Food and Agriculture Organization of the United Nations

Session 5 – *Understanding the food-water-energy nexus in the context of NAPs: processes and success stories*

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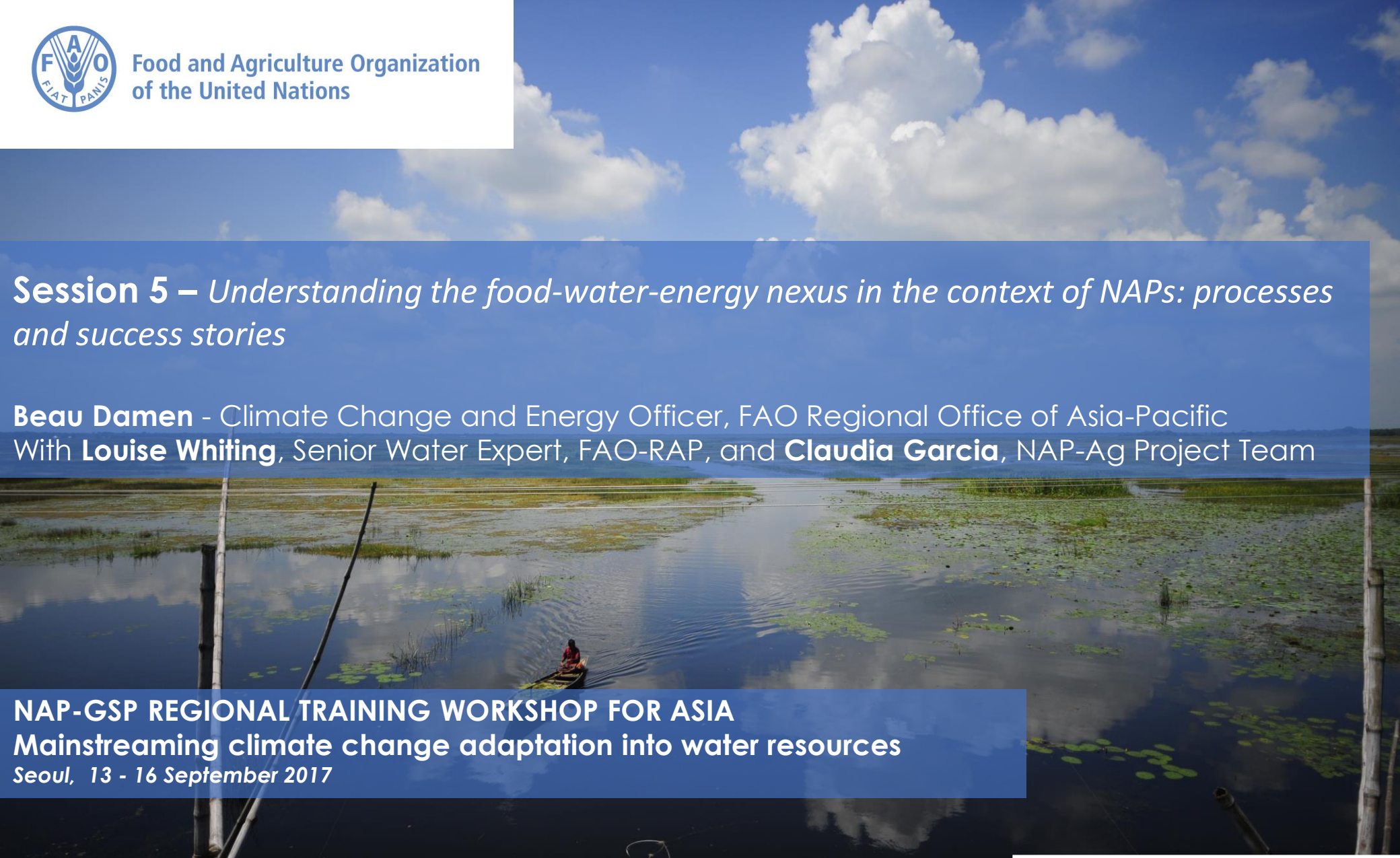
With **Louise Whiting**, Senior Water Expert, FAO-RAP, and **Claudia Garcia**, NAP-Ag Project Team



NAP-GSP REGIONAL TRAINING WORKSHOP FOR ASIA
Mainstreaming climate change adaptation into water resources
Seoul, 13 - 16 September 2017

NAP-GSP
NATIONAL ADAPTATION PLAN GLOBAL SUPPORT PROGRAMME

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Overview

1. Defining the water-energy-food nexus in Asia
2. Using the NAP as a framework to tackle the nexus issues
3. Take away messages

Part 1

Defining the water-energy-food nexus in Asia

Fruit Salad

Introductory game

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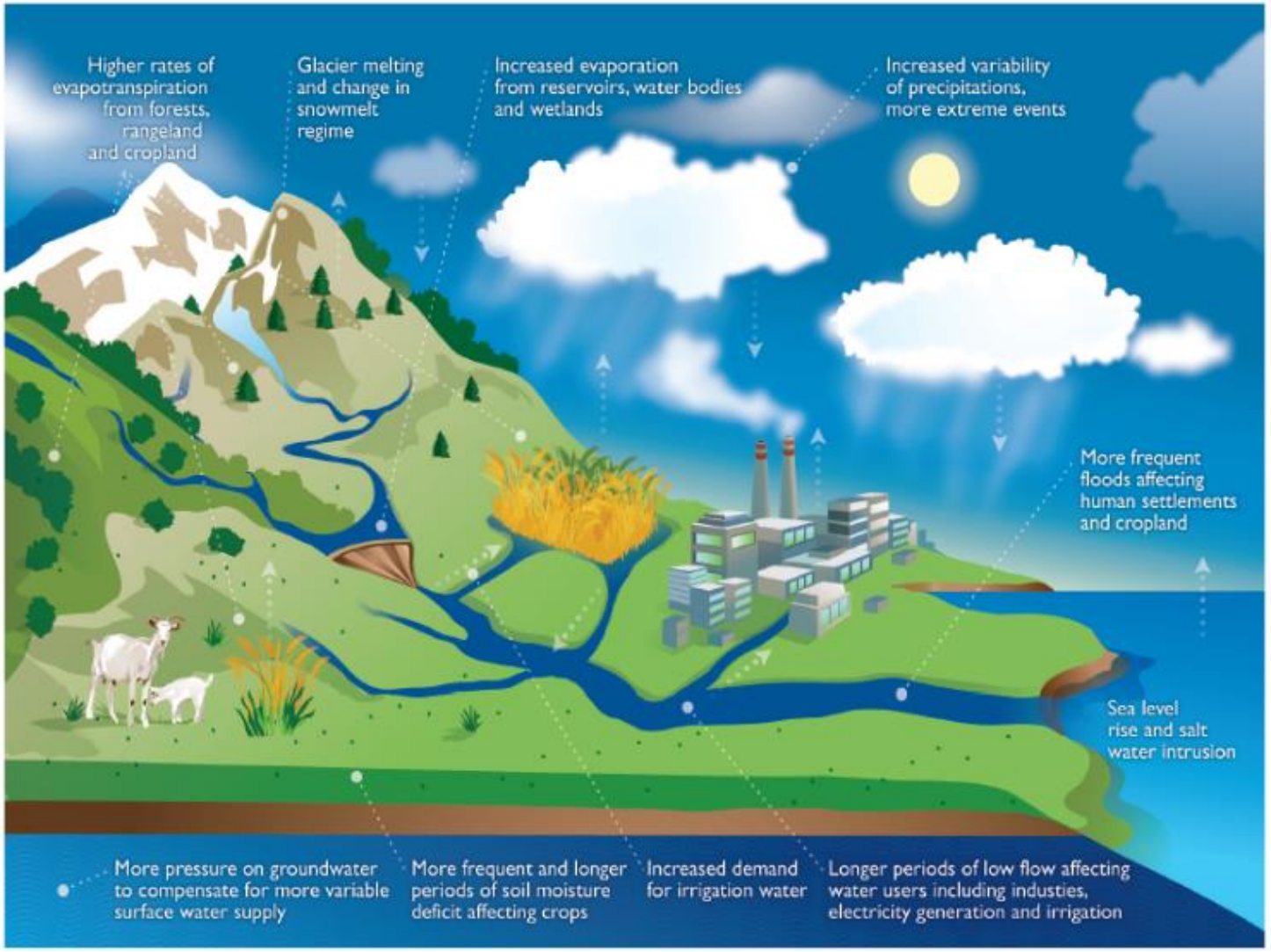
Basis of the Nexus

Inter-sectoral interdependencies

- Water is used for agricultural production – up to 90% of overall withdrawals in many countries
- Water is used in almost every aspect of energy production, making it the second largest withdrawer of water after agriculture globally.
- At the same time, food production consumes about 30% of total energy consumed globally (incl. supply chains)
- Energy is required to produce, transport and distribute food as well as to extract, pump, lift, collect, transport and treat water
- Upstream food production can pollute and alter water resources downstream

Impacts of climate change on the water cycle and agriculture

(illustrative example)



Source: FAO, 2013

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Some key nexus issues in Asia

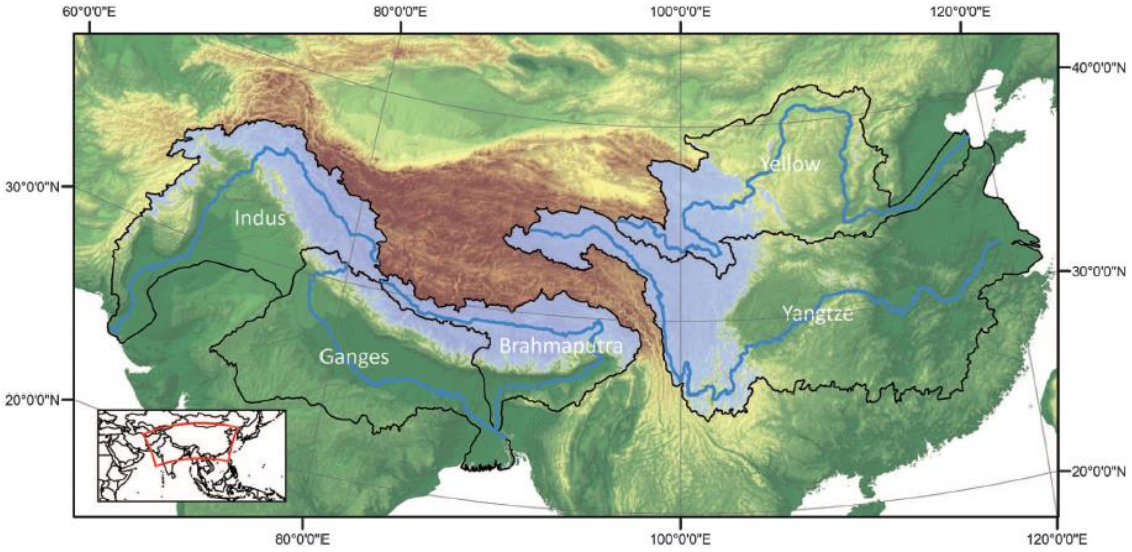
Towards a more resource-intensive agriculture

- Intensification and mechanization of agricultural production
- More food processing, more energy needed

Growing demand = growing pressures

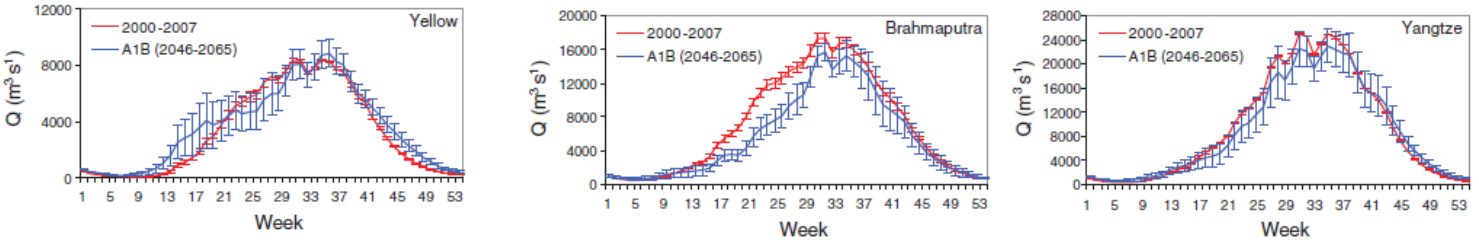
- Water scarcity
- Groundwater irrigation
- Hydropower development
- Polices, subsidies, prices

System wide risk – Climate Change



Basin boundaries and river courses of the Indus, Ganges, Brahmaputra, Yangtze, and Yellow rivers.
Blue areas denote areas with elevation exceeding 2000 masl. The digital elevation model in the background shows the topography ranging from low elevations (dark green) to high elevations (brown)

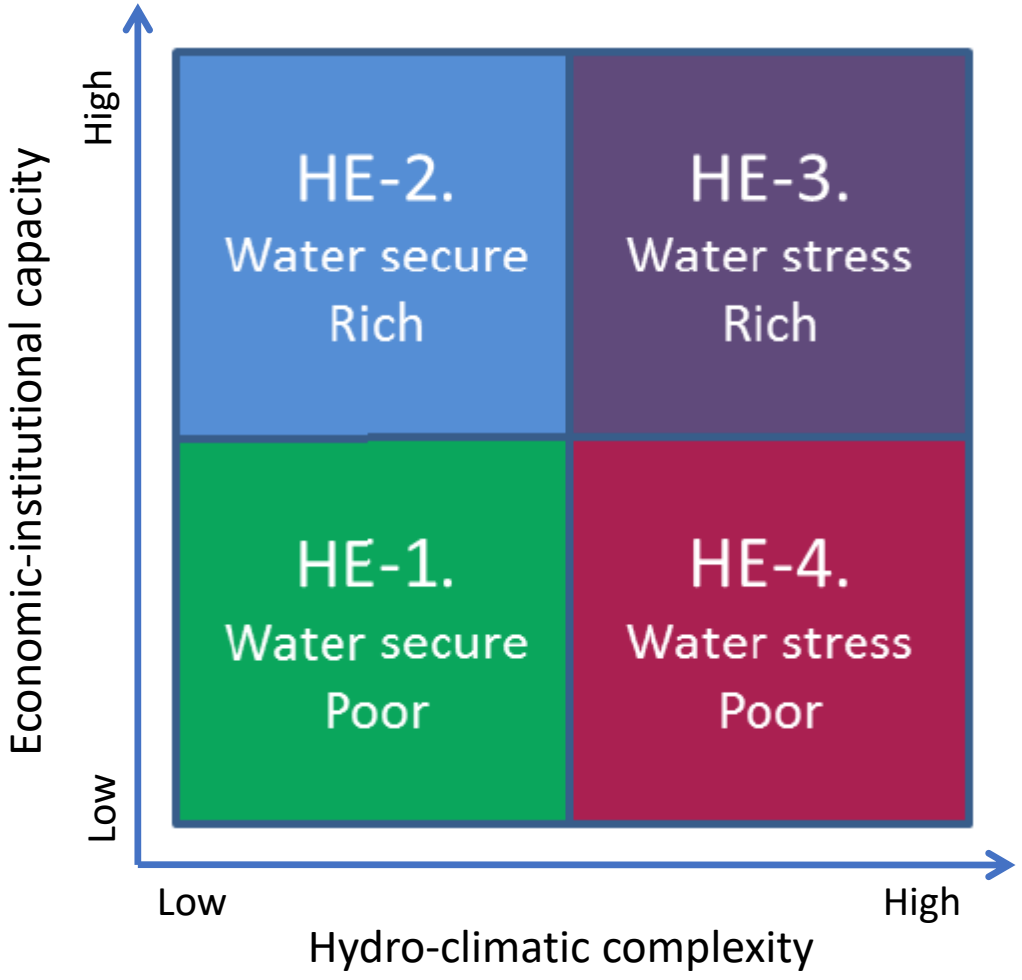
Simulated mean upstream discharge for the present (2000 to 2007) and future climate for the A1B SRES scenario [A1B (2046 to 2065)]



Source: Imerzeel et al, 2010, Climate Change Will Affect the Asian Water Towers

Water Security: Hydro-Economic Conditions, Present to 2050

(Interim research by Water futures and solutions initiative - IIASA)



By 2050 in HE-3 and HE-4:

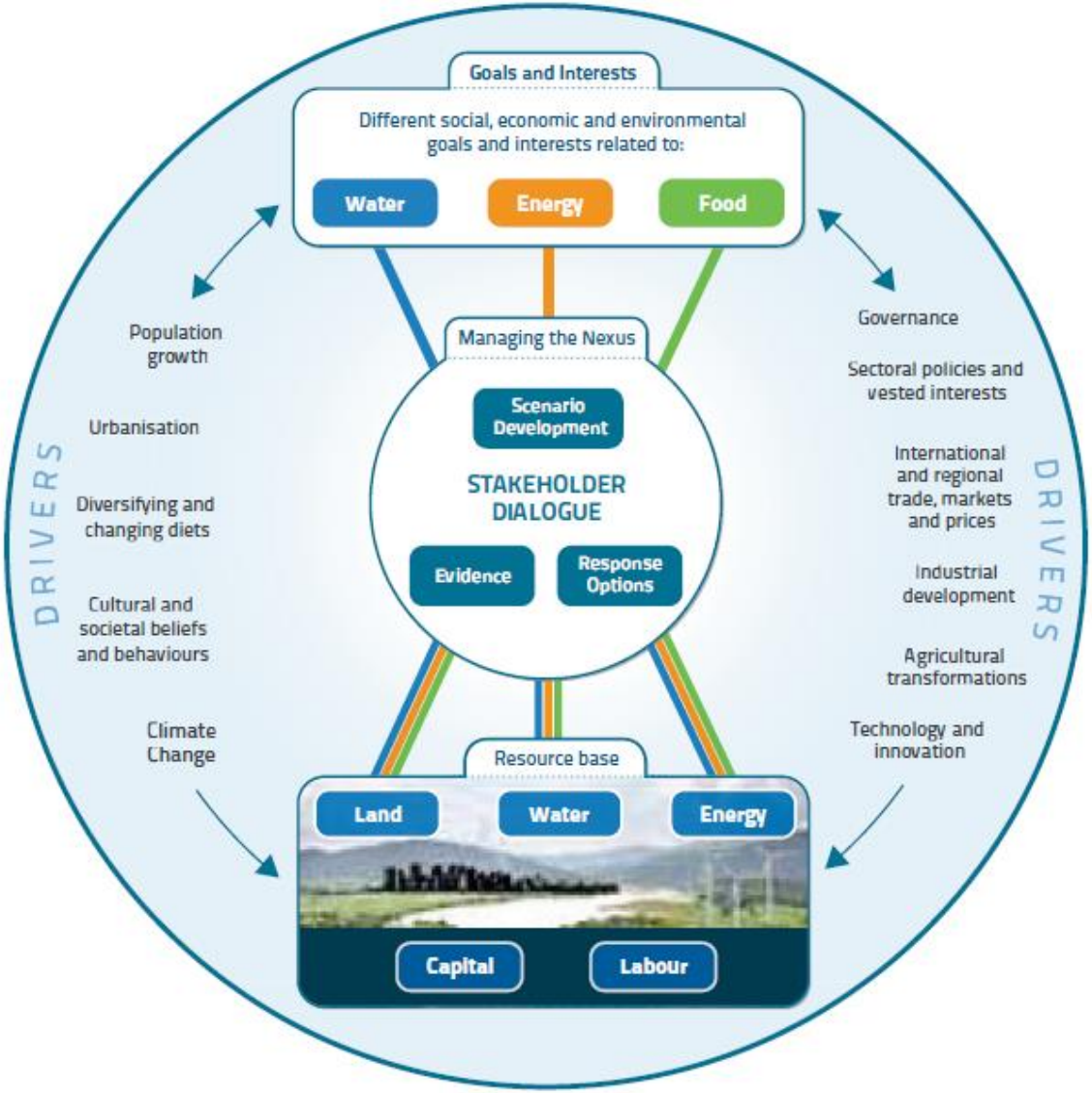
- 60% population, 60% GDP
- > 80% of Asia's population and GDP

Currently in HE-4:

- 44% population, 20% of GDP
- 65% of Asia's population

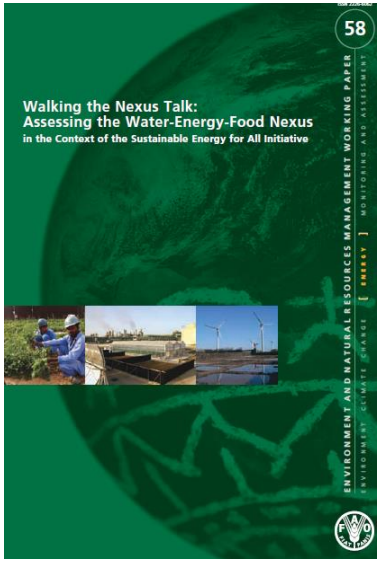
Source: Cosgrove et al, 2015; Wiberg, 2016

Framing the nexus



Water, food and energy are enablers of economic growth (or a constraint on growth)

Amplifiers of strategic resource stress



FAO, 2015

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From nexus concept to practice

Why is it so difficult?

- Pace of change
- Complex, wicked problems
- Deep uncertainty
- Power and politics
- Poor experience with IWRM

What is needed?

- Political compromises and ‘good enough’ policy
- Focus on implementation
- Adaptable policy models and temporary solutions
- Multi-sectoral solutions
- Strategic data-sharing

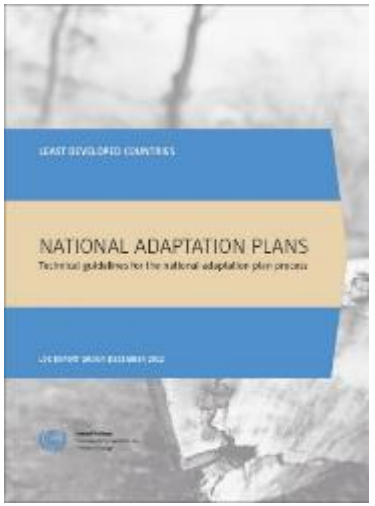
Source: http://blogs.lse.ac.uk/impactofsocialsciences/2017/03/15/ten-top-tips-for-social-scientists-seeking-to-influence-policy/?platform=hootsuite

Part 2

Using the NAP as a framework to tackle the nexus issues

UNFCCC NAP Technical Guidelines (2012)

- **A** • Lay the Groundwork and Address the Gaps
- **B** • Preparatory Elements
- **C** • Develop Implementation Strategies
- **D** • Monitoring, Reporting and Review of the process



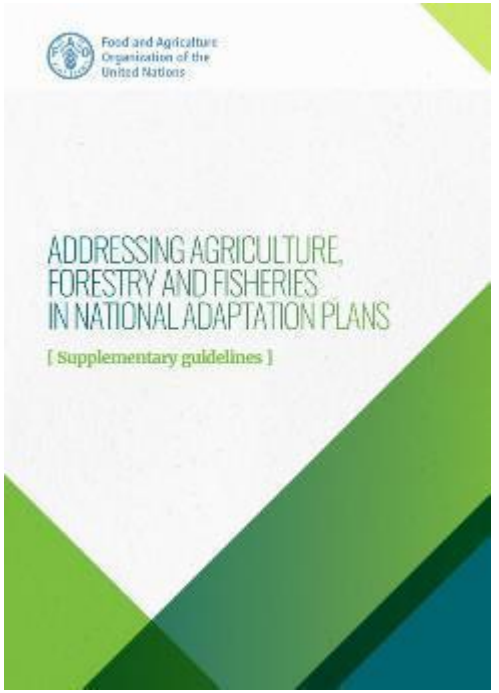
NAP-Ag Guidelines

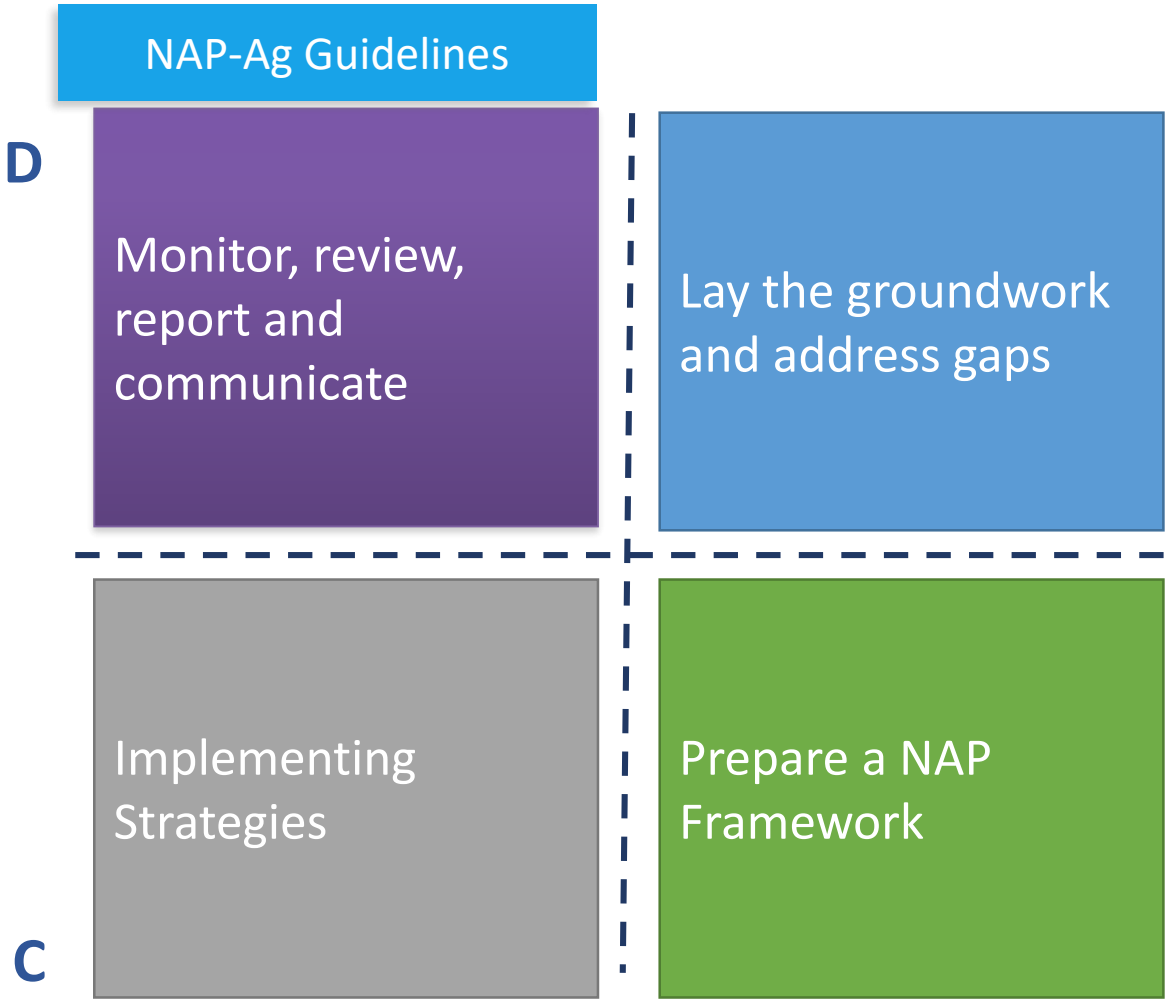
Supplementary Guidelines for Addressing Agriculture, Forestry and Fisheries in National Adaptation Plans

Highlight the agriculture sector-specific aspects in the process to formulate and implement NAPs

Mainstream adaptation in agriculture sector policies, plans and programmes

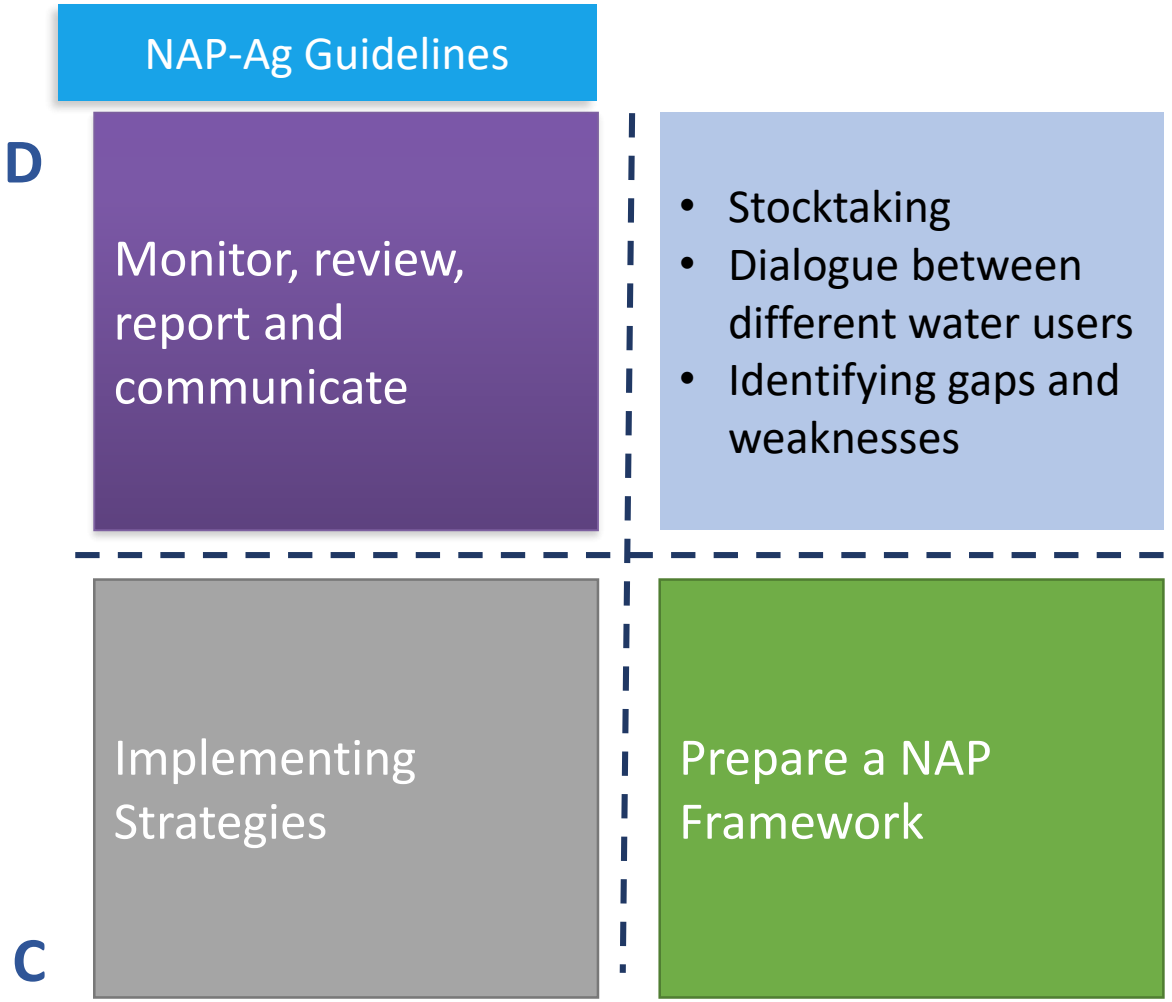
Support countries' efforts to reduce the agriculture sectors vulnerability to the impacts of climate change





- **NAP** provides a **framework** to **address** some of these **challenges**
- The **NAP-Ag** LEG Guideline Supplement can provide **sector specific guidance** that can help to address nexus issues

Using the NAP-Ag Supplement to address the food-water-energy nexus

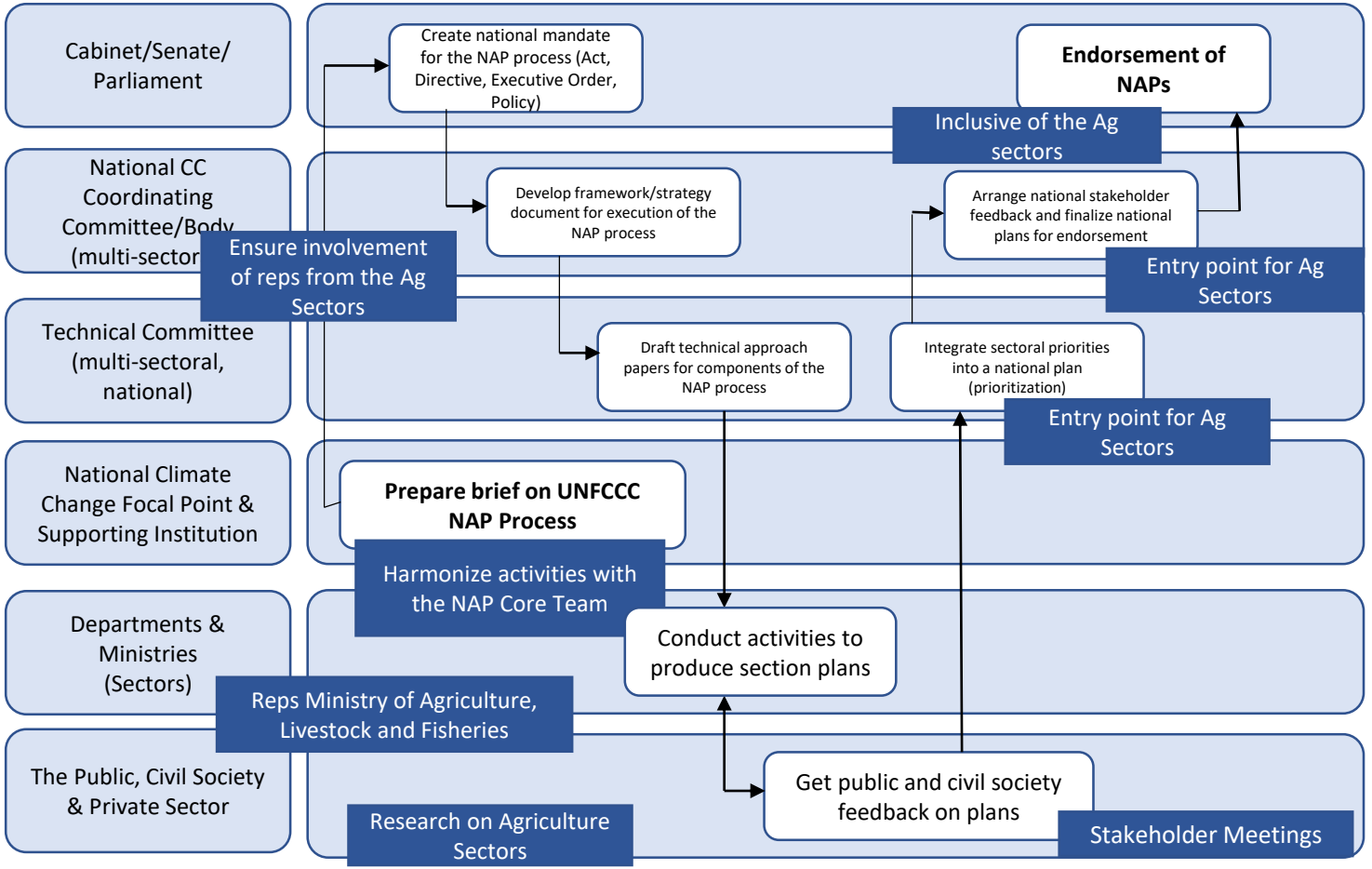


- Ensure and **facilitate** the appropriate **involvement** of relevant **stakeholders** from the various agriculture sectors in the process to formulate and implement NAPs

A. Lay the groundwork and address gaps

NAP-Ag Guidelines

Process flow for addressing Ag



Supported by Research, Systematic Observation, Education, Training, Communications, Stakeholder Inputs, etc

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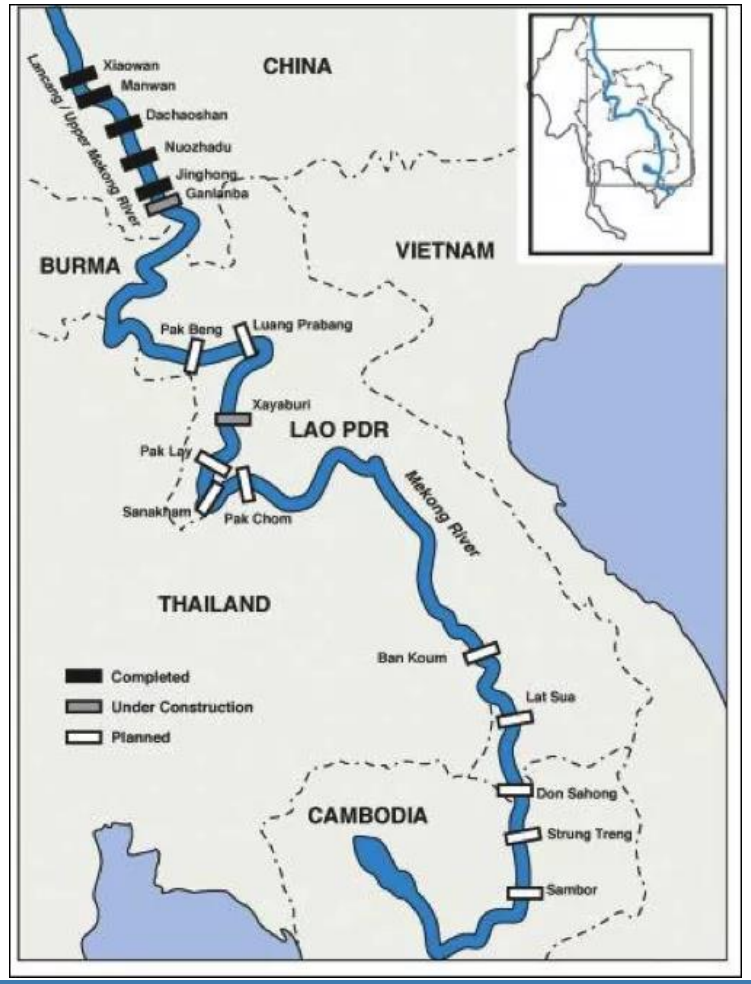
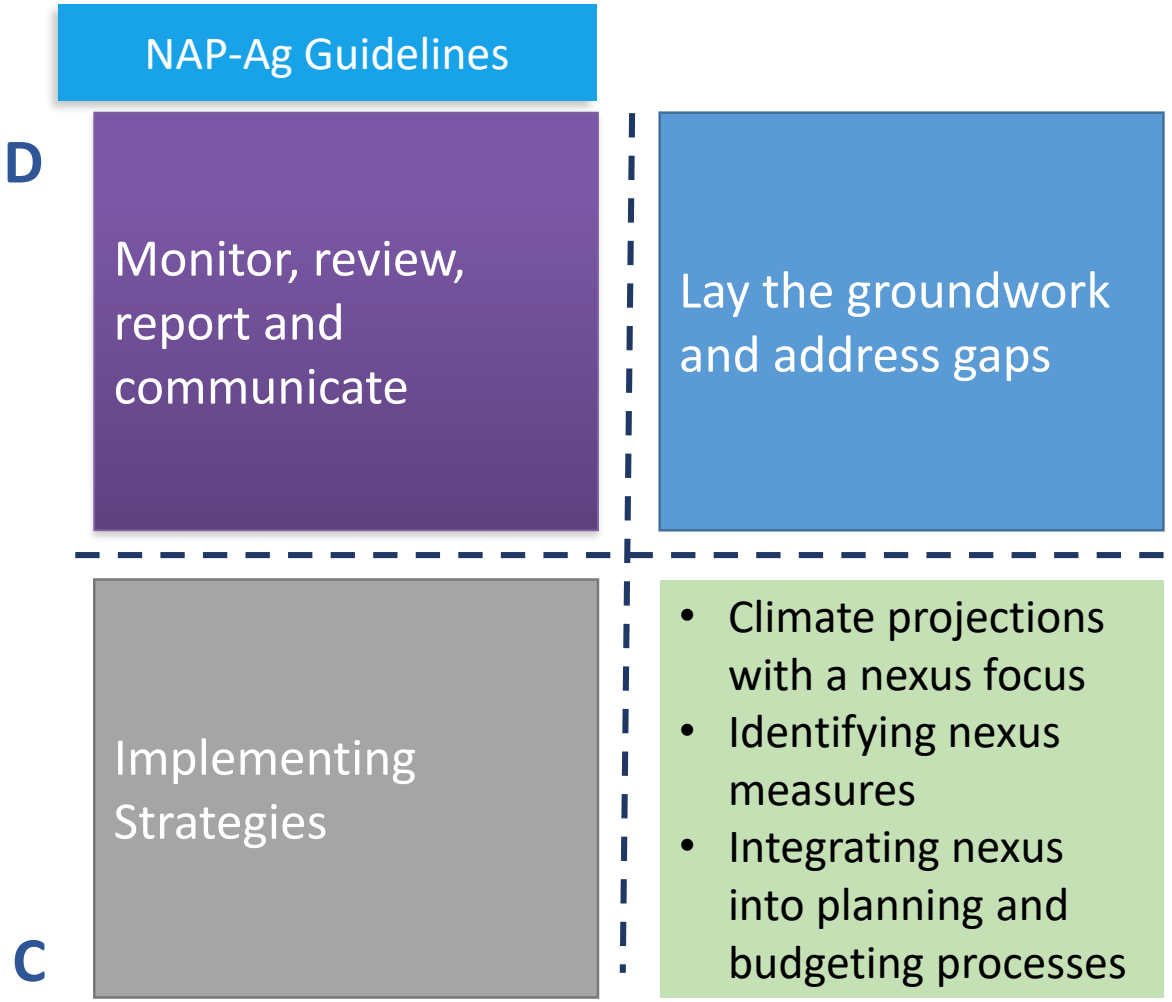
Exploring nexus trade-offs and synergies



Xiaowan Dam, Mekong River, China



- **Analysis** of climate change scenarios, vulnerabilities and risks in the agriculture sectors for **identifying**, selecting and **prioritizing** medium- to long-term **adaptation options**

B. Prepare a NAP Framework

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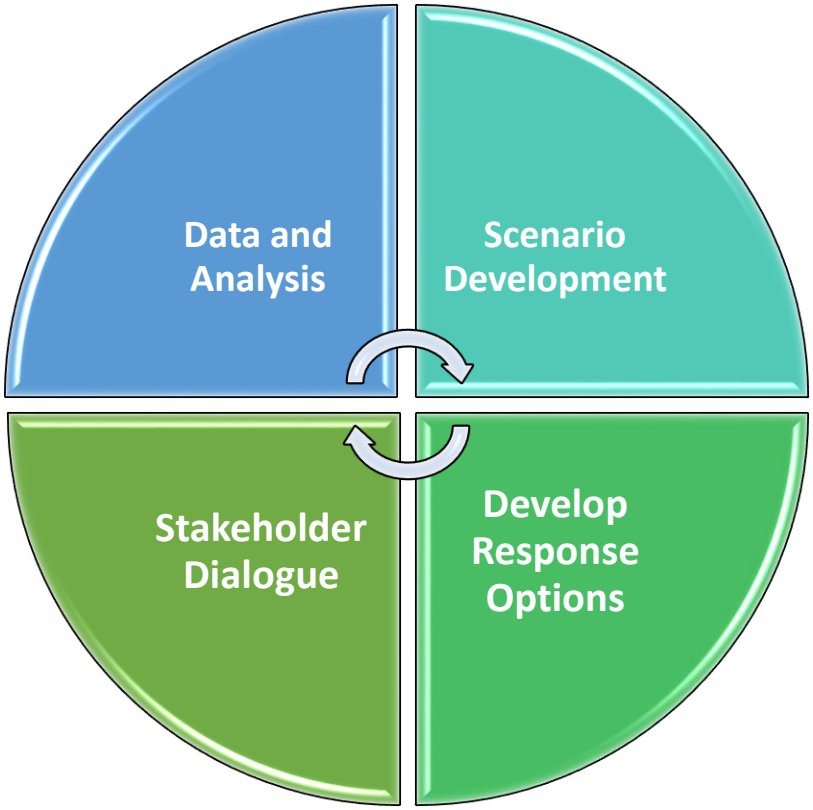
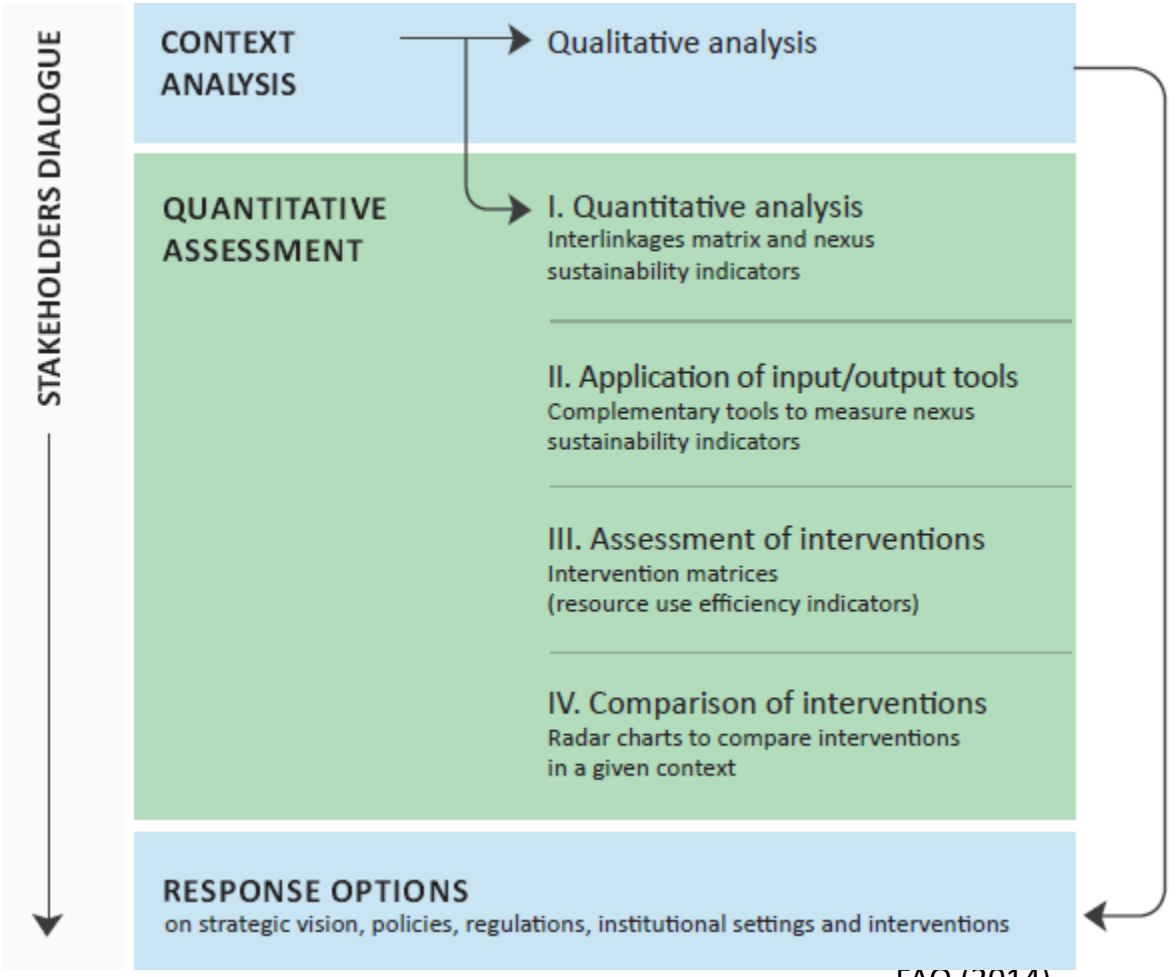
Assessment Tools





FAO (2014)

Tools & Data Sources

Selected Tools - Water

- **Aquastat** – Global data base of water information
- CLIMWAT & CROPWAT – Integrated assessment tools for agriculture water use
- **Water Accounting Sourcebook** – Guide for assessing impacts of different measures
- **MASSCOTE** – System for modernising large-scale irrigation schemes
- **MASSMUS** – Mulit-purpose water planning tool

http://www.fao.org/climate-change/en/

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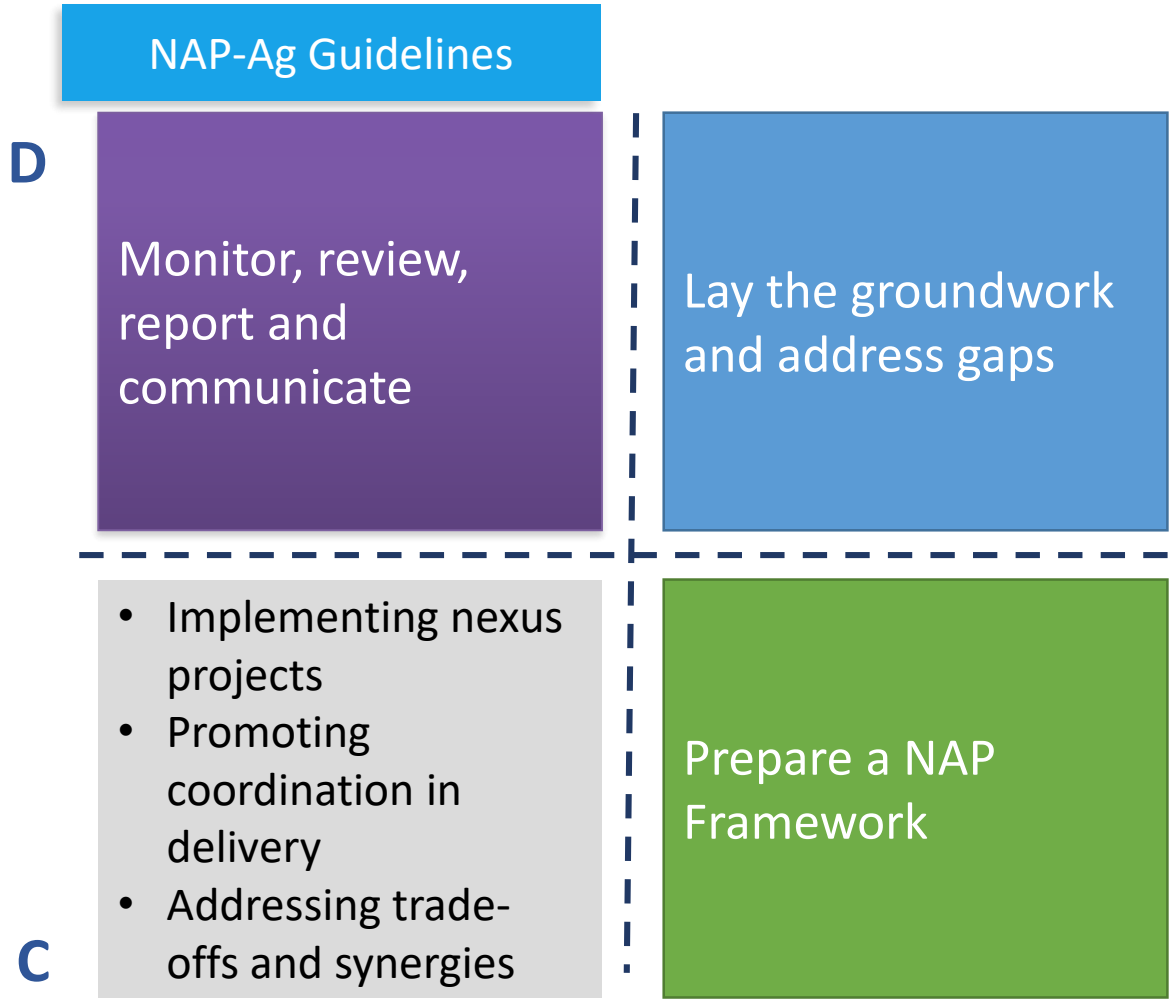
Appraising options & addressing risks

- **Groundwater depletion**, especially in water scarce countries
- **Technical risks**: Requires certain capital, knowledge and skills to operate, maintain and make the most effective use
- **Equity**: Need to ensure that everyone, including small-scale farmers, women farmers and other vulnerable groups, can benefit from solar irrigation



- Ensuring the agriculture sectors' **adaptation priorities** are prioritized in the NAP

C. Implementing Strategies

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Example Option – Solar Irrigation

- **Clean** energy without toxic pollution or greenhouse gas emissions
- Reliable **access to modern energy** in rural areas that currently lack reliable access or where diesel / fuel is expensive
- Depending on context, gradually becoming **cost-effective**
- Potentially improved **agricultural productivity** and **increase in incomes**

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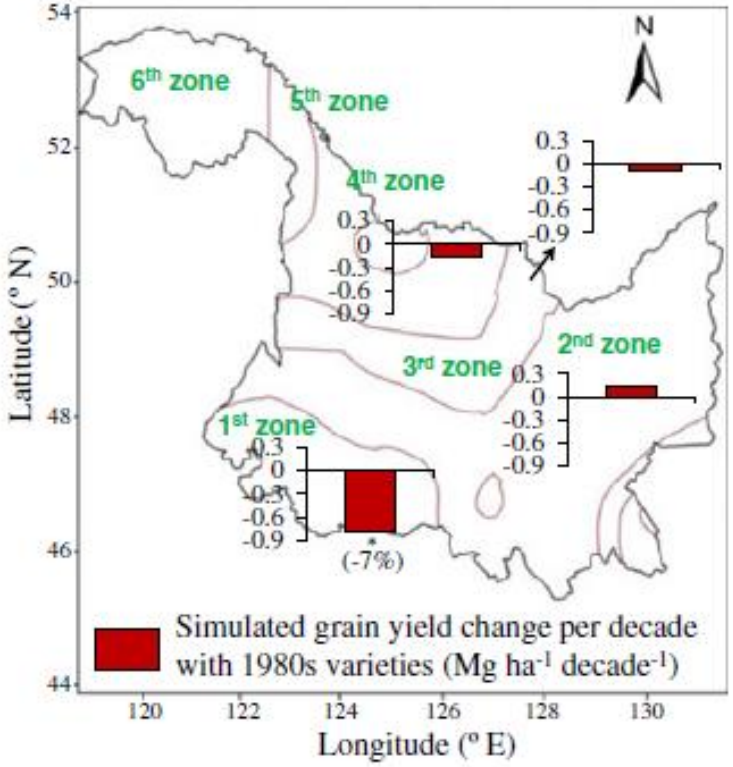
Nexus risks and synergies

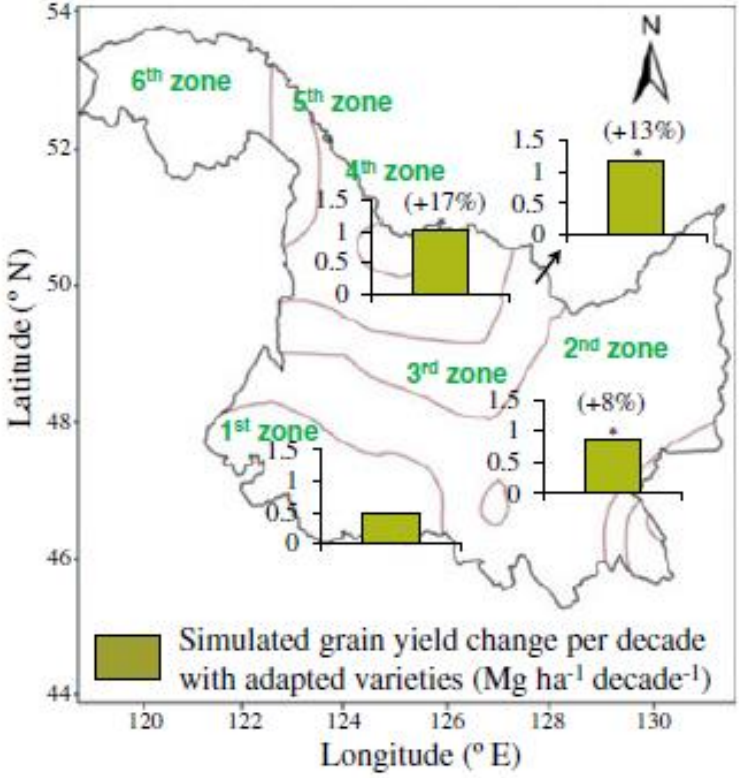
- Risks include groundwater depletion, unequal access and technical challenges
- Conditions on subsidies require improved on-farm water management to reduce consumption
- Farmers can also choose to sell surplus power to grid instead of pumping (solar cash crop).
- If risks are addressed it could relieve stress on drying aquifers without affecting incomes/poverty levels

Example of Trade-offs – Maize in China



Grain yield change for warming with 1980s varieties and yield performance with adapted varieties

The change of grain yield from 1980 to 2000 with 1980s varieties. Number in parenthesis shows the percent of simulated grain yield change per decade from 1980s to 2000s.



The change of grain yield from 1980 to 2000 with adapted varieties. Number in parenthesis shows the percent of simulated grain yield change per decade from 1980s to 2000s.

Source: Meng et al 2016

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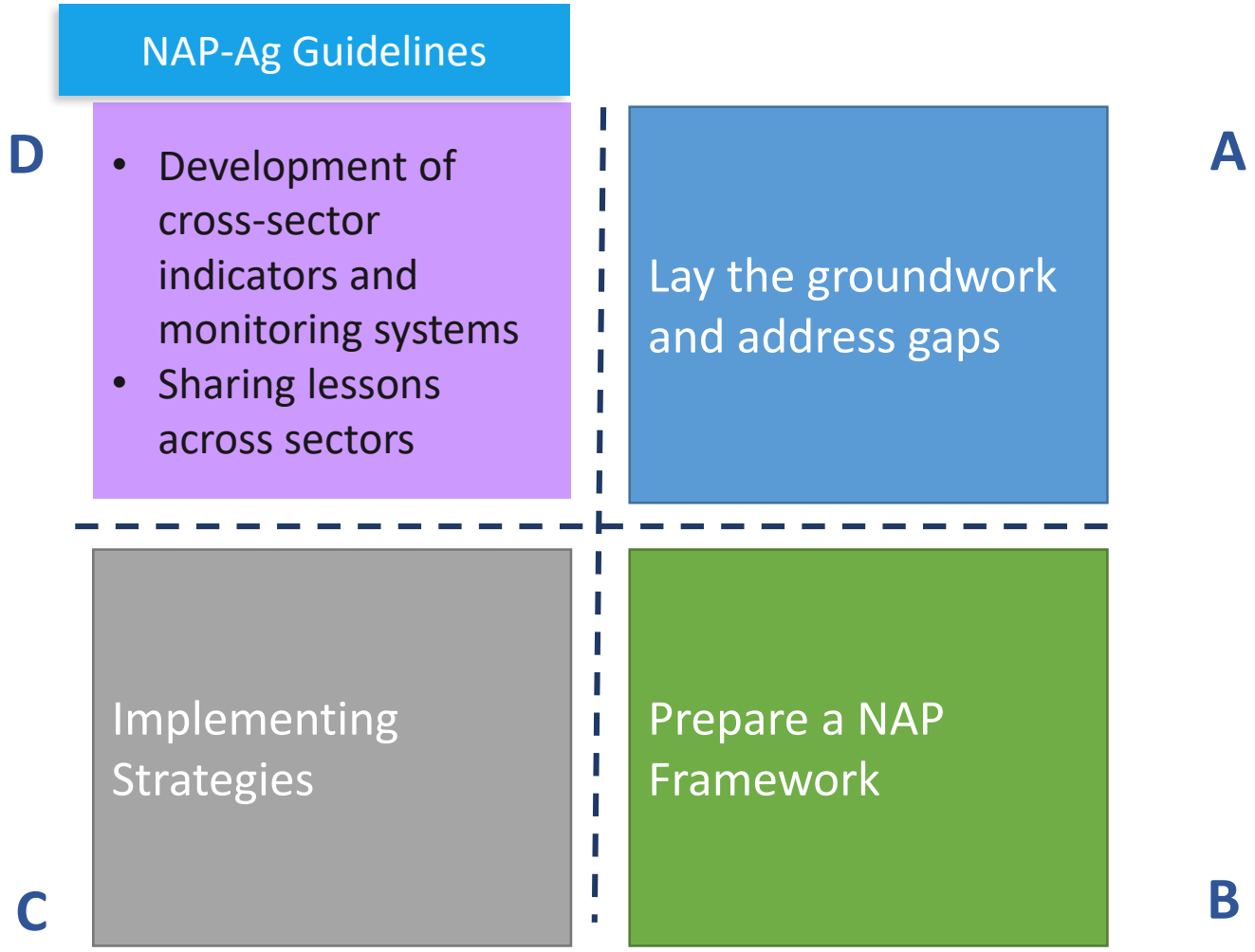
Nexus risks and synergies

- Risks include increased need for irrigation in an area under increasing water scarcity
- Example illustrates that successful adaptation can have unanticipated impacts for other aspects of the nexus
- Further monitoring and assessment will be required
- Policies or measures regulating water use may be required



- Build **effective monitoring and review** systems to assess – progress, effectiveness and gaps in integrating Ag in NAPs

D. Monitor, review, report and communicate

Example: Agriculture indicators with relevance for water sectors

Example of Potential Impact Indicators for Adaptive Capacity Projects

Adaptation activity: Promote sustainable and efficient agricultural production

Outcome Indicator	Impact Indicator
• Improved collection and analysis of climatic data	• Diversification of farm revenues from adoption of multiple cropping
• Extent of diversification practices at farm level, based on crop/livestock/horticulture systems suited to local agro-ecological and climate projections conditions	• Stability of yields/productivity over the long term
• Changes in awareness among farmers of climate change implications and adaptations practices	• **Soil and water improvements**
• **Improved water management**	• Stability of farm-level returns over time
	• Maintenance of farm-level soil fertility and vegetative cover over time
	• **Maintenance of quality and flow levels of watercourses**
	• **Changes in ecological footprint**

Source: Clim-Eval (2015) adapted from World Bank (2005)

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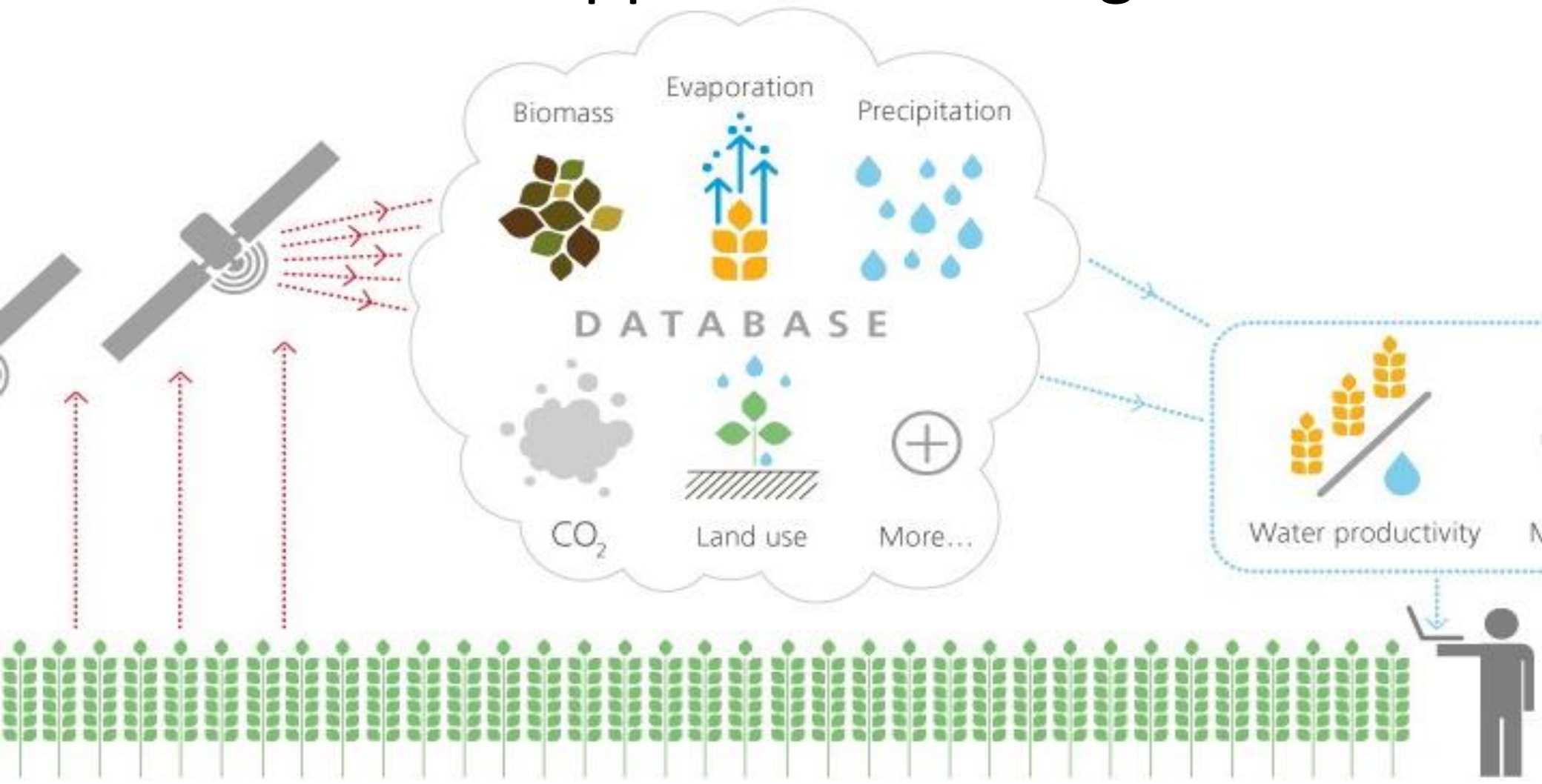
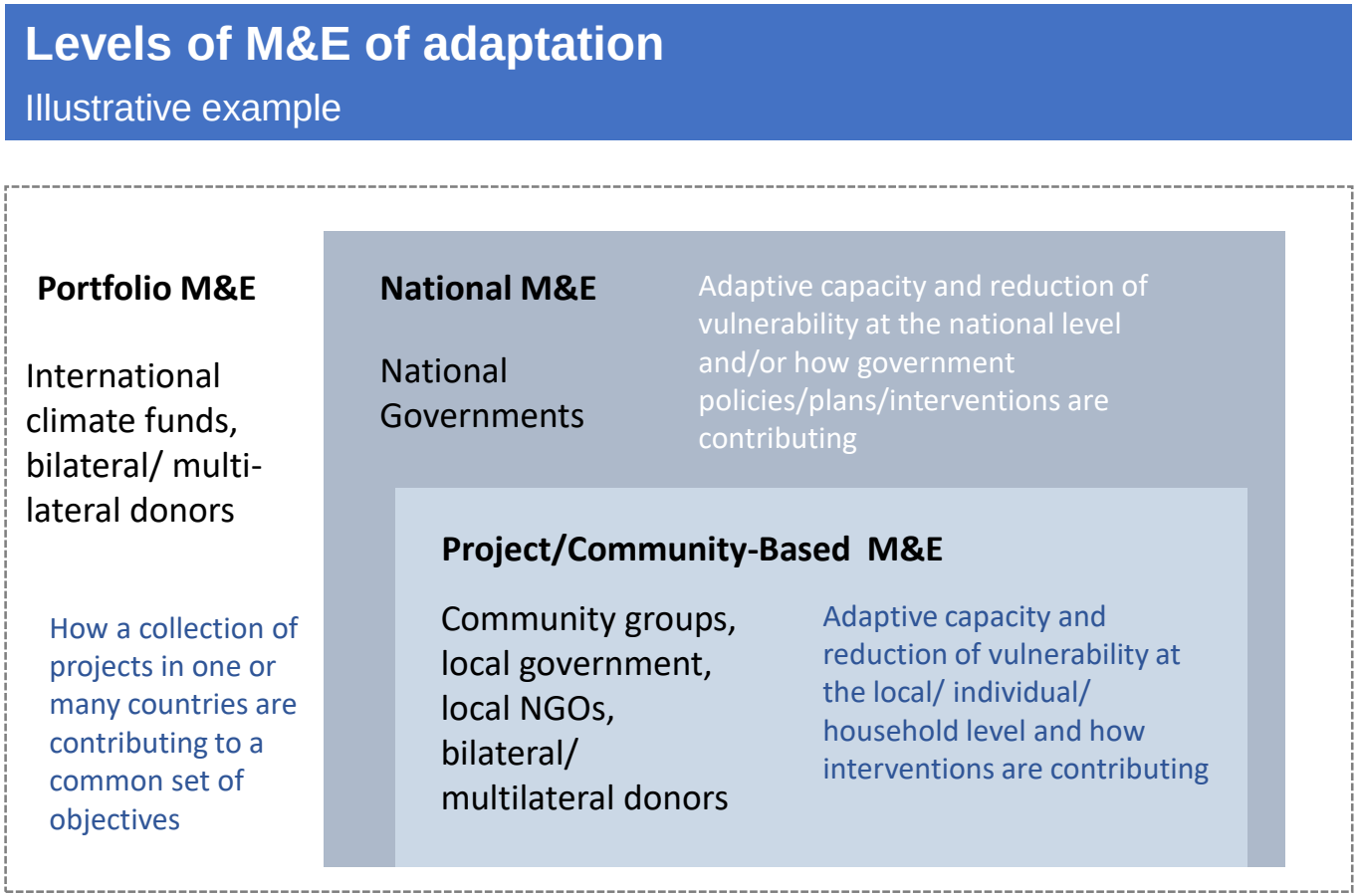
IT solutions to support monitoring



Where does sector M&E fit?



- Adaptation can occur and be monitored at many levels
- NAP is the overall framework at the national level
- Sector M&E should be integrated
- Challenges

Source: Price-Kelley et al, 2015

Source: Clim-Eval, 2015; Bours et al, 2014

Part 3

Take Away Messages

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Next Steps for FAO

- **Regional initiative on Climate Change** to support sector priorities related to Paris Agreement and 2030 Agenda
- **South Asia Water Scarcity Program** with International Water Association and Australian Water Partnership
  - New work program on the solar powered irrigation-groundwater nexus in South Asia
- **Asia Pacific Water Forum** lead on Nexus issues

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Take away messages

- Food-water-energy nexus arises due to the **interconnectedness** of natural and human systems
- **Rapid** pace of **development** in Asia presents a number of **challenges** and **opportunities** for the agriculture sectors from the **nexus** perspective
- Resolving nexus issues requires **intersectoral collaboration** to assess options and prioritize actions to address **trade-offs** and realize **synergies**

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Take away messages

- The **NAP** provides a **framework** to facilitate collaboration
- NAP **LEG Guidelines** and new **NAP-Ag Supplement** provide the basis for **how** to go about it
- **Partners** such as FAO and NAP-GSP can provide **technical support** and **tools** to help

Thank you

www.fao.org/water

www.fao.org/climate-change