

Market Consultation Report

Results of the
Open Market Consultation for the future Pre-Commercial
Procurement of R&D services of innovative Climate
Services based on Earth Observation in four challenges:
**FLOODS, FIRE, WATER &
SUSTAINABLE INFRASTRUCTURE**



November 2023

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Abbreviations and Acronyms

COTS	Commercial Off-The-Shelf
CS	Climate Services
EAFIP	European Assistance for Innovation Procurement
EO	Earth Observation
EU	European Union
FAIR	Findable, Accessible, Interoperable and Reusable
FRAND	Fair, Reasonable and Non-Discriminatory
GEOSS	Global Earth Observation System of Systems
GDPR	General Data Protection Regulation
HE	Horizon Europe
IPRs	Intellectual Property Rights
OMC	Open Market Consultation
PBG	Public Buyers Group
PCP	Pre-Commercial Procurement
PIN	Prior Information Notice
R&D	Research and Development
SMEs	Small and Medium Enterprises
SOTA	State of the Art
TED	Tenders Electronic Daily
TRL	Technology Readiness Level



1. Introduction

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It should be noted that this document is based upon the information publicly available to the PROTECT project (including but not limited to information on the upcoming pre-commercial procurement call of the European Commission on the “Customisation/pre-operationalisation of prototypes end-user services in the area Climate Change Adaptation and Mitigation”) and the feedback provided during the market consultation. As such, the PROTECT project and any of its partners cannot guarantee the accuracy and/or completeness of this information and the actions and measures based upon this information. It is recommended to access the relevant EU platforms to receive the actual relevant information and updates thereof.

This document has been drafted with the utmost care, but no guarantees are given regarding its soundness and/or completeness. Any errors or inaccuracies can be reported via email to (info-PROTECT@group-gac.com)

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Economic operators and other stakeholders are being informed that any information regarding the setup and execution of both the procurement process and the execution of any contract/framework agreement as a result of the procurement process as well as public summaries of the results of the PCP project, including information about key R&D results attained and lessons learnt by the procurers during the PCP, can be shared after consultation with the respective R&D provider by the PROTECT-PCP Group with(in) the context of the contract and consequently can be analysed, (re-)used and published by the PROTECT project. Details should not be disclosed that would hinder application of the law, would be contrary to the public interest, would harm the legitimate business interests of the R&D providers involved in the PCP or could distort fair competition between the participating R&D providers or others on the market.

¹ The Horizon Europe PCP call HORIZON-CL6-2021-GOVERNANCE-01-15 will on 17 October 2023. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-9-food-bioeconomy-natural-resources-agriculture-and-environment_horizon-2023-2024_en.pdf The implementation of the PCP depends on the obtention of this funding by the potential public buyers. <https://www.protect-pcp.eu/pcp-call/>



PROTECT project receives funding under the European Union's Horizon Europe framework program for research and innovation under the grant agreement grant agreement No 101060592. The EU is however not participating as a contracting authority in the procurement.

A Prior Information Notice (PIN) has been published in Tenders Electronic Daily (TED) to announce the Open Market Consultation on potential future procurement activity:
<https://ted.europa.eu/udl?uri=TED:NOTICE:574857-2023:TEXT:EN:HTML&src=0>



2. Purpose of the Open Market Consultation

2.1. Scope and main objectives

This document describes the results of the Open Market Consultation (OMC) of the PROTECT project regarding 4 challenges, namely: Floods, Fire, Water resilience, and Sustainable & resilient Infrastructure, as described in the OMC Document with Annexes.

The OMC began on the date of its publication in the Tender Electronic Daily (TED), and ends on the date indicated as such in this document. The rules and objectives of the PROTECT OMC, as well as the challenges, the potential public buyers and the PCP approach are described in [the OMC Document with Annexes](#).

Through the OMC, the Public Buyers Group (PBG) organized under the PROTECT project informed market operators regarding the upcoming Pre-Commercial Procurement (PCP) of Research and Development (R&D) services for the “Customisation/pre-operationalisation of prototypes end-user services in the area Climate Change Adaptation and Mitigation”². The PCP responds to commonly identified challenges in the area of climate adaptation and mitigation that can be better addressed jointly or that a single procurer could not otherwise have addressed alone.

The OMC also aimed to understand the market operators’ capabilities to satisfy the PBG’s needs and to obtain their input on the viability of the procurement plans and conditions as described in this document and annexes.

In sum, the objectives of this OMC were to:

- 1) Validate the findings of the State-Of-The-Art (SOTA) analysis and the viability of the set of technical and financial provisions.
- 2) Raise awareness of the industry and relevant stakeholders (including other users) regarding the upcoming PCP.
- 3) Collect insights from the industry and relevant stakeholders (including users) to finetune the tender specifications.

This OMC was performed under the law of the lead procurer, which is Dutch law.

The Public Buyers involved in the PROTECT project are not legally bound in any way by the outcome of the OMC.

Starting an OMC does not mean that the PBG in the PROTECT project is obliged to start a tendering or purchasing procedure. If this OMC is followed by a tendering procedure and/or purchasing procedure, the PBG reserves the right to adjust and/or supplement the solution described in this document on every

² The upcoming €19 million pre-commercial procurement call is fully funded by the EU. The goal of the “Customisation/pre-operationalisation of prototypes end-user services in the area Climate Change Adaptation and Mitigation” call is for a consortium of public procurers (the “buyers group”) to prepare, launch and implement a pre-commercial procurement procedure that responds to a commonly identified challenge in the area of climate adaptation and mitigation. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-9-food-bioeconomy-natural-resources-agriculture-and-environment_horizon-2023-2024_en.pdf#page=555



element. No rights can be derived from statements and/or communications during this OMC in any future tendering procedure and/or purchasing procedure.

The OMC is not part of any pre-qualification or selection process. No advantage or disadvantage will be given to any supplier / group of suppliers to the detriment of others during the OMC and the sub-sequent competitive procedure for the award of contracts.

All information provided during the OMC and other background information is published online in English. Where appropriate, parts of the information received from market parties can be shared with the European Commission.

2.2. Participation in the OMC

The target groups of this OMC were users and technology vendors. All interested parties were invited to take part in the OMC. However, it was clarified that the participation in the PCP may be restricted to companies from EU and Associated Countries.

Participation in the OMC was voluntary and non-binding and was at the own expense and risk of market operators. A market operator could not charge any costs to the PBG for participation in the OMC or for (re) use of its information in the context of a future procurement procedure.

Participation in the OMC is not a condition for submitting a tender in the subsequent procurement, does not lead to any rights or privileges for the participants, and is not part of any pre-qualification or selection process. The provided input in this OMC will not be used to evaluate future proposals.

Based on the feedback provided in the EU Survey questionnaire, the majority of respondents belong to start-ups and SMEs, as indicated in the figure below.



Figure 1.- Type of organisations who replied to the Request for Information using the EU Survey tool

The participants who replied to the EU Survey questionnaire are from organisations in France, Germany, Greece, Luxembourg, Italy, Spain, the Netherlands and United Kingdom.

Participation during the OMC webinars was larger. In each of the four OMC webinars, the number of participants ranged from 25 to 35 persons who followed each of the four complete 90 minutes session. The webinars celebrated within the framework of the OMC were recorded. The [video recordings](#) are available on the website of PROTECT.

The data collected, processed, stored and used by the PROTECT Consortium has the only purpose of implementing the PROTECT project and is handled according to the General Data Protection Regulation (Regulation 2016/679 of the European Parliament and of the Council - GDPR). Participants may



exercise your right to access your personal data and the right to rectify such data by contacting: (info-PROTECT@group-gac.com)

2.3. Timeline and activities

The timetable of activities and required actions of the OMC is indicated below:

Date	Event
20 September 2023	Publication of the Prior Information Notice (PIN) on TED
25 September 2023	Publication of the OMC documents in the project's website and EU Survey: https://ec.europa.eu/eusurvey/runner/PROTECT-PCP-2023 Open registration for the events and submission of questions
10 November 2023	Deadline to submit questions (17:00h CET)
14 November 2023	Deadline to register for the webinars (17:00h CET)
15-16 November 2023	Celebration of the 4 OMC webinars
17 November 2023	Publication of the Q&A document in the project's website
20 November 2023	Deadline to fill in the EU Survey (17:00h CET)
27 November 2023	Publication of the OMC report
30 November 2023	Closure of the OMC

The PROTECT Consortium was entitled to adjust the timetable above and to terminate the OMC for its own reasons at any time, and to publish such modifications or termination on TED and the project's website (<https://www.protect-pcp.eu/>).

The OMC activities consisted of:

- **Four webinars** that took place on 15th and 16th November 2023. The webinars were carried out in English and broadcasted online.
- **A request for information** in the form of an EU Survey questionnaire which was filled out by 18 respondents.
- **Other activities and questionnaires** as deemed necessary within the scope of the project, including a publication of a **Q&A document**.

The PROTECT Consortium was entitled to adjust the planned activities or to include new activities at any time according to the needs and responses of the market.



3. The OMC results

3.1. The OMC procedure and reporting

The OMC started on the date of its publication in the EU's Supplement to the Official Journal (TED) and ended on the date set in the timetable above.

Interested parties were requested to register in order to participate in the events and receive additional information of the project. Additional written contribution in the form of a Request For Information (RFI) questionnaire was requested through the EU Survey questionnaire. The responses to the questionnaire could not contain any confidential information. The questionnaire was intended to explore the market 'as is', there are no wrong or right answers. The answers provided will be used as input for the procurement strategy and contract conditions.

The PROTECT Consortium supported interested parties throughout the whole OMC during the webinars, and by answering questions through a Q&A document which was published in the project's website.

Market operators who wished to provide additional confidential information during the OMC could send this to the email: info-PROTECT@group-gac.com. The information had to be clearly marked as confidential. Confidential information is not included in the OMC report.

The language of this market consultation is English.

3.2. Open Market Consultation report

After processing and analysing the answers, the PROTECT Consortium aims to disseminate the results to the widest possible audience through this OMC Report. Nevertheless, all answers provided by market parties are anonymized. The PROTECT Consortium will therefore provide only the general findings and a summary of the answers obtained in the EU Survey questionnaire. The OMC Report is published on the website of PROTECT.

3.3. Summary of the results

This section summarises the feedback provided to each of the 24 questions of the EU Survey under 5 topics: (1) The PCP challenge requirements and planning; (2) The State-Of-The-Art analysis and TRL; (3) The testing strategy; (4) Miscellaneous; and (5) Questions for users.



3.3.1. PCP challenge requirements and planning

1. Do you have questions about the PCP requirements? If yes, please explain.



Figure 2.- Questions about the PCP requirements

Respondents wanted to know how they can be a part of the PCP and what the criteria will be. They would like to know if the requirements of economic standing would allow a start-up to participate. They asked which associated countries are able to participate in the PCP. If, for example, UK is included in the HE associated countries.

Finally, respondents asked if there will be a list of the PCP requirements to make it easier to recognize them and address them.

The PCP tender documents will clarify the criteria, requirements and specifications. In principle, PCP will foster the participation of start-ups and SMEs; therefore, the requirements will allow their participation encouraging synergies.

The HE Programme indicates the [list of associated countries](#), where UK is included.

2. Which challenges can you tackle? Please explain.



Figure 3.- Challenges that can be tackled

According to the respondents, some challenges can be tackled as follows:

- Irrigation control and weather forecast services.
- A methodology to assess flood risk based on past events, satellite radar data and digital elevation models (DEMs).



- A range of services for water management in a platform combining 3 services: (1) monitoring irrigated and non-irrigated plots and characterizing irrigation practices; (2) mapping water bodies and monitoring water availability, and (3) monitoring water quality (turbidity, chlorophyll-a concentration, etc.).
- Measuring atmosphere gases (GHG), both measure the carbon release in case of fire, and provide inputs during the fire about the atmosphere and thus evolution of the fire (providing data and analysis about atmosphere gases during and after the fire).
- Cybernetic data collecting devices that are for hours in the state of levitation.
- Measures to fight against environmental and public health damages and climate change using remote sensing spans from visible to microwave electromagnetic spectrum.
- For the **FIRE challenge** specific expertise can be useful to detect littering and illegal dumping and to assess the environmental risk and the climatic conditions that increase the likelihood of fire outbreaks.
- For the **Water resilience challenge** the combination of different observations will be key to developing advanced KPIs that attempt to correlate information on drought, weather, water consumption, water pollution, crop type and cycles etc.
- Services for resilient cities (wildfire, extreme heat, flooding, droughts) and Blue-Green Infrastructure (location, health, risk) and overlay these to help mitigate risks (especially related to climate risks).
- Use of hyperspectral data with high spectral resolution allowing to locate water sources (classification) and study the water composition. This type of data are openly or privately accessible via several providers.
- Because climate change will pose a challenge for the water supply and management, there are currently different initiatives, methods and approaches used to plan and manage the activities in this area, but there is a lack of connection between them. The tools, methods, norms, etc. of application in areas such as basin management, distribution networks, water infrastructure (dams, reservoirs, etc.), agriculture, etc. are completely different and it is not possible to implement an overarching management system. Despite the fact that nexus between water, agriculture and other sectors are of high relevance in the scientific literature, it is proposed to develop: (1) Methods for identifying the probability of occurrence (both in the current and future climate) of drought, episodes of high water flow and other situations that may pose a risk for water management; (2) Systems and methods for processing observation data from local stations, gauges, earth observation, etc.; (3) Methods for identifying risk level considering climate trends and projections in conjunction with socioeconomic trends (land use changes, demands, etc.); (4) Early warning- detection and prediction systems; (5) Basin and water management systems (considering status, monitoring & forecast –estimated progression) allowing to manage water resources in the face of droughts, high river flow events, scarcity, etc.; (6) Maps & graphical representation of water information derived from observational data and integrated digital twins (simulating hydro-climatology, basin, network, infrastructure and all components of the water cycle).



- Meso modelling of Urban Heat Island and Micro Modelling of Thermal Comfort. For policy makers and urban designer to make decision for more adapted cities and public places and to assess the effectiveness of climate adaptation measures and applied adaptations.
- Micro modelling of flooding to assess effectiveness of climate adaptation measures and applied adaptations. Combination of both variables to facilitate decision making process mainstreaming.
- There are solutions developed to track coastline resilience, and other blue-economy related challenges.
- Use of satellite imagery, raster maps, and servers to facilitate structured management and analysis of Big Geo Data. Tapping into existing data services on public data, without compromising data.
- Monitoring GHG emissions from energy infrastructure (power plants, gas pipelines),.
- Customization/development of existing platforms for Flood Mapping at high resolution and mitigation measures assessment.

3. Can you contribute on the outcomes related to EO? Yes/no. Please explain.



Figure 4.- Can you contribute to EO related outcomes

The contribution to EO outcomes can include:

- Irrigation control and weather forecast.
- Services based on satellite imagery and Earth observation technologies.
- Earth observation capabilities and AI to solve environmental problems. Earth Observation, and in particular satellite imagery, is the only means to regularly classify events of interest at scale, with high accuracy and cost-effectively. AI is key to automating classification at scale in very large volumes of data acquired during observation. Over the past decade, both fields have benefited from synergetic effects and their combined use is triggering the environment moment, a moment when we have the necessary tools to measure anthropogenic environmental impacts and inform decision making and policy. Our expertise is threefold: Remote sensing processing, advanced AI technologies and environment.



- Deploying a solution for water resilience (water pollution and water management) which are applications related to EO.
- A predictable demand for fresh water. This will be allowed through tools and systems that will take in consideration the regulatory landscape and policies (flood, biodiversity, water quality, etc.) providing a cohesive framework for water management. The system will be capable of effectively handling stress situations (both in the long-term/planning and in the short term/operational timescales) through data-driven decision making and interventions, allowing to simulate activities such as changes in the reservoir management policies, new infrastructure for water storage, supply and consumption, water saving measures, etc. connecting the supply and demand sides for sweet water.
- Water quality requirements for different purposes (industrial, biodiversity, bath, etc.). A comprehensive understanding of the consequences and a combined approach to relevant data within the entire water cycle chain will be achieved and facilitated by policy guidance, user engagement, surveys, etc.
- Assessment of the evolution of the LST (in cities) using images to evaluate the effectiveness of climate adaptation measures.
- Access and analytics in space and time, through a huge spectrum of 3rd party clients, without programming.
- Focus on mitigation of GHG emissions using EO data.
- A platform aligned with the expected outcomes of the call by leveraging Earth Observation data (including Copernicus program), to enhance flood preparedness and response. With a worldwide the service, at high-resolution, exploiting satellite and geospatial data with AI, to provide accurate flood risk intelligence and scenario analysis, fostering mitigation and climate adaptation strategies adoption. This can contribute to reducing demand fragmentation as it addresses common needs across regions. Furthermore, the platform has scalability, capability to ingest local user data when available, and flexible business model (Software As a Service or Data As a Service) to foster market uptake of climate solutions, encouraging investments in mitigation/adaptation measures, economic growth and climate resilience.

4. Are you able to enhance the development of new environmental information? Yes/no. Please explain.



Figure 5.- Are you able to enhance the development of new environmental information

Respondents provided the following feedback regarding the development of environmental information:



- Some have at the core business Earth Observation working with ESA.
- Some are developing an own constellation, and are able to work with other data (Sentinel 5P)
- Some have new patented technology dedicated to circular economy.
- For the **FIRE challenge**, some can come up with new type of classification leveraging different observations combining optical, swir & radar (for instance to discriminate between the type of waste).
- Some can enhance the resolution of satellite imagery and therefore get detailed insights that were not previously available in its raw form. Meaning they can apply technology on open satellite imagery and thus drastically reduce the costs without compromising on detail and providing regular and consistent information.
- Other have an R&D team, specialized in data and image processing (all bands) with expertise in AI, computer vision with a thorough history in developing new solution based on satellite images for earth observation, especially for urban planning (demography and population density history and prediction) such as land classification, urban vs. natural zones evolution forecast, climate change impacts and inundation. The expertise could be applied to developing models for new environmental information and further selling operational SaaS services to public & private clients and end-users.
- Some proposed systems and tools can deliver measures, forecasts, and projections of river flow, water availability, demand, etc allowing to optimize the water cycle management and planning.
- Some would like to explore developing adaptation indexes (Thermal and Flood) through the combination of surface information and thermal and climate indicators for spatial explicit data at micro and meso to assess the combined effectiveness of solutions or NbS.
- Other focus on developing tools and products for private and public stakeholders using space-based technologies, mainly Earth Observation ones (Copernicus) ad-hoc real time derivation of new visualizations and insights.
- Some indicate a platform which enhances environmental information development through Earth Observation by integrating satellite data with AI algorithms to create actionable flood risk intelligence. Its capacity to process extensive EO datasets (and integrate them with local knowledge and data when available) facilitates the creation of detailed digital twins for urban areas, improving predictive environmental modelling and supporting the implementation of effective, data-driven, climate resilience strategies.
- One demonstration video was provided.³

³ <https://youtu.be/ZBoVvX1XTik>



5. Are you ready to explore pre-operational European services through the exploitation of new Earth Observation (EO), digital infrastructures and modelling capabilities? Yes/no. Please explain.



Figure 6.- Are you ready to explore EU services through the exploitation of EO

Respondents indicate that they are ready to explore EU services through the exploitation of new EO, digital infrastructures and modelling capabilities:

- Some could integrate already the data they collect into the ESA Copernicus Open Hub to allow users 1cm resolution instead of 10m resolution.
- Some teams have a strong background in leveraging advanced EO technologies and data. They have invested in developing and maintaining state-of-the-art digital infrastructure that enables the processing and analysing of large datasets efficiently. This is crucial for handling the complex and voluminous data in EO projects.
- The core business of some is modelling. Including measuring methane emissions from Earth observation, calculating biomass in agroforestry projects and assessing the environmental risks of illegal landfills.
- Some emphasised to be committed to working collaboratively and believe in the power of shared knowledge and resources. They believe a PCP project is an excellent opportunity to engage with other European institutions, share expertise, and learn from others.
- Other emphasised on the readiness to explore pre-operational EU services through the exploitation of new EO data, infrastructures and modelling capabilities such as ESA Hub, new Copernicus Digital Access Service - DAS, Copernicus Contributing Missions - CCM, DestinationEarth - DESP (incl. digital twin Hydrology and computing), Copernicus CAMS.
- Several respondents indicated having extensive expertise and a solid track record in exploring pre-operational European services, and can transform climate and earth observation data into products and applications.
- Other indicated having a solution to explore pre-operational European services by utilizing new Earth Observation (EO) data as it natively combines digital infrastructure to deploy the service to final user, and advanced modelling capabilities to provide n flood risk assessments and **predictions**. Its integration of EO datasets with innovative AI-driven models adds value to EO data translating them into actionable intelligence.



6. Do you see problems or contradictions between the PCP requirements and planning? Yes/no. Please explain.

		Answers	Ratio
Yes		1	5.56 %
No		17	94.44 %
No Answer		0	0.00 %

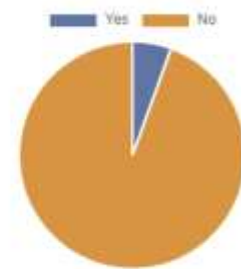


Figure 7.- Do you see problems or contradictions

Most participants indicate that they find no problems at this stage. One respondent mentions possible restriction to work with ESA.

7. Do you have questions/suggestions about the use cases? Yes/no. Please explain.

		Answers	Ratio
Yes		4	22.22 %
No		14	77.78 %
No Answer		0	0.00 %

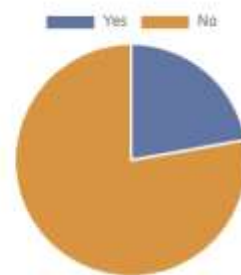


Figure 8.- Do you have suggestions about use cases

The suggestions mainly relate to the FIRE challenge pointing out the possibility that the use cases benefit from leveraging the data that are supposed to be filled and obtained before any entry of waste in a waste facility. The combination of earth observation data and in-situ data could help to develop anomaly detection models. Most of the time the “official” data should fit to observed data, and it could be possible to develop a stronger model to correlate observation with AI predictions, and raise alarm on anomaly.

For the Sustainable and Resilient Infrastructure challenge, the suggestion is measuring the effectiveness of climate adaptation measures and applied adaptations.



3.3.2. State-of-the Art (SOTA) Analysis and TRL

8. Do you think there is room for development beyond the state of the art? Yes/no. In which specific area?

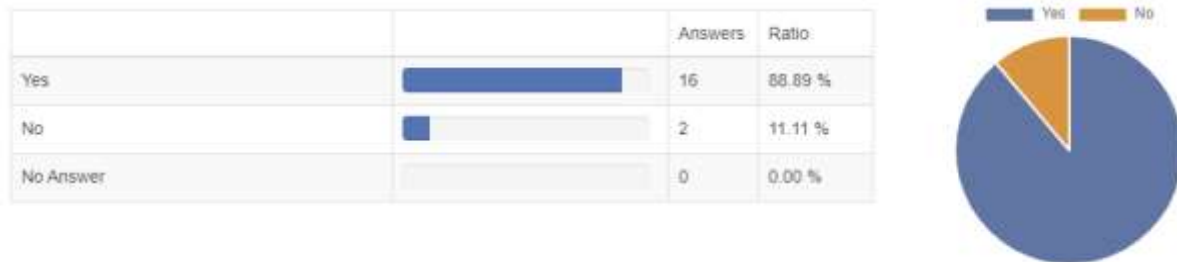


Figure 9.- Is there room for development beyond the state of the art

The room for innovation has been pointed out in the following specific areas:

- Exploring the relationship between floods and ecosystems.
- The state of the art algorithms. Earth observation algorithms are not yet able to distinguish between different types of waste. And to the best of our knowledge there is no model that combines external data and satellite imagery to detect anomalies in waste facilities that could trigger fire.
- The combination of all the data that is currently available and developing solutions in this way so that the information is made accessible.
- Despite the availability of various software and infrastructure tools to study drought probability, risk level, water management, etc., no application is proposed to study the level of water pollution and the impact of human activities (industry, agriculture, etc.) near water sources.
- Some topics for development beyond the state of the art are: (1) Common methodologies, terminologies, metadata, etc. for all the agents and activities involved in water cycle; (2) Overarching systems that integrate the monitoring and modelling of all the subsystems of the water cycle (climatology, hydrology, water storage and distribution, water consumption, sanitation, etc.); (3) Inclusion of different timescales: most of the tools already existing operate in the short-term scale, but the inclusion of forecast and projections in the seasonal, annual, decadal and multidecadal scales can bring benefits for planning and managing; and (4) Consideration of the water-soil-other activities nexus.
- The potential inferences of LST to Air Temperature. Developing monitoring and effectiveness assessment model through the analysis of evolution of the LST (in cities) using the Landsat 8 and 9 images.
- Safe AI integration, location-transparent federation, automatic data fusion across data archives, and more are needed to maximize EO exploitation.
- It was emphasised that while the current market offers a mix of commercial and free solutions for medium-resolution flood mapping and weather forecasting, a specific solution sets itself apart by delivering a unified global coverage and cloud-based platform that not only meets already part of the FLOODS CHALLENGE needs but goes above and beyond. It provides high-detail flood maps, interoperable with every GIS software, leverages on fast flood algorithms, enable interaction for mitigation measures effects testing ("what if") and does not require highly



skilled professionals to be run. Acknowledging the gaps the solution can undergo further development to fulfil all the requested innovation needs.

9. What developments would you propose?

Among the developments proposed are:

- Prescription maps.
- Merging flood analysis with agricultural and forestry monitoring applications.
- Other tools to complete a range of long-term water management solutions.
- Models of gas dispersion, inverse modelling to define the original source LTA UAVs.
- A model that integrates multiple observations from multiple instruments. One of the difficulties is the spatial and temporal registration. The others concern the constitution of dataset sufficient to make the model learn. Self-supervised learning and semi supervised learning methods will be leveraged to reduce the need of label.
- Combining different data sources together, looking further into the use of AI.
- Tools for analysing the composition of water sources & rivers and studying areas of activity near water sources (agricultural zones using chemicals (pesticides, herbicides, etc.); industries, air pollution (impacting rainfall) will add value for the water resilience plan.
- Some actions including: (1) The analysis of the legal framework, responsible public authorities and other relevant agents, tools, methodologies, etc. in each of the subcomponents of the water cycle; (2) The development of new observational methods for water cycle management; (3) The generation of overarching digital twins, simulating weather/climate, hydrology, water infrastructure, distribution and sanitation networks, demand (e.g. agriculture, tourism, etc.); (4) The development of simulation framework (including both physical and data-driven methodologies such as artificial intelligence) for evaluating the effectiveness of actions and measures to optimize the water cycle components, allowing to make actionable decisions in the short, medium and long term; (5) Guidance, training and visualization tools, including tailored dashboards for different decision-makers.
- Potential inferences of LST to Air Temperature. Developing monitoring and effectiveness assessment model through the analysis of evolution of the LST (in cities) using the Landsat 8 and 9 images.
- Meso modelling of Urban Heat Island and Micro Modelling of Thermal Comfort. For policy makers and urban designer to make decision for more adapted cities and public places and to assess the effectiveness of climate adaptation measures and applied adaptations.
- Micro modelling of flooding to assess effectiveness of climate adaptation measures and applied adaptations.
- Combination of both variables to facilitate decision making process mainstreaming NBS.
- The modelling of thermal comfort and the impact of the climate change on it, and the modelling of the impact of the new urban planning project on the thermal comfort.
- Multi-stakeholder participations to benefit from mutual collaboration for win-wins.
- Focus on the creation of scalable products that can be quickly accessed and used by any organization, not creating boundaries.



- Allow anybody to have access to information, so anybody (not just specialized technical departments) can benefit from it, accessing the webpages/information at will.
- Enhance datacubes, European-based rasdaman, enhance and integrate further sources and developments.
- Operational and daily monitoring of GHG emissions from infrastructure and facilities worldwide.
- API for access to flood risk intelligence, Climate scenarios for all types of FLOODS, 3D Digital Twin , link to ground stations for AI -based flood river stage forecasting

10. Do you know the TRL of those solutions/developments?

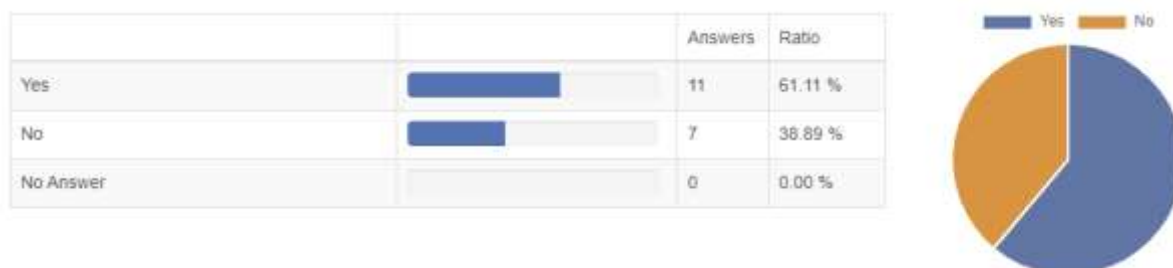


Figure 10.- Do you know the TRL

The feedback from participants pointed out solutions at different TRL. Several respondents indicated lower TRL 2, 3, 4, while others indicated to have solutions at TRL 5-6. Other solutions are moving up from TRL 6 to 7 and 8. Some indicated to be aligned with the PCP expectations between TRL 3-8.

It is emphasised that developments could be achieved by bringing together advances in imaging systems such as hyperspectral imaging, which provides information on water and soil composition based on spectral reflectance at several wavelengths, and the Copernicus Sentinel-5P to study air quality and pollution in regions where water sources & rivers are located, as well as advances in AI and computer vision methods, and big data analysis.

In some cases, it was mentioned that the overarching system is in a conceptual state. Prototypes have been developed internally with TRL 4 – 5. However, very mature technologies are implemented in different sectors of the water cycle. They see as the goal of a proposal to connect all of them to maximize their benefits.

Finally, some pointed out data solutions already at TRL 9.



11. Do you know any certifications and/or standards that are relevant to the PCP project? If yes, please explain.



Figure 11.- Do you know relevant certifications and standards

Among the certifications and standards indicated as relevant to the PCP project are:

- EASA Rules
- ISO14064 related to GHG procedures, quantification, measurement etc.
- A very diverse set of certifications applicable to the different components of the water cycle. The harmonization of data for the whole water cycle is planned to be done under the STAC Specification.
- ESA BIC incubation, FrenchTech labelling.
- INSPIRE, ISO, OGC coverage standards for spatio-temporal data & services: Coverage Implementation Schema, WCS, WCPS.

Some participants pointed out that there are a lot of certifications and standards. However, certification and standard procedures are intensive processes. This should be investigated during the solution design phase.

3.3.3. Testing strategy

12. In your opinion, are the timelines and testing for phases 2 and 3 feasible? Yes/no. Please explain.



Figure 12.- Are timelines and testing for the PCP phases feasible

In general, participants indicated that the 18 months planning for the PCP phases is acceptable and feasible considering the provided budgets.



It was indicated that if a new iterative development process is set in place, the timing provided could be enough (although it is still optimistic that in 6 months a European-wide solution can be tested, and consequently corrected).

A smaller number of the respondents considered that the PCP phases might require more time.

13. Do you have any comments on the budget assigned per supplier and per phase? Do you prefer option 1, 2, 3 or 4? Yes/no. Please explain.

Figure 13.- Do you have any comments on the budget



Figure 14.- Which budget option is preferred (see [OMC document](#))

Most respondents had no comments about the budget. Other stressed that the four challenges are key to meeting Europe’s future needs in terms of climate change resilience and public health security, thus funding at least two challenges could be a good option.

Other indicated that the successive reduction of the budget available for the suppliers should be limited, especially for the Phase 3, therefore option 2 is a good compromise.

It should be noted that small companies can be sensible to payment plans based on milestones. Therefore, a payment scheme should consider enabling small companies to participate.

The budget details will be further defined in the tender documents, however, it should be noted that more than 50% of the budget should be allocated to R&D activities as defined in the [Frascati manual](#).



3.3.4. Miscellaneous

14. What information do you still need in order to make a good plan of action?

Some respondents indicated that the information is clear for now. Other needed more precise information on the project’s deadlines and objectives, which will be clarified when the PCP tender is launched.

Some asked about the possibility to make consortia. This is indeed possible when presenting a bid to the PCP tender.

Other participants referred to the need of more information on available historical data. More data on the economic, public health and environmental impacts, specifically regarding fires. More details on preferred data sources, target users (non-expert, casual, expert), etc. are also welcome.

More details of the end-user detailed requirements, decision-making context and timeline were also required. This includes the exact needs of future customers and their needs over time. It was suggested to have a clear calendar with deliverables expected in order to join the PROTECT PCP. The description of technical requirements for the challenges, validation and testing are requested. Other suggested the possibility to provide a step by step guide.

These aspects will be clarified when the PCP tender is launched.

Finally, some highlighted that they would like to have interviews with the buyers to identify specific customer problems.

15. Do you have any suggestions on the open-source data/information requirement of open access?

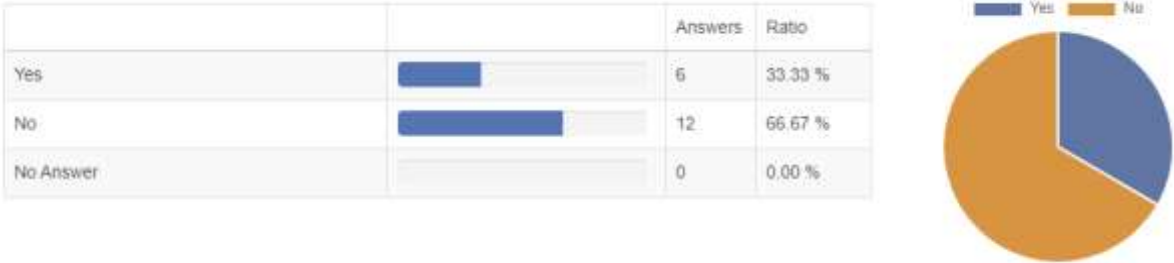


Figure 15.- Do you have any suggestions of open-source and open access

Regarding the suggestions on the open-source data/information and open access requirement, some comments are:

- That what is done in Europe a dozen times only needs to be done for IT solutions just once. Sometimes the same solution is funded several times, while missing systems do not get funds, as the evaluators do not understand what they decide about. Decision makers need to have the ability to program otherwise they are simply "analphabet" in terms of digital transformation. They simply do not speak the language (programming language) they have to decide about.
- One of the key factors to achieve the expected outcomes of the (FIRE) challenge will be the ability to create a continuous integration of the data collected in situ.



- The developments could be integrated in already existing platforms which are evolving and a tailored strategy should be adjusted.
- The wish to learn more about open-sourcing. In previous projects open-sourcing has been a goal, but it is not always as straightforward (e.g. usage capabilities of customers, for instance through software packaging, which requires training and maintenance).
- Open-source is a business model, not a software quality criterion, and no guarantee for vendor independence (despite this is often said). Actually, some open-source tools enforce a lock-in. Hence, a criterion should be to select the best of breed, with a best-fit.
- OGC standard compliancy

16. What are the risks associated to the proposed cooperation between stakeholders and EU programmes?

Regarding the risks identified, respondents indicated the following:

- Political and Economic Instability
- Property rights management
- Lack of data protection, especially when sharing skills
- Delay in the planning linked to public agenda
- The protectionism of Airbus, OBS, Thales, the Helmholtz Society, ESA and many others who are afraid to lose their relevance as there are by far better performing groups outside of these organisations.
- Long sales cycles
- The proposed activities can be partially funded by programmes such as DestinE, Copernicus, Horizon Europe, but they are competitive and funds cannot be assured. Stakeholders can contribute providing a basal funding and demonstrating the value of the solutions, so the lack of end-user involvement, low absorption capacity, etc. is the main risk.
- Misalignment of objectives
- Bureaucratic complexity
- Financial risks
- Regulatory compliance
- Cultural and communication barriers
- Data security and privacy concerns
- Dependency risks
- Project management and coordination challenges
- Impact assessment and evaluation difficulties
- Timings: the European public sector is known of their slowness in response and analysis of any kind of feedback/documentation/deliverable shared from private companies to them. With the tight schedule, it would be wise to set up methods of communication that could enable the agile development from us, the private companies.
- Lack of outreach of SMEs, they might be too invisible

Some respondents did not identify any risk. They suggested a cooperation agreement between the stakeholders (partners, beneficiaries) to clarify IPR, access to data, etc.



17. Are there any omissions in these questions? Yes/No. Please explain.



Figure 16.- Are there any omissions in these questions

According to some respondents, the relevant parts related to education and sharing of knowledge are missing.

It was also asked to indicate the risks foreseen with regard to the ability to achieve the objectives of the Challenges and how it is proposed to mitigate them.

18. Do you have any suggestions?

Some suggestions relate to answering the following:

- How to take care of a sustainable, fair and valid education in terms of sustainability.
- How sustainable processes need to be profitable, while they can be compared to the process of garbage collection.
- How to teach that the value of sustainability gets visible, even when no one pays for it.
- How to make EU sustainability and education profitable.

19. You may provide suggestions applicable to any of the use cases: FLOODS, FIRE, WATER RESILIENCE & SUSTAINABLE INFRASTRUCTURE

Some specific suggestions have been made with regard to the challenges:

- **FLOODS:** LTA UAV pre Warning. Stress the capability to have a scalable and sustainable service.
- **FIRE:** Aerial Imagery. The Fire Challenge should not be limited to official waste landfills and must also include risks from illegal landfills and littering. These problems are prone to trigger forest fires with the climate change, which is weakening forests all over Europe, not only in southern countries.
- **WATER RESILIENCE:** PRobes with drones to lab to App.
- **SUSTAINABLE & RESILIENT INFRASTRUCTURE:** needs education.

It is also mentioned that the documentation does not indicate if critical infrastructure is related to the European coastline (most of population in Europe lives in communities next to the sea/ocean). Or if this a point considered in the "Floods" challenge.

Critical infrastructure could be relevant to all challenges.



3.3.5. Questions for users

20. Do you have specific remarks on the functionalities of a specific challenge that should be taken into account? Yes/no. Please explain.



Figure 17.- Do you have specific remarks on the functionalities

Regarding the remarks on the functionalities of specific challenges, respondents indicated that:

- Soon no fossil fuels will be used, and the regenerative power train does not stand yet. The question is if the delta is known, and how much we have left and how much an equivalent powertrain will cost?
- Overall, the challenges of the cities of Haarlem, Barcelona and Helsinki are similar to the challenges faced in Greece, namely in relation to floods, fires, infrastructure and water solutions. For example, the Municipality of Keratsini-Drapetsona is a highly dense urbanized area, dealing with floods and the urban heat island might be a priority.

21. Can you indicate any use cases that you will be interested in, which are not indicated by PROTECT? Yes/no. Please explain.



Figure 18.- Can you indicate any use cases of interest

Participants highlight some possible use cases related to:

- Education
- Study of water pollution and the impact of nearby human activities and air pollution on the quality of water sources.
- Hydropower and other energy facilities: the management of hydropower production, associated to dams and reservoirs, is a key aspect of the water cycle management. In dry areas, multipurpose reservoirs define the overall water availability and offer, and most of them are also connected to the requisites, regulations, etc. of the energy system. So, the connections between the energy and water systems are obvious in this regard, but also in terms of the water used for refrigeration of thermal plants, and other energy uses. The monitoring, simulation and modelling



of the energy system linked to the water system can allow to create a digital twin that will meet the requirements of the users and the call more effectively.

- Soil health: Carbon farming, targeted fertiliser application, land restoration monitoring. Compliance with EU Soil Health Law, the Farm to Fork Strategy, CSRD policy recommendations by public bodies. And the overarching EU Green Deal.
- Coastline Resilience, as it is a critical infrastructure affecting the livelihood and economies of most of the European countries, and it is one of the most direct effects of climate changes that can be tracked down using satellite based information (sea level rise, warmer currents, degradation of the beaches, effects of storms on harbours and other critical infrastructure).
- Newspace

22. Do you know any developments that PROTECT needs to take into account? Yes/no. Please explain.



Figure 19.- Do you know any relevant developments for PROTECT

Respondents indicated to take into account the following developments:

- Global Protectionism
- Earth observation (Copernicus, etc.) and digital infrastructure (DestinE, DIAS, etc.) are critical for the development of the actions proposed
- HEATWAVES Service. Routine that calculates and characterises the frequency, intensity and duration of heatwaves at different regional scales (NUTS2, NUTS3 and Local Administration Units) globally according to different hazard levels (warning, alert and alarm) that are defined according to the severity of the potential impacts. The routine characterises past and future heatwaves based on observed or reanalysis and projected daily maximum and minimum temperature data considering free and open source data sources available at Copernicus Climate Change Service (E-OBS, ERA5-Land and EURO-CORDEX). More information on the source data used can be found in the e-OBS dataset (daily observed data for the whole of Europe), ERA5-Land reanalysis (daily global reanalysis data), and the CORDEX dataset (future regional climate conditions for different emission scenarios - RCP2.5, RCP4.5 and RCP 8.5 - providing different trajectories of future climate forcing from 2006 to 2100. TX 9-271-314
- CLIMTHON. Library for managing climate data from different official sources. It contains routines for performing bias corrections, model ensembles as well as calculation of climate indicators. It also includes functions to calculate extreme events (heat waves, return periods etc.). TX 9-271-292
- THERMAL ASSESSMENT TOOL TX 9-271-606"
- Datacubes and analysis-ready data



23. How could you contribute to PROTECT?



Figure 20.- How could you contribute to PROTECT

In general, participants are highly motivated to contribute to PROTECT PCP and open to explore possibilities. One respondent emphasised on having an existence dedicated to next generations.

Other pointed out at the importance of co-construction with the end-users (the beneficiaries); co-develop the operational solution/ pilot (practicing design thinking, with agile and lean startup methodology with sprints, UX design...).

One respondent mentioned the access to the multi-Petabyte datacube federation, EarthServer, for custom analytics with zero-coding.

24. Do you have any suggestions?

The suggestion made is that companies would really like to see that two challenges are selected, not only one, as this would facilitate startup companies like ours to find entry points more easily.



4. The follow up PCP

PROTECT is preparing the operational ground for a Pre-Commercial Procurement (PCP) proposal in response to the Horizon Europe pre-commercial procurement call “Customisation/pre-operationalisation of prototypes end-user services in the area Climate Change Adaptation and Mitigation” fully funded by the EU with to €19 million. The goal of the call is for a consortium of public procurers (Public Buyers Group) to prepare, launch and implement a PCP procedure that responds to commonly identified challenges in the area of climate adaptation and mitigation.⁴

The envisaged future PCP – i.e. a joint procurement of R&D services – is intended to be launched to reinforce public demand driven innovation in end-user services in the area of climate adaptation and mitigation. PCP has the potential to be an effective demand-side innovation action and a useful tool to close the gap between supply and demand for innovative solutions. **Solutions are expected to achieve TRL 7-8.**

The future PCP should deliver successful innovative and fully tested product(s) and/or service(s) that meet the common needs of the PBG to procure research, develop innovative marketable solutions, speed up the time-to-market and provide best value for money.

The future PCP on the customization/pre-operationalisation of prototypes of end-user services in the area of Climate Change Adaptation and Mitigation will be contributing to the European Green Deal related domains benefiting from further deployment, uptake and exploitation of Environmental Observation data and products. Furthermore, it will be contributing to fit-for-purpose Environmental Observation Systems and a strengthened Global Earth Observation System of Systems (GEOSS).⁵

GEOSS is a set of coordinated, independent Earth observation, information and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors. GEOSS links these systems to strengthen the monitoring of the state of the Earth. It facilitates the sharing of environmental data and information collected from the large array of observing systems contributed by countries and organizations within GEO. Furthermore, GEOSS ensures that these data are accessible, of identified quality and provenance, and interoperable to support the development of tools and the delivery of information services. Thus, GEOSS increases the understanding of Earth processes and enhances predictive capabilities that underpin sound decision-making: *it provides access to data, information and knowledge to a wide variety of users.*

If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, they must make use of Copernicus and/or Galileo/EGNOS (although other data and services may additionally be used).

The future PCP proposal will build on the outcomes coming from the PROTECT project funded under HORIZON-CL6-2021-GOVERNANCE-01-15: Preparing for pre-commercial procurement (PCP) for end-user services based on environmental observation in the area of climate change adaptation and mitigation (the PROTECT project), the work done previously under Horizon 2020 and Horizon Europe (e.g., from e-shape, climate service projects and downstream services projects), and GEOSS initiatives.

The future solutions should take advantage of the use, uptake, and deployment of environmental observations as well as digital and data-based green solutions, assessed through the European Green

⁴ HORIZON-CL6-2024-GOVERNANCE-01-5: Customisation/pre-operationalisation of prototypes end-user services in the area Climate Change Adaptation and Mitigation. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-9-food-bioeconomy-natural-resources-agriculture-and-environment_horizon-2023-2024_en.pdf#page=555

⁵ The mission of the Group on Earth Observations is to build the Global Earth Observation System of Systems (GEOSS) [GEOSS \(earthobservations.org\) https://www.earthobservations.org/geoss.php](https://www.earthobservations.org/geoss.php).



Deal's 'do no harm' principle, **to contribute to innovative governance models and for designing, implementing and monitoring science-based policy.**

The project to be carried out under the HE-funded PCP should contribute to Innovative governance supporting the European Green Deal objectives recognizing, coping with and promoting resilience and inclusiveness in the face of on-going shocks and disruptions across Europe and the world, whether these be climatic, ecological, economic, social, geopolitical or related to agricultural inputs and resources, food, health, bio-based sectors or the wider bioeconomy. The creation of networks with the public (citizen engagement) and researchers, including also through digital technologies, can step up transformation and enhance resilience in different areas, such as food.⁶

PCP proposals should set out a credible pathway contributing to innovative governance and sound decision-making on policies for the green transition and more specifically to one or more of the following impacts:

- innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, societal engagement and innovation;
- areas related to the European Green Deal benefit from further deployment and exploitation of environmental observation data, products and “green” solutions;
- a strengthened Global Earth Observation System of Systems (GEOSS)⁷
- sustainability performance and competitiveness improved through further deployment of digital and data technologies as key enablers;
- stakeholders and end users including primary producers and consumers are better informed and engaged thanks to effective platforms such as AKIS;
- strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

When considering their impact, proposals also need to assess their compliance with the “Do No Significant Harm” principle according to which the project’s R&I activities should not support or carry out activities that cause a significant harm to any of the six environmental objectives of the EU Taxonomy Regulation.⁸

Solutions should have impacts in the following areas:

- “Climate change mitigation and adaptation”;
- “Clean and healthy air, water and soil”;
- “Enhancing ecosystems and biodiversity on land and in water”;
- “High quality digital services for all”;
- “A Competitive and secure data-economy”.

Social innovation is also relevant when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. It is envisaged the coordination with

⁶ The new partnership ‘Agriculture of Data’ will help improve the sustainability performance of agricultural production and strengthen policy monitoring and evaluation capacities through using the full potential of Earth and environmental observation and data technologies. It will address public and private sector interests in a synergetic way. This will be done through responsible R&I delivering data-based green solutions and through establishing governance structures which allow for systemic approaches to capitalizing and using data. The partnership for a ‘Climate-neutral, sustainable and productive Blue Economy’ will enable a just and inclusive transition to a climate-neutral, sustainable and productive blue economy providing for a healthy ocean, people’s wellbeing, and a blue economy that is in harmony with nature and whose benefits are distributed fairly.

⁷ The European Commission is a member and co-chair of the Group on Earth Observations (GEO), as such the European Commission adopted the GEO Canberra Declaration and Commission Decision C(2019)7337/F1, and committed to contribute to the GEO objectives, including to the Global Earth Observation System of Systems (GEOSS).

⁸ As per Article 17 of Regulation (EU) No 2020/852 on the establishment of a framework to facilitate sustainable investment (EU Taxonomy Regulation).



European Space Agency (ESA) actions so that ESA space data and science can be proactively integrated into the relevant research actions.

The PROTECT public buyers will submit a proposal to obtain the 19M HE grant by February 2024. Following the award of the HE grant, the public buyers aim to launch a PCP tender in Q4 2024 or Q1 2025. The PCP would have a duration of approximately 18 months.



5. Conclusions

The OMC revealed that the market is ready to participate in a PCP. Some providers indicated that they could add value to tackling all the four challenges due to the wide range of services they can cover. Other providers can tackle some elements of solutions and contribute to part of the functional requirements of one or more challenges, and they will be interested in cooperation and synergies to address the challenges.

The assumption of PROTECT that there is room for innovation was confirmed by most of the respondents. Several fields for R&D were identified.

Several companies indicated specific interest in the Fires and Water resilience challenge, while others are interested in the Sustainable and Resilient Infrastructure challenge. Others indicated that they have already tools to tackle most of the functions of the floods challenge.

Some indicated the capacity to tackle challenges related to Water or Infrastructure of coastline municipalities/regions. Some mention having expertise in remote sensing processing, advanced AI technologies and environment.

Some assured that have demonstrated products and are ready to go with needed references and also the EIC Seal of Excellence and the solar Impulse efficient Solution Label.

Some providers would like that two challenges are selected, not only one, as this would facilitate start-up companies to find entry points more easily. It could be that the challenge has sub challenges encouraging the participation of more providers.

The PCP tender is expected to be launched following the award of the HE PCP 19M grant to which the public buyers will apply in February 2024. The award of the grant may take place in fall 2024, and the PCP tender would be launched in Q4 2024 or Q1 2025.

