FREDERICK S. PARDEE CENTER FOR INTERNATIONAL FUTURES
JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES
UNIVERSITY of DENVER

Scenario Forum Conference, Denver 10-13 March 2019

IIASA

Bridging the gap across scales in scenario planning: Co-designing water-energy-land visions and pathways in transboundary basins

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IIASA

"Integrated Solutions for Water, Energy, and Land" (ISWEL) Project

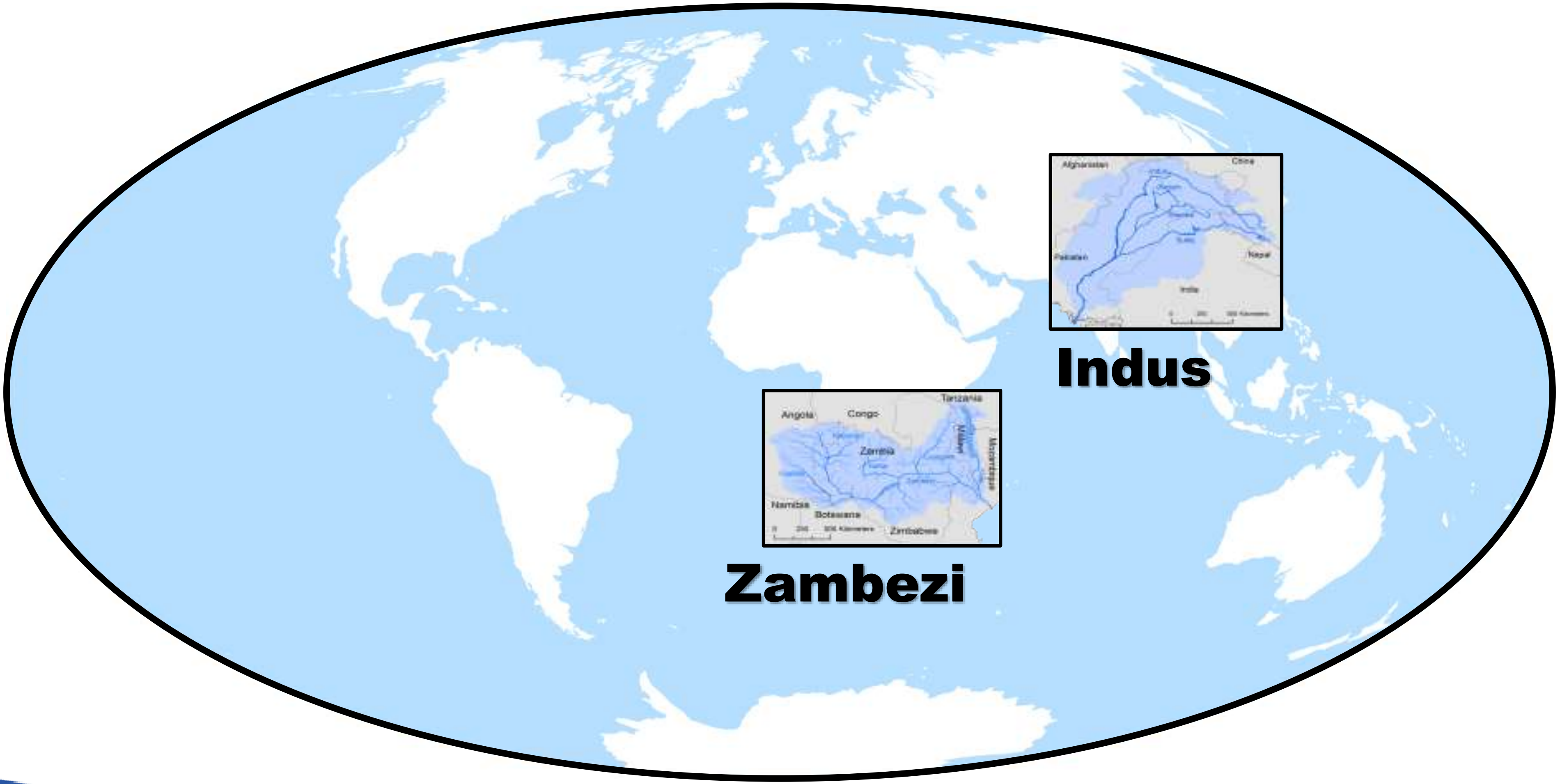
2017-2019

Develop tools and capacities that can support the management of the water-energy-land nexus at global and regional scales

Partners: IIASA, gef GLOBAL ENVIRONMENT FACILITY INVESTING IN OUR PLANET, UNIDO

GEF Contract Agreement: 6993

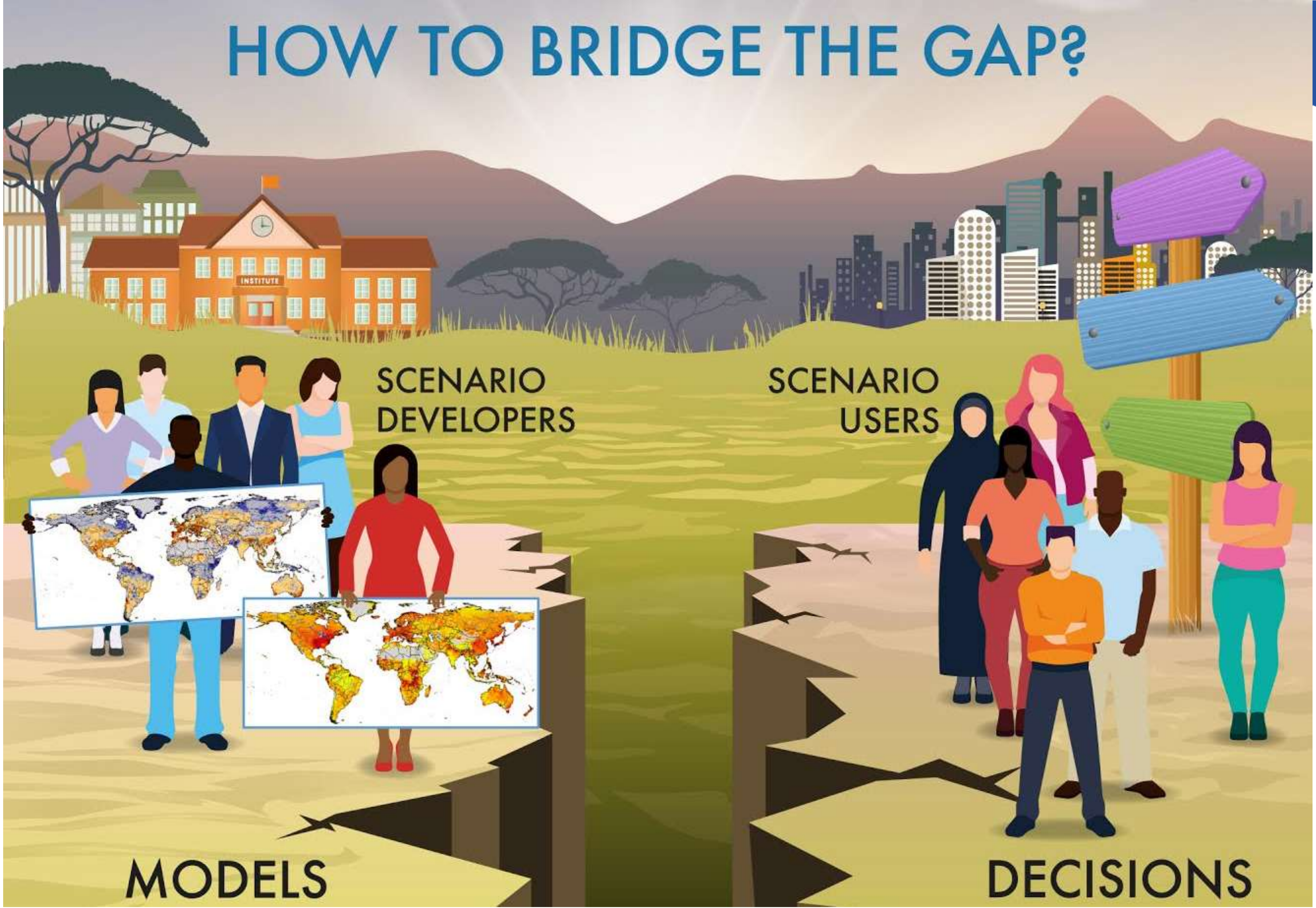
Basin Assessment



Outputs and outcomes

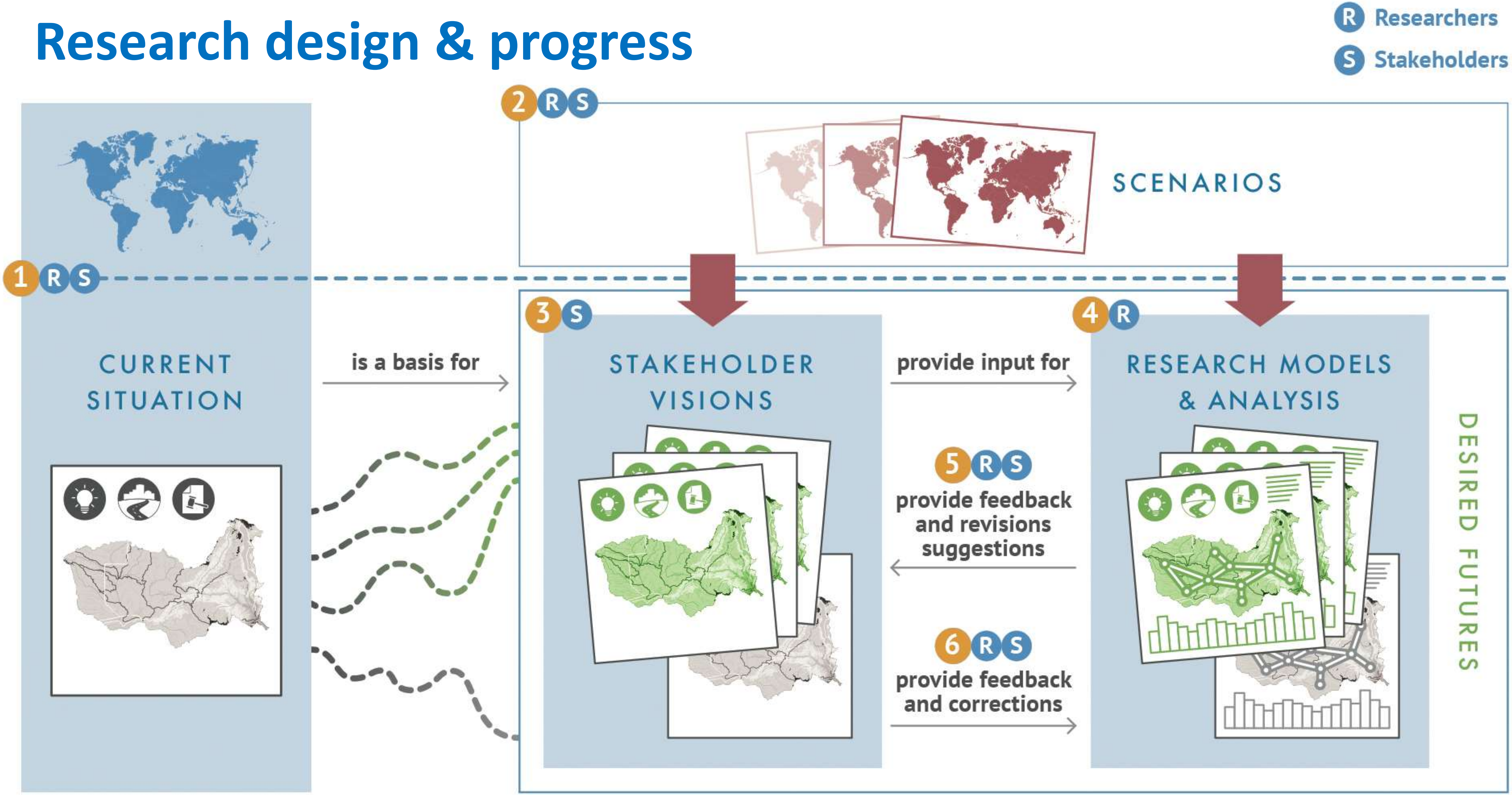
- Two types of tools to address WEL nexus development challenges
  - Regional basin planning model (policy optimization IAM)
  - Policy exercise to develop stakeholder visions and pathways
- Stakeholder scenarios
- Enhanced capacities for nexus management and research

Participatory Scenario Development process


HOW TO BRIDGE THE GAP?
INSTITUTE
SCENARIO
DEVELOPERS
SCENARIO
USERS
MODELS
DECISIONS

From Global to Basin scale

Research design & progress



Stakeholders

IIASA

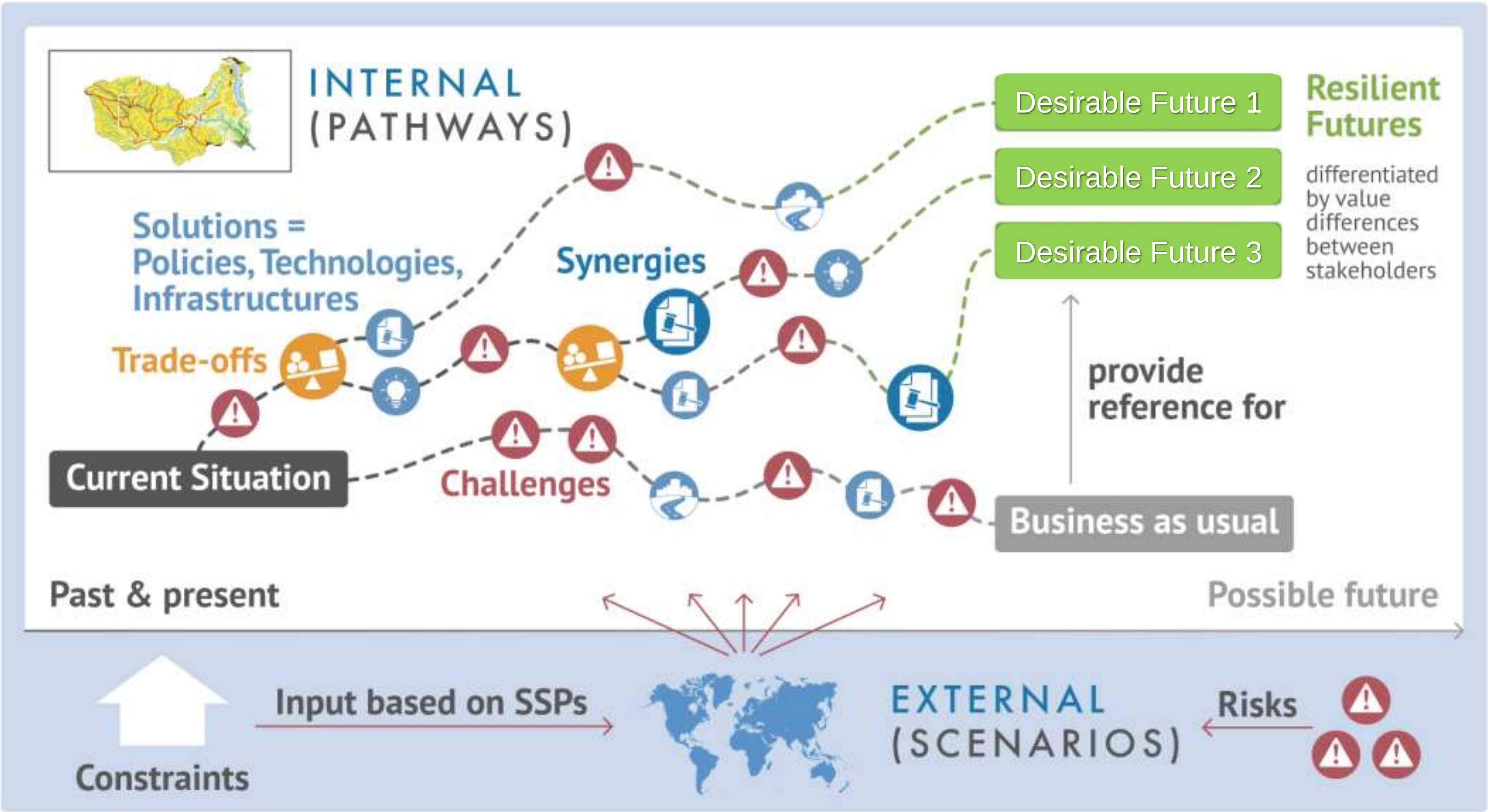
INDUS

LUMS
teri
ICRIER
Ministry Energy & Water
WAPDA
Water and Power Development Authority
中国气象局
China Meteorological Administration
Pakistan Meteorological Department
Integrated Research and Action for Development (IRADe)
Ministry of Planning, Development & Reform
Planning and Development Department
नीति आयोग
Balochistan.gov.pk
PARC
PCRWR
CEEW
teri univers
Government of Khyber Pakhtunkhwa
The Pakistan Business Council
USAID
FROM THE AMERICAN PEOPLE
Institute for Defence Studies and Analyses (idsa)
IDRC CRDI
LEAD Pakistan
Inspiring leadership for a sustainable world
TIFAC
Technology Think Tank
ICIMOD
Government of Pakistan
Ministry of Science and Technology
Xinjiang Institute of Ecology and Geography
Chinese Academy of Sciences

ZAMBEZI

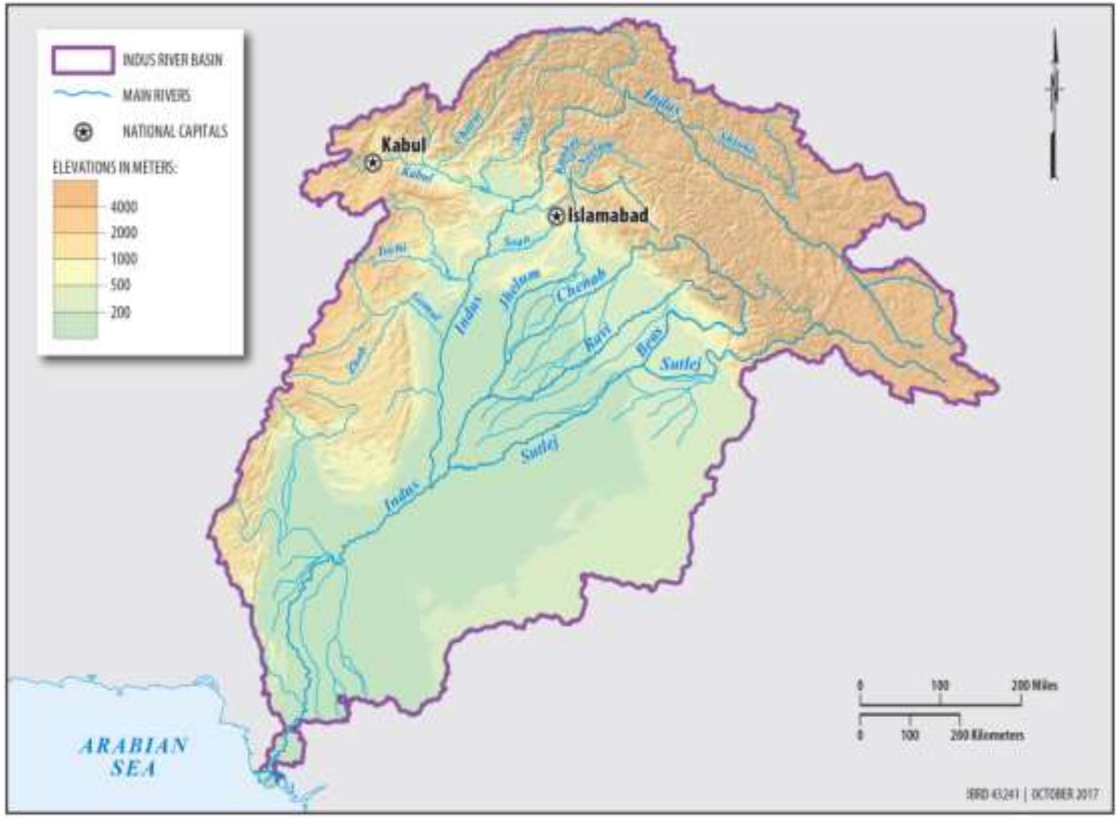
ZAMCOM
IAPRI
República de Angola
Ministério da Energia e Águas
Ngwato
MMEWR
Department of Water Affairs
ARA Zambeze
INRH
Instituto Nacional de Recursos Hídricos
WWF
Republic of Botswana
Ministry of Land Reform
THE WORLD BANK
IBRD • IDA
Malawi Government
Republic of Zambia
Ministry of Energy and Water Development
Ministry of Agriculture
A Smart And Value-Centered Public Service

Stakeholder visions and pathways



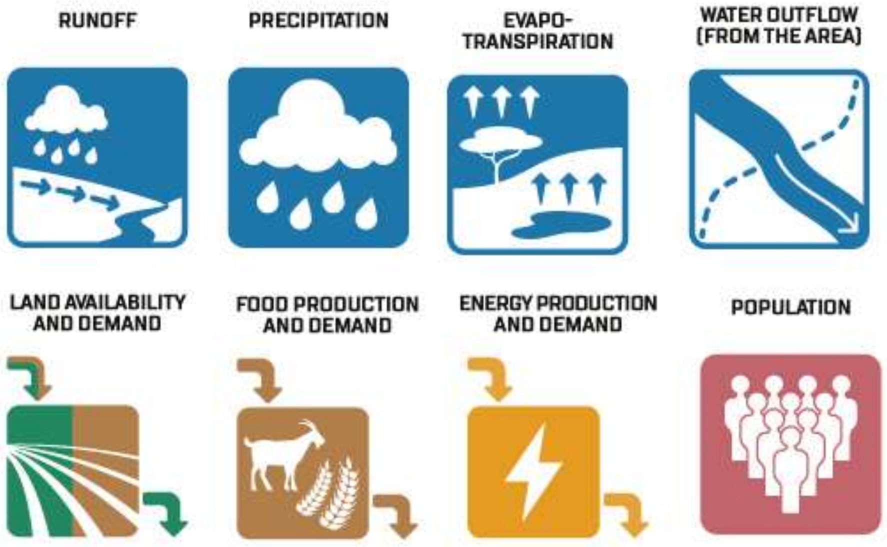
Elements

Map



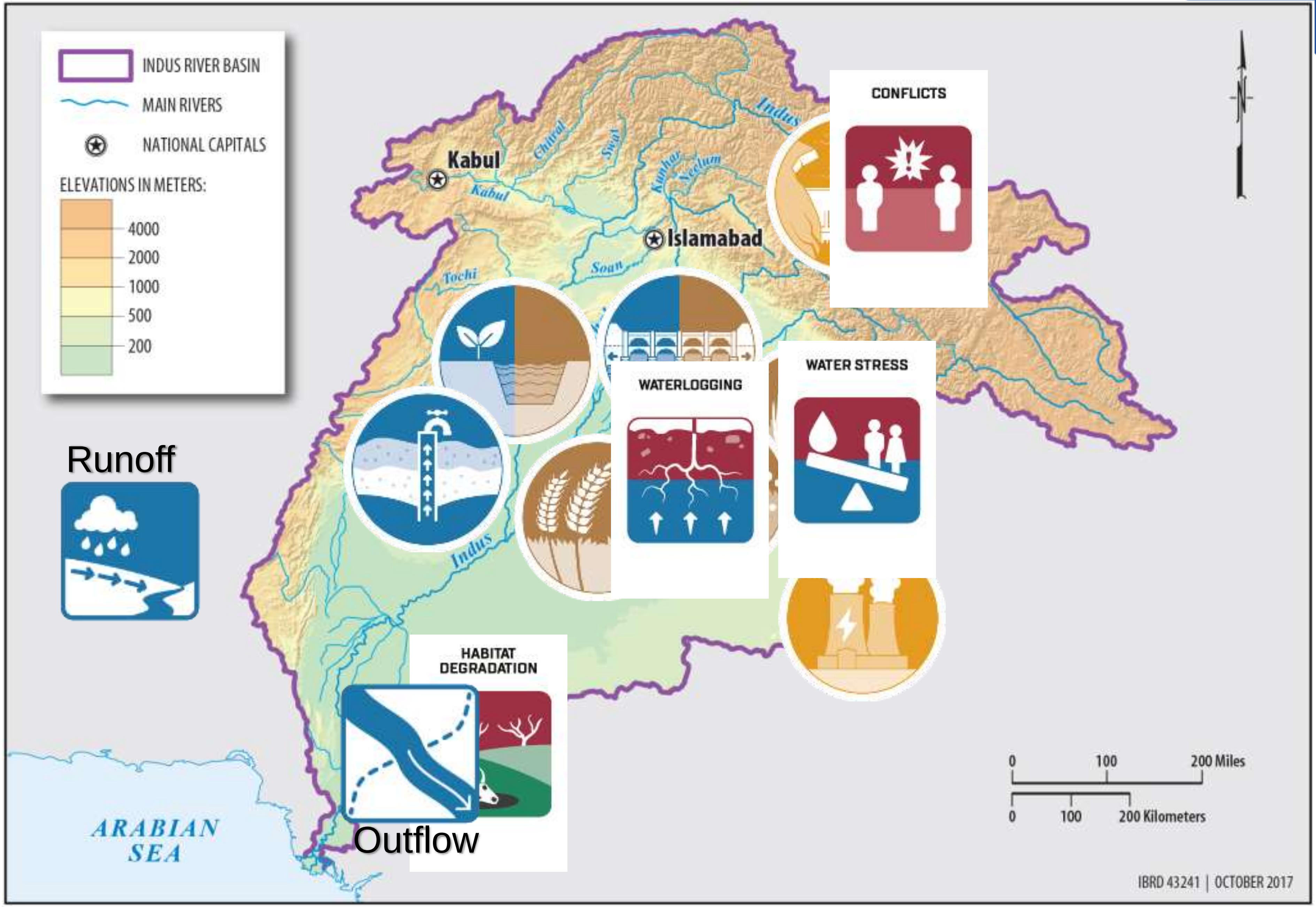
Cards

Indicators



STEP 1

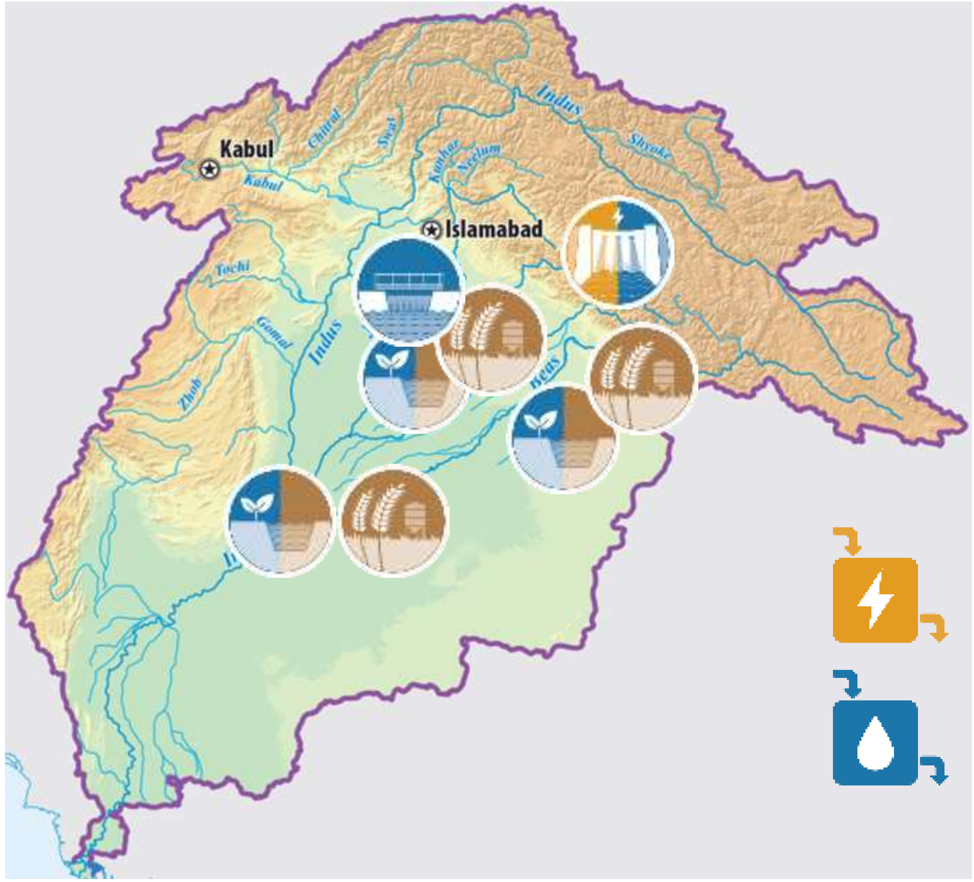
Current Situation

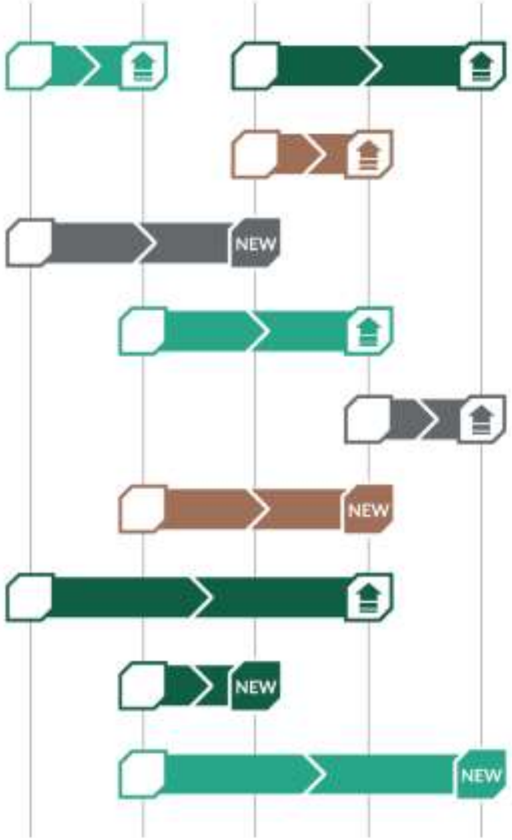


STEP 2

Business as Usual Pathway

2018 2050

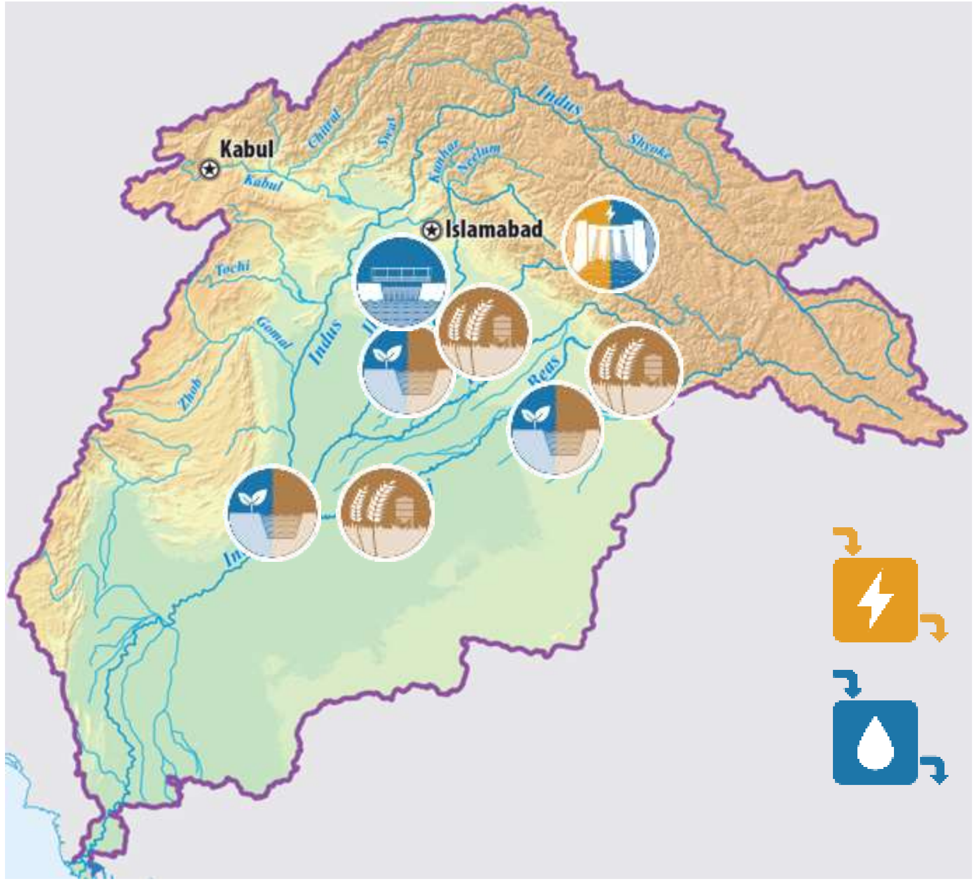


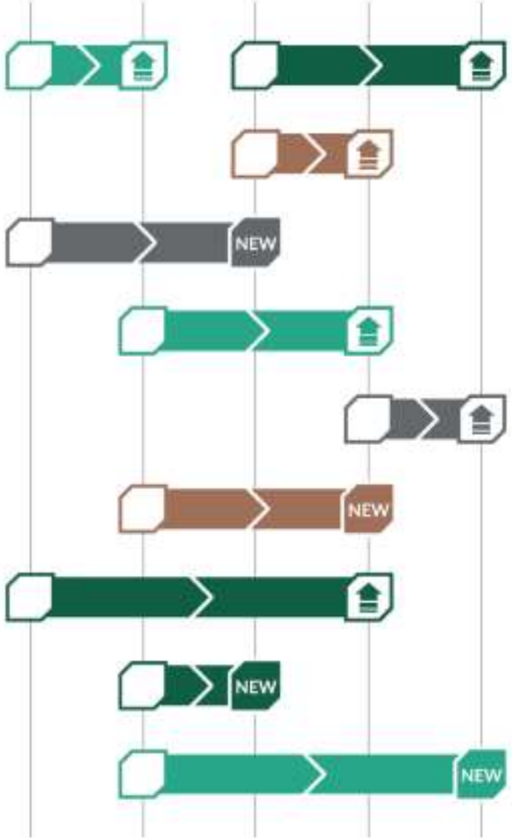


STEP 3

Desired Future Pathway

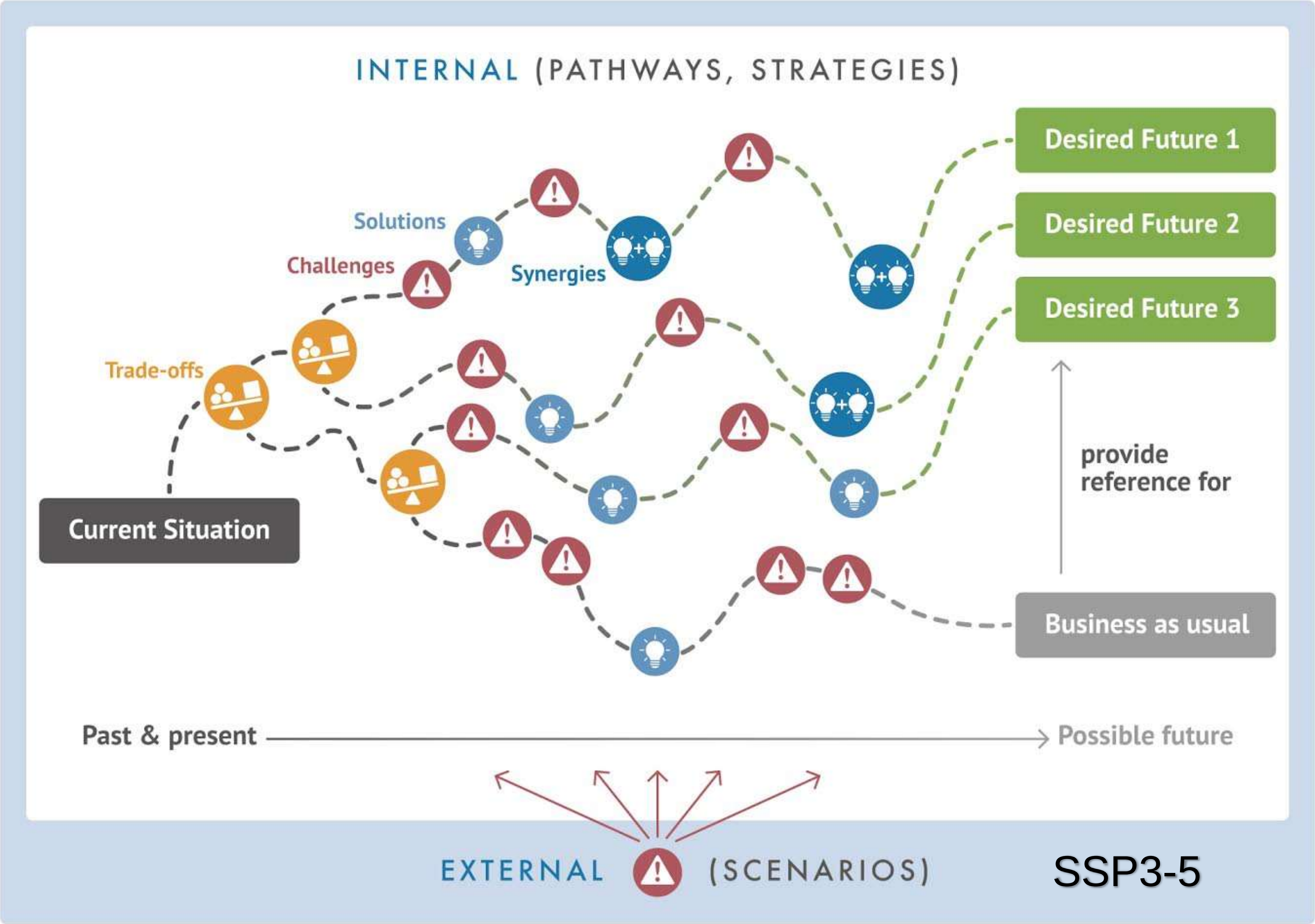
2018 **2050**





Robustness of Pathways

STEP 4

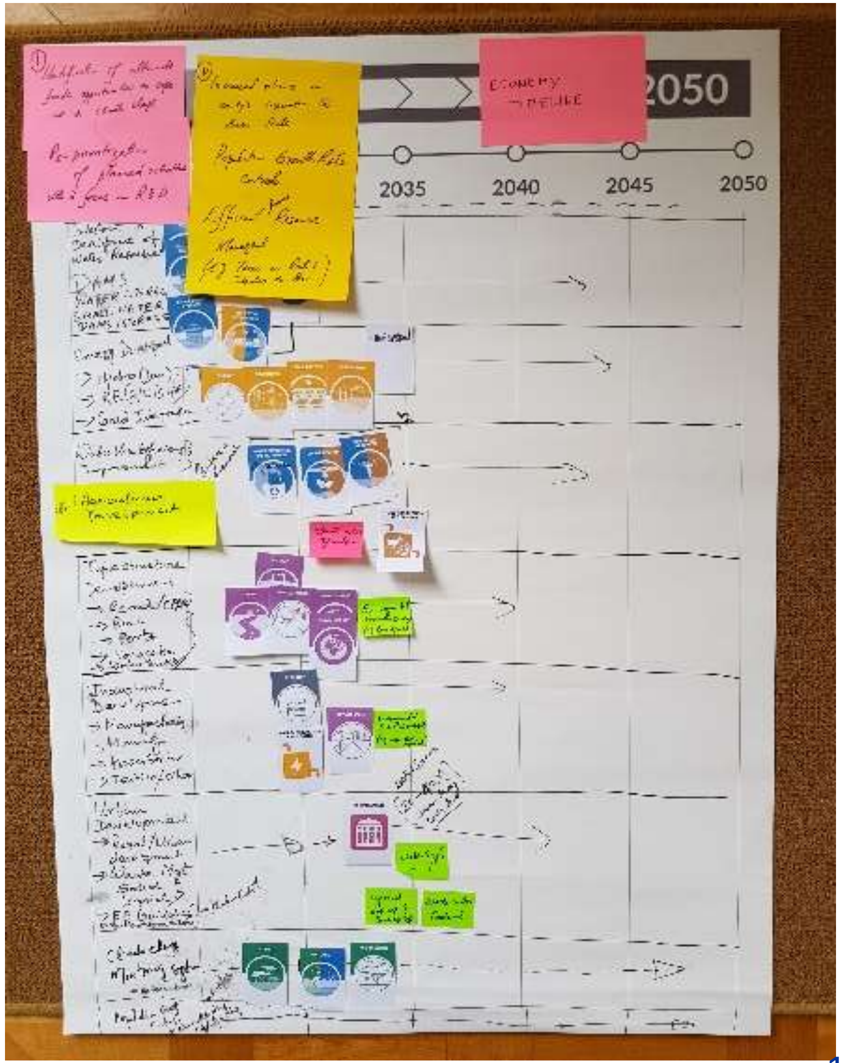


SSP3-5

Indus Workshop, June 2018

Indus visions and pathways

Economy pathway   Society pathway   Environment pathway



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 tratement 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

Pros/cons of the tool/approach

1. Well received by stakeholders (great buy-in)
2. Very flexible, can be adapted to explore a wide range of different challenges and pathways
3. It allows to generate sets of regional scenarios that are coherent with global storylines. Inter-comparability
4. Combined with IAMs, suitable for policy issue identification and measure development
5. Time and resource consuming
6. Not everything can be modelled (manage expectations)

IIASA Young Scientists Summer Program (YSSP)

Each year: 50 international students working under the supervision of IIASA staff

- 1 June - 31 August, in Laxenburg, Austria
- Open to advanced PhD. students whose research interests correspond to IIASA's research
- Goal: publishable journal article
- Funding available from IIASA's National Member Organizations
- On-line application (Oct – Jan) www.iiasa.ac.at/yssp

VIDEO

Thanks

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Stakeholder Process-ROADMAP

Build partnerships with regional partners: national and basin organizations

Meeting 1:
Warming Up
Identify priority needs from stakeholders

Meeting 2:
Scenario and Capacity Development Workshop

Meeting 3:
Presentation of results and Capacity Development Workshop

Beyond 2019

Identify opportunities for continuing the collaboration

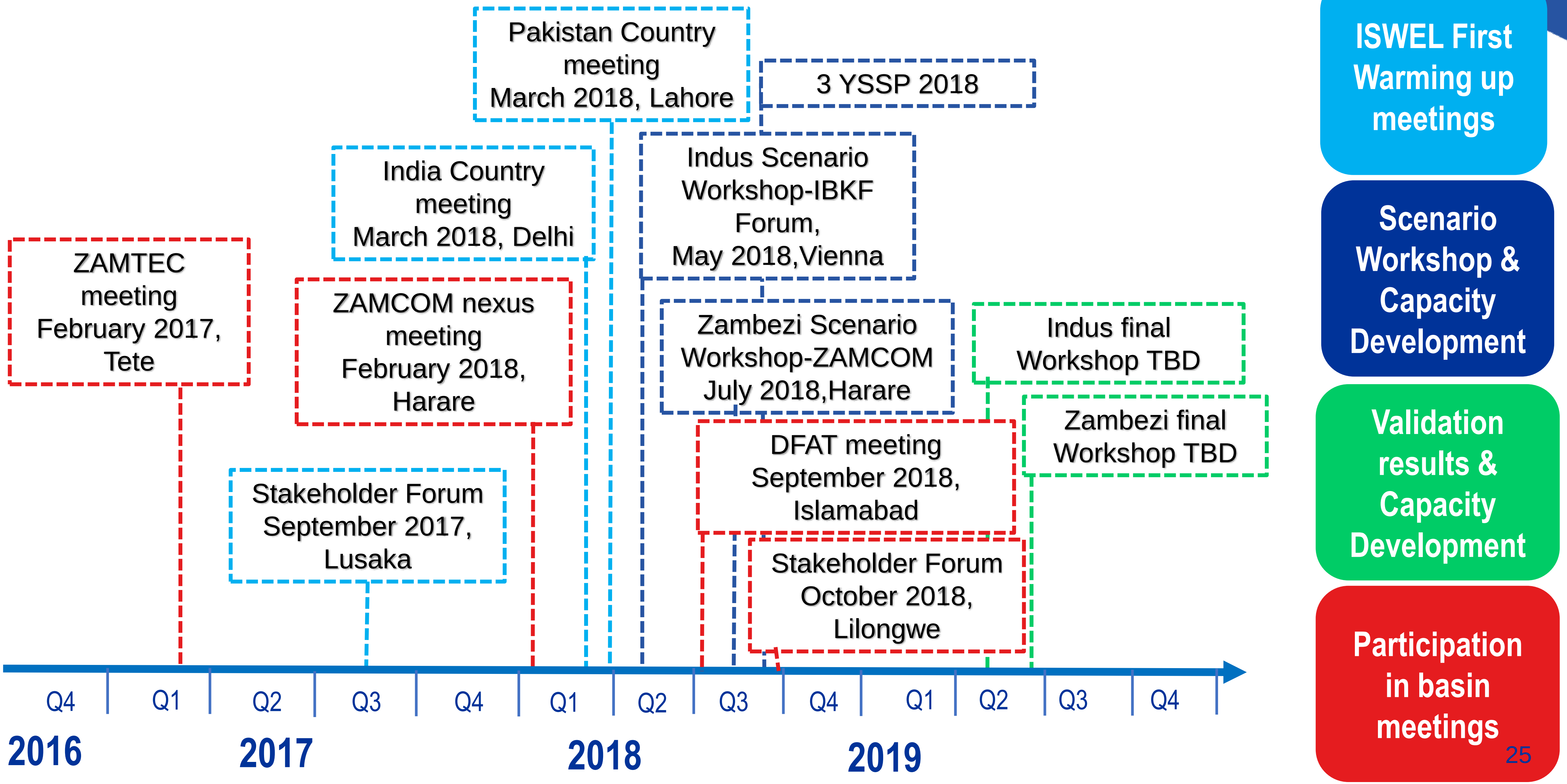
STEP 1 Current Situation

STEP 2 Business as Usual Pathway

STEP 3 Desired Future Pathways

STEP 4 Robustness of Pathways

Workshops & meetings



Basin Nexus challenges

Preliminary results

- Process-wise the approach has been very well received by stakeholders
- There is not one but various possible desirable futures and pathways. Yet to quantify if these imply big differences…
- Basins have different perceptions about how global scenarios might influence their regional pathways
- The stakeholder visions encompass many dimensions that cannot be modelled (expectation management)

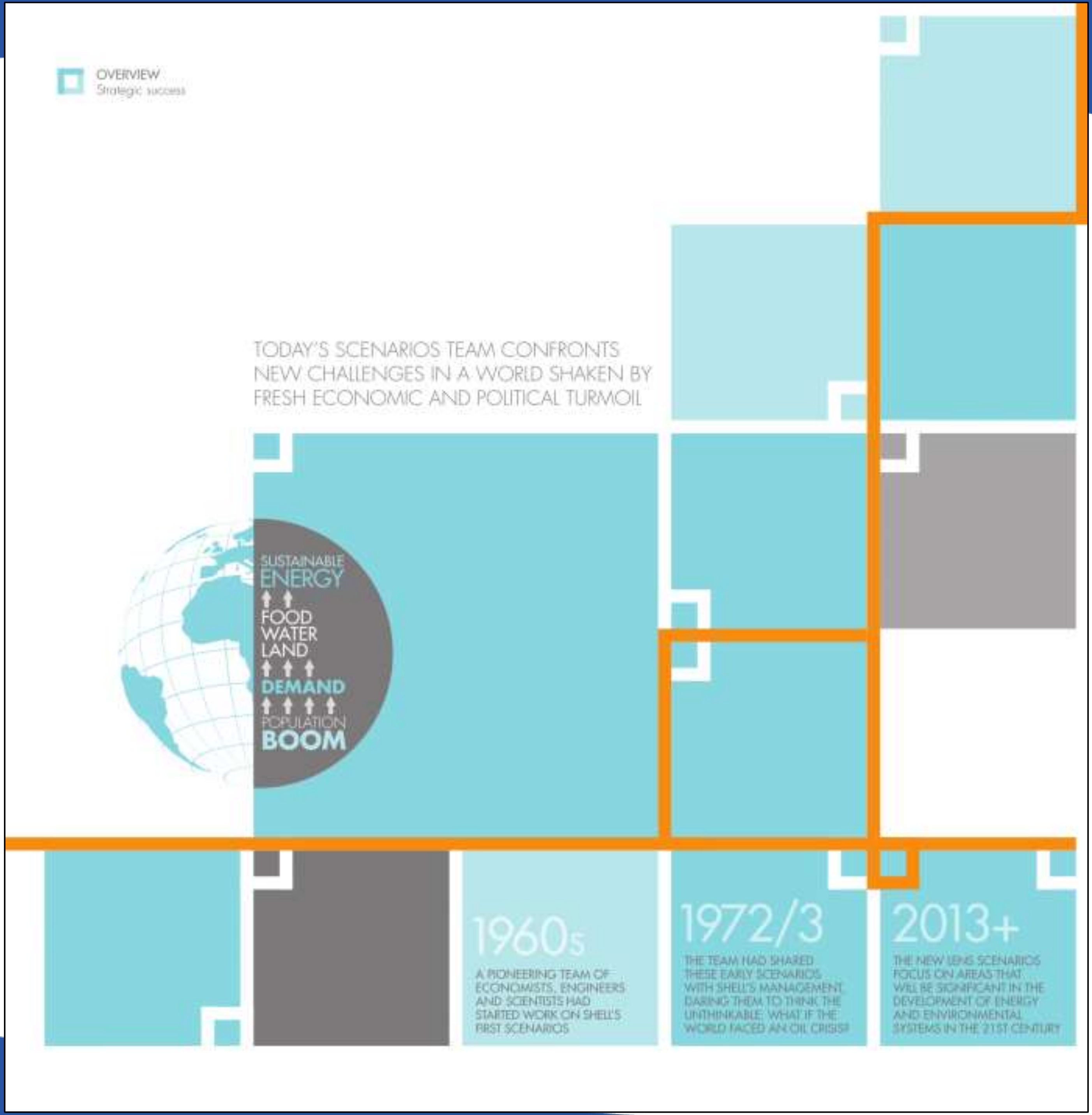
Take home messages

- Mixed bottom up and top down approaches ensure buy-in from stakeholders and coherence regional scenarios with global storylines

- Thinking outside of the box is challenging for stakeholders but

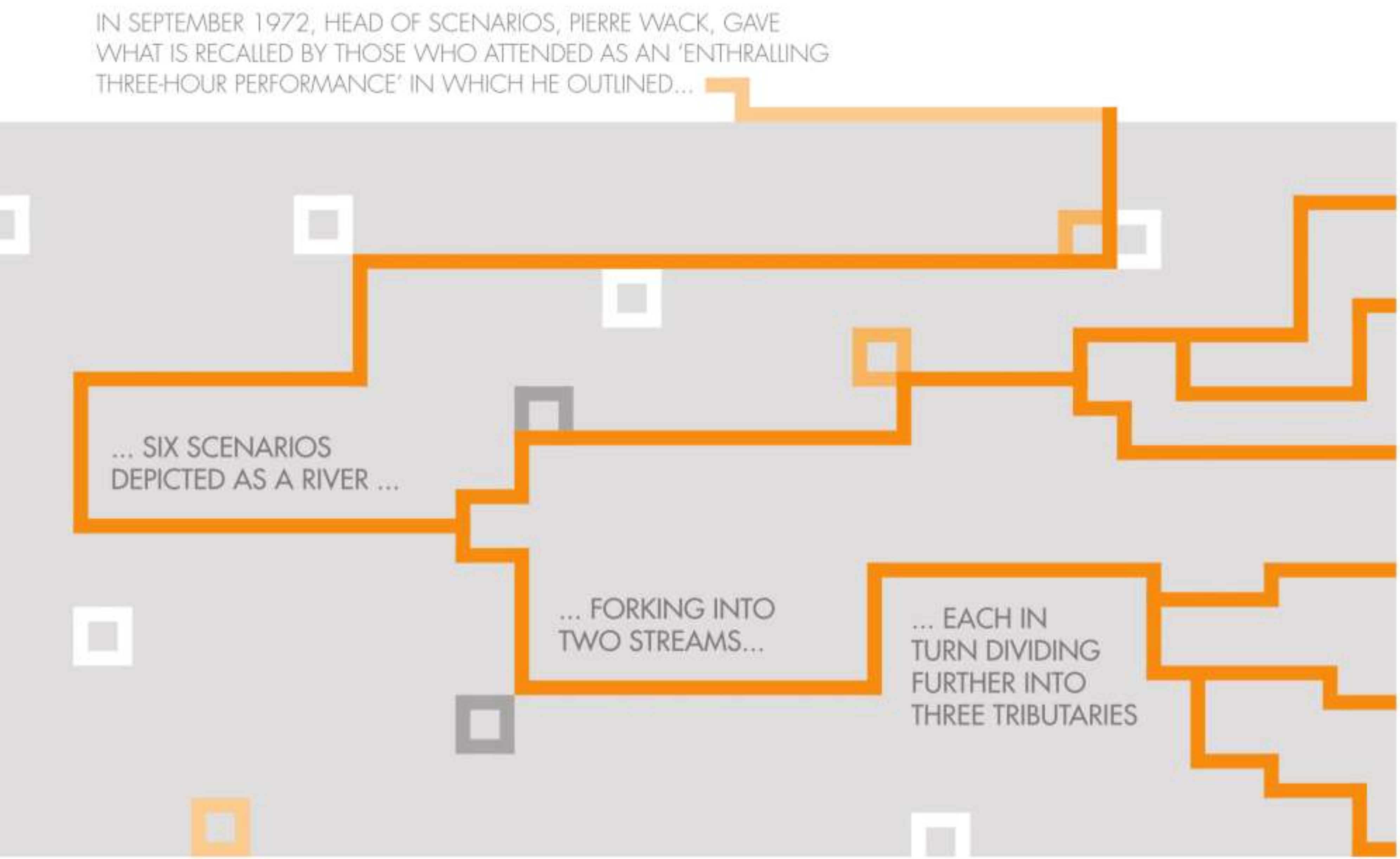
Key nexus challenges

Basin	Water-Energy	Water-Land	Energy-Land
ZAMBEZI	– Hydropower potential under Climate Change – Balancing hydropower production & other water users	– Irrigation development to address productivity gaps – Impacts of irrigation developments for other water uses	– Charcoal energy in rural households as the main driver of forest degradation, land erosion and dam sedimentation
INDUS	– Hydropower development upstream will affect downstream & Climate Change – Energy subsidies & groundwater mining	– Inefficient irrigation systems and its impact on soil salinization – Priority allocation to irrigation causing economic water scarcity	– Biomass energy in rural households causing soil degradation and air pollution



In 1973,
the global economy
was shocked
by a major oil crisis.

Shell wasn't.



Scenarios enabled Shell to successfully adapt to unexpected changes.

2018 Basin outcomes

- Cross-sectoral and transboundary knowledge exchange
- Nexus approach mainstreaming the policy agenda (e.g. Zambezi Nexus dialogues)
- ZAMCOM interested in using the Scenario development tool for ZSDP
- LUMS and TERI researchers taking ownership on Indus modeling tool
- UNIDO and WB interested in applying the tools in other geographical contexts

Scenario comparison

	Energy-land-climate	Water	SDGs
Baseline	2.0°C	BAU	7, 13
1.5°C	1.5°C	BAU	7, 13
SDG6	2.0°C	SDG6	6
SDG6 + 1.5°C	1.5°C	SDG6	6, 7, 13

Constraint category	Water Sector Development Scenario: Baseline	SDG6-Supply	SDG6-Efficiency
Water infrastructure access	1. Piped water and treatment access proceeds according to the baseline SSP2 socioeconomic projections	1. **SDG 6.1/6.2** By 2030 100% municipal withdrawals from piped water infrastructure 2. **SDG 6.2** By 2030 100% municipal return flows collected 3. **SDG 6.3/6.6** By 2030 50% of return flows treated	1. **SDG 6.1/6.2** By 2030 100% municipal withdrawals from piped water infrastructure 2. **SDG 6.2** By 2030 100% municipal return flows collected 3. **SDG 6.3/6.6** By 2030 50% of return flows treated
Water demand	1. Baseline SSP2 per capita water withdrawals and return flows	1. Baseline SSP2 per capita water withdrawals and return flows 2. **SDG 6.1** By 2030 Urban domestic withdrawals exceed 100 liters per day and rural domestic withdrawals exceed 50 liters per day	1. **SDG 6.4/6.6** Baseline SSP2 per capita water withdrawals and return flows + 10% end-use efficiency improvement due to behavior change 2. **SDG 6.1** By 2030 urban domestic withdrawals exceed 100 liters per day and rural domestic withdrawals exceed 50 liters per day
Water allocation	1. No change to allocation schemes	1. **SDG 6.4/6.6** By 2030 20 % less withdrawals from rivers and aquifers relative to 2010 2. **SDG 6.4/6.6** By 2030 minimum 5% reduction in energy sector water consumption relative to BAU	1. **SDG 6.4/6.6** Up to 30% of irrigation withdrawals can be efficiently re-allocated to other sectors. 2. **SDG 6.4/6.6** By 2030 30 % less withdrawals from rivers and aquifers relative to 2010 3. **SDG 6.4/6.6** By 2030 minimum 10% reduction in energy sector water consumption relative to BAU
Water technology development	1. Expansion of advanced recycling and desalination in water stressed regions at historical rates 2. Phase out of freshwater once-through systems 3. Energy intensive water supply technologies	1. Energy intensive water supply technologies 2. **SDG 6.4** Rapid expansion of desalination and wastewater recycling in water stressed regions 3. **SDG 6.4/6.6** No once-through power plant cooling systems (freshwater or seawater)	1. Energy efficient water supply technologies 2. **SDG 6.4** Rapid expansion of desalination and wastewater recycling in water stressed regions 3. **SDG 6.4/6.6** Increased end-use recycling by 2030 (10% reduction in consumption). 4. **SDG 6.4/6.6** No once-through power plant cooling systems (freshwater or seawater)

Parkinson, S., et al., *Environmental Research Letters, 2019*

VIDEO