The HuT

Monitoring activities to be developed in the Demonstrators

Deliverable D4.2

DEVELOPED WITHIN
WP4 Science and Technology, T4.2 Innovative Nexus Modelling

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1. Technical references

Project Acronym	The HuT
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* PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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1.1. Document history

Version	Date	Lead contributor	Description
0.1	30.06.2023	Eisharc Jaquet (ARANTEC), Guido Rianna (CMCC)	First draft
0.2	17.07.23	Joanne Robbins (MO)	Critical review and proofreading
1.0	18.07.23	Guido Rianna (CMCC)	Final version

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2. Table of contents

2.1. List of Tables

None

2.2. List of Figures

None

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3. Purpose

Task 4.2 has the goal of developing, within the demonstrators, cutting-edge approaches for monitoring precursors and indicators of extreme climate events. It has two main pillars:

- IoT monitoring: exploiting new low cost and robust technologies (e.g., Internet of Things sensors) to improve the observation of weather forcing (e.g., increased spatio-temporal resolution) or impacts at or in the ground (e.g., soil moisture).

- Human Sentinels (citizen science experiences): involving people working/living in risky areas for a proper maintenance of sensors or for documenting the impacts of extreme climate events (e.g., photos and reports by community members uploaded in local data platforms).

In this regard, Deliverable 4.2 has the goal to define an agreed and reliable Action Plan for the activities to develop and implement during the Project. Monitoring and citizen science activities are not expected to be carried out in all the Demonstrators in the same way. Following The HuT philosophy, for each area according to the specific features and needs, different suites of Innovations will be developed taking into account insights and suggestions of local Partners and communities of Practice. Furthermore, in the first part of the Project, some Demonstrators could act as *frontrunners* for specific innovations that will be scaled out (replicated) in other areas in the following periods.

The Action Plan is informed by two surveys given to the DEM leaders in December 2022 and May 2023[1] collecting information about current expertise and initiatives on such topics and the expected activities in The HuT context.

The main results are discussed in the next section at DEM and Project level.

[1] The results of both the surveys are available at the links in the text

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4. Activities in the Demonstrators' Arena

4.1. DEM1 - Valencia city, Spain

Monitoring initiatives currently available in the DEM:

Variables: Network for monitoring water status (water pH, chlorophyll, water temperature, water conductivity, dissolved oxygen at different depths, nutrients, rainfall, reservoir storage) at key points of the water supply network). Temperature sensors in the city.

Availability for The HuT purposes (e.g. platform, model validation): to be verified. Long data series for rainfall and temperature are available while variables related to water quality are available only for the most recent periods.

Planned monitoring activities: At the moment, no additional monitoring is assumed needed. A final decision will be taken after interaction with the stakeholders. Monitoring data will be stored in the VLC city platform.

Citizen science initiatives currently available in the DEM: Citizen consultation strategy by the city of Valencia.

Planned citizen science activities: Student dissemination activities.

Further modelling work in Valencia includes the development of a digital twin at neighbourhood level for heat stress impact assessment. Monitoring data sources concentrate on heat stress impact assessment. The proposed digital twin requires the following KPIs to be monitored at neighbourhood level for the city. Monitoring in Valencia has been performed using the infrastructure from the city and a previous Horizon 2020 project named GrowGreen (project # 730283) in the Benicalap neighbourhood within the city.

Eklipse[2] Challenge Area	Core KPIs
Climate mitigation & adaptation	• Air temperature • Humidity
Water resilience	• Run-off coefficient in relation to precipitation quantities
Water Management	• Reduction of runoff peak discharges • Reduction of runoff volume rates
Green Space Management	• Diversity of trees and shrubs • Diversity of vegetation strata
Potential of economic opportunities, green jobs and business models	• One-off construction costs • Recurring / maintenance costs • Property betterment • Direct jobs & local economy

Table 1 – Valencia Heat Stress demonstrator (GrowGreen) Core KPI's

[2] https://oppla.eu/product/26260

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Data from the demonstration pilot uses Valencia's open data portal (to be found in https://opendata-innova.vlci.valencia.es/).

4.2. DEM2 - Val d'Aran region, Spain

Monitoring initiatives currently available in the DEM:

Variables: rainfall, snow height, soil moisture, discharge. They are made available by SMARTY River initiative, METEOCAT and other agencies.
Availability for The HuT purposes (e.g. platform, model validation): some of them are publicly available, for other specific agreement with the owner of the data is needed.

Planned monitoring activities:

Rain gauges, weather stations and soil moisture sensors with different communication technology like LoraWAN, 4G, satellite. The monitored areas will be susceptible to impacts but not yet been monitored

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them.

Planned citizen science activities: workshops in schools on the topic of natural hazards under the title "build your first raingauge"

4.3. DEM3 - Lattari mountains, Italy

Monitoring initiatives currently available in the DEM:

Variables: Regional network managed by the Regional Functional Centre of Civil Protection: http://centrofunzionale.regione.campania.it/#/pages/sensori/pluviometrici; data available in real time with a time resolution of 1 h while, after, they are released with a time resolution of 10 minutes
Availability for The HuT purposes (e.g. platform, model validation): data "digitalized" after 2000 (10 minutes resolution); data before 2000 are available but they need to be digitalized.

Planned monitoring activities:

Installation of new sensors (low cost, IoT when possible) in areas not adequately covered by the network already in place: the first idea is that of monitoring three deep valleys in DEM3 in three different Municipalities (Amalfi, Sorrento, Piano di Sorrento).

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them.

Planned citizen science activities: in the portal under development for civil protection purposes at Municipal level, reports from local experts (e.g. practitioners, hikers, trekkers) about incipient failures, vulnerabilities, sudden changes in landscape conditions are expected supporting decision making.

4.4. DEM4 - Vilnius city, Lithuania

Monitoring initiatives currently available in the DEM:

Variables: Two rain gauges and a meteorological radar (at the moment under renovation) are installed in the city center and on its (urban area) outskirts. Hourly rainfall data is available from 2013 to present. There is also radar data, but the format of the data is unclear. Legal problems

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may arise if this raw data should be made public, as it belongs to another institution and is not fully open to the public. However, there are open data alternatives such as reanalyses, private gauges and others.
Availability for The HuT purposes (e.g. platform, model validation): Legal problems may arise if this raw data should be made public, as it belongs to another institution and is not fully open to the public. However, there are open data alternatives such as re-analyses, private gauges and others.

Planned monitoring activities: Not expected.

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned citizen science activities: Not expected.

4.5. DEM5 - Schleswig-Holstein state and harbour cities, Germany

Monitoring initiatives currently available in the DEM:
Variables: Weather, floods, sea level, chemical disasters, and any other disasters got registered through the national warning system.
Availability for The HuT purposes (e.g. platform, model validation): Only present time (real-time) and warning in the next hours or days are available.

Planned monitoring activities: Not expected.

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned citizen science activities: Not expected.

4.6. DEM6 - East fjords, Iceland

Monitoring initiatives currently available in the DEM:
Variables: Temperature, precipitation, wind, snowdepth. In Seyðisfjörður: Groundwater level as well as soil movement and deformation, formation of cracks. Automatic weather stations, lowland and at higher elevations. Seyðisfjörður and Eskifjörður to a degree: Groundwater boreholes, some of which have automatic water level gauges installed. Soil temperature sensors. Automatic deformation gauges and inclinometers in boreholes. Automatic GPS stations. Total station and a network of reflectors. Ground based InSAR radar.
Availability for The HuT purposes (e.g. platform, model validation): Currently, several stations are available while a limited number prior to December 2020.

Planned monitoring activities: Not expected.

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

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Planned citizen science activities: Not expected.

4.7. DEM7- Hungarian Tisza River basin, Hungary

Monitoring initiatives currently available in the DEM:
Availability for The HuT purposes (e.g. platform, model validation): at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned monitoring activities: Not expected.

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned citizen science activities: Not expected.

4.8. DEM8 - Ogliastra province, Italy

Monitoring initiatives currently available in the DEM:
Availability for The HuT purposes (e.g. platform, model validation): at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned monitoring activities: Not expected.

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them. Nevertheless, it is not expected that such activities will be developed in the DEM.

Planned citizen science activities: Not expected.

4.9. DEM9 - Dorset county, UK

Monitoring initiatives currently available in the DEM:
Availability for The HuT purposes (e.g. platform, model validation): The installation of IoT sensors planned in the previous projects in place prior to The HuT did not achieve full outcomes.

Planned monitoring activities: It is planned that IoT sensors will be installed to monitor landslide activity with different sensors: GPS, accelerometers, gyroscopes, time-of-flight sensors (distance measurements), but also temperature, pressure and a nearby weather station(s). The sensors will be Nb-IoT sensors (Narrowband Internet of things), i.e. communication via low-power wide-area network (LPWAN) radio technology for further analysis. The monitored area will be: coastal cliff environment (rock falls and rotational landslides), rock fall locations at Burton Bradstock and rotational landslide locations at Lyme Regis.

Citizen science initiatives currently available in the DEM: BGS do 'report a landslide' data collection https://www2.bgs.ac.uk/reportalandslide/reportForm.html (not specifically associated with the DEM)

Planned citizen science activities: Not expected.

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4.10. DEM10 - Bern canton, Switzerland

Monitoring initiatives currently available in the DEM: Precipitation and river discharge measurements are available

Planned monitoring activities: Weather stations to complement already available monitoring tools

Citizen science initiatives currently available in the DEM: at this stage, the DEM leaders were not able to retrieve information about them.

Planned citizen science activities: Not planned; it could act as follower in the second part of the Project.

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5. Brief considerations

Following the survey findings, four DEMs (2:Val d'Aran, 3:Monti Lattari, 9:Dorset, 10:Bern Canton) clearly emerge as main actors in the Task activities. They will act as frontrunners while in the second part of the Project, their experience and expertise could support other DEMs potentially interested in these activities.

Furthermore, for what concern the monitoring activities, three of them (2, 9, 10) have internal expertise and competencies to carry out on their own the activities associated with selection of the sensors and implementing communication systems while DEM3 is expected to benefit from the knowledge and know-how transfer from the other Partners.

For what concerns citizen science initiatives, two innovations are expected to be implemented in DEM1 and DEM3. In this regard, the activities carried out in Val d'Aran are clearly connected to training and educational activities planned in WP2 while the decision support tool under development in DEM3 will be embedded in the Local Portal (Task 1.3); it could also capitalize the experience of BGS ("report a landslide").

To follow how the activities proceed, quarterly (at least) remote meetings will be fixed among the Partners working on the four DEMs (2,3,9,10) while the main findings and achievements will be shared and discussed with the other DEM Leaders during the Demonstrators Management Board meetings.

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