

Climate Change Down to Earth

Challenges from the large to the small scale

Eddy Moors

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Who am I

- Born in Senegal
- At present living in the Netherlands
- Worked for:
 - World Meteorological Organisation
 - Wageningen University
 - VU University
 - Alterra (now Wageningen Environmental Research)
 - IWACO
 - Ministry of Defence

Examples of activities in India

- 2017 – 2022: **LOTUS-HR**: Water for Health (DBT - STW/NWO)
- 2016 – 2017: **HIMAP**: Hindu Kush Himalayan Monitoring and Assessment Programme: “Scenarios and Pathways”.
- 2014 – 2018: **CASCO**: Climate Adaptation and Services COmmunity India – EU cooperation (EU)
- 2015: Reviewer for: Swiss Development Cooperation Himalaya Programme (SDC), Sustainable Water Programme UK – India (NERC UK)
- 2014 – 2018: **Hi-Aware**: Himalayan Adaptation, Water and Resilience. Research on Glacier and Snowpack Dependent River Basins for Improving Livelihoods. Adaptive Pathways (DFID – CARIAA)
- 2011 – 2015: **MARECLIM**: Indo-European research facilities for studies on marine ecosystem and climate in India (Europe AID)
- 2009 – 2012: **HighNoon**: adaptation to changing water resources availability in northern India with Himalayan glacier retreat and changing monsoon (EU, DG-Research and Innovation)

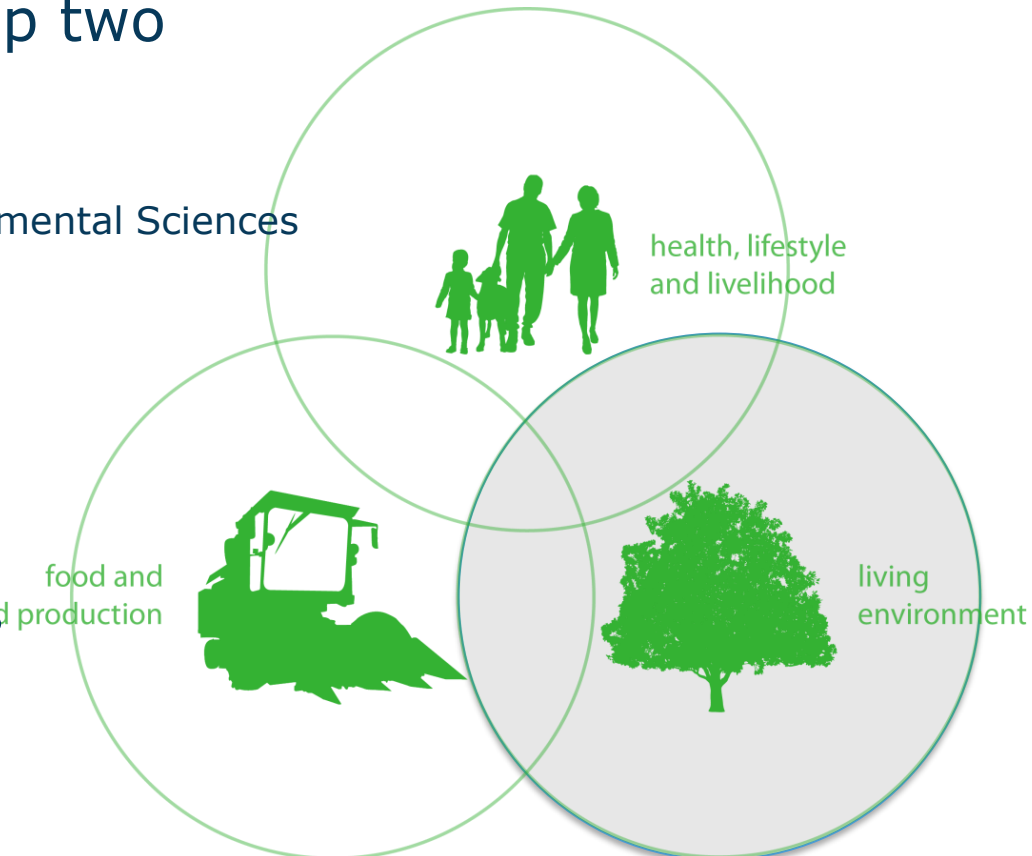
Wageningen UR

Our international impact

Top ten world player in Environmental Sciences (4th in 2016), Top two In Agricultural Sciences

QS World University ranking for Environmental Sciences

6,500 employees
10,000 students
100 different nationalities



Wageningen Environmental Research

- Research priorities (next 5 to 10 years):
 - **Climate adaptable society**
 - **Sustainable water management**
 - Sustainable land use
 - Healthy and secure living environment
 - Biodiverse environment
 - Green growth

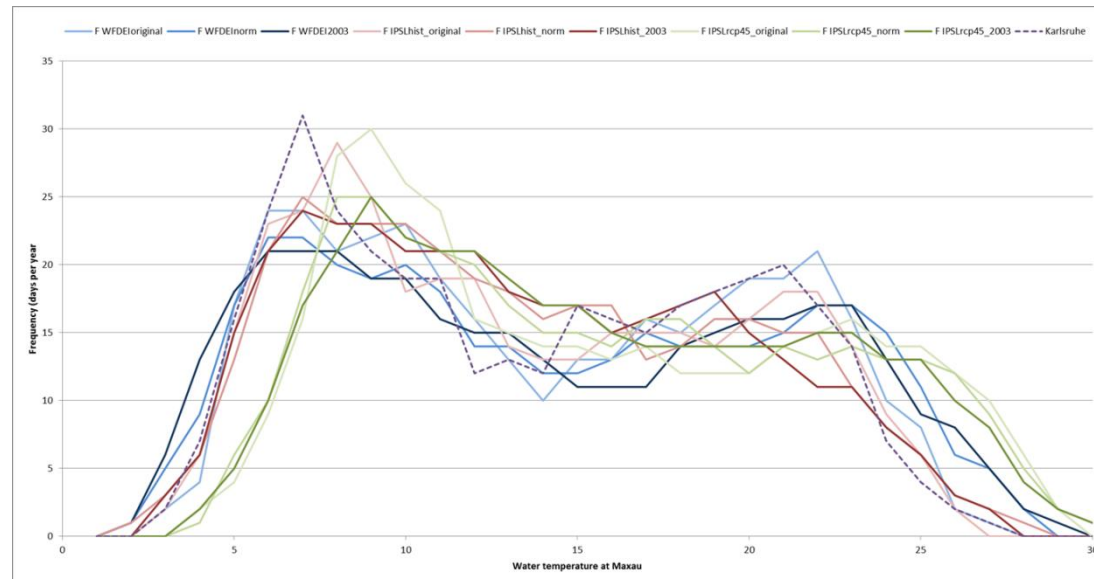
Climate projections

Issues:

- Down scaling
- Choice of GCM/RCM

Remarks:

- Dependency on reference climate
- Regional differences
- Order of steps



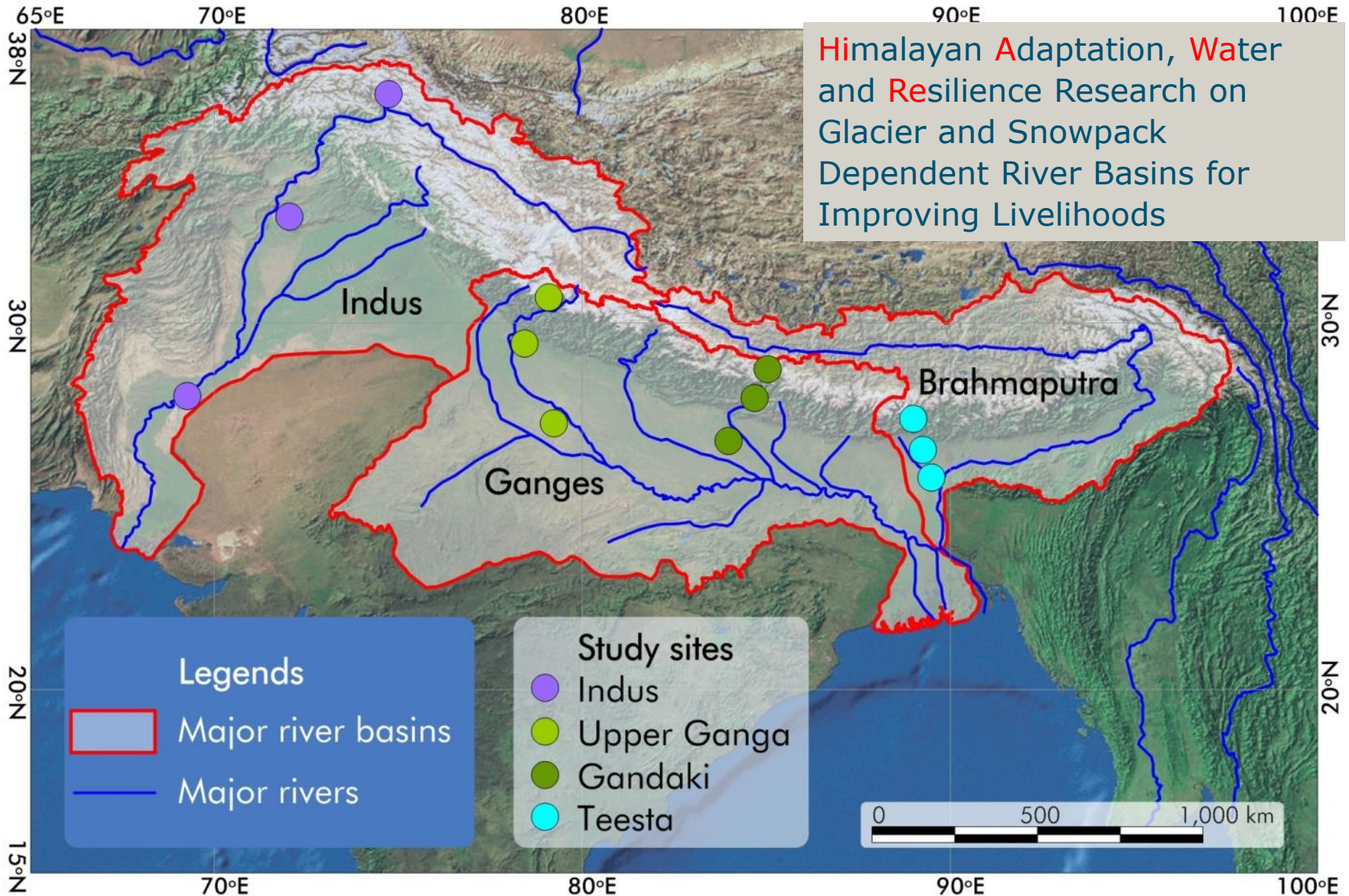
Climate Extremes

- Family of Delta approaches
- Weather generator based on an analysis of atmospheric flow patterns (e.g. AnaWege by Yiou, 2014)
- Ways forward:
 - Combination Weather generator + Delta approach
 - Weather generator for climate projections
- Advantage: rapid assessment of changes in climate extremes.

Participatory design of adaptation options

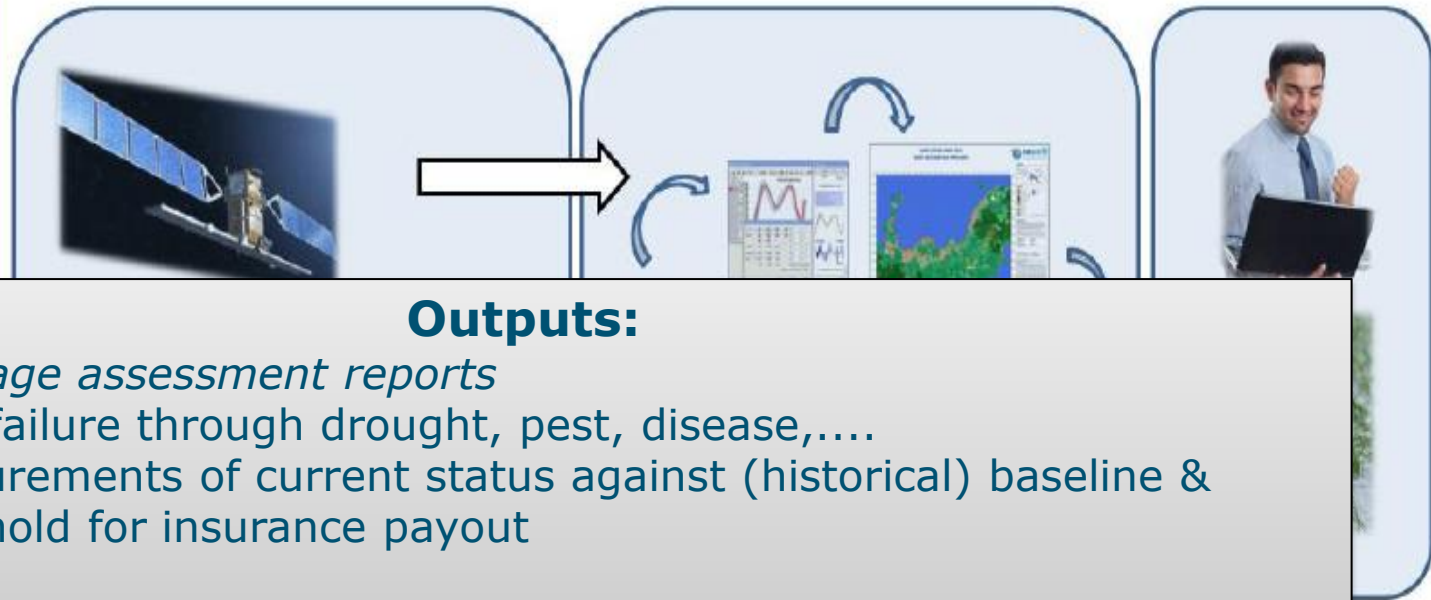
- Awareness raising through Visualization:
 - Finding key indicators by e.g. climate impact atlas, climate portal, adaptation support tool, ...
- Prioritization by finding common ground:
 - Design ateliers, serious gaming, meta models
 - Technical design, economic analysis, ...
 - Agreement on measures and Key Indicators
- Implementation
 - Decision Support System
 - Remote sensing and ground based measurements

Providing evidence: pilots and demos



Contact: Hester.Biemans@wur.nl

Weather & Satellite Index Insurance service (G4Indo)



Outputs:

- *Crop damage assessment reports*
 - Crop failure through drought, pest, disease,....
 - Measurements of current status against (historical) baseline & threshold for insurance payout
- *Crop management advice*
 - Data on planting moment, fertilizer amount & timing, seed variety selection,.....

EO image acquisition

Weather data collection

(Field data collection)

Weather data processing

EO image processing

Field data processing

Crop and hydrology modeling

Product generation

Quality Control

Service provision

Data acquisition

Value Adding

Products delivery



ALTERRA
WAGENINGEN

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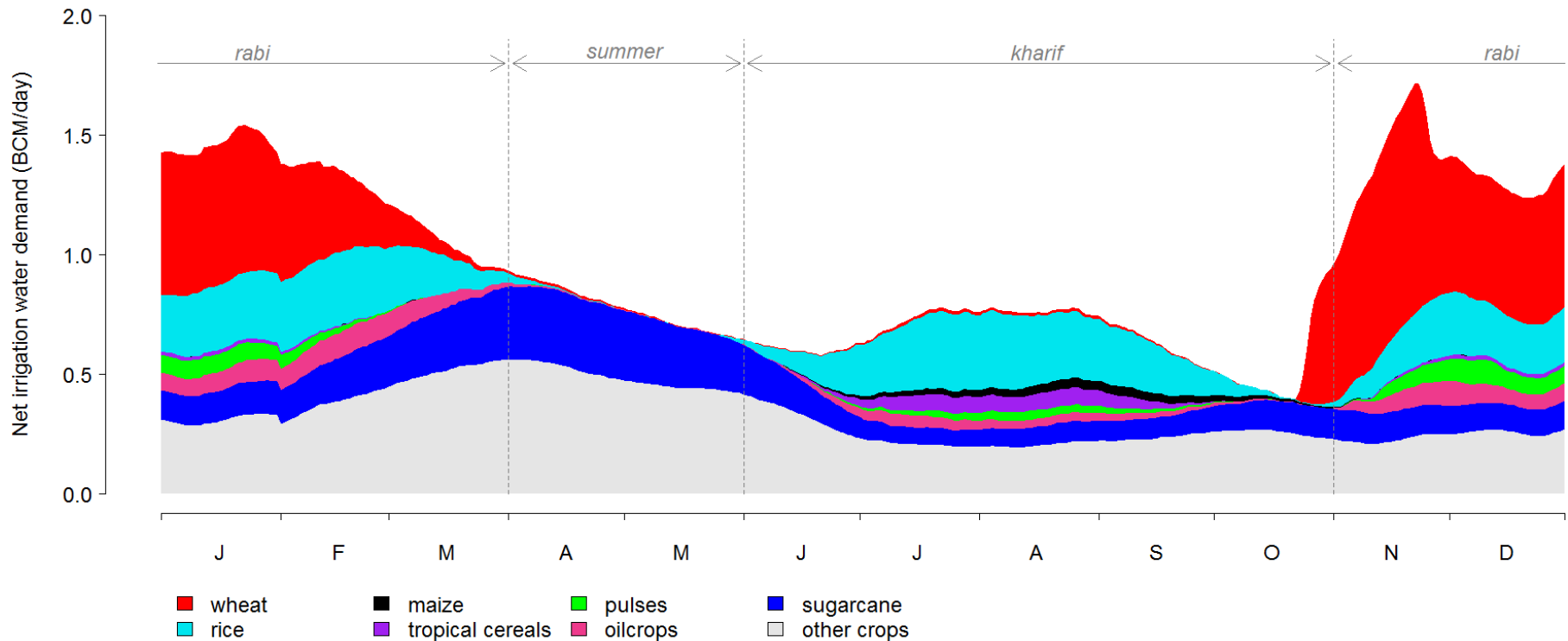
Field-level innovations

- Irrigation method
- Crop choice

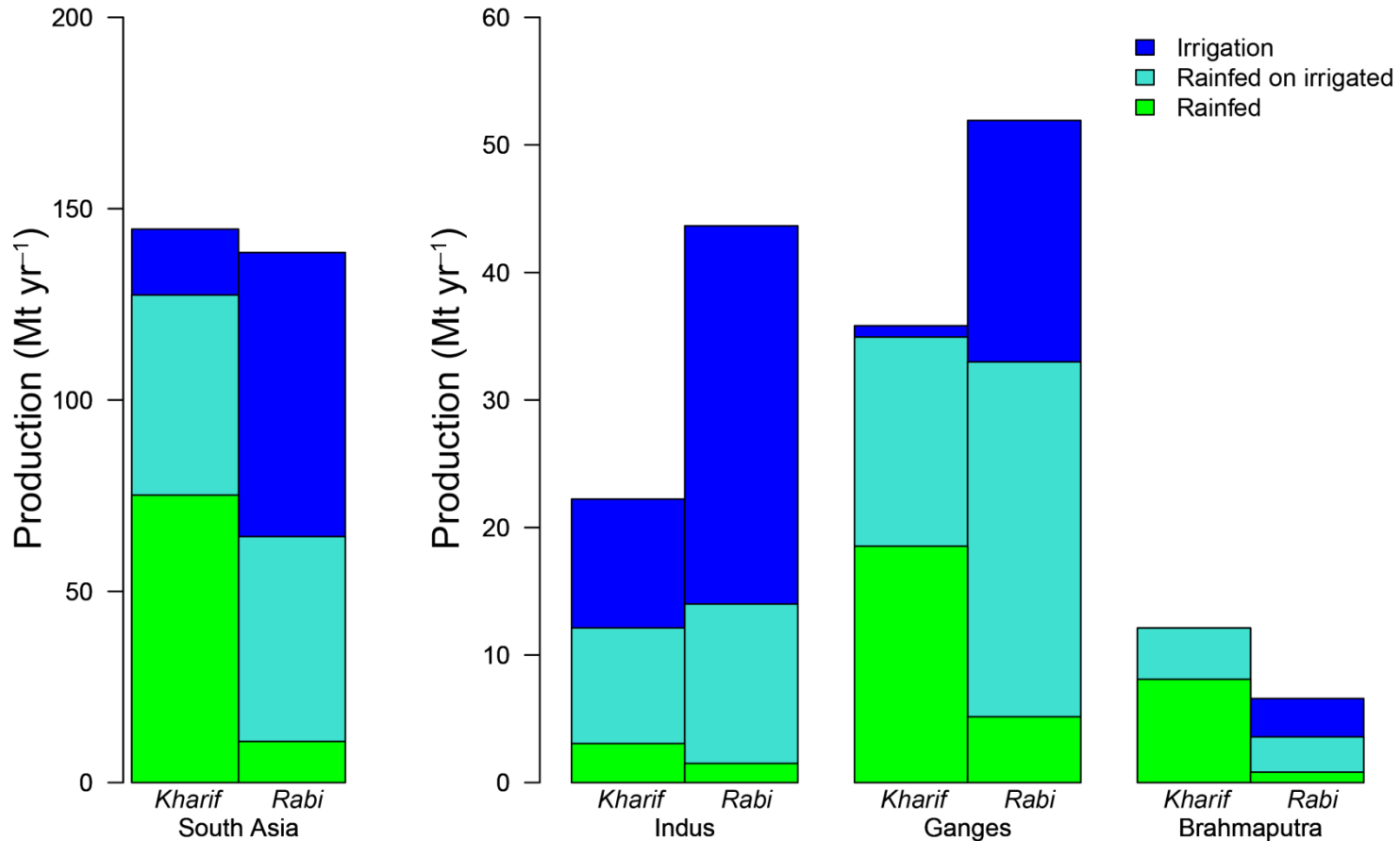


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Critical moments: Mean annual cycle of irrigation demand in South Asia after implementation of double cropping

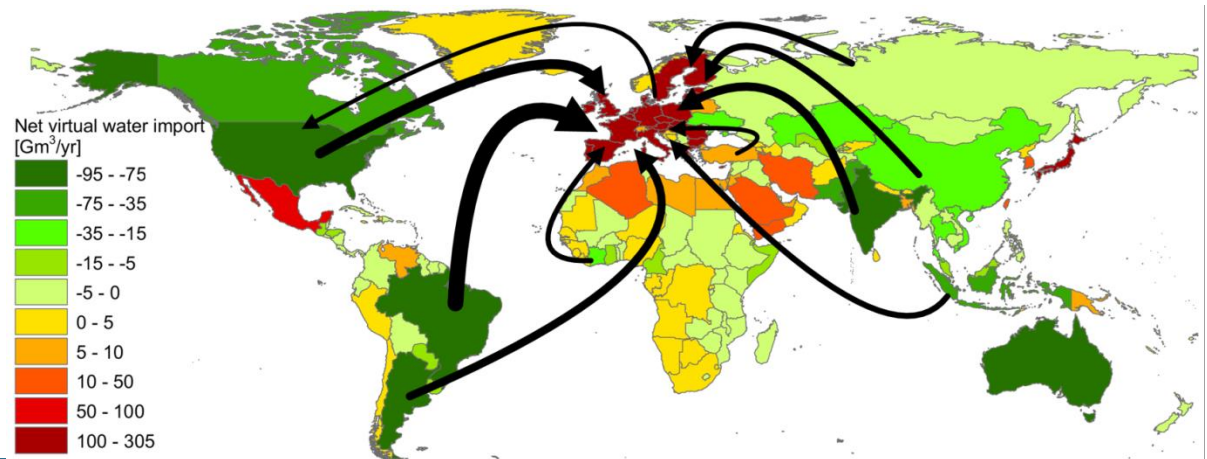


Food crop production in two main cropping seasons



Improve farmers income

- Supply chain development
 - Agrofood industry (fruit juice, extracts, dried, ...)
- Higher farm gate price
 - Branding of local organic sustainably produced crops
- Cash crops
 - Egypt exports cash crops and imports stable crops

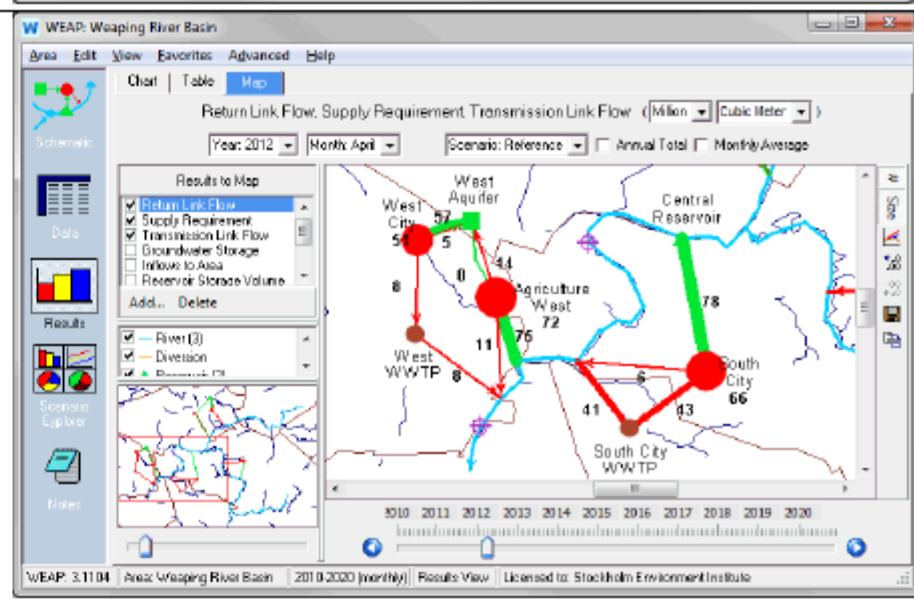
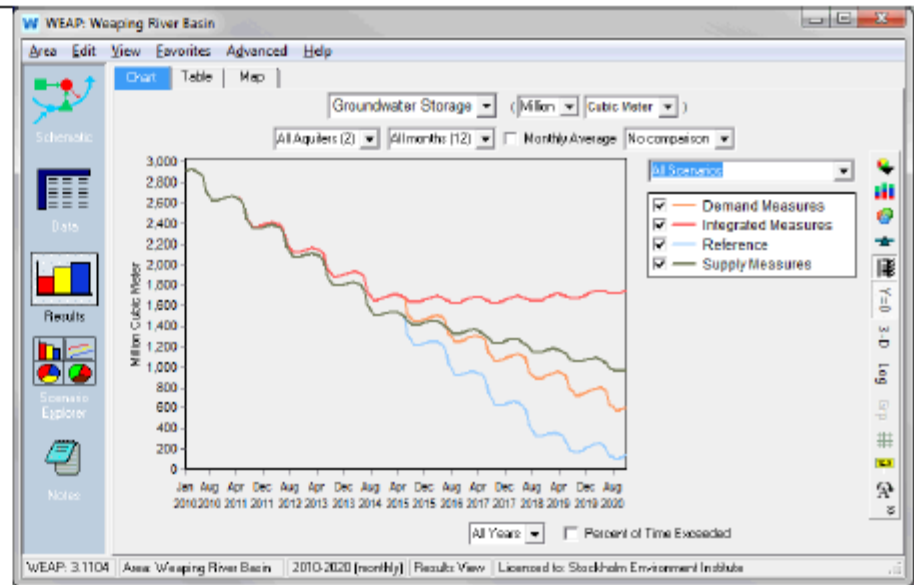
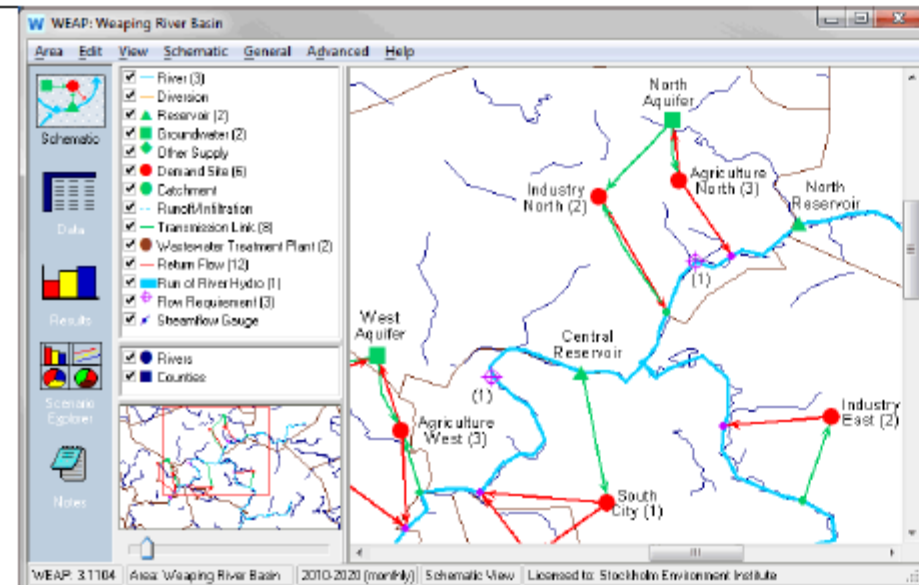


Issues to be considered

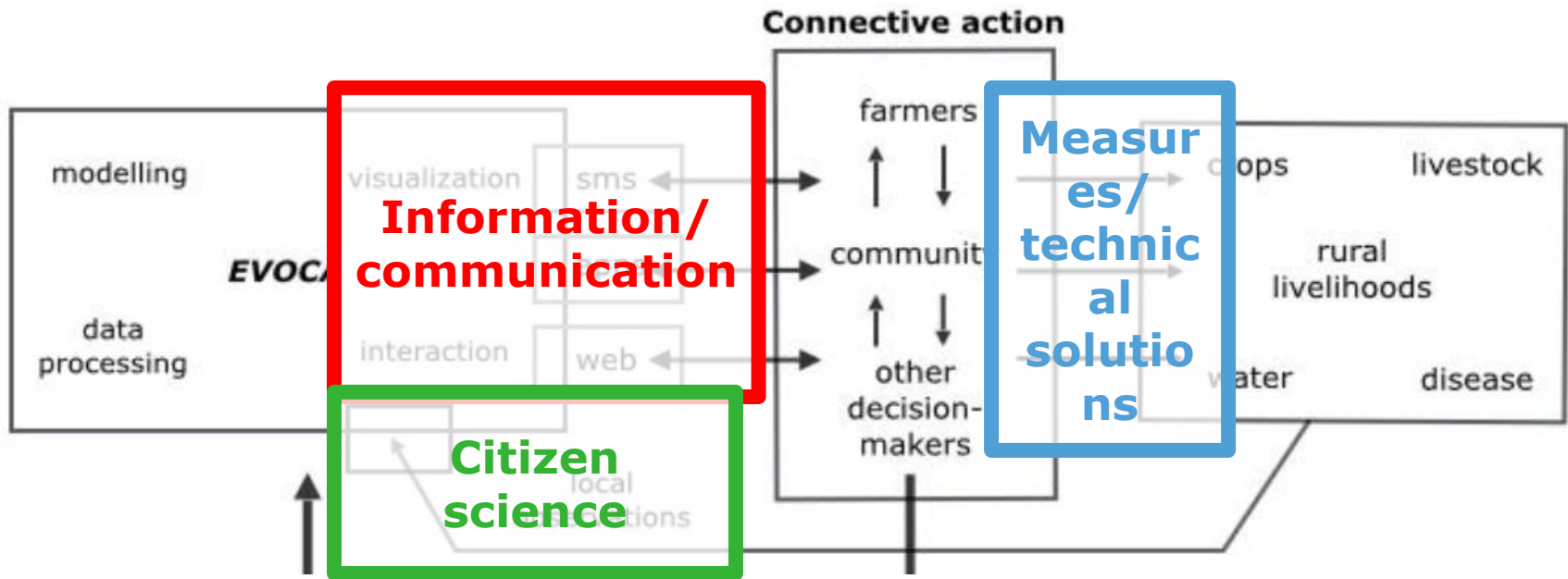
- Actual water availability across the basin comprehensive understanding of **water transfers** and **return flows** (both within and to/from neighbouring basins);
- Implications of **land use shifts** (such as urbanization, deforestation, agricultural intensification and regular shifts between rain-fed and irrigated crops) on streamflow, groundwater recharge and evaporation;
- **Irrigation efficiency paradox**;
- Effects on wider basin water availability of **hundreds of thousands of small-scale interventions**. Although small and often occurring in an unofficial, decentralized manner, cumulatively these interventions dramatically alter basin hydrology and the flow regimes of the region's rivers.

How much water is available?

How to allocate? What is the value?

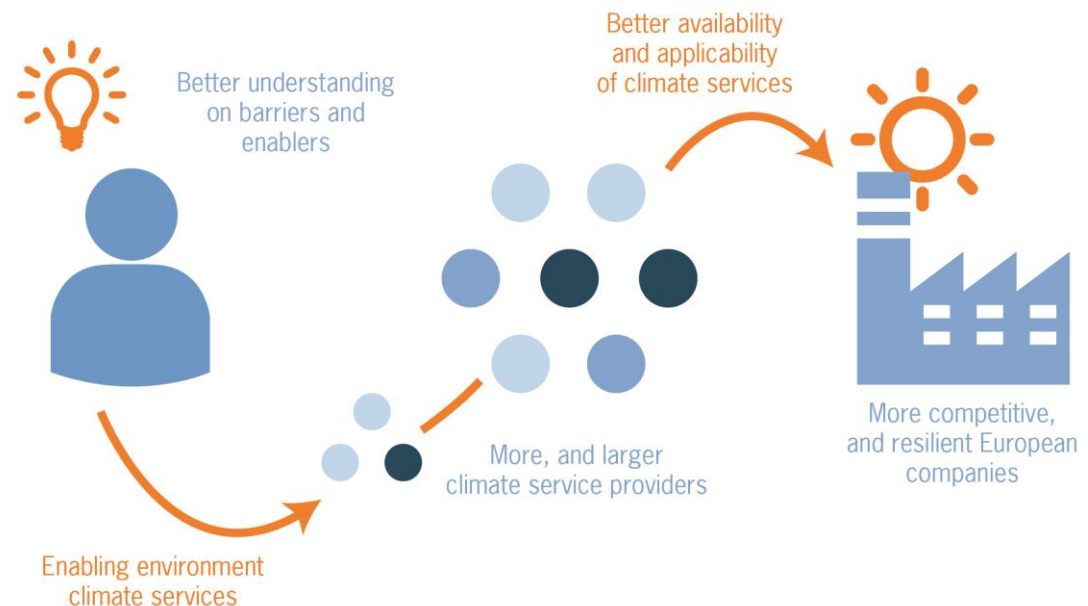


Climate Services: Business opportunities



Climate Services 4 Business

- Analysis of barriers and enablers for the uptake of climate services
- Facilitation of dialogue with businesses and network organizations on the implications of the Paris agreements on reducing greenhouse gas emissions and dealing with the impacts of climate change

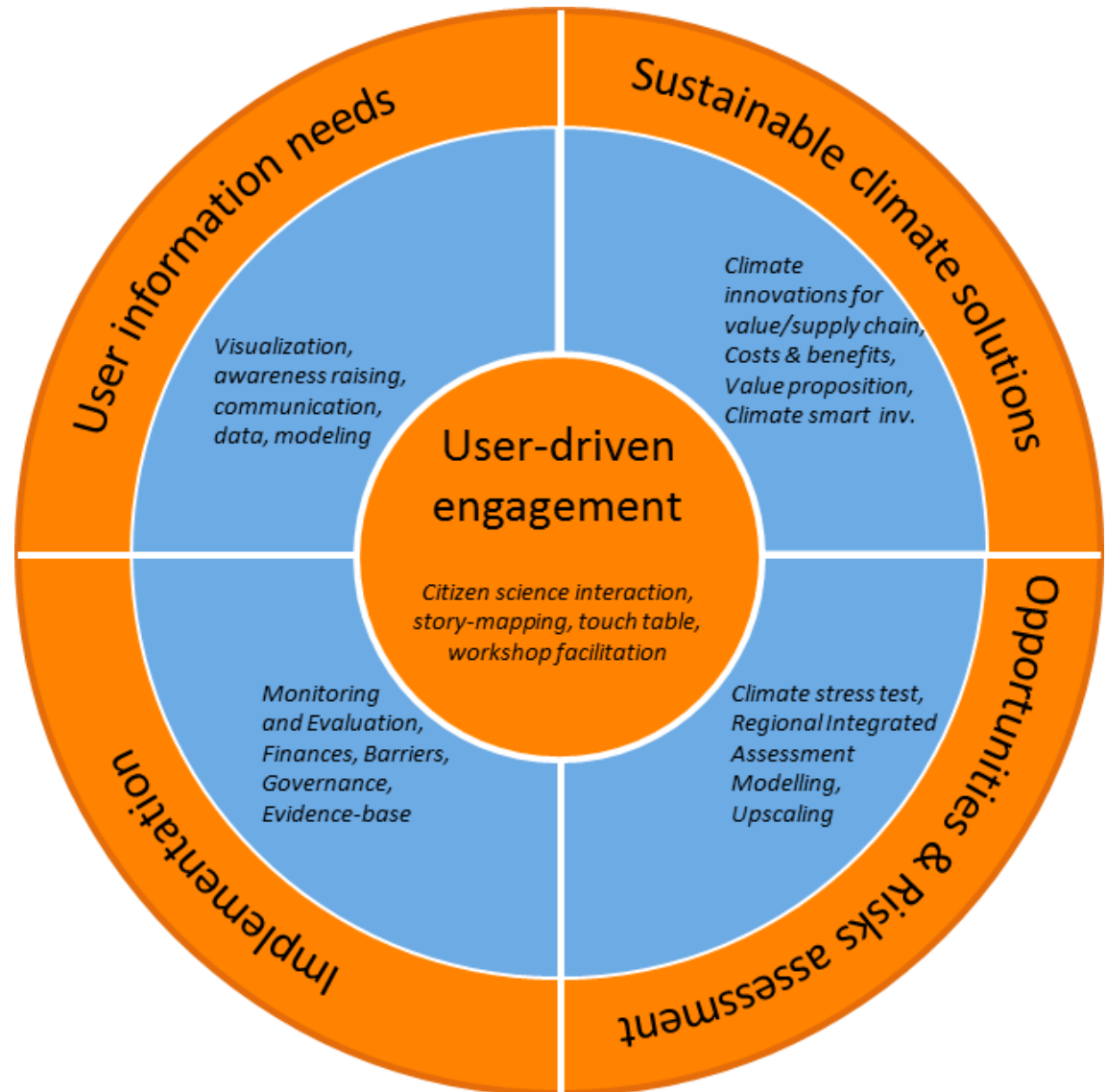


Climate Adaptive Society

Climate Services XXXL

Starting point:

- End user needs
- Adaptation AND mitigation
- Value chain perspective



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Research topics (green: papers in progress)

- Social perception and health/economic impact of water treatment and water reuse;
- Impact of heat on health and possible adaptation options for less fortunate people (pilot phase testing of options);
- Projections of extreme precipitation:
 - Wet extremes: Combination weather generator in climate projections;
 - Dry extremes: Drought generator;
- Regional Integrated Assessment model;
- Precipitation correction at high altitudes in HKH region
- Critical moments in water availability and crop water demand
- **Implementation of ATPs and pathways** (among others in Flood modelling and urbanization)
- **Impact of climate change on livelihood of fishermen (Kerala)**
- **Cryosphere effects on soil respiration (Siberia)**

Way forward

- Collaboration opportunities:
 - MSc and PhD research topics
 - Climate Services: e.g. H2020, DFID, JPI Climate,
 - ...
- At TERI University until 24th February 2017
 - Teaching MSc course on Hydrology (January)
 - Room 223, ext. 4863
 - Cell: 8860790758
- <http://www.weatherlink.com/user/hiawaredelhi/index.php?view=summary&headers=1>