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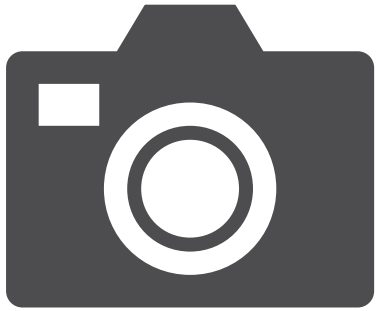
AFRICA

Fundamentals of climate services

July 2nd, 2025

Welcome!

We will record this session





Avoid distractions



Be comfortable



Use the chat for questions or raise your hand if you want to speak

We have three special guests today!

Dr. Hasse Goosen

Climate Adaptation Services



Dr. Mónica Camarena

Weather Impact



Hayford Asuako Yeboah

GHANA METEOROLOGICAL AGENCY



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What are we going to do today?

Agenda

Welcome

Introduction to climate services – Dr. Hasse Goosen

Chatbot for localized weather information – Dr. Mónica Camarena

Climate atlas for long-term climate predictions - Hayford Asuako Yeboah

Closing

Today’s learning goal

Be able to explain the basics of climate services and learn about best practices.



Sign up for our newsletter!

Receive news and updates about SAFE4ALL Africa

https://mailchi.mp/c8b95dfbd95c/safe4all-africa

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Introduction to climate services

Poll: I know what climate services are

Raise your hand if you would like to say something

What are climate services ?

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


Farmer in Narok, Kenya
I want to know when the rains will start and stop, so I don’t lose my harvest to floods or plant too early.

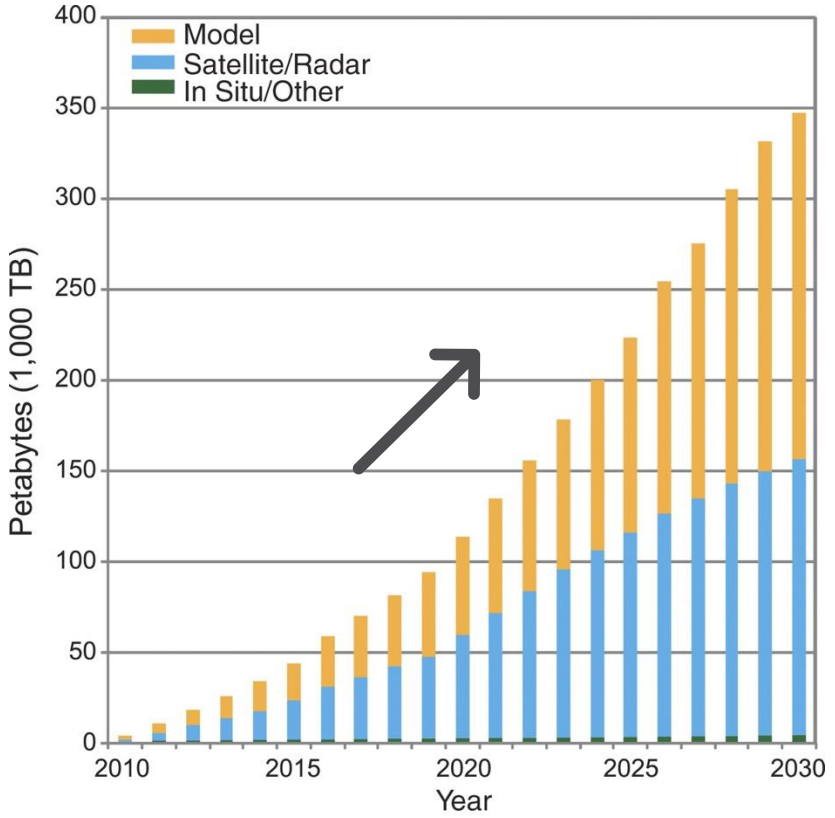

Health worker
When it gets hotter, we see more malaria. I want to prepare ahead.

Investor at development bank



Challenges

- There is a large growth in climate data
- But this data is often hard to find, use and understand
- Often the data is too generic, not tailored to the specific needs
- Data is often not updated
- Data alone is not enough!



Gap between science and society

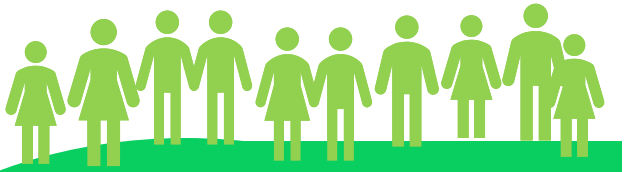
Researchers

Climate scientists

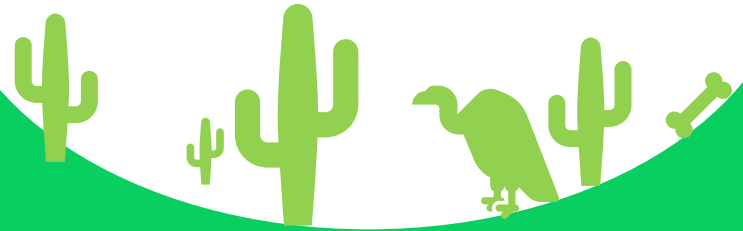


Decision-makers

Societal actors



Climate knowledge SUPPLY



Climate service DEMAND

From sharing weather information



Radio forecast



News forecasting



Smartphone's

To decision making services











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Timescales of climate services

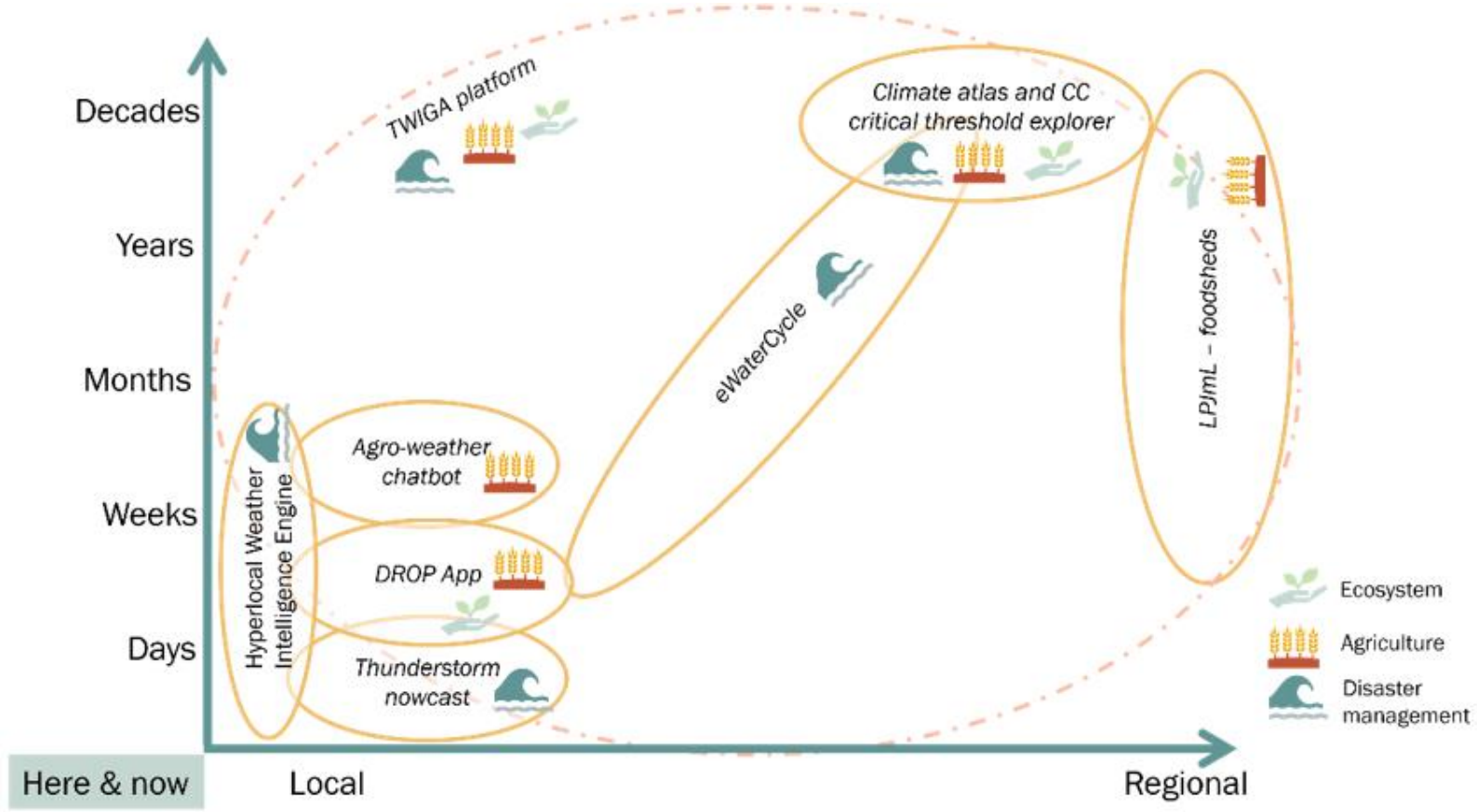


Real time decision making

Adaptive decision making

Longer-term planning

Climate services target different time scales



Example:
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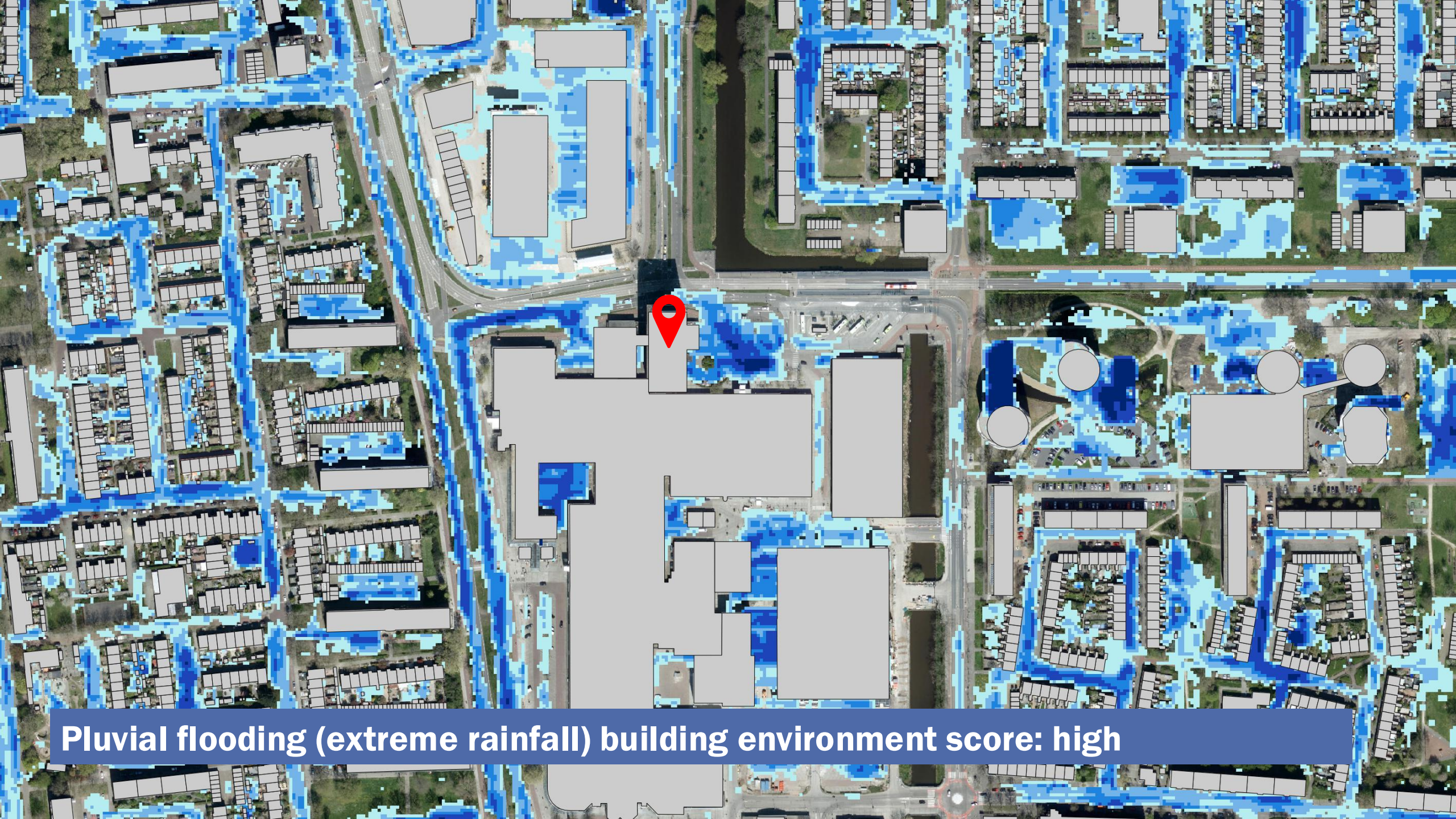
Examples

Financial sector: are my assets at risk







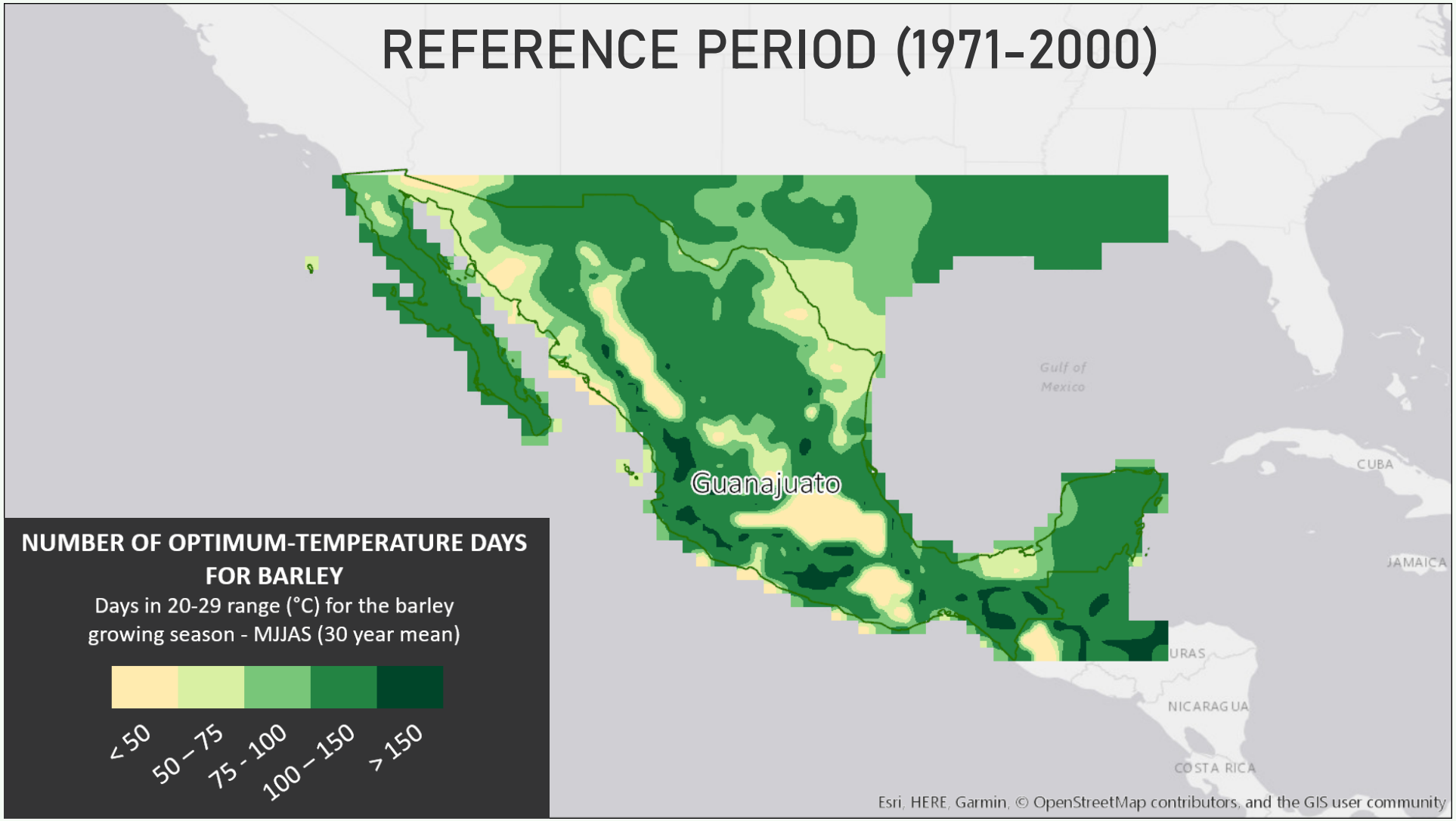
Pluvial flooding (extreme rainfall) building environment score: high

Climate Adaptation Services

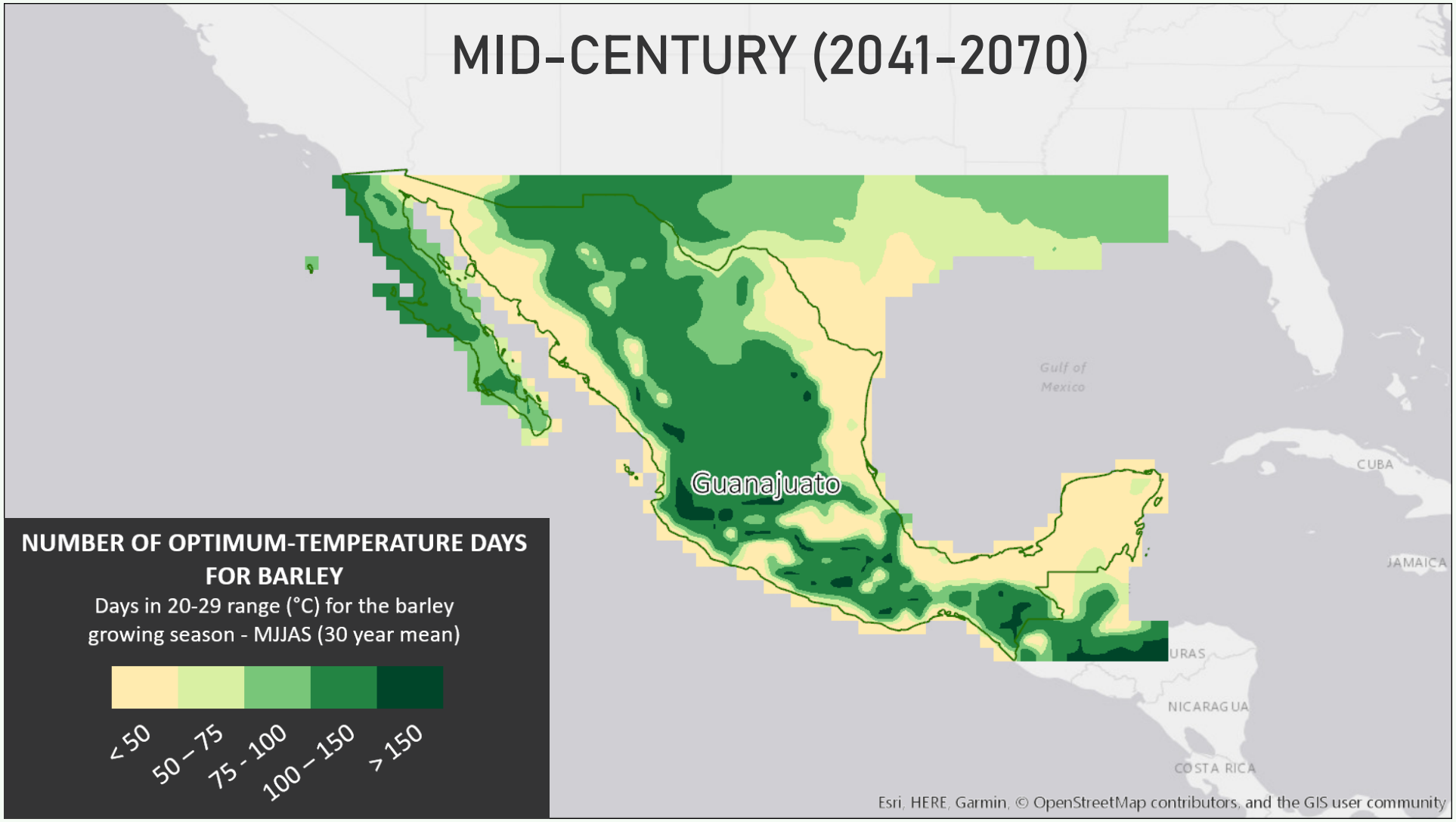
Climate services for beer production



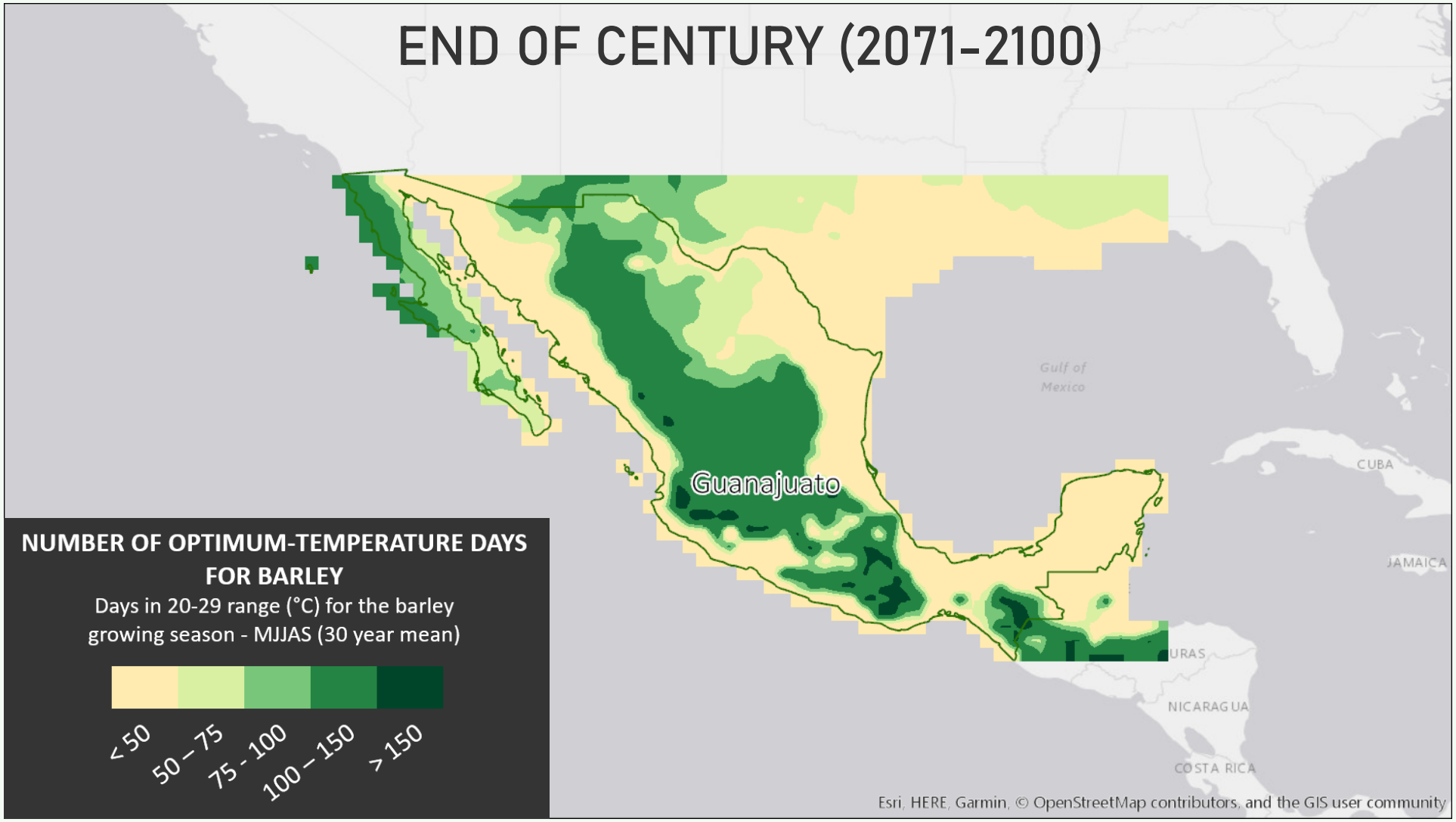
Climate Adaptation Services



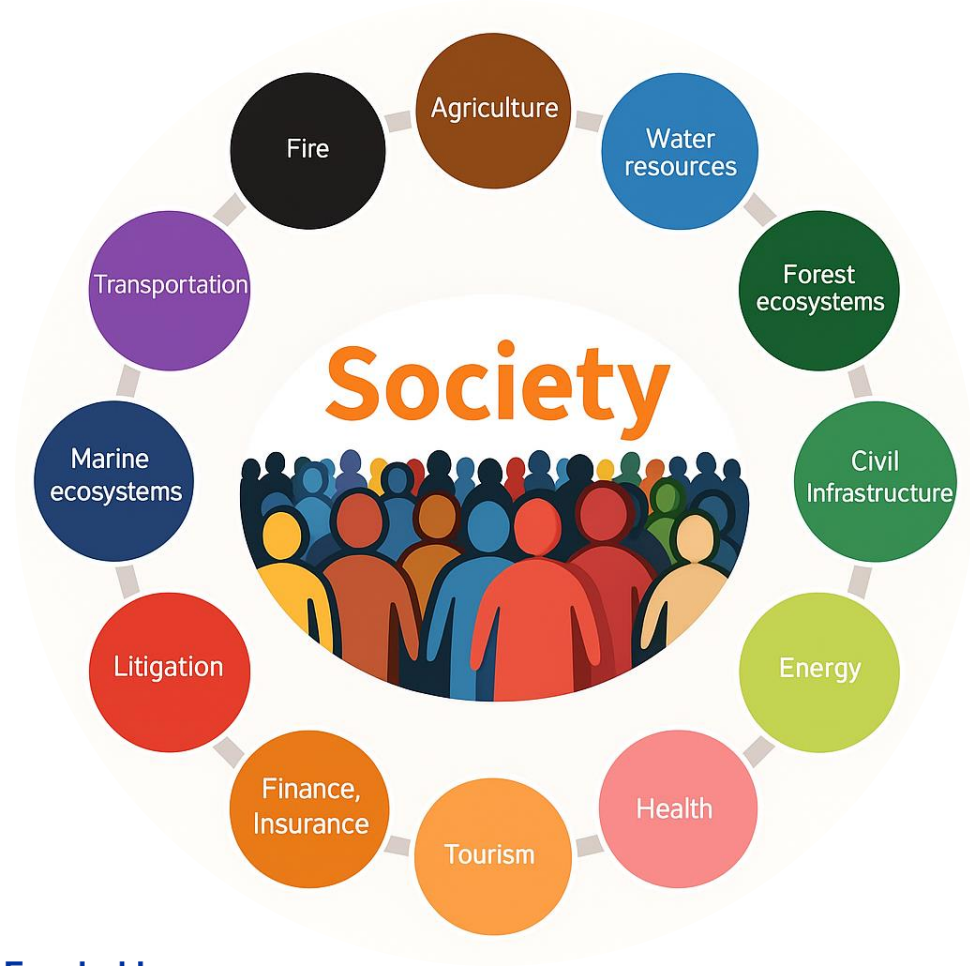
Climate Adaptation Services



Climate Adaptation Services



Climate services for many sectors



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Poll: I use a climate service

Raise your hand if you would like to say something

What do we need to design a service?

- Clear overview of the needs of your user
- Co-development process → engage your user through the process!



- Use relevant climate data
- Must be reliable, localized, and timely

- Clear, simple, actionable messages
- How will information be delivered?
- Maintenance of service

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Questions



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Uliza-WI chatbot for localized weather information – The chatbot and co-creation

Mónica Camarena (Weather Impact)

Agro-weather advisory services





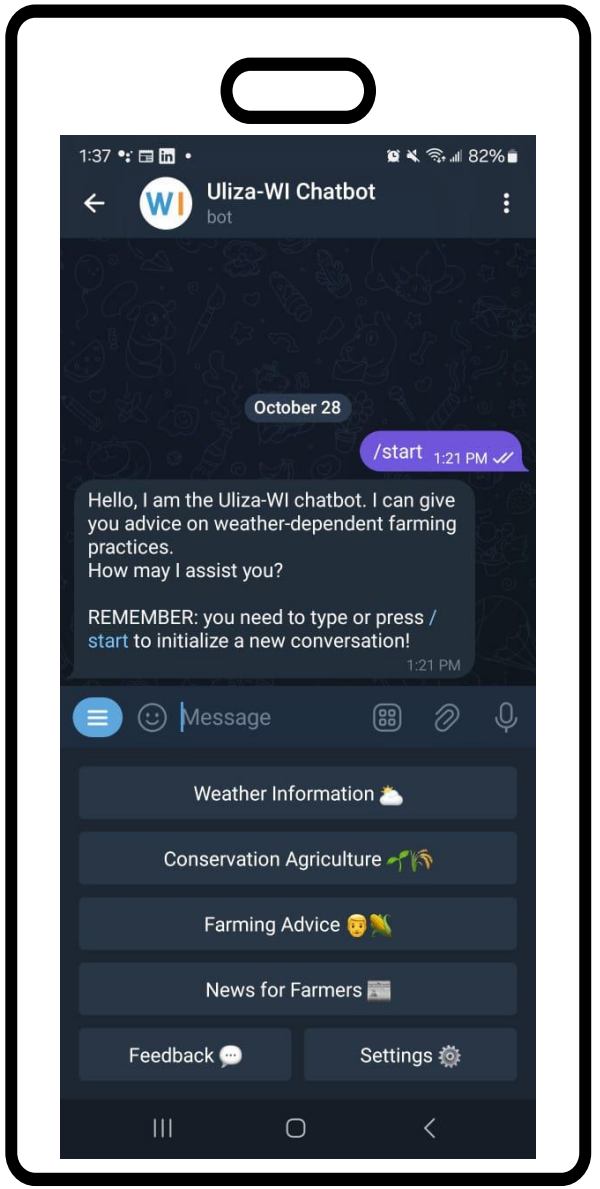


Uliza-WI

Agro-weather advisory chatbot

ADVANTAGES compared to standard SMSs climate advisories

- Information **accessible 24/7**
- It can include **voice messages/photos/videos**
- Increase in the **number and extent of advisories** which can be sent
- **Two-way communication**



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Weather Impact

Chatbot features

Weather information

- 5 days weather forecast
- Seasonal forecast
- Weather alert (push notification)
- Rain season status (focus on onset)

Livestock module

- Cattle, sheep & poultry
- Heat & cold stress
- Nearby fires

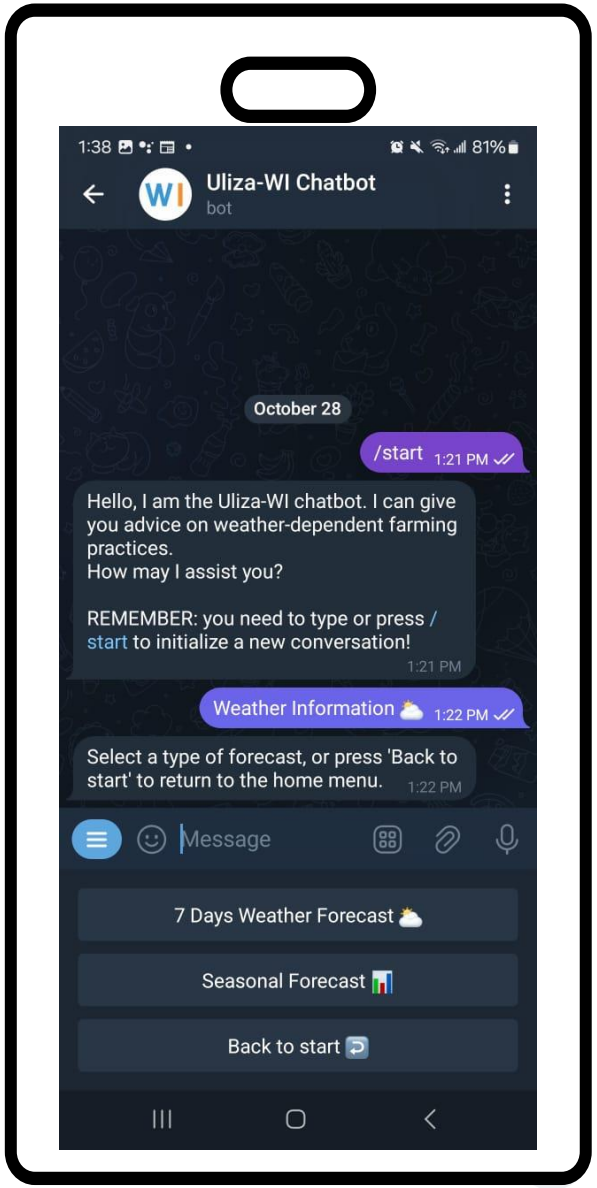
Farming advice

- Produced by WI's Agro-Weather Advisory Model (AWAM)
- **Farmer and crop-specific:** Tailored to location, planting date and farming practices
- Producing weather-informed farming advice on planting, weeding, fertilizing, harvesting, etc.

Other information

- Conservation agriculture practices
- Crop suitability maps
- Adaptation information
- Push notifications

Translated to local languages (Shona)



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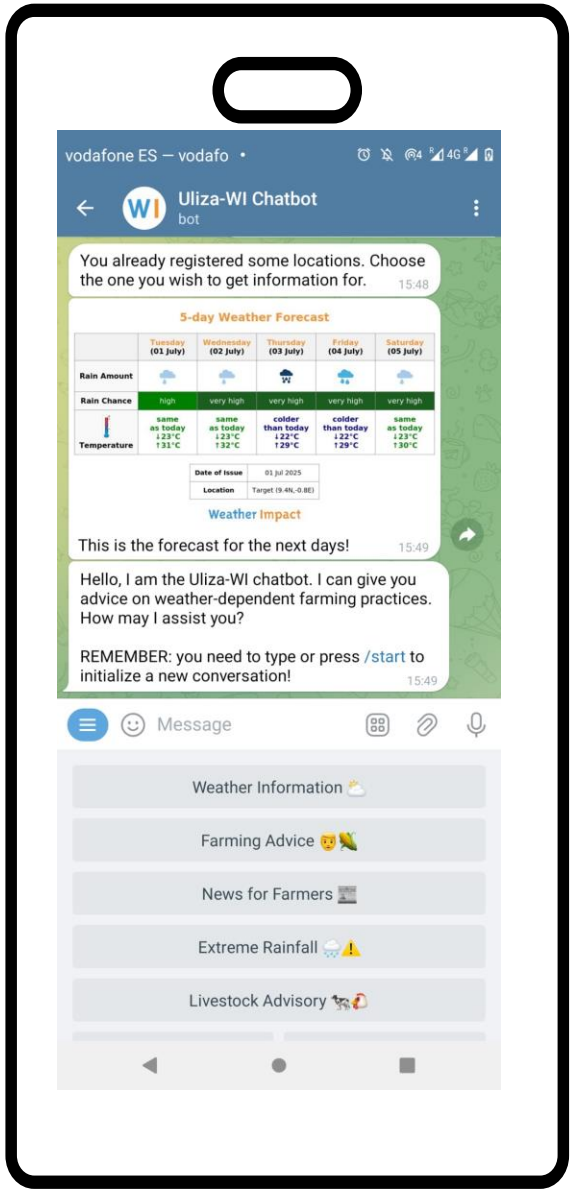
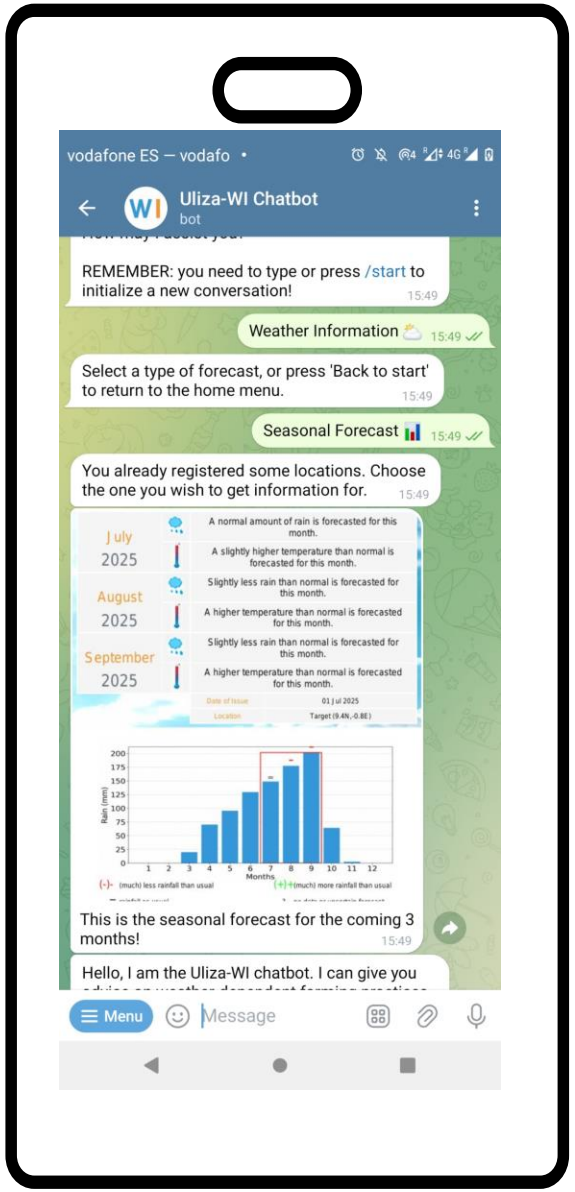
Chatbot features

Weather information: 5-day forecast and seasonal forecast





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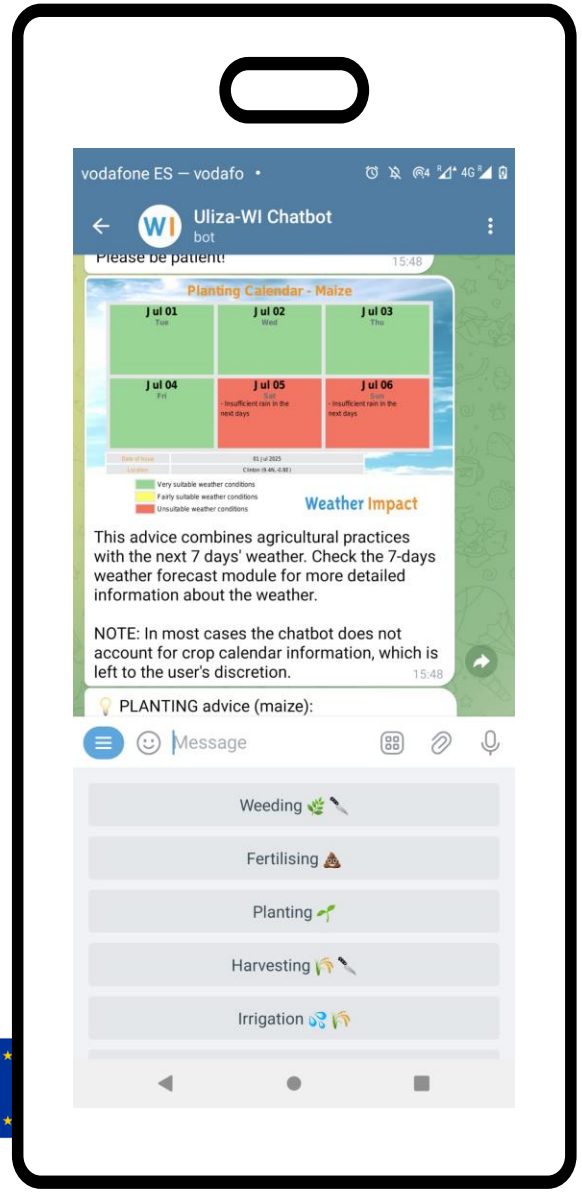
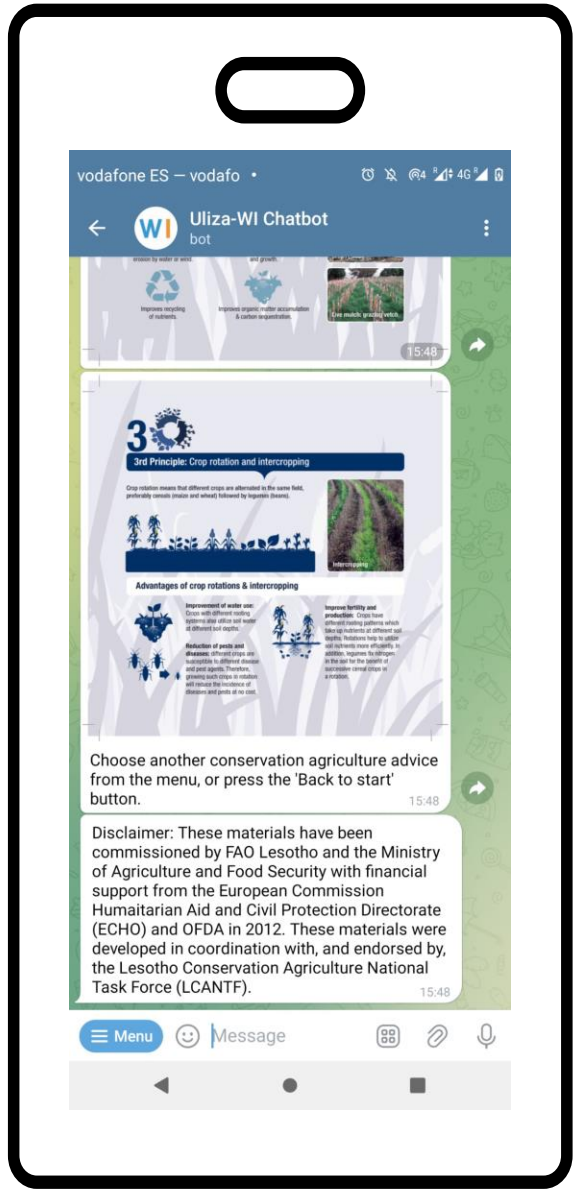
Weather Impact

Chatbot features

Farming advice:
For different crops and farming activities



Conservation agriculture:
Access to information about different practices



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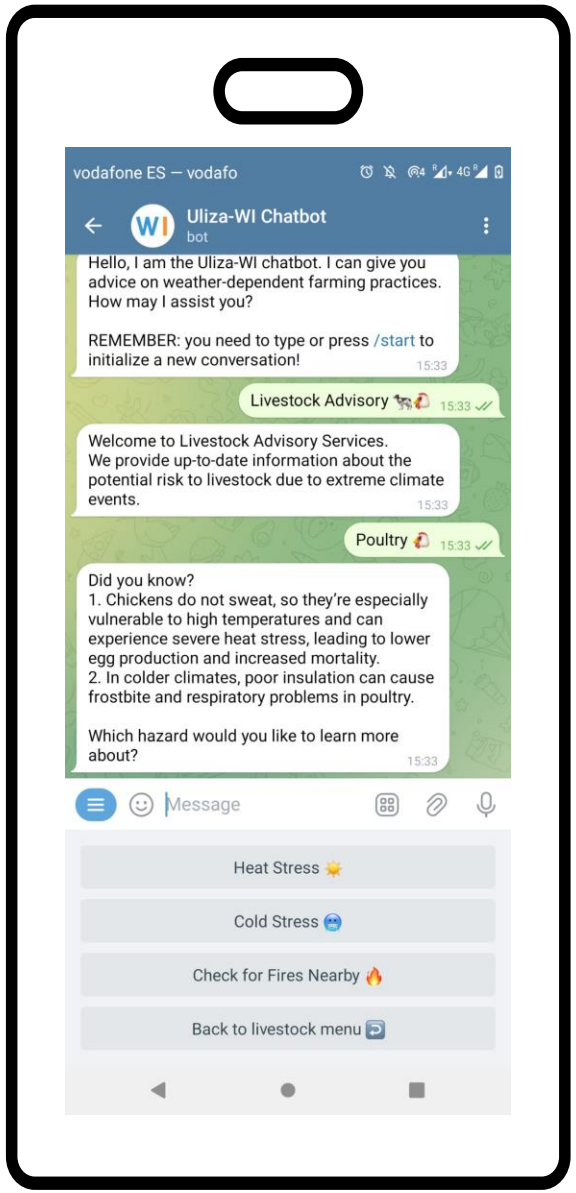
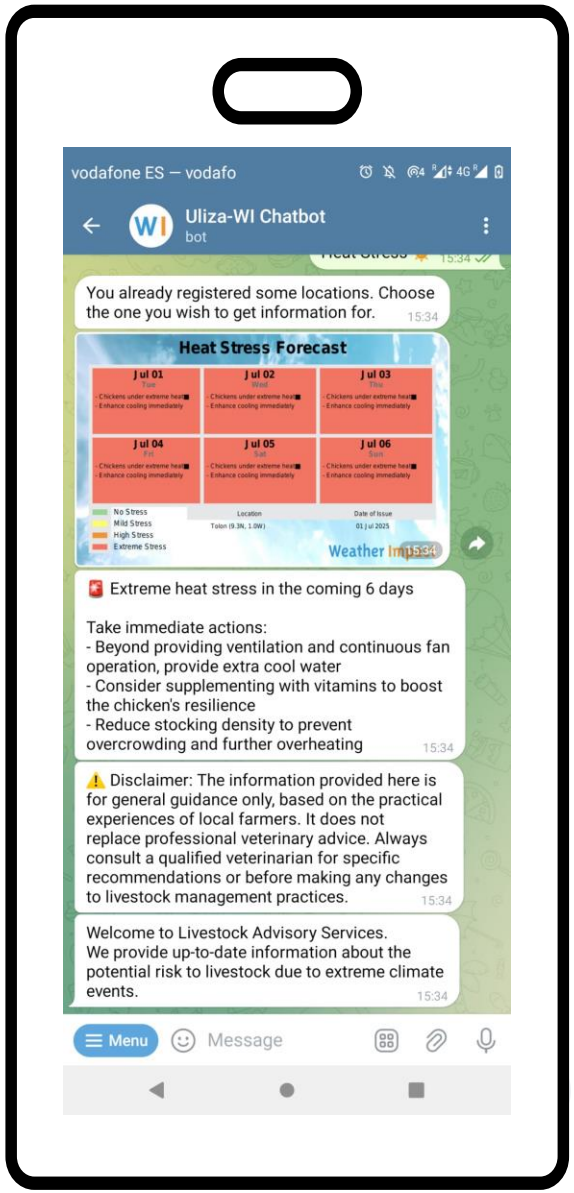
Chatbot features

Weather Impact

Livestock advice:

- **Cattle, sheep & poultry**
- **Multiple hazards**





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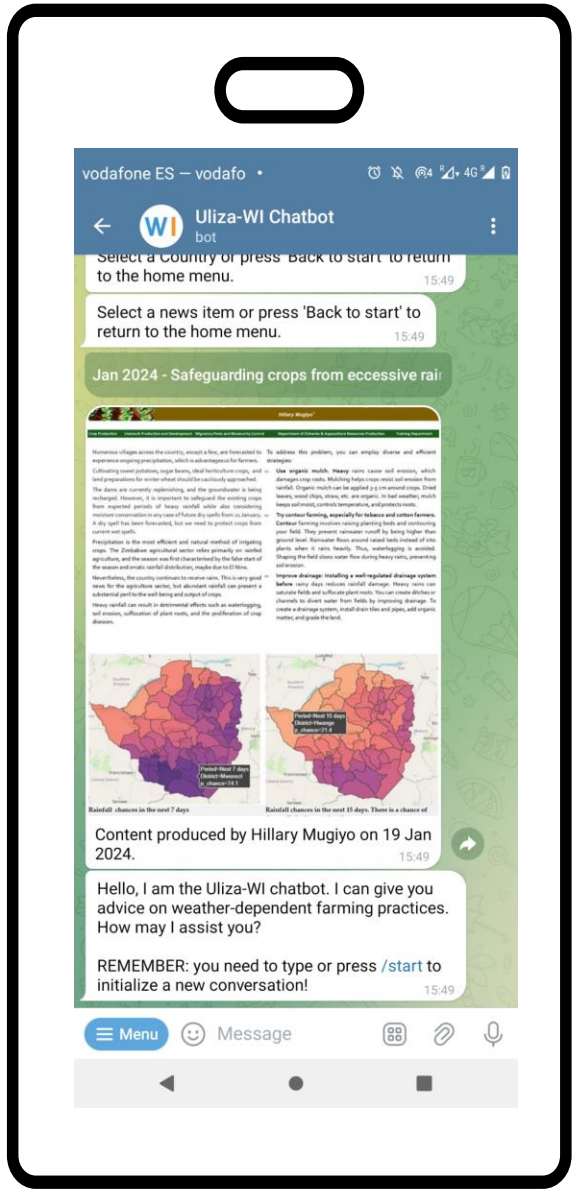
Chatbot features

Weather Impact

News for farmers:
Information dissemination option for Govt. and others



Future features:

- **Available in multiple languages**

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Co-creation of climate services – Why?

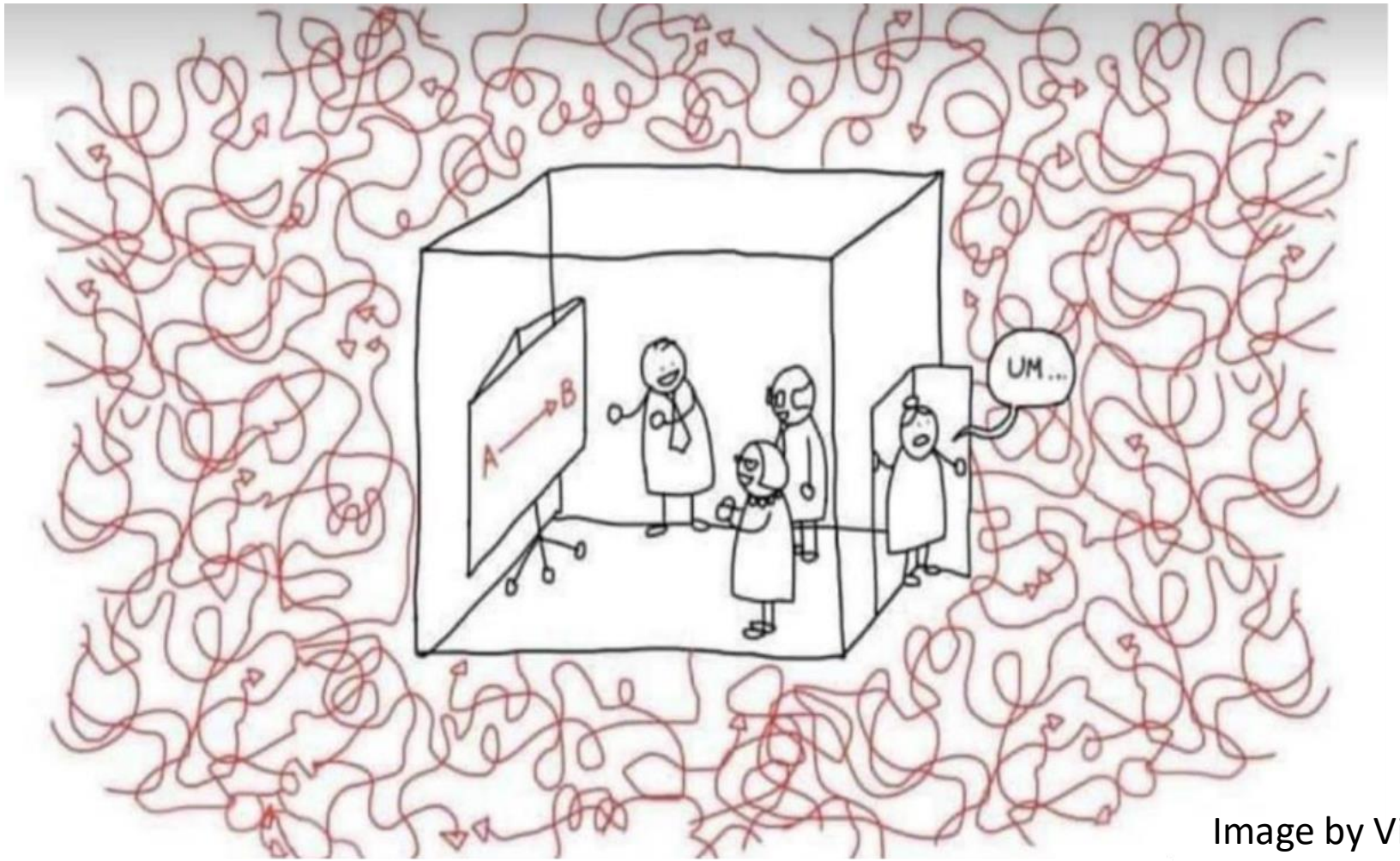

Image by Virpi Oinonen

Co-creation of climate services

- **Poll: What is co-creation?**

1. Educating people about decisions
2. Consulting them on decisions
3. Designing solutions *with* them
4. Giving them full power to produce outcomes *together*

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Co-creation of climate services

- **Poll: When** should farmers be involved in developing climate services *meant for them*?

1. After the service is designed, to test or give feedback
2. During development, to refine content and tools
3. During planning, to help define priorities and approaches
4. From the very beginning, co-identifying the problem and building together

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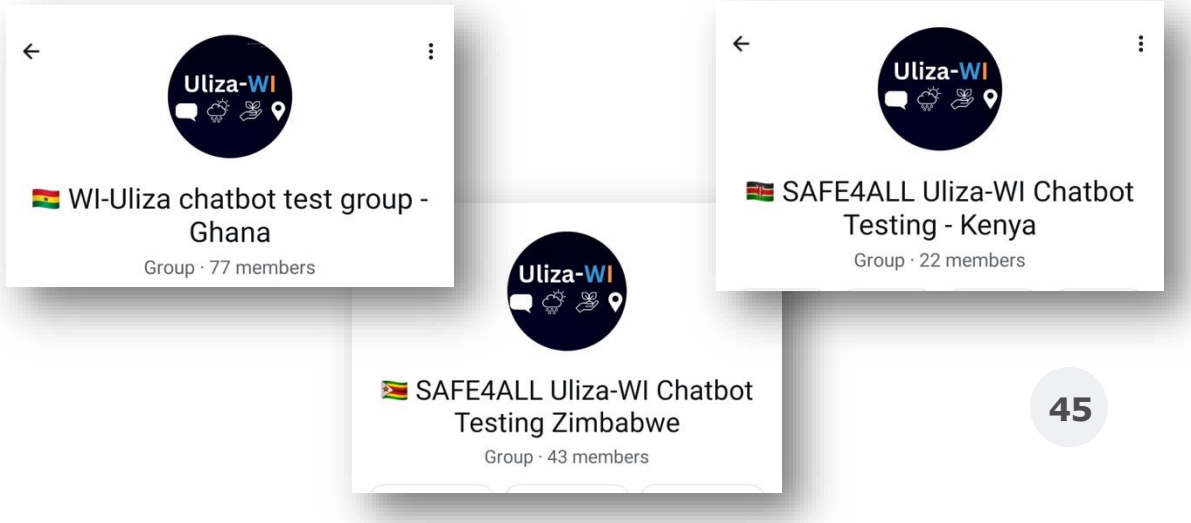
User tests and co-creation

- **Goal: Tests and co-creation with end users, to make climate services that "make sense" – services that are relevant, sustainable and useful**





- User test groups: **Zimbabwe** (2024), **Kenya** (late 2024), **Ghana** (2025)
- First test phase: **User interface & service interpretability**
- In-person workshops & WhatsApp groups
- **Thanks to our partners for their on-the-ground support!**



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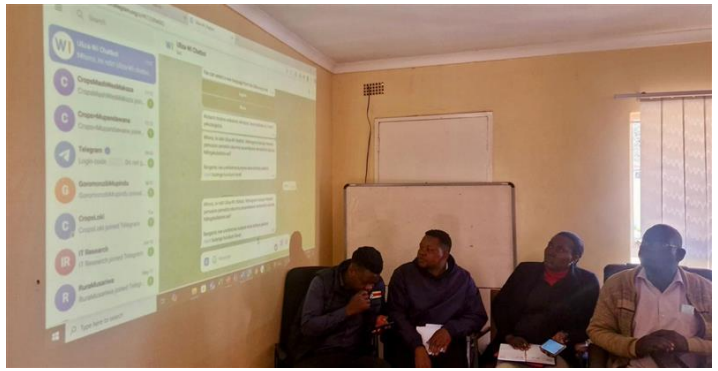
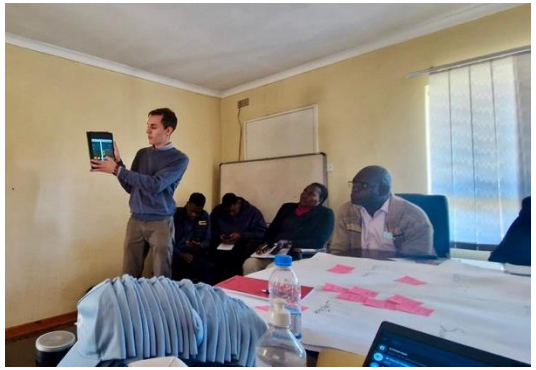
User tests and co-creation

Chatbot training and co-design sessions,
Ghana,
April 2025



User tests and co-creation









Chatbot training and usability test with Agritex | With initial farmers + extension officers in the Marondera district **Zimbabwe**, June 2025

User tests and co-creation

User tests in
Northern Ghana, April2025









7-day Weather Forecast

	Rain Amount	Rain Chance	Temperature	Wind Speed
27 October Sun	0 mm	low	16-28°C	light breeze
28 October Mon	0 mm	very low	15-29°C	light breeze
29 October Tue	0 mm	very low	14-30°C	light breeze
30 October Wed	0 mm	very low	14-30°C	light breeze
31 October Thu	0 mm	medium	15-29°C	light breeze
01 November Fri	1 mm	medium	17-30°C	light breeze
02 November Sat	2 mm	high	17-28°C	light breeze
Date of Issue	28 Oct 2024			
Location	Mapple Inn (-1.2N,36.9E)			

Weather Impact

First version weather forecast

5 days Forecast

	Chipiri (03 Chikumi)	Chitatu (04 Chikumi)	China (05 Chikumi)	Chishanu (06 Chikumi)	Mugovera (07 Chikumi)
Mvura					
Tarisiri yekunaya	pasi kwazvo	pasi	Pakati nepakati	yakakwirira	yakakwirira kwazvo
Tembiricha	zvakafanana nezvazviri nhasi (max. 15°C)	zvakafanana nezvazviri nhasi (max. 15°C)	kupisa kupfuura nhasi (max. 15°C)	kutonhora kupfuura nhasi (max. 15°C)	kutonhora kupfuura nhasi (max. 16°C)

Zuva	04 Jun 2025
Nzvimbo	Try (-29.7N,27.5E)

Weather Impact

Updated weather forecast

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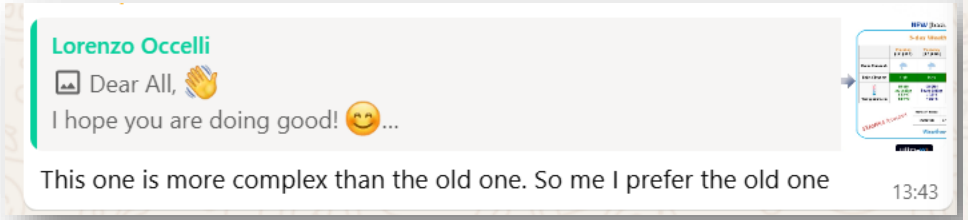
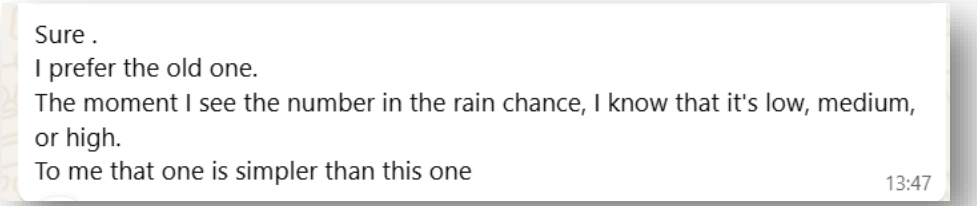
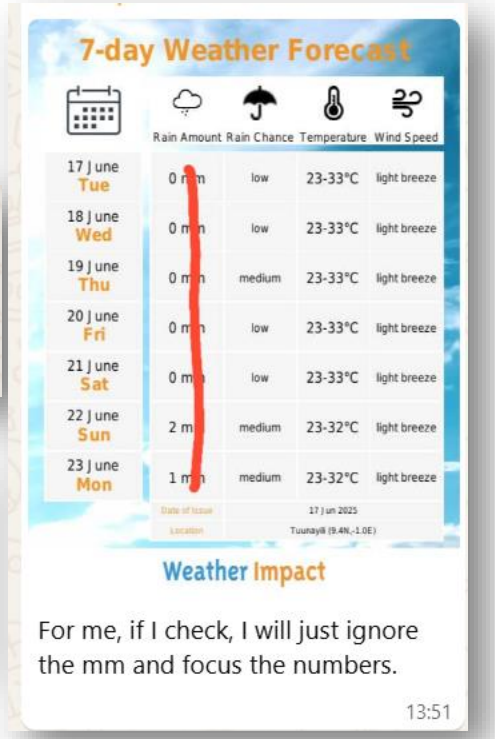
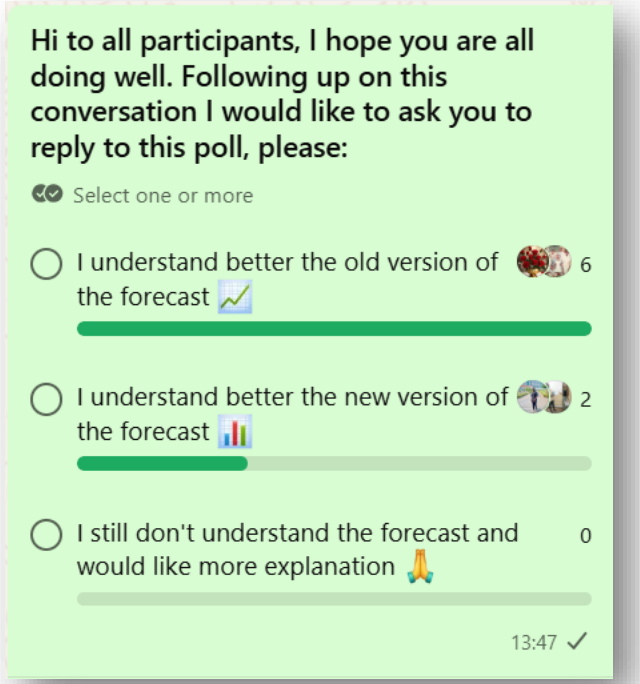
User tests and co-creation

It did not go as planned!
(Feedback from Ghana)









What happened?
Did they get used to the old version?

Lessons learnt

- **Technical challenges:**
  - Smartphones challenges – Even when smartphones are available, sometimes there is still a challenge with the operating system or memory issues
  - Telegram is a challenging platform
- **Accessibility challenges of the chatbot:** Training is needed, on chatbot use & forecast
- **Extension officers** are a good **in-between step** to get to farmers, but then we lose the farmer-specific advice
- **If the target is smallholder farmers, we need to think of what information is really needed (and in what way)**

Complexity in chatbot functionalities



Chatbot accessibility to smallholder farmers

Lessons on co-creation

- Co-creation is **necessary but difficult**, it needs to be budgeted and planned for
- **Invested and continuous engagement is needed**. Once-off engagement is not enough

  (WhatsApp groups are also not enough)
- Building **relations** through continuous engagement is necessary
- **Working with local partners is essential –** consistent presence, cultural context, local languages

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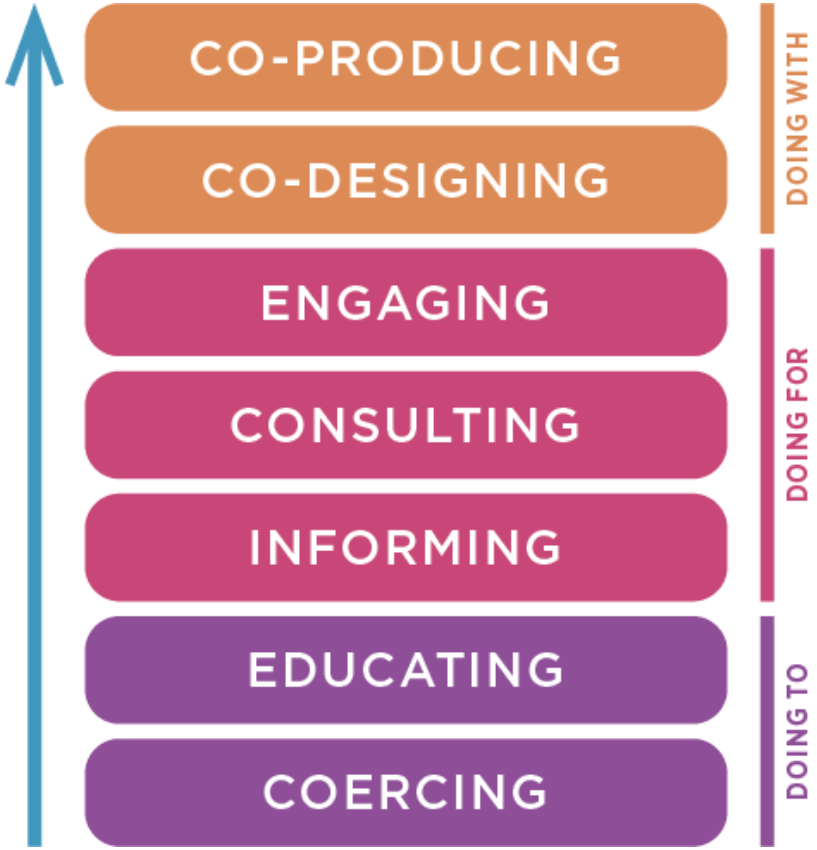
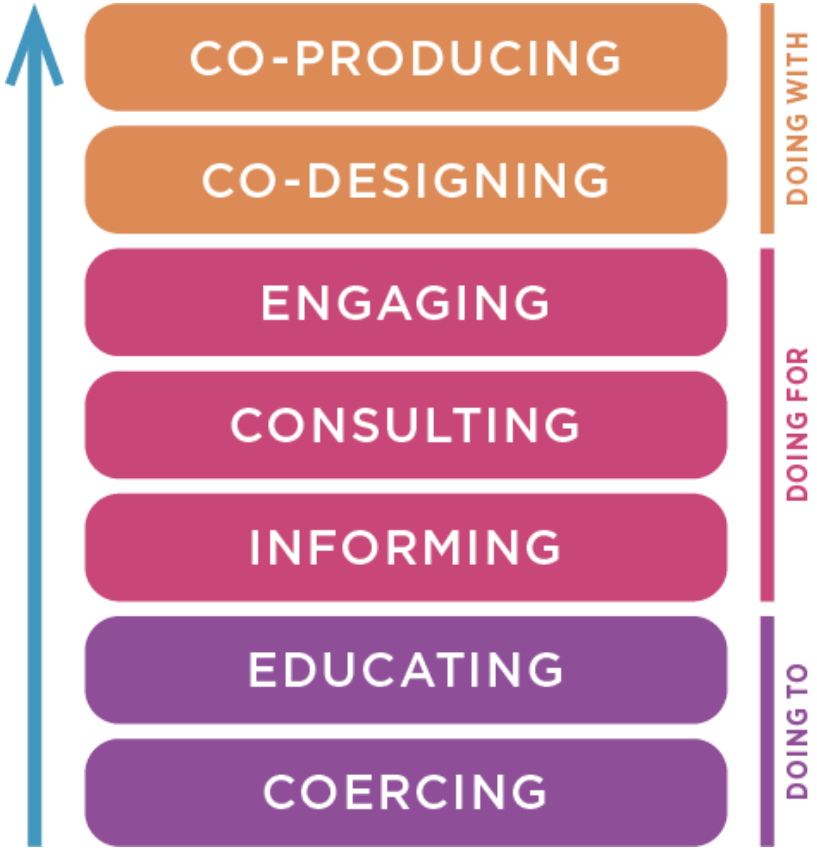
Co-creation of climate services



The New Economic Foundation Participation Ladder

- **Coercing** – People are forced to comply with decisions made without them. *Developers create the chatbot alone and require farmers to use it or lose support.*
- **Educating** – People are told what's best, with little room for feedback. *Experts build the chatbot and train farmers to accept and use it.*
- **Informing** – People are given information, but not asked for input. *Farmers are told a chatbot is being developed but not asked for input.*
- **Consulting** – People are asked for their views, but final decisions are made elsewhere. *Farmers are surveyed about needs but have no role in design decisions.*
- **Engaging** – People participate in dialogue, but influence may still be limited. *Farmers share input during development, but key decisions stay with developers.*

Co-creation of climate services



The New Economic Foundation Participation Ladder

- **Co-designing** – People help shape ideas, plans, or solutions together. *Farmers help shape the chatbot's design, language, and interaction style.*
- **Co-producing** – People share power and responsibility to deliver outcomes together. *Farmers are full partners throughout design, testing, and ongoing improvements.*

Is co-creation co-production or co-design?

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Co-creation of climate services

Poll: What level of participation do you think should be our target in the creation of climate services?

1. Coercing
2. Educating
3. Informing
4. Consulting
5. Engaging
6. Co-designing
7. Co-producing

Question to debate: What would true co-production look like for the chatbot?

The New Economic Foundation Participation Ladder

Give it a try!



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Questions



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Ghana Climate Atlas for Climate Projection & Decision-making

Hayford Asuako Yeboah
Ghana Meteorological Agency(GMet)

Poll: ...

Do you know of any climate atlas?

A) Yes
B) No

If yes, what is the source of this climate atlas?

A) National Meteorological institutions
B) Non-Meteorological institutions
C) International platforms eg. IPCC, C3S

About Ghana Meteorological Agency

Ghana Meteorological Agency (GMet) is mandated (Act 682, 2004) to provide meteorological services in the country and ensure the operation and maintenance of international standards and practices in meteorology and advice the Government on meteorology generally for socio-economic development.

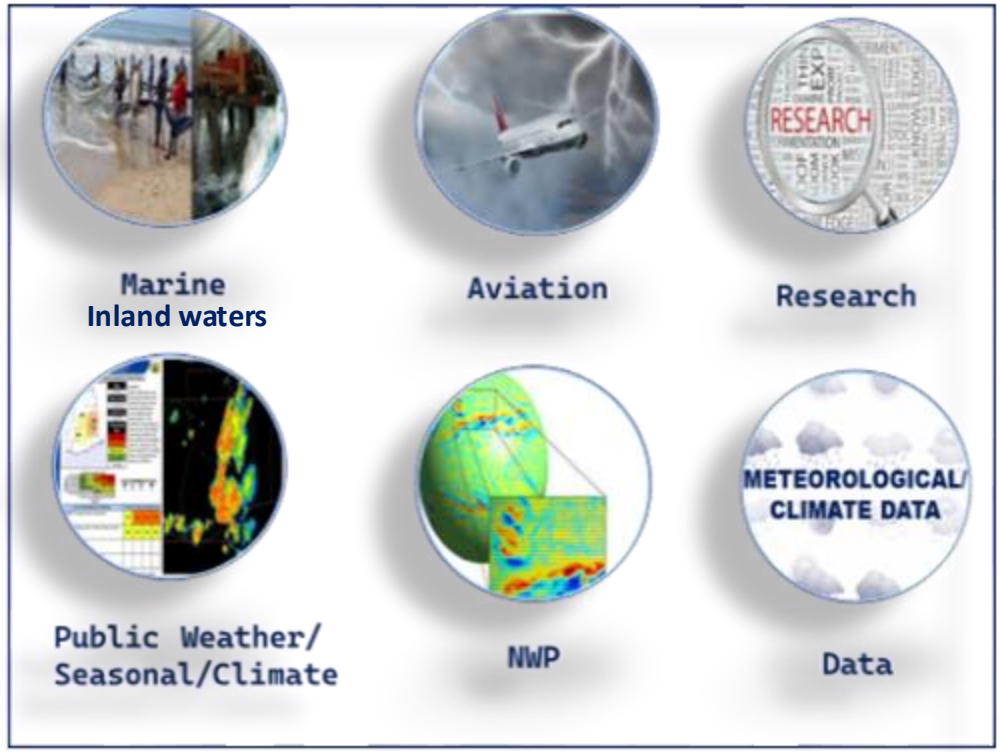
Mission

To provide efficient weather and climate services for socio-economic development in Ghana.

Vision

To become the lead meteorological service provider in the sub-region.

Climate Services



Channels of Dissemination



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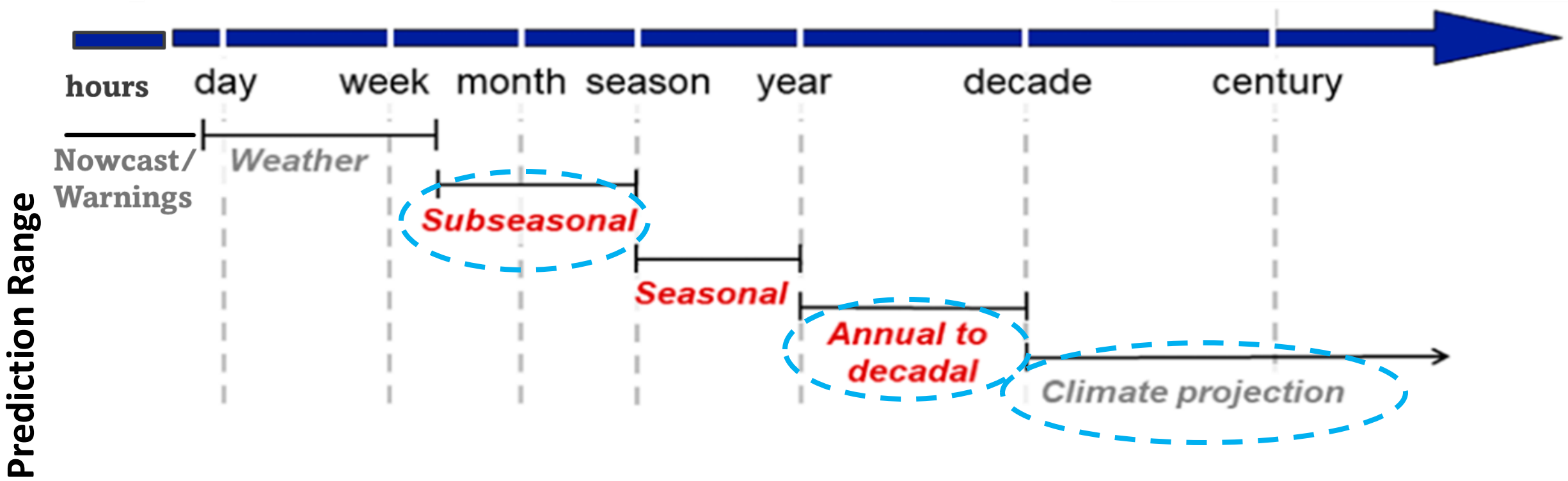
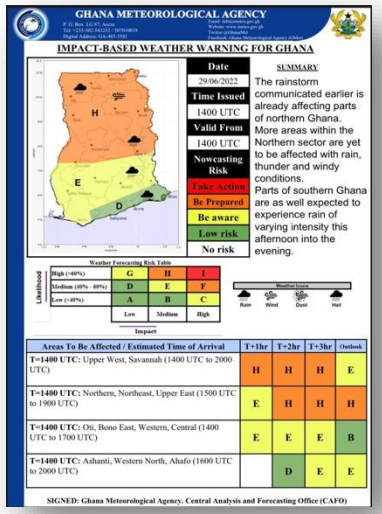
GMet Forecast Timescales

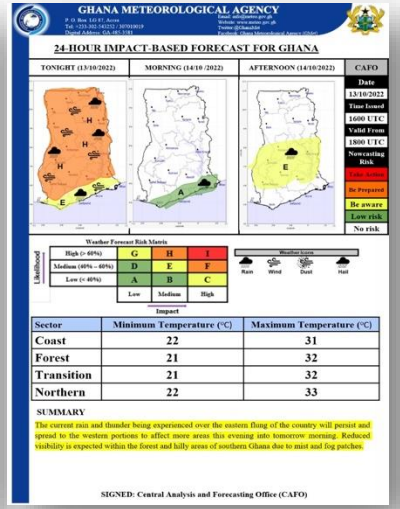


Broken circles represents gaps in GMet's operational forecasts and timescales which are currently been explored for all forecasting timescale and prediction

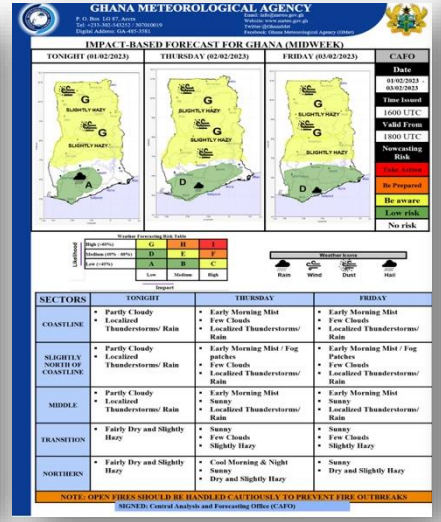
GMet Products



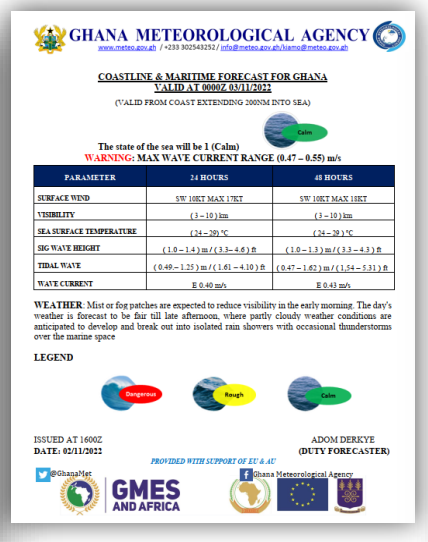
Weather Warnings



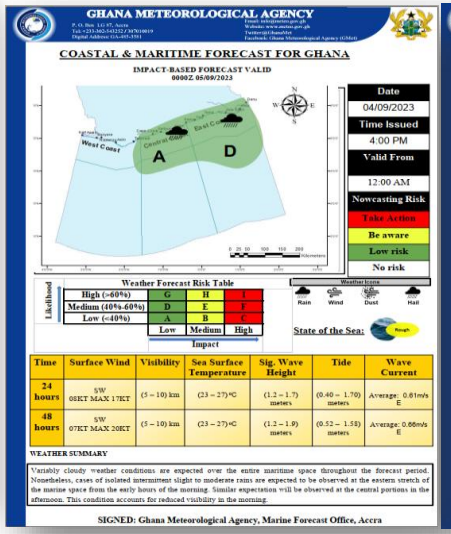
Daily

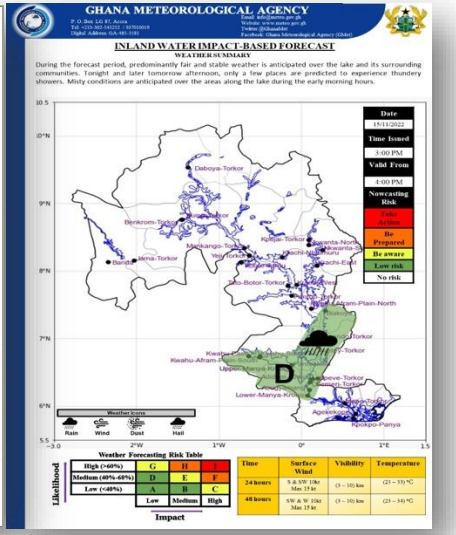


Weekly



Marine

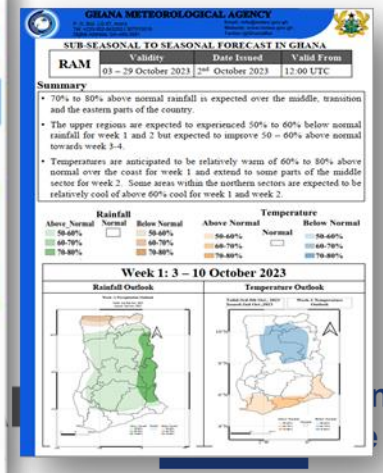




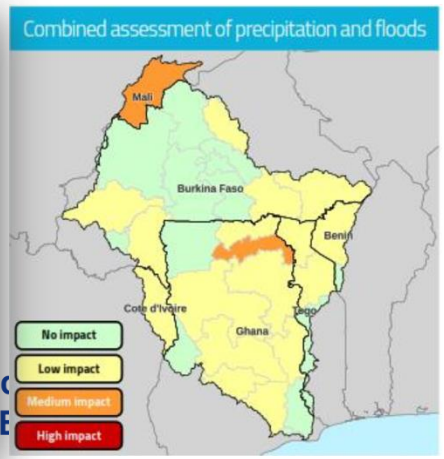
Inland waters



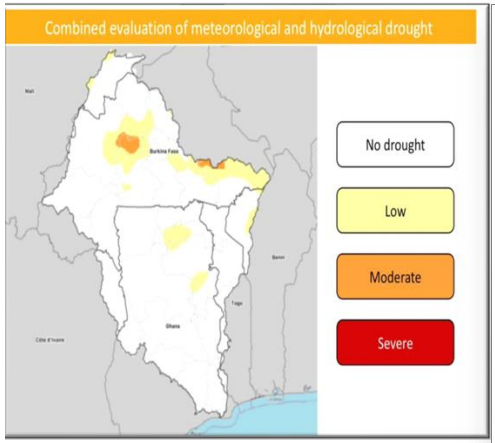
Seasonal



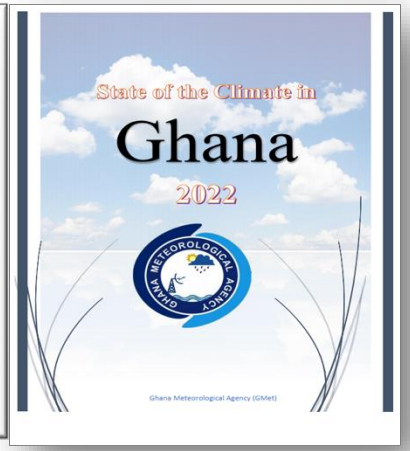
Sub-Seasonal



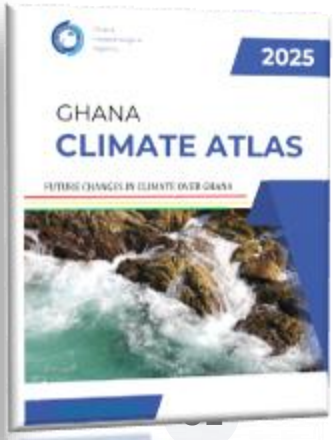
Flood product



Drought product

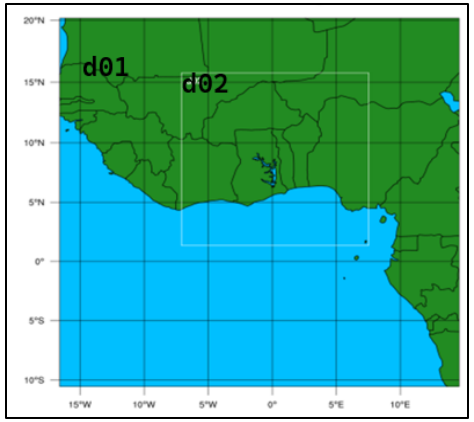


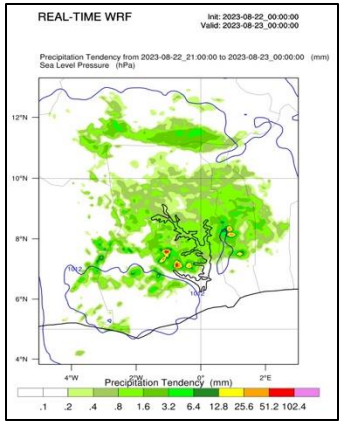
Sate of the Climate



Climate Projection

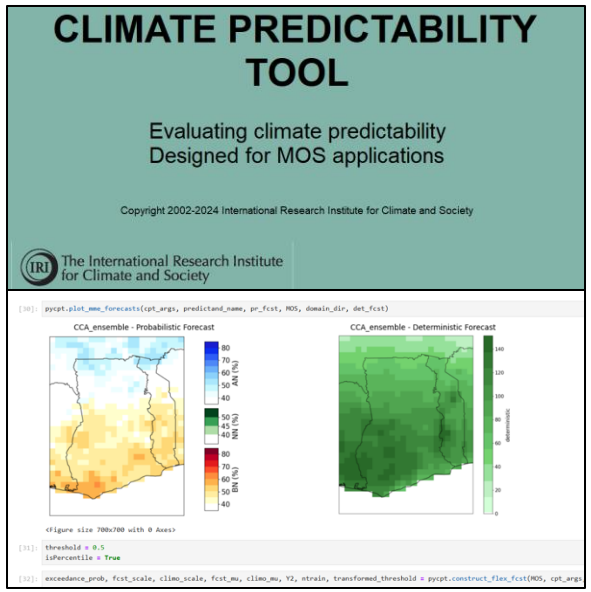
GMet Models & Statistical Tools



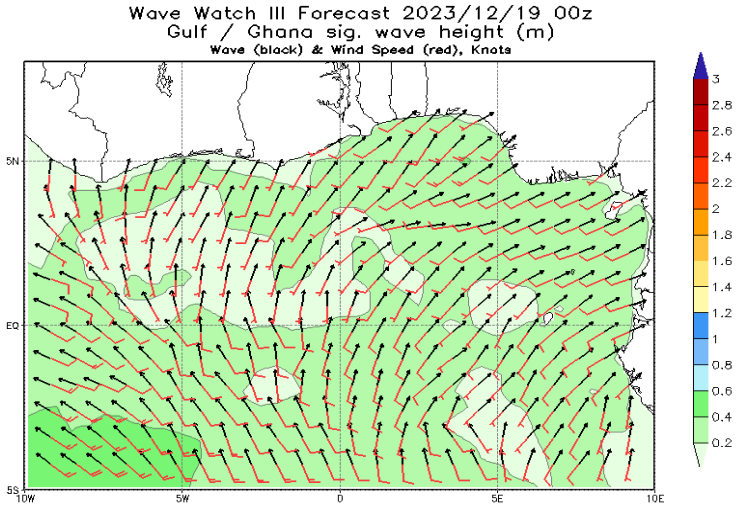


GMet **Weather Research and Forecasting (WRF)**

Resolution = 12km (d01) and 4 km (d02)

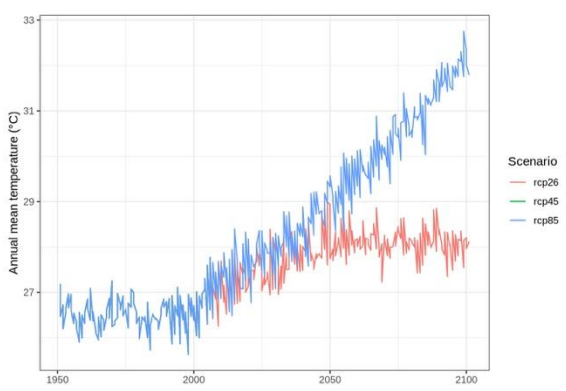


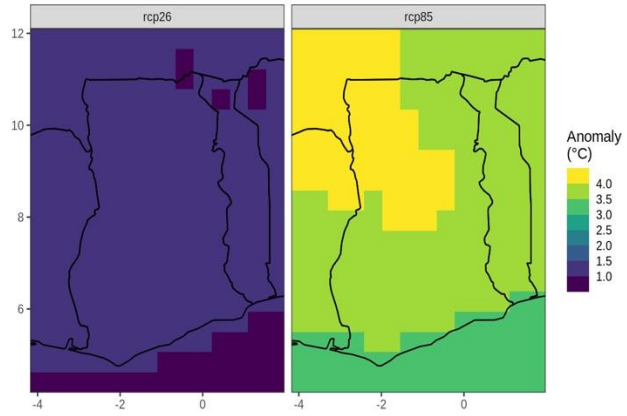
CPT/PyCPT for Monthly & seasonal forecasting



WaveWatch3 for Marine modeling

Climate Atlas: Climate change Projection information
(Rainfall, Temperature & Sea level**)**





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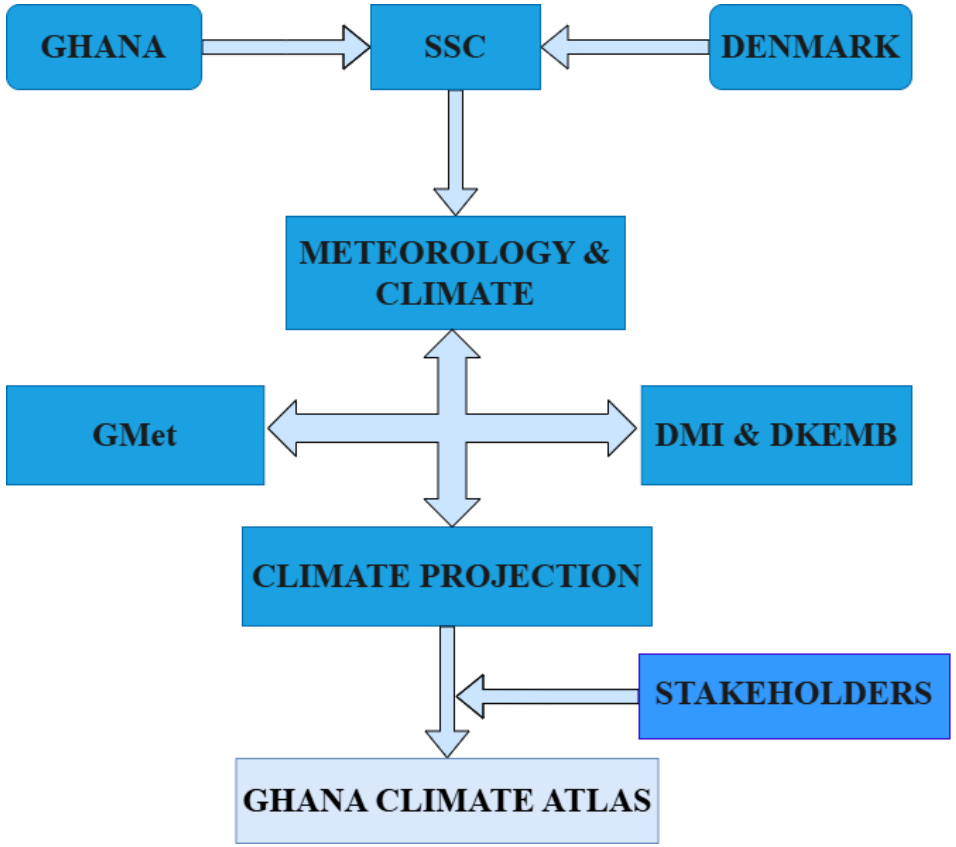
The Ghana Climate Atlas Partnership





The Ghana Climate Atlas is an initiative of the Ghana Meteorological Agency with technical support from the Danish Meteorological Institute (DMI) and the Danish Embassy Ghana (DKEMB) under the Strategic Sector Cooperation (SSC) between Ghana and Denmark

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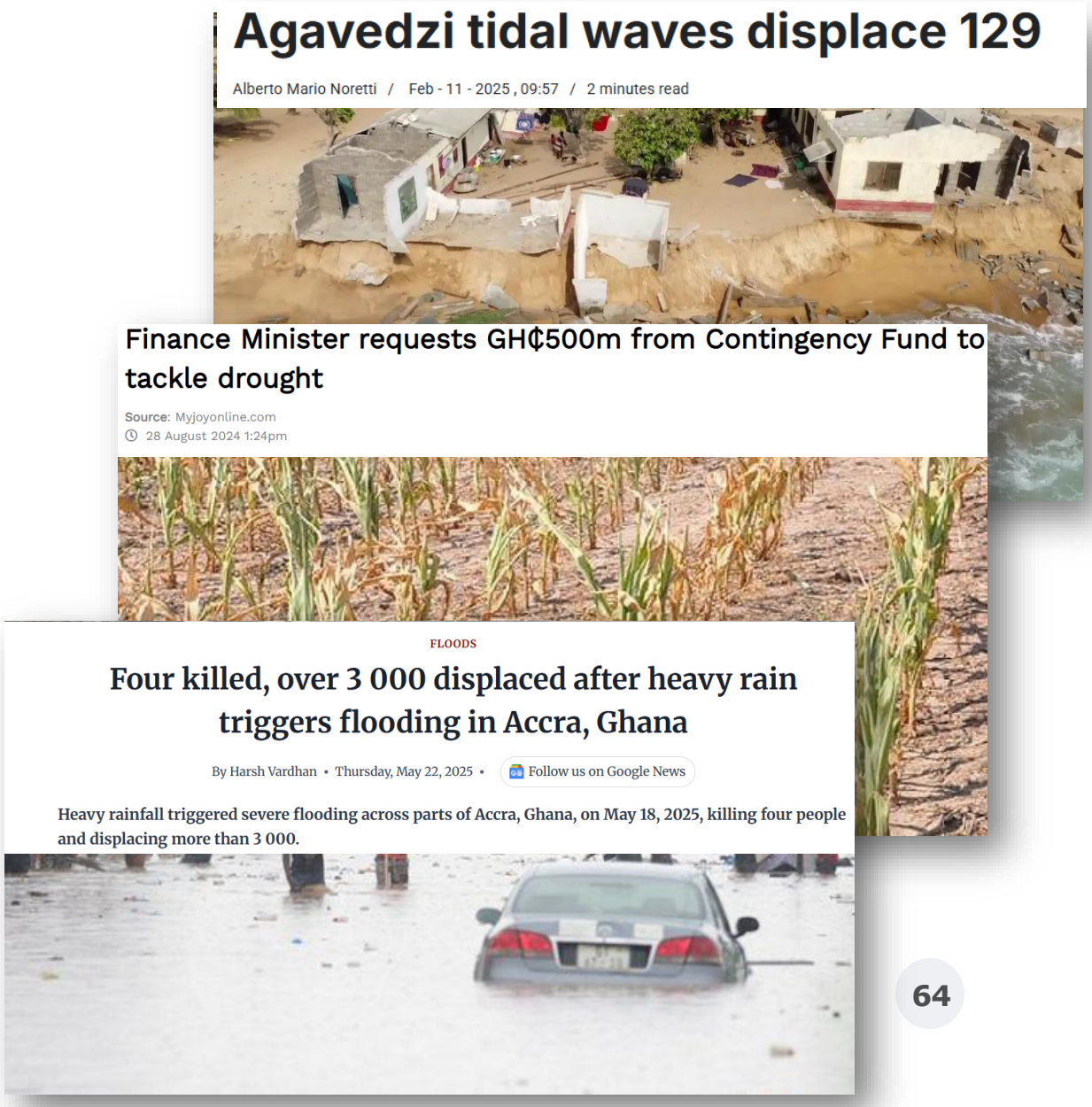
Why a Ghana Climate Atlas?

Climate change affects the environment in many ways, including high temperatures, coastal erosion/inundation, drought, floods among others.

The Ghana Climate Atlas is a user-friendly and interactive tool that :

- Illustrates how Ghana's climate is expected to change over the coming years.
- Ensures standardization of long-term climate information
- Informs policy and decision-making for climate resilience



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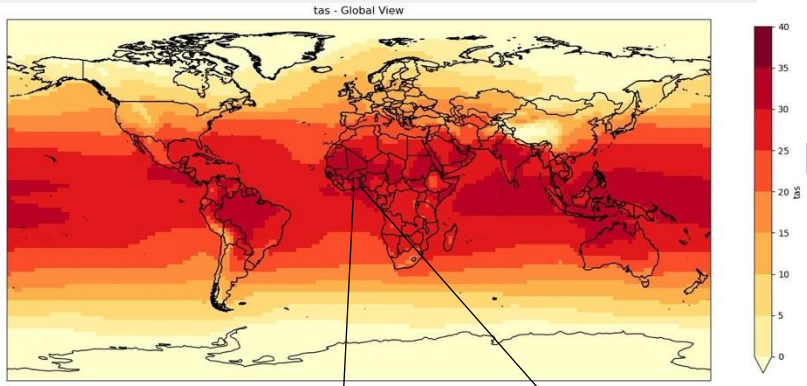
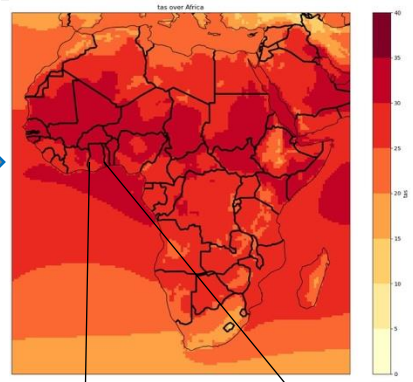
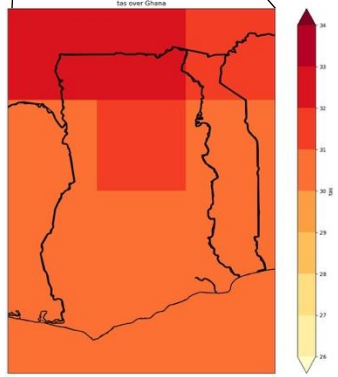
How does the Climate atlas work?

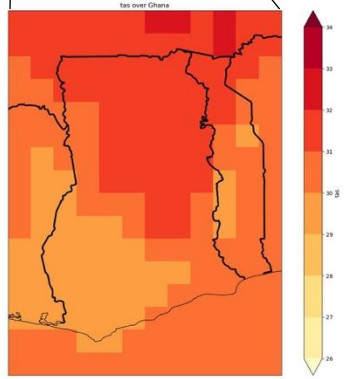
Global Models
~100 km



Regional Models
~50 km



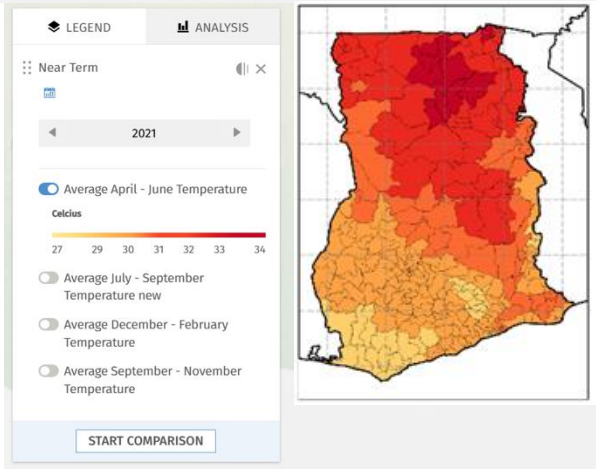




KAPy

Downscaling

Ghana Climate Atlas
~25 km



ipcc INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

WCRP CORDEX

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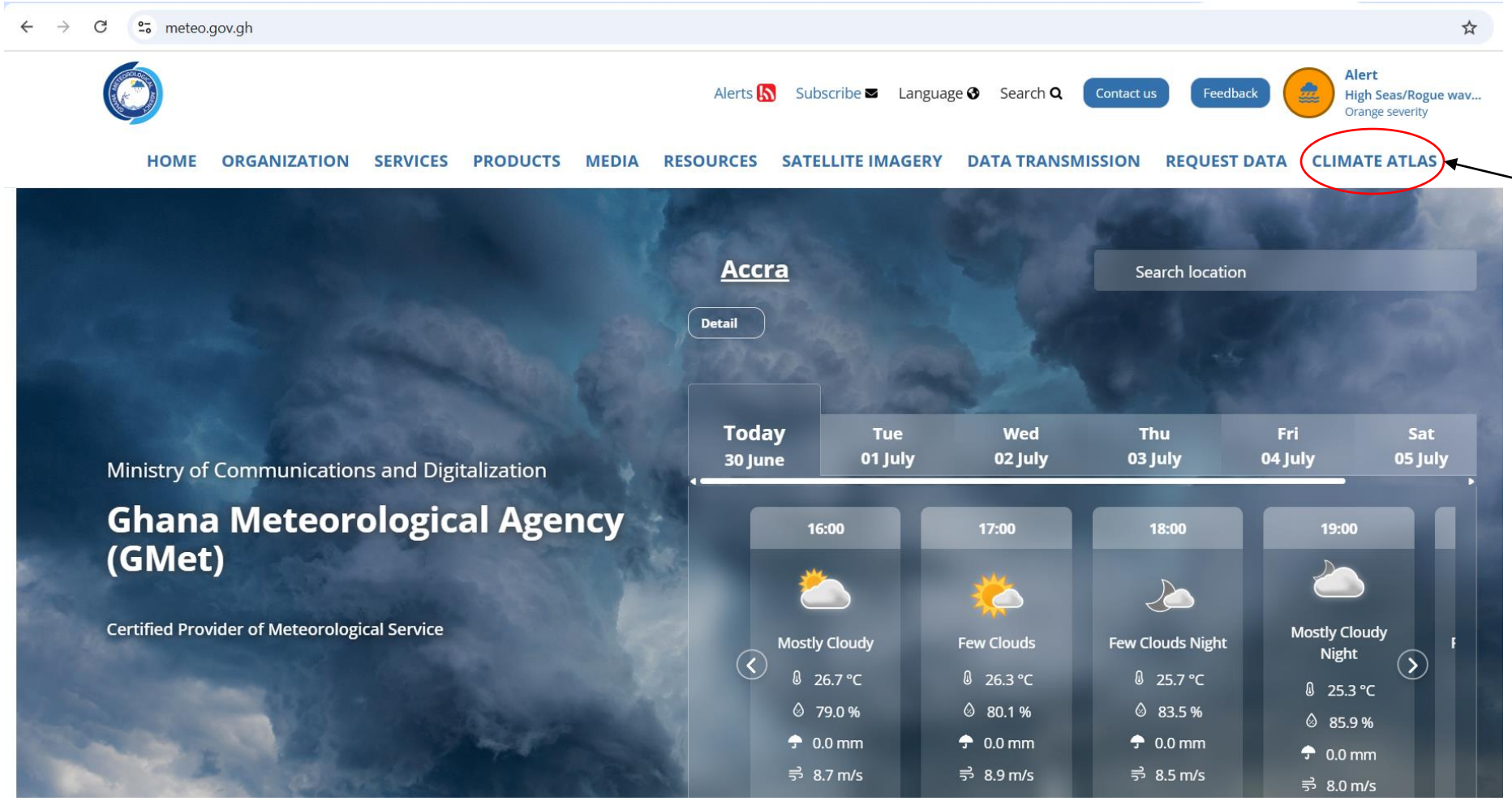
GMet Website



Will be available soon

www.meteo.gov.gh

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What does the atlas look like?

❑Climate Indicators

- Average Temperature (Annual/Seasonal)
- Total Rainfall (Annual/Seasonal)
- Sea Level Rise

❑Emission scenarios

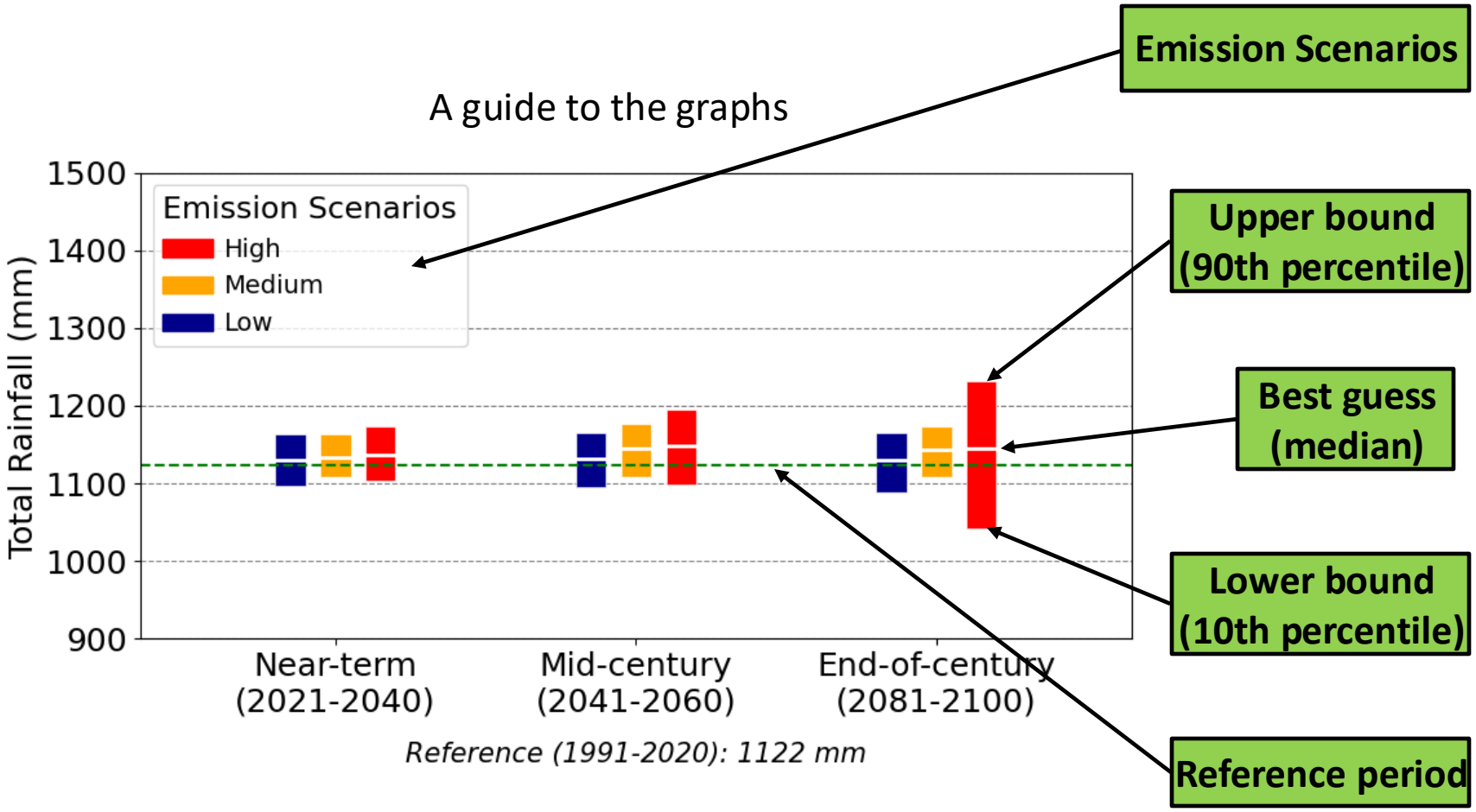
- High (RCP 8.5/SSP 6-8.5)
- Medium (RCP 4.5/SSP 3-4.5)
- Low(RCP 2.6/SSP 1-2.6)

❑Time Periods

- Reference Period (1991-2020)
- Near term (2021-2040)
- Mid century (2041-2060)
- End of century (2081-2100)

❑Uncertainties

- 90th Percentile
- 50th Percentile
- 10th Percentile



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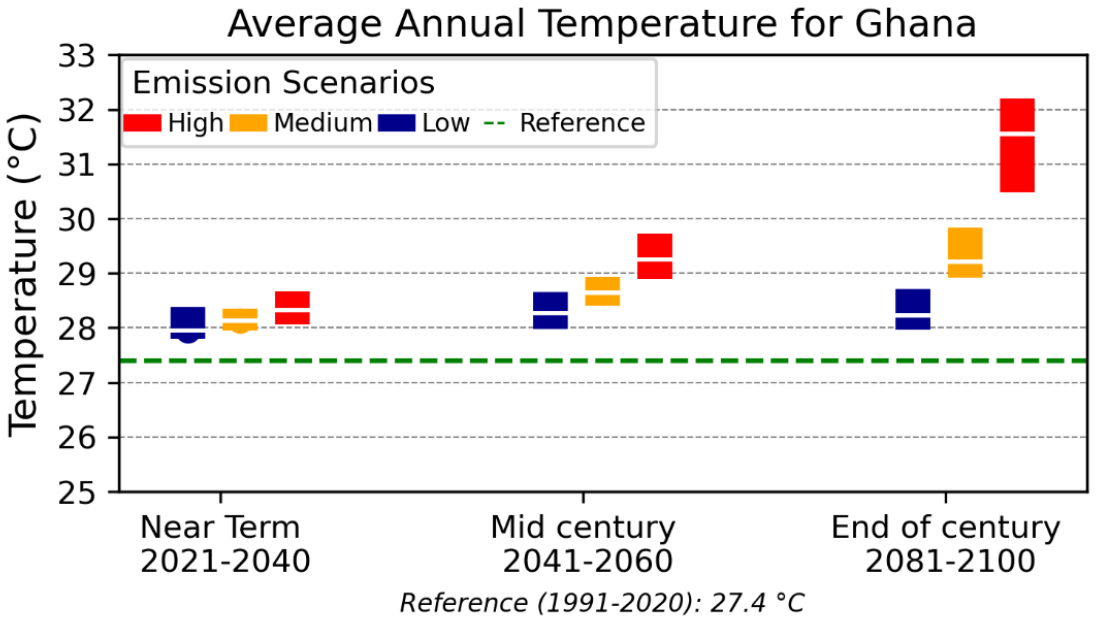
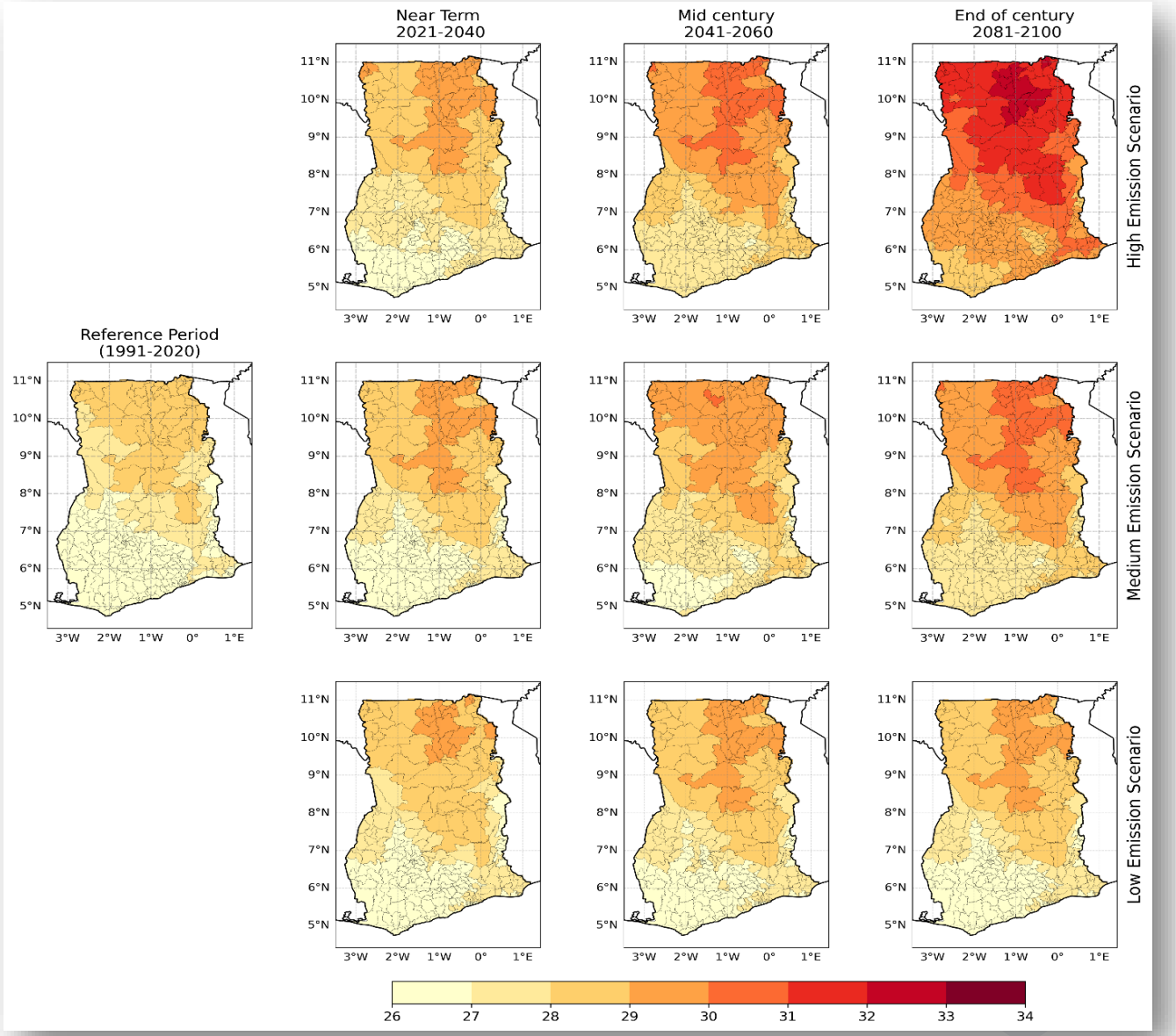
Average Annual Temperature Projection





Key finding: By end of this century (2081-2100), in a medium emission scenario (RCP4.5/SSP3-4.5):

- Average annual temperature is expected to rise by 1.8ºC above the reference period value of 27.4°C.
- Average annual temperature will be 29.2°C.

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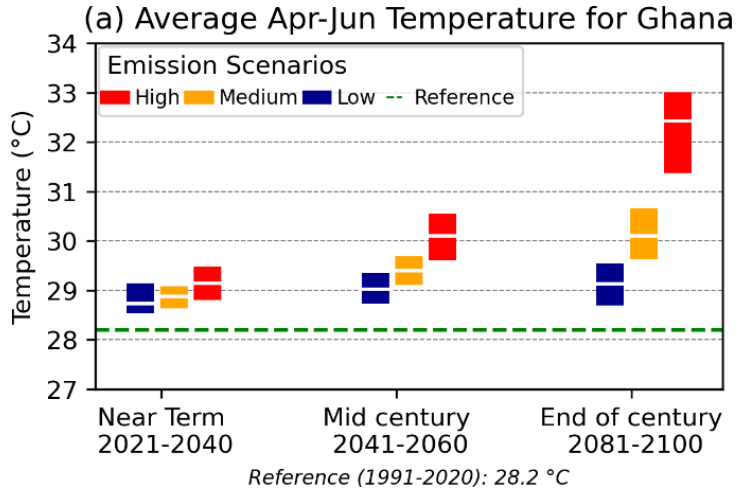
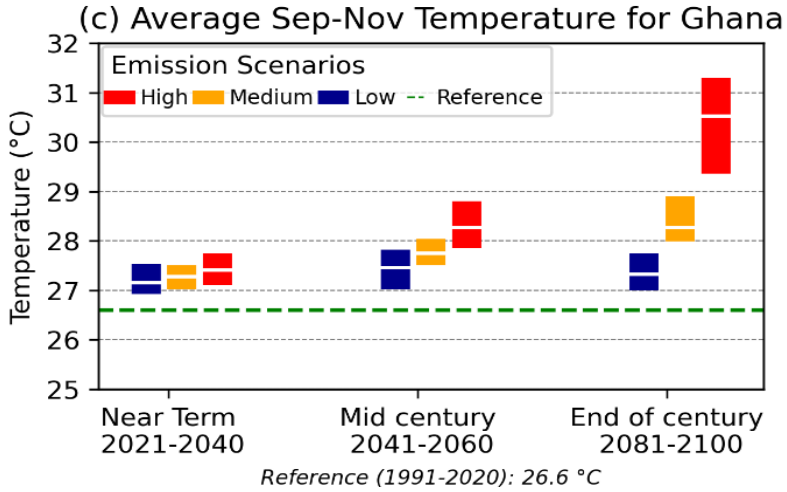
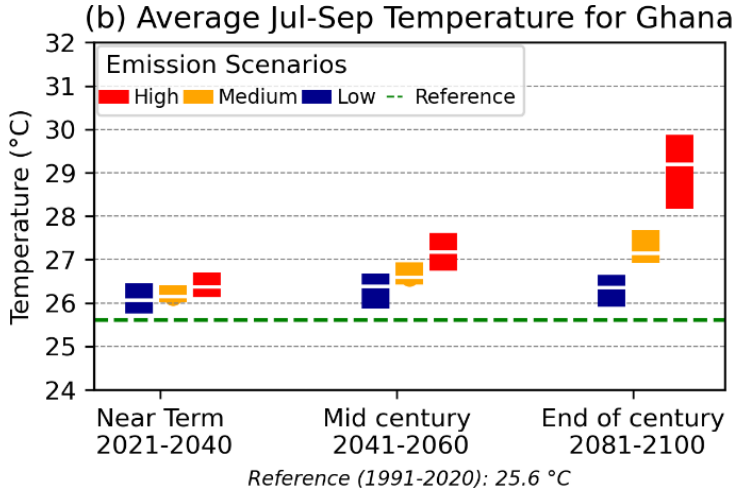
Average Seasonal Temperature Projection

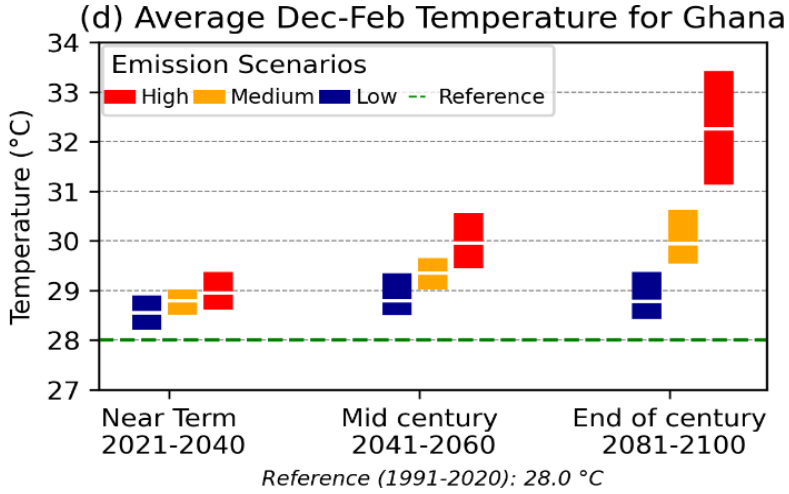
Key finding: By end of this century (2081-2100), in a medium emission scenario (RCP4.5/SSP3-4.5):

- Average seasonal temperature is expected to increase the most during December-January-February (DJF) season by 2ºC while the least increase of 1.6ºC is projected to occur during July-August-September (JAS).









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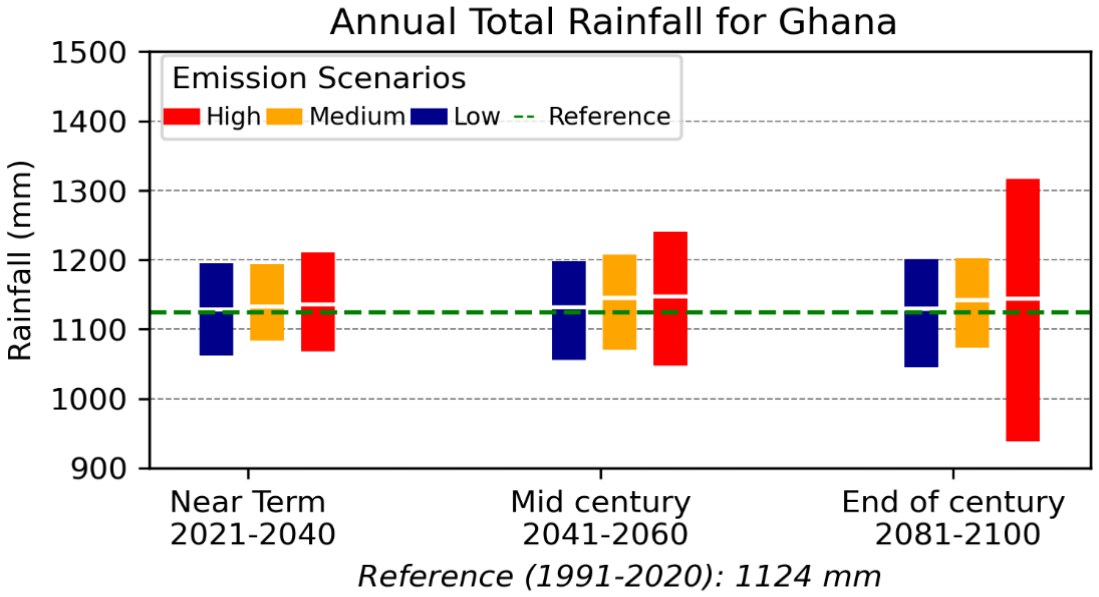
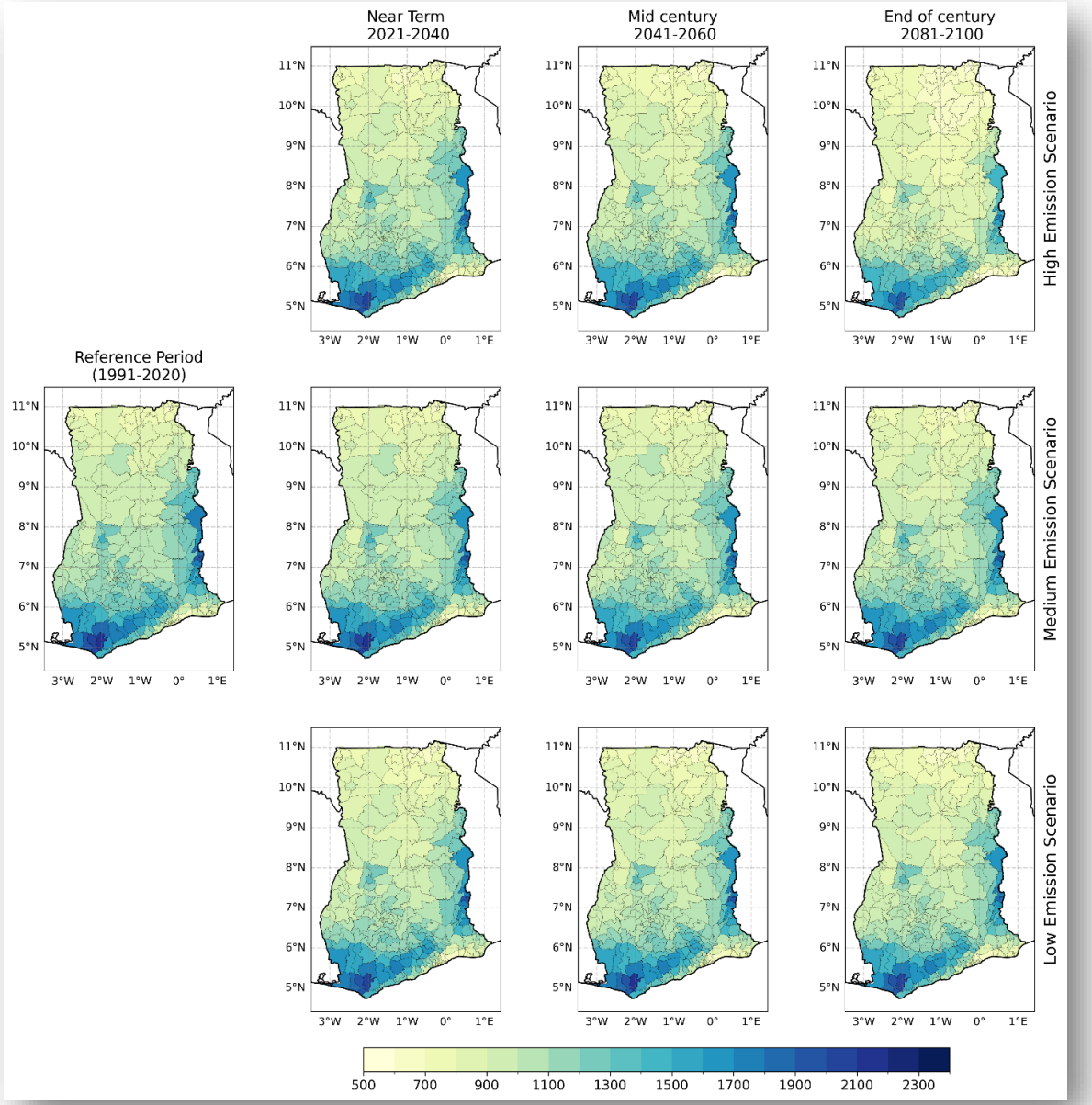
Total Annual Rainfall Projection





Key finding: By end of this century (2081-2100), in a medium emission scenario (RCP4.5/SSP3-4.5):

- Total annual rainfall will likely increase by 22mm (1.9%).
- Total annual rainfall will be 1146mm

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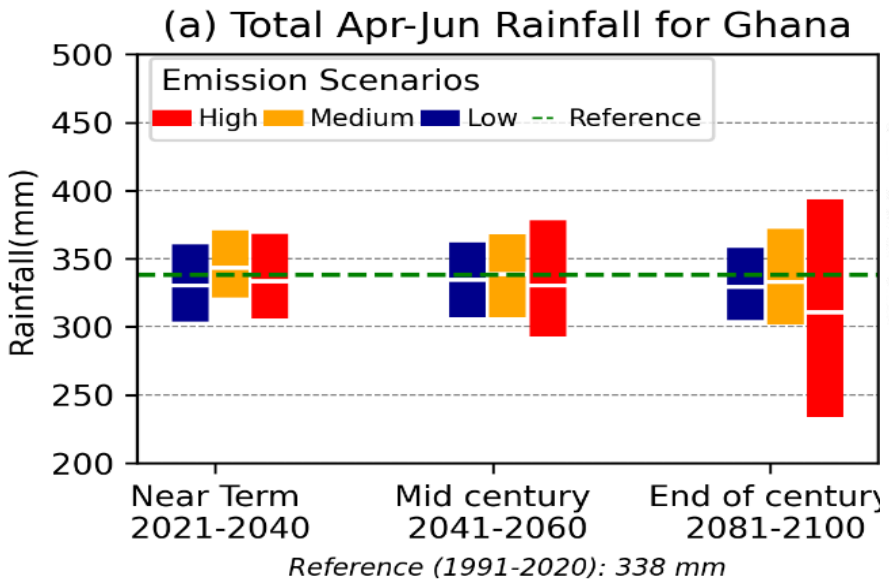
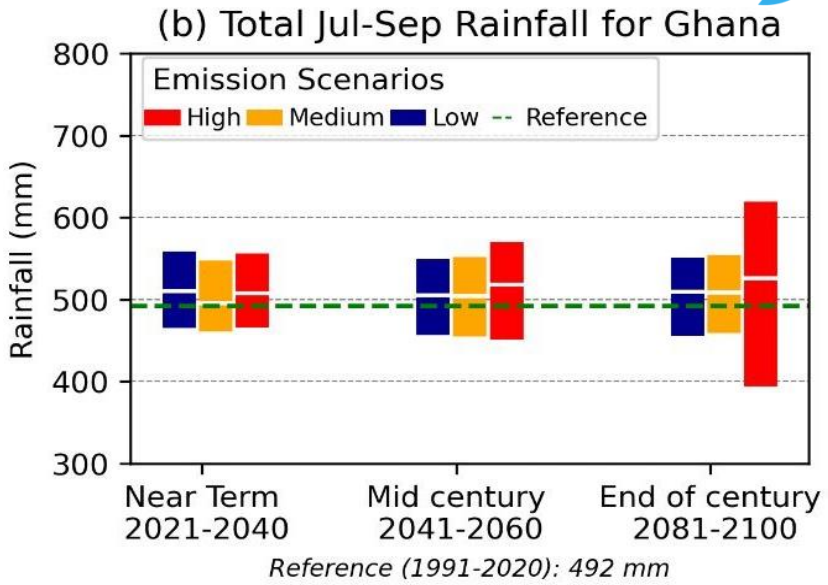
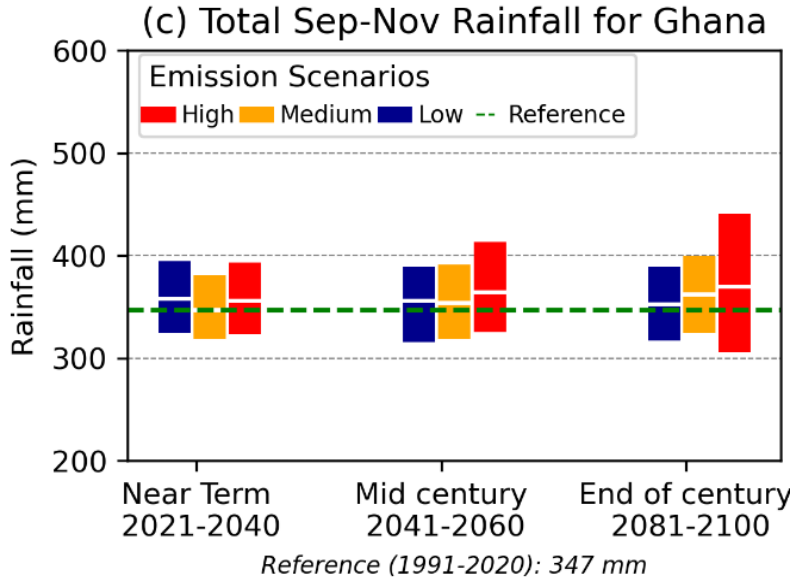
Total Seasonal Rainfall projection

Key finding: By end of this century (2081-2100), in a medium emission scenario (RCP4.5/SSP3-4.5):

- The seasons of September-October-November (SON) will experience the most increase in rainfall of 15mm (4.3%) compared to its reference period, whereas a decline in rainfall of 4mm (-1.3%) will be seen during the seasons of April-May-June (AMJ).







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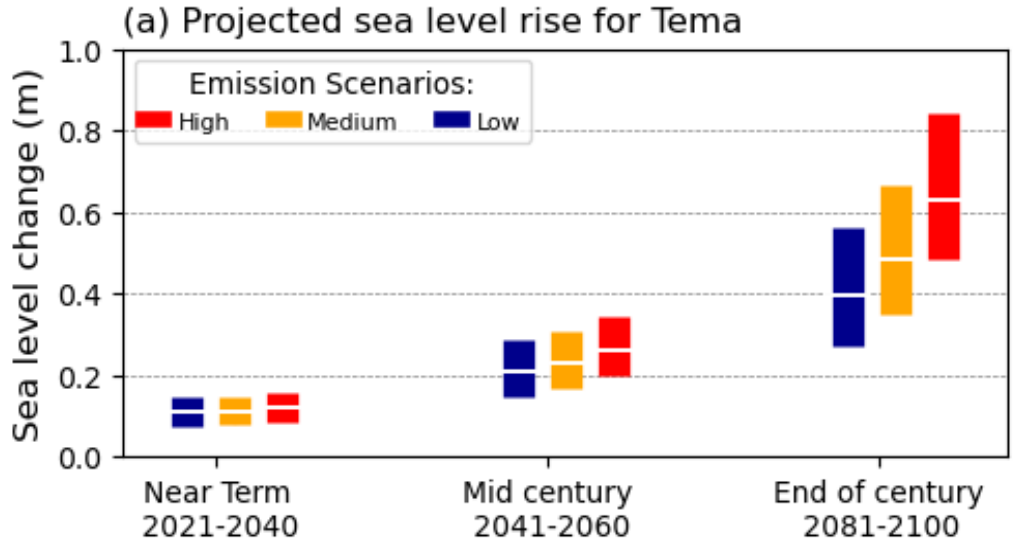
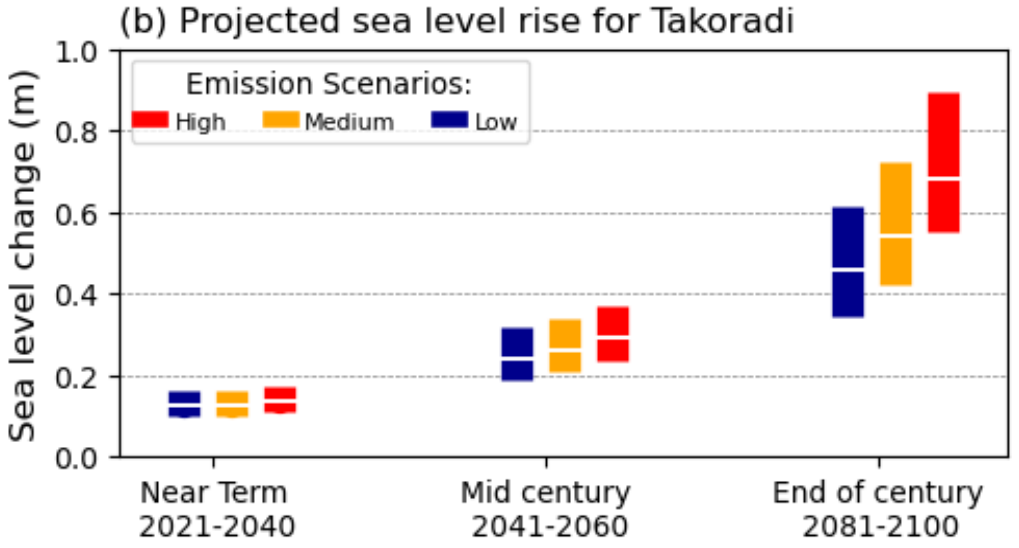
Sea Level Rise for Tema and Takoradi

Key finding: By end of this century (2081-2100), in a medium emission scenario (RCP4.5/SSP3-4.5):

- Continuous rise in mean sea level for both the east coast and west coast.
- Tema representing the east coast is projected to experience a mean sea level rise of approximately 0.48m.
- The west coast represented by Takoradi is projected to record a mean sea level rise of around 0.54m.





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Who are/will be the users and for what purpose?

The Ghana Climate Atlas is designed for a wide range of users:

- Policy Makers & Government Agencies
- Researchers & Academia
- Disaster Risk Managers & Emergency Responders
- NGOs & Development Partners
- Farmers & Agricultural Extension Services
- Private Sector (e.g., Insurance, Agribusiness, Energy)
- Local Communities & Civil Society Organizations

The Ghana Climate Atlas can be tailor-made to user-specific needs

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Lessons learnt and what other Met Services can learn from the Ghana Climate Atlas

The Ghana Climate Atlas offers valuable insights into climate trends and future projections in the Ghana. Other meteorological services and countries can draw several lessons from this initiative.

1. Provision of Climate services at all timescales.
2. Strengthen collaboration between forecasters/meteorologists and climate scientists.
3. Capacitate the Met Services to contribute to frameworks/policy such as IPCC Report, Nationally Determined Contributions, National Adaptation Plan and the government on climate-related issues.
4. Aid standardization of climate information to ensure effective communication and use of complex climate data.
5. Enhance the understanding of the impact of climate trends.
6. Help to inform contingency planning for Disaster Risk Reduction

How do you envision the atlas in 5 years?

In 5 years, the Agency envisions the Ghana Climate Atlas evolving into a dynamic, interactive platform that is fully integrated into national climate services and decision-making processes. It will:

- Integrate higher-resolution observation datasets
- Expand spatial coverage to regional and district levels
- Serve as a go-to tool for climate-smart planning
- Provide tailor-made products for all sectors
- Inform regional/district-level climate action plans
- Build user capacity to effectively use the Atlas
- Influence and support broader regional climate initiatives

Questions



Question: Which climate service would you like to make?

Raise your hand if you would like to say something

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?? Climate Impact Atlas Netherlands / how to design climate services

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ONBOARDING LEARNING PROGRAM

Session 5:

STAKEHOLDER ENGAGEMENT: COMMUNICATING INFORMATION AND CLIMATE RISK

Communicating climate risk to a broad range of stakeholders

DATE
September, 2025

TIME
9 AM GMT | 11 AM CAT
12 PM EAT

DURATION
1.5 hours

Climate Adaptation Services

RESILIENT CITIES NETWORK

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Next session!

Recordings will be posted on:
https://kenya.safe4allafrica.eu/

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Have a great day!