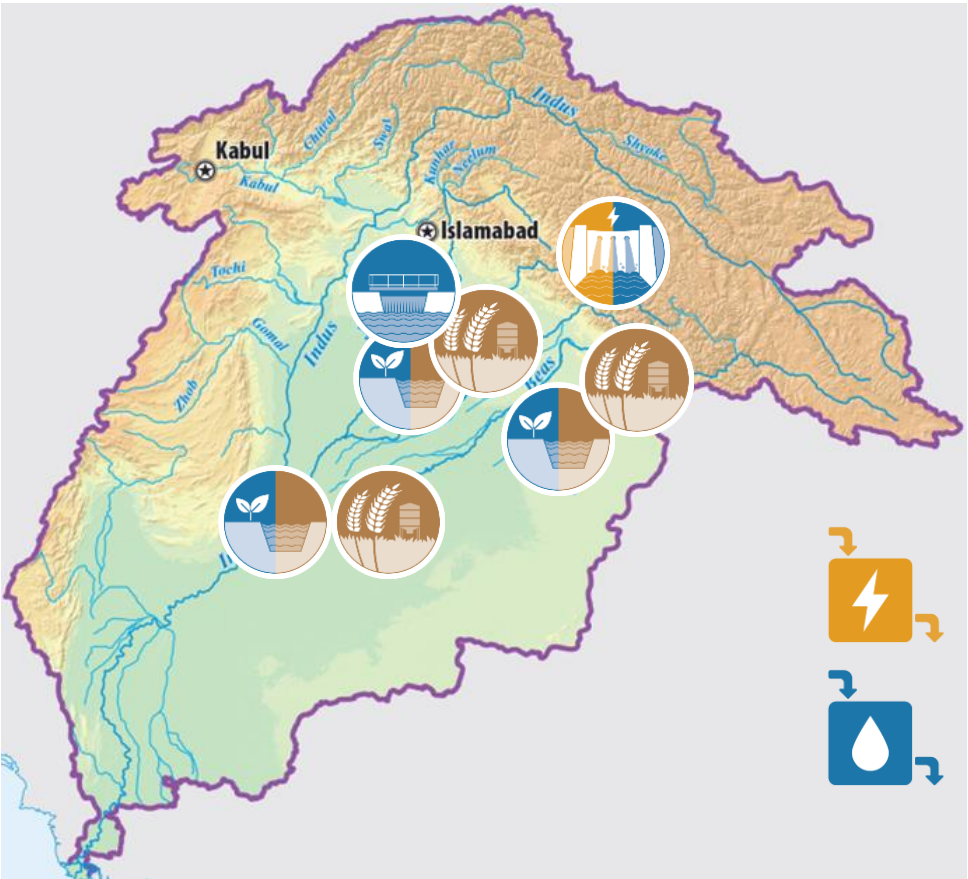


STEP 2

Business as Usual Pathway

2018

2050

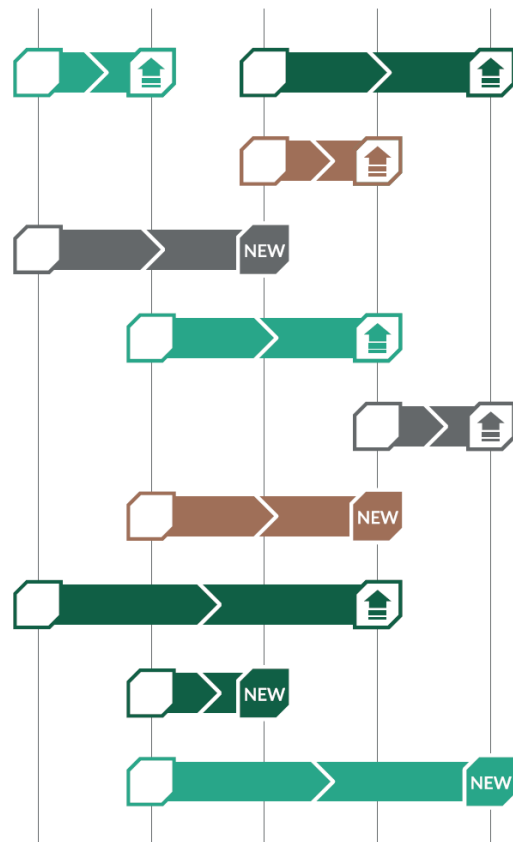
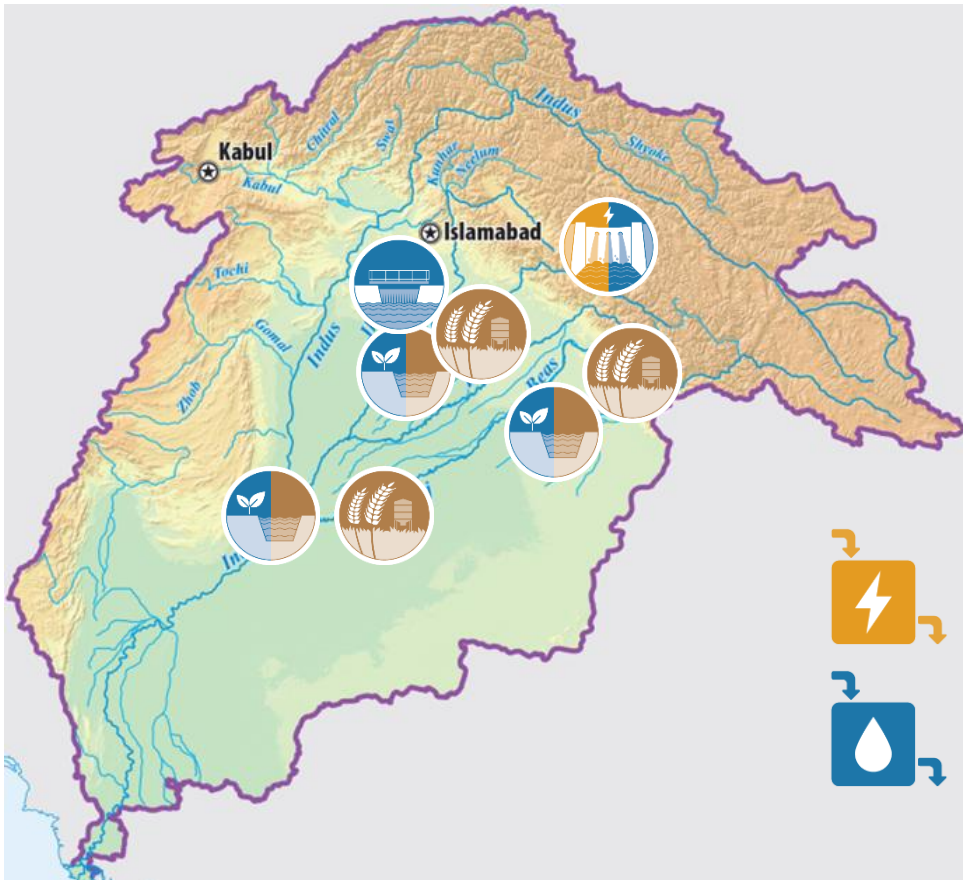


STEP 3

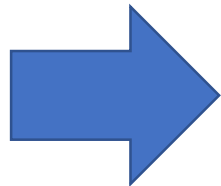
Desired Future Pathway

2018

2050



From pathways to basin scenarios



Sector(s)	Policy	Target (Economy)	Target (Society)	Target (Environment)	Model Represent.	Model Indicators
Water	Access to water clean water	100% in 2050	100% in 2030	100% in 2030	people connected to pipes	infrastructure costs and urban water demand
	Water storage and supply	Development of large storage dams and interbasin transfers	Strategic large storage dams combined with small scale storage	Strategic storage dams; develop groundwater potential	Storage capacity	total storage capacity, min, max and actual level of reservoirs, storage investment costs
	Conservation of water-related ecosystems	Economic water uses attended first	Securing environmental flows	Securing environmental flows + conservation of sensitive wetlands	Allocation prioritization, Restrict land use changes	Volumetric flow by sector (km ³), Share of wetlands protected (%)
	Ensuring water quality	At least primary treatment of industrial and urban water	At least primary treatment of industrial and urban water	Secondary wastewater treatment and recycling;	wastewater treatment and water pollutants	Investments in clean water technologies
	Flood and drought management	Multipurpose-dam management ; Joint surface and groundwater management	Multipurpose-dam management+Transboundary cooperation strategy	Multi-purpose dam management and NBS	Maximum river flows	Activity of river, canals and level of reservoir

Scenario tool

VIDEO

The Nexus Game



LUMS, Lahore, March 2018

Capacity Enhancement

Visiting researchers 2018



Ansir Ilyas
LUMS, Pakistan



Mengru Wang
WUR, China



Fabio Amendola
UFRJ, Brazil

Nexus Game



Zimbabwe University
Harare, July 2018



LUMS
Lahore, March 2018



Trainings and Lectures

- ✓ Keynote on Water-Energy-Land Nexus, Lahore, 26 March 2018
- ✓ Training on IAMs for nexus management, Vienna, 1 June 2018
- ✓ Training on Scenario Planning Approaches, Harare, 9 July 2018

Outcomes from the basin tools and scenarios

1. Well received by stakeholders: help breaking the silo mentality and enhancing mutual learning
2. Flexible, can be adapted to explore a wide range of issues at different scales
3. Combination of Model + scenario tool suitable for policy issue identification and measure development
4. Regional scenarios are coherent with global storylines, allowing for inter-comparison

Thanks

[willart@iiasa.ac.at](mailto:willaart@iiasa.ac.at)