Water & Climate Information Services for society

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3rd popular online lecture –
Series of Lunchtime Talks on EXtreme Climate

EXtremeClimTwin
BUILDING EXCELLENCE IN HYDRO-CLIMATE RESEARCH

Outline

Introduction to Climate Services for society

- Story on Climate Change
- 1^{st} + 2^{nd} generation Climate Services
- Design principles
- Co-production & Stakeholder engagement
- Data for decisions
- Climate services domains & real-life examples

What are Climate Information Services?

Story on weather forecast

1920’s

1980’s

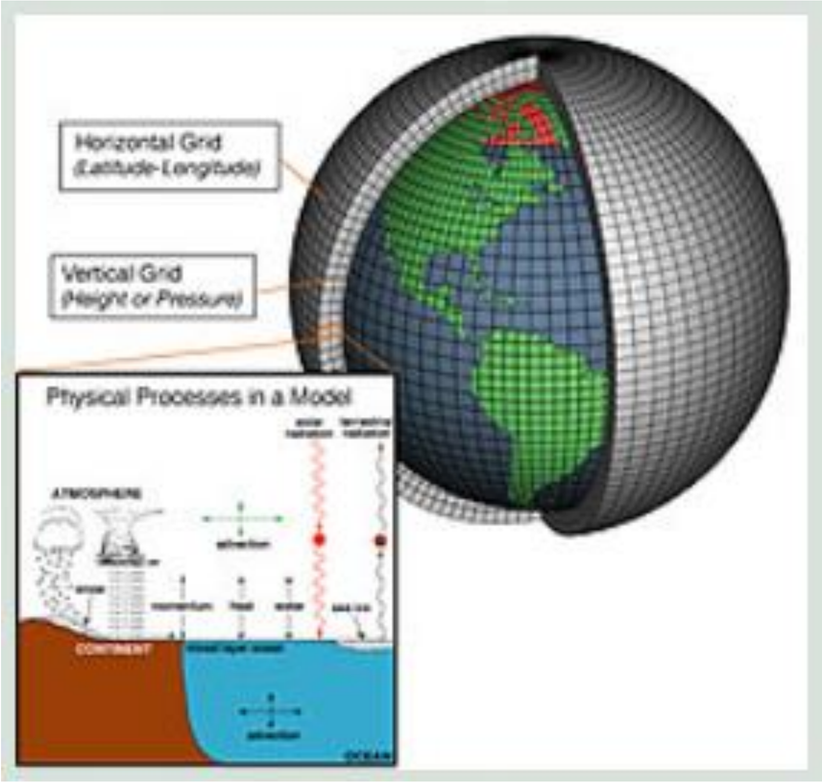
today

Story on climate change (short version)

1938 Guy Stewart Callendar demonstrated evidence of temperature and CO2 increase in the atmosphere

In the 1960s, the first-of-its-kind general circulation climate model was developed

Glenn T. Seaborg (Nobel price) warned of the climate crisis in 1966



70s and 80s were the firsts scientific consensus on climate change

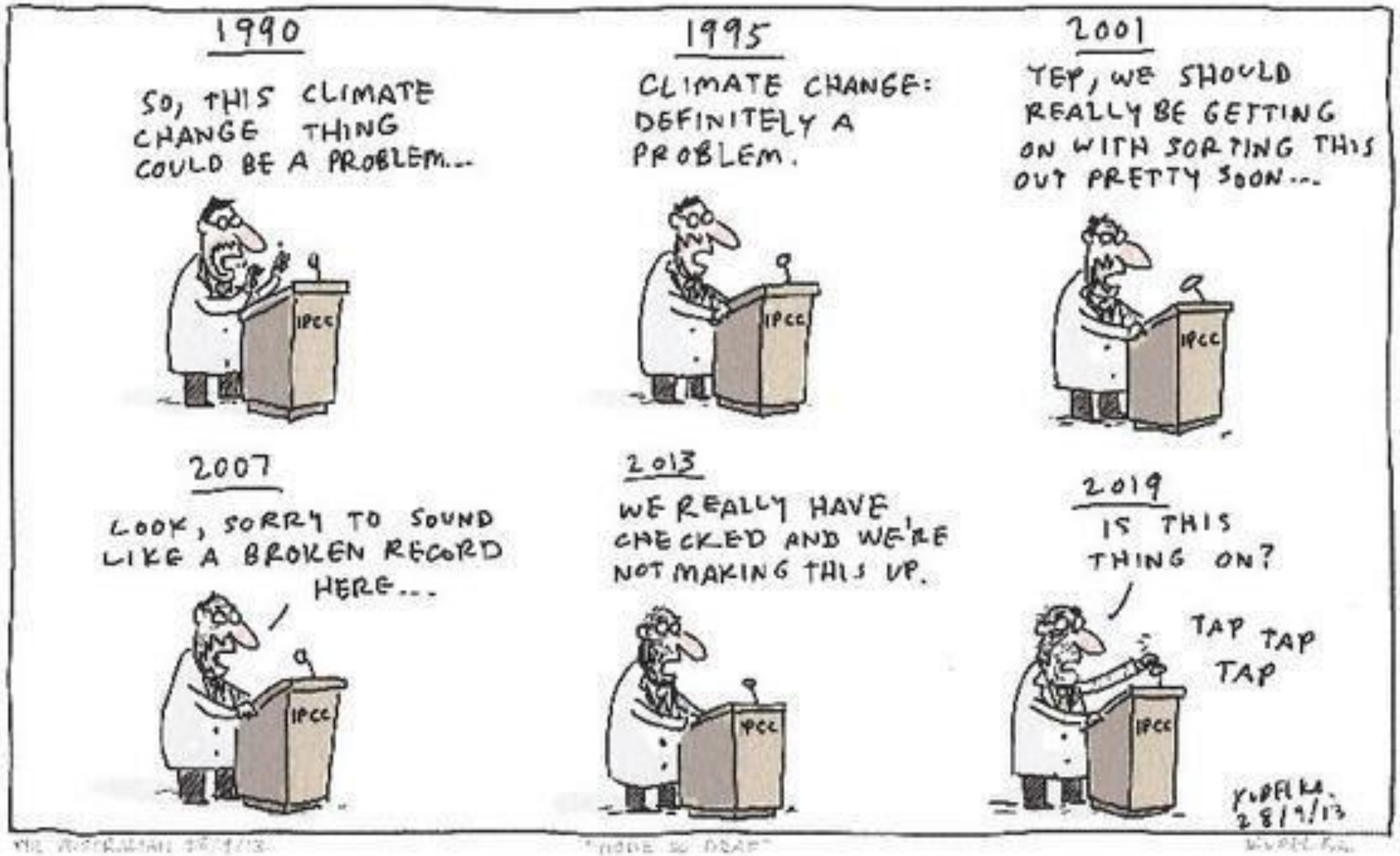
Intergovernmental Panel on Climate Change (IPCC)

Why the IPCC ?

Created in 1988 by WMO and UNEP.

The objective of the IPCC is to provide governments at all levels with scientific information that they can use to develop climate policies.

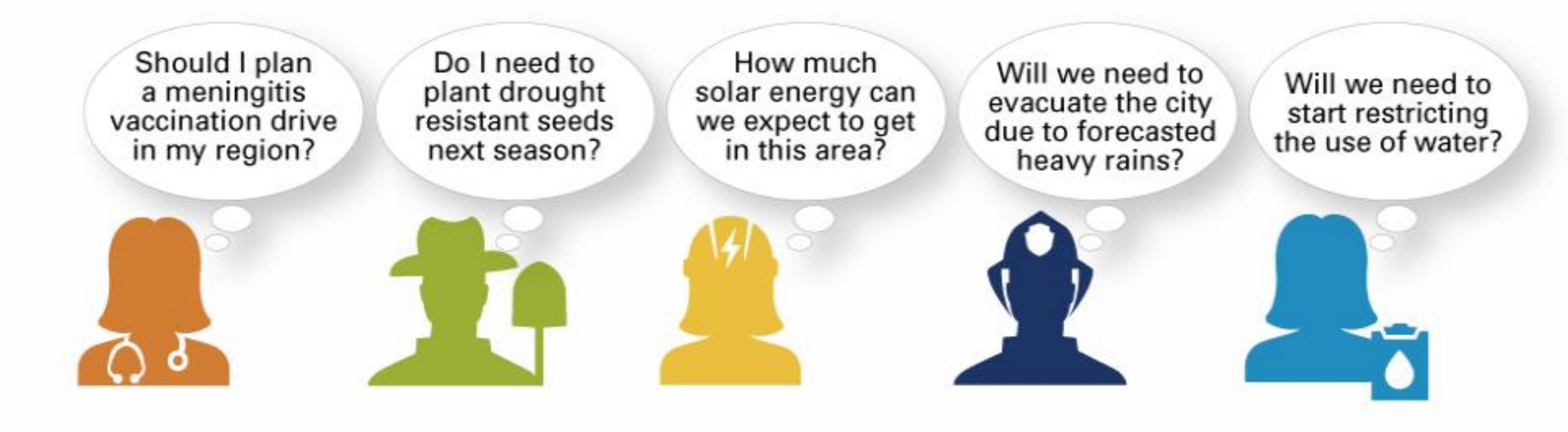
WMO = World Meteorological Organization
UNEP = United Nations Environment Programme


1990
SO, THIS CLIMATE CHANGE THING COULD BE A PROBLEM...
IPCC
1995
CLIMATE CHANGE: DEFINITELY A PROBLEM.
IPCC
2001
YEP, WE SHOULD REALLY BE GETTING ON WITH SORTING THIS OUT PRETTY SOON...
IPCC
2007
LOOK, SORRY TO SOUND LIKE A BROKEN RECORD HERE...
IPCC
2013
WE REALLY HAVE CHECKED AND WE'RE NOT MAKING THIS UP.
IPCC
2019
IS THIS THING ON?
TAP TAP TAP
IPCC
KUDELKA. 28/9/13


CLIMATE
CHANGE

What are climate services ?

Services that **provide** climate **information** to help individuals and organizations make **climate smart decisions**.



Climate Services for sectoral applications

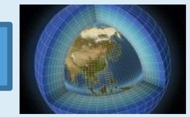
- Weather and climate information are used for a variety of applications:

Sectoral applications	
Agriculture	Health
Water resources	Tourism
Forest and Ecosystems	Insurance
Civil Infrastructure	Litigation
Construction	Marine and coastal ecosystems
Coastal Hazards	Transportation
Energy	National Security

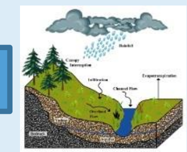
1st generation of services: top-down

Hydro & Climate observations

Climate Models



Impact Models

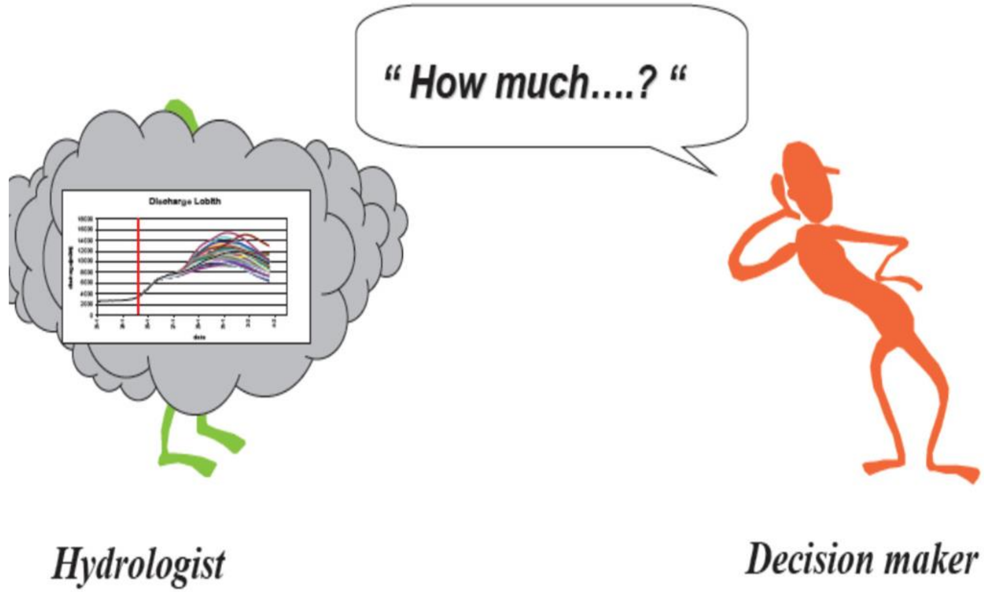


Scenario development, data analyses and multi model assessments

Visualisation and User interface

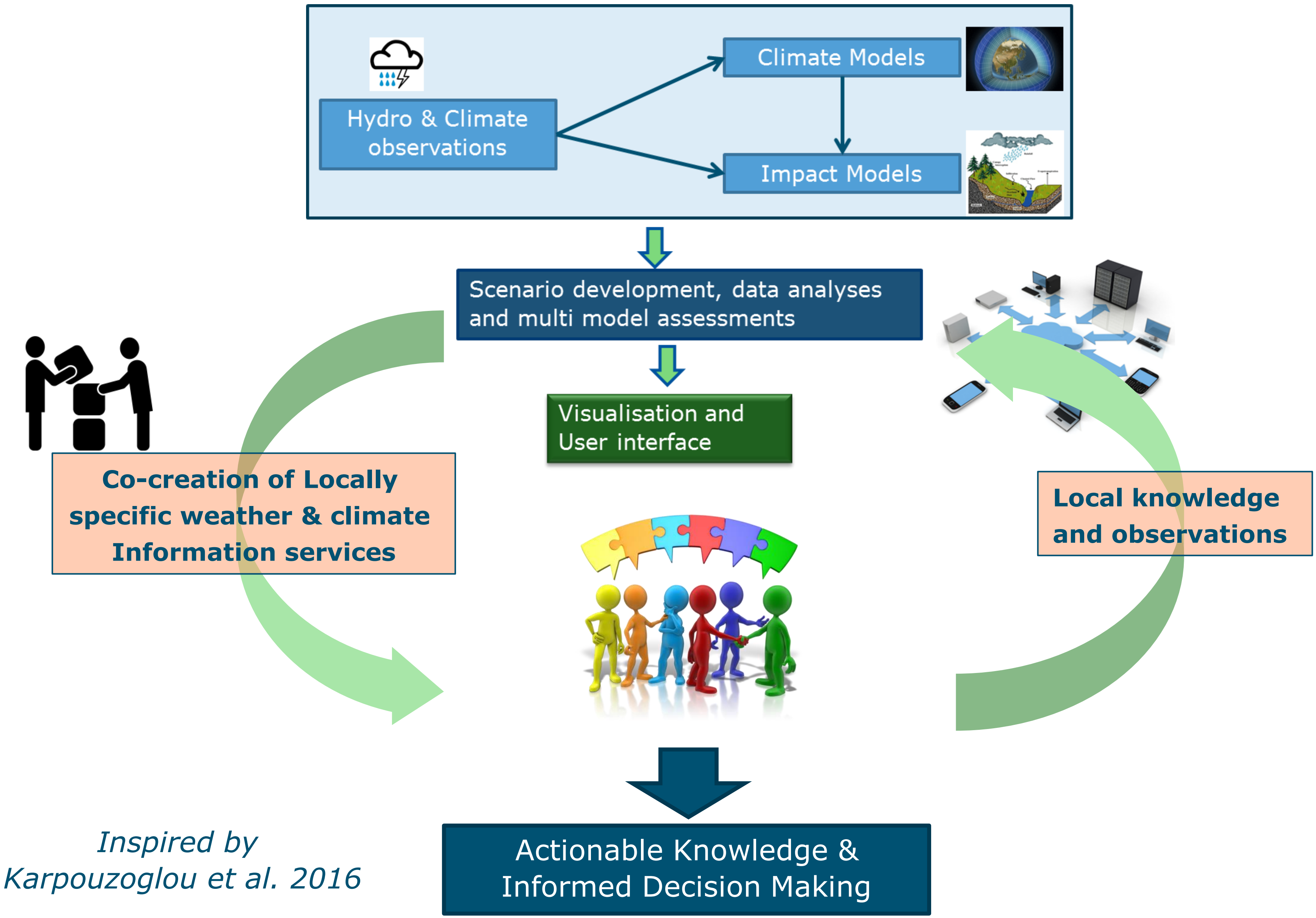
PRODUCTS

Usability gap



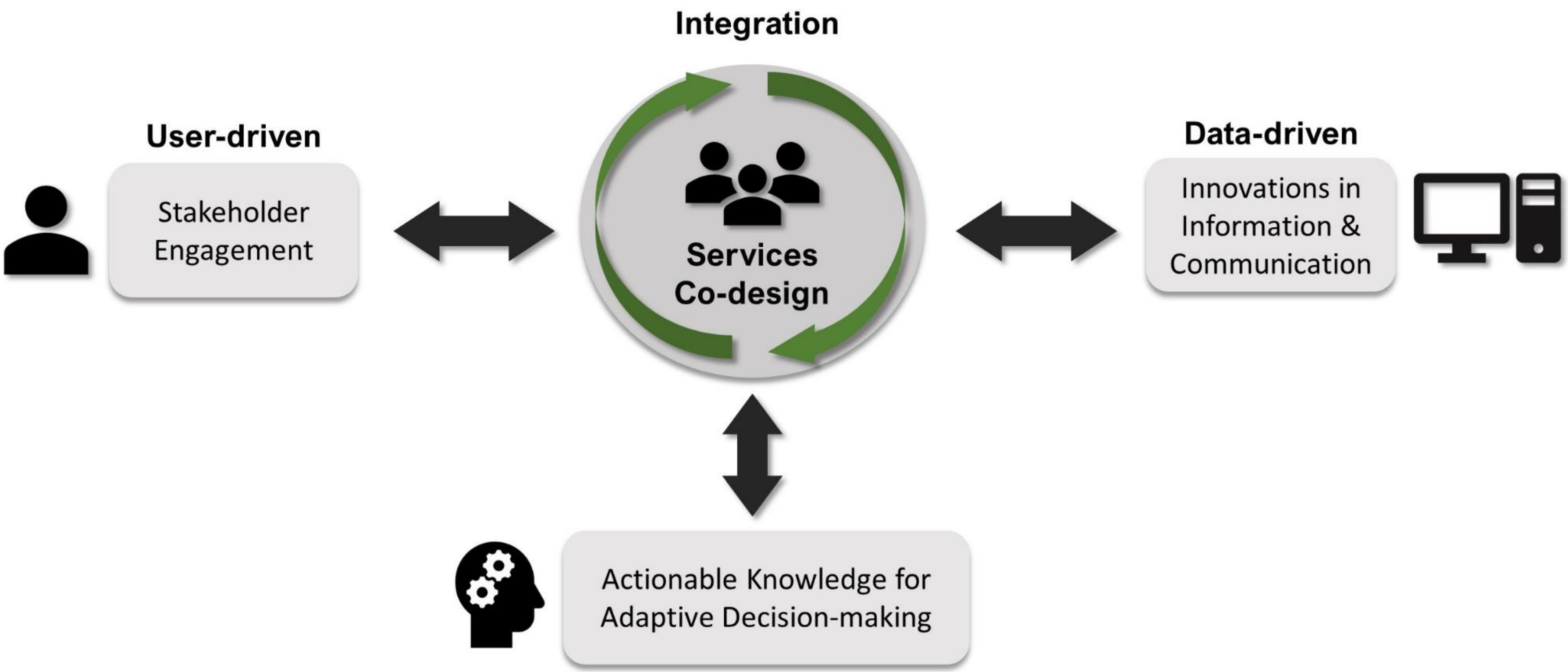
" unsuitability to inform decision-making processes in relation to adaptation against climate change"

2nd generation of services: bottom-up



How can we design our services?

Services tailored to the needs of end-users



Participatory services for decision-making

Co-designing participatory services incorporates 3 components:

1. Stakeholder engagement

2. Use of innovations in information and communication technologies

3. Actionable knowledge for adaptive decision-making

1. Stakeholder engagement

- ✓ Information that is relevant to the users
- ✓ Helps build trust
- ✓ Active engagement on the arena
- ✓ Harness local knowledge
- ✓ Jointly (co-)develop services
- ✓ Capacity building
- ✓ Multi-sector & multi-actor approach

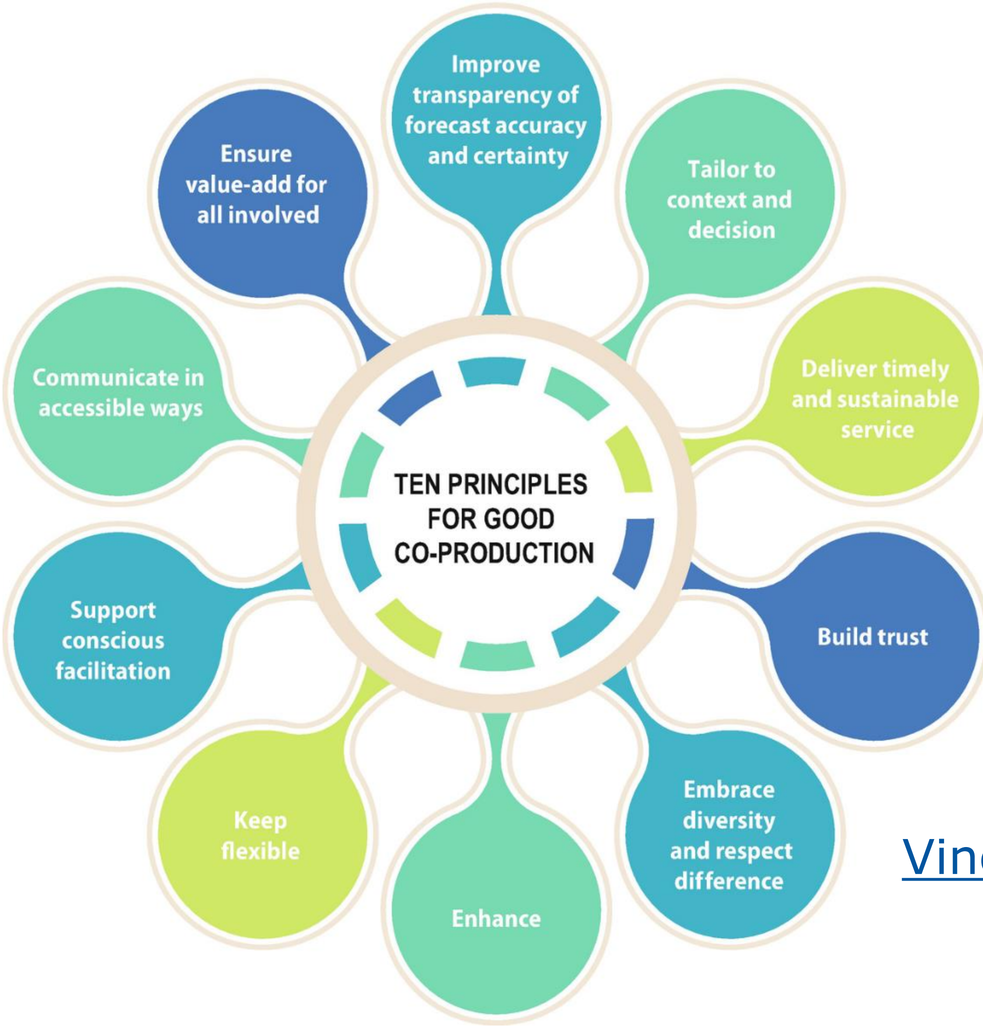
2. Innovations in Information & Communication

- ✓ Knowledge sharing platforms
- ✓ Virtual communities
- ✓ Possibilities for interaction
- ✓ Evolving capability to predict weather
- ✓ Possibilities for interaction
- ✓ 'More local scale' information
- ✓ Enhance digital literacy

3. Adaptive decision making

- ✓ Actionable knowledge
- ✓ Individual & collective decision-making
- ✓ Climate services → an adaptation option
- ✓ CC adaptation → governance
- ✓ Public-Private Partnerships
- ✓ Institutional uncertainties
- ✓ Services' hybridization

Why do we co-produce our services?



Vincent et al. 2021

User/demand-driven approaches

User/demand-driven approaches allows to deliver a climate service that provides actionable knowledge

Actionable knowledge reflects the learning capability of individuals and organizations to connect heterogeneous elements (social, technical, economic , political, etc..)

Tailor-made services are:

- Timely
- Accessible
- Understandable to the decision-maker -> Usable

Stakeholders in climate services

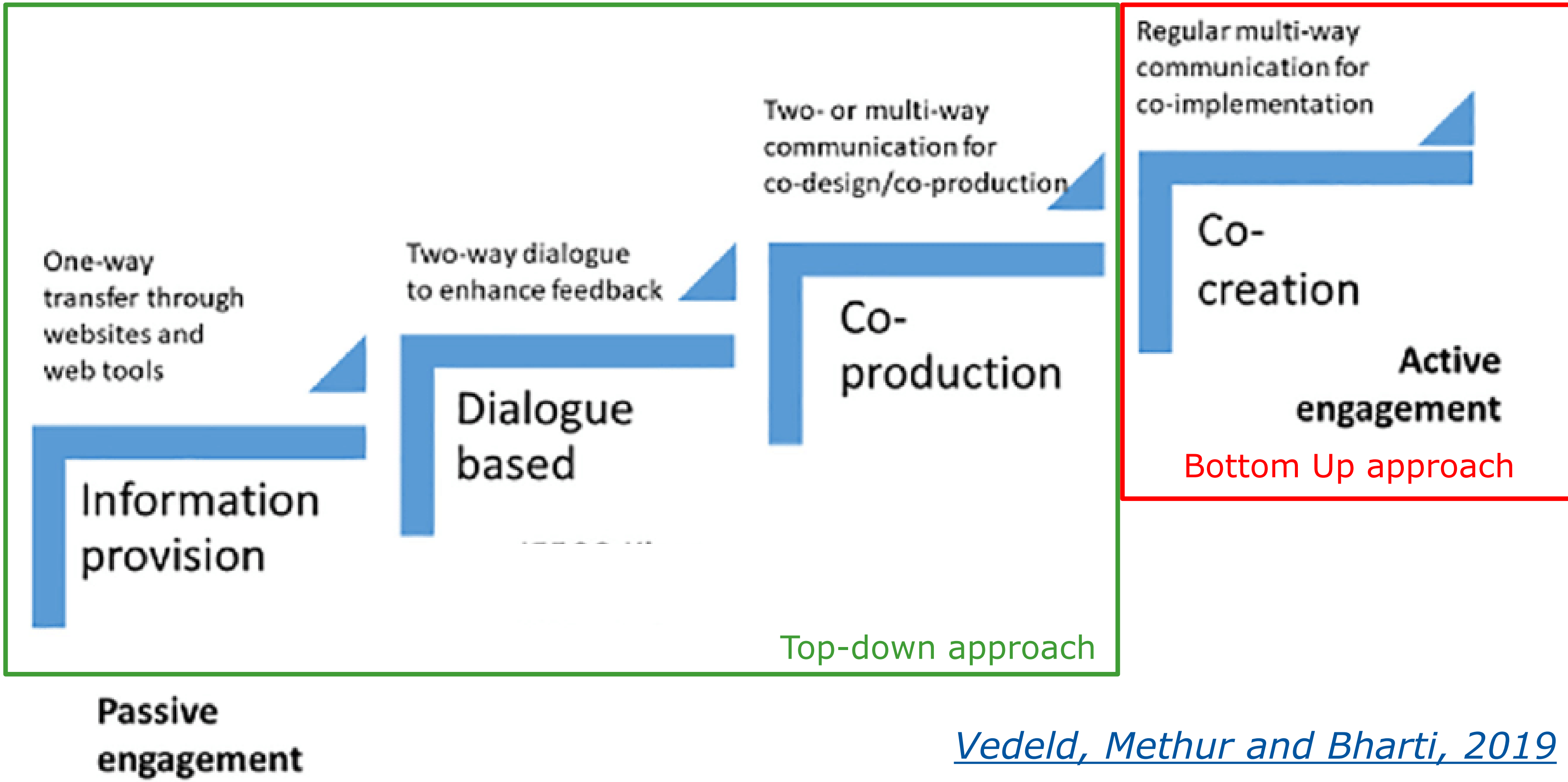
User engagement

End-Users
(decision-makers)

Climate service producers
(information generation)

Climate service providers
(supply)

Levels of user engagement



Vedeld, Methur and Bharti, 2019

Data-driven approaches

- Current **weather and climate data** are used in many ways
- **Decision-makers** rely on easy-to-understand graphs and maps while planning for energy needs, water management, extreme weather events, etc.
- Local climate data are also used to determine specific local budgets
- Climate data are used by people across **many sectors of our economy**

Domains of Climate Services

Real time decision making

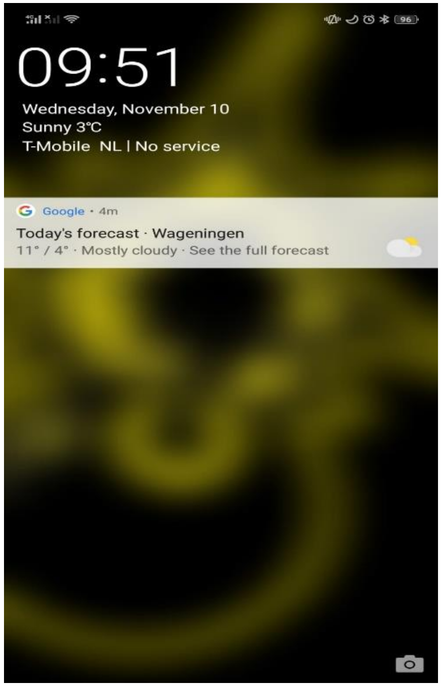
Adaptive decision making

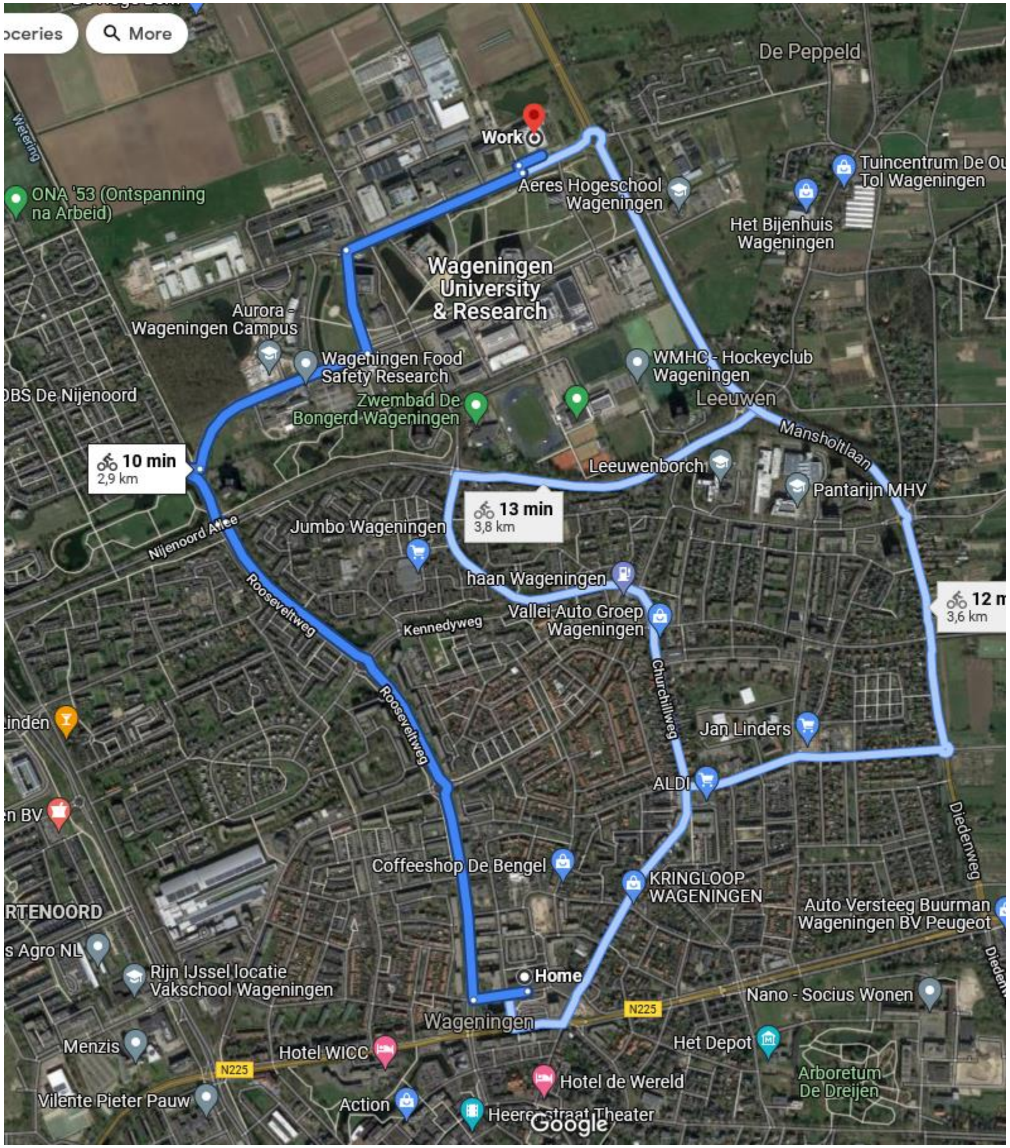
Longer-term (strategic adaptation) planning

Awareness

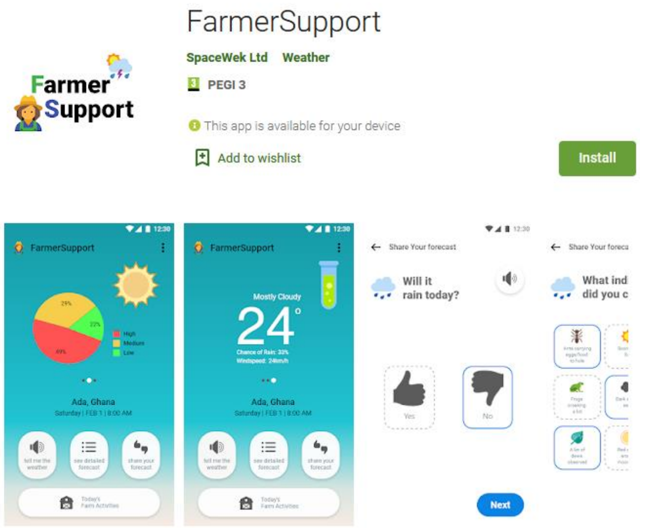
Weather → **Climate**

Real time decision making





Adaptive decision making



WATER APP

http://www.waterapps.net/waterapp/

WATER APP scale

http://www.waterapps.net/waterappscale/

Longer-term (strategic adaptation) planning

Bangladesh Delta Plan 2100

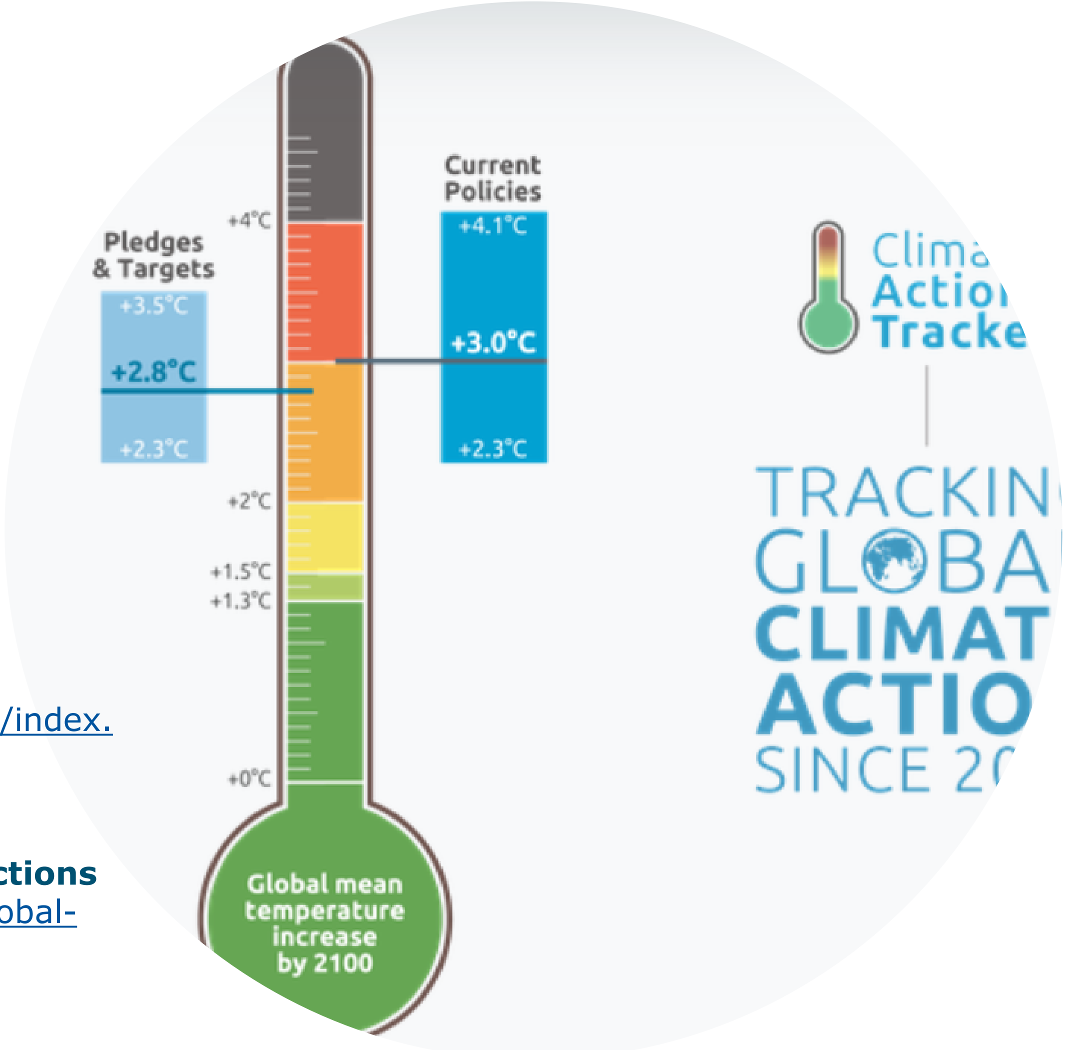
Awareness

Climate Action Tracker
https://climateactiontracker.org

Europe CC, Impact & vulnerability
http://www.climsave.eu/climsave/index.html

Exploring Climate Model Data
https://climate4impact.eu/impactportal/general/index.jsp

Atlas of Global and Regional Climate Projections
https://www.ipcc.ch/report/ar5/wg1/atlas-of-global-and-regional-climate-projections/



Combined-domain climate services

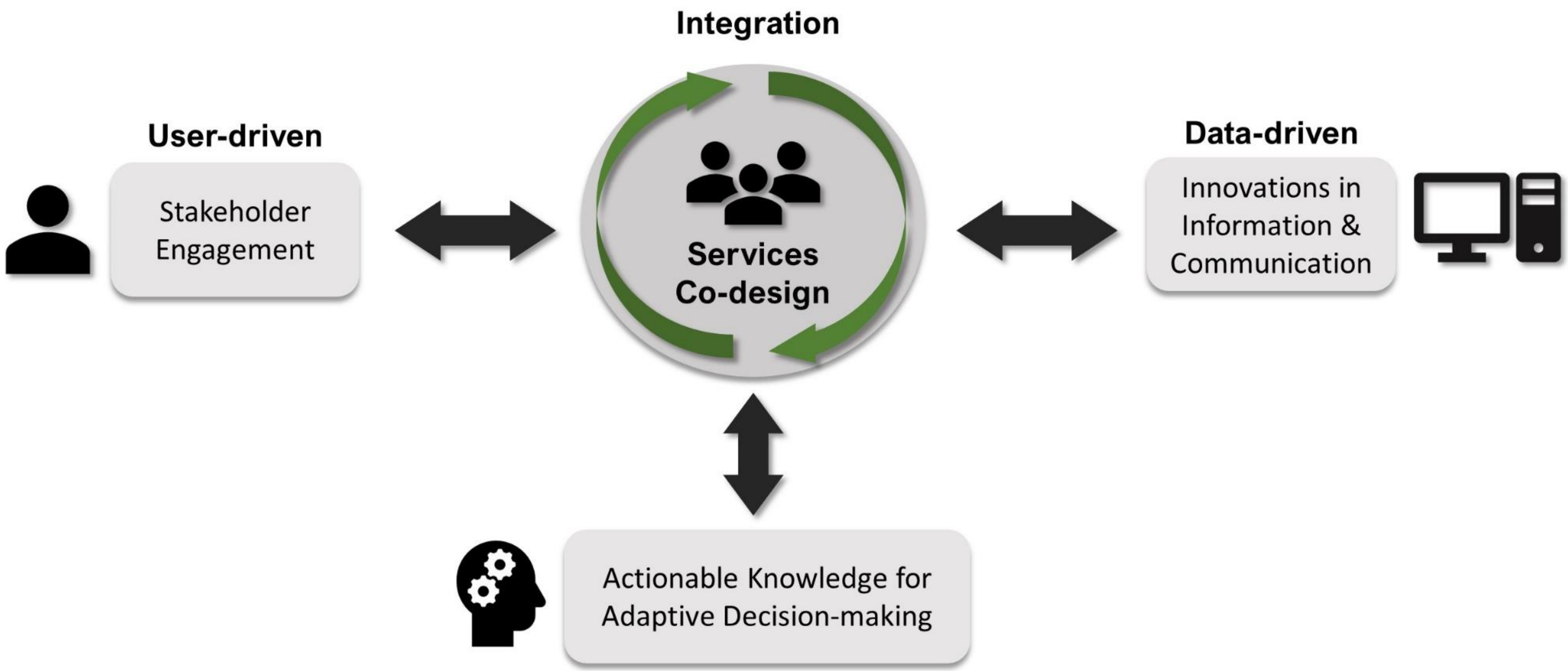
Copernicus Services

(Some of the many) remaining issues…

- Integration of local and scientific knowledge
- Role of co-production within the design and delivery of services
- Role of capacity building
- Mechanisms that provide actionable knowledge to support adaptive decision-making
- Services uptake, upscale & sustainability

Take home message

Tailor-made services to the needs of end-users ⟶ Integration is key!



Thank you!
Dank U!

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100years
1918 — 2018

APPENDIX

WATERAPPS project

2016-2021

Aim

Provide **tailor-made** water and climate information services **with and for farmers** for sustainable food production in peri-urban delta areas in Ghana and Bangladesh.

Ada, Ghana

Khulna, Bangladesh

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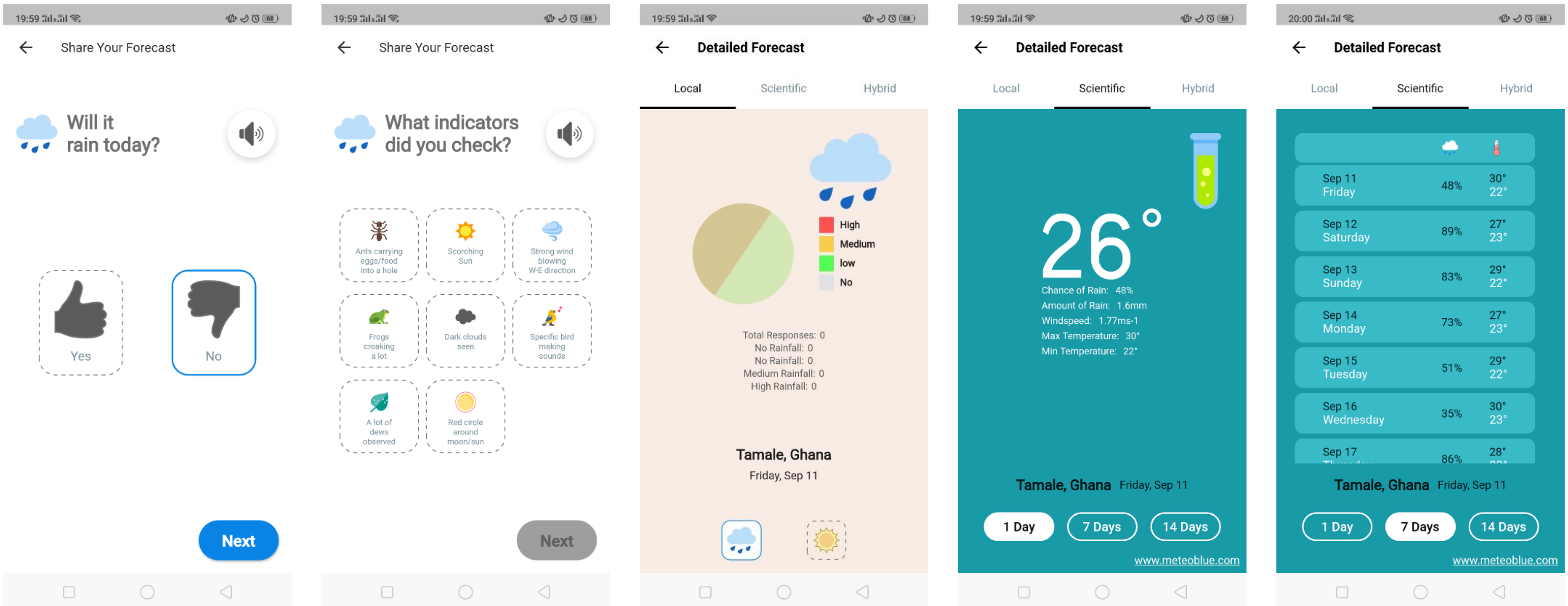
100years 1918 — 2018

Source: WaterApps website

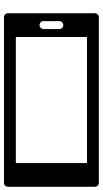
...into an actual information service

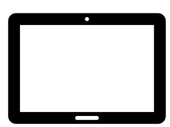
Farmer Support

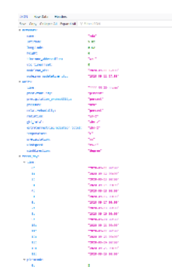


Farmers insert data

meteoblue provides data







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Source: FarmerSupport app - WATERAPPS

Way forward: WATERAPPscale

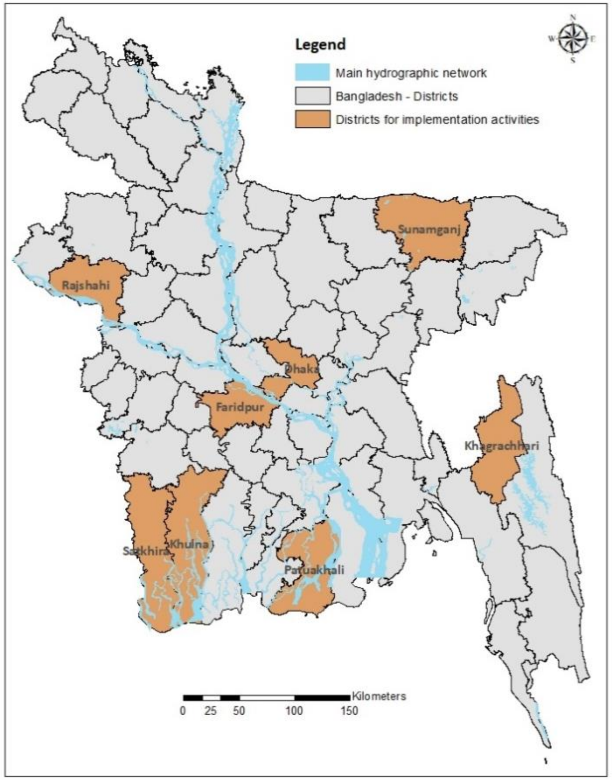
2021-2023

Aim
Upscale the WATERAPPS activities by transferring and **implementing the knowledge from WATERAPPS** in other regions on Bangladesh in accordance with the BDP-2100.

1. **Proof of concept:**
Implementation and testing at multiple locations

2. **Services design:**
Further develop and implement design principles.
Bridge top-down & bottom-up activities

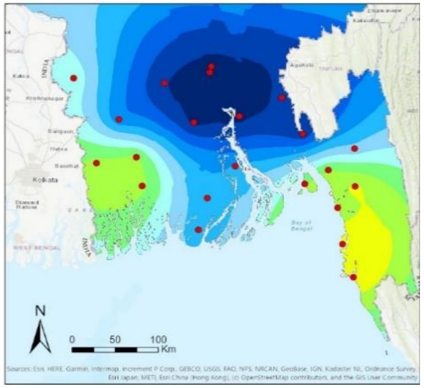
3. **Adaptive delta management:**
Enable adaptive decision-making



What can be a climate service?

Let’s use the WATERAPPS example. A service can be:

- An ICT-Tool Farmer Support
- A website (www.waterapps.net)
- A map, figure, animation, ...
- A document (report, policy briefs)
- A social media group
- A capacity building training (WATERAPPS Weather club)
- An announcement (Amphan cyclone warning!)
- ...



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100years 1918 — 2018

Conceptual framework WCIS

STEP 1	STEP 2	STEP 3	STEP 4
What / whose decision / action to support ?	Information demands / needs Information supply / actionability	Testing / co-production Interface / visualization	Monitoring success / value of information system
Rural and peri-urban farming communities	Needs assessment	With and for farmers	Feedback / optimization

Data for decisions: water resources

- Use **short-duration rainfall** values to reduce stormwater-borne pollutants
- Using the **amount**, **location**, and **duration** of rainfall from a **heavy precipitation event** to define the magnitude of a storm
- Using **drought information** to regulate water levels
- Using **temperature** and **snowpack** trends to determine changes in runoff

Data for decisions: civil infrastructure

- Climate data to design **buildings** to withstand hurricane-force winds
- Use historic precipitation data to build **roads** above potential flood levels
- Use maximum precipitation data for designing and constructing **dams**
- Use hourly and daily temperatures to determine averages and frequency distributions to design heating, cooling and **refrigeration systems**
- Use ice thickness (due to freezing rain) for **structural design** consideration

Data for decisions: construction

- Use precipitation data to design resistant natural gas **pipeline trenches**
- Use temperature data to determine the **optimal building insulation**
- Use past data to construct **residential** and **commercial buildings**
- **Operational**: Use historical rainfall data to plan ahead for "rain days"—days in which no outdoor work can be conducted due to precipitation events
- Use rainfall data to determine optimal **locations** for building **outdoor venues**

Data for decisions: coastal hazards

- Use climate data related to frequency, intensity, and duration of extreme weather events to assess potential **mitigation and adaptation strategies**

- Use data to develop coastal erosion information for **construction works**

- Use local climatology data to assist in the design and construction of homes and **infrastructure** that can **withstand extreme coastal weather events**

- Use tide gauge data to evaluate local sea-level rise and the **potential impacts** on infrastructure, and transportation in **low-lying coastal regions**