



climate



water



disasters



renewable
energy



agriculture



health



ecosystem

<https://e-shape.eu>

e-shape

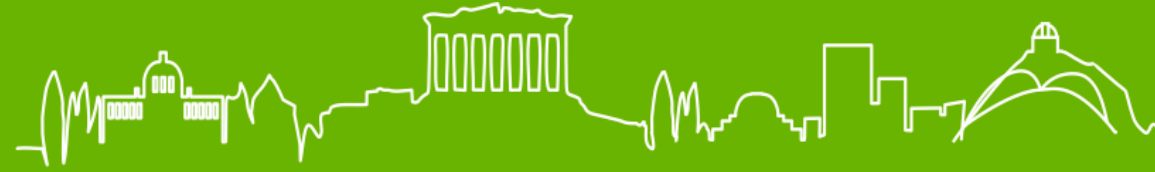
Mikko Strahlendorff,

Finnish Meteorological Institute

Euro-GEO workshop Climate showcase

EuroGEOSS Showcases: Applications Powered by Eir

ATHENS 7-9 DECEMBER 2022

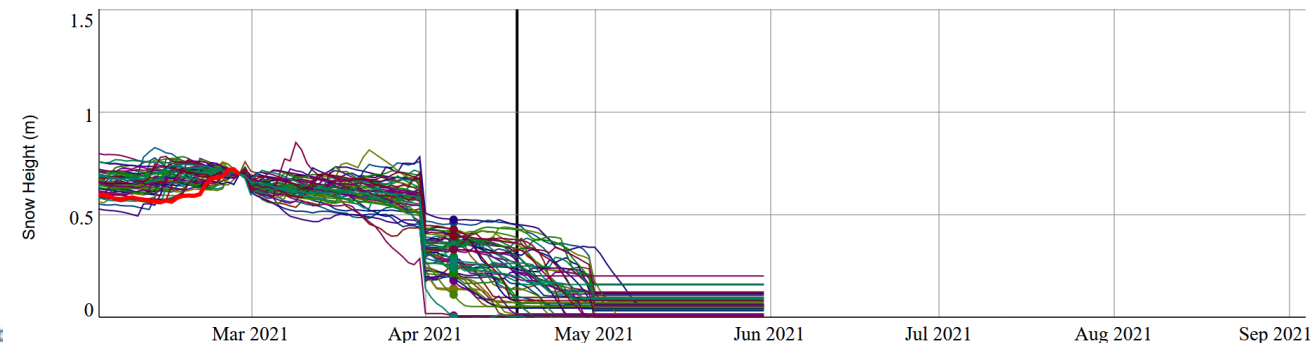
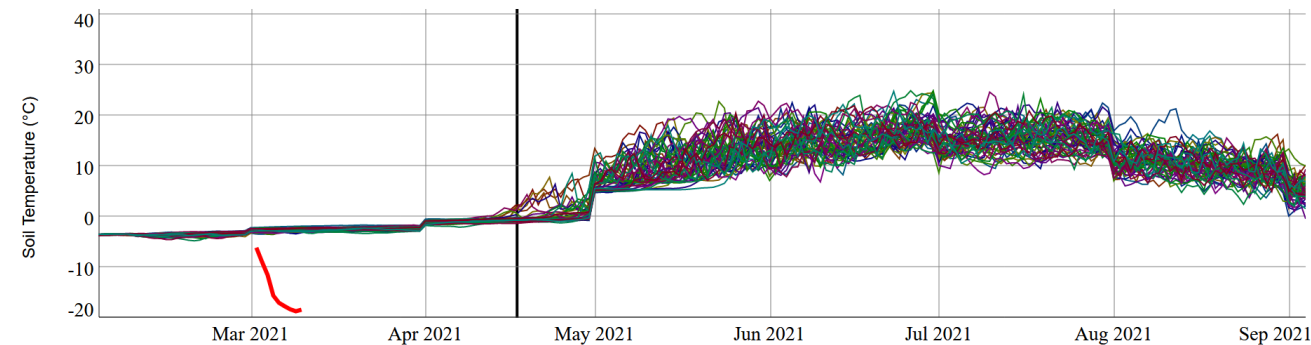
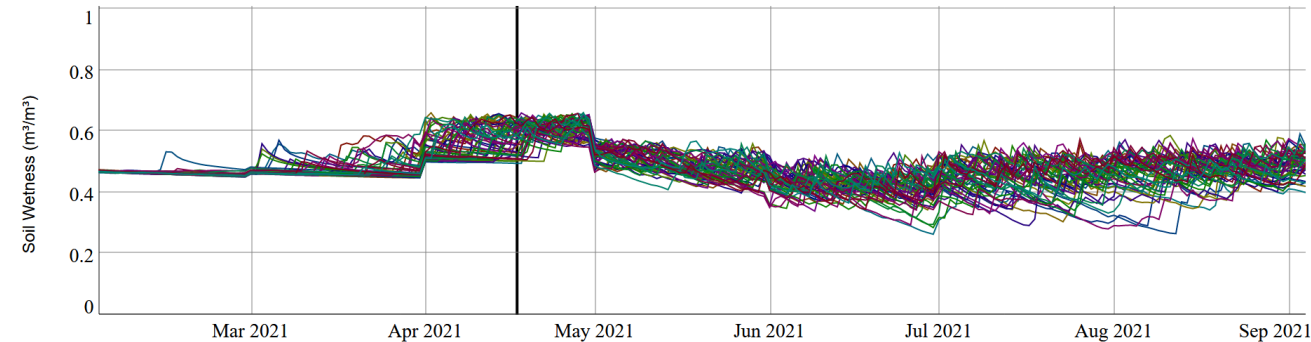


Climate showcase pilot services

- 5 pilots, with 4 including Seasonal forecasts as a common denominator
- One improves carbon fluxes for oceans and land areas
- Seasonal forecasts are available open and free from Copernicus Climate Changes Service C3S
 - <https://cds.climate.copernicus.eu/>
- Ensemble forecasts up for 6 months ahead once a month - 51 forecasts to enable probability prediction
- Bias adjustment based on past statistics is vital
- Pilot Services:
 - **Urban resilience - Saskia Buchholz**
 - **Harvester Seasons - Miriam Kosmale**
 - **Hydropower from Snow - Jaakko Ikonen**
 - **Seasonal preparedness - Andrea Vajda and Stavros Solomos**

ATHENS 7-9 DECEMBER 2022

2021/04/06: SH-0: 0.25 SH-1: 0.38 SH-2: 0.39 SH-3: 0.36 SH-4: 0.24 SH-5: 0.28 SH-6: 0.36 SH-7: 0.47 SH-8: 0.2 SH-9: 0.35 SH-10: 0.4 SH-11: 0.2 SH-12: 0.14 SH-13: 0.29 SH-14: 0.22 SH-15: 0.38 SH-16: 0.43 SH-17: 0.41 SH-18: 0.13 SH-19: 0.29 SH-20: 0.4 SH-21: 0.19 SH-22: 0.21 SH-23: 0.48 SH-24: 0.11 SH-25: 0.22 SH-26: 0.34 SH-27: 0.43 SH-28: 0.23 SH-29: 0.33 SH-30: 0.42 SH-31: 0.18 SH-32: 0.22 SH-33: 0.34 SH-34: 0.36 SH-35: 0.36 SH-36: 0.35 SH-37: 0.29 SH-38: 0.3 SH-39: 0.27 SH-40: 0.26 SH-41: 0.01 SH-42: 0.37 SH-43: 0.36 SH-44: 0.36 SH-45: 0.34 SH-46: 0.24 SH-47: 0.43 SH-48: 3.83e-3 SH-49: 0.4 SH-50: 0.28





We e-shape EuroGEO

7-9 Dec.2022 | Athens



EuroGEO
Showcases:
Applications
Powered
by Europe

“
**Blazing new trails
for EO markets**
”

EuroGEO
Workshop
2022

- www.e-shape.eu
- Horizon2020-e-shape
- @eshape_eu
- e-shape project

Pilot 7.2 Urban resilience to extreme weather - climate service

Buchholz Saskia (DWD), Hyvärinen Otto
(FMI) and Žuvela-Aloise Maja (ZAMG)



e-shape

Learn more here:



EuroGEO GEO GROUP ON
EARTH OBSERVATIONS



The e-shape project has received funding from the
European Union's Horizon 2020 research and
innovation programme under grant agreement 820852

ATHENS 7-9 DECEMBER 2022





Pilot Overview

S7 Climate showcase

P2 Urban resilience to extreme weather

Goal: strengthen urban resilience and preparedness to extreme weather and climate using sub-seasonal, seasonal and climate projection data



ILMATIETEEN LAITOS

Sub-seasonal and seasonal forecast products for the city of Helsinki

Climate projection products for various Austrian cities



ZAMG
Zentralanstalt für Meteorologie und Geodynamik

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Seasonal forecasts products for state capital cities in Germany



Seasonal climate forecast products for German state capital cities

Saskia Buchholz, Andreas Paxian, Birgit Mannig, Amelie Hoff
Deutscher Wetterdienst

Seasonal climate forecast products for city authorities

- decrease the vulnerability of urban population to hazardous weather events and risks caused by climate variability (e.g., for periods of anomalous high temperatures, so that preventive measures can be taken in the occupational health and safety sectors)
- provide the scientific basis for midterm planning decisions (decadal climate predictions)

Use of the German Climate Forecast System Version (GCFS) Version 2.1

- hindcasts: 30 ensemble members, forecasts: 50 ensemble members
- ECMWF Atos BullSequana XH2000, Bologna Italy, post-processing DWD HPC architecture

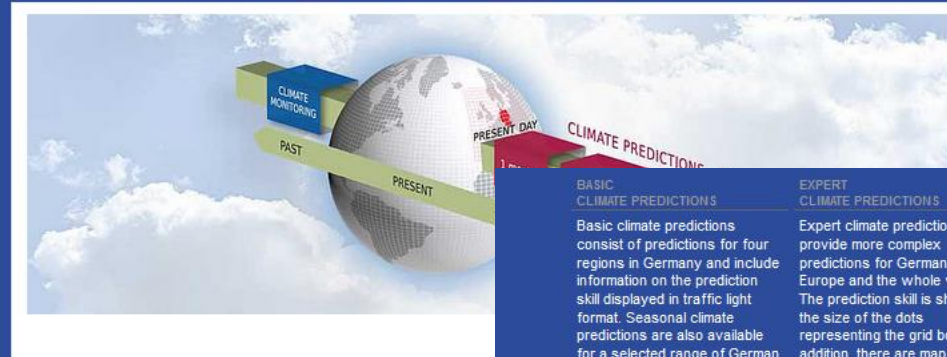
Increase of the GCFS spatial resolution to 5km x 5km via a statistical down-scaling approach called EPISODES



www.dwd.de/climatepredictions

The e-shape pilot is accessible via the "Basic Climate Predictions" and "Seasonal Climate Predictions", as well as "Decadal Climate Predictions"

Climate Predictions for the Next Weeks to Years DE



BASIC CLIMATE PREDICTIONS

Basic climate predictions consist of predictions for four regions in Germany and include information on the prediction skill displayed in traffic light format. Seasonal climate predictions are also available for a selected range of German cities.

EXPERT CLIMATE PREDICTIONS

Expert climate predictions provide more complex predictions for Germany, Europe and the whole world. The prediction skill is shown by the size of the dots representing the grid boxes. In addition, there are map representations of the prediction skill available.

SPECIFIC CLIMATE PREDICTIONS

Specific climate predictions are offered that deal with questions going beyond the general differentiation between basic and expert climate predictions. For example, one such topic is El Niño.

Data and publications

[Animations](#) >

[Access to data](#) >

[Publications](#) >

[Related products and links](#) >

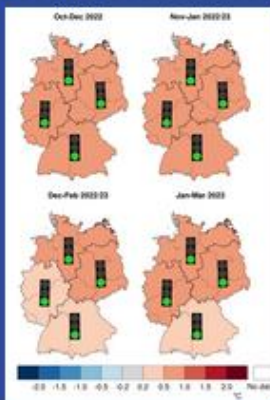
SUBSEASONAL CLIMATE PREDICTIONS

2 - 5 WEEKS



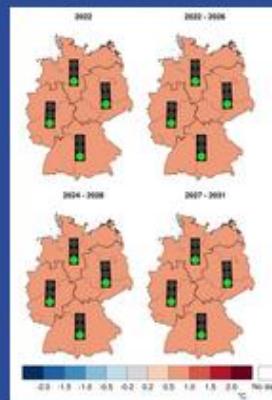
SEASONAL CLIMATE PREDICTIONS

1 - 6 MONTHS



DECADAL CLIMATE PREDICTIONS

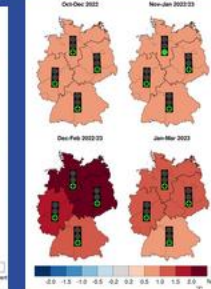
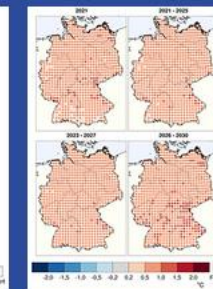
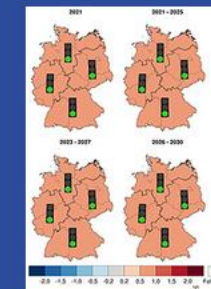
1 - 10 YEARS



of the Deutscher Wetterdienst (DWD) for climate predictions of available climate predictions and corresponding products (weeks, seasons, years) and varying spatial scales (Germany, Europe, World). All climate predictions on this website are further explained.

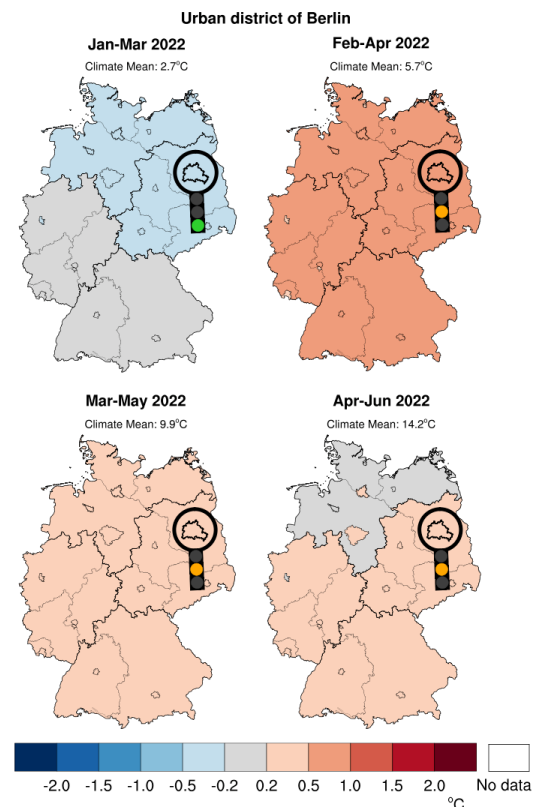
on products on this website are based on different models and methods that provides equally successful results for all the constellations, we therefore offer more than one product for Germany in the winter half-year, for example seasonal climate predictions are used (compared to the cases, we will always explicitly mention the product will be used).

between basic, expert and - as a complement - specific climate predictions below. Background information is available via the links in the feedback you may have on the website and its content.





Map Ensemble Mean Prediction Temperature



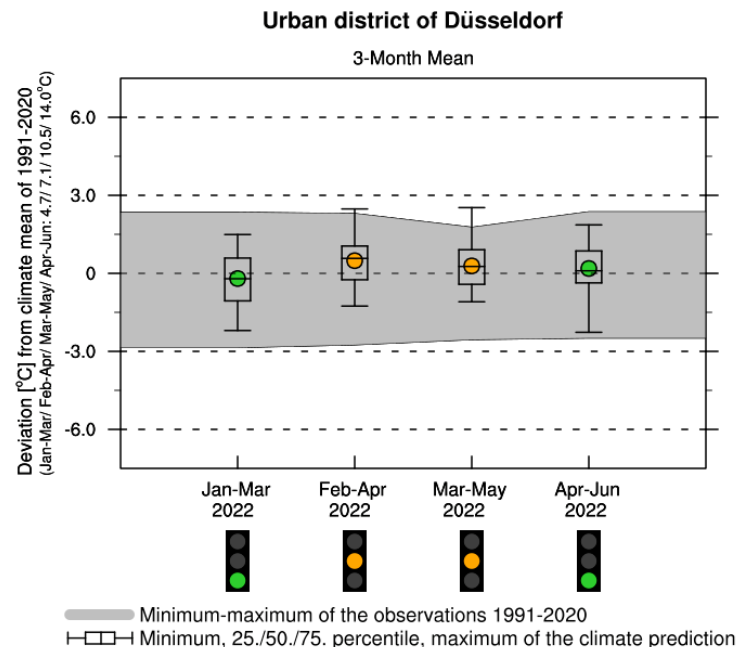
Ensemble mean prediction for temperature:
The colour represents the deviation of the ensemble mean prediction (3-month mean) from the climate mean of the time period 1991-2020.

Prediction skill:
The traffic light shows the prediction skill in the evaluation period 1990-2020:

- significantly worse than the observed climate mean
- comparable to the observed climate mean
- significantly better than the observed climate mean

© DWD: generated on 06 Jan 2022

Time series Ensemble Mean Prediction Temperature



Ensemble mean prediction for temperature:

The coloured dots represent the deviation of the ensemble mean prediction (3-month mean) from the climate mean of the time period 1991-2020. The box-whisker represent the distribution of the prediction ensemble. The area in gray shows the spread of the observations in the time period 1991-2020.

Prediction skill:

The traffic light shows the prediction skill in the evaluation period 1990-2020:

- significantly worse than the observed climate mean
- comparable to the observed climate mean
- significantly better than the observed climate mean

© DWD: generated on 06 Jan 2022

Table Probabilistic Prediction Precipitation

Urban district of Stuttgart Probability of the Categories Dry/Normal/Wet in Comparison to the Climate Characteristics for 1991-2020				
Time Period	Category Normal	Dry	Normal	Wet
Jan-Mar 2022	100 - 137 l/m ²	40%	36%	24%
Feb-Apr 2022	80 - 145 l/m ²	36%	40%	24%
Mar-May 2022	109 - 183 l/m ²	34%	36%	30%
Apr-Jun 2022	163 - 211 l/m ²	26%	40%	34%

Probabilistic prediction for precipitation:

The table represents the probabilities of the three categories (Dry/Normal/Wet) of the climate prediction (3-month sum) in comparison to the climate characteristics for the time period 1991-2020.

Prediction skill:

The traffic light shows the prediction skill in the evaluation period 1990-2020:

- significantly worse than the observed climate mean
- comparable to the observed climate mean
- significantly better than the observed climate mean

© DWD: generated on 07 Jan 2022



Sub-seasonal and seasonal predictions for winter street maintenance activities in Helsinki

Otto Hyvärinen, Andrea Vajda, Mika Rantanen, Andreas Tack, Markus Mellin

Finnish Meteorological Institute

Serving City of Helsinki authorities

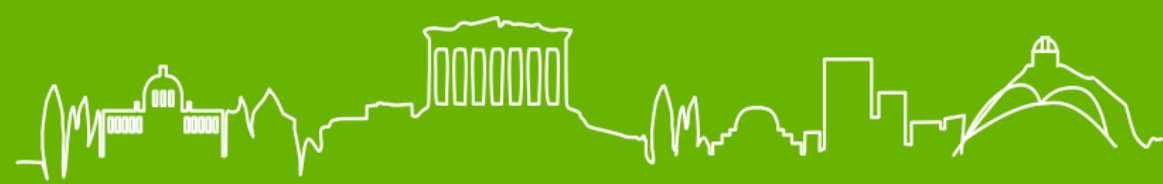
- in planning their activities,
- improving winter safety and
- optimizing maintenance costs

Winter street maintenance activities include

- snow removal from streets,
- street sanding,
- cleaning streets of sand and grit in spring

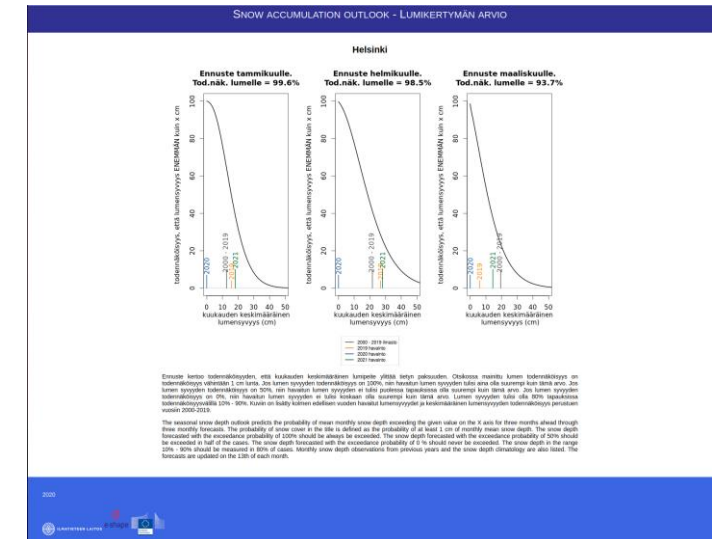
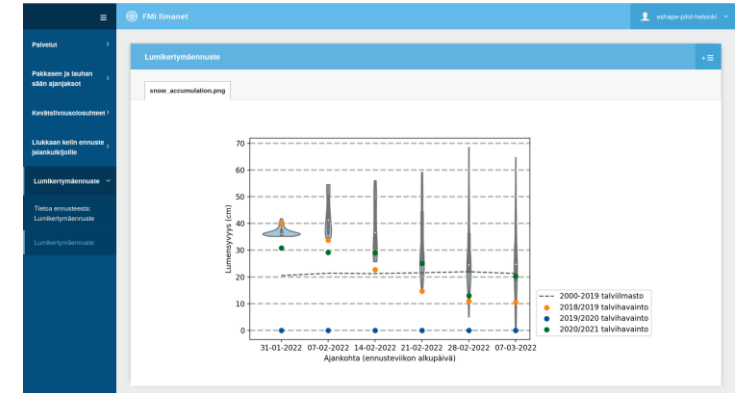


<https://pixabay.com/photos/car-under-snow-winter-helsinki-car-5994674/>



Sub-seasonal and seasonal outlooks and technical implementation

- Sub-seasonal (six weekly) climate outlooks
 1. long periods of freezing and mild weather
 2. snow accumulation
 3. slippery conditions for pedestrians
 4. conditions for street spring cleaning
- Most of the planning activities are scheduled **on timescales of several weeks or less**
- Run on the FMI server, disseminated on Ilmanet (the FMI portal for meteorological products) since December 2020
- Seasonal climate outlooks
 1. snow accumulation
 - Information **on the seasonal time** scale for the preparation of snow dump sites and haulage
 - Run on WEkEO platform, disseminated on the FMI web-portal (seasonal.fmi.fi) since January 2021

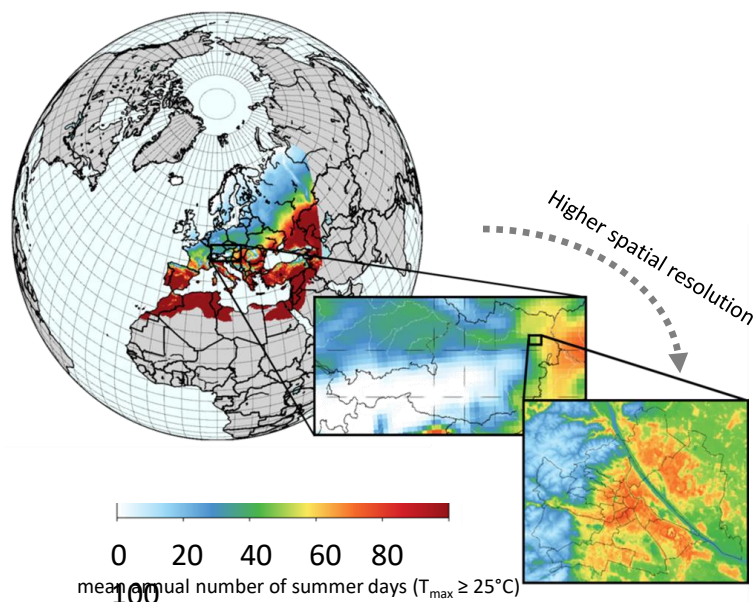




Future climate projection of heat indices for major cities in Austria

Michael Avian, Sandro Oswald, Maja Žuvela-Aloise, Chris Schubert

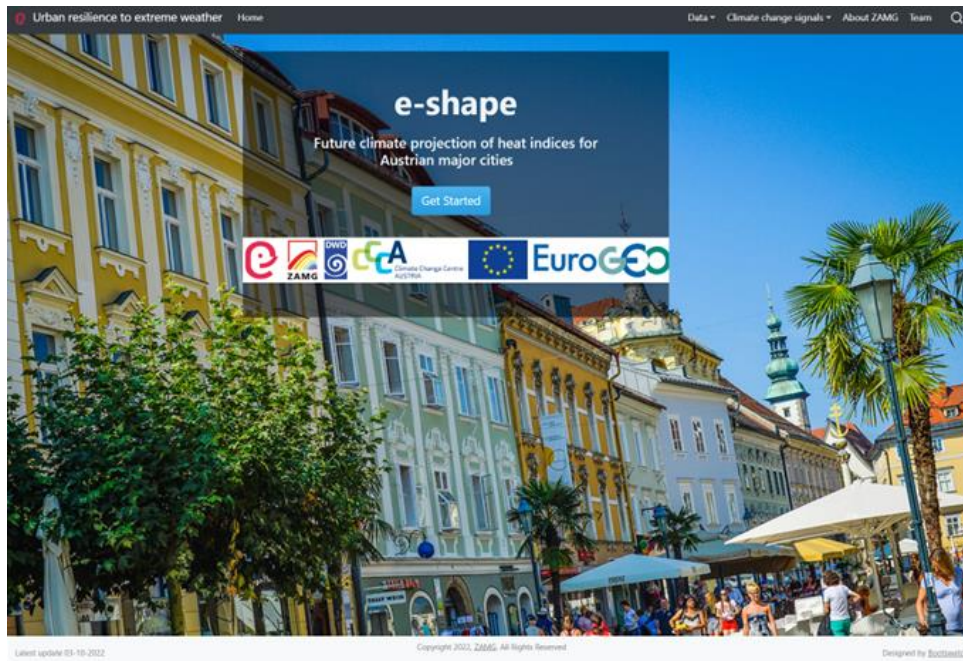
ZAMG – Zentralanstalt für Meteorologie und Geodynamik



- Climate scenarios on city-scale based on urban climate model simulations and climate projections from global (GCM) and regional climate model (RCM) outputs
- Product: High spatial resolution maps of heat indices including Climate Change and Urban Heat Island information
- Data are used as input for urban development plans, risk management, environmental protection
- Stakeholders: city administrations



Future climate projection of heat indices for major cities in Austria – pilot webpage



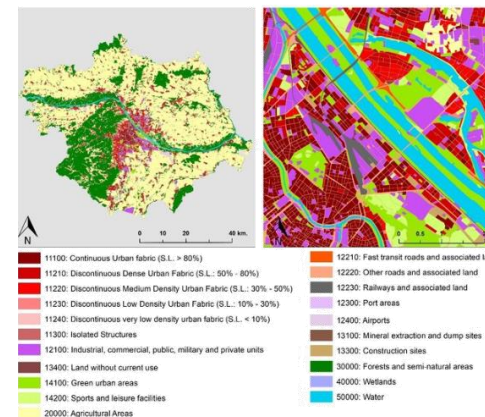
- More information available on pilot webpage: <https://e-shape.egitlab.zamg.ac.at/e-shape/>
- Method and input data description
- Climate change signals and links to data download

Land use and land cover

Classification to distinguish between urban areas, vegetation, bare soil and water

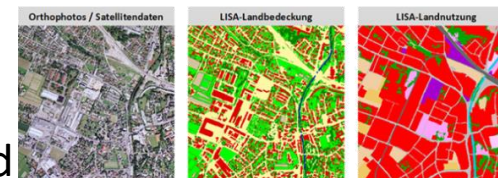
1 Urban Atlas

The Land Use (LU) classification of the Urban Atlas (UA) was merged with information obtained from the local municipal authority, including nearby districts, to statistically analyze the LU characteristics. These classification were used to characterize each LU class's basic urban features such as the fraction of buildings, streets, vegetation and bare soil (see below).



2 LISA

In addition, data from the Land Information System Austria (LISA) were used, which covered huge areas of Austria with a 1 m resolution. LISA provides extensive land cover data derived from satellite pictures from 2014 to 2016 and includes eleven distinct land cover types, such as buildings, steets, trees, annual crops, and cobblestone sidewalks.



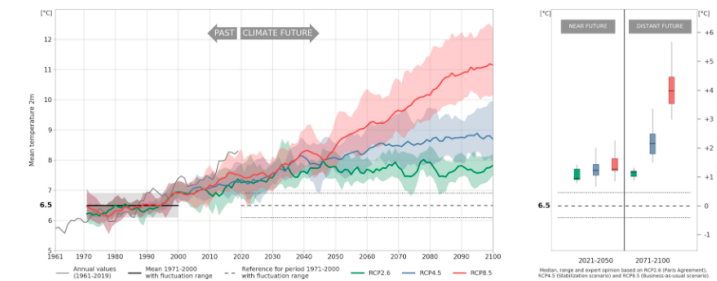
Climate projections

Representative concentration pathways

1 EURO-CORDEX

The World Climate Research Programme launched the Coordinated Regional Downscaling Experiment (CORDEX) with the goal of supporting, coordinating, and improving regional climate scenarios through global collaboration. The EURO-CORDEX research project for Europe aggregated future climate forecasts through Regional Climate Models (RCMs) at 50 and 12.5km spatial resolution based on RCPs as established in the Intergovernmental Panel on Climate Change's Fifth Assessment Report. These models give data on key meteorological characteristics through 2100 under various climate change scenarios.

We used model outputs from three different RCMs combined with six Global Climate Models at the 12.5km spatial resolution under RCP4.5 and RCP8.5 for the time period 2011-2100 to estimate possible future urban climate scenarios from the EURO-CORDEX model database. RCP4.5 is a scenario in which CO₂ emissions peak by 2040, whereas RCP8.5 represents a more extreme scenario in which CO₂ emissions continue to climb until 2100.



Past observed (1961–2019) and future projected (5-year running mean regional climate model simulations for scenarios RCP2.6, RCP4.5, and RCP8.5 in the period 1970–2100) annual mean temperatures for Austria (left) and climate change signal compared to the 1971–2000 period (right). Shaded hues represent the bandwidth per scenario provided by the various climate models, whereas solid lines represent the model median. Source: [Olefs et al. \(2021\)](#)



Pilot 7.4: Hydropower from snow by FMI

Jaakko Ikonen
Cemal Tanis

Kemijoki Hydrological Forecast System
FMI - HOPS (Hydrological Operations and Prediction System)



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE



Watershed Maps

Information

Download

Contact Us

Links

Points: River Gauge Network (Forecast/Hindcast) ▾

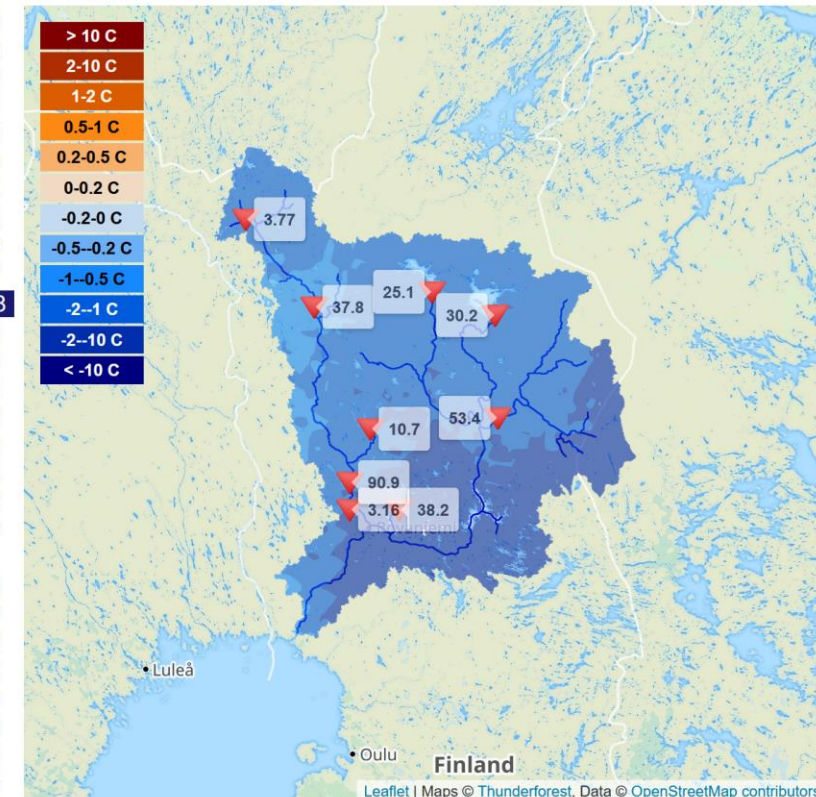
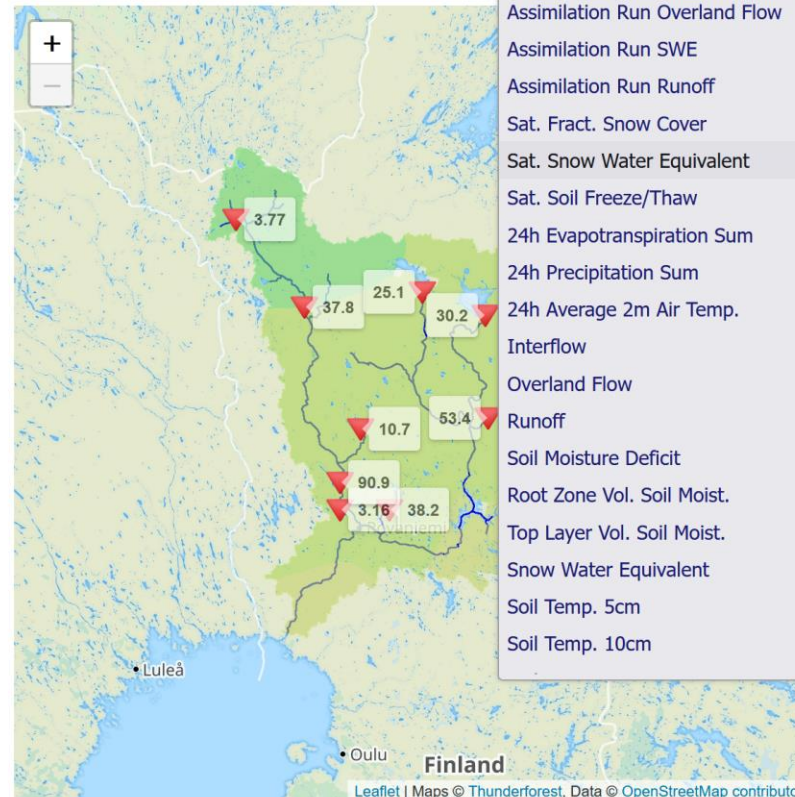
Sat. Snow Water Equivalent ▾

Soil Temp. 5cm ▾

☐ Animate

☒ Legends

☐ Help



- Biggest hydropower operator in Finland with many dams on the same river system
- Observations on snow and weather are visualized
- Model analysis on soil conditions and river flow as well



Seasonal forecasts

- Default time window is 20 days back and 10 forward based on NWP weather forecasts
- Clicking on river gauge stations the time window is expanded also to seasonal forecasts 3 months ahead based on ECMWF SEAS5
- Hindcasts are demonstrating how well the HOPS model has performed until now
- A very good new machine learning forecast developing

Kemijoki Hydrological Forecast System FMI - HOPS (Hydrological Operations and Prediction System)



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

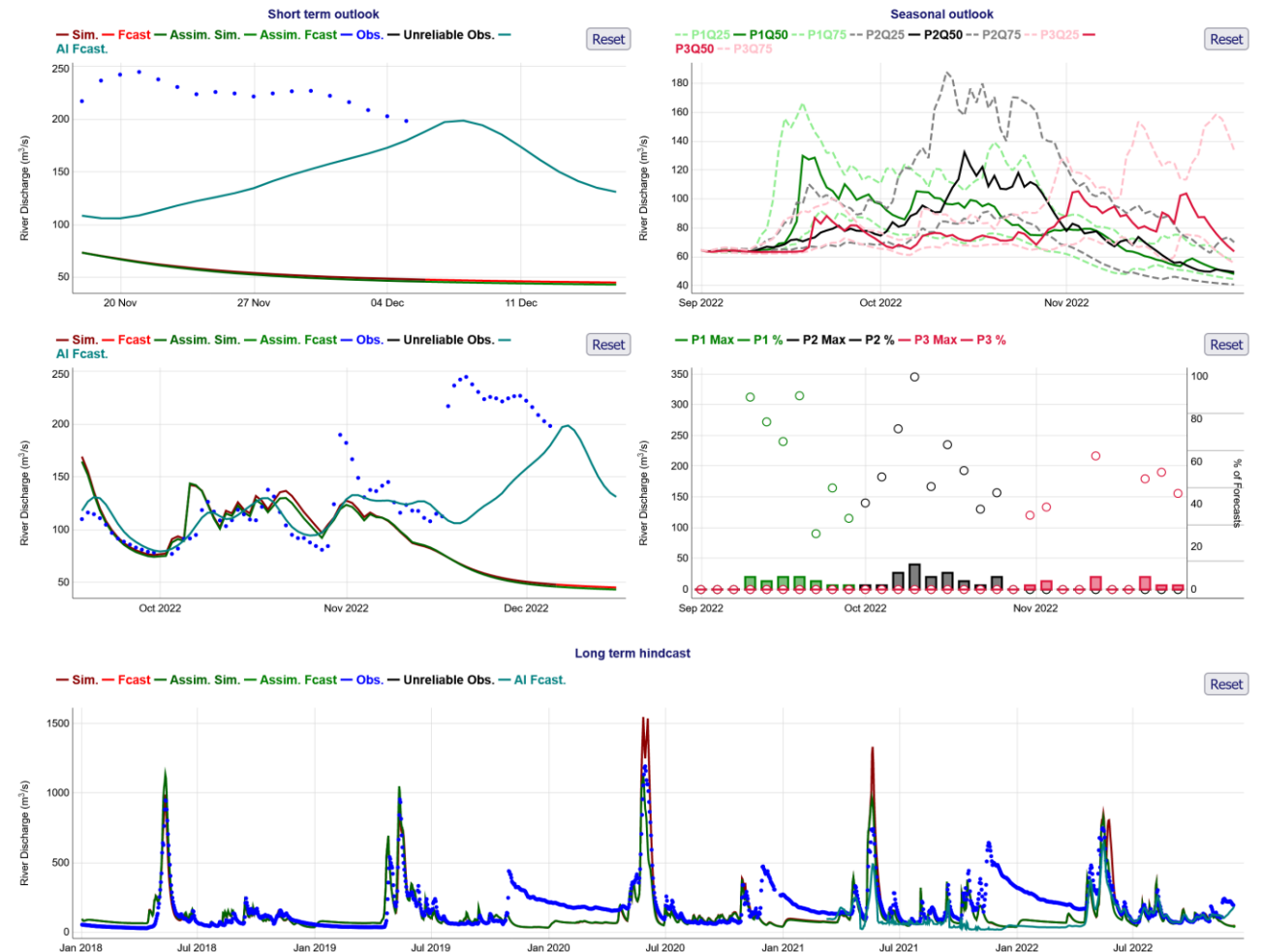
e-shape



[Watershed Maps](#) [Information](#) [Download](#) [Contact Us](#) [Links](#)

X

River Discharge (m^3/s) forecast at Kemihaara (6501700)





FMI's Climate Bulletin: Research Letters - e-shape special issue

https://issuu.com/fmi-ik/docs/rl-e-shape_special_issue-1-2022

FMI'S CLIMATE BULLETIN



Editorial — 4

Seasonal preparedness pilot – sub-seasonal and seasonal prediction service for tyre companies — 5

Development of the weather and climate service “CRITERION” for the touristic sector in e-shape — 8

Urban resilience to extreme weather - sub-seasonal and seasonal forecasts for winter maintenance activities in Helsinki — 11

Harvester Seasons – a forestry service supporting climate smart operations — 14

Seasonal climate predictions for German cities to strengthen urban resilience to climate variability — 17

The Kemijoki Hydrological Forecast System – a service supporting sydropower production in Northern Finland — 21

Future climate projection of heat indices for Austrian major cities: strengthening urban resilience and meeting user needs — 24

Thank you very much for your attention!