Water & Climate Information Services for society

Υδρο-κλιματολογικές υπηρεσίες πληροφόρησης για την κοινωνία

Spyros Paparrizos

Assistant Professor Water & Climate Information Services
Water Systems and Global Change Group (WSG)
Wageningen University & Research (WUR), Netherlands
spyros.paparrizos@wur.nl

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UNIVERSITY & RESEARCH

100years
1918 — 2018

WUR – WSG - Spyros

BSc. *'Forestry & Environment and Natural Resources (integrated masters)'* – DUTh, GR

MSc *'Sustainable development of the Environment'* – DUTh, GR

PhD *'Spatial & Applied Hydro-climatology'* – Freiburg University, Germany

Wageningen University and Research (**WUR**)

Water Systems and Global Change (**WSG**)

Climate Services

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100years 1918 — 2018

[WSG-WUR website]

Outline – DAY 1

Part I: Introduction to Water and Climate Information Services

- Story on Climate Change
- 1st + 2nd generation WCIS
- Domains of WCIS
- Data for decisions
- Stakeholder engagement for services co-production

(*30-40 mins*)

BREAK (*5-10 mins*)

Part II: Exercise

- Explain exercise (*5 mins*)
- Self-study (*15-20 mins*)
- Plenary discussion (*10-15 mins*)

What are Climate Information Services?

Story on weather forecast

1920’s

1980’s

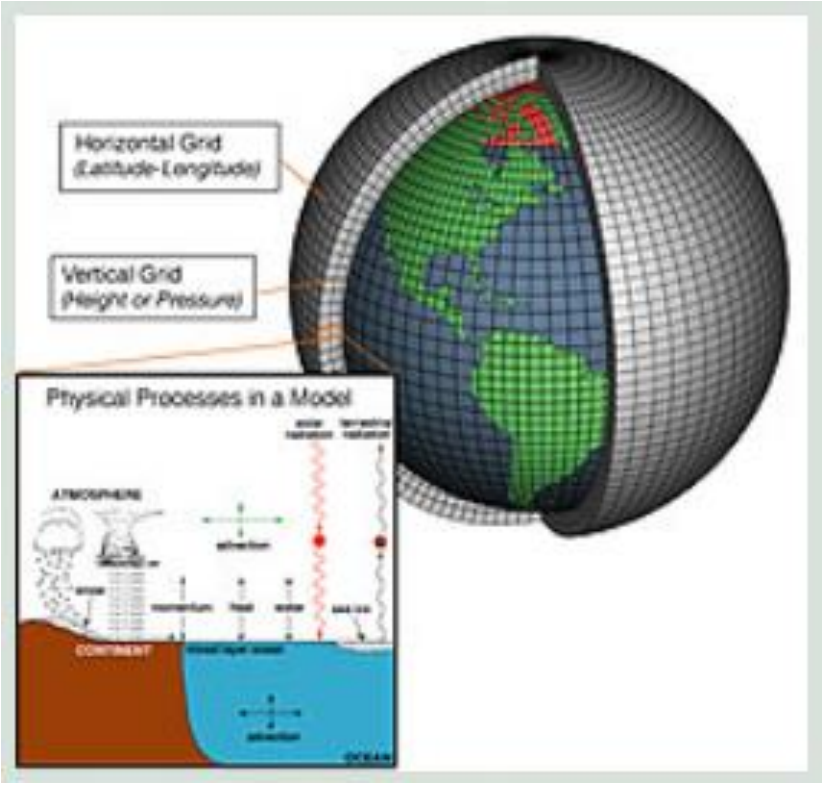
today

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

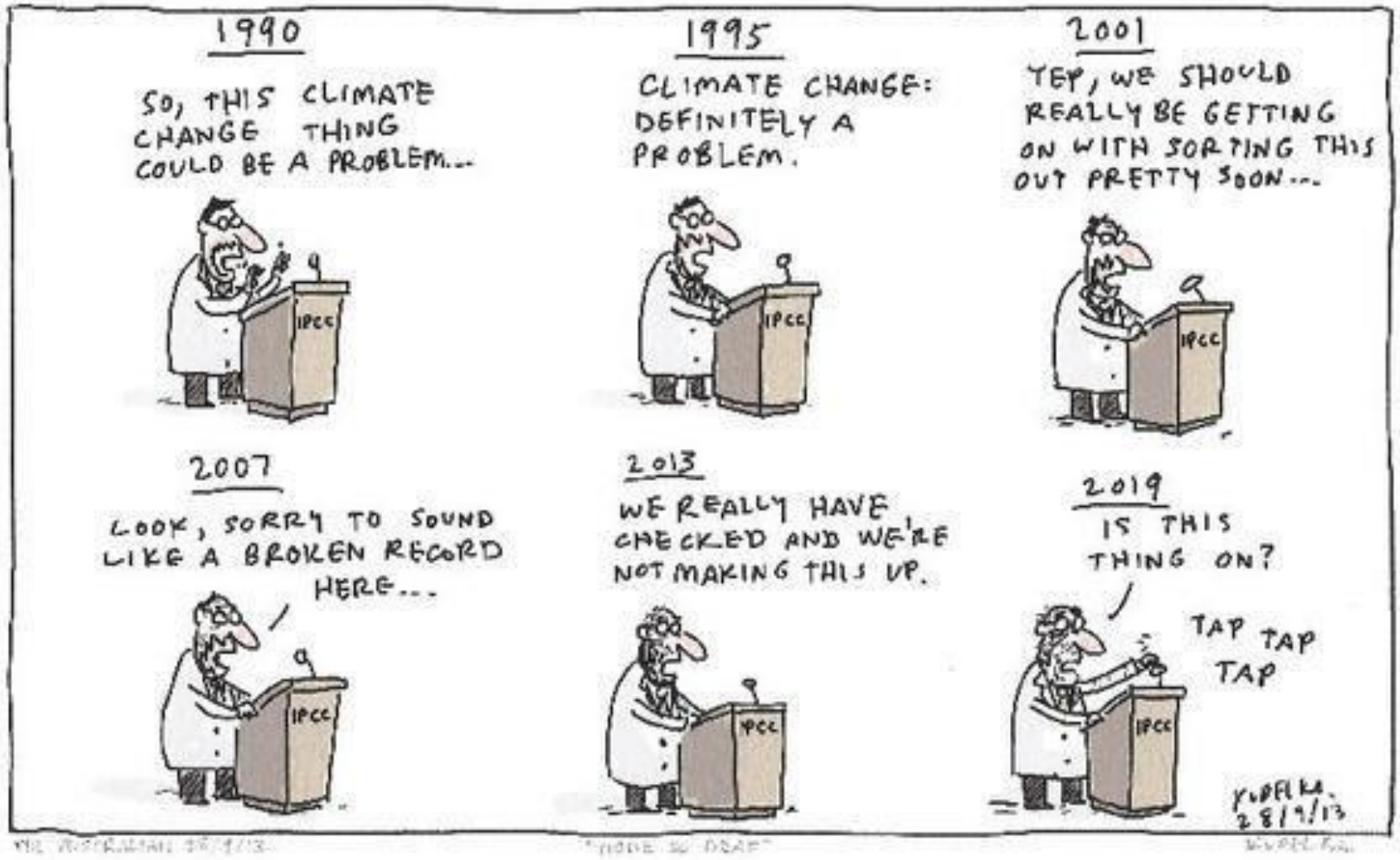
Intergovernmental Panel on Climate Change (IPCC)

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.

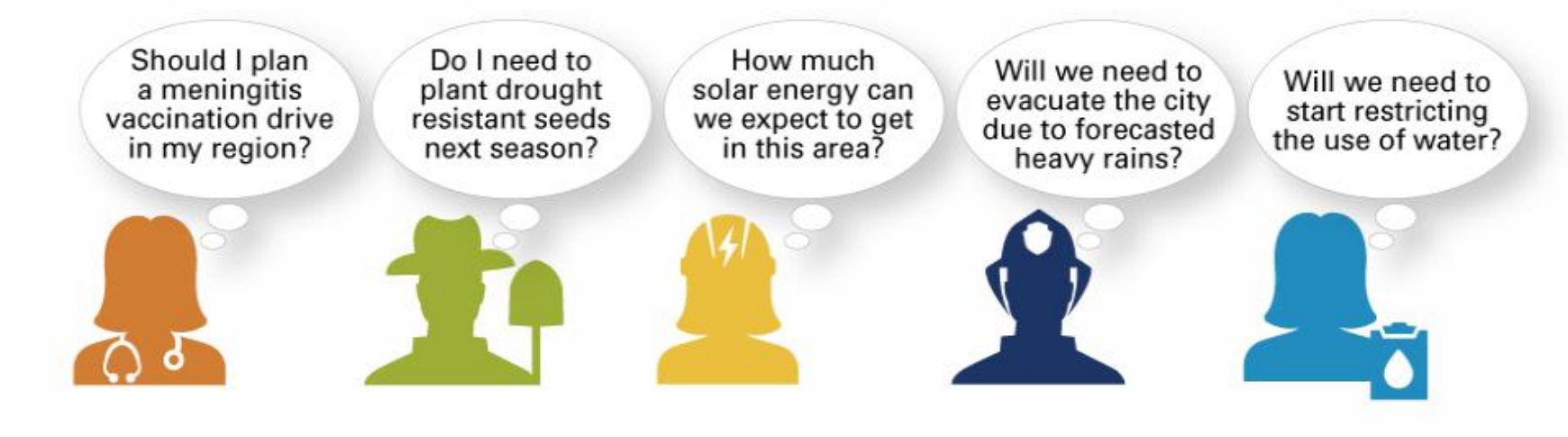
WMO = World Meteorological Organization
UNEP = United Nations Environment Programme


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

Τι συμβαίνει εδώ?

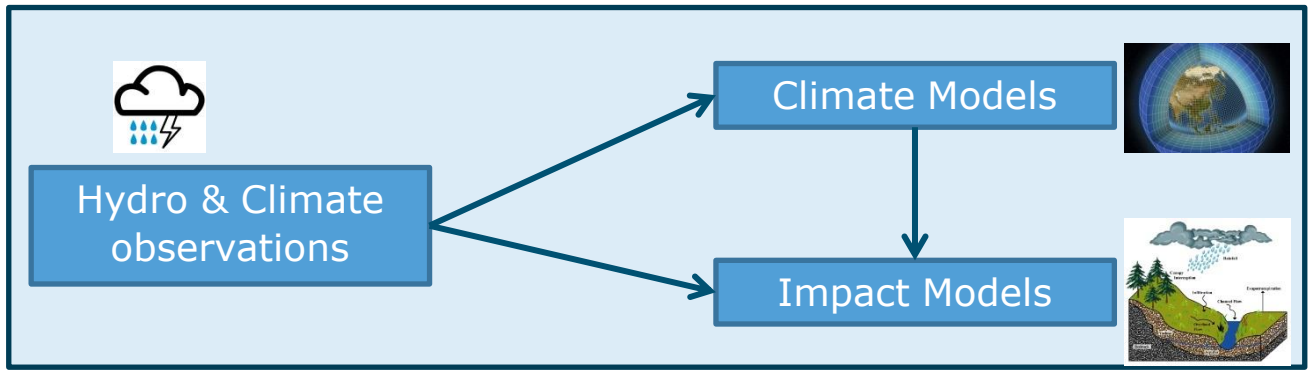
What are weather & climate services ?

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



Climate Services for sectoral applications

1st generation of services: top-down

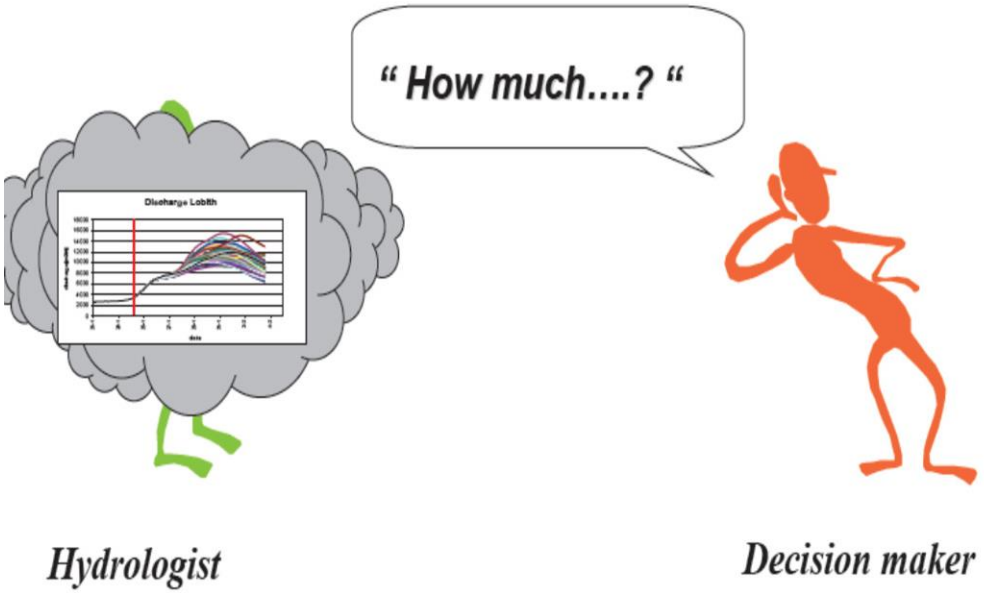


Scenario development, data analyses and multi model assessments

Visualisation and User interface

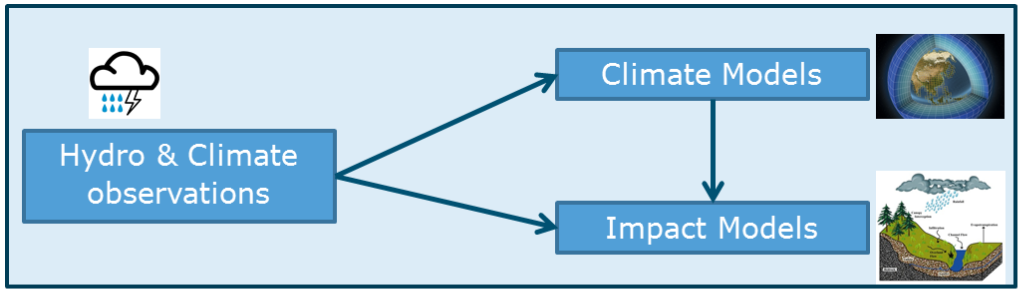
PRODUCTS

Usability gap



" unsuitability to inform decision-making processes in relation to adaptation against climate change" (source: K. Raaphorst, et al. 2019)

2nd generation of services: bottom-up



Scenario development, data analyses and multi model assessments

Visualisation and User interface

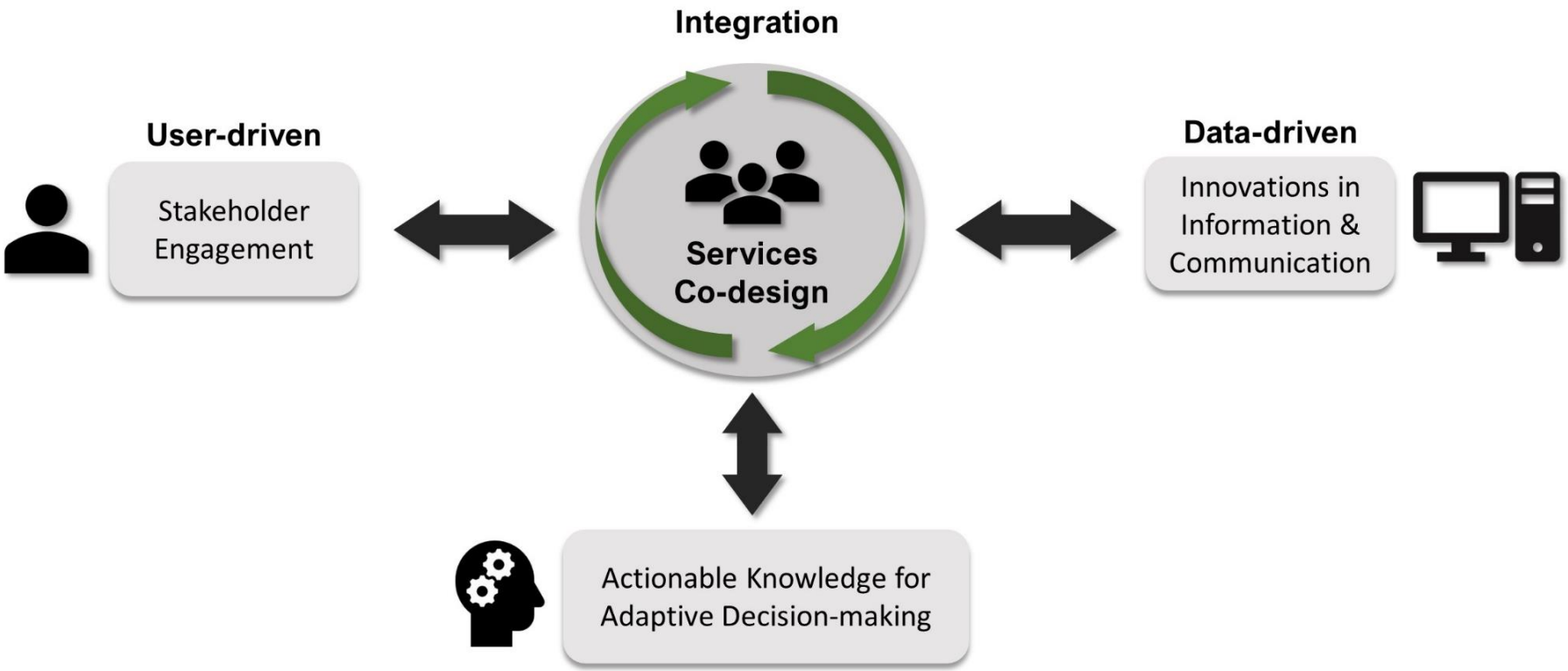
Co-creation of Locally specific weather & climate Information services

Local knowledge and observations

Actionable Knowledge & Informed Decision Making

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

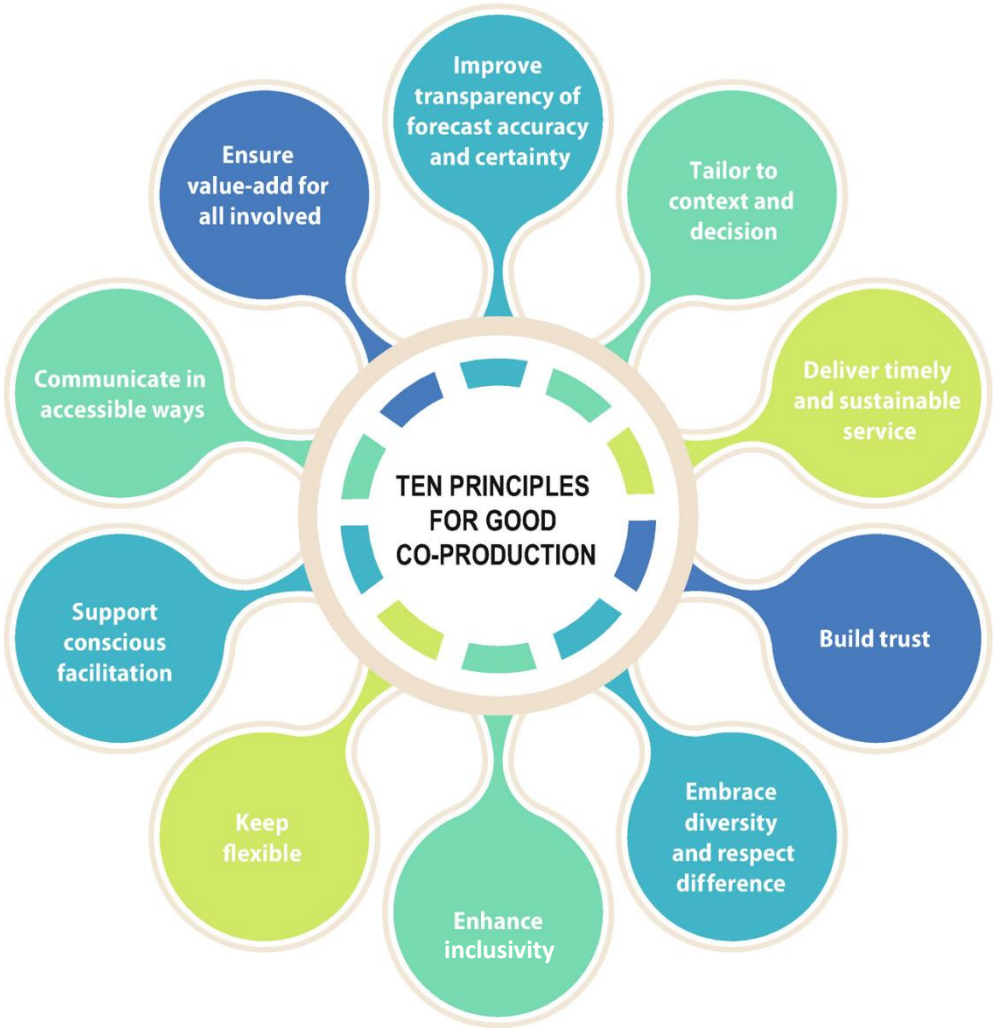
2. Innovations in Information & Communication

- ✓ 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 climate services

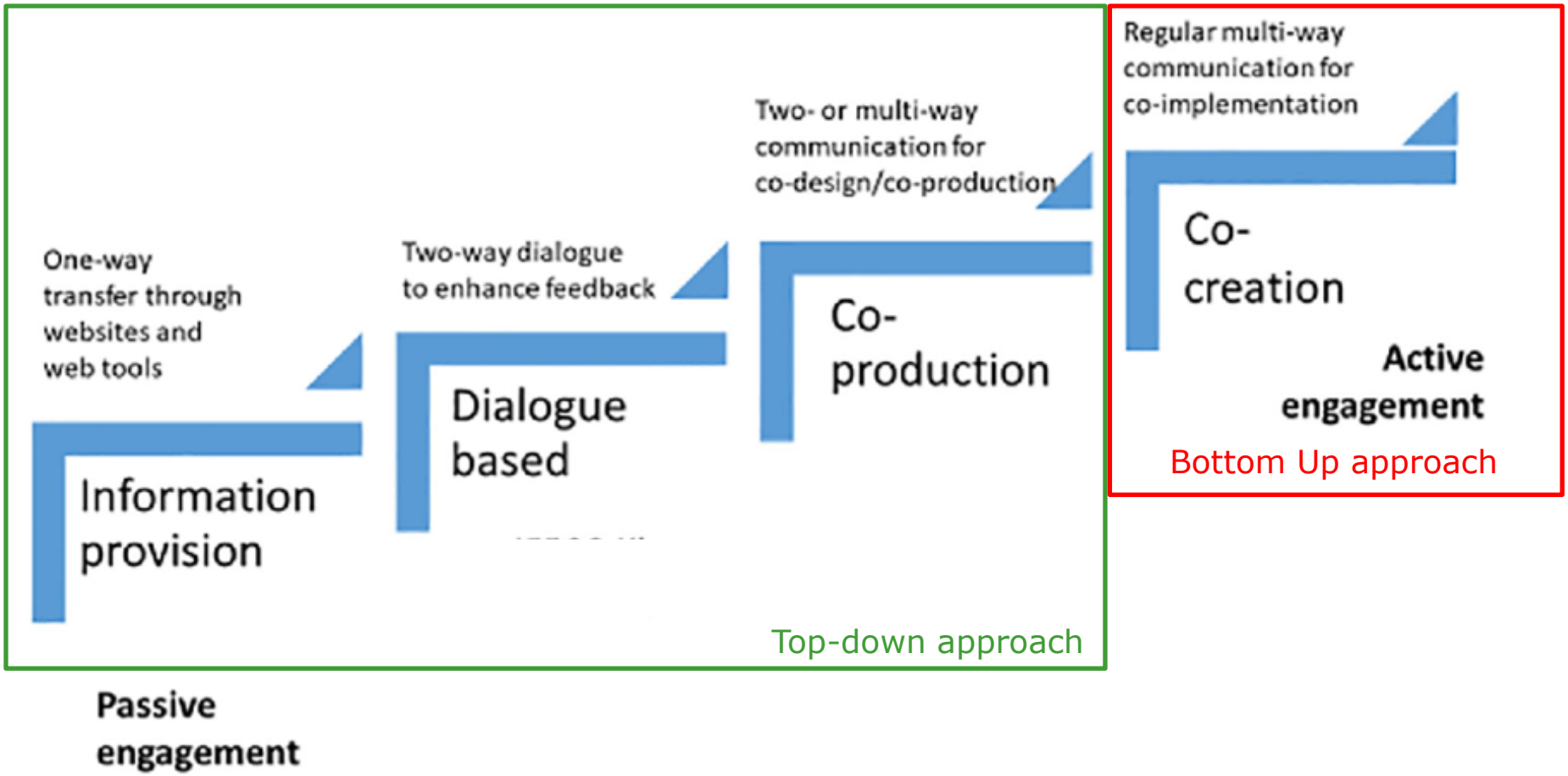
User/demand-driven approaches allows to provide a climate service that provide actionable knowledge

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

User engagement in climate services

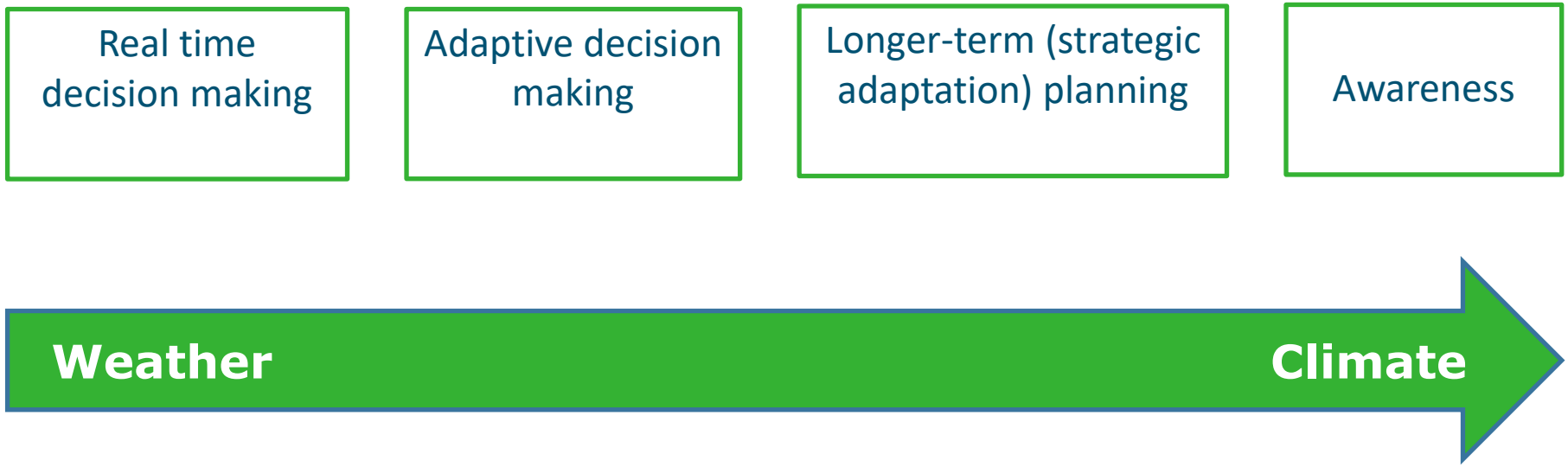


Source: Vedeld, Methur and Bharti, 2019

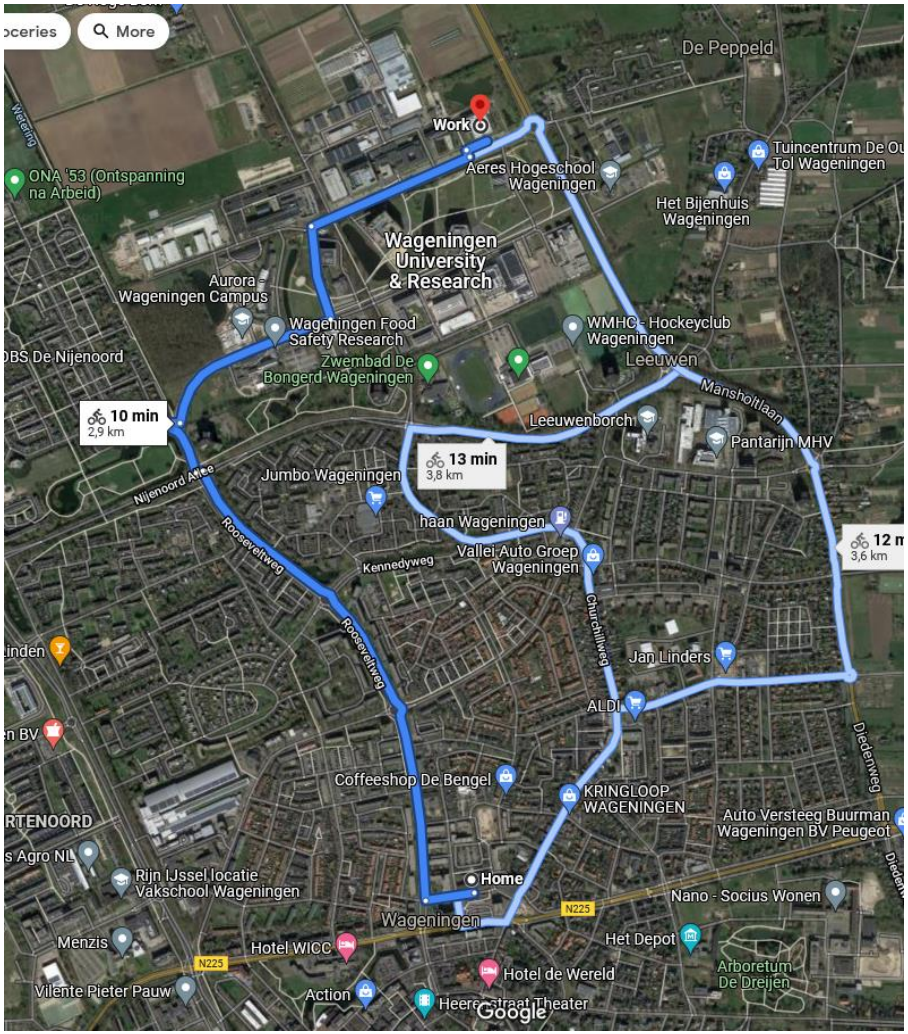
Data-driven approaches

- 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**

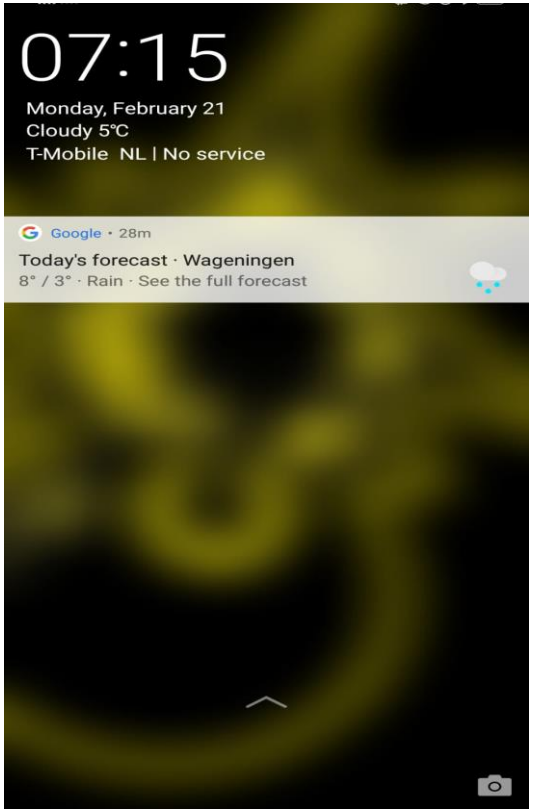
Domains of Climate Services



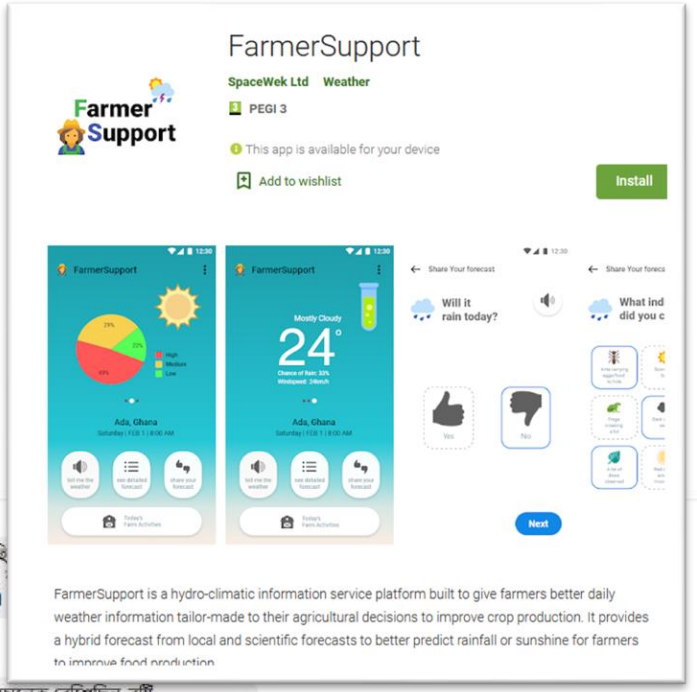
Real time decision making



Google

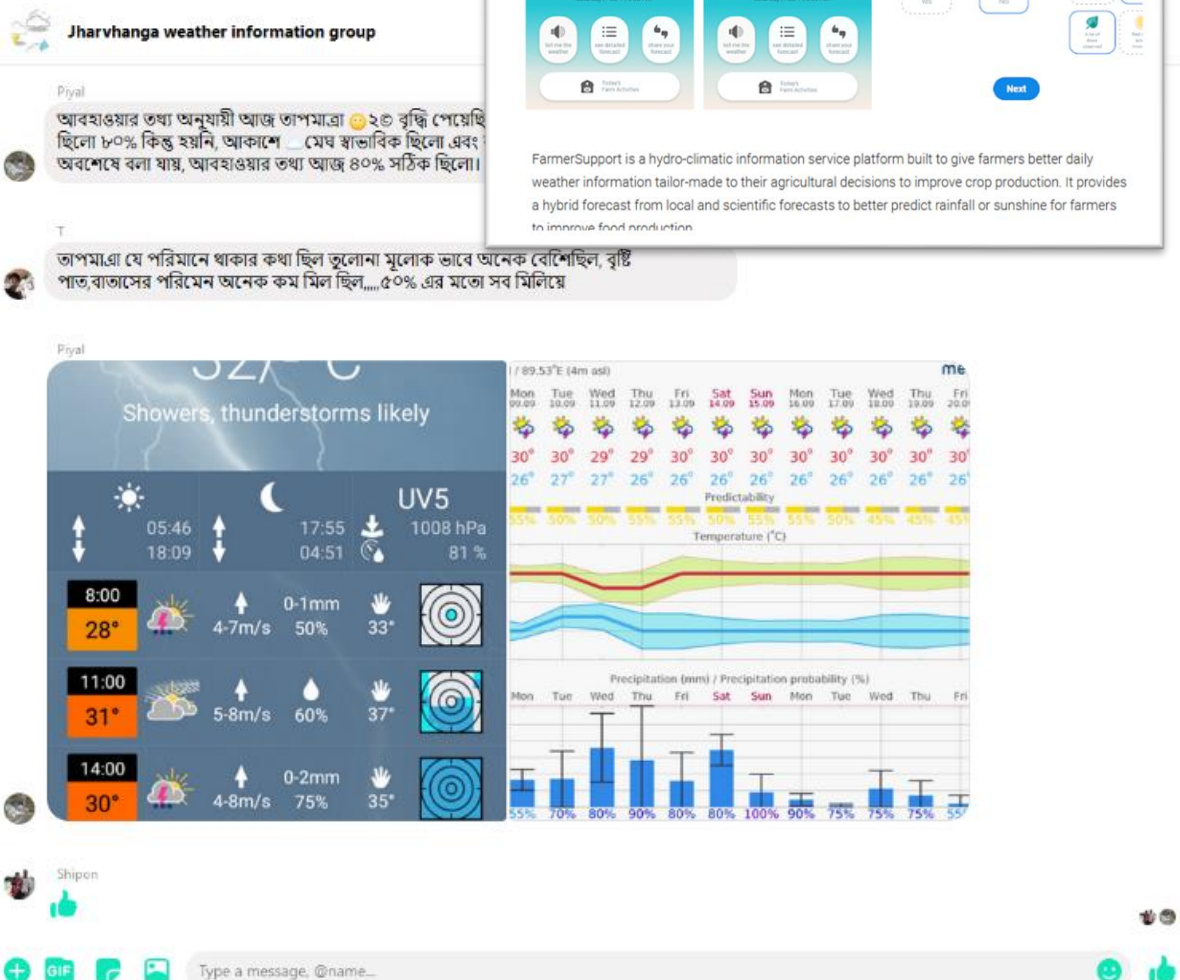


Adaptive decision making

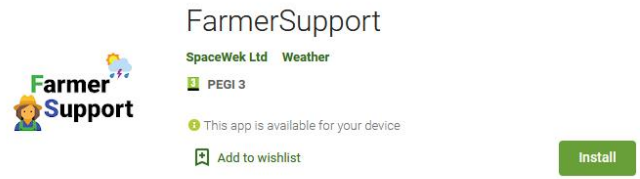


WATER APP

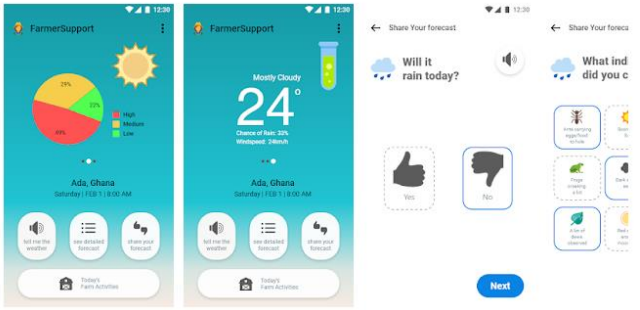
http://www.waterapps.net/



Adaptive decision making



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



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

scale

Longer-term (strategic adaptation) planning

Bangladesh Delta Plan 2100

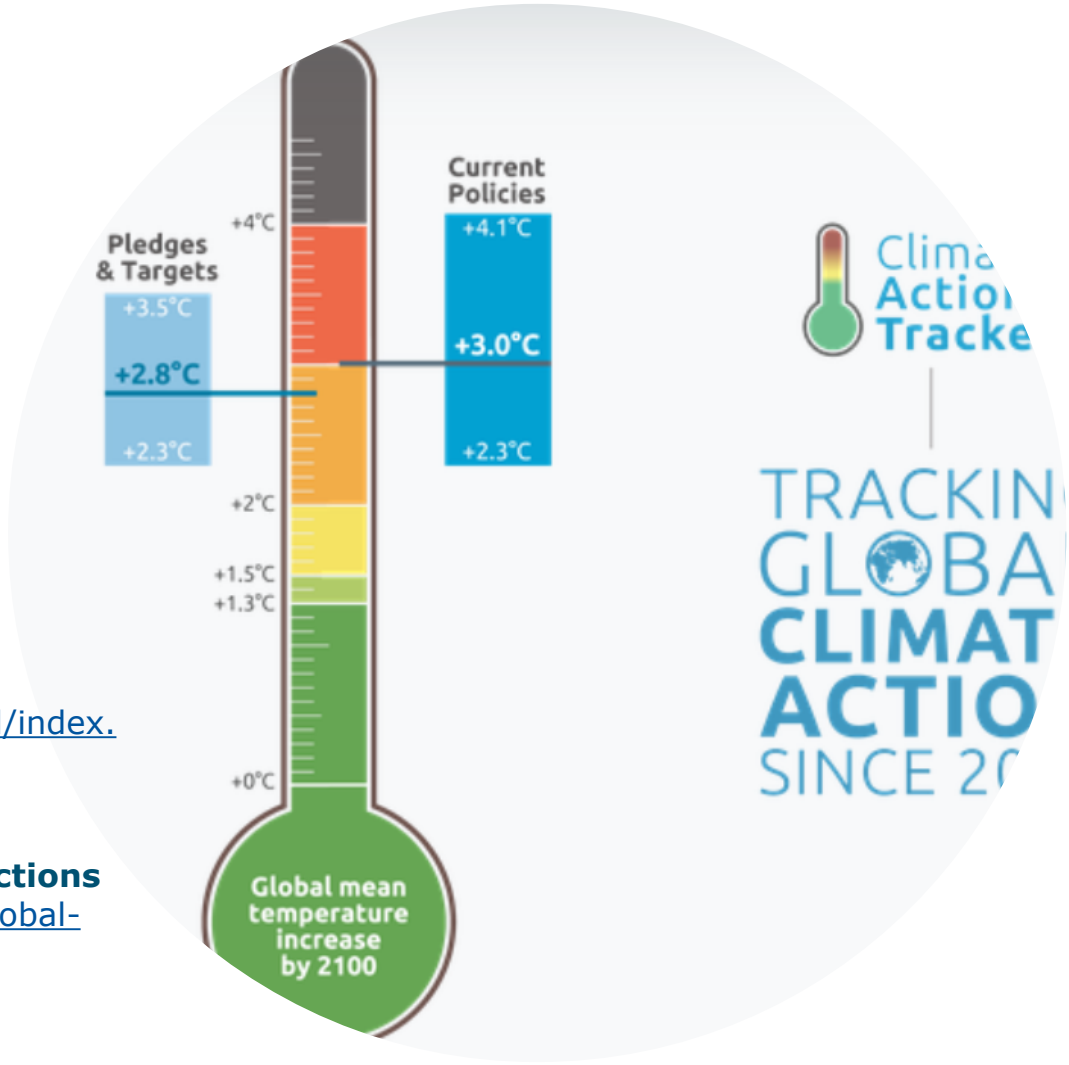
Awareness

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/

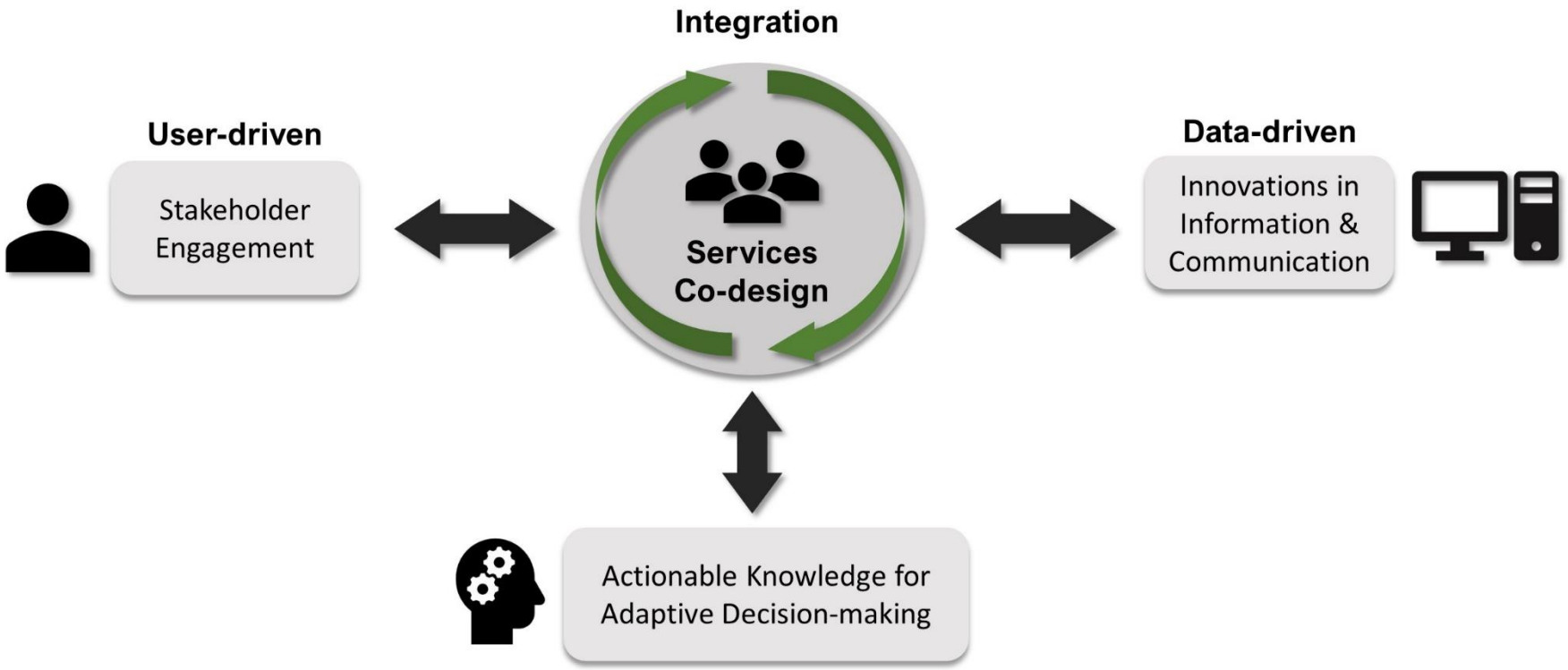


Combined-domain climate services

Copernicus Services

Take home message

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

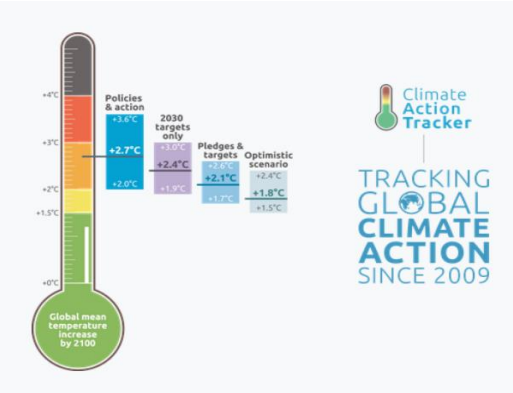


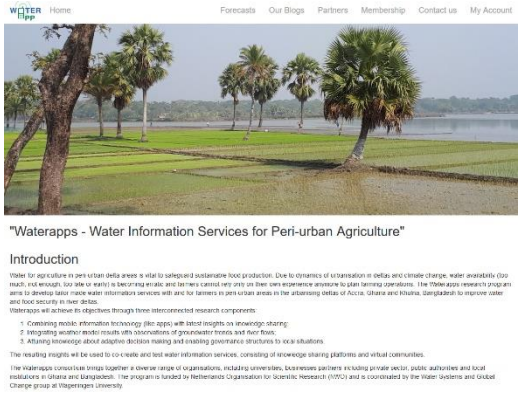
BREAK (5-10 mins)

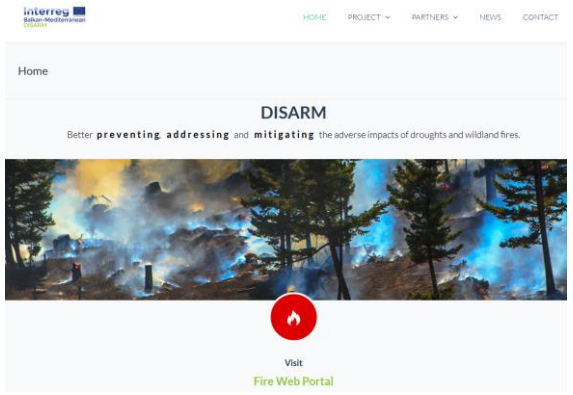
Exercise

Choose one of the following cases (WCIS) & answer the questions (*15-20 mins*). Jointly answer the questions in class (*10-15 mins*).

- *What are the main users of the service?*
- *What are the actions/decisions the services support?*
- *Type of data sources used?*
- *How the service describes the design process USER ENGAGEMENT of the WCIS between the users and developers? Use one of the 4 categories*

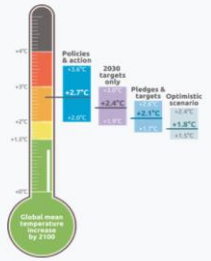






https://climateactiontracker.org/ http://www.waterapps.net/ http://disarmfire.eu/

Climate action tracker

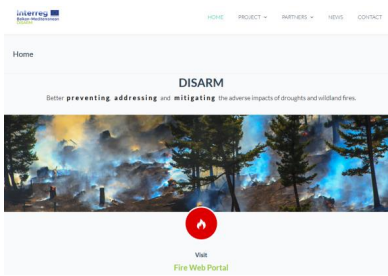


Users	Ερευνητές, policy makers, ...
Actions/decisions the service supports	Πληροφορίες σχετικά με την κλιματική αλλαγή. Tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C
Type & data sources	CO2 information, GHG emission information,
User engagement	Information provision

WATERAPPS

Users	Αγρότες, υπάλληλοι αγροτικών καλλιεργειών, επαγγελματίες που ασχολούνται με τη γεωργία, μεσάζοντες, agricultural extension officers
Actions/decisions the service supports	Πληροφορίες σχετικά με τον αγροτικό σχεδιασμό,
Type & data sources	Βροχόπτωση, υγρασία, θερμοκρασία, άνεμος, δεδομένα από διάφορους οργανισμούς
User engagement	Co-production, co-creation

DISARM



Users	Κάτοικοι, απλοί πολίτες, πολιτική προστασία (σε τοπικό επίπεδο), πυροσβεστική υπηρεσία,
Actions/decisions the service supports	Δείκτες πρόβλεψης και πυρόσβεση πυρκαγιάς, διάδοση πληροφοριών μέσω χρηστών,
Type & data sources	Μετεωρολογικοί σταθμοί εδάφους, δορυφορικά δεδομένα, υγρασία, άνεμος, βροχόπτωση, Fire Weather Index (FWI), ατμοσφαιρικά δεδομένα
User engagement	Information provision, dialogue-based

Outline – DAY 2

Part I: Examples of services

Part II: Assignment exercise explanation (graded)

Thank you!
Dank U!
Ευχαριστώ!

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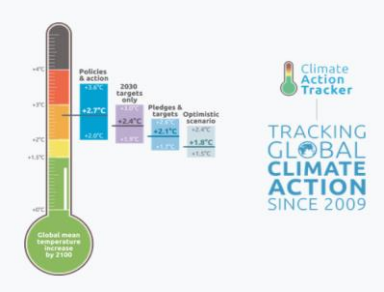
100years
1918 — 2018

APPENDIX

Climate action tracker



2021 students' answers

Users	Κυβέρνηση (Governments), Οργανισμοί, επόπτες, ερευνητές
Actions/decisions the service supports	Εντολές/μέτρα μετριασμού εκπομπών θερμοκηπίου, δεδομένα κανονισμών (Paris agreement 2015) για κυβερνήσεις, φορείς και ιδιώτες
Type & data sources	GHG (δεδομένα εκπομπών θερμοκηπίου) data on emissions, historical data (e.g. Temperature, etc.), climate projections (κλιματολογικές προσομοιώσεις)
User engagement	Passive engagement (μη ενεργή συμμετοχή)

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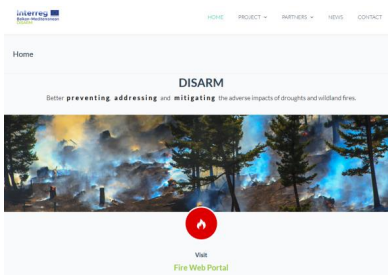
2021 students' answers

Users	Αγρότες, κυβερνητικοί φορείς (περιφέρεια/δήμος),
Actions/decisions the service supports	Καλλιεργητικές αποφάσεις, μελλοντικές συνθήκες,
Type & data sources	Θερμοκρασία, Ύψος βροχόπτωσης (ιστορικά δεδομένα, προβλέψεις)
User engagement	Dialogue-based -> Co-creation

DISARM



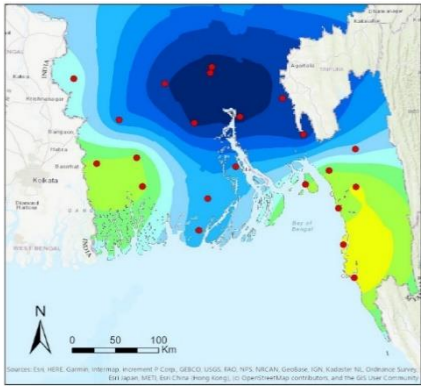
2021 students' answers

Users	Κυβερνήσεις, Πολιτική Προστασία, Υπηρεσίες, Πολίτες*,
Actions/decisions the service supports	Αξιολόγηση κινδύνου πυρκαγιάς, πρόβλεψη/έγκαιρη προειδοποίηση κινδύνου πυρκαγιάς, ..
Type & data sources	Δείκτες πυρκαγιάς (θερμοκρασία, βροχόπτωση, άνεμος, εδαφική ξηρασία), μοντέλα πρόβλεψης
User engagement	Information provision

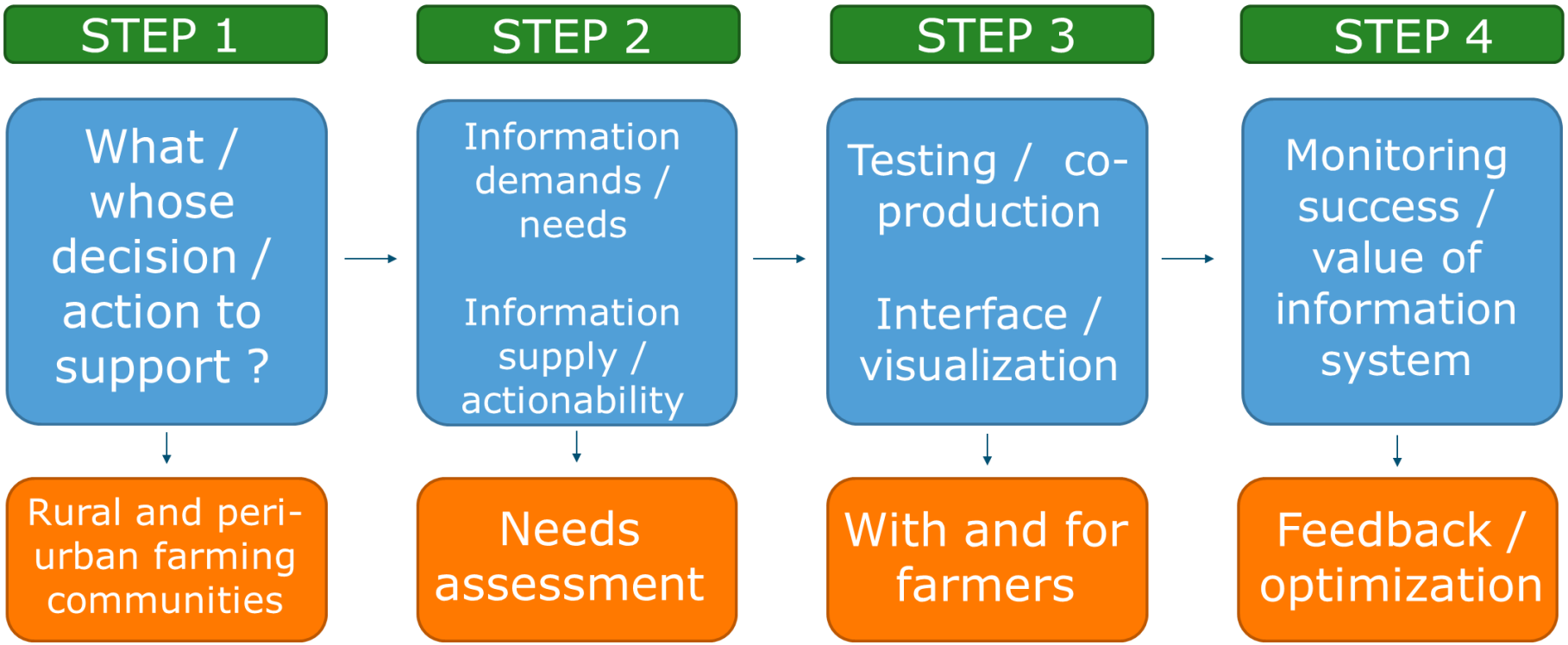
What can be a climate service?

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!)
- ...



Conceptual framework WCIS

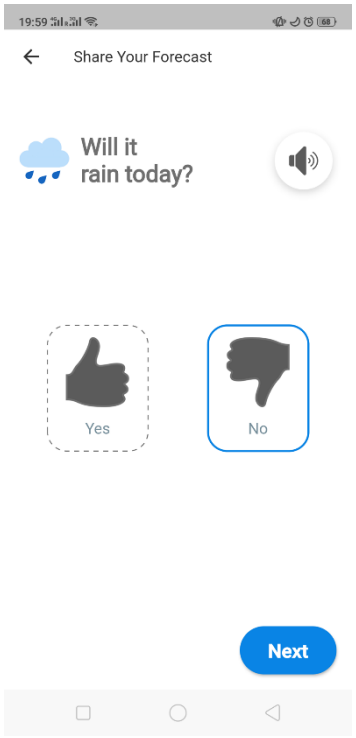


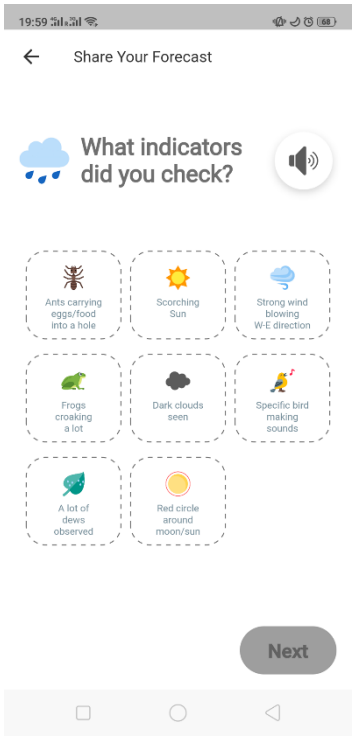
Why do we co-produce our services?

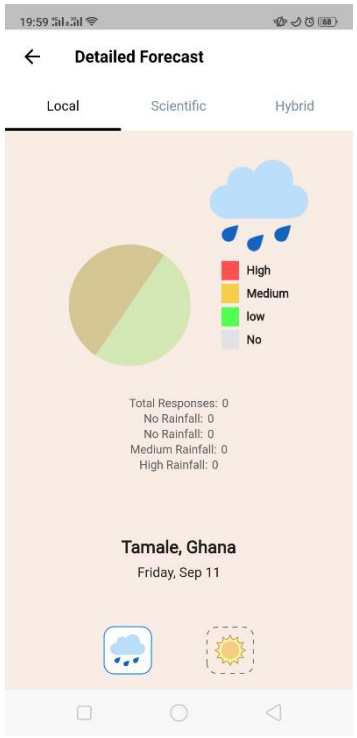
1. Improve transparency of forecast accuracy and certainty
2. Tailor to context and decision
3. Deliver timely and sustainable services
4. To ensure value-add for all involved
5. To communicate in accessible ways
6. Support conscious facilitation
7. Keep flexible
8. Enhance inclusivity
9. Embrace diversity and respect differences
10. Build trust

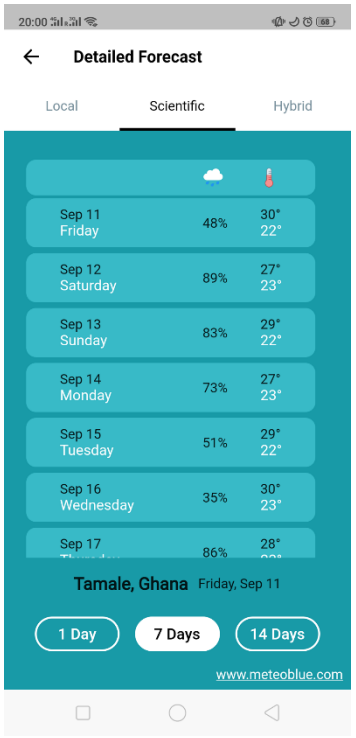
...into an actual information service

Farmer Support



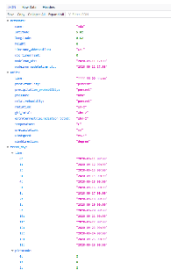






Farmers insert data

***meteoblue* provides data**



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Source: FarmerSupport app - WATERAPPS

Data-driven climate services (for decisions)

- Current **weather and climate data** are used in many ways
- **Decision-makers** in cities 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 city budgets for maintaining roads, bridges, and other infrastructure
- Climate data are used by people across **many sectors of our economy**

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**