ASPECT
FACILITATING SEAMLESS CLIMATE ADAPTATION

Introduction

Author: Albert Soret & Marta Terrado (BSC)
Venue: ASPECT Workshop for National Met Services
Date: 22 October 2024

Funded by
the European Union

Motivation

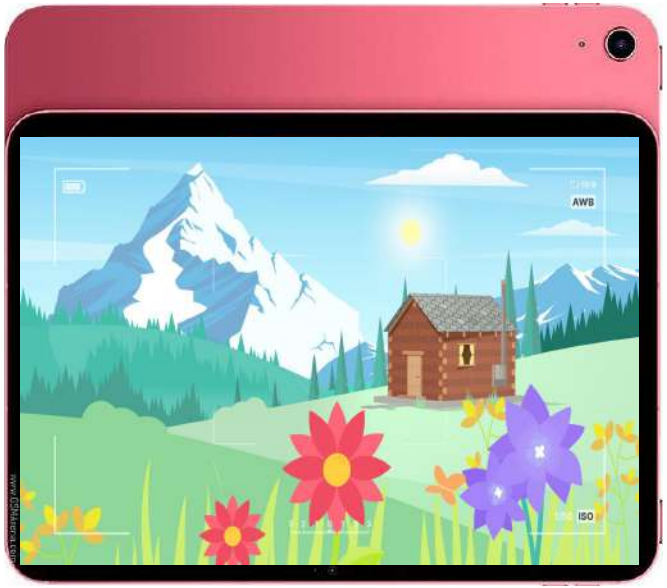
Research gaps

SEASONAL CLIMATE PREDICTIONS: Complexity; under development (e.g. Copernicus)

MULTI-ANNUAL CLIMATE PREDICTIONS: Complexity; still emergent/ lack of examples

CLIMATE PROJECTIONS: Familiarity, enhanced usability

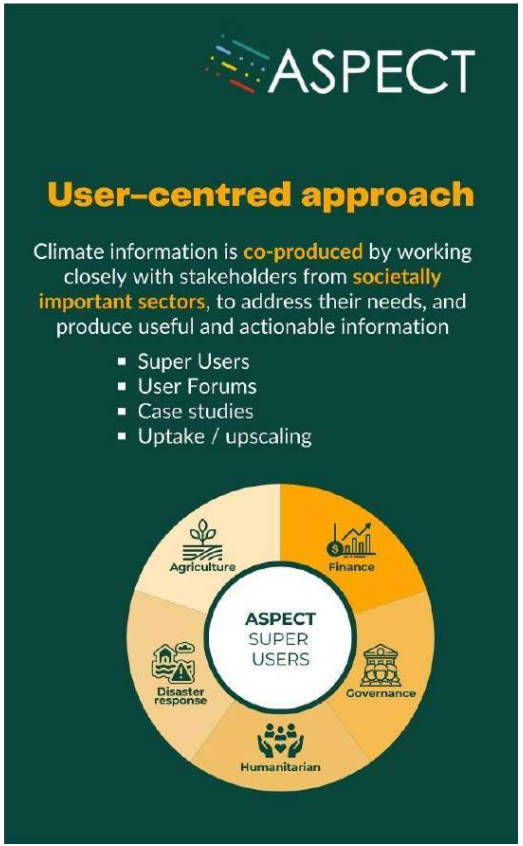
ASPECT SEAMLESS CLIMATE PREDICTIONS: Enhanced; integrated; consistent information across time scales; enhanced usability



Overview

Facilitating climate adaptation using seamless predictions

ASPECT is a four-year Horizon Europe project that aims to improve and produce seamless climate predictions covering the next 30 years and embed these into societally important climate change adaptation decisions.

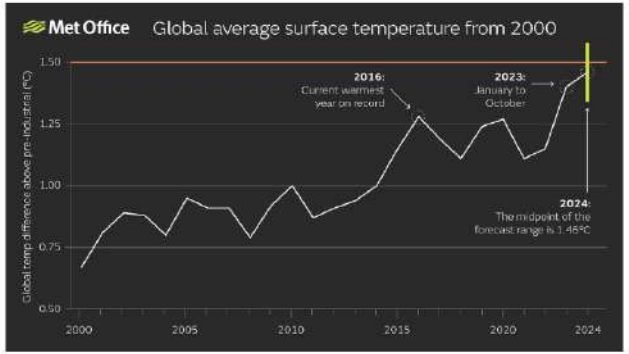


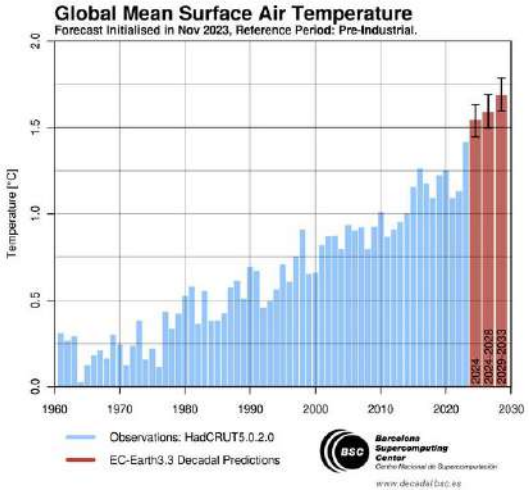
Main achievements

Objective 1

Improve seasonal-to-decadal (S2D) forecasts, targeting user-driven metrics and accounting for the signal-to-noise paradox and other model deficiencies.

- A structured questionnaire was developed and distributed among WPs to **gather user feedback on perceived needs. M1 summarized proposed enhancements for testing and benchmarking.**
  - **Main conclusion: Users supported increasing ensemble sizes and extending the reforecast period.**





ASPECT research has contributed to develop decadal predictions showing that 2024 is likely to be the warmest year on record globally, which could exceed 1.5° C.

https://decadal.bsc.es/

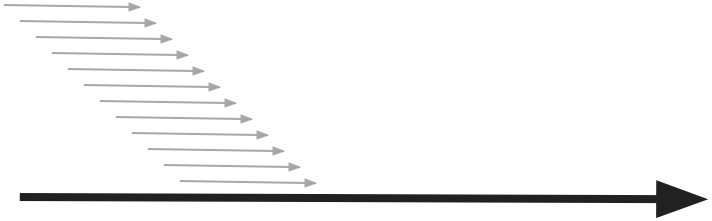
Main achievements

Objective 2

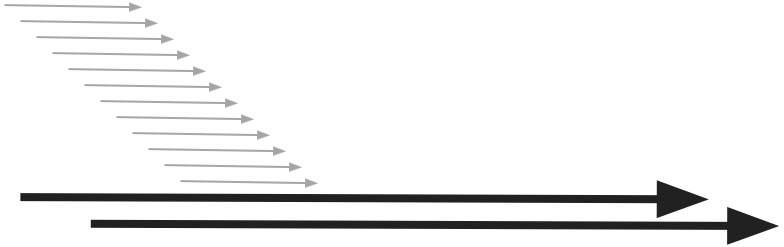
Pioneer new extended initialised forecasts up to 30 years ahead and assess whether they can provide improved information for users.

- **New experimental protocols featuring 2-3 forecast years produced biannually** with a reforecast period from 1981-2022 and around 20 ensemble members.
- Defined **new experimental protocols termed bridge decadal-to-projections (D2P).** These protocols involve initialized predictions extending up to 20 or 30 years, serving as an extension of decadal forecasts but with less frequent reforecast samples. Preliminary efforts to analyse the results have begun, with substantial support from WPs involving users and the wider scientific community, now adopting this protocol as part of the Decadal Climate Prediction Project (DCPP).

Current practices: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)



ASPECT innovation: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)



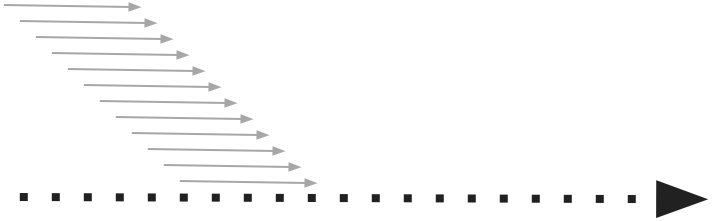
Main achievements

Objective 2

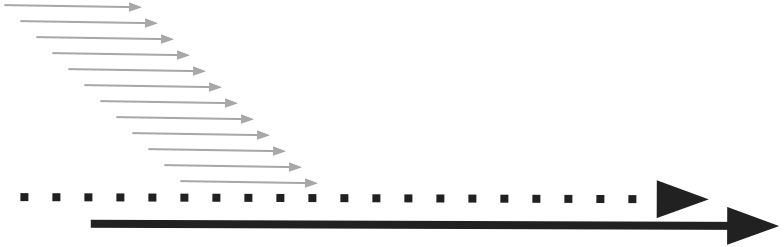
Pioneer new extended initialised forecasts up to 30 years ahead and assess whether they can provide improved information for users.

- **New experimental protocols featuring 2-3 forecast years produced biannually** with a reforecast period from 1981-2022 and around 20 ensemble members.
- Defined **new experimental protocols termed bridge decadal-to-projections (D2P).** These protocols involve initialized predictions extending up to 20 or 30 years, serving as an extension of decadal forecasts but with less frequent reforecast samples. Preliminary efforts to analyse the results have begun, with substantial support from WPs involving users and the wider scientific community, now adopting this protocol as part of the Decadal Climate Prediction Project (DCPP).

Current practices: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)



ASPECT innovation: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)



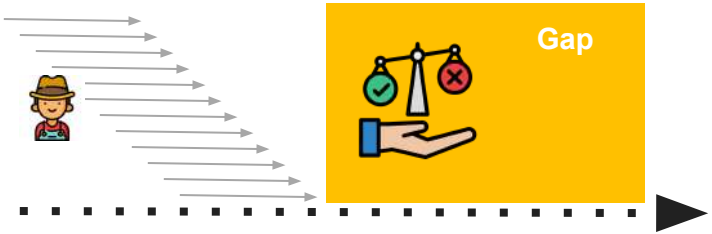
Main achievements

Objective 2

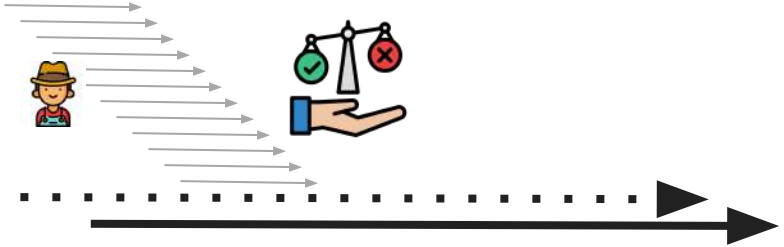
Pioneer new extended initialised forecasts up to 30 years ahead and assess whether they can provide improved information for users.

- **New experimental protocols featuring 2-3 forecast years produced biannually** with a reforecast period from 1981-2022 and around 20 ensemble members.
- Defined **new experimental protocols termed bridge decadal-to-projections (D2P).** These protocols involve initialized predictions extending up to 20 or 30 years, serving as an extension of decadal forecasts but with less frequent reforecast samples. Preliminary efforts to analyse the results have begun, with substantial support from WPs involving users and the wider scientific community, now adopting this protocol as part of the Decadal Climate Prediction Project (DCPP).

Current practices: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)



ASPECT innovation: Illustration of the seasonal forecasts initialized every month (grey arrows) and decadal predictions (black arrow)

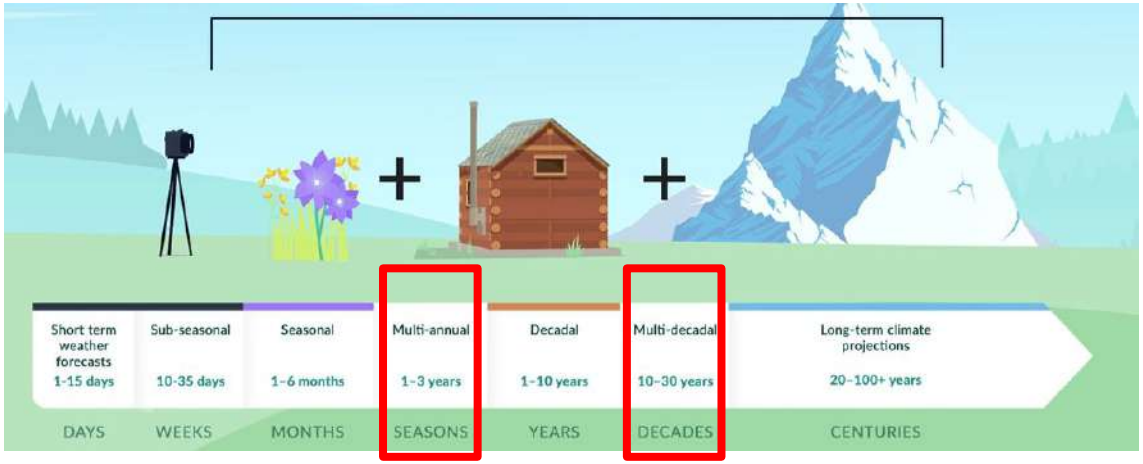


Main achievements

Objective 3

Pioneer new approaches to join the best forecasts on seasonal / 1-5-year / 5-30-year time scales and apply them to user-relevant adaptation decisions.

- **Development of methodologies to produce seamless climate information**



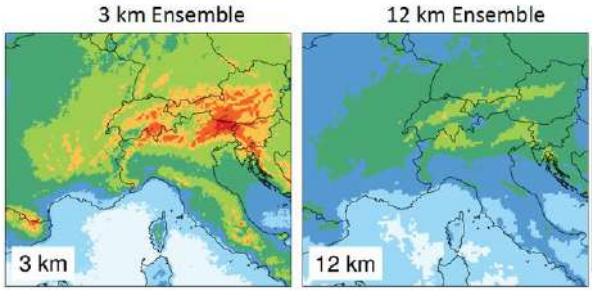
- ASPECT provides **consistent information** across time scales and **covers gaps in current climate prediction systems**, facilitating its integration in existing decision-making and policy frameworks.
- ASPECT supports users in different socio-economic sectors adapt to climate variability and change simultaneously at all time scales (seamlessly), hence **reducing the risks of maladaptation**.

Main achievements

Objective 4

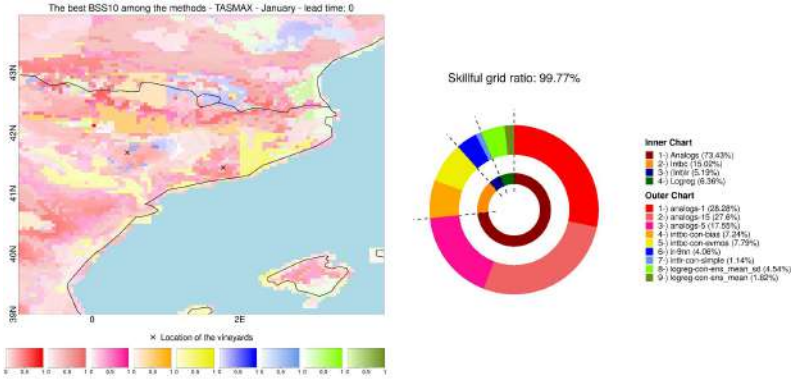
Design and implement new ways to extract high resolution information on extremes from seasonal to 30-year predictions.

- **Development of event-based dynamical downscaling** includes detecting particular events in a coarser model, efficiently spinning up regional climate models before these events, and performing short downscaling in a compact process chain. Application in the Emilia-Romagna region, IT.



Ensemble of climate models; taken from Carbon Brief, credit: Nikolina Ban

- **Development of statistical downscaling approaches** interpolation methods combined with bias adjustment and regression techniques and analogue-based methods focusing on large-scale atmospheric circulation and weather regimes. Application in Catalonia, ES.



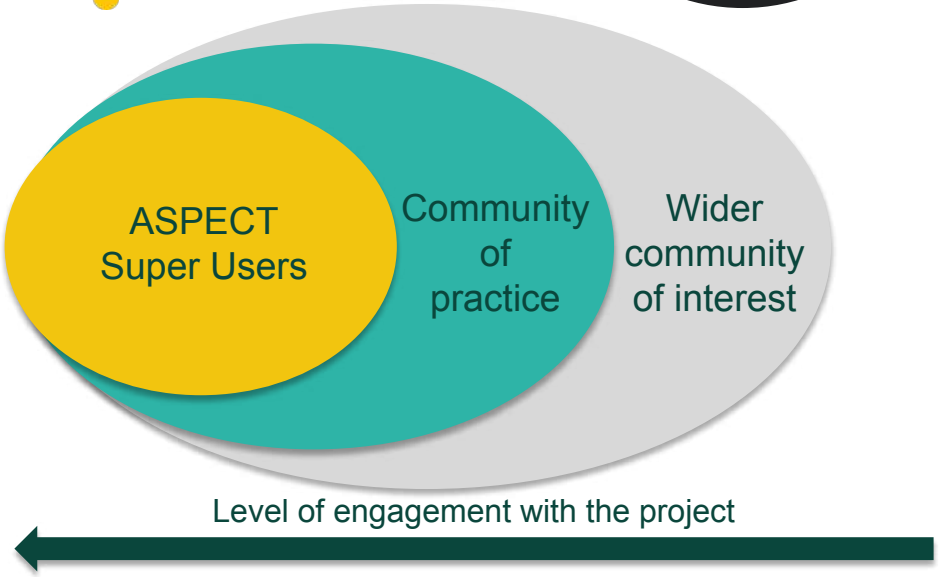
Eren Duzenli (BSC)

Main achievements

Objective 5

Explore for the first time how users can get value from considering information on seasonal / 1-5-year / 5-30-year time scales together to improve decision-making.

- **Co-development of prototype climate services with Super Users.** Interactions through interviews, meetings and participation in **User Forums**.



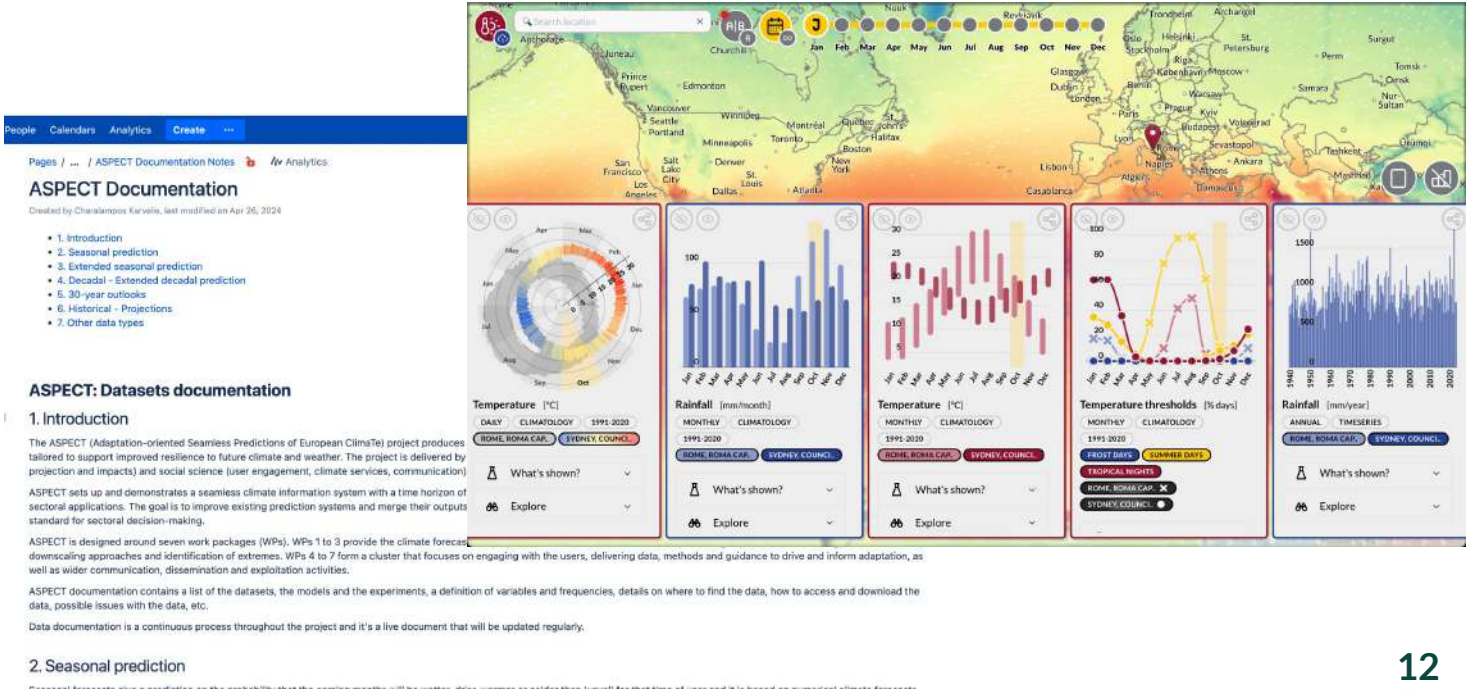
- **Internal user community:** project partners + Super Users collaboratively developing prototype climate services.
- **Community of practice:** users that know what to do and start to build capacity to be able to use climate services. Expected to be a legacy of ASPECT.
- **Community of interest:** individuals that are aware of and desire to use climate services.

Main achievements

Objective 6

Design & implement a delivery system for the data and methods produced by ASPECT, enabling the scaling up of the use of climate risk information on the 1-30-year time scale beyond pilot studies.

- **Initial steps towards a delivery system**
  - New project datasets and their documentation stored in ESGF and MARS to ensure wider accessibility.
  - Online catalogue with decadal forecasts



ASPECT

FACILITATING SEAMLESS CLIMATE ADAPTATION

CONTACT

Albert Soret & Marta Terrado

CONNECT

hello.aspect@bsc.es

@ASPECT_project

/company/aspect-project

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101081460. The sole responsibility for the content of this document lies with the ASPECT project and does not necessarily reflect the opinion of the European Union.