

# C3S Sectoral Information System to Support Infrastructure, Transport and Associated Standards

JASPERS Networking Platform

Third workshop on Climate Change Adaptation in the  
Transport Sector

Experiences from Project Preparation and Network  
Management

- Virtual meeting - WebEx
- 7 April 2022

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# The Copernicus Climate Change Service



## Key products and services



Climate bulletin



Climate Data Store



Data in action



In focus

# The Copernicus Climate Change Service

## Welcome to the Climate Data Store

Dive into this wealth of information about the Earth's past, present and future climate.

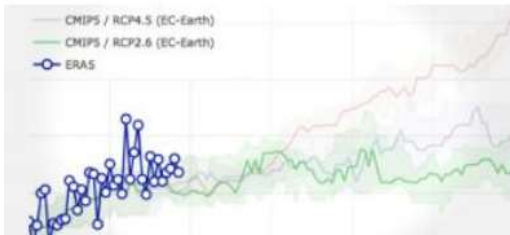
It is freely available and functions as a one-stop shop to explore climate data. [Register for free](#) to obtain access to the CDS and its Toolbox.

We are constantly improving the services and adding new datasets. For latest announcements, watch the posts on the [CDS forum](#).

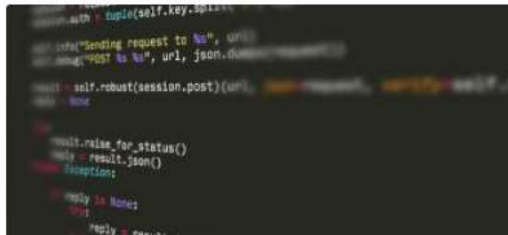
All



Search



Climate Data Store **Toolbox**

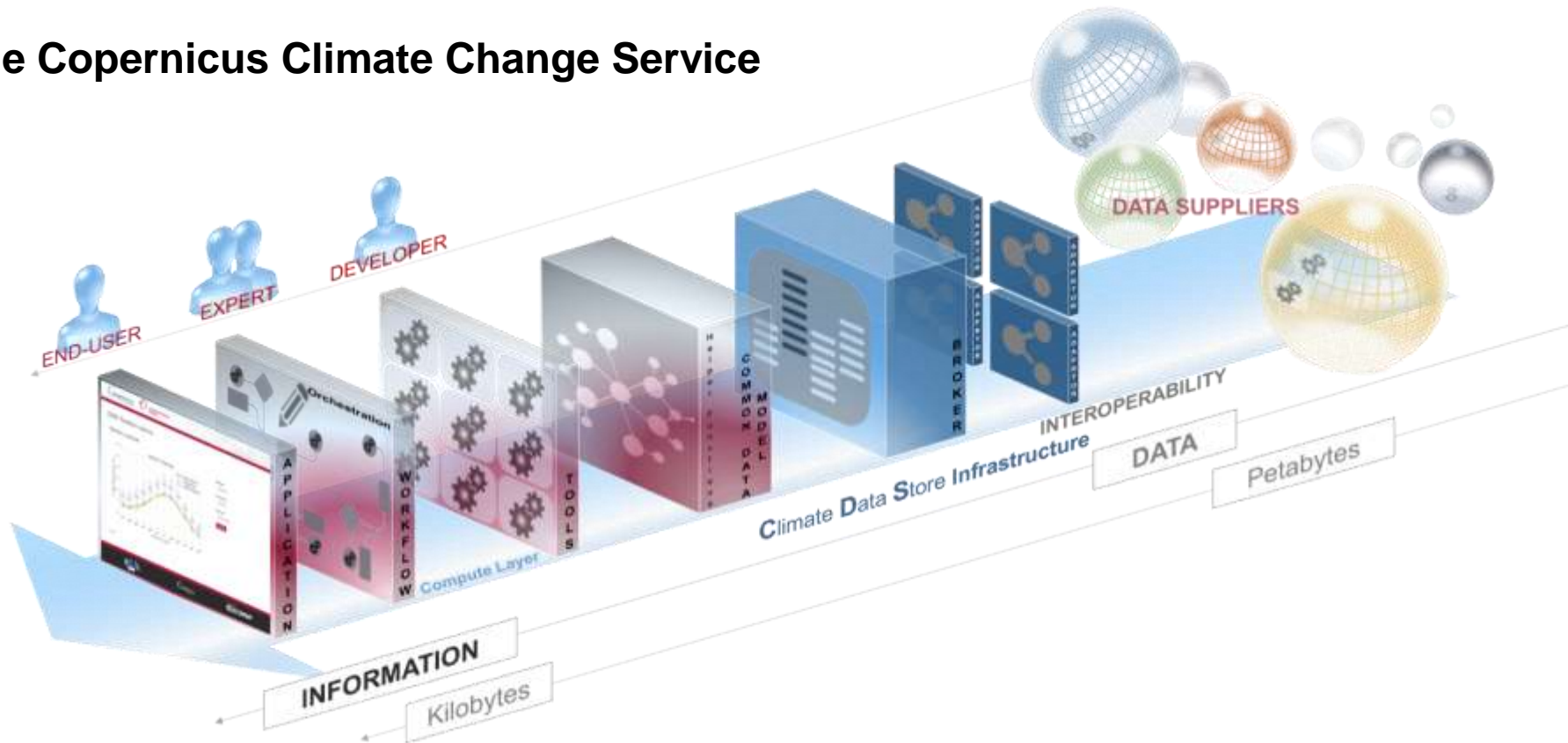


Climate Data Store **API**



Access the **ECMWF Support Portal**

# The Copernicus Climate Change Service



# C3S Sectoral Information System to Support Infrastructure, Transport and Associated Standards



John Dora Consulting  
Limited

# C3S Sectoral Information System to Support Infrastructure, Transport and Associated Standards

## Overview

Development of trustworthy and traceable climate information on how extreme events and weather patterns impact infrastructure to help inform civil engineering practices and standards.



## Datasets

Two new datasets containing information about the changes in the frequency and intensity of extreme events (Extreme Values) and changes in the patterns (Design Years)

## Applications

The contract has demonstrated how C3S data and toolbox can be used to incorporate C3S climate information in the design and operation of infrastructure, considering the relevant norms and standards.



## Technical reports

The contract has also explored the development of Climate Corrected Intensity Duration Frequency curves (CC IDFs) and how to support the assessment of climate change hazards on urban infrastructures.

## Explorer for bias-adjusted extreme values for developments of standards

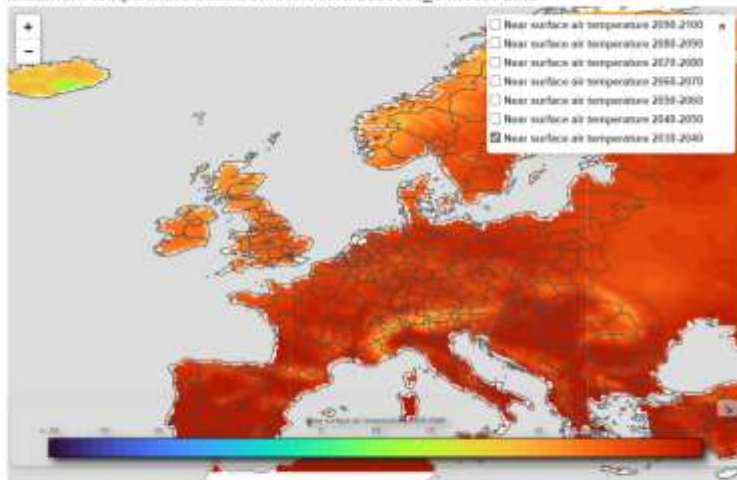
- Objective:
  - To use CDS data to generate extreme-values outcomes for development of standards.
- Added-value for end-users
  - Bias correction (Quantile Delta mapping) is applied to the data.
  - Models are combined to allow comparison / evaluation of the spread ( $\approx$ uncertainty)
  - Information could be used to explore the incorporation of climate change projections on standards (e.g. Thermal actions of the Eurocodes may use the 50-year return period for temperature).
  - Data download available.



# Explorer for bias-adjusted extreme values for developments of standards

## Explorer for bias-adjusted extreme values for developments of standards

Maximum temperature based on corrected access1\_0 model data



In this application

- A given decade extreme value was obtained by including the previous 20 years, i.e. the 2030s refer to the period 2011-2040
- The "Continued" approach was obtained by averaging the eight CMIP5 models.
- In a similar way, the uncertainty was based on the standard deviation showed by the eight CMIP5 models.
- The estimations that are shown in the plot are NUTS2 level averages to reduce the impact of the spatial resolution of the input datasets in the estimations, although in the map the original corrected layer is shown

Get more information about how the extreme values were estimated here: / [Extreme values dataset](#)

Variable

Choose a variable

Maximum temperature

Extreme value

Select a extreme value estimation

1

Model

Select a CMIP5 model or continuous approach

access1\_0

# Explorer for bias-adjusted extreme values for developments of standards

## Explorer for bias-adjusted extreme values for developments of standards

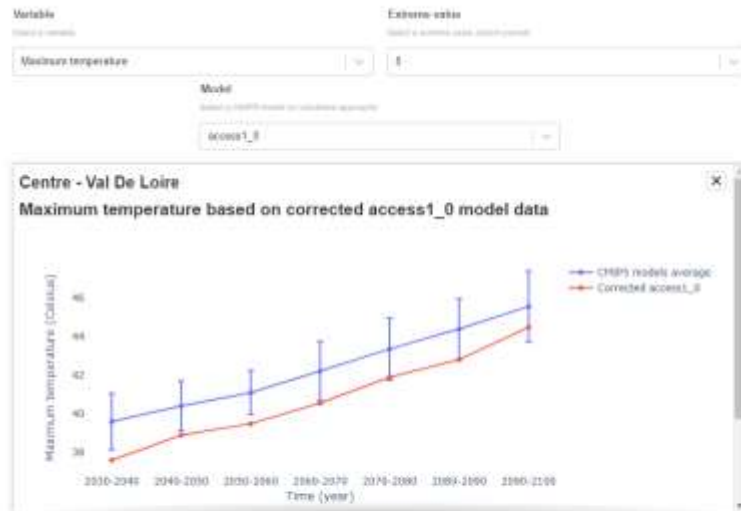
Maximum temperature based on corrected access1\_0 model data



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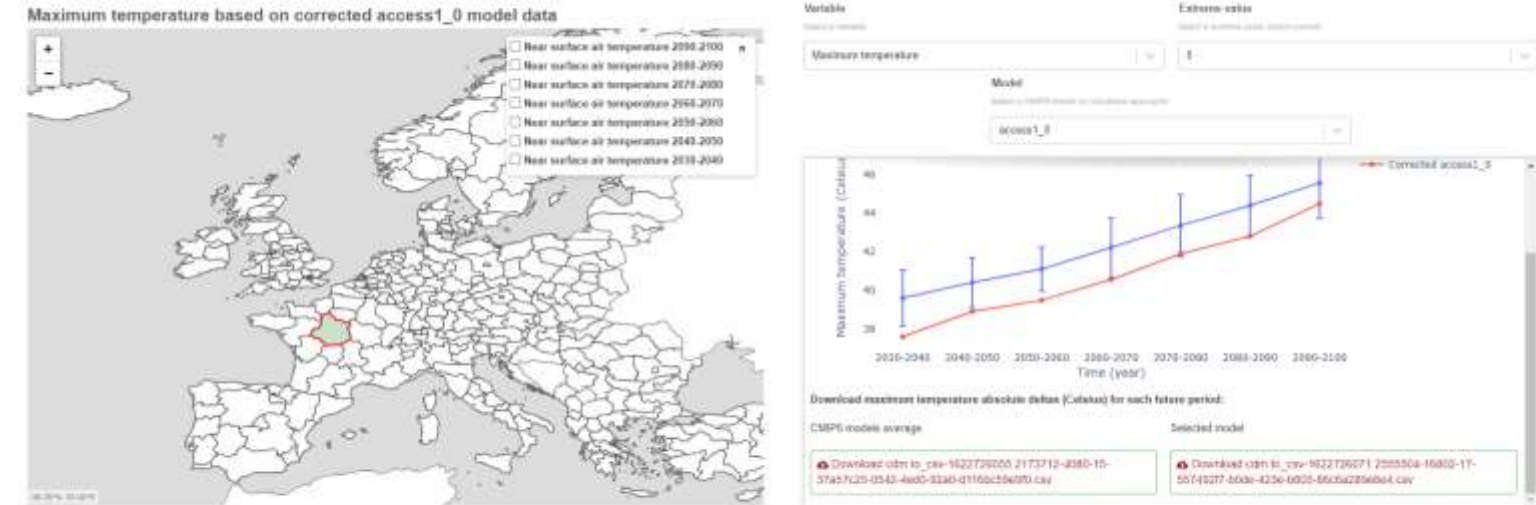
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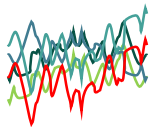
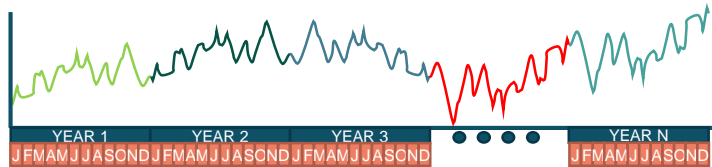
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# Explorer for design years for infrastructure resilience in future climates

## How and why we built design years

Very powerful when:

- We study "highly nonlinear" systems
- We need high coherence between variables
- Sub daily evolution is critical



J F M A M J J A S O N D

Consideration of all the data  
for each month



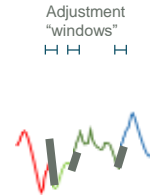
J F M A M J J A S O N D

Selection of the most  
representative January,  
February, etc. using an  
statistical test: e.g.  
Finkelstein-Schafer ISO  
15927-4



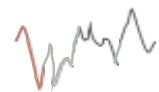
J F M A M J J A S O N D

Generation of a synthetic  
year.



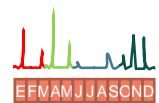
J F M A M J J A S O N D

Interpolation between  
incoherent data



E F M A M J J A S O N D

Selection of other variables from the same month and  
years. (that may don't need adjustment e.g. precipitation)

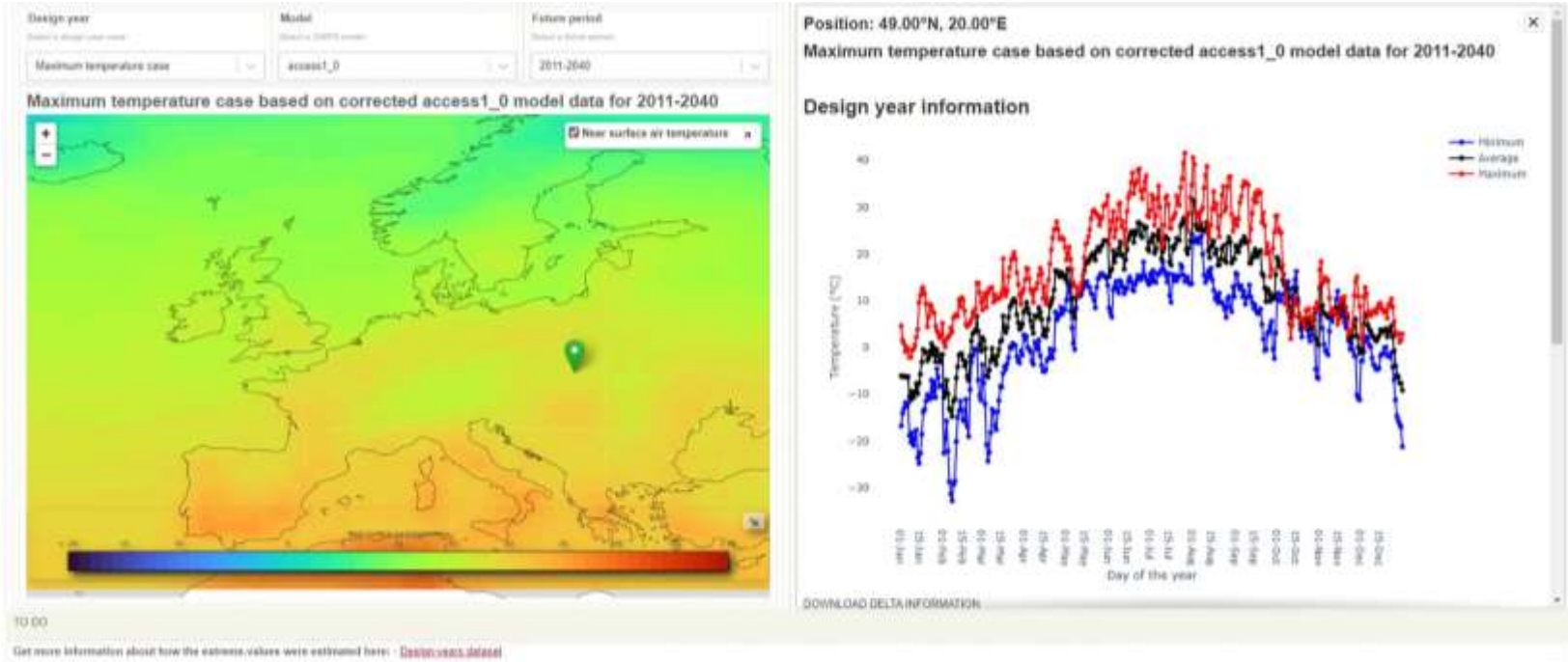


E F M A M J J A S O N D

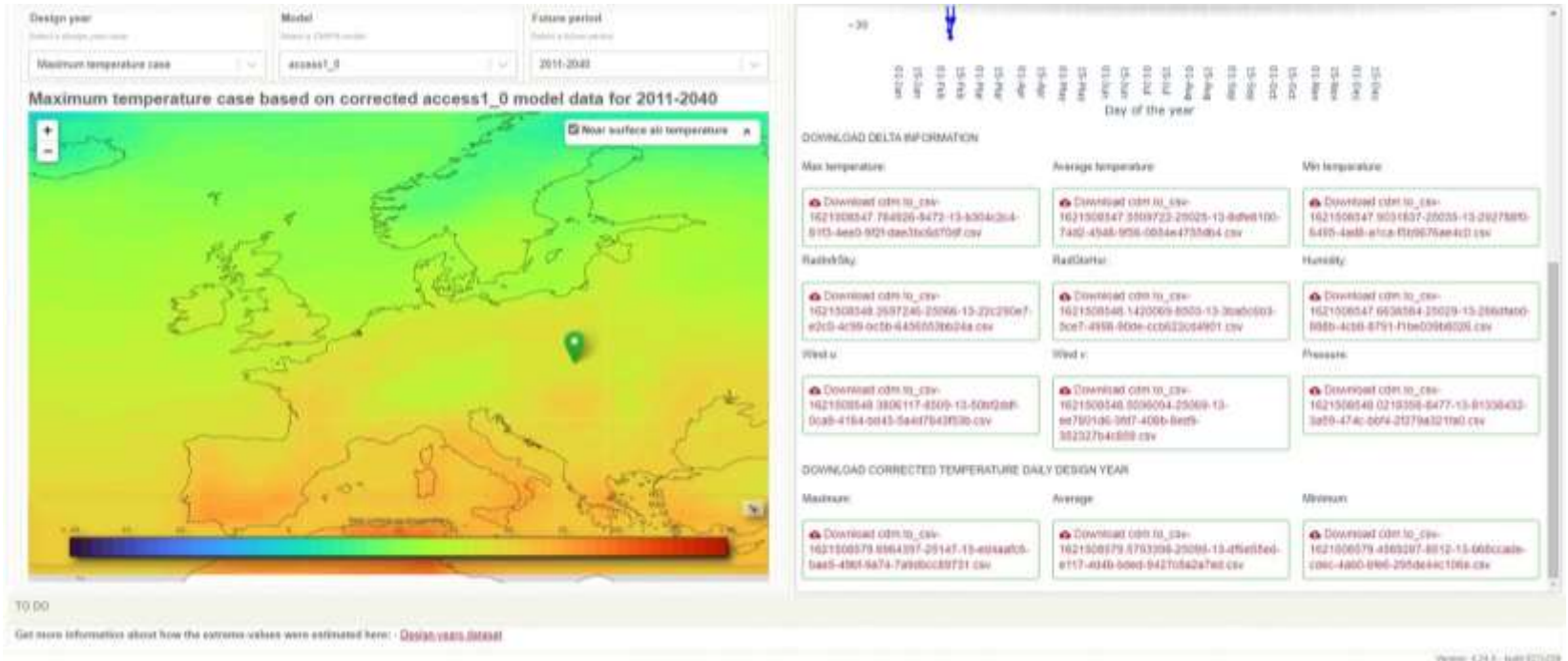
## Explorer for design years for infrastructure resilience in future climates

- Objectives:
  - To provide design years for the present and the future.
  - To simulate the energy demands of buildings in Vitoria (comparing present and future)
  - To use Energy Plus to assess the energy heating and cooling demands of a neighbourhood in Vitoria.
- Added-value for end-users
  - Provide “climate signal” from different models ( $\approx$ uncertainty) eurowide.
  - Demonstrate how a C3S application can provide Design years and related data.
  - Suggest how to incorporate climate projections into the ISO 15927-4 methodology (Hourly Design Year to assess building performance for energy or thermal comfort).
  - Demonstrate how to run energy performance simulations using climate C3S derived products (that are mainly outcomes from climate models vs the current practice of using data from observations).

# Explorer for design years for infrastructure resilience in future climates



# Explorer for design years for infrastructure resilience in future climates



# Explorer for design years for infrastructure resilience in future climates

In order to validate the methodology, the outcomes of the app have been used to generate a design year according to the ISO 15927-4 methodology.

Data have been recorded in an EnergyPlus weather format file (epw).

Several buildings have been modelled using EnergyPlus demonstrating that new data and data from observations generate comparable results.

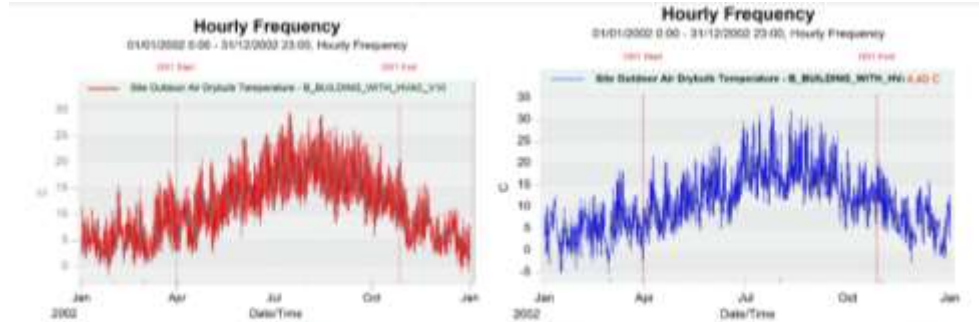


Figure 10 Site outdoor air (drybulb) temperature with old .epw file (red) and with the developed .epw file (blue).

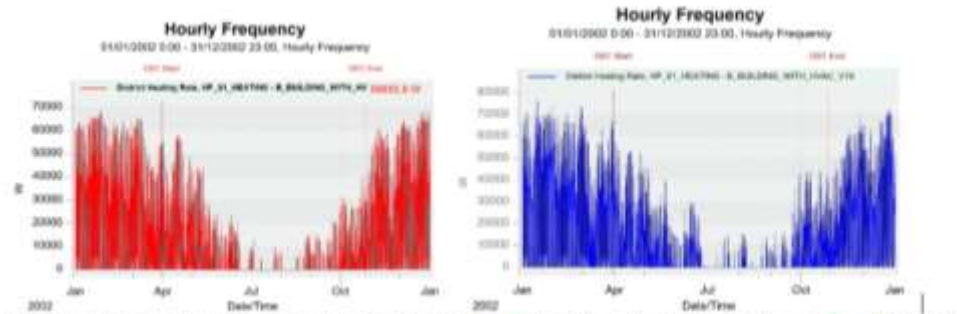
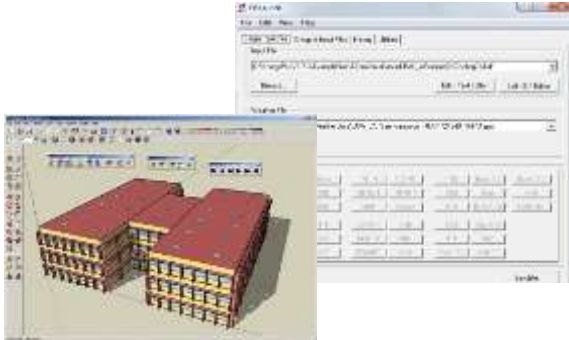
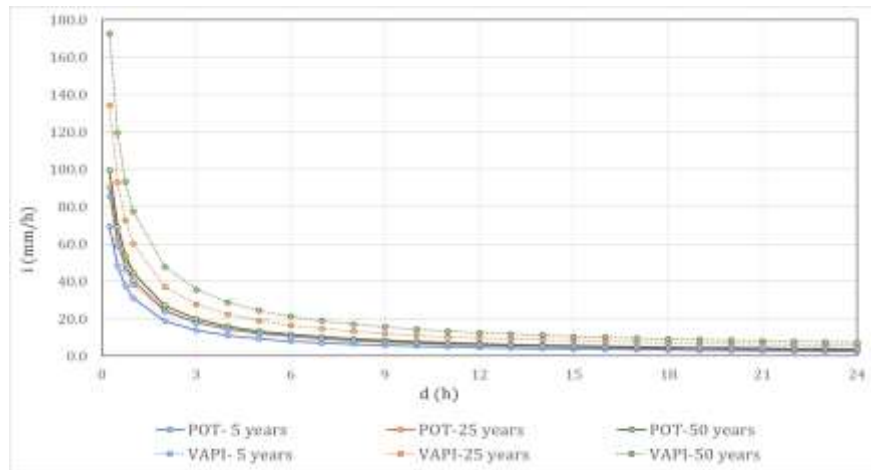


Figure 11. Use of district heating calculated with old .epw file (red) and with the developed .epw file (blue).

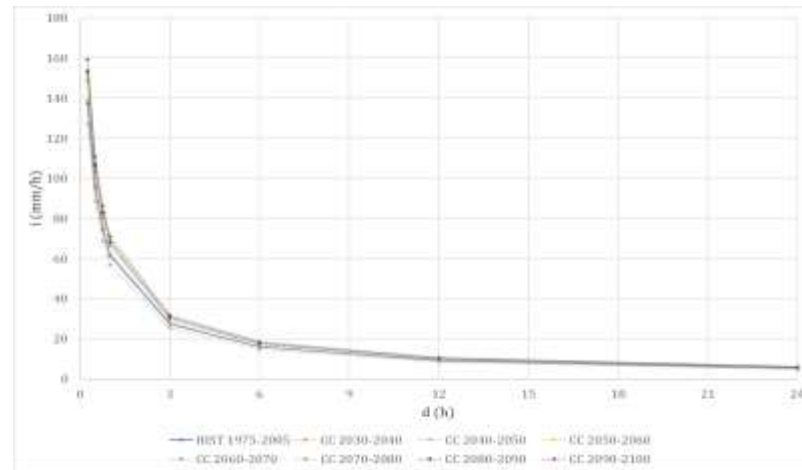




# Development of climate-corrected Intensity Duration Frequency curves for the City of Rome



Comparison of historical IDF curves derived using rain gauge observations with the Peak Over Threshold procedure (continuous lines) and using the VA.PI approach (dashed lines). The intensity  $i$  (mm/h) depicted in y-axis is the average intensity for an event with duration  $d$ (h) given in the x-axis, and return time given in years, which is constant for each curve.



Comparison of IDF curves derived using rain gauge historical observations (continuous line) and using the future projections scenarios developed by WP2 for all the decades (dashed lines). The reference return period is 25 years.

# More Information

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**For info or further questions on this webinar please contact the JASPERS Networking Platform team:**

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[jaspers.eib.org](http://jaspers.eib.org)

