

Water & Climate Information Services for society

Υδρο-κλιματολογικές υπηρεσίες πληροφόρησης για την κοινωνία

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WUR – WSG - Spyros

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

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

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Wageningen University and Research (**WUR**)

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

Climate
Services

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



shutterstock.com • 1659374104

1920's



1980's



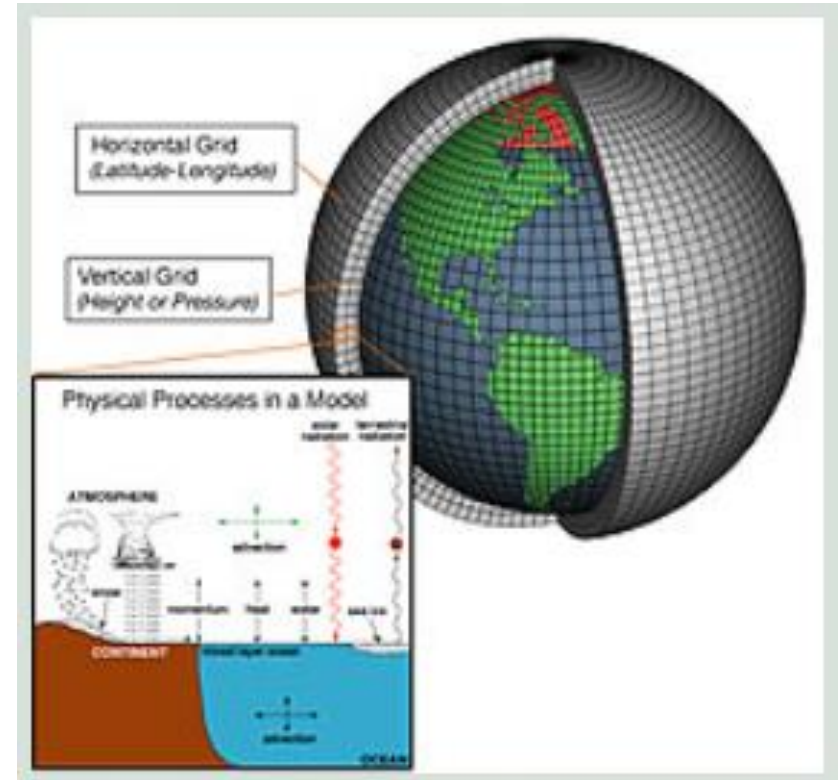
today

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...



1995

CLIMATE CHANGE: DEFINITELY A PROBLEM.



2001

YEP, WE SHOULD REALLY BE GETTING ON WITH SORTING THIS OUT PRETTY SOON...



2007

LOOK, SORRY TO SOUND LIKE A BROKEN RECORD HERE...



2013

WE REALLY HAVE CHECKED AND WE'RE NOT MAKING THIS UP.



2019

IS THIS THING ON?



KUPALA 28/9/13

THE ASSOCIATED PRESS

"HIDE SO DEEP"

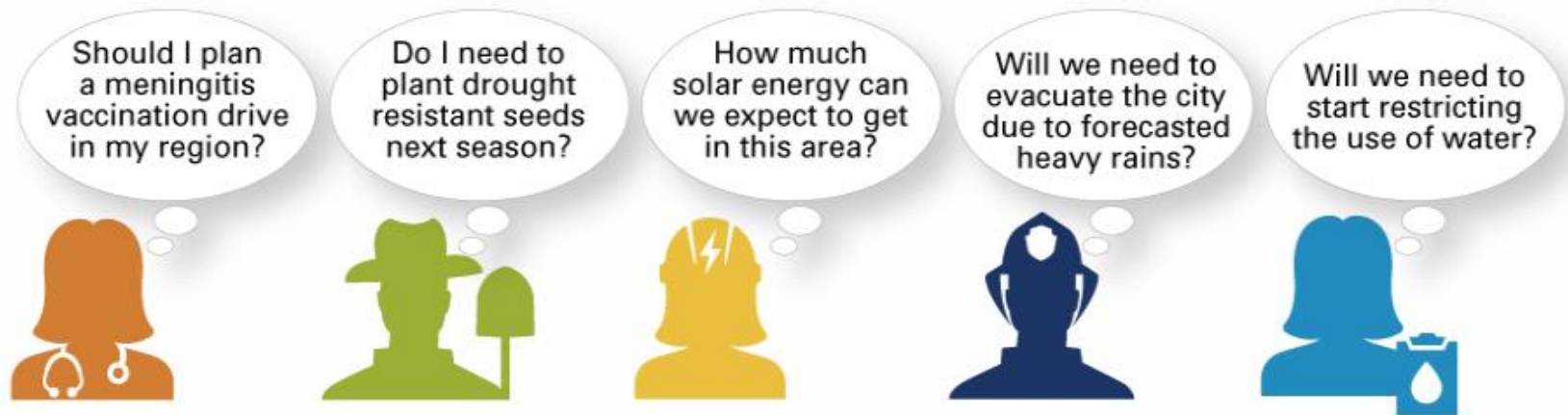
KUPALA

Τι συμβαίνει εδώ?



What are weather & climate services ?

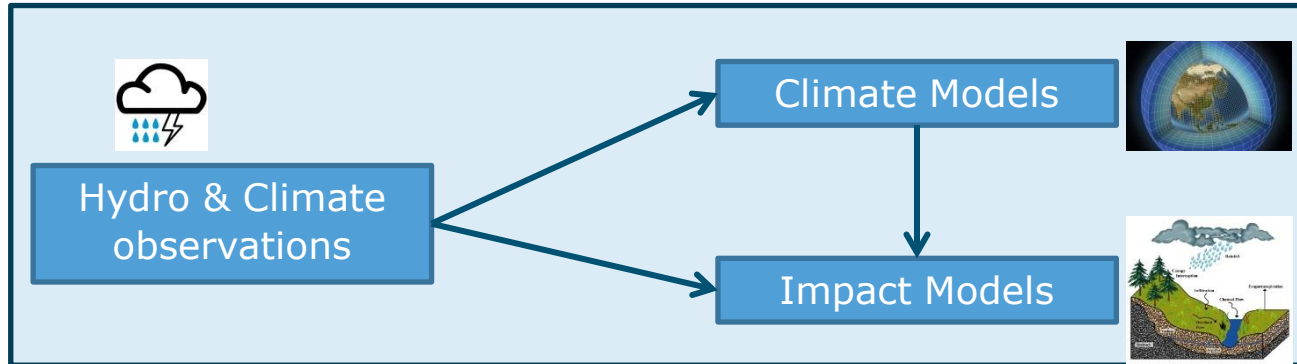
Services that **provide** weather & climate **information** to help individuals and organizations make **climate smart decisions**.



Climate Services for sectoral applications



1st generation of services: top-down



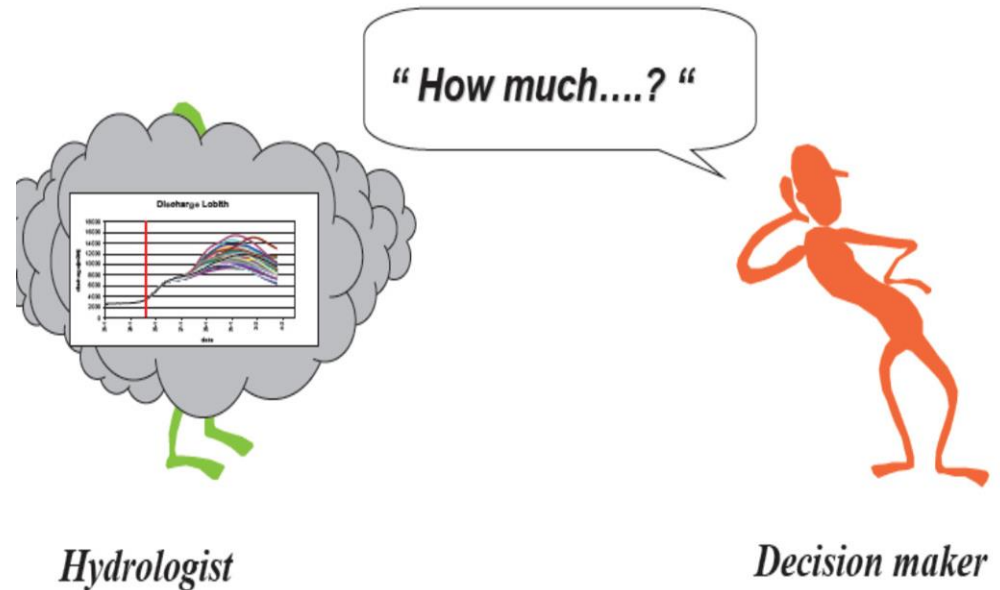
Scenario development,
data analyses and multi
model assessments

Visualisation and
User interface

PRODUCTS

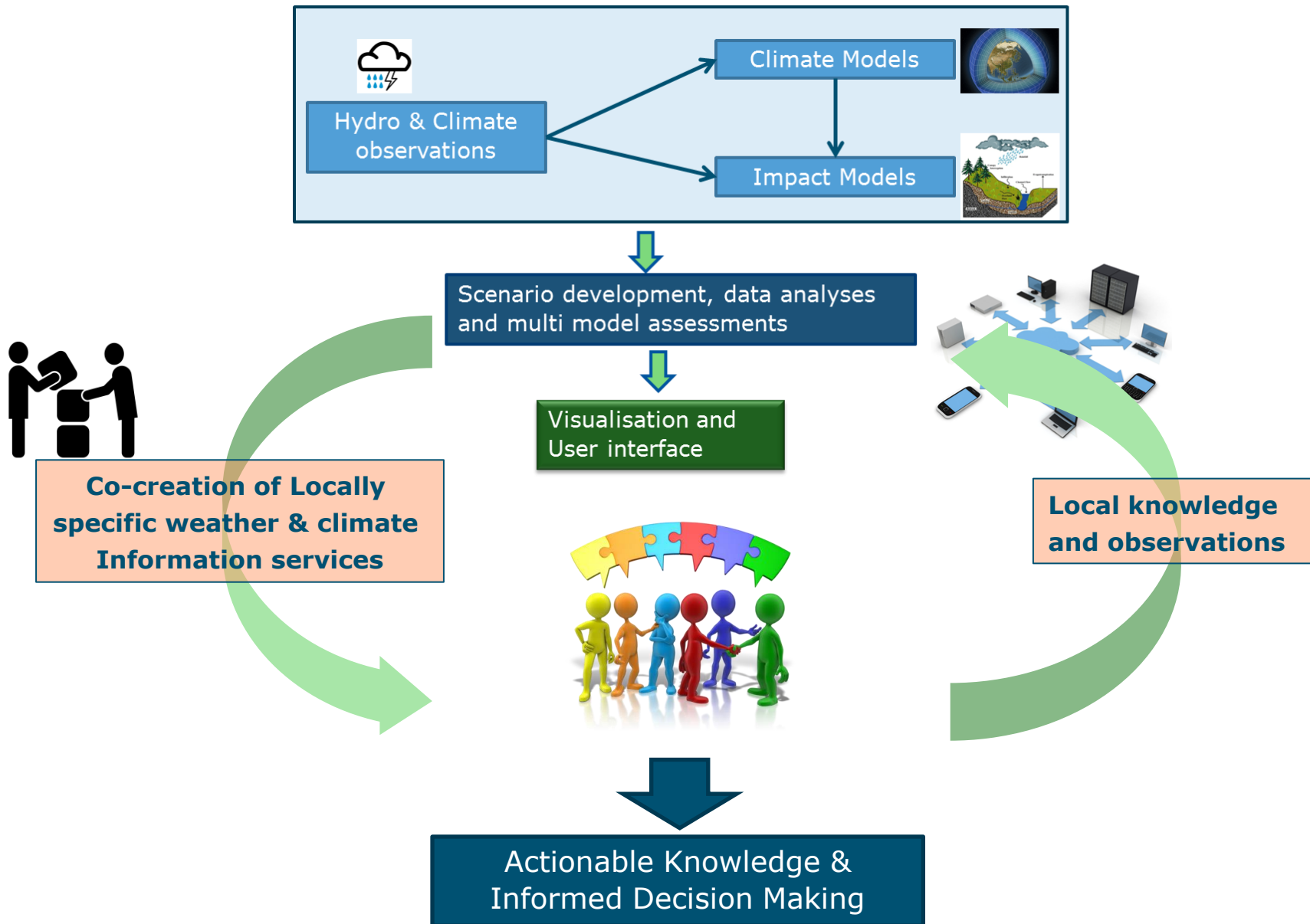


Usability gap



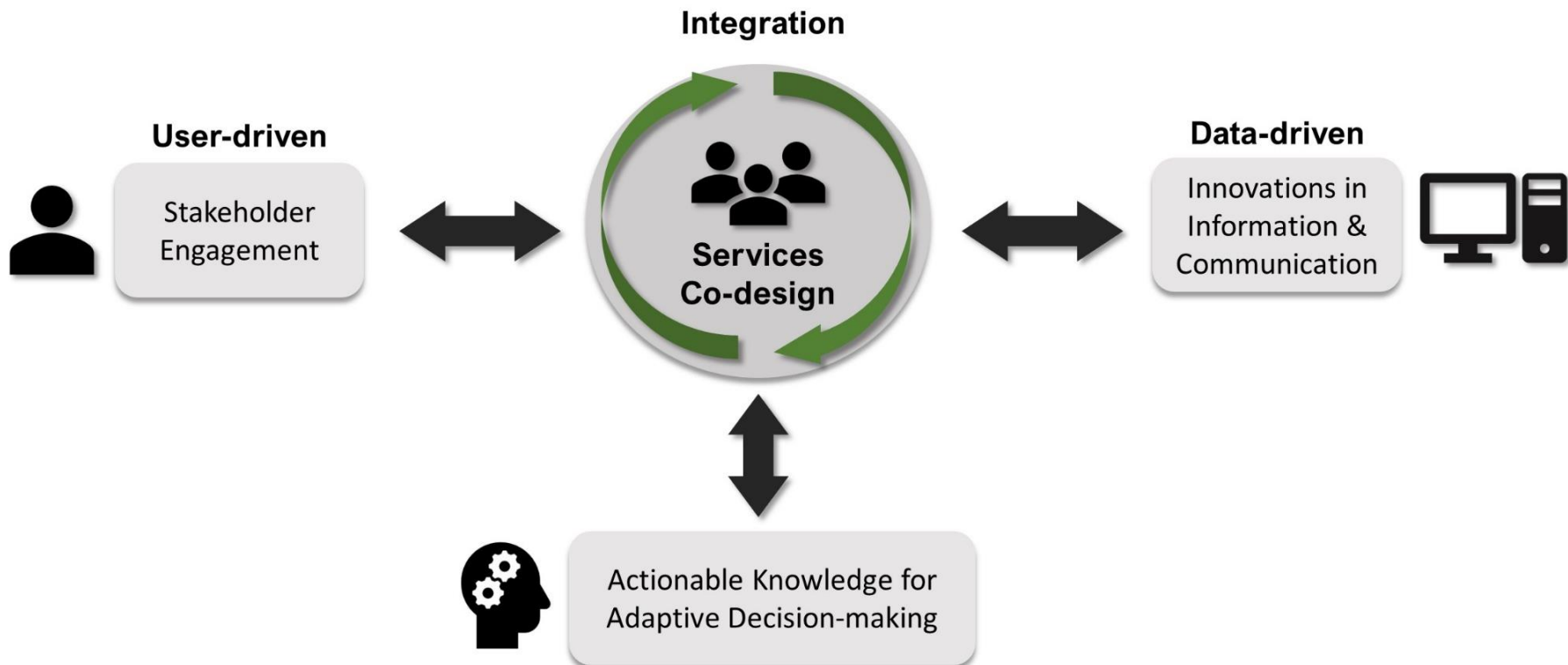
“ unsuitability to inform decision-making processes in relation to adaptation against climate change” (source: K. Raaphorst, et al. 2019)

2nd generation of services: bottom-up



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

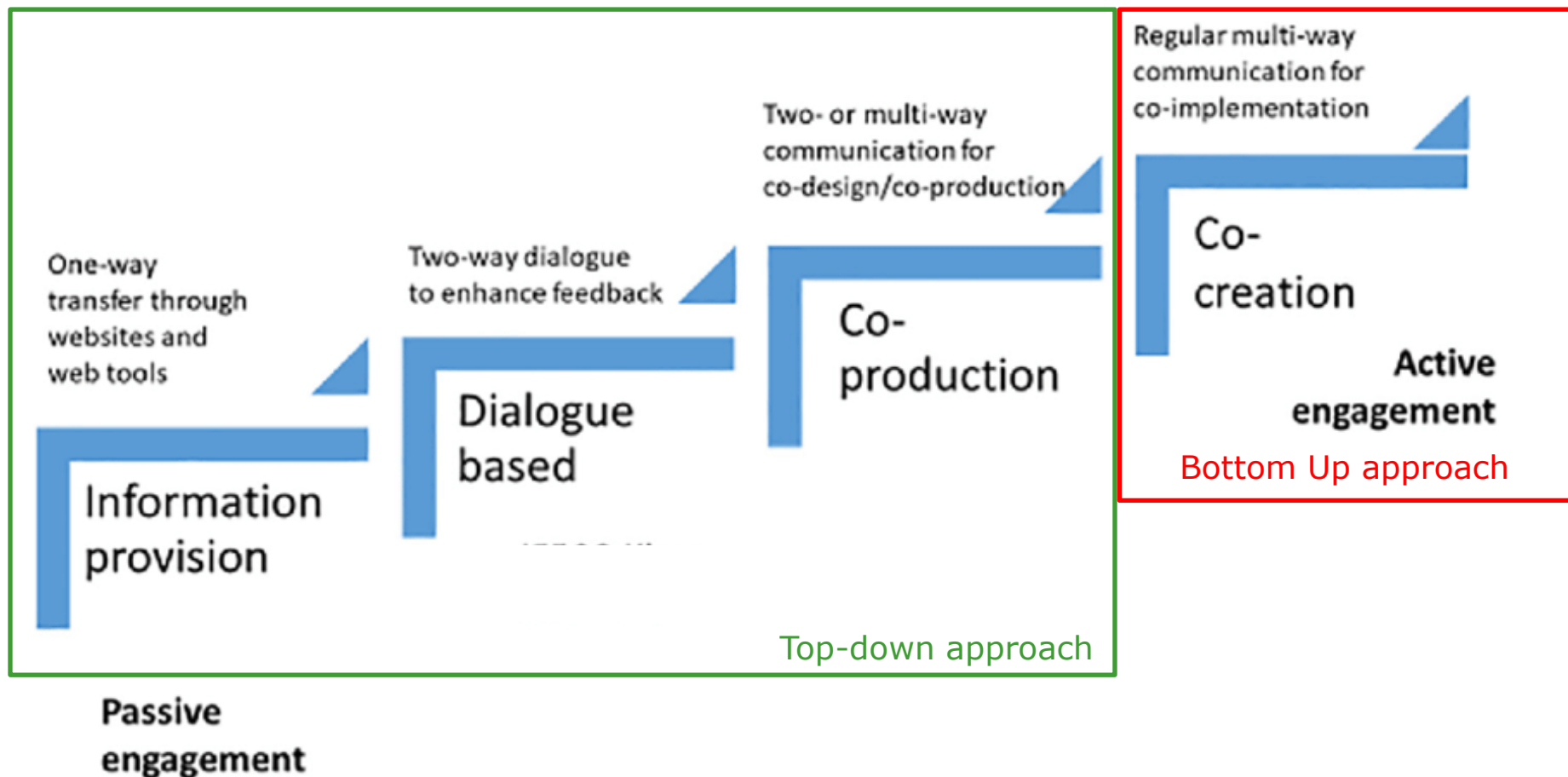
Actionable knowledge reflects the learning capability of individuals and organizations to connect heterogeneous elements (social, technical, economic , political, etc..)

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

Adaptive decision
making

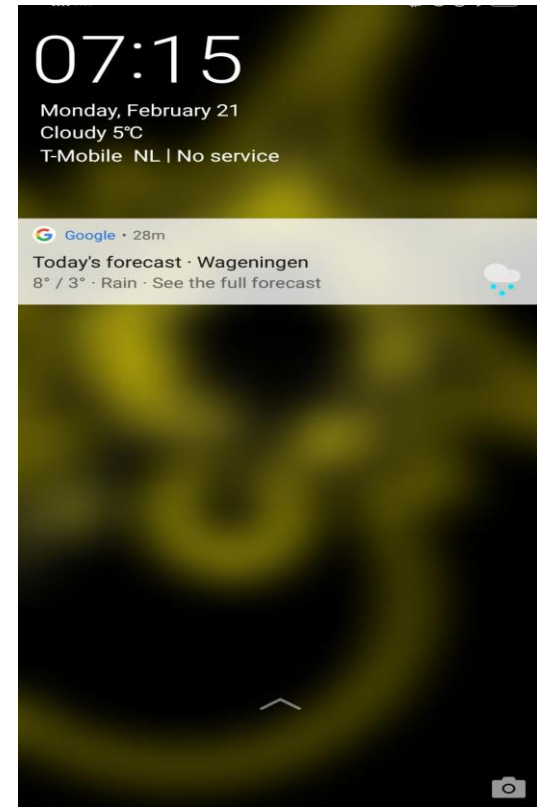
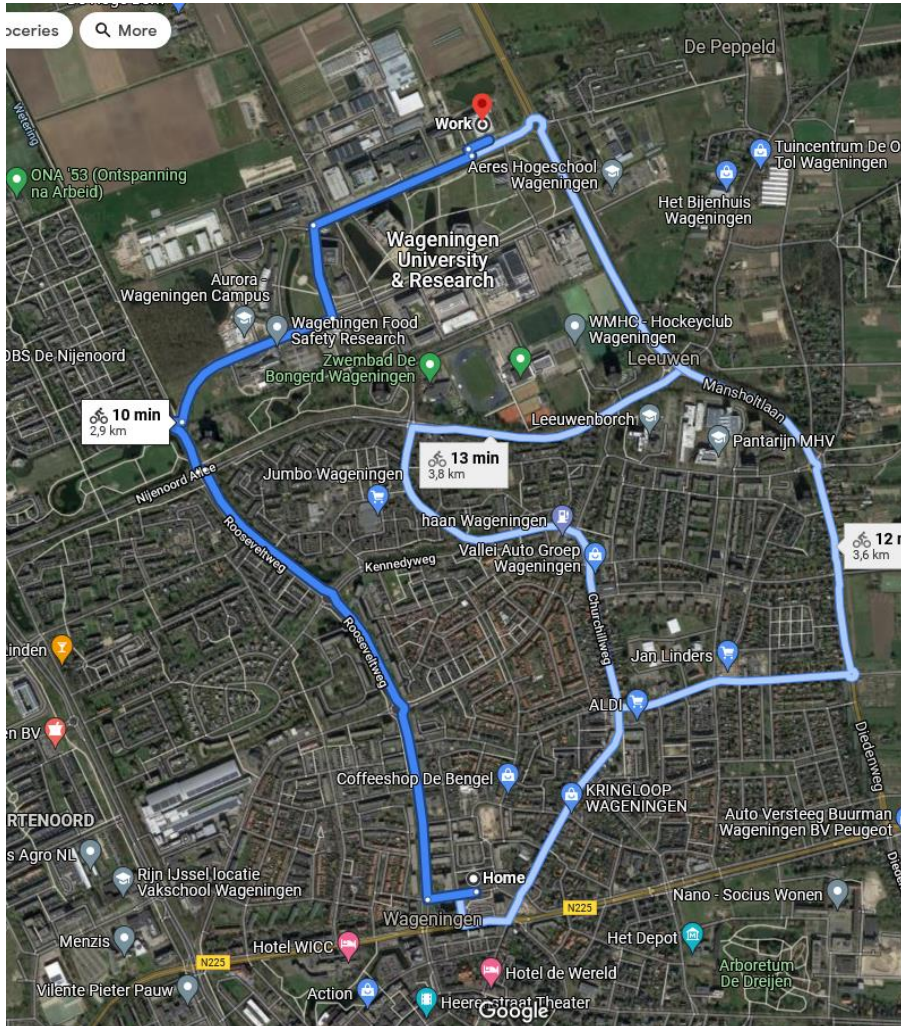
Longer-term (strategic
adaptation) planning

Awareness

Weather

Climate

Real time decision making



Adaptive decision making



<http://www.waterapps.net/>



FarmerSupport

SpaceWek Ltd Weather

PEGI 3

This app is available for your device

Add to wishlist

Install

Share Your forecast

Will it rain today?

What kind did you c

Next

FarmerSupport is a hydro-climatic information service platform built to give farmers better daily weather information tailor-made to their agricultural decisions to improve crop production. It provides a hybrid forecast from local and scientific forecasts to better predict rainfall or sunshine for farmers to improve food production.

Jharvhanga weather information group

Piyal

আবহাওয়ার তথ্য অনুযায়ী আজ তাপমাত্রা ২৬ বৃদ্ধি পেয়েছে ছিলো ৮০% কিন্তু হয়নি, আকাশে মেঘ স্বাভাবিক ছিলো এবং অবশেষে বলা যায়, আবহাওয়ার তথ্য আজ ৪০% সঠিক ছিলো।

T

তাপমাত্রা যে পরিমানে থাকার কথা ছিল তুলোনা মূলোক ভাবে অনেক বেশিছিল, বৃষ্টি পাত,বাতাসের পরিমেন অনেক কম মিল ছিল,৫০% এর মতো সব মিলিয়ে

Showers, thunderstorms likely

☀️

05:46
18:09

🌙

17:55
04:51

UV5

1008 hPa
81%

8:00	☀️	↑	0-1mm	☀️
28°		4-7m/s	50%	33°
11:00	☁️	↑	60%	37°
31°		5-8m/s		
14:00	☀️	↑	0-2mm	☀️
30°		4-8m/s	75%	35°

// 89.53°E (4m asl) me

Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
99-09	30-09	11-09	12-09	13-09	14-09	15-09	16-09	17-09	18-09	19-09	20-09
☀️	☀️	☀️	☀️	☀️	☀️	☀️	☀️	☀️	☀️	☀️	☀️
30°	30°	29°	29°	30°	30°	30°	30°	30°	30°	30°	30°
26°	27°	27°	26°	26°	26°	26°	26°	26°	26°	26°	26°
Predictability											
55%	50%	50%	55%	55%	50%	55%	55%	50%	45%	45%	45%

Temperature (°C)

Precipitation (mm) / Precipitation probability (%)

Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
55%	70%	80%	90%	80%	80%	100%	90%	75%	75%	75%	55%

Shipon

Type a message, @name...

Adaptive decision making



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



<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

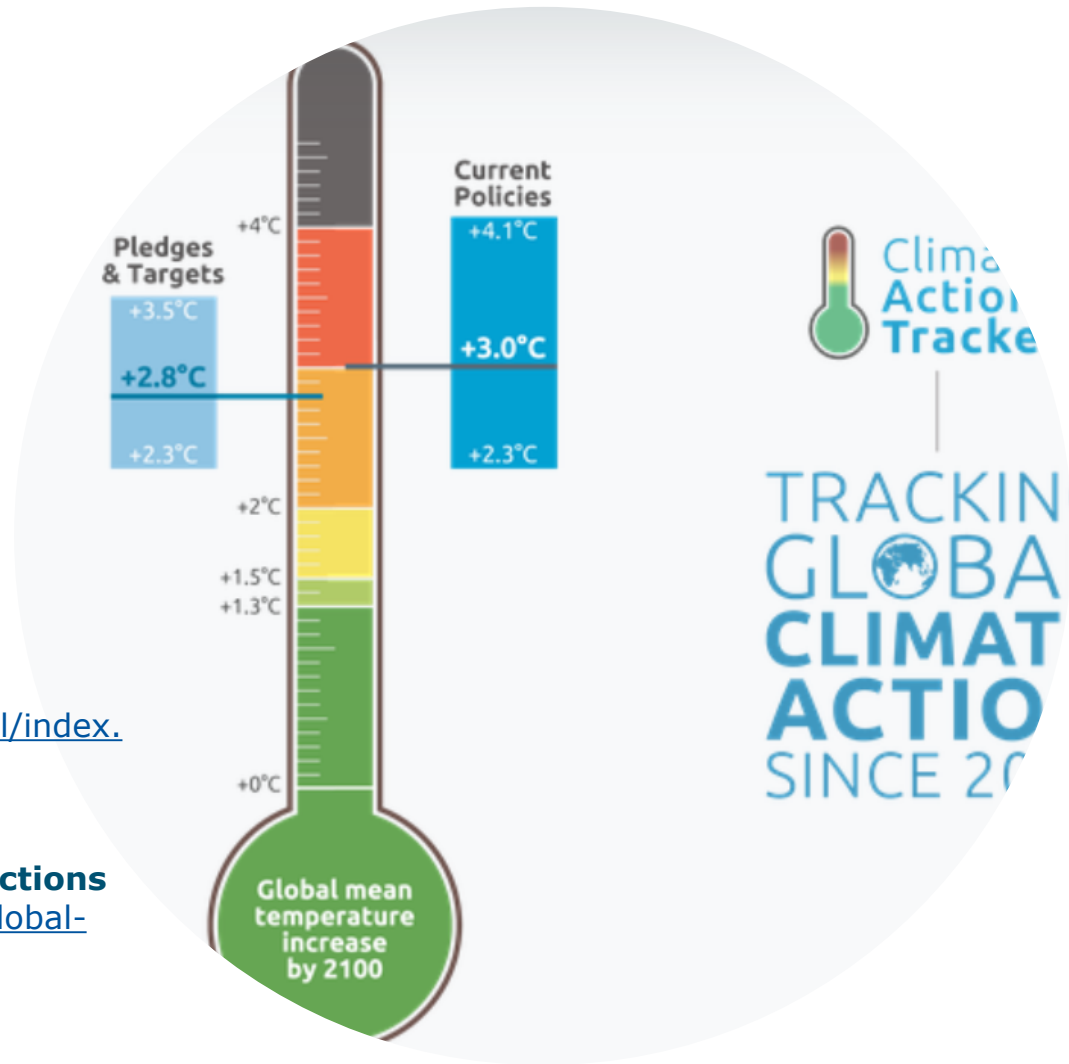
<http://www.climsave.eu/climsave/index.html>

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/>



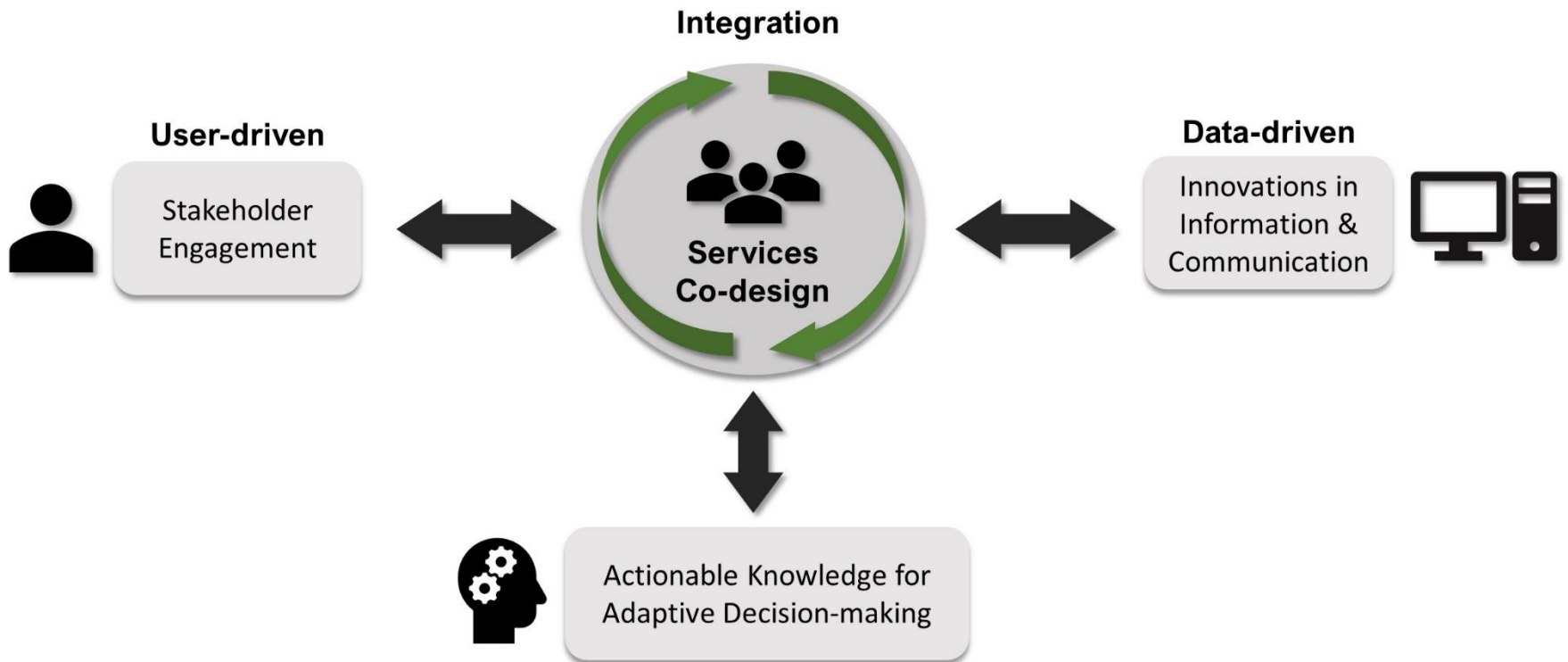
Combined-domain climate services

Copernicus Services



Take home message

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

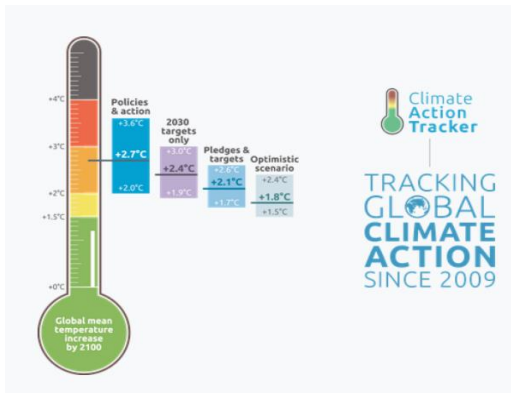


BREAK (5-10 mins)

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*



The screenshot shows the homepage of the Waterapps website. The header includes navigation links: Home, Forecasts, Our Blogs, Partners, Membership, Contact us, and My Account. The main content area features a large image of a tropical landscape with palm trees and a body of water. Below the image, the text reads: "Waterapps - Water Information Services for Peri-urban Agriculture". The introduction section discusses the challenges of peri-urban agriculture and the role of Waterapps in providing water information services. It lists three objectives: 1. Combining mobile information technology (like apps) with local insights on knowledge sharing; 2. Integrating weather and/or climate data with information of groundwater trends and their flows; 3. Attaching knowledge about adaptive decision making and enabling governance structures to local situations. The text concludes by stating that the resulting insights will be used to co-create and test water information services, consisting of knowledge sharing platforms and virtual communities. The footer mentions that the Waterapps consortium brings together a diverse range of organizations, including universities, business partners, existing private sector, public authorities and local producers in climate and agriculture. The program is funded by Horizon Europe (ERC) and is coordinated by the Water Systems and Global Change group at Wageningen University.

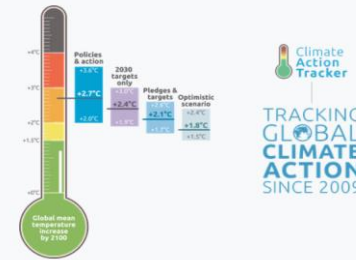
The screenshot shows the homepage of the DISARM website. The header includes navigation links: HOME, PROJECT, PARTNERS, NEWS, and CONTACT. The main content area features a large image of a forest fire. Below the image, the text reads: "DISARM" and "Better preventing addressing and mitigating the adverse impacts of droughts and wildland fires." A red fire icon is visible in the bottom right corner. The footer includes the text "Visit Fire Web Portal".

<https://climateactiontracker.org/>

<http://www.waterapps.net/>

<http://disarmfire.eu/>

Climate action tracker



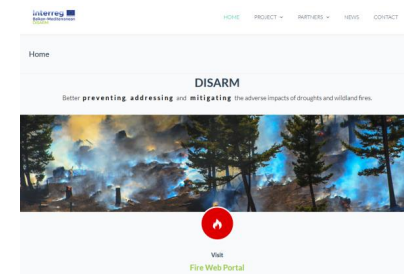
Users	Ερευνητές, policy makers, ...
Actions/decisions the service supports	Πληροφορίες σχετικά με την κλιματική αλλαγή. Tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C"
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)

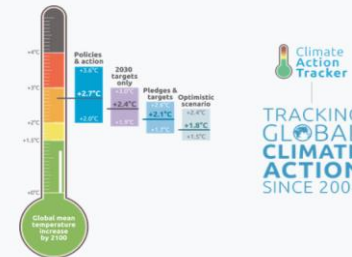
Thank you!
Dank U!
Ευχαριστώ!



Wageningen University,
The Netherlands

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)

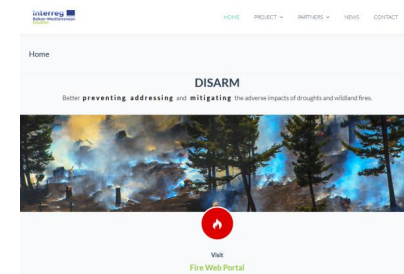
WATERAPPS



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



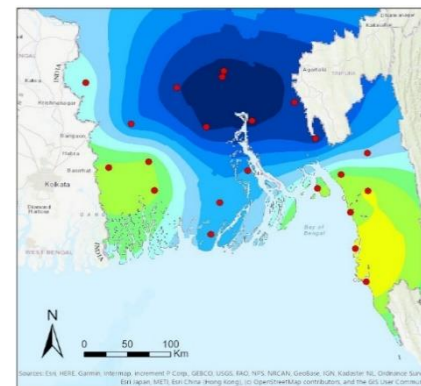
2021 students' answers

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

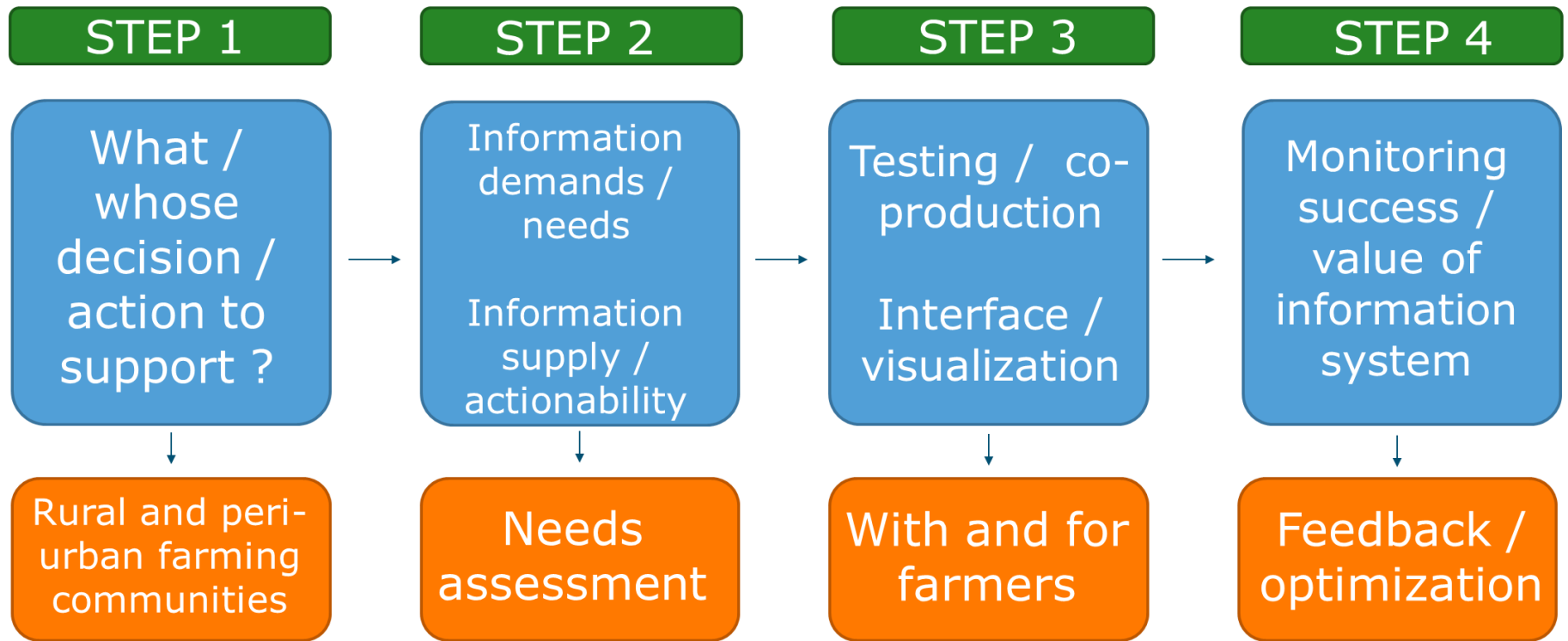
What can be a climate service?

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

- An ICT-Tool 
- 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!](#))
- ...

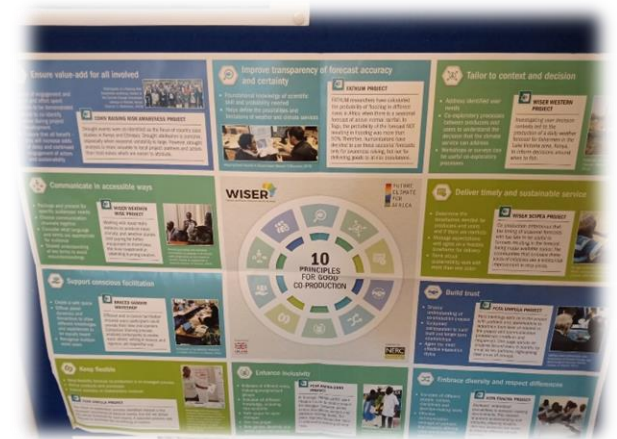


Conceptual framework WCIS

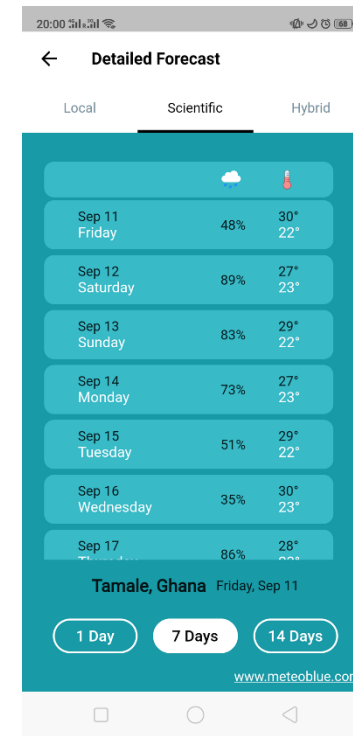
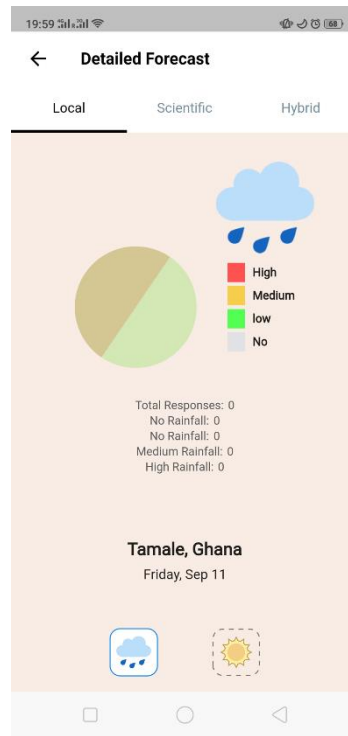
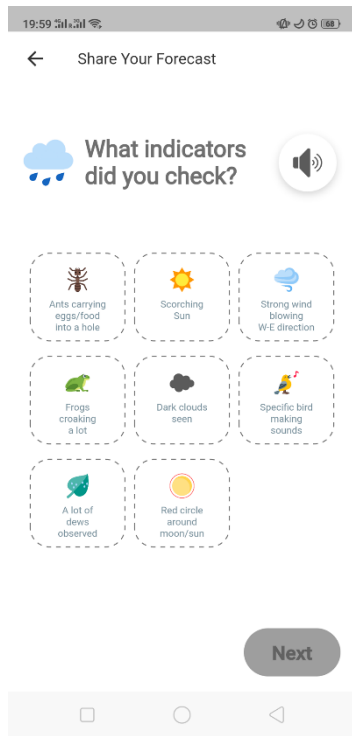
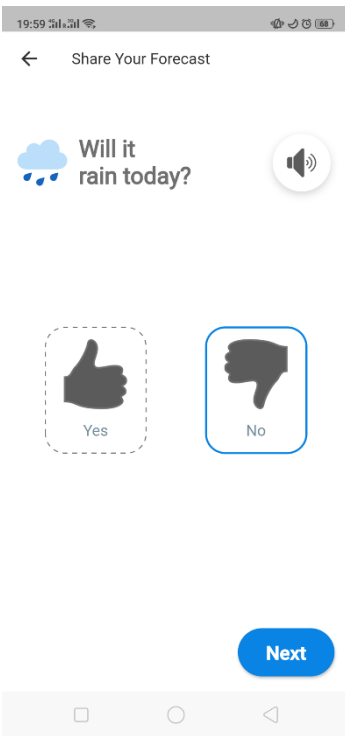


Why do we co-produce our services?

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



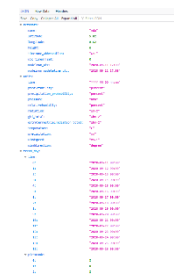
Farmers insert data

meteoblue provides data



UNIVERSITY & RESEARCH CENTER

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**

