Preparing a Pre-Commercial Procurement: needs identification and assessment using value methodologies

One of the objectives of PROTECT is to identify procurement challenges – (unmet)needs – that could be tackled via Pre-Commercial Procurement (PCP). PCP is a specific approach to procure R&D services that involves competitive development in phases, risk-benefit sharing under market conditions, and where there is a clear separation between the PCP and the deployment of commercial volumes of end-products (potential follow-up Public Procurement of Innovative Solutions – PPI).

PCP identifies the best possible solutions the market can develop, by comparing alternative solution approaches from different technology vendors in parallel. By steering the development of innovative solutions towards concrete public sector needs, PCP may trigger industry to initiate R&D that was previously unthought-of. In PCP, procurers are thus demanding customers, who are articulating advanced solution requirements as potential future early adopters of the developed solutions (which will be selected in a separate PPI procurement that follows the completion of the PCP).

Procurers also share the IPR related risks and benefits of undertaking new developments with the R&D providers participating in PCP. As a general rule, IPR ownership rights are vested on the contractors, while the public procurers keep license free rights to use the developed solutions, the possibility to require the contractors to license IPRs to third party providers at reasonable market conditions, and an option that enables procurers to call back the IPR ownership rights in case the contractors fail to commercialise the solutions within a specific timeline after the PCP.

This approach maximizes the incentives to commercialise the developed solutions to other markets.

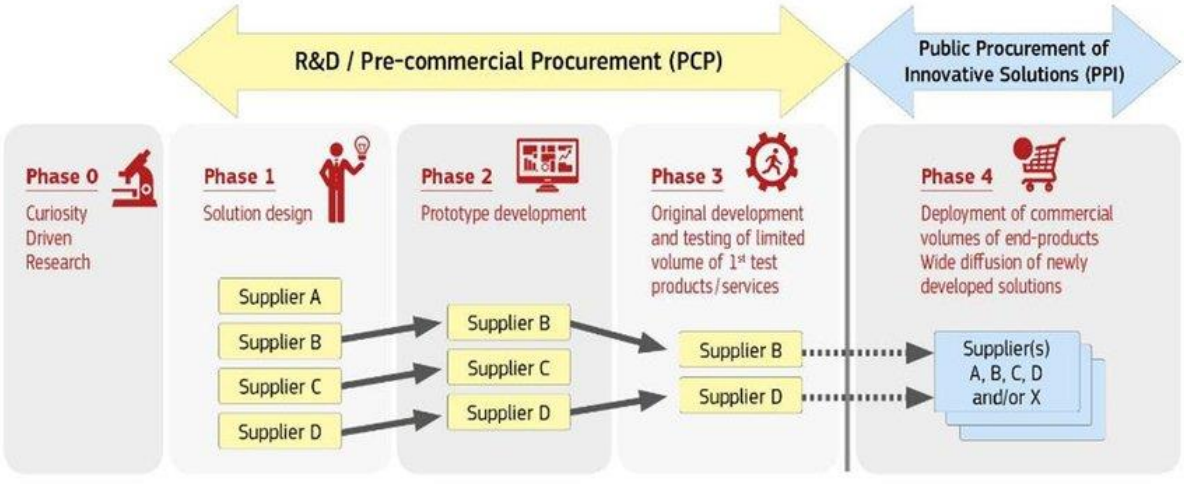

Figure 1: European Commission, 2016

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PCP was defined in 2007 in the PCP Communication[1] in full compliance with the legal framework.[2] Parts of the PCP Communication have been included in later legislation. For instance, the 2014 European Public Procurement Directives clarify that PCP is exempted from its remit, and the 2014 State Aid Framework for Research and Development and Innovation clarifies the conditions under which PCP is done according to market conditions and therefore does not constitute State aid. [3]

Once the procurement challenges – (unmet)needs – have been preliminarily defined, PROTECT will follow the EAFIP[4] methodology for an in-depth analysis of the challenges eligible for a future PCP throughout five preparatory steps: (i) Needs Identification and Assessment; (ii) Prior State-of-the-Art Analysis; (iii) Analysis of the Standards Landscape; (iv) Open Market Consultation (OMC); and (v) Business Case and Value Calculations.

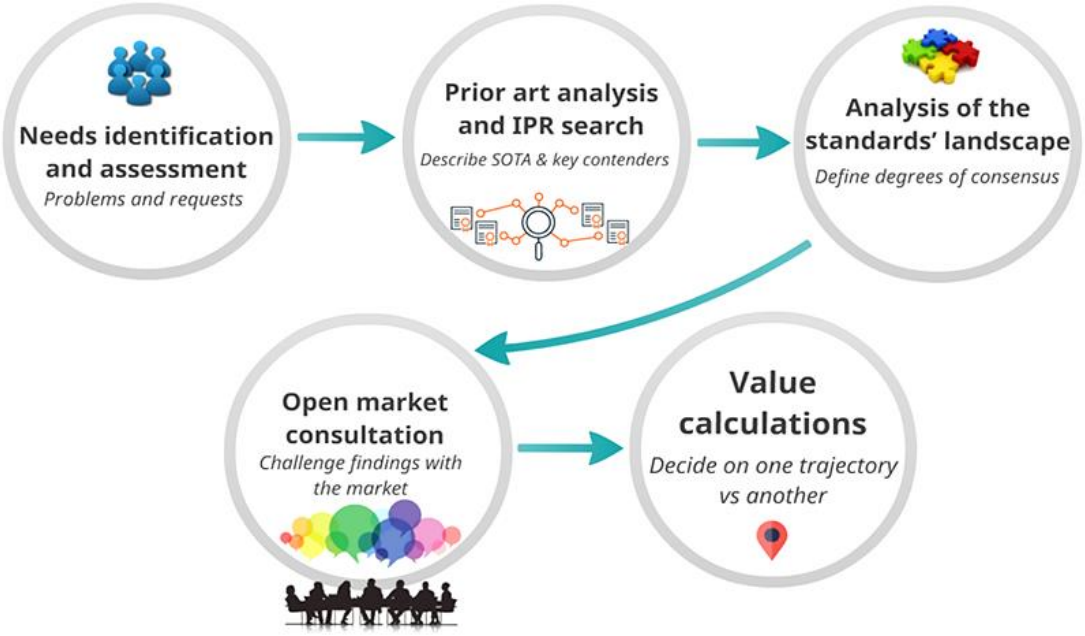

Figure 2: EAFIP business case methodology[5]

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region, "Pre-commercial procurement: driving innovation to ensure sustainable high quality public services in Europe", COM(2007) 799 final, 14.12.2007 (PCP Communication).
[2] PCP is exempted from the application of the European Public Procurement Directives, but remains subject to the applicable provisions of the Treaty on the Functioning of the European Union and the EU competition rules.
[3] Communication from the Commission "Framework for state aid for R&D&I", COM(2014) 3282, 21.5.2014 (2014 EU State Aid Framework).
[4] European Assistance for Innovation Procurement – EAFIP.
[5] www.eafip.eu

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The results of the five-steps preparatory phase will provide the grounds for the procurement of R&D services, as of the novelty of the solutions that could be developed to tackle (unmet) needs given the analysis of the maturity of existing technologies and the identification of the Technology Readiness Levels (TRL). The procurement of R&D services from TRL 3 to TRL 8 can be realized through the PCP.

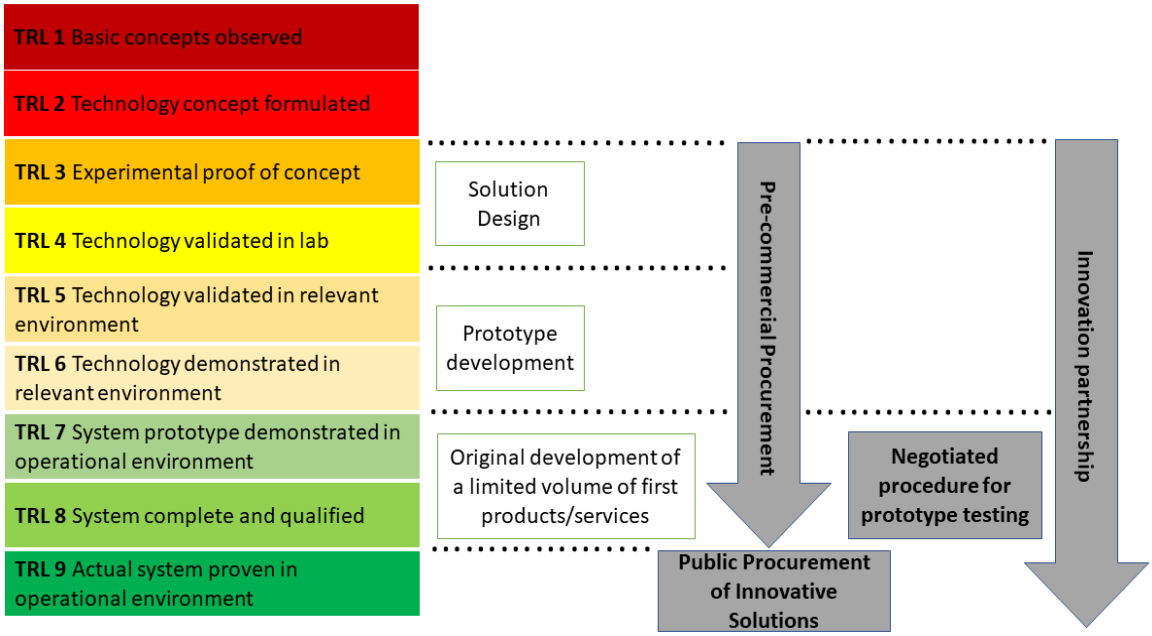

Figure 3: Technology Readiness Levels

To identify, assess and select the needs to be tackled using the Innovation Procurement instruments, in particular PCP, PROTECT combines several methodologies that build upon each other: questionnaires, interviews, round-table discussions, and focused workshops.

In this context, the next sections provide an overview that summarizes the methodology for the preliminary identification of procurement needs, which comprises desk research, the EU Survey questionnaire, and the value methodologies to be used in pain point workshops to obtain:

a) The description of challenges/needs per domain;
b) Use cases per application domain; and
c) Value identification in each use case.

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1. Methodology for the preliminary identification of needs

To define the (unmet) needs related to climate change services using Earth Observation (EO) technologies of procurers in five application domains, a value (engineering) based methodology of a 3-stage approach is applied:

(1) Pre-study consisting of desk research, an EU Survey questionnaire, the identification of potential participants, and the preparation of several workshops;
(2) Workshops using value methodologies and tools based on the Value Management standard[6] and the Lean principles; and
(3) Post-study defining common challenges/needs expressed as functional requirements and preliminary use cases for each domain with the identification of value creation activities.

Figure 4: 3-stage approach of the value method

1.1. Pre-study activities

The results of the pre-study stage provide a baseline to define the challenges – (unmet) needs – as a result of the information obtained from the desk research on the taxonomy of environmental sustainable activities, the EO taxonomy, and the EU Survey questionnaire.

[6] Value Management standard NEN-EN 12973 - Value Management | Engineering360 (globalspec.com)

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1.1.1. Environmental sustainable activities and risks

The methodology used in the EU Taxonomy Regulation[7], based on the work by the Technical Expert Group (TEG), considers that environmental sustainable activities can make a substantial contribution[8] when:

- They have a low impact on the environment and have the potential to replace high impact activities (e.g. renewable energy);
- They reduce impact from other activities (e.g. wastewater treatment); or
- They make a positive environmental contribution (e.g. restoration of wetlands).

Substantial contribution to climate change mitigation, for example, means levels of performance that are aligned with climate neutrality and limiting the increase in temperature to 1.5 degrees Celsius globally. **For climate change adaptation**, this means the implementation of solutions to substantially reduce the most significant identified climate risks to a particular activity such as wildfires, storms or droughts.[9]

For the purposes of PROTECT, the analysis of substantial contribution and climate risks relate to five encompassing application domains:

Figure 5: Application domains in PROTECT

[7] The EU Taxonomy Regulation establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable for the purposes of establishing the degree to which an investment is environmentally sustainable. https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

[8] These are not types of activities explicitly listed in the Taxonomy Regulation. Instead, they are ways to understand and frame the concept of 'substantial contribution', based on Articles 10 to 15 of the Taxonomy Regulation. An economic activity can contribute substantially to the environmental objective of transitioning to a circular economy in several ways. It can, for example, increase the durability, reparability, upgradability and reusability of products, or can reduce the use of resources through the design and choice of materials, facilitating repurposing, disassembly and deconstruction in the buildings and construction sector, in particular to reduce the use of building materials and promote the reuse of building materials. It can also contribute substantially to the environmental objective of transitioning to a circular economy by developing 'product-as-a-service' business models and circular value chains, with the aim of keeping products, components and materials at their highest utility and value for as long as possible. Any reduction in the content of hazardous substances in materials and products throughout the life cycle, including by replacing them with safer alternatives, should, as a minimum, be in accordance with Union law. An economic activity can also contribute substantially to the environmental objective of transitioning to a circular economy by reducing food waste in the production, processing, manufacturing or distribution of food. See Recital 28 of EU Taxonomy Regulation.

[9] See EU Taxonomy Regulation FAQ. https://finance.ec.europa.eu/system/files/2021-07/sustainable-finance-taxonomy-article-8-faq_en.pdf

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One way to approach a substantial contribution could be to identify how to tackle the risks related to each of the 5 application domains, for example:[10]

Domain	Risk[11]
1. Marine and coastal environments	Sea contamination, pollution[12], rising levels, coastal erosion
2. Energy & utilities	Interruption/disruption of services
3. Sustainable urban communities	Waste management
4. Agriculture, forestry and other land use	Food shortage, deforestation, drought
5. Civil security protection	Fire, flood, loss of inhabitability

In this context, EO based technologies and applications can serve general objectives (such as monitoring, measurement, comparison and data analytics) to enable, for example, the following functions with regards to climate change key topics:[13]

- ***Renewable Energy:*** Supporting the transition to renewable energy and improving energy efficiency to reduce emissions and improve energy access. [14]
- ***Forests and landscapes:*** Reducing emissions by combating deforestation and improving conservation and management of carbon-rich forests and landscapes. Restoring forests and other land, tackling unsustainable land use from agricultural expansion and poor agricultural management, illegal logging, damaging charcoal and timber production. Measurement of greenhouse gas emissions. [15]

[10] For a climate risk analysis see: Larsen, M. et al. (2021). "Advancing future climate services: Multi-sectorial mapping of the current usage and demand in Denmark". Climate Risk Management, 33, pp. 100335. Available at: https://doi.org/10.1016/j.crm.2021.100335

[11] An economic activity that pursues the environmental objective of climate **change adaptation** should contribute substantially to **reducing or preventing the adverse impact of the current or expected future** climate, or the risks of such adverse impact, whether on that activity itself or on people, nature or assets. That environmental objective should be interpreted in accordance with relevant Union law and the Sendai Framework for Disaster Risk Reduction 2015–2030. See Recital 25 of the EU Taxonomy Regulation.

[12] The environmental objective of pollution prevention and control should be interpreted in accordance with relevant Union law, including Directives 2000/60/EC, 2004/35/EC, 2004/107/EC, 2006/118/EC, 2008/50/EC, 2008/105/EC, 2010/75/EU, (EU) 2016/802 and (EU) 2016/2284 of the European Parliament and of the Council. See Recital 29 of EU Taxonomy Regulation.

[13] See the related literature in https://doi.org/10.1016/j.crm.2021.100335

[14] 'Energy efficiency' in a broad sense should be construed by taking into account relevant Union law, including Regulation (EU) 2017/1369 of the European Parliament and of the Council and Directives 2012/27/EU and (EU) 2018/844 of the European Parliament and of the Council, as well as the implementing measures adopted pursuant to Directive 2009/125/EC of the European Parliament and of the Council. See Recital 33 of EU Taxonomy Regulation.

[15] The environmental objective of the protection and restoration of biodiversity and ecosystems should be interpreted in accordance with relevant Union law, including Regulations (EU) No 995/2010, (EU) No 511/2014 and (EU) No 1143/2014 of the European Parliament and of the Council, Directive 2009/147/EC of the European Parliament and of the Council, Council Regulation (EC) No 338/97, Council Directives 91/676/EEC and 92/43/EEC, and with the communications of the Commission of 21 May 2003 on 'Forest Law Enforcement, Governance and Trade (FLEGT)', of 3 May 2011 on 'Our life insurance, our natural capital: an EU biodiversity strategy to 2020', of 6 May 2013 on 'Green Infrastructure (GI) – Enhancing Europe's natural Capital', of 26 February 2016 on 'EU Action Plan against Wildlife Trafficking' and of 23 July 2019 on 'Stepping up EU Action to Protect and Restore the World's Forests'. See Recital 30 of EU Taxonomy Regulation.

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- ***Prepare for, respond to, and recover from climate-related disasters:*** Helping communities and countries better prepare for, respond to, and recover from climate-related disasters.
- ***Food and nutrition security:*** Strengthening global food and nutrition security by advancing climate-smart agriculture and increased resilience to droughts, rising temperatures, and changing rainfall patterns.
- ***Climate-resilient drinking water and sanitation, and manage water resources:*** Helping people and economies deliver climate-resilient drinking water and sanitation, and manage water resources(link is external) to cope with growing scarcity. And protecting our oceans by limiting climate impacts and addressing other critical threats, like ocean plastic pollution.
- ***Reducing greenhouse gas emissions and air pollutants:*** Reducing greenhouse gas emissions and air pollutants(link is external) which in turn improves public health, reduces poverty and inequality, and lessens climate change impacts.

1.1.2. Earth Observation taxonomy

The Earth Observation (EO) taxonomy[16] includes a generic and comprehensive definition of available products and how these form the basis for the delivery of the EO services (the combination of – for example – EO products, in-situ data, modelling, etc.) to provide contextualized knowledge to citizens, business, government and other organizations.

The taxonomy takes a two-sided approach, describing this common list of services from both the suppliers' and users' points of view as described in the following images.

Figure 6: EARSC Taxonomy (Market/User) Perspective (2020)

[16] See EARSC https://earsc.org/2020/09/03/eotaxonomy/

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Figure 7: EARSC Taxonomy (Thematic/Provider) Perspective (2020)

In addition to the mapping of taxonomies on EO services, it is interesting to mention that the EUSPA EO and GNSS report[17] identifies 17 market segments: Agriculture / Aviation and Drones / Biodiversity, Ecosystems and Natural Capital / Climate Services / Consumer Solutions, Tourism and Health / Emergency Management and Humanitarian Aid / Energy and Raw Materials / Environmental Monitoring / Fisheries and Aquaculture / Forestry / Infrastructure / Insurance and Finance / Maritime and Inland Waterways / Rail / Road and Automotive / Space / Urban Development and Cultural Heritage.

[17] Source: EUSPA (2020) EUSPA EO and GNSS Market Report, Issue 1. Luxembourg: Publications Office of the European Union. Available at: https://www.euspa.europa.eu/european-space/euspace-market/gnss-market/eo-gnss-market-report

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Role and key trends of EO across the market segments

Of the 17 market segments presented in the first EO and GNSS Market Report, 16 have a strong or even dominant influence of EO applications. For each of these segments, a brief summary of the scope and key trends are presented below. More insights into segment-specific trends can be found on their respective 'Key Trends' page. The Space segment is the exception that does not cover any EO content.

Agriculture – Modern farming relies on EO data and information for sustainable nutrient management, restoring soil health and the preservation of biodiversity. A major trend in the field is the increased use of EO as an input for smart analytics for optimising agri-tech solutions.

Aviation and Drones – Traditionally, EO has enabled the monitoring of volcanic ash clouds and hazardous weather, as well as helping aviation identify preventative maintenance in response to particulate matter. In combination with GNSS it is expected to help accurately understand and reduce the impact aviation has on the environment.

Biodiversity, Ecosystems and Natural Capital – EO helps to progress our understanding of the health of ecosystems and existing and potential stressors therein, thus paving the way towards more concrete and effective measures against ecosystem and biodiversity loss. While most of biodiversity assessments are still done on-site, the use of EO in the field is growing.

Climate Services – The role of EO in climate services is well-established and contributes with invaluable data for climate modelling. The integration of EO with innovative technologies and the number of policies requiring close monitoring are set to further boost the market of EO applications related to climate resilience and adaptation.

Consumer Solutions, Tourism and Health – EO-enabled health apps focusing on air quality and UV monitoring are finding traction in the market. Sustainable and safer tourism is enabled by EO e.g. by providing insights about wave conditions and water quality.

Emergency Management and Humanitarian Aid – EO is providing a full picture needed for context-aware emergency responses, ranging from preparedness and early warning to rapid mapping and post-event analysis.

Energy and Raw Materials – EO related to renewable production is mainly linked with the planning and operation monitoring phases, while for raw materials, EO can have an important role in all stages of the mining cycle from exploration, discovery and development, to production and reclamation. EO data also has great potential to support novel energy solutions, such as power-to-x solutions in post-production phases, contributing to a greener future.

Environmental Monitoring – Various environmental parameters obtained by EO data contribute to an increasing number of international, regional, and local policies related to, or impacting, the environment. This is expected to drive the growing demand for EO data and applications in the sector.

Fisheries and Aquaculture – Dedicated EO services and products bring value-added in the fisheries and aquaculture segment providing insights in salinity, temperature, water quality etc., greatly improving fisheries and aquaculture outputs. As the importance of aquaculture grows, a major trend is the increasing use of EO products and services in the field.

Forestry – EO is becoming an extremely valuable tool in monitoring and maintaining the sustainability of forests. From carbon monitoring to battling deforestation and degradation, EO is contributing to conservation in this area. A key trend emerging in the forestry industry is the use of EO in monitoring carbon offsetting practices.

Infrastructure – EO supports the various stages of the infrastructure life cycle, from site selection to post-construction infrastructure health monitoring. Thanks to its capacity to deliver information on risk exposure and future impacts of climate change, EO should increasingly contribute to the design of more resilient and sustainable infrastructures.

Insurance and Finance – EO data is used to compute parametric products benefiting both finance and insurance stakeholders. Risk and claim assessments based on EO data brought increased granularity in risk selection and pricing for insurers.

Maritime and Inland Waterways – Thanks to EO, and in synergy with GNSS, applications such as ship route optimisation contribute to a more efficient means of maritime transport. This optimisation also leads to reduced emissions as well as safer means of navigation, leading to net benefits for the industry and society.

Rail – EO contributes to the overall safety of the railway network by providing railway infrastructure managers with information on risk exposure in relation to vegetation encroachment, landslides and floods. In the future, thanks to its capacity to detect millimetre-scale ground movements, EO should also play an increasing role in the monitoring of track deformation and infrastructure health along the track.

Road and Automotive – Whilst the use of EO is rather new and innovative, applications such as driving comfort have greatly benefited from global EO data, contributing to road safety.

Urban Development and Cultural Heritage – A key enabler for healthier cities, EO assists officials, developers and citizens with the monitoring of air quality, light pollution and mapping of green areas as well as the preparation of urban planning in general. EO will contribute to novel solutions related to smart and sustainable cities.

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Figure 8: EO across market segments

Climate Services EO Value Chain[1]

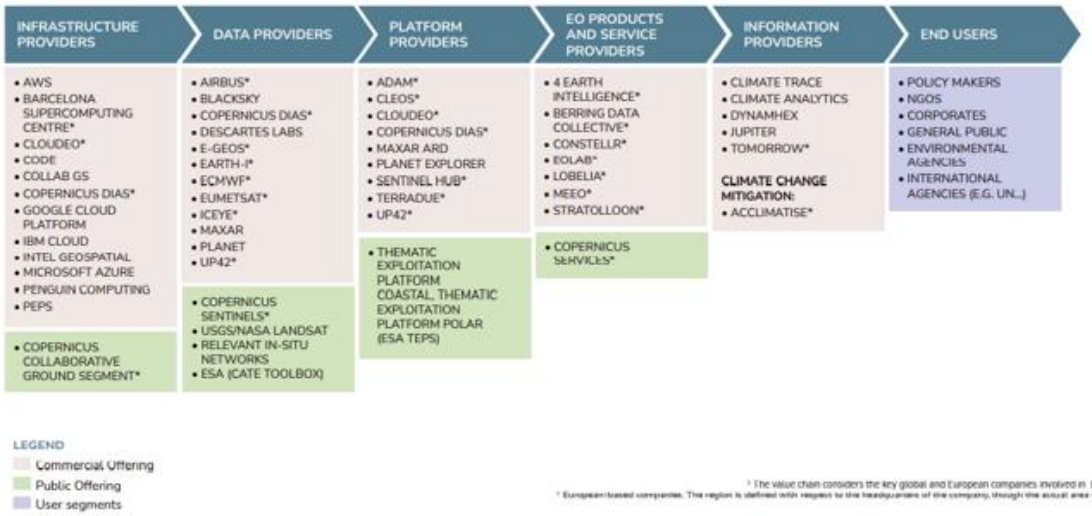

Figure 9: Climate Services EO Value Chain

Source: EUSPA EO and GNSS Market Report, Issues 1, 2022

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1.1.3. The EU Survey results

The EU Survey questionnaire aimed to collect feedback coming (mostly) from legal and technical experts in one of the five domains. [18] The majority of them represent public organisations.

The feedback to the EU Survey questionnaire shows the following results:

- The highest interest expressed is in the domain of Energy & Utilities, followed by Sustainable Urban Communities; Marine and Coastal Environment; Agriculture, Forest and other Land use; and, finally, Civil Security and Protection.
- The main pain point challenge is the transition to new processes, followed by lack of overview about existing and upcoming services; lack of data and tools to implement climate action; interoperability issues; difficulties to engage with the market; joint-cross border procurement; and excessive energy costs.
- The functions with the highest costs are the maintenance of operations, followed by data processing and analytics; specific human resources roles; and asset management.
- The most pressing need is the transition (engineering) to sustainable processes, followed by real time data analytics and asset management.
- Several respondents provided specific input on real time data analytic that needs to be further explored during the workshops.

The results of four main questions on (1) the interest on an application domain; (2) the main challenges; (3) the functions with highest costs; and (4) the pressing needs, are summarized in the following tables.

1. The initial focus of PROTECT will be on five encompassing application domains. In which of these areas do you procure or is most interesting to you? Please put them in order (1 being the most interesting and 5 being the least interesting to you)

	1	2	3	4	5	Score
Energy and Utilities	**27.77%** 10	**30.55%** 11	**25.0%** 9	**16.66%** 6	**0.0%** 0	**3.69** 36
Sustainable urban communities	**19.44%** 7	**11.11%** 4	**11.11%** 4	**33.33%** 12	**25.0%** 9	**2.66** 36
Marine and coastal environment	**2.77%** 1	**13.88%** 5	**25.0%** 9	**19.44%** 7	**38.88%** 14	**2.22** 36
Agriculture, Forestry and other Land use (including bioeconomy)	**19.44%** 7	**27.77%** 10	**22.22%** 8	**13.88%** 5	**16.66%** 6	**3.19** 36
Civil Security and Protection	**30.55%** 11	**16.66%** 6	**16.66%** 6	**16.66%** 6	**19.44%** 7	**3.22** 36

[18] PROTEC EU Survey questionnaire: https://ec.europa.eu/eusurvey/runner/PROTECTSurvey

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2. Could you please indicate pain-points (challenges) that you experience at present?

		Answers	Ratio
Lack of data and tools to implement climate action		17	47.22 %
Interoperability issues to operate		16	44.44 %
Excessive energy costs		8	22.22 %
Transition to new processes		24	66.67 %
Joint cross-border procurement barriers		10	27.78 %
Difficulties regarding common needs analysis and business case development		18	50 %
Difficulties to engage with the market		13	36.11 %
Lack of overview about existing and upcoming services		18	50 %
Nobody in my organisation knows		5	13.89 %
Other		2	5.56 %
No Answer		0	0 %

3. For which functions do you experience the highest costs?

		Answers	Ratio
Data processing and analytics		12	33.33 %
Human resources specific roles		12	33.33 %
Asset management		10	27.78 %
Maintenance of operations		17	47.22 %
Nobody in my organisation knows		4	11.11 %
Other		2	5.56 %
No Answer		1	2.78 %

4. Could you indicate pressing needs in either of the areas - Energy and Utilities, Sustainable urban communities, Marine and coastal environment and Agriculture, Forestry and other Land use (including bioeconomy) and Civil Security and Protection- that would benefit from Climate Services?

		Answers	Ratio
Transition (engineering) to sustainable processes		25	69.44 %
Real time data analytics		17	47.22 %
Asset management		11	30.56 %
None		1	2.78 %
Nobody in my organisation knows.		5	13.89 %
Other		1	2.78 %
No Answer		1	2.78 %

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1.2. Workshops

During the workshops, three main value (engineering) techniques are embedded in the methodology to focus on what creates "value" for the public and private buyers:

(i) Functional Analysis System Technique (FAST) helps thinking about the problem objectively and identifying the scope of the project by showing the logical relationships between functions;

(ii) Value Stream Mapping[19] (VSM) helps display critical steps in a specific process and quantify the time taken at each stage;

(iii) Value Stream Design[20] (VSD) or "value chain design" helps represent the process according to its ideal conditions based on the 5 principles of Lean Manufacturing.

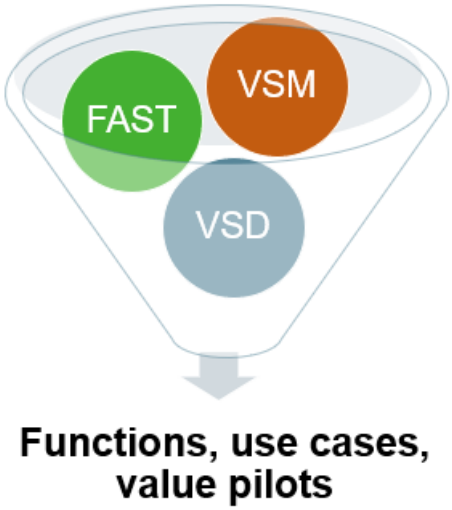

Figure 10: Value Methodologies Functional Analysis System Technique, Value Stream Mapping, Value Stream Design

These techniques are based on the Value Management standard tools and the 5 Lean principles described below.

1. **Identifying value**: Assess the product and service from the user's point of view. How does the product help to do the job, accomplish a mission or improve a position? This helps to determine the unique value of their product or service. Leading questions are, for example:

[19] For more information see: ISO - ISO 22468:2020 - Value stream management (VSM)
[20] For more information see: Value Stream Design

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What does the user need? Why and when do they need it? What can be produced to meet that need? How and when can it be achieved?

2. **Mapping the value stream:** Once you determine the unique value (what to create, why, and for whom), the team can evaluate each process that leads to that end goal. Value stream mapping enables teams to understand how value flows through the organization – and more importantly, where it gets stuck. The product of a value stream mapping exercise is a physical 'map' of the organization, which maps every step of the process for every part of the business: production, R&D, marketing, HR, etc.
3. **Creating flow:** With the value stream map in hand, it is possible to move to the third principle: creating flow by analyzing each step in the process and finding ways to maximize efficiency and reduce waste. Here you can think of the following issues: Which tools do we need for each step and are these tools needed every day to make production/work run smoothly?
4. **Establishing the pull:** The teams take into account the user's perspective on the end product and look effectively at the activities of the organization. When does the user need the product in hand? The idea is that the user is able to pull value. Instead of investing in materials, it is possible to use the user's real needs to manage a more sensible model that saves costs, space, time and resources
5. **Searching for perfection:** Finally, the teams identify areas for improvement and implements meaningful changes.

In practice, these 5 Lean principles are cyclical. While the Lean teams strive for perfection, they continuously analyze each process for the increase in value (lower costs, time, resources used, space, etc.). The entire process is therefore completed as often as possible.

These techniques adapted to the context of PROTECT can help to prioritize and fine-tune the procurement challenges. The results will be **used to define keywords on functions and performance** to conduct a prior State-Of-The-Art (SOTA) analysis using the online-based IPlytics tool that helps identify technology and market landscapes.

Subsequently, an Open Market Consultation (OMC) – in the form of events and questionnaires to the market providers to gather more granular information – will be conducted. The SOTA analysis also gives information about suppliers/technology vendors that can come up with solutions for the procurement challenges. The suppliers will be contacted and informed well in advance about the upcoming OMC to ensure their participation. The OMC will be widely announced in the Tenders Electronic Daily via a Prior Information Notice (to ensure European coverage), as well as via other communication channels.

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1.3. Post-study defining common challenges/needs expressed as functional requirements

An initial appraisal to common needs based on risk challenges per application domain and expressed as functional requirement, to be further evaluated as a result of the pain point workshops of PROTECT, is presented below.

Marine and coastal environment

Risk challenge: Sea contamination, rising levels

Needs examples as functional requirement
Mapping trends in long-established hazardous substances and control contamination levels of Europe's regional seas using earth real time data analytics to map
Developing digital elevation models to understand and predict changes in earth's environment, and conserve and manage coastal and marine resources to meet economic, social, and environmental needs.

Energy and Utilities

Risk challenge: Interruption/ disruption of services

Needs examples as functional requirement
Managing assets to reducing energy consumption using real time earth data.
Transitioning to renewable energy sources based on earth data analytics.

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Sustainable urban communities

Risk challenge: Waste management

Needs examples as functional requirement
Identifying waste management blind hazard spots using real time earth data analytics.
Transitioning to sustainable asset management based on earth data analytics.

Agriculture, Forestry and other Land use

Risk challenge: Food shortage, deforestation, drought

Needs examples as functional requirement
Spotting reforestation areas for planting trees of a specific sort based on real time earth data.
Advancing climate-smart agriculture and increased resilience to droughts based on earth data analytics and drones.

Civil security and protection

Risk challenge: Fire, flood, migration

Needs examples as functional requirement
Preventing floods and improving control by **identifying rain and soil conditions** using real time earth data.
Preventing fire prevention by identifying danger areas using real time earth data.

In conclusion, the 3-stage value methodology applied in the context of PROTECT aims to guide public procurers in five application domains to assess procurement challenges and identify those functionalities that may require R&D (through PCP) to maximize the use EO for the provision of climate change related services.

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