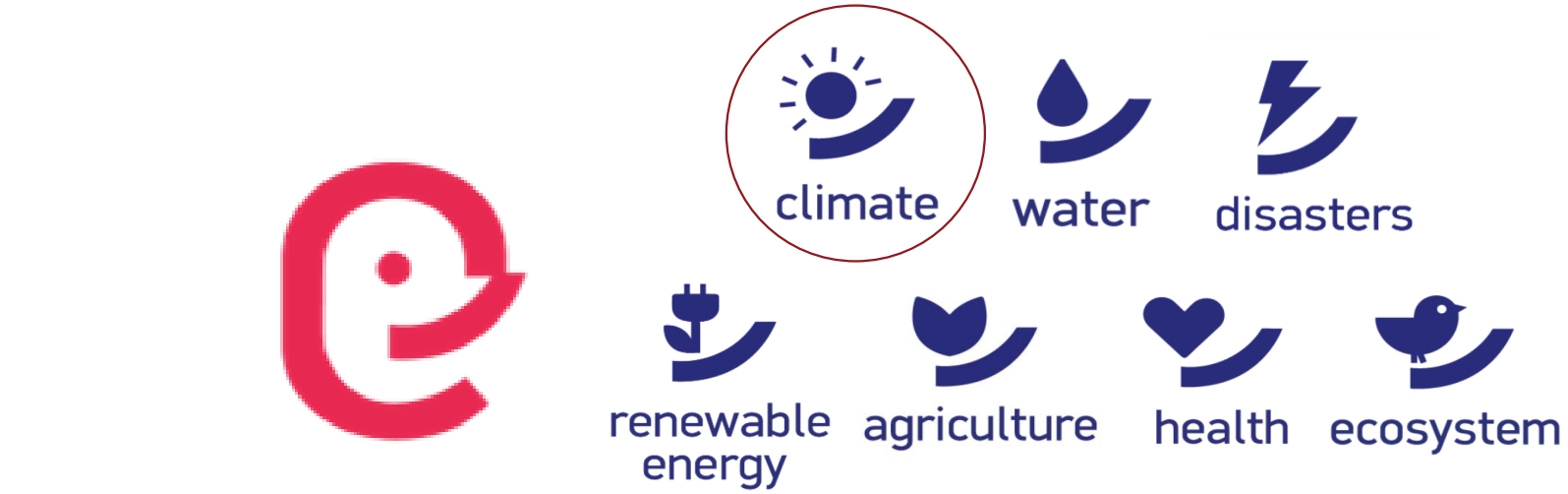


https://e-shape.eu

e-shape

EuroGEOSS Showcases: Applications Powered by E

Mikko Strahlendorff,

Finnish Meteorological Institute

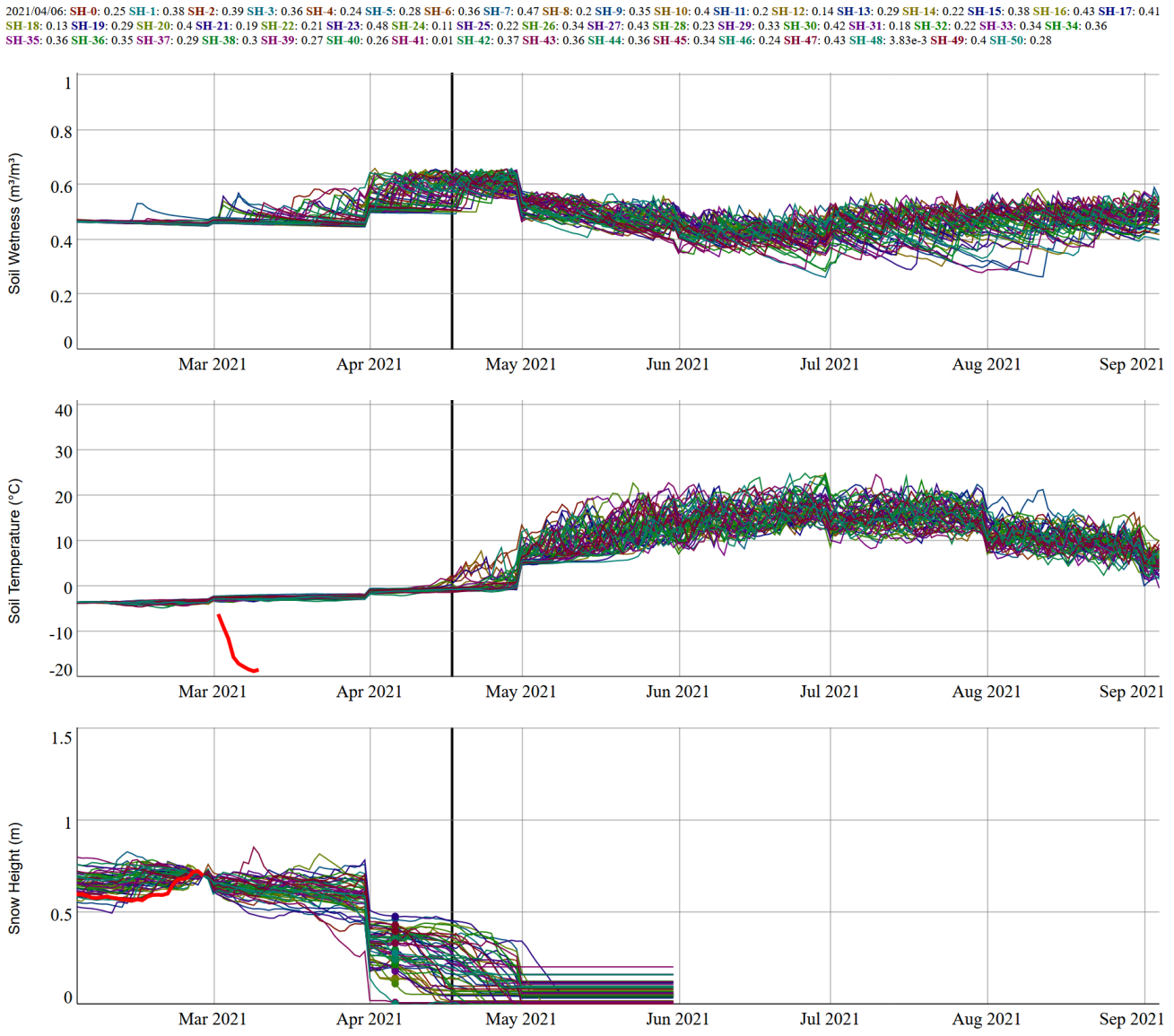
Euro-GEO workshop
Climate showcase

HELLENIC REPUBLIC MINISTRY OF DEVELOPMENT AND INVESTMENTS | GSRI GENERAL SECRETARIAT FOR RESEARCH AND INNOVATION

European Commission

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**



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:

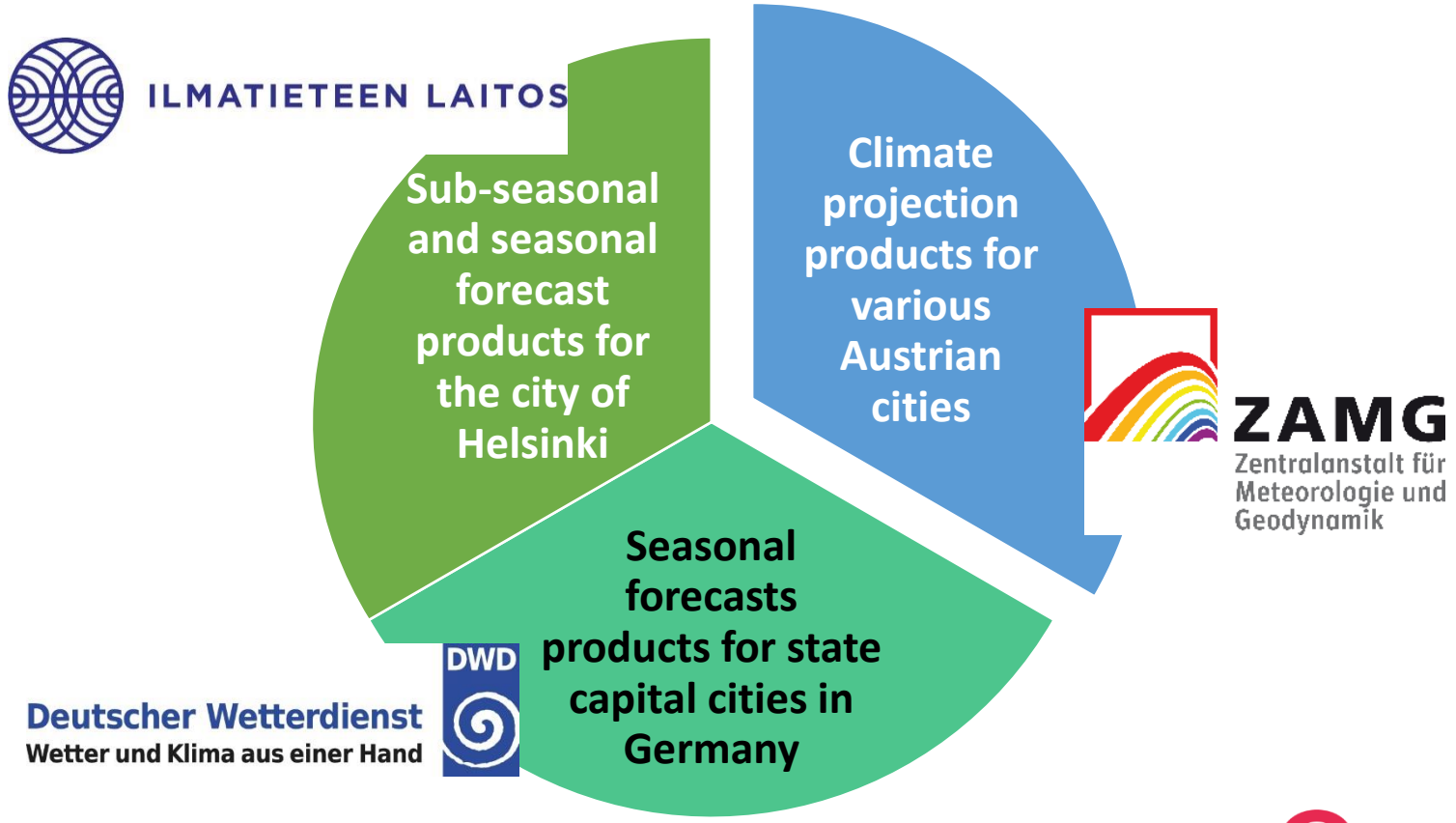
The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

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



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

e-shape

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-pocressing DWD HPC architecture

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

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

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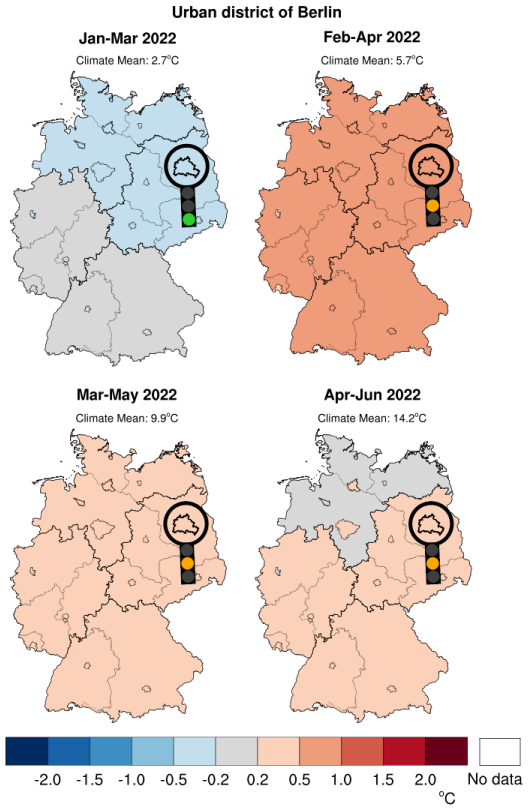
www.dwd.de/climatepredictions

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

EuroGEO GEO GROUP ON EARTH OBSERVATIONS Copernicus
The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852
e-shape

EUROGEO WORKSHOP 2022

Map
Ensemble Mean Prediction
Temperature



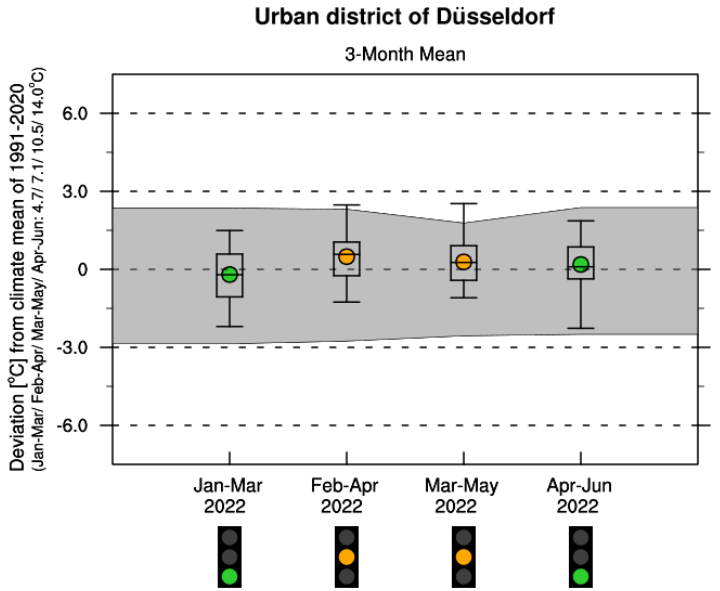
Ensemble mean prediction for temperature:
The colour represents the deviation of the ensemble mean prediction (3-month mean) from the climate mean of the time period 1991-2020.

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

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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/m²	40%	36%	24%
Feb-Apr 2022	80 - 145 l/m²	36%	40%	24%
Mar-May 2022	109 - 183 l/m²	34%	36%	30%
Apr-Jun 2022	163 - 211 l/m²	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

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ATHENS 7-9 DECEMBER 2022

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

e-shape

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

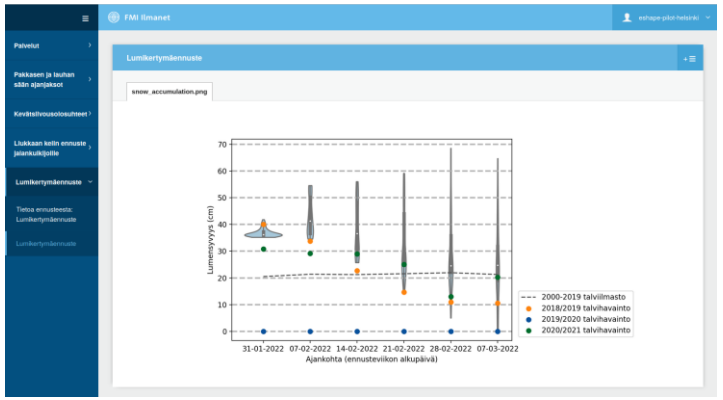
- snow removal from streets,
- street sanding,
- cleaning streets of sand and grit in spring

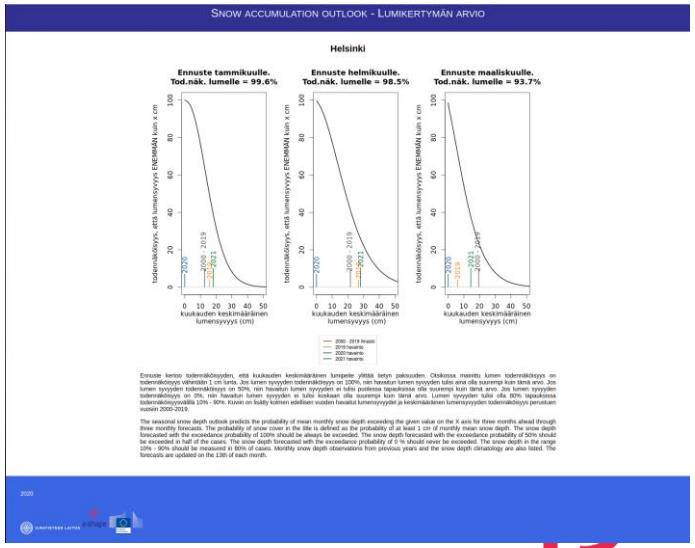
https://pixabay.com/photos/car-under-snow-winter-helsinki-car-5994674/

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

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



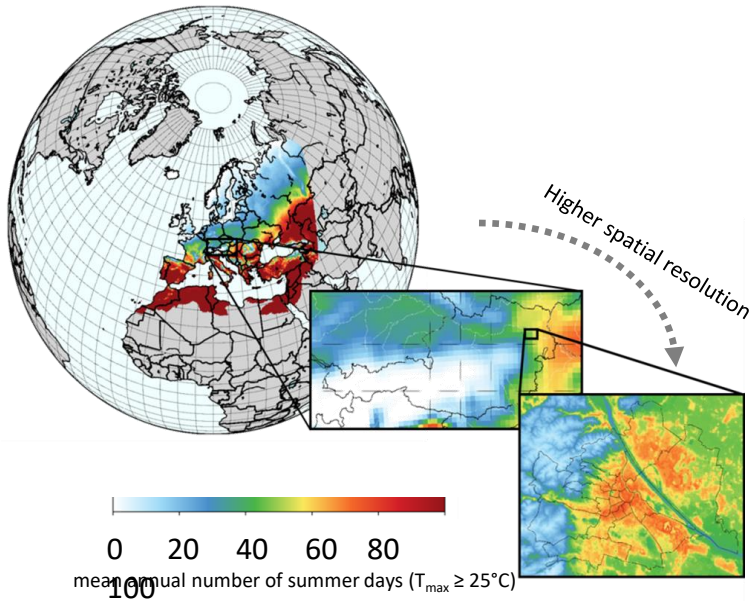


The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

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

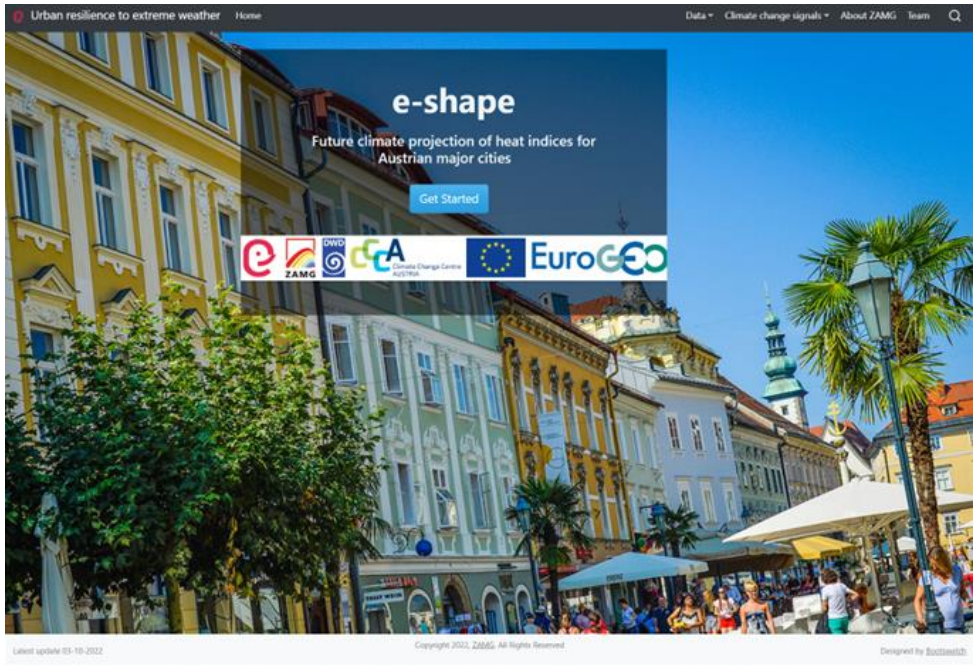


- Climate scenarios on city-scale based on urban climate model simulations and climate projections from global (GCM) and regional climate model (RCM) outputs
- Product: High spatial resolution maps of heat indices including Climate Change and Urban Heat Island information
- Data are used as input for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

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

e-shape

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

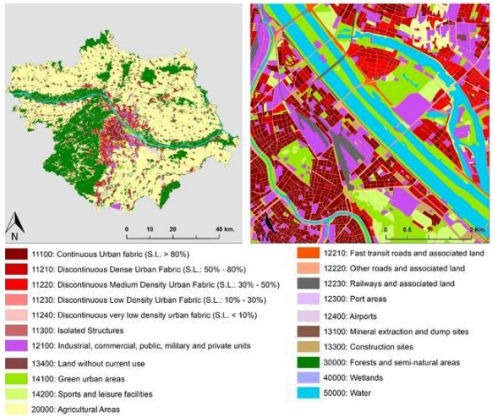


Land use and land cover

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.

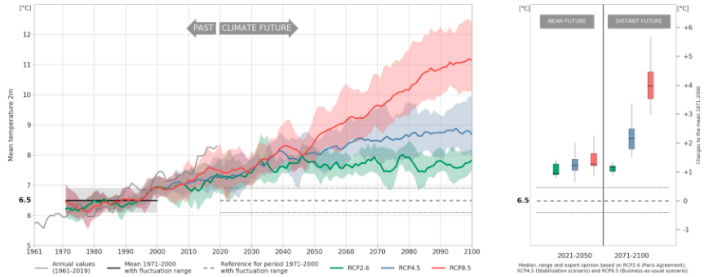
Climate projections

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 CO_2 emissions peak by 2040, whereas RCP8.5 represents a more extreme scenario in which CO_2 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)

- 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

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

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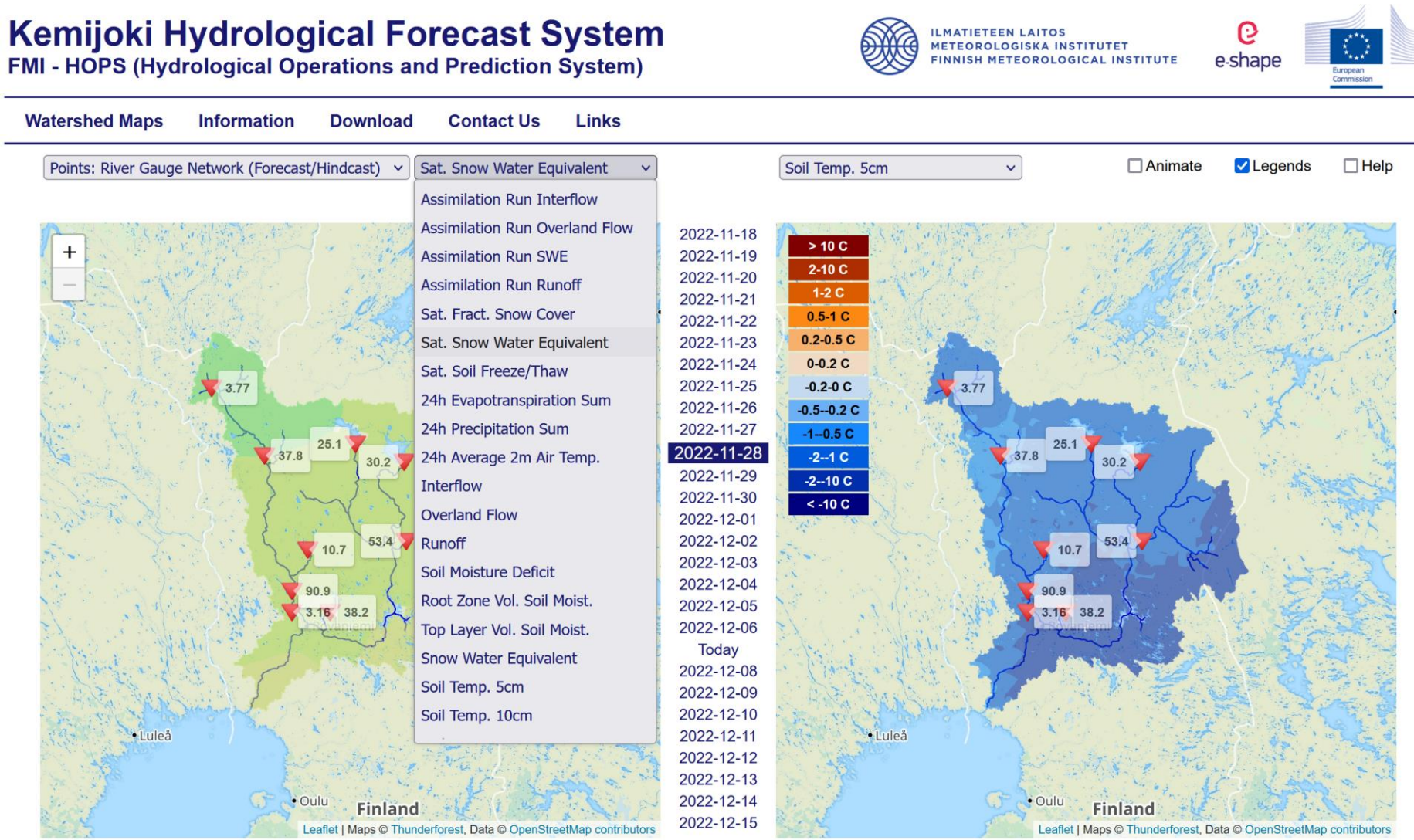
Pilot 7.4: Hydropower from snow by FMI

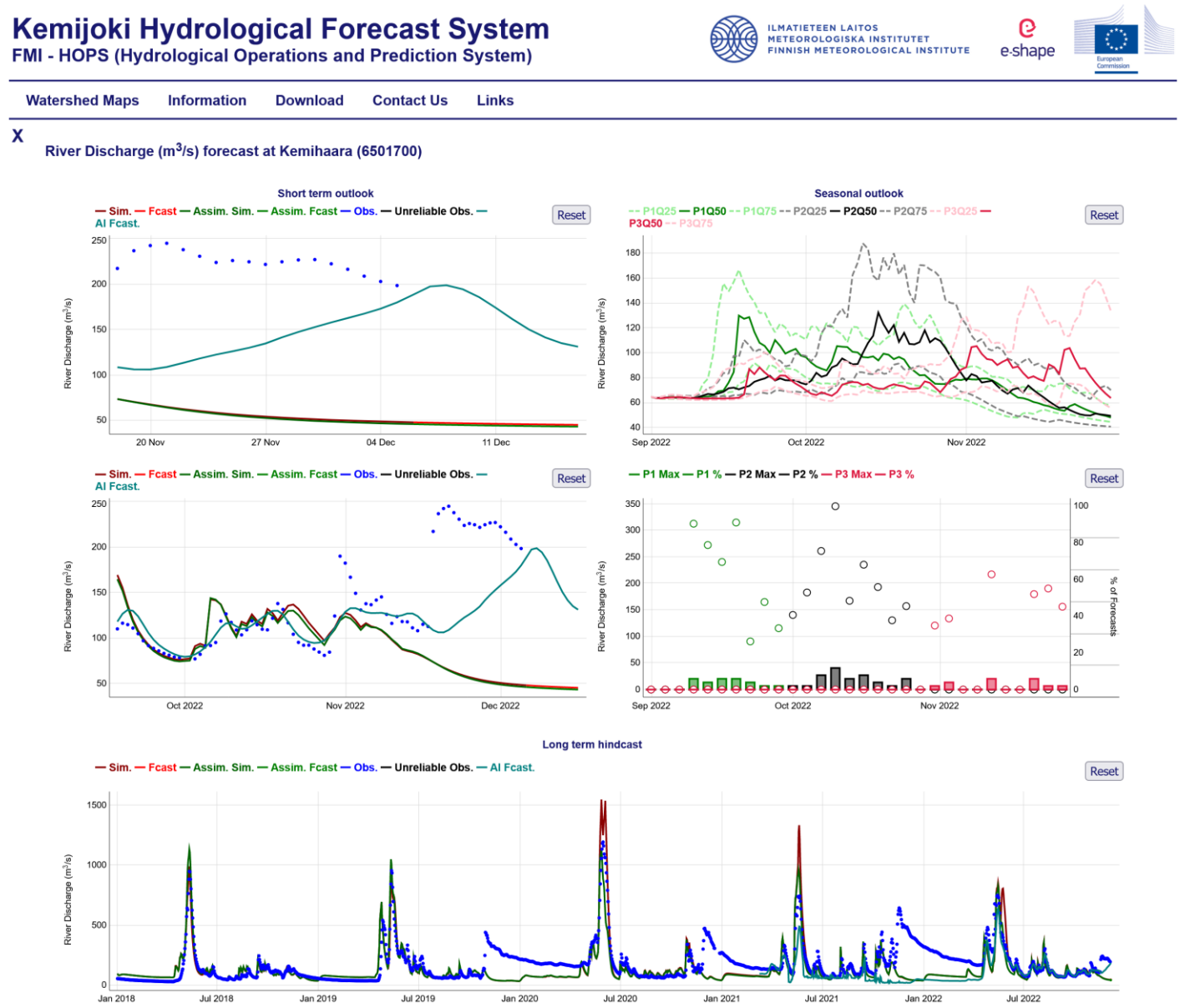
Jaakko Ikonen
Cemal Tanis

- 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



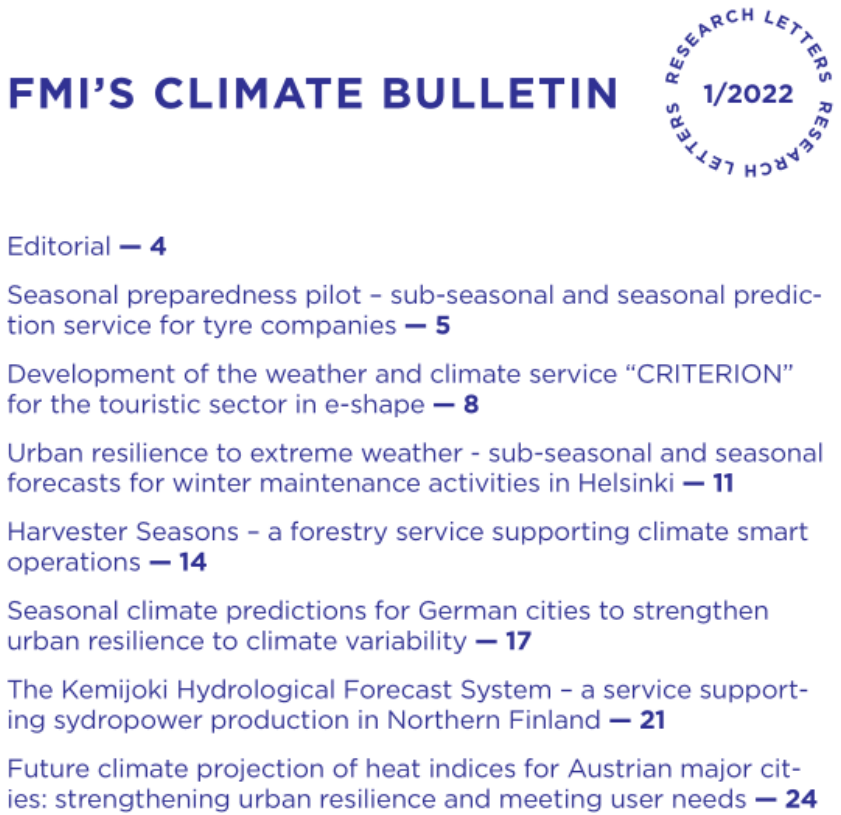
Seasonal forecasts

- 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



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

RESEARCH LETTERS 1/2022

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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!

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