Interim Report On Clustering Activities

Work Package:	1
Deliverable:	8.7
Due Date:	31.10.2024
Submission Date:	31.10.2024
Dissemination Level:	Public
Type:	Report
Responsible:	NORCE
Author(s):	Stefan Sobolowski

Funded by the European Union

Contents

Abbreviations Used

WCRP	World Climate Research Programme
DestinE	Destination Earth
TRACCS	TRAnsforming Climate Modelling for Climate Services
CORDEX	Coordinated Regional Downscaling Experiments
FPS	Flagship Pilot Study
CPRCM	Convection Permitting Regional Climate Modelling

1 Summary for Publication

Clustering with outside initiatives is a critical part of any Horizon Europe project. Such actions provide valuable meeting places and networking opportunities and are impact multipliers. Within I4C we aim to cluster with other initiatives on three different levels: i) fundamental science, ii) climate services and co-production and iii) CDE activities. To-date I4C has established strong ties with its sister project ASPECT, the WCRP-CORDEX community and DestinE. We expect to strengthen these collaborations in the second half of the project and expand our clustering activities to include CDE. This last aim has the added benefit of helping to communicate consistent messages around climate change and climate adaptation.

2 Contribution to the top-level objectives of Impetus4Change

Clustering with other initiatives extends the reach and impact of I4C and helps to communicate consistent messages around climate change and adaptation. In addition, I4C can leverage advances from other initiatives to support our scientific aims and vis-versa. We also experience efficiency and sustainability gains through collaborations on CDE such as joint workshops, webinars, policy briefs. This reduces the carbon footprint of the project while also enable impact multipliers.

2.1.1.1 Objective	2.1.1.2 Contribution from Deliverable
Overall Objective: to improve the quality, accessibility and usability of near-term climate information and services at local to regional scales – where impacts are most keenly felt and on-the ground adaptation is implemented – to strengthen and support end-user adaptation planning and action	All our clustering activities are targeted at being consistent with our overall objective and contribute to this in myriad ways. The diverse contributions can be seen in the summary table in section 4.2.
1) Improve understanding and flow of climate information through knowledge networks;	Clustering with ASPECT, ClimateEurope2 and the Mission on Adaptation contributes to a better and broader understanding of information flow.
2) Address persistent shortcomings to deliver seasonal to decadal predictions of improved quality;	Clustering with ASPECT contributes to this objective.

3) Develop novel methods to downscale predictions to local scales;	Clustering with the CORDEX task force on machine learning advances this objective
4) Improve assessments of hazards and translate this into usable information for local risk assessments;	Clustering with DestinE contributes to this objective.
5) Make advances towards the goal of end-to-end seamless climate services;	Clustering with ASPECT on this topic advances the community's efforts towards achieving seamlessness.
6) Through transdisciplinary co-production approaches develop fit-for-purpose "Adaptation support packs" at municipal scales through our so-called urban Demonstrators;	N/A
7) Ensure high impact and visibility through robust and targeted communication and engagement;	All clustering contributes to enhanced visibility of the project.
8) Commit to Open Science through development of open access tools and exploitation of data/model outputs via relevant platforms thereby ensuring improved accessibility and usability of climate knowledge.	The sharing of data, tools, outcomes through clustering is in keeping with Open Science principles.

3 Detailed Report

3.1 Introduction

Below the clustering activities to-date are summarized. As with other aspects of the project this will serve as a living document which will serve as a guide and will be updated later in the project lifetime to assess progress and add new clustering activities. In the next iteration of the report an assessment of the benefits of our clustering activities will be carried out.

3.2 Work Carried Out

ASPECT

To-date the most significant clustering activity between I4C and its sister project has been a joint workshop held May 27-30, 2024 in Bergen, Norway. The workshop was also co-sponsored by several other European and National initiatives. A key outcome is a perspectives piece that is currently in-preparation.

There have also been discussions between the technical work packages on potential collaborations. Due to the different foci of the projects identifying concrete tasks to undertake jointly has been a challenge. In the second half of the project I4C

will aim to cluster more closely with ASPECT on CDE efforts such as webinars, outreach, policy briefs and events.

Figure1. Flyer from the jointly sponsored workshop with ASPECT.

DestinE

Early in I4C efforts were made to link to DestinE activities. These efforst have paid off with the involvement of I4C scientists in several DestinE Use Cases. These are mostly concerned with the urban impacts of climate change and are therefore closely linked to I4C's demonstrators. There are four where we are currently collaborating at varying levels of engagement:

Addressing Urban Heat Island Effect (Addressing Urban Heat Island Effect - Destination Earth): Providing high-resolution urban heat maps for cities across Europe to underpin urban climate adaptation measures.

CITYNEXUS: A novel urban DestinE Platform application (CITYNEXUS: A novel urban DestinE Platform application - Destination Earth): Designing an innovative urban application for the DestinE Platform to assess the potential impacts of urban development decisions.

More Resilient City Planning (More Resilient City Planning - Destination Earth): Providing a heat stress index to allow urban planners to have a better understanding of the best adaptation practices against extreme temperatures in urban environments.

UrbanSquare (UrbanSquare - Destination Earth): Supporting decision makers in assessing climate related challenges and their impact on urban areas.

The first initiative is specifically connected to Demonstrator City of Prague, and we focus on that here. I4C scientists were approached to connect this Use Case to City of Prague to become a test user. This succeeded and we can follow the development, although the Use Case is based on a bit different modelling approach than what we expect in I4C, the VITO as main provider of the tools for the Use Case to develop urban heat map to support EU adaptation policies is using their model URBCLIM.

In the first phase of the project, a broad stakeholder community was gathered around the topic of urban heat stress. Three main users of the service were identified: DG REGIO, the City of Prague and the Lisbon Metropolitan Area. Besides these three main users, a long list of additional stakeholders are involved in the service. Through teleconferences and a dedicated hybrid user exchange workshop in Brussels, user needs and requirements were collected, which provided input to shape the outline of the use case.

The Urban Heat service will be compiled in a way that computation of the following output data will be possible:

- Heat stress calculations will be performed for both a recent past period (2011-2020) and future climate projections (2020-2040/2050).
- The climate projections from DT Climate will be compared to IPCC CMIP6 global climate model results.
- Three advanced heat stress variables (the Wet Bulb Globe Temperature (WBGT), the Universal Thermal Climate Index (UTCI) and the Apparent Temperature), that take temperature, humidity, wind speed and radiation into account, will be calculated.
- The calculations will be performed with a horizontal resolution of 100m and will cover the entire metropolitan areas of Prague and Lisbon.
- Both raw hourly output data as well as decadal overview maps will be provided.
- The following output indicators will be provided: Urban Heat Island (UHI) intensity, number of heatwave days, exposure of the population to heatwaves, heat-related mortality, exceedances of health threshold levels, lost working hours and cool island identification.

Important to note is that the service, demonstrated for 2 specific cities, Prague and Lisbon, will be implemented in a way that can be easily replicated for any urban area in Europe.

The second phase of the project has started and the UrbClim model was set up for the two demonstration cities of Prague and Lisbon, performing model simulations for the reference period (2011-2020), based on ERA5 reanalysis data. Postprocessing scripts have been written to calculate the agreed upon urban heat indicators. First output maps were produced and discussed with the demonstration cities. One can see an example of one of these indicators, Tropical Nights, in Figure 2.

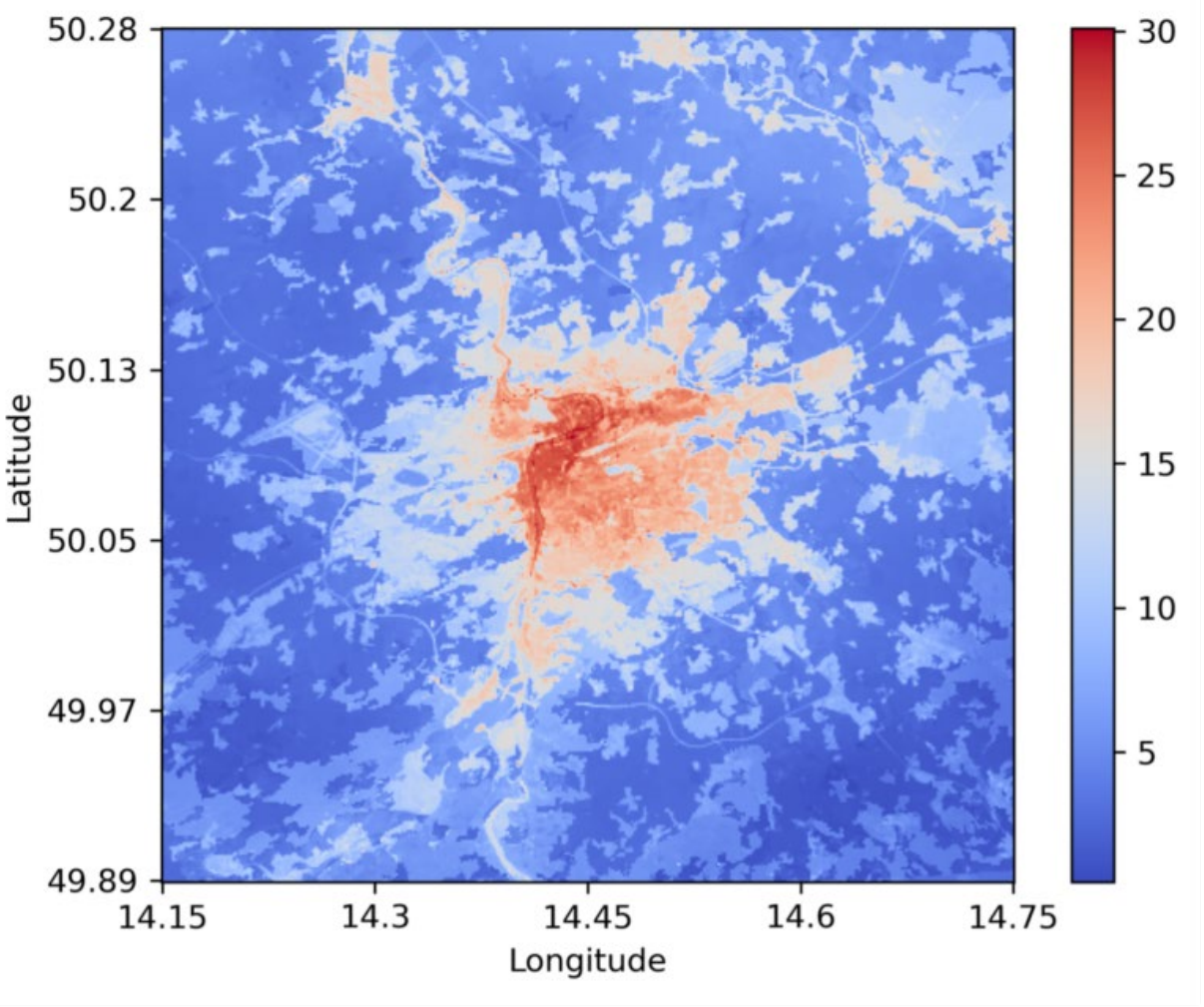

Figure 2. Annual number of tropical nights, defined as nights during which the 2m air temperature was always above 20°C, for the city of Prague. Source: VITO.

Furthermore, a validation exercise was performed, using existing networks of local measurement stations that were available in both demonstration cities. The UrbClim results were compared to daily mean temperatures and daily maximum apparent temperatures from measurements for the summer of 2022. The model was capable of reproducing observed values with small biases and good error statistics. An impressive achievement considering the fact that most of these stations were in sub-optimal measurement locations and used non-professional equipment.

The users and contractor will jointly demonstrate the utility of urban-scale data, maps and the user interface. This might be done by overlaying urban heat indicator maps with suitable spatially explicit socio-economic information to derive sectoral and demographic heat impact maps. As part of this joint exercise, a performance assessment will be made, considering both the scientific uncertainty of the data and their fitness-for-purpose.

WCRP

I4C partners are very closely associated with CORDEX, which exists under the WCRP banner. We have coordinators for the European and Mediterranean community modelling efforts as well as participants in many FPSs which establish community

efforts to advance cutting edge science. I4C is playing a key role in the development of CORDEX's strategy around convection permitting modelling (CPM) as well as AI and machine learning (AI/ML). Specifically, the protocols established for emulators in WP3 will be crucial for the foundations of community-wide standards of practice. I4C scientists are sitting on or leading CORDEX Task Forces on CPM and AI/ML.

There are two new FPSs where I4C will contribute. These are: 1) the recently submitted CORDEX FPS on Seasonal to Decadal scale (PREMEDICT) that targets to develop a specific approach for the S2D scale in CORDEX and 2) the FPS-IC-Pac on the small Pacific Islands that will be follow the Caribbean run protocol we are developing in WP3 of I4C. Finally, I4C scientists are leading an FPS focused on Urban climate where the urban environment is the target. Here, two of our demonstrator cities (Paris, Prague) are involved.

I4C's WP6 leader (Dragana Bojovic, BSC) is a member of the WCRP's Regional Information for Society (RIfS) scientific steering group. RIfS is one of the WCRP's core projects. Within that community knowledge and experience from I4C is shared with RIfS, particularly related to the work in demonstrators and the knowledge network activities.

Horizon Mission Adaptation

I4C has joined the MAIA project multiplier network (https://maia-project.eu/). MAIA is a Horizon Europe project aimed at connecting and multiplying communities, knowledge and research on climate change. To-date, this engagement has been limited, but as the results begin to accumulate I4C will take a more active role in multiplying its impact via the services offered through MAIA. Likewise, I4C has joined the EU Mission on Climate Change Adaptation community (https://climate-adapt.eea.europa.eu/en/mission). As with MAIA, we expect this engagement to become more concrete through the second half of I4C.

TRACCS-LOCALISING

TRACCS-LOCALISING is French national project that has started recently (2024-2031) lead by WP3 lead Samuel Somot (Meteo-France). There is a clear connection between the WP3 of I4C and LOCALISING. Specifically, the development of CPRCM to tackle very high spatiotemporal resolutions and related phenomena in climate simulations as well as for the development of Statistical Emulators of CPRCM are areas where the two projects share common objectives. Ideas and methods developed in I4C will inspire LOCALISING and the project will be one of the legacies of I4C.

3.3 Main Results Achieved

In the first 18M of the project the main aim was to establish clustering activities. This has been achieved. The goal for the second half of the project is more ambitious and that is to strengthen and fully realize the potential of these clustering activities. Here we highlight three key results to date: One is the joint workshop that was held in Bergen, Norway 27-30, May 2024. The other key result is the very robust clustering with DestinE projects and use cases focusing on urban heat extremes. The third is our robust clustering with CORDEX and the role that I4C will play in setting standards,

protocols and a foundation from which we can build coordinated, community efforts around climate emulators.

3.4 Discussion and Next Steps

In the second half of the project I4C will aim to collaborate more strongly with its sister project on scientific objectives and CDE initiatives. Specifically, we are in discussions with ASPECT leadership on joint evaluations of improved global predictions and climate emulators. Additionally, we will seek to collaborate on outreach activities such as webinars, the I4C roadshow and an end-of-project policy event in Brussels. We will also continue and strengthen our scientific collaborations with DestinE, ASPECT, CORDEX and other activities. Lastly, a key target will be linking I4C CDE activities with the MAIA project multiplier network.

4 Impact

Clustering acts as a force multiplier and has a positive impact on all aspects of a project and its broader dissemination and communication.

5 Communication, Dissemination and Exploitation

As noted in subsection 3.4 Discussion and Next Steps, there will be a strong focus in the second half of the project on clustering within CDE activities.

5.1 Peer Reviewed Articles

Currently, I4C scientists are working with colleagues from our sister project, ASPECT (and many others) to finalize a joint publication that emerged out of the prediction workshop described above.

1. Keenlyside, N. et al. (in-prep). Recent advances in climate prediction and services over the Atlantic-Arctic region.

IMPETUS4CHANGE (I4C)

IMPROVING NEAR-TERM CLIMATE PREDICTIONS FOR SOCIETAL TRANSFORMATION

Grant agreement ID: 101081555

Call: HORIZON-CL5-2022-D1-02

Type of Action: HORIZON-RIA

Start date: 1 November 2022

Duration: 48 months

Website	impetus4change.eu
Twitter	@I4C_eu
LinkedIn	Impetus4Change
Zenodo repository for I4C open access documents	Impetus4Change Community