

Policy Brief: Agriculture, Forestry, and other Land Use

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a 'buying with impact' approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

Summary

- The Agriculture, Forestry, and other Land Use sector (Fig. 1) **faces risks and challenges due to climate change**, relating to freshwater, soil, extreme events, and biodiversity.
- The sector is also **uniquely positioned for Greenhouse Gas (GHG) mitigation** approaches through emission reduction and carbon sequestration.
- Innovative Climate Services, utilising Earth Observation data and technologies, have the potential to address these challenges and opportunities.
- **Pre-commercial procurement (PCP) of these services drives innovation** and enables public authorities to procure solutions that best address their needs to increase the adaptation, mitigation, and resilience of their sector.



Recommendations

- To meet the EU's targets for the AFOLU sector of a net reduction of 310 Mt CO₂ equivalent by 2030 [6], **innovative solutions are required**.
- Climate Services utilising Earth Observation data can support the sector **in harnessing its full potential for carbon sequestration** as well as support its resilience to the multifaceted risks posed by climate change.
- A PCP call enables stakeholders from the AFOLU sector to trigger the development of innovative solutions that can **address the sector's main challenges and opportunities**.

Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

The risks and challenges posed by climate change for the Agriculture, Forestry, and other Land Use (AFOLU) sector are widely documented and include droughts, soil erosion and degradation, extreme weather events, forest fires, extreme temperatures, as well as biodiversity loss, all of which can affect yields and productivity. The AFOLU sector is also **uniquely positioned in facilitating GHG mitigation**, by reducing its own emissions, acting as a carbon sink, and even enable mitigation in other sectors [4].

Climate Services (Box 2), especially those utilising Earth Observation data (Box 3), are increasingly used to monitor the health and sustainability of AFOLU systems, to optimise their outputs, and track their carbon capture potential [5]. **Pre-commercial procurement of these services is a key driver** in the development of innovative Climate Services that aim to address the risks and challenges posed by climate change.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Policy developments

The EU's land use change and forestry (LULUCF) sector regulation was revised in May of 2023 and will specifically include emissions from the agricultural sector from 2031 [6]. The decision was made to regulate the AFOLU sector more holistically and to set joint emission targets. The regulation thus calls for an **EU-wide target of -310 Mt CO₂ equivalent of net removals** for the AFOLU sector by 2030, reversing the current trend of declining net removals from the sector [6].

The revised regulation makes specific note of the increased use of **land monitoring through digital mapping, remote sensing, and Earth Observation** to enhance the quality of monitoring, reporting, and verification (MRV) of emissions and removals [6].

Opportunities

Climate Services provided innovative solutions to the AFOLU sector for risk reduction, effective resilience policies and adaptation planning in the face of the risks posed by climate change and the demands of changing carbon removal policies.

For example, the development of the best possible Climate Services to **support these removal monitoring goals** can be triggered by a PCP approach.

Climate Services procured through a PCP call can further increase the AFOLU sector's resilience to the risks posed by climate change through the **timely supply of climate and weather data, models, and predictions** that are tailored to the specific stakeholder needs.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaption measures by providing vast amount of EO data.

Conclusions

The AFOLU sector is exposed to a variety of risks caused by climate change, but due to its high potential for carbon sequestration it is a **key driver of change and emission reductions**. Innovative Climate Services, procured through a PCP call, can provide key insights to support the monitoring of carbon removal as well as the strengthening of the sector's resilience to climate change impacts.

Contact PROTECT: info-protect@group-gac.com

References:

- [1] [Roadmap for Climate Services](#) (2015)
- [2] [University of Alberta](#) (2023)
- [3] [European Space Agency](#) (2020)
- [4] [IPCC](#) (2022)
- [5] [EUSPA](#) (2022)
- [6] [European Parliamentary Research Service](#) (2023)
- [7] [European Commission](#) (2023)

Policy Brief: The Benefits of Pre-Commercial Procurement and PROTECT for Development Agencies

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a 'buying with impact' approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

Summary

- Pre-commercial procurement (PCP) is an effective tool for public authorities to incentivise the market to provide goods and services that are needed but not currently available.
- A prime example of its application are climate services, which help mitigate and adapt to the most severe impacts of climate change.
- As PCPs fall outside of international public procurement agreements, place of performance conditions can be applied, thus favouring local businesses.
- Because of their intermediary role between government (demand) and business (supply), Regional Development Agencies are in a unique position to help overcome barriers to PCP.

Recommendations

- Encourage your authorities to issue PCPs for climate services to mitigate and adapt to the impacts of climate change on your territory in a timely manner.
- Encourage local companies to apply for PCPs, as this is an excellent way to open up the procurement market for them and to participate in the research and development of future technologies.
- Analyse your local PCP ecosystem, potential barriers, and ways to overcome them.
- Think about how to bring supply (businesses) and demand (procuring authorities) together, e.g., via an online marketplace/platform.

Box 1: Pre-Commercial Procurement

Pre-commercial Procurement (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).

Introduction

The impact of climate change on European territories has become omnipresent. Droughts, floods and forest fires are only the most visible phenomena due to their immediate and catastrophic nature. Biodiversity loss and the need to adapt agricultural land to climate change are less visible but no less urgent issues, to name but a few.

European territories need to mitigate, adapt and prepare for the impacts of climate change. To this end, they need to understand what impacts climate change is most likely to have on their territories, what

measures need to be taken to adapt to the most drastic impacts, and consequently what adaptation and mitigation services need to be procured.

However, even when the specific impacts of climate change on a territory are known (e.g., high risk of flooding in rivers or on coasts), the services needed for adaptation are often not available (e.g., early warning systems). Buying something that is not yet available on the market can be a major challenge for authorities and thus a major obstacle to taking the necessary and urgent steps to adapt to and mitigate climate change. This is where pre-commercial procurement comes into play.

Regional development agencies are entrusted with the development of their territories and are uniquely positioned to help overcome such obstacles due to their intermediary role between government (demand) and business (supply).

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Procuring Innovation

When public authorities purchase goods and services, they do so in a regulated, transparent and competitive procedure called public procurement. A procedure that is much more difficult when the goods or services needed are not available on the market. One option would be for public authorities to wait for the market to provide the needed goods and services. **Or, in an effort to incentivise the market to provide the needed goods or services, public authorities can instead buy research and development (R&D) services that meet public needs in the medium to long term.**

However, procuring innovations (R&D services) instead of market-ready or proven goods and services involves risks for both contracting authorities and suppliers. In 2007, pre-commercial procurement (PCP) was introduced in the EU [2], which allows risk-benefit sharing between the contracting authority and the participating companies on market terms. The contracting authority reserves the right to use the results but does not acquire exclusive rights of use. The participating developers have the option of marketing their solutions

themselves if they drop out in the course of the procedure or if their solution is not purchased by the contracting authority. This not only allows the providers to exploit their solutions with other clients or in other markets, but the early feedback also helps them further in their development, which can shorten the time to market.

Example 1: PCP

A prime example of the benefits of pre-commercial procurement can be witnessed in the acquisition of so-called “long-endurance unmanned surface vehicles” by the UK National Oceanography Centre (NOC) in 2014 [3]. Multiple government operations require Autonomous Surface Vehicles (ASVs) that are able to cover longer distances/duration, are more cost-effective and are more resource-efficient than the ones previously available. Therefore, the NOC launched a pre-commercial procurement call in 2013 where five tenders were awarded contracts to kick-start the concept study. Thereafter, two promising concepts were developed into prototypes that would be extensively tested during the PCP’s development and testing phase. Ultimately, the contractors opted to procure both products that are in use to this very moment. The phased approach in this PCP not only ensured the involvement of medium and smaller enterprises but also exhibits the broader principles of PCP by accelerating time to market and encompassing rather modest procurement investment.

Through pre-commercial procurement, public authorities can therefore drive demand-side innovation while encouraging companies to engage in research and development. PCP has also proven to bring new players, particularly SMEs, into the procurement market, which accounts for no less than 14% of European GDP. “73.5% of PCP contracts are won by SMEs, 61.5% of total values of PCP contracts, more than twice the average in public procurement across Europe (29%)” [4].

It is important to note that PCPs are not covered by international agreements on public procurement such as the WTO Government Procurement Agreement. Therefore, **PCPs can use place of performance conditions that require participating contractors to carry out most of the activities performed for the PCP contract in EU Member States or in specific regions.**

As PCP and R&D processes take time, it is particularly important to initiate them as soon as possible so that the goods or services needed can meet the demands of the territories as quickly as possible.

Climate Change Adaptation & Mitigation

When it comes to measures to be taken by European territories in response to climate change, it is usually either **adaptation** or **mitigation**. Failure to take either of these two measures may have catastrophic consequences.

Climate adaptation means taking measures to anticipate and prepare for both the current and future impacts of climate change. This can mean both anticipating the negative impacts of climate change and taking appropriate measures to prevent or minimise the damage they may cause, or taking advantage of opportunities as they arise [5]. Examples are the construction of infrastructures to prevent flood damage or the cultivation of crops that can better cope with changing climatic conditions.

Climate mitigation means reducing or avoiding the emission of greenhouse gases in order to prevent future climate impacts. Since climate change is mainly caused by greenhouse gases released from the burning of coal, oil and gas, reducing or improving the storage of emissions is an important step in mitigating the negative impact on the climate.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [6]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [7]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaptation measures by providing vast amount of EO data.

Climate Services & Earth Observation Data

Specific climate services can be procured to meet a territory's climate change adaptation or mitigation needs that often make use of aerospace technologies such as Earth Observation.

Earth Observation (EO) data can be of enormous value for detecting and monitoring climate change and thus supporting climate change adaptation and mitigation measures. Earth Observation is defined as the process of capturing observations of the Earth's surface and atmosphere

through remote sensing instruments (i.e., satellites). "Satellite-based EO relies on the use of satellite-mounted payloads to gather imaging data about the Earth's characteristics. The images are then processed and analysed in order to extract different types of information that can serve a very wide range of applications and industries" [8].

Climate services that use Earth Observation data therefore often have the potential to meet the climate adaptation and mitigation needs of public authorities. The challenge then is for the procuring authorities to clearly identify and articulate their needs that could be met by climate services, whether or not they are based on Earth Observation data. While some support structures are in place at the European level, at regional level a close look needs to be taken at how well PCP is being used by the respective procuring authorities and what barriers might prevent them from doing so. **This is also where Regional Development Agencies can step in and take on the role of analysing the regional PCP ecosystem.**

At European level, individual procurers can receive financial support from the European Structural and Investment Funds. In addition, the Horizon programmes co-finance the establishment of public procurer networks to prepare the launching of PCPs and the undertaking of joint PCPs on topics of common interest. One of these projects is PROTECT.

PROTECT

The Horizon Europe funded PROTECT project empowers public authorities by sharing content and formats that can be easily used by non-specialists to promote the benefits of EO-based climate services. For example, PROTECT sourced and assessed existing and high-potential climate services solutions and technologies that use Earth Observation data. Sharing the current state of the art in the climate services market aids public procurers in better assessing the benefits and potential of climate services.

Longer term, PROTECT is preparing the operational ground for joint, cross-border PCP processes on four identified challenges:

- Flood mapping and prediction;
- Climate resilient water solutions (predicting, collecting data, planning);
- Fires prediction & prevention (tracing, identifying – e.g., illegal waste dump fires);
- Sustainable & resilient infrastructure in vulnerable urban & regional areas (integrated sustainable re-development, restoring & adaptation of old and existing buildings).

A [range of relevant resources](#) regarding the PCP of climate services has been developed by PROTECT.

The Role of Regional Development Agencies

Due to their unique intermediary position supporting both public authorities (demand) and local businesses (supply), **Regional Development Agencies (RDA) can help overcome barriers to PCPs of climate services and thus increase the uptake of this important tool for adaptation and mitigation of climate change impacts.** This is especially true because PCPs fall outside of international public procurement agreements and can thus use place of performance conditions.

Regional Development Agencies can:

- Analyse the current use and uptake of PCP by regional procuring authorities;
- Analyse the need/demand for PCP by regional procuring authorities;
- Identify barriers to the adoption of PCP and create incentives for authorities to overcome them;
- Analyse the regional ecosystem of businesses that have the potential to provide the needed (climate) services;
- Create incentives for regional businesses to participate in PCP calls and thereby engage in research and development;
- In this way, both supply and demand are driven and brought together by RDAs.

Example 2: RDAs & PCP

An illustrative example of the role Regional Development Agencies can play in PCP is exemplified by ACCIÓ, the Catalan government agency for business competitiveness which serves as an intermediary between regional enterprises with innovative solutions and public buyers [9]. ACCIÓ hosts an online platform that collects tenders and allows entities to make searches based on various criteria [10]. Furthermore, ACCIÓ provides a mailbox for innovative proposals where enterprises submit their innovative solutions to known issues for public buyers. In case of interest in the particular solution, ACCIÓ initiates public market consultations further underlining the connecting role RDAs play between the demand and supply side of PCP.

Contact PROTECT: info-protect@group-gac.com

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- [1] [Roadmap for Climate Services](#) (2015)
- [2] [COM\(2007\) 799 final](#)
- [3] [Long-endurance unmanned surface vehicles](#)
- [4] [Procure-PCP](#)
- [5] [European Environment Agency](#)
- [6] [University of Alberta](#) (2023)
- [7] [European Space Agency](#) (2020)
- [8] [European Union Agency for the Space Programme](#) (2023)
- [9] [ACCIÓ](#)
- [10] [Catalonia Open Challenges](#)

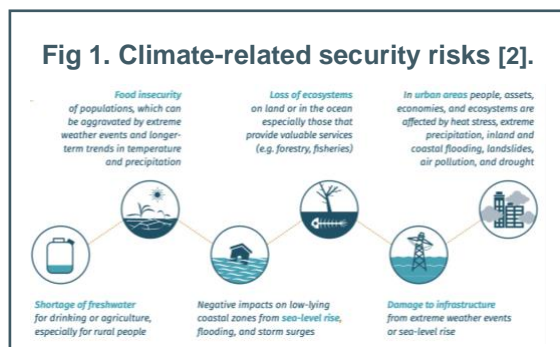
Policy Brief: Civil Security and Protection

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Summary

- Climate changes **exposes the Civil Security and Protection sector to several challenges and risks** (Fig. 1), in rural and urban areas both in Member States and beyond, where the EU supports civil protection efforts.
- Extreme weather events, storms, floods, wildfires, and other climate-related hazards, such as air pollution or heat stress, can all **cause damage to critical infrastructure** and endanger human health and security [1].
- These challenges are reflected in the EU's civil protection policies, which highlights **climate change as a megatrend rapidly altering the work of civil protection** [1].
- Climate change is further seen as a **risk-multiplier**, as one climate-related security risk can trigger another, causing a cascading effect of multiplying effects [2].
- Climate Services using Earth Observation data can **support emergency response in Europe and abroad** and the monitoring of vulnerable infrastructure, extreme events, and weather patterns.



Recommendations

- The EU's Civil Protection Mechanism recognises that to tackle the increasing threat of climate change for civil security, critical infrastructure, and human health, **innovative solutions are required**.
- Climate Services utilising Earth Observation data can **support emergency response, predict extreme events** as well as increase the resilience of critical infrastructure to the multifaceted risks posed by climate change.
- A PCP call enables stakeholders to trigger the development of innovative solutions that can **address the main challenges** the Civil Security and Protection sector is facing.

Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

The risks and challenges posed by climate change for The Civil Security and Protection sector are complex, including extreme temperatures, fires, and air pollution, which damage critical infrastructure and endanger human health and security [1]. Additionally, climate change is set to **increase the likelihood and frequency of disasters**, such as floods and storms, as well as expanding the areas exposed to them [1].

Effective Civil Security and Protection **depends on timely and accurate forecasts and early warnings** of extreme events to enable rapid assistance to affected regions and countries [3]. Communicating this information in a clear and effective manner is crucial to **increase public awareness of and preparedness** for disasters [3].

Climate Services (Box 2), especially those utilising Earth Observation (EO) data (Box 3), are increasingly used for precise forecasting of weather patterns, extreme events, and natural disasters. **Pre-commercial procurement of these services is a key driver** in the development of innovative Climate Services that aim to address the risks and challenges posed by climate change.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Policy developments

The EU's Civil Protection Mechanism, established in 2001, coordinates the EU-level response to natural and man-made disasters, operated by the EU **emergency response coordination centre (ERCC)** [3, 4]. Satellite maps, produced by the EU's **Copernicus Emergency Management Service**, are already used frequently to support civil protection efforts in the EU and abroad [4].

In 2022, the European Council adopted a **new conclusion that specifically integrates climate change in the EU's civil protection work**. The conclusion highlights the need for investments in research and innovation, as well as the development of better climate data and information to increase

citizen preparedness in the face of climate-related security risks [3].

Opportunities

The EU's Civil Security and Protection sector **face risks and challenges** from climate change that can multiply each other's effects (Fig. 1) and cause severe harm to human health and security, as well as damage to critical infrastructure, which necessitates **innovative solutions and better climate information** [3].

Climate Services procured through a PCP call offer such solutions that **support the prediction of extreme events**, increase infrastructure resilience to climate impacts, and facilitate the planning and coordination disaster response activities, all **tailored to specific stakeholder needs**.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaption measures by providing vast amount of EO data.

Conclusions

To **ensure the security and health of Europe's population**, as well as support the EU's disaster response activities in Member States and abroad, the Civil Security and Protection sector depends on timely, high-quality, and accurate climate data.

Innovative and sustainable Climate Services, procured through a PCP call, can **provide key insights to support the sector**, increasing the resilience of critical infrastructure and ensuring effective early warning about threats to the health and safety of European citizens.

Contact PROTECT: info-protect@group-gac.com

References:

- [1] [European Parliament](#) (2020)
- [2] [United Nations Environment Programme](#) (2022)
- [3] [European Council](#) (2022)
- [4] [European Commission](#) (n.d.)

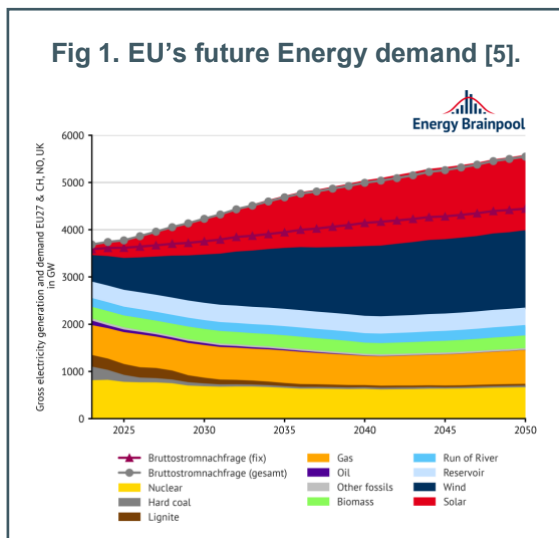
Policy Brief: Energy and Utilities

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Summary

- Climate changes **exposes the Energy and Utilities sector to several challenges**, including droughts, heatwaves, extreme weather events, and water pollution, all of which can affect freshwater and energy supply at the same time as the **demand for those services is rising**.
- To meet rising energy demands [5] in the future, caused by a **move to a net zero economy**, the Energy and Utilities sector must become more resilient and independent.
- Climate Services using Earth Observation data can **support the development of climate-resilient energy infrastructure** and the monitoring of water pollution and extreme events.



Recommendations

- To meet the EU's ambitious zero emission and zero pollution targets for the Energy and Utilities sector, **innovative solutions are required**.
- Climate Services utilising Earth Observation data can support the sector in **optimising energy efficiency** as well as increase its resilience to the multifaceted risks posed by climate change.
- A PCP call enables stakeholders to trigger the development of innovative solutions that can **address the main challenges and opportunities** the Energy and Utilities sector is exposed to.

Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

The risks and challenges posed by climate change for the Energy and Utilities sector are **complex**, including extreme temperatures and heat waves, which can spike energy demand, leading to **potential brown outs or blackouts** [1]. Additionally, extreme rainfall, storms, and flooding can damage energy infrastructure, spiking costs, while droughts, or water pollution can affect freshwater resources [1].

The Energy and Utilities sector is further responsible for **73% of global greenhouse emissions** and these would need to be reduced by 70% by 2050 to meet global climate goals [2]. For effective climate risk management, that protects the vulnerable energy infrastructure and to **achieve a sustainable energy transition** away from fossil fuels, innovative solutions are needed.

Climate Services (Box 2), especially those utilising Earth Observation (EO) data (Box 3), are increasingly used to support climate risk management in the Energy and Utilities sector, as well as for the optimisation of resource management. **Pre-commercial procurement of these services is a key driver** in the development of innovative Climate Services that aim to address the risks and challenges posed by climate change.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Policy developments

The EU's Energy Policy calls for a reduction to **net zero greenhouse gas emissions by 2050** and an improvement of 32.5% in energy efficiency by 2030 [3]. In March 2023, it was further agreed that by 2030 to aim for a 45% share of renewable energies in energy consumption as well as an **overall reduction of 11.7% for the EU primary and final energy consumption** [3].

The EU Drinking Water Directive, which came into force in 2022, set strict standards for water quality, access to freshwater, and increase resource efficiency of the sector [4]. The policy further calls for

requirements for **frequent risk assessments and water quality reporting** [4].

Opportunities

The Energy and Utilities sector **faces risks and challenges** from climate change as well as ambitious policy targets, which necessitates **innovative solutions**.

Climate Services procured through a PCP call offer such solutions that **support the efficiency and optimisation** of the Energy and Utilities sector, increase its resilience to climate impacts, and facilitate its transition to zero emission industry, in line with policy targets, all **tailored to specific stakeholder needs**.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaptation measures by providing vast amount of EO data.

Conclusions

As a current major source of greenhouse emissions, the **Energy and Utilities sector must commit to the transition to a zero emission and pollution industry** at the same time as increasing its resilience to climate change impacts.

Innovative and sustainable Climate Services, procured through a PCP call, can **provide key insights to support this transition** and make the sector resilient to the impacts of climate change and extreme events.

Contact PROTECT: info-protect@group-gac.com

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- [3] [European Parliament](#) (2023)
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- [5] [Energy Collective Group](#) (2022)

Policy Brief: Marine and Coastal Environments

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a 'buying with impact' approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

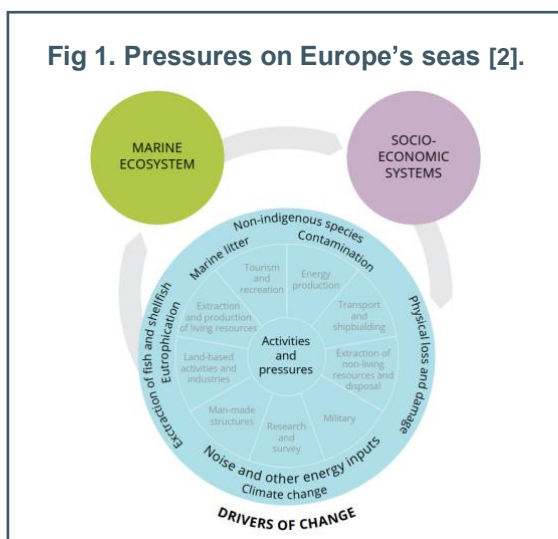
Summary

- Climate changes **exposes the Marine and Coastal Environments to several challenges**, including coastal erosion and degradation, flooding, rising water temperatures, extreme weather events, and inland intrusion of saltwater, all of which can affect freshwater supply as well as **fishing and aquaculture**.
- These challenges are reflected in EU policies, which **approach coastal management in a systematic way** [1], enabling the Marine and Coastal Environments to become more resilient to climate change and other pressures (Fig. 1).
- Climate Services using Earth Observation data can **support sustainable coastal development** and the monitoring of extreme events and weather patterns.

Recommendations

- To meet the EU's ambitious zero pollution, biodiversity, and fishing targets for Marine and Coastal Environments, **innovative solutions are required**.
- Climate Services utilising Earth Observation data can support the coastal management **in predicting extreme events** as well as increase the resilience of coasts to the multifaceted risks posed by climate change.
- A PCP call enables stakeholders to trigger the development of innovative solutions that can **address the main challenges** Coastal and Marine Environments are exposed to.

Fig 1. Pressures on Europe's seas [2].



Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

The **risks and challenges posed by climate change for Marine and Coastal Environments are complex**, including extreme temperatures and flooding, which can lead to eutrophication, affecting water quality and causing loss of marine life [2]. Additionally, extreme rainfall and storms can cause coastal erosion, which can affect inland freshwater resources, coastal stability, and habitats [2].

In the EU, **46% of coastal waters are exposed to eutrophication** [3] and the average sea surface temperature has been steadily increasing since 1981 [4]. With about 50% of Europe's population living within 50km of coastal environments, the urgency of **protecting these vulnerable environments calls for research and innovation** [5].

Climate Services (Box 2), especially those utilising Earth Observation (EO) data (Box 3), are increasingly used to support coastal management, as well as for precise forecasting of weather patterns. **Pre-commercial procurement of these services is a key driver** in the development of innovative Climate Services that aim to address the risks and challenges posed by climate change.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Policy developments

The EU's moved to an **integrated coastal management approach** with the introduction of the Marine Strategy Framework Directive (MSFD) in 2008, which itself is supported by key policies such as the Zero Pollution Action Plan, the EU Drinking Water Directive, and the Common Fisheries Policy, among others [4]. The MSFD calls for an **ecosystem-based approach for managing the EU's entire marine environment** [3].

The EU Drinking Water Directive, for example, which came into force in 2022, set strict standards for water quality, access to freshwater, and increase resource efficiency of the sector [6]. The policy further calls for requirements for **frequent risk assessments and water quality reporting** [6].

Furthermore, the **EU Mission to restore our Oceans and Waters by 2030** aims to eliminate pollution and make the “blue” economy carbon-neutral and circular, with **marine and aquatic innovation as a key component** of its strategy [5].

Opportunities

Marine and Coastal Environments **face risks and challenges** from climate change as well as other pressures (Fig. 1), which necessitates **innovative solutions**.

Climate Services procured through a PCP call offer such solutions that **support the prosperity and health** of the EU's oceans, increase coastal resilience to climate impacts, and facilitate the elimination of aquatic pollution, in line with policy targets, all **tailored to specific stakeholder needs**.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaption measures by providing vast amount of EO data.

Conclusions

To meet policy targets, employing an ecosystem-based approach, and maintain sustainable fisheries and aquaculture, Marine and Coastal Environments **must commit to the transition to a zero pollution and climate resilient sector**.

Innovative and sustainable Climate Services, procured through a PCP call, can **provide key insights to support this transition** and make Marine and Coastal environments resilient to the impacts of climate change and extreme events.

Contact PROTECT: info-protect@group-gac.com

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Policy Brief: The need and use of PCP in the development of EO-based solutions

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a 'buying with impact' approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

Summary

- Through the use of Pre-Commercial Procurement (PCP, Box 1), EO-based service providers can conduct R&D while receiving direct client feedback and inputs.
- When implemented properly, PCP can bridge multiple policy-level and market-level gaps.
- Innovation Procurement can support the development of service delivery and business models that leverage EO climate services to advocate for more environmentally sustainable practices in various sectors.

Recommendations

- Enhance knowledge regarding the PCP initiatives.
- Apply the PCP methodology to the development of EO-based solutions.
- European policies are stimulating a surge in demand for climate services in the crucial domain of EO.

Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

Achieving climate neutrality by 2050 and reducing greenhouse gas emissions by at least 55% by 2030 are objectives of the European Union (EU) [1]. These goals are fundamental to the European Green Deal and are consistent with the European Union's pledge to take global action as outlined in the Paris Agreement [2]. The realization of the green transition in Europe

necessitates the active engagement of all relevant stakeholders who possess the ability to effectuate profound and systemic alterations. By means of the Copernicus program [3], the GEO initiatives, EMODnet [4], the European Commission (EC) Knowledge Centre of Earth Observation [5], and the establishment of sizable, high-quality, open-access repositories of fundamental climate data, the EC has also made substantial investments in recent years to promote the development of Earth Observation (EO) data and EO in particular (Box 3). Additionally, the EC provides funding for an increasing number of Climate Services (CS, Box 2) related activities. In addition to cross-sectoral research on CS markets (for instance, CLARA, EU-MACS, and MARCO), these activities include initiatives under the H2020 and ERA4CS programs that cover a wide range of industries, from water to energy, from agriculture to cities, marine environments, and tourism.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Although the public sector has been the primary consumer of EO services since 2012 and is expected to continue doing so, despite these endeavours, there has been no significant adoption of CS that could facilitate a substantial turnaround [6]. The reason for this phenomenon is the fragmented public demand for CS across different sectors and regions of Europe. Additionally, potential users lack awareness and understanding regarding the ways in which climate information and data obtained through different EO modalities can assist them in tackling challenges and anticipating upcoming needs. The identical fragmentation hinders CS suppliers from meeting demand and developing suitable, individualized, and implementable solutions, thereby having a direct effect on the

supply side. The implementation of innovative and suitable governance models is crucial for public authorities to effectively comply with forthcoming climate change legislation, as transformative changes, including those exemplified by the Green Deal, are inherently dynamic in nature.

Public procurement (PP) enables contracting authorities [7] (public authorities and bodies governed by public law) across all levels (particularly regions and cities) in the European Union to significantly contribute to the definition and advancement of innovative, environmentally friendly, and sustainable policies and initiatives.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaptation measures by providing vast amount of EO data.

Cooperation to mitigate the fragmentation of demand for CS and promote the adoption of innovative PP practices is thus in the best interest of all contracting authorities in the EU, particularly those tasked with overseeing budget control and decision-making regarding their procurements, and which are particularly important sectors and areas that are profoundly affected by climate change.

An approach to operationalizing these partnerships among diverse stakeholders is through PCP-related initiatives, such as PROTECT, which are funded by the European Commission under the HORIZON EUROPE program. Despite the providers of EO-based climate services desiring to customize these services to meet the requirements of public authorities, they have encountered numerous obstacles over time, including and not limited to:

- Limited financial and human resources on both public authorities and suppliers,

- Obstacles related to communication from the use of both technical and non-technical terminology,
- Restrictions from policies perspective depending on the country,
- Insufficient knowledge regarding the capabilities of EO to address or alleviate the requirements of public authorities, and
- Insufficient delineation of the requirements or technological facets.

Therefore, by implementing PCP-related initiatives, the aforementioned disparities could be bridged, which would further the development of EO-based solutions. These voids may be filled within the scope of a PCP by means of the following activities, among others:

- Open Market Consultations
- Pain Point Workshops
- Trainings on an assortment of subjects

Policy developments

Multiple duties and investigations have been undertaken during the PROTECT initiative to prepare the groundwork for an actual PCP. One of these activities stood out as a significant foundation for all stakeholders, particularly in regards to the policies that have the potential to stimulate the demand for climate services and PCP at the European Union level. The types of policy instruments studied were Regulations, Directives, and Communications.

It has been observed throughout this study that the European Union has implemented a multitude of policies in recent years with the objective of diminishing greenhouse gas emissions (GHG) and alleviating the consequences of climate change.

EO is a critical domain in which European policies are fostering increased demand for climate services. Numerous programs and initiatives of the European Union are focused on monitoring the effects of climate change and advancing our understanding of the planet's systems. As a result, the EU is a leader in the field of EO. The development of innovative environmental products and services, such as those that assess the health of ecosystems and forecast natural disasters, can be facilitated through PCP of EO solutions.

Innovation Procurement can significantly facilitate access to cutting-edge solutions that utilize EO climate services to tackle unresolved obstacles associated with the implementation of climate policy. As an illustration, Innovation Procurement may facilitate the creation of novel tools and applications that support decision-making and risk management in domains including energy systems, water resource management, and disaster response, as well as enhance climate monitoring, modelling, and forecasting via EO data.

Additionally, Innovation Procurement can facilitate the creation of service delivery and business models that leverage EO climate services to promote more environmentally friendly practices in sectors including urban planning, agriculture, and forestry.

Opportunities

There are numerous opportunities for stakeholders to participate in this initiative for the development of innovative EO-based solutions, which can be categorized into the following levels:

- European level (e.g. HORIZON program)
- National level (depending on the country)
- Regional level (depending on the country)

In general, the primary advantage is that all participants in these endeavours benefit: challenges are addressed and novel services are introduced to the market.

Conclusions

The usage of PCP should be increased by stakeholders in order to produce EO-based solutions that are customized to meet the unique requirements of the stakeholders. The usage of PCP is not only advantageous for the providers, but it is also an excellent instrument for filling in the gaps on a number of different levels, including knowledge, financial support, communication, cooperation, and collaboration between stakeholders.

Contact PROTECT: info-protect@group-gac.com

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https://ec.europa.eu/growth/content/european-commission-unveilsprocurcompeu-%E2%80%93-european-competency-framework-public-procurement_en. For the sake of clarity and space in this proposal, PROTECT uses the term 'procurers' to refer to all profiles of public procurers in the E](#)

Policy Brief: Pre-Commercial Procurement of R&D speeding up Green and Digital innovation in Europe

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a 'buying with impact' approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

Summary

- With an annual value of €2 trillion, public procurement is a key **driver for green and digital transformation**, involving 250.000 European contracting authorities and [1].
- If there are no solutions available in the market to satisfy a current or future genuine need, **public authorities can resource to the Pre-Commercial Procurement (PCP) approach** (Box 1) to purchase R&D services from different technology providers who compete throughout phases of solution design, prototype development and testing and validation.
- PCP falls outside the WTO-GPA and the EU Public Procurement Directives. The flexibility of the PCP approach **enhances competition and mitigates risks**.

Recommendations

- A **key instrument to steer and speed up R&D** is the competitive approach in phases and shared risk/benefit of Pre-Commercial Procurement (PCP).
- The PCP approach has proven benefits like **speeding up the time to market of innovative solutions**, while creating opportunities for European companies (in particular SMEs) that can grow in new market segments based on the public demand.
- A PCP can stimulate the participation of international companies, bringing together several public organisations for a **joint cross-border procurement**, making use of the Horizon Europe Programme.
- A proper step-by-step preparation of a PCP based on functional requirements **increases the success of a project** [7].

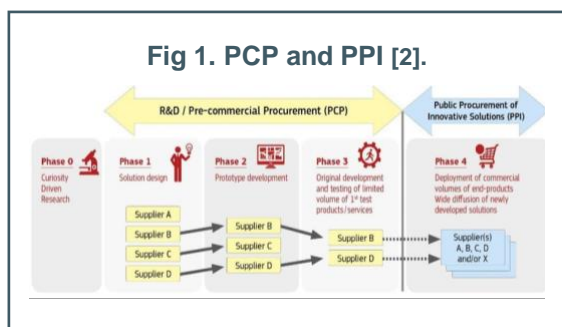
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Introduction

In the PCP approach (Box 1), **procurers share the IPR related risks and benefits** of undertaking new developments with the R&D providers participating in PCP. This approach maximizes the incentives to commercialise the developed solutions to other markets.

Traditional procurement is based on short-term tactical purchasing considerations, usually prioritizing low cost over quality, or looking only at immediate instead of longer-term cost/quality impact [6]. Lack of knowledge about technological solutions often leads to over or underspecified tender specifications. When procurement decisions are driven more by considerations to avoid deployment risks (fear to introduce 'new' solutions) instead of maximizing cost / quality improvements, this often leads to suboptimal overall value for money and technology / vendor lock-in. It is understandable that the obligation to wisely spend taxpayers' money makes procurers inevitably risk-averse.



However, when innovation procurement is implemented as a smart PCP/PPI combination (Fig 1), it becomes a **strategic tool to systematically improve the quality/efficiency of public services whilst minimizing the risks of deploying 'new' solutions**. PCP enables procurers to de-risk novel technologies, remove supplier lock-in, and gain invaluable insights into the pros and cons of competing solutions 'before' making any commitments to deploy large volumes of solutions.

Policy developments

PCP was defined in 2007 in the PCP Communication [2] in full compliance with the legal framework [3]. Parts of the PCP Communication have been included in later legislation: The 2014 **public procurement directives clarify that PCP is exempted from its remit** and the 2014 State aid framework for Research

and Development and Innovation [4] clarifies the conditions under which PCP is done according to market conditions.

Box 2: Funding

In the 2023-2024 calls of the Horizon Europe programme, there are 263M EURO of funding opportunities in different fields: health, security, climate change and research infrastructures etc.

Horizon Europe offers the following funding opportunities for consortia of procurers to prepare and undertake together PCP procurements. In addition, public procurers can also propose themselves to implement PCPs in any call for Research and Innovation (RIA) actions in the WP that does not require the participation of industry in the consortium. Public authorities that want to implement joint cross-border innovation procurement calls via their national funding programmes can also apply for support for such joint PCP calls via the HE programme co-fund actions.

The funding rates are 100% for the PCP actions. In PCP actions, groups of procurers implement together one joint PCP procurement. The funding rates for PCPs implemented as part of an RIA action is also 100%, as in PCP actions. The funding rate of programme co-fund actions can depend on the call.

PCP, due to its characteristics is **exempted from the GPA of the WTO and consequently of the EU Public Procurement Directives**. This is of particular interest to foster European strategic autonomy and resilience, since contracting authorities may require the performance of the R&D services to take place in Europe, which in turn strengthens Europe's technological potential and increases the resilience of Members States to potential supply chain disruption in emerging technologies. It also supports the **goal of having an autonomous Europe when it comes to key enabling technologies**.

The use of multiple sourcing in pre-commercial procurement also strengthens EU strategic autonomy and resilience. By triggering in a forward looking way a range of suppliers to **develop new innovative solutions that can address upcoming mid-to-long term procurement needs**, public procurers can bring in competition from new innovative companies into a supply chain that was previously plagued by supplier lock-in, or build up a

totally competitive pool of European suppliers that can address its strategic needs in the future with solutions that are 'made in Europe'.

The IPR and commercialisation conditions that can be used in pre-commercial procurement also contribute to **fostering EU strategic autonomy**. It is a key characteristic of PCP to leave the IPR ownership rights with the participating contractors so that they can commercialise their solutions more widely, which increase the range of European suppliers able to deliver solutions to the public sector, thus enhancing resilience and strategic autonomy.

This comes with a **condition to commercialise** the solutions within a specified time. This condition can be extended with the requirement to perform the majority of the commercialisation activities in Europe (e.g. production, marketing, service delivery facilities) also after the PCP contracts ends.

In addition, the procurer can **restrict exclusive transfer and licensing** of the results/IPR from the PCP to non-EU suppliers. An IPR call back clause ensures that the public procurer can require IPR ownership rights to be transferred back to the procurer in case a supplier does not respect the PCP's place performance conditions, establishment and control from Europe obligations, IPR obligations or commercialisation obligations or in case other EU strategic autonomy or essential security interests are compromised (e.g. in case of a merger or acquisition of a PCP supplier by a non-EU entity).

Conclusions

Public organizations can **perform more R&D procurement on strategic key technologies through the PCP approach**, to avoid becoming overly dependent on non-EU suppliers by requiring R&D to be done in Europe. This gives vendors a first mover advantage and ensures that there will be vendors in Europe who can deliver solutions.

By using a phase approach and multiple sourcing, the number of suppliers that can deliver solutions increases, **reducing supplier lock-in, and thus increasing resilience** in case of supply chain shocks.

Leaving IPR ownership with suppliers in procurement – as in the standard approach in Europe – enables more vendors to commercialise/offer solutions to procurers, on the **condition that vendors will keep a significant part of product commercialisation in Europe** (e.g., minimum 50% of the production). In this regard, a measure could be set to allow vendors to do 'exclusive' licensing or transfer of IPR/results to non-EU players only after approval of the procurer. It is important to keep the right to call back IPR in case of mergers/acquisition of contractors by non-EU players.

Another measure is to keep the right to call back the ownership of IPR/results, in case of non-compliance with any of the place of performance, control from Europe, commercialisation, IPR, security etc. obligations (e.g., EU blockchain PCP). **Announcing the mid-to-long term procurement needs more in advance to the market is fundamental** to alert all actors in the supply chain to get ready to provide solutions (e.g., climate neutral solutions).

Box 3: Case Studies

More than 600 public buyers around Europe have already successfully implemented PCPs [6]:

- Boosting business opportunities for SMEs and startups.
- Awarding 70% instead of usual 30% of contracts to SMEs and startups.
- Boosting their international growth (20 X more contracts awarded cross-border).
- Doubling the commercialisation success rate (>50% companies increased their revenues/grew their company).
- Helping create strategic partnership with larger companies, acquire new companies or enter the stock market.
- Increasing 20%-30% of quality and efficiency improvements in public services.
- Contributing to roll-out of more interoperable solutions / uptake of standards.
- Resulting in 40% of innovation procurements done to obtain more interoperable solutions.
- Reinforcing strategic autonomy through 'made in Europe' solutions.

Contact PROTECT: info-protect@group-gac.com

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Policy Brief: Public Procurement of Innovative solutions (PPI) to adopt clean technologies

The PROTECT Project

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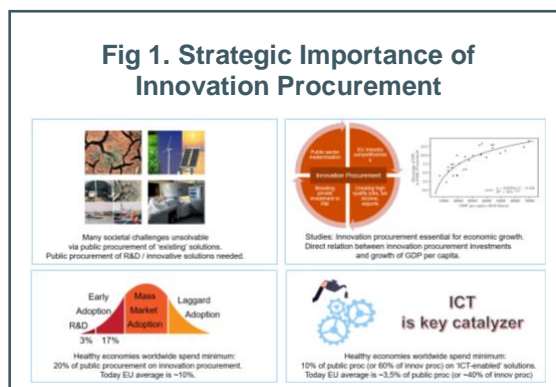
Summary

- Public procurement is an important driver for the green and digital transformation of public sector organisations and enterprises, with an **annual value of € 2 trillion**, involving over 250.000 contracting authorities across Europe [1].
- The public sector has a crucial role in **steering innovations from the demand side** by informing the market of the needs to tackle societal challenges and prepare for a more resilient future (Fig. 1).
- The public procurement legal toolbox has different instruments to purchase research and development (R&D) services through Pre-Commercial Procurement (PCP) and/or **purchase innovative solutions through Public Procurement of Innovative solutions (PPI)**, depending on the maturity of technologies based on technology readiness levels (TRLs).
- As PPI falls under the scope of the **WTO-GPA and the EU Public Procurement Directives**, any of the procedures thereof may be applied (e.g. open, restricted, negotiated procedures).
- The PPI approach the market readiness can be **verified through conformance testing, certification or quality labelling**.

Recommendations

- Public organisations across Europe can **make strategic use of public procurement instruments** towards innovative and sustainable goals for the green and digital transformation.
- The starting point to implement a PPI approach is having a **clear definition of needs** and functional specifications, which after a state-of-the-art analysis and sound market consultation show higher TRL 7-9.
- A PPI approach can be applied using any of the different types of **contracting procedures as established in the EU Public Procurement directives** based upon a procurement strategy designed given a business case.

Fig 1. Strategic Importance of Innovation Procurement



Introduction

Public procurement of innovative solutions (PPI) means procurement where **contracting authorities act as a launch customer** of innovative goods or services which are not yet available on a large-scale commercial basis and may include conformance testing.

PPI is a **specific approach for procuring innovative solutions** in which procurers, unless they conducted prior to a PCP, announce well in advance their intention to buy a significant volume of innovative solutions, to **trigger industry to bring to the market solutions** with desired quality/price ratios within a specific time.

Market readiness prior to deployment can be verified through e.g., **conformance testing, certification, or quality labelling of solutions**. In PPI, procurers act as launch customers, also called early adopters or first buyers of the innovative solutions. PPI can also entail the **combination of the R&D and deployment of commercial solutions** through an Innovation Partnership procedure.

The PPI can **establish Intellectual Property Rights (IPR) conditions** to stimulate, for example an open source and open hardware approach. The PPI can implement criteria and contract performance clauses to foster innovative solutions, interoperable standards, as well as social and environment considerations such as those established in the soft law of the International Labour Organisation (ILO).

The PPI can also implement **value engineering clauses** in framework agreements to stimulate the possibility to add value along the term of the contract through the systematic analysis of the functions and the **possibility of reducing costs while enhancing the efficiency of solutions**.

A PPI can take place as a joint cross-border procurement bringing together several public organisations across Europe. For this purpose, they may use of the **funding schemes of the Horizon Europe Programme** (Box 1).

Box 1: Funding

Horizon Europe offers funding opportunities for consortia of procurers to prepare and undertake together PPI procurements (see the calls for PPI actions). To cooperate on identifying opportunities and preparing for future PPIs (see the calls for CSA actions). Public authorities that want to implement joint cross-border innovation procurement calls via their national funding programmes can also apply for support for such joint PPI calls via the HE programmes co-fund actions. The funding rates are 50% for PPI actions. In PPI actions, procurers can choose between implementing one joint PPI procurement or several separate but coordinated PPI procurements. The funding rate of programme co-fund actions can depend on the call.

PPI vs PCP [2]

PPI focuses on innovative solutions which are not yet available on a large-scale commercial basis. This also includes **solutions based on existing technologies that are used in a new, innovative way**.

The solutions may have been (partially) demonstrated with success on a small scale (e.g., field testing of a first batch of products) and may be nearly or already available in small quantity on the market.

However, due to residual risk or market uncertainty, the innovations are not being produced at large scale yet and do not meet market price/quality requirements of procurers for wide deployment yet.

While PCP focuses on the R&D phase prior to commercialization, PPI, which does not cover R&D, concentrates on the commercialization/diffusion of solutions. In other words, **PCP only covers the procurement of R&D services, in a way that is clearly separated from any potential subsequent purchase of commercial volumes of end-products**. The main differences between PCP and PPI are indicated in the table below.

	PCP	PPI
When?	The identified challenge requires R&D to get new solutions developed and tested. No commitment to deploy (PPI) yet.	Challenge requires solution which is near to the market/already on the market in small quantity but does not meet public sector requirements for large scale deployment yet. No R&D involved (R&D already done, or no R&D needed to solve challenge).
What?	Public procurer buys R&D to steer development of solutions to its needs, gather knowledge about pros/cons of alternative solutions, avoid supplier lock-in later (create competitive supply base).	Public procurer acts as launching customer / early adopter / first buyer for innovative products and services that are newly arriving on the market (not widely commercially available yet).
How?	Public procurer buys R&D from several suppliers in parallel (comparing alternative solution approaches), in form of competition evaluating progress after critical milestones (design, prototyping, testing). IPR related risks and benefits of R&D are shared between procurer and suppliers to maximize incentives for wide commercialization.	Public procurer announces the intention to buy a critical mass of innovative solutions to trigger industry to bring products on the market with desired quality / price ratio within a specific time. After verification if the market was able to deliver the desired quality/price – e.g. via a test and/or certification - the public procurer buys a significant volume of innovative solutions.

PPI is suitable in cases when, the required solution is **close to the market**, and it is sufficient to signal the intention to buy a significant volume of solutions to encourage suppliers to invest in bringing the solutions to the market that meet the price/quality requirements of the procurer.

Alternatively, for cases in which the solution still needs substantial R&D, **active demand side steering during development is needed** to ensure that developed solutions will meet all the procurers' requirements (e.g. regarding interoperability) and suppliers are not likely to invest in developing in such solutions on their own. **PPI can be used to invest in clean technologies developed through PCP.**

A healthy economy should **spend at least 20% of public procurement on innovation procurement**. This is essential for economic growth [3]. 10% of public procurement (that is 60% of innovation procurement) should be invested in **ICT-enabled solutions**. Under the PPI approach, the market dialogue and a fine-tuned business case, public buyers can choose the most suitable procurement procedure.

If Research and Development services are needed, the Pre-Commercial Procurement approach could be used. Otherwise, for a PPI approach, depending on the scope and the object of the procurement, **open, restricted, and negotiated procedures are available under Directive 2014/24/EU.**

Policy implications

Innovation policy is essential for advancing the transition to a green economy seeking to promote sustainable development and environmental stewardship. By promoting green innovation, such as renewable energy technologies, resource-efficient practices, and sustainable agriculture, **innovation policy can drive economic growth while reducing environmental impacts and promoting social well-being.**

Effective innovation policies offer various benefits (Box 2), including:

- a. **Economic Growth:** Innovation stimulates entrepreneurship, creates new industries and job opportunities, and drives economic growth for fostering the development and adoption of sustainable technologies and practices.
- b. **Environmental Sustainability:** Innovation policy encourages the development of environmentally friendly technologies, resource-efficient processes, and sustainable business models, thereby contributing to the preservation and protection of the environment.
- c. **Social Welfare:** Innovation policy can lead to the developments of inclusive and affordable solutions that improve quality of life, address social challenges, and enhance access to essential services such as clean energy, clean water, and sanitation.

Box 2: Benefits of PPI

Based on evidence from relevant case studies, the benefits of implementing PPI are:

- Improving the quality and/or efficiency of public services.
- Helps innovative (start-up) companies to grow.
- Incentivizes companies to invest in innovation.

The **public sector accounts for a large share of the demand** in several areas like mobility, health, construction, e-government, waste management, recycling etc. In these areas, PPI can generate benefits for the demand and supply side:

- **Quality improvements and cost savings** to the procuring organization that deploys the innovative solutions as well as wider economic,
- **Environmental and societal benefits** for European citizens that benefit from the improved public service and for companies, including SMEs, that are looking for first customers for their innovative solutions.

Conclusions

The role of innovation policy is vital in driving the transition to a green economy. By promoting green innovation, integrating innovation into economic and trade policies, building capacity, and fostering innovation procurement **it is possible to harness the power of innovation for sustainable development.**

Effective innovation policies embedded in the Public Procurement of Innovative solutions (PPI) have the potential to **drive economic growth, protect the environment, and improve social welfare**, creating a pathway towards a more sustainable and inclusive future.

Contact PROTECT: info-protect@group-gac.com

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- [1] [Pircher \(2020\)](#)
- [2] [EAFIP Toolkit](#)
- [3] [Benchmarking of innovation procurement investments and policy frameworks across Europe | Shaping Europe's digital future \(europa.eu\)](#)

Policy Brief: Sustainable Urban Communities

The PROTECT Project

PROTECT supports urgent action for **climate adaptation, mitigation, and resilience**. It enables public authorities to use state-of-the-art public procurement approaches in order to identify solutions – **Climate Services (CS) based on Earth Observation** – that best fit the specific and systemic needs of the public demand. The focus is on five application domains, namely: Energy & Utilities, Sustainable Urban Communities, Agriculture, Forestry and other Land use, Marine and Coastal Environments and Civil Security and Protection. PROTECT will source and assess existing and high-potential CS solutions and technologies that use Earth Observation data. It will engage with an extensive and varied community of procurers, facilitate the definition and aggregation of their needs and functional requirements for climate services, explaining, fostering and supporting a ‘buying with impact’ approach. PROTECT will **prepare the operational ground for one or more joint, cross border or coordinated pre-commercial procurement (PCP) processes**. At policy level, it will provide decision-makers for procurement, climate and policy, at EU, national, regional and local levels, with practical recommendations and guidelines to boost the use of innovation procurement for climate action.

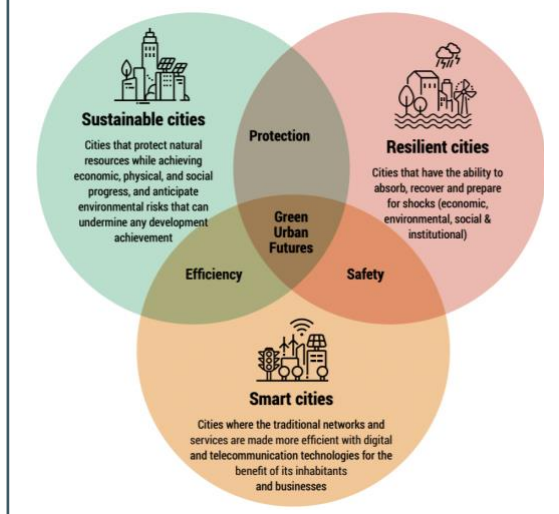
Summary

- Urban communities are growing globally, but cities are also **threatened by the effects of climate change**, such as extreme temperatures and weather events, resource scarcity, and air pollution [1].
- The trend towards sustainable urban communities requires innovation in the fields of **transport, circular economy, health, and air quality** monitoring [1].
- Climate Services using Earth Observation data can **support the development of climate-resilient urban infrastructure** and the monitoring of air pollution and urban emissions, promoting urban sustainability.

Recommendations

- To improve the air quality in European cities and meet the EU’s ambitious zero pollution targets **innovative solutions are required**.
- Climate Services utilising Earth Observation data can support urban communities **in monitoring air quality** as well as support its resilience to the multifaceted risks posed by climate change.
- A PCP (Box 1) call enables stakeholders from urban communities to trigger the development of innovative solutions that can **address the main challenges and opportunities** cities are exposed to.

Fig 1. Net-zero development in cities [1].



Box 1: Pre-commercial procurement

Pre-commercial Procurement (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 that 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).

Introduction

The **risks and challenges posed by climate change for urban communities are multifaceted**, including air pollution, extreme temperatures, the urban heat island effect, urban flooding, and general resource scarcity, for example freshwater scarcity due to droughts or pollution of groundwater [2]. Urban communities also harbour **significant human, financial, and natural capital**, which puts them at the forefront of the development of innovative solutions to tackle the challenges they face and move towards becoming sustainable and resilient in the face of climate change [3].

Climate Services (Box 2), especially those utilising Earth Observation data (Box 3), are increasingly used to support urban planning and development, as well as for the monitoring of air quality in cities. **Pre-commercial procurement (PCP) of these services is a key driver** in the development of innovative Climate Services that aim to address the risks and challenges posed by climate change.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM) [1].

Policy developments

With 97% of urban dwellers in Europe exposed to air pollution, the EU's policies targeted at improving air quality explicitly mention that **cities are at the forefront** of implementing pollution-relevant laws, policies, and programmes [5]. The EU's **Zero Pollution Action Plan** aims to reduce the number of premature deaths due to air pollution by 55% by 2030 [5]. The goal is for **European Cities to be climate neutral by 2050** [5], enabling cities to become sustainable, resilient, and smart (Fig 1.).

The EU's **Green City Accord**, with 100 city signatories, has set ambitious goals to tackle air pollution, water quality issues, threats to urban biodiversity, implementation of a circular economy, and reduction of urban noise pollution, which are **tracked with mandatory indicators** [6].

Opportunities

Urban communities can act as platforms for innovation [1], which is reflected in the EU's Urban Agenda naming **innovative and responsible public procurement** as one of its 14 priority themes [4]. The Urban Agenda specifically highlights the potential of PCP to develop innovative solutions for the challenges urban communities face.

Climate Services procured through a PCP call thus increase urban communities' resilience to the risks posed by climate change through the **timely supply of climate, weather, and air quality data, models, and predictions** that are tailored to the specific stakeholder needs.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans [2]. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery [3]. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaption measures by providing vast amount of EO data.

Conclusions

With 75% of Europeans living in urban environments, Urban Communities are exposed to a variety of risks in the face of climate change, but they are also **uniquely positioned and equipped with capital to address those risks**.

Innovative and responsible sustainable Climate Services, procured through a PCP call, can provide key insights to support the reduction of air pollution, as well as **support urban communities in increasing their resilience** to the impacts of climate change and extreme events.

Contact PROTECT: info-protect@group-gac.com

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- [1] [UN Habitat](#) (2022)
- [2] [UN Habitat](#) (2021)
- [3] [European Environment Agency](#) (2023)
- [4] [EU Urban Agenda](#) (2021)
- [5] [European Commission](#) (2021)
- [6] [Green City Accord](#) (2022)

Policy Brief: Leveraging Pre-Commercial Procurement (PCP) for Sustainable Climate Action Plans (SECAPs)

The PROTECT Project

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Summary

- The ever-changing challenges resulting from an accelerating climate change urges municipalities to adapt faster and further invest into innovative solutions.
- Using pre-commercial procurement as a measure in sustainable energy and climate action plans can help a municipality to streamline their climate change risk and vulnerability assessments and reach higher impacts with their adaptation plans.
- With the procurement of those innovative solutions a municipality can steer development in their area and foster business to invest in R&D useful to the municipalities needs to adapt to climate change
- SECAPS can be a vehicle to introduce the procurement of innovative solutions to the municipalities administration.

Recommendations

- **Political Support through SECAP Development:** Use SECAP development as an opportunity to garner political backing for Pre-commercial procurement (Box 1), particularly when restructuring municipal procurement processes.
- **Align PCP with Long-Term Municipal Strategies:** Harness PCP to fulfil the municipality's long-term objectives, such as monitoring flood-prone areas and combating illegal dumping.
- **Earth Observation and PCP for Risk Assessment:** Employ Earth Observation (Box 3) and PCP to develop tools that assess climate change risks and formulate adaptation strategies, facilitating progress monitoring.

- **Innovative Procurement for Specialized Tools:** Utilize innovative procurement to encourage the development of specialized tools that support the goals set in Risk and Vulnerability Assessments and enhance progress monitoring.
- **Integrated PCP in Planning Phase:** Create an environment where PCP is considered during the planning phase of measures, recognizing its problem-solving potential.

Box 1: Pre-commercial procurement

Pre-commercial Procurement (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).

Introduction

Climate change presents an unprecedented challenge for our society. Although driven by a single cause, greenhouse gas emissions, its consequences are multifaceted and can

feel overwhelming, necessitating rapid adaptation. Government institutions possess a potent tool for addressing these challenges: public procurement, specifically **Pre-Commercial Procurement (PCP) and Innovative Procurement (IP) of Climate Services** (Box 2). In the context of Sustainable Energy and Climate Action Plans (SECAPs), municipalities can leverage innovative procurement to great effect.

Box 2: Climate Services

Climate services describe the transformation of **climate-related data** — together with other relevant information — into customized products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large. As such, these services include data, information and knowledge that support adaptation, mitigation, and disaster risk management (DRM).

SECAPs: A Commitment to Act

SECAPs set ambitious targets, including a **55% reduction in greenhouse gas emissions by 2030** and climate neutrality by 2050. They aim to enhance resilience and prepare for climate change impacts while addressing energy poverty as part of a just transition. SECAPs serve as **comprehensive tools for cities and regions to plan, implement, monitor, and evaluate climate and energy policies**, contributing to global mitigation and adaptation goals. Through SECAPs, cities can systematically implement measures, surpass national legislation, and communicate their commitment to stakeholders.

A Vehicle for Innovative Procurement

PCP allows municipalities to procure ground-breaking technologies and services, **fostering collaboration between local authorities and the private sector**. This approach aids climate risk and vulnerability assessments and emissions inventory development, catering to each municipality's unique challenges. Specialized solutions can provide a deeper understanding of emissions sources, particularly challenging ones like swamps or wetlands. Innovative procurement can **enhance existing adaptation strategies and progress monitoring**, such as satellite monitoring systems tailored to local biodiversity.

Municipalities as Climate Leaders

Municipalities championing climate action can utilize SECAP implementation to **gain support for PCP adoption across various administrative functions**. This can lead to a broader recognition of PCP's problem-solving capabilities.

PCP and SECAP: A Synergistic Approach

In summary, PCP offers **proactive solutions**, tailored to each municipality's unique needs, allowing for a quicker response to climate challenges. Despite potential upfront costs, PCP can lead to substantial long-term savings, making it cost-effective. Moreover, it drives innovation and benefits society as a whole.

PCP integrated into SECAPs enhances energy, water, and material savings, reduces pollutants and greenhouse gas emissions, improves public services,

stimulates green innovation, and ensures cost savings over the product life cycle.

Box 3: Earth Observation

Environmental observation involves collecting and monitoring information and data regarding changes and trends in industrial, economic, and global environments. These pieces of data help researchers understand changing environments to inform potential changes in things like climate change policies and disaster relief plans. **Earth Observation (EO)** is defined as the process of acquiring observations of the Earth's surface and atmosphere via remote sensing instruments. The acquired data is usually in the form of digital imagery. EO satellites have been essential to identifying and monitoring climate change and it supports mitigation and adaption measures by providing vast amount of EO data.

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In summary, PCP offers **proactive solutions, tailored to each municipality's unique needs**, allowing for a quicker response to climate challenges. Despite potential upfront costs, PCP can lead to substantial long-term savings, making it cost-effective. Moreover, it drives innovation and benefits society as a whole.

PCP integrated into SECAPs enhances energy, water, and material savings, reduces pollutants and greenhouse gas emissions, improves public services, stimulates green innovation, and ensures cost savings over the product life cycle. Ultimately, **this approach makes innovative solutions more appealing to consumers, fostering a culture of sustainability**.

Contact PROTECT: info-protect@group-gac.com

Policy Brief Technology Readiness Levels to identify the maturity of Climate Services

The PROTECT Project

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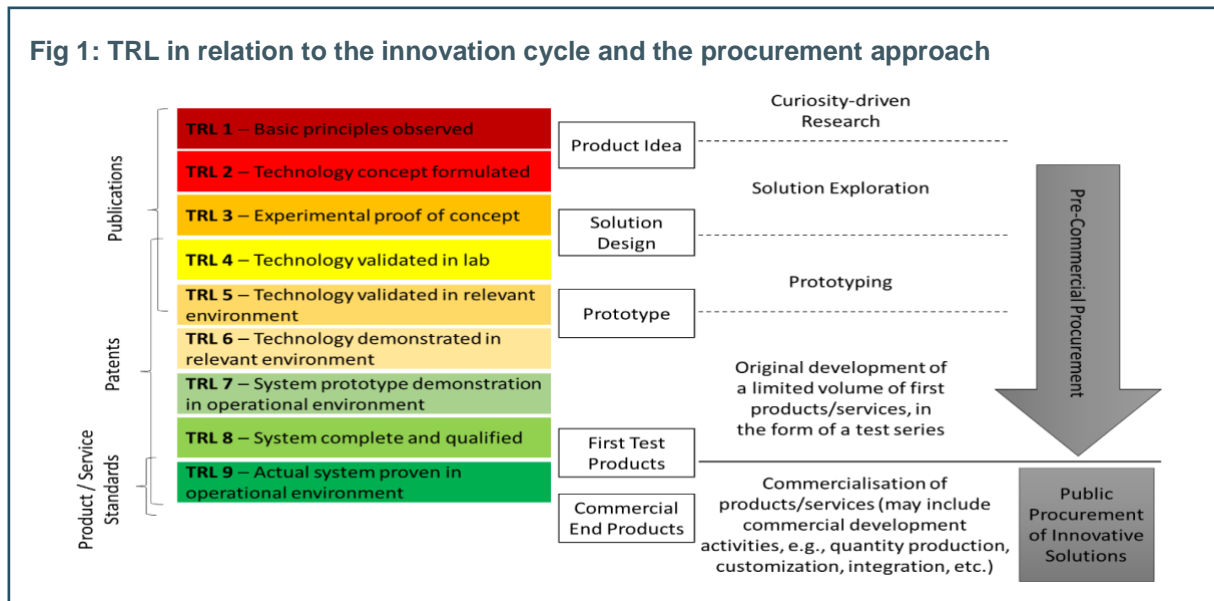
Summary

- The stages of technology development can be illustrated by and agreed upon the concept of '**Technology Readiness Levels**' (TRL).
- There are 9 Technology Readiness Levels, ranging from 1 (fundamental research) to 9 (early deployment of near-commercial technologies).
- Each of these stages **relate to specific activities covered by Pre-Commercial Procurement (PCP) or by Public Procurement of Innovative solutions (PPI)**.
- The TRL framework is relevant for the assessment of the maturity of Climate Services (CS).
- **CS technologies at TRL 6 can be demonstrated in a relevant environment**, while at TRL 7 the system prototype is demonstrated in an operational environment.
- At TRL 8 a CS system is **complete and qualified**.
- At TRL 9 the actual CS system is **proven in operational environment**.

Recommendations on the TRL assessment

- Public organisations across Europe can **make strategic use of public procurement instruments** towards innovative and sustainable solutions including Climate Services.
- A state-of-the-art analysis and a sound market consultation can provide information to assess the maturity of available solutions.
- Essentially, **solutions at a lower TRL** (e.g., TRL 3-5) that may require further development, **could be tackled through a PCP**.
- **Solutions at higher TRL** (e.g., TRL 7-9), on the other hand, **can be procured through a PPI** approach using any of the different types of contracting procedures as established in the EU Public Procurement directives.
- A common understanding and good assessment of the TRL concept is essential to define the procurement strategy.

Fig 1: TRL in relation to the innovation cycle and the procurement approach



Introduction

The different typical stages of technology development are explained and broken down using the concept of ‘**Technology Readiness Levels**’ (TRLs, see Fig. 1). There are 9 TRLs, ranging from 1 (fundamental research) to 9 (early deployment of near-commercial technologies).

Each of these stages relates to specific activities covered by Pre-Commercial Procurement (PCP) or by Public Procurement of Innovative solutions (PPI).

The assessment of the TRL of a solution provides the grounds for a choice of procurement approach and procedure. Agreeing upon the definition of the levels of a TRL framework to understand the readiness of solution is also the basis for the evaluation and testing scheme.

Mapping Procurement with TRLs

While PCP focuses on the R&D phase prior to commercialization, PPI, which does not cover R&D, concentrates on the commercialization/diffusion of solutions. In other words, **PCP only covers the procurement of R&D services**, in a way that is clearly separated from any potential subsequent purchase of commercial volumes of end-products.

The boundaries of what R&D may cover under PCPs (which clarifies also how PCP maps to TRLs) are set by the following two legal frameworks: **the 2014 EU State aid framework for research, development and innovation (R&D&I)** and the **WTO Government Procurement Agreement (GPA)**.

PCP procures R&D covering solution exploration and design, prototyping, original development and validation/testing of a limited volume of first products or services in the form of a test series.

According to Article XV (1)(e) of WTO GPA 1994 and Article XIII(1)(f) of the revised WTO GPA 2014, which **defines original development as the boundary of where R&D stops**, original development of a first product or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for production or supply in quantity to acceptable quality standards, but does not include quantity production or supply to establish commercial viability or to recover R&D costs.

This fits with the 2014 EU State aid framework for research, development and innovation (R&D&I), which states that **in order for PCP to exclude State aid, the object of a PCP contract must fall within one or several categories of research and development** defined in this framework and must be of limited duration, it may include the development of prototypes or limited volumes of first products or services in the form of a test series but the purchase of commercial volumes of products or services must not be an object of the same contract. The **R&D categories** defined in the [R&D&I State aid framework](#) that may thus be covered by PCP are listed below.

R&D Categories

'fundamental research' means experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct commercial application or use in view;

'industrial research' means the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components parts of complex systems, and may include the construction of prototypes in a laboratory environment or in an environment with simulated interfaces to existing systems as well as of pilot lines, when necessary for the

industrial research and notably for generic technology validation;

'experimental development' means acquiring, combining, shaping and using existing scientific, technological, business and other relevant knowledge and skills with the aim of developing new or improved products, processes or services. This may also include, for example, activities aiming at the conceptual definition, planning and documentation of new products, processes or services. Experimental development may comprise prototyping, demonstrating, piloting, testing and validation of new or improved products, processes or services in environments representative of real life operating conditions where the primary objective is to make further technical improvements on products, processes or services that are not substantially set. This may include the development of a commercially usable prototype or pilot which is necessarily the final commercial product and which is too expensive to produce for it to be used only for demonstration and validation purposes. Experimental development does not include routine or periodic changes made to existing products, production lines, manufacturing processes, services and other operations in progress, even if those changes may represent improvements. The latter are considered innovation / commercial development activities.

Types of Innovation

On the other hand, PPIs do not procure R&D but innovative commercial end-products/ services. **A PPI is started when products/ services are near-to-the market or already on the market in small quantities.** In order to deliver those innovative solutions with the required quality/price level to the procurer for the PPI, vendors may still need to do 'innovation' activities e.g. to customise existing solutions to specific client needs and/or scale up their production chain from R&D to commercial production volumes. According to the 2014 EU State aid framework for research, development and innovation (R&D&I), 'innovation' activities include:

‘organisational innovation’

the implementation of a new organisational method in an undertaking’s business practices, workplace organisation or external relations, excluding changes that are based on organisational methods already in use in the undertaking, changes in management strategy, mergers and acquisitions, ceasing to use a process, simple capital replacement or extension, changes resulting purely from changes in factor prices, customisation, localisation, regular, seasonal and other cyclical changes and trading of new or significantly improved products;

‘process innovation’: the implementation of a new or significantly improved production or delivery method (including significant changes in techniques, equipment or software), excluding minor changes or improvements, increases in production or service capabilities through the addition of manufacturing or logistical systems which are very similar to those already in use, ceasing to use a process, simple capital replacement or extension, changes resulting purely from changes in factor prices, customisation, localisation, regular, seasonal and other cyclical changes and trading of new or significantly improved products.

Policy implications

Innovation policy is essential for advancing the transition to a green economy, sustainable development and environmental stewardship. By promoting the innovation of Climate Services can have an impact on climate change mitigation and adaptation. To understand the potential of existing off-the-shelf services and identify technology gaps where R&D is needed a

maturity requires the assessment on standard TRL framework.

Relation between PCP and TRLs

As explained under footnote 40 of the 2014 EU R&D&I State aid framework, the different R&D categories¹ can also be considered to correspond to Technology Readiness Levels 1 (fundamental research), 2-4 (industrial research – the type of by activities targeted by phase 1 of a PCP) and 5-8 (experimental development – the type of activities targeted by phase 2 and 3 of a PCP)². As PCP is driven by a specific procurement need (with a concrete use case in mind), fundamental research is not the aim of a PCP. Procurers launching a PCP have a concrete use case/application for the innovative solutions in mind so they will launch a PCP call for tender that does not request providers to undertake "fundamental" research but "applied" R&D: industrial research and experimental development including field testing (so PCP call for tenders will call for R&D activities ranging in between TRLs 2-8). However, it is possible that during a PCP some vendors realise that they could achieve better applied R&D results if they further elaborate some fundamental research aspects related to their solution approach. If they decide to do this, it is up to them to do that within the budget and timeline of the ongoing PCP.

In cases where the final end-products of a PCP do not need to be produced in large quantities and the procurer requests to obtain the limited set of end-products that results from phase 3 testing at the end of the PCP, then in fact TRL 9 does not exist and TRL 8 covered by the PCP equals the final commercial deployment of the end-products. In some cases, even TRL 6-7 may not exist and then TRL 9 meets TRL 6. This happens for example when the prototype consists of the final end-product and there is no

¹ Due to the multiplicity of TRL classification systems and their generic description, it is not possible to provide a concrete and generally applicable mapping of TRLs. See point 31 in: [Revision of the Frascati Manual: Chapter 8. Government Sector R&D \(oecd.org\)](#)

² According to this framework, when classifying different activities according to the relevant category,

the Commission will refer to its own practice as well as to the specific examples and explanations provided in "The Measurement of Scientific and Technological Activities, Proposed Standard Practice for Surveys on Research and Experimental Development", Frascati Manual, OECD, 2002.

need of any mass production / large scale testing nor integration with other components. The whole R&D trajectory of a typical product would normally be less complex and lengthy as the TRL scale may suggest.

Whereas mapping this TRL scale and sequence of steps may not apply to every procurement process or to all sectors³, it provides a guidance scheme to understand the progress in terms of 'technology maturity' that the solutions of vendors are making as the R&D progresses during the PCP. For example, a procurer may use TRL levels to compare the level of maturity of solutions at different milestone points in a PCP (e.g. at the end of phase 1/2/3). Another example is the TRL table below that refers to software development.

TRL	Definition
1	Preliminary algorithmic stage. Publication of research results.
2	Individual algorithms or functions are prototyped.
3	Prototype of the main functionalities of the integrated system.
4	Alpha version. Preliminary release of non-mature software version; distributed to a community at an early stage of the software development life-cycle; that implements the main functionality of the software and by which preliminary verification and validation activities are archived.
5	Beta version. Preliminary release of non-mature software version; distributed to a community at an early stage of the software life-cycle, that implements the complete functionality of the software and by which preliminary verification and validation activities are archived.
6	Ready for use in an operational or production context, including user support, as a building block or a tool.
7	Demonstrator. Building block and tailored generic software product qualified for a particular purpose.
8	System qualified and ready to be applied in an operational environment.
9	Has been applied in the execution of an operational environment

Relation between PPI and TRLs

PPIs do not procure R&D but commercial volumes of innovative commercial end-

³ The TRL scales were originally developed by the defense/space sector where complex systems of several subcomponents exist, and the security/safety

solutions that correspond to TRL level 9 (system proven in operational environment). To ensure that the solutions that are offered by potential bidders for the PPI meet this requirement, it is wise that the procurer requires vendors to demonstrate proof of compliance via conformance testing, certification, labelling before awarding the PPI contract.

A mistake often made is that procurers sign PPI procurement contracts for deploying commercial volumes of end-solutions at a point in time when TRL level 9 has not been reached yet. They discover only during contract implementation that they have locked themselves into a contract with a suboptimal vendor, who is in reality not able to deliver the solution (the vendor had in reality not finished R&D yet before signing the PPI contract and the technological risk of R&D failure is carried into the PPI contract). Or they are stuck with a vendor who needs significant extra time and budget to deliver the solution with the required performance / price levels. In some sectors (e.g. e-health) this leads to 70% of contracts not reaching the initial objectives, with colossal budget and time overruns or even total contract failures as a result. Preventing risk of failure for large scale PPI contracts is one of the main reasons for using separate procurements/contracts for R&D (PCP) and deployment (PPI).

Conclusion

The role of innovation policy is vital in driving the development and deployment of Climate Services (CS). Effective innovation policies fostering the strategic use of innovation procurement have the potential to drive economic growth, protect the environment, and improve social welfare, creating a pathway towards a more sustainable and inclusive future. In this context, a common understanding of the TRL framework is essential to define the starting and ending TRL of solutions to be procured.

requirements are so high that the quality of a first prototype is never ready/reliable enough to use as final end-product.