PROCURING INNOVATIVE CLIMATE CHANGE SERVICES

# Cross-analysis of climate services and barriers

## 1. Outcomes and conclusions of the cross-analysis

Various types of analyses have been considered in under the tasks of the project contained in D1.2. They all look at different aspect of climate services and pre-commercial procurement, with the aim of providing clear potential paths and identifying spaces where needs and opportunities would meet and where innovation procurement could bring relevant formats to optimise the match between supply and demand.

At this stage of the project, comparing the outcomes from Tasks 1.1, 1.3 and 1.5 shows broad consistency across scales between priority needs that could be addressed through, or supported by climate services. However, it also confirms that each level – European Union policies, national strategies and plans, main challenges and risks as highlighted in regional documents and surveys, challenges identified by individual procurers – brings up complementary perspectives that reflect different perimeters and levers for action.

Notably, the granularity exhibited in the desktop research on regional challenges is less detailed than some of the needs that were surfaced in workshops as a result of direct interaction with stakeholders, e.g., waste fires or climate impacts associated with illegal dumping. While some of the documents that fed into the table of climate challenges per region contain more specific elements than can be found in that table, they generally remain more generic than the above-mentioned needs. Information collected in the T1.3 work to source and analyse climate services, technologies and providers, can be quite precise as some of the providers are focusing on niches, both in terms of technology and of envisioned customer segments, but their potential applications frequently – and understandably – span wider scopes than those needs.



A few showcases have been considered below. They are based on intersections between findings from the various tasks, combined with desktop research and expert knowledge within the consortium.

The following showcases have exemplative, and non-restrictive scope. They serve as examples of how findings from the various tasks can be crossed in the search for potential PCP topics. Examples other than these showcases can be similarly drawn using the findings, as published in the annexes of the document. All of these initial findings are subject to further rounds of validation. At the same time, the showcases in the following pages are the most complete instances coming out of this initial cross-analysis, in terms of looking at whether, based on the available information, the following criteria are met, simultaneously and to the highest possible extent of overlap:

(i) there is a clear (abstract) climate challenge perceived by a number of potential procurers, as per the analysis in T1.1.2

(ii) there is a (specific) need for a climate service (expressed by a potential procurer in T1.5 or perceived by the consortium, based on their expertise)

(iii) there is room for climate services using EO beyond those available off-the-shelf today and analysed in T1.3 (as otherwise, there would be no need of PCP) and potential providers which may be interested in participating in the PCP



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(iv) the above criteria intersect and point to a precise (narrow or broad) topic or intersections of topics prone to be (after further validations) subject of PCP, or -at the very least- to draw potential procurers together around their interest and willingness to discuss the topic.

| Showcase title (T1.5) | **Challenges presented by water scarcity** |
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| Domain (cross-analysis) | Energy and utilities<br>(also AFOLU, Sustainable urban communities, Marine and coastal) |
| Explanation (T1.5) | Droughts can put stress in the provision of water for different uses, such as irrigation, drinking water. This can be felt in terms of water quantity but also of deterioration of the water quality. The depletion of water sources (e.g. less water in the rivers due to lack of melting ice from mountains) may be overcome by connecting the supply and demand of sweet water with data from the whole water cycle with insights - including for sectors that are not always connected (e.g., on sewage system water and the requirements of treated water for farming) and a common language/taxonomy. |
| Concerned climate challenges (T1.1.2) | Drought and water related issues are threats found in the largest number of regions. More frequent and longer periods of drought are notably expected in Germany (Baden-Württemberg, Brandenburg, Saxony, Thuringia), northern and southern Italy, across the Netherlands and Spain (Andalusia, Castilla-Mancha, Canarias, Catalonia, Extremadura, Galicia); they are often coupled with water quality and quantity concerns (Brussels region and several Flemish regions, Emilia-Romagna, Lombardy, Apulia, Aragon, most regions across France, Lithuania), causing competition for water between urban and agricultural use (e.g. Sardinia), stress in natural ecosystems, agriculture and forestry (north-western Germany, Balearic Islands), risks of desertification (Basilicata, Calabria, Emilia-Romagna, Sicilia). Closely related is the issue of water scarcity and associated threats of lower water recharge and decrease in aquifer levels (e.g. PACA, Apulia, Piedmont, Balearic Islands, the Netherlands), risks on pastures and fodder (Poland) and vegetation areas (e.g. Thuringia).<br>Increased frequency of droughts and of heatwaves is a concern from Lithuania and Poland to Spain, from Belgium to France, Germany, Italy and Greece, with consequences both on water quality and quantity and indirectly on other economic sectors, e.g. energy production (water scarcity in highly industrialised regions of western Germany and in Marche, impact of hotter waters in parts of Belgium, France, Italy, Lithuania). More broadly, hydrogeological instability threatens regional water balance and availability, from southern Germany to southern Italy.<br>General hydrogeological instability (western and eastern Italy) can also be combined with more frequent droughts and change in rainfall regime (e.g. Liguria).<br>For coastal regions, coastal water issues include increased saltwater intrusions, risks of salinization and freshwater & drinking water shortages (western France, Emilia-Romagna, Spain, the Netherlands…), decreased water quality (Lithuania, Tuscany, bathing water quality in the Netherlands), stress on the aquatic ecology notably due to high water temperatures, sea acidification (northern Germany, Canarias, Galicia, Murcia with reduced capacity of carbon storage), toxic algae (Catalonia, Italian lakes)." |
| Possible scopes (cross-analysis) | - need for finer management of scarce water resources across levels of quality as much as between competing uses (incl. effects on energy production, on agriculture, on aquatic ecology)<br>- competition between urban, agricultural and other use of water<br>- need for quicker and more agile access to shared data to inform consistent decision-making across user segments |



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| Relevant EU legislation (T1.1.1) | The EU Water Framework Directive 2000 (WFD) is arguably the most important, far-reaching, water legislation ever to emerge from the EU. It was transposed into law in EU Member States by the end of 2003. In addition to chemical water quality targets, ecological objectives have been set for each water body. A key aim of the WFD is for all water bodies to achieve 'good ecological and chemical status'. The original target for achieving good status was 2015, but further deadlines have been set for 2021 and 2027. |
| Companies offering EO-based CS in similar domains (T1.3) | EOMAP / Water quality online, FutureWater, InSitu-Systems, MEOSS, Nelen & Schuurmans: 3Di Water Management, Research Institute of Water and Environmental Engineering (IIAMA) / The HuT<br><br>Agri Dataservices BioScope BV, Arpae SIMC, BlackShore, BlueHorizon, constellr, FIC / Ensembles, HSS / Garbal, Murmuration, Terranis / Pixagri, VisioTerra / MISBAR, VorteX, Water Insight |
| Possible topics for PCP (cross-analysis) | **Finer management of scarce water resources across levels of quality as much as between competing uses (e.g. in mixed urban / agricultural areas)** |

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| Showcase title (cross-analysis) | **Supporting the transition towards green energy** |
| Domain (cross-analysis) | Energy and utilities<br>(also: Sustainable urban communities, Marine and coastal, Civil security and protection) |
| Explanation (cross-analysis) | Europe is aiming at leading the way towards renewables for the purposes of both increased sustainability and geopolitical independence. Many climate services exist and more can be developed around renewable energy (solar, wind and others). As energy storage is still a critical point to maximise the energy efficiency of renewables, Earth observation data can be extremely valuable in forecasting energy peaks, as well as more broadly, for planning and monitoring purposes. |
| Concerned climate challenges (T1.1.2) | Several challenges are widely shared across Europe. Increased frequency of droughts and of heatwaves is a concern from Lithuania and Poland to Spain, from Belgium to France, Germany, Italy and Greece, with consequences both on water quality and quantity and indirectly on other economic sectors, e.g. energy production (water scarcity in highly industrialised regions of western Germany and in Marche, impact of hotter waters in parts of Belgium, France, Italy, Lithuania). More broadly, hydrogeological instability threatens regional water balance and availability, from southern Germany to southern Italy. The multiplication of extreme events – flooding, either extreme rainfall or sea level rise, threatens to disrupt energy production in Germany, Lithuania, Poland; frost is mentioned as a disrupting factor in some Polish regions, but also in Tuscany (affecting water provision), as can be tree falls resulting from storms e.g. in Finland. Increase in other more specific risks ranges from water pollution, landfill flooding and fires (Lithuania) to peak flood discharges (northern Germany) or consequences of ocean acidification on infrastructures (western France). Systemic risks such as coupled issues on water availability or quality and energy production are amplified in densely populated areas such as the Berlin and Paris regions. Cascading effects are expected as energy demand rises (e.g. during heatwaves, in Italy but also in less hot countries such as the Netherlands or Slovakia), water reserves are put under growing strain, and the effects of suboptimal insulation and energy efficiency of buildings across Europe are aggravated by climate change. |
| Possible scopes (cross-analysis) | - need for more integrated forecasting capabilities (including between different energy sources)<br>- need for a more agile system for water-based energy due to draughts |



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| Relevant EU legislation (T1.1.1) | **2030 climate & energy framework**<br>The 2030 framework proposes new targets and measures to make the EU's economy and energy system more competitive, secure and sustainable. It includes targets for reducing greenhouse gas emissions and increasing use of renewable energies, and proposes a new governance system and performance indicators.<br>**Renewable energy targets**<br>The energy sector is responsible for more than 75% of the EU's greenhouse gas emissions. Increasing the share of renewable energy across the different sectors of the economy is therefore a key building block to reach the EU's energy and climate objectives: (I) cutting greenhouse gas emissions by at least 55% (compared to 1990) by 2030 and (II) becoming a climate neutral continent by 2050<br>**The Clean energy for all Europeans package**<br>The Clean energy for all rules will bring considerable benefits for consumers, the environment, and for the economy. By coordinating these changes at EU level, the legislation also underlines EU leadership in tackling global warming and makes an important contribution to the EU's long-term strategy of achieving carbon neutrality (net-zero emissions) by 2050. |
| Companies offering EO-based CS in similar domains (T1.3) | CloudEO<br>SARWind<br>EOMAP Water Quality<br>FIC/ENSEMBLES<br>geopredict/CLIMFOR<br>HD Rain for Energy<br>Hydroclimat<br>Steadysun/Steadycast<br>SUEZ/Dynamic management of coastal waters<br>Ticinum Aerospace/Deep Property<br>YNSAT |
| Possible topics for PCP (cross-analysis) | **integrating data to address coupled issues on water availability or quality (incl. temperature) and energy production (focus on clean energy?)** |

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| Showcase title (T1.5) | **Waste management and related storage issues** |
| Domain (cross-analysis) | Sustainable urban communities<br>(also: Energy and utilities, Civil security and protection, AFOLU) |
| Explanation (cross-analysis) | Due to their complexity and importance, waste management systems could seek at tacking issues coming from climate and non-climate factors. Thermal monitoring and predicting waste fire can help avoid the spontaneous ignition in waste storages. Certain conditions (like the level of humidity, air temperature, hight of the pile of waste, etc.) are conducive to spontaneous waste ignition. This causes bad air quality and if not controlled on time it could cause material and/or human damage and loses. |
| Concerned climate challenges (T1.1.2) | Waste management appears little in the mapping, partly because associated climate challenges may pertain more to mitigation than to adaptation. However, waste management and storage issues should be coupled with adaptation challenges as some of the latter are likely to aggravate or complexify the impact of such issues; conversely, waste value chains are sufficiently important to be taken into account in adaptation plans. Taking this two-way perspective can allow to surface gaps and needs for (combinations / developments of) innovative products and services. |



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| | Cities are affected by many the challenges linked to other application domains, often at more acute levels due to the concentration of population and economic activities. Classic examples are heatwaves, who are generally expected to rise in frequency, duration and intensity, and urban heat islands mostly in meridional regions. Heatwaves are mentioned in almost every region of the mapping. Being characterised in comparison with average local temperatures, they remain globally hotter in more southern regions; however, they also come on top of climate challenges in regions that are generally cooler (from the northeast of France to the southern half of Finland) as local populations are much less used to dealing with abnormally high temperatures, both biologically and in terms of housing design, insulation and equipment. In many cases, e.g. in Spain and in parts of Italy, heatwaves and degradation of air quality are coupled and amplify each other's negative impact on human health.<br><br>Droughts, water quality and quantity concerns appear wherever they also affect energy and utilities: they have been a major challenge in the southern half of Europe for many years, where they are often linked with water scarcity including drinking water, but they are now also concerning countries such as Belgium, the Netherlands, the south of Germany.<br><br>Swelling and shrinking soils are also an increasingly common consequence of hydrogeological instability, for instance in southern France and in Italy: they primarily affect agriculture and land use but also create vulnerability for building foundations in urban areas, and sometimes landslide risks.<br><br>(possibly less relevant here)<br><br>One other frequently recurring challenge is the growing risk of flooding in urban areas, coming from heavy rainfall or from river overflow, marine submersion or sea level rise, often aggravated by soil degradation, itself amplified by droughts. Almost every province in Belgium and in the Netherlands is affected, as are some Greek, Italian, Polish and inland French regions. |
| Companies offering EO-based CS in similar domains (T1.3) | SENSORTEC |
| Possible topics for PCP (cross-analysis) | **Predicting and preventing waste fires** |

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| Showcase title (cross-analysis) | **Flooding in coastal areas** |
| Domain (cross-analysis) | Marine and coastal environment<br>(also: Sustainable urban communities, Civil security and protection, Energy and utilities) |
| Explanation (cross-analysis) | Floods pose risks to the cities in coastal areas leading to potential disaster. More insights into the phenomena are needed, overcoming data gaps and combining data in a timely manner.<br>Reliable mapping of flooded areas is needed for planning, preventing, predicting and for post event intervention, as well as for cooperation towards a positive end result. |
| Concerned climate challenges (T1.1.2) | With the exception of Slovakia, all countries addressed by this mapping have coastal regions.<br>Flooding risks are mentioned in almost all coastal regions, associated with sea level rise (French Mediterranean coastline, Liguria, Andalucia, Balears, but |



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| | also northern Germany and Poland, Asturias, Friuli Venezia Giulia), marine submersion (North and Baltic seas, Cantabria, Liguria, Provence Côte d'Azur), extreme rainfall, thunderstorms and gales (Poland, Cantabria), combinations of those factors (e.g. northern Germany, northern Spain, Netherlands, Lithuania, French Atlantic coast), general hydrogeological instability (western and eastern Italy) combined with more frequent droughts and change in rainfall regime (e.g. Liguria).<br><br>It may be relevant also to feed in elements related to flooding from other application domains: energy and utilities, sustainable urban communities, AFOLU.<br><br>The multiplication of extreme events – flooding, either extreme rainfall or sea level rise, threatens to disrupt energy production in Germany, Lithuania, Poland. Increase in other more specific risks ranges from water pollution, landfill flooding and fires (Lithuania) to peak flood discharges (northern Germany) or consequences of ocean acidification on infrastructures (western France).<br><br>One other frequently recurring challenge is the growing risk of flooding in urban areas, coming from heavy rainfall or from river overflow, marine submersion or sea level rise, often aggravated by soil degradation, itself amplified by droughts. Almost every province in Belgium and in the Netherlands is affected, as are some Greek, Italian, Polish and inland French regions.<br><br>More frequent or intense extreme events shall also impact land use, often in combinations (floodings, droughts, heavy rains, storms) from southwestern (Emilia Romagna, Lombardy, Aragon) to north-eastern Europe (Lithuania, Poland). Flooding risk will increase notably in agricultural areas (e.g. Åland, Lappi, Île-de-France, Thuringia, Sardinia, Veneto, Canary Islands…), amplified by destructive storms (e.g. east of France), more intense rainfall episodes (Friuli-Venezia Giulia, Tuscany) and globally increased precipitation (e.g. northern Slovakia), often causing faster surface run-off, less soil hydration, erosion (e.g. Poland). |
| Possible scopes (cross-analysis) | - water quality and quantity<br>- flood mapping (incl. post-event analysis) |
| Relevant EU legislation (T1.1.1) | Directive for Maritime Spatial Planning<br>Marine Strategy Framework Directive<br>(indirectly) |
| Companies offering EO-based CS in similar domains (T1.3) | CLS / FLOODAM, LITTOSCOPE DIGINOVE / TeleCense GECOSistema / SaferPlaces GMV / EOCLIMA Hydroclimat MEEO / FRIEND PREDICT SERVICES / EWS4ALL SUEZ France / Dynamic management of coastal waters Thales Services Numériques / Flood4Kast (WASDI / Floods) |
| Possible topics for PCP (cross-analysis) | **integrating real time analytics and mapping on a relevant range of risks: flooding, sea level rise, marine submersion, extreme rainfall and storms/gales**<br><br>**coupled data between above risks and infrastructural risks (multiplication of extreme events etc.)** |

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| Showcase title (T1.5) | **Illegal waste dumping** |
| Domain (cross-analysis) | Civil security and protection<br>(also: Sustainable urban communities, Marine and coastal environment) |



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| Explanation (cross-analysis) | When waste is dumped Illegally (in water or elsewhere), it may be difficult for law enforcement agencies to trace the responsible of criminal behaviour. It is also not possible to inform and prevent the flow of the waste cross-borders. There is no data which can be used in criminal proceedings as proof. |
| Concerned climate challenges (T1.1.2) | Many of the challenges pertaining to civil security and protection stem from other application domains. (Also see comments above on Waste management and storage.)<br><br>Increased frequency of droughts and of heatwaves is a concern from Lithuania and Poland to Spain, from Belgium to France, Germany, Italy and Greece, with consequences both on water quality and quantity and indirectly on other economic sectors, e.g. energy production (water scarcity in highly industrialised regions of western Germany and in Marche, impact of hotter waters in parts of Belgium, France, Italy, Lithuania).<br><br>The multiplication of extreme events – flooding, either extreme rainfall or sea level rise, threatens to disrupt energy production in Germany, Lithuania, Poland; frost is mentioned as a disrupting factor in some Polish regions, but also in Tuscany (affecting water provision), as can be tree falls resulting from storms e.g. in Finland. Increase in other more specific risks ranges from water pollution, landfill flooding and fires (Lithuania) to peak flood discharges (northern Germany) or consequences of ocean acidification on infrastructures (western France).<br><br>Cities are affected by many the challenges linked to other application domains, often at more acute levels due to the concentration of population and economic activities. Classic examples are heatwaves, who are generally expected to rise in frequency, duration and intensity, and urban heat islands mostly in meridional regions. Heatwaves are mentioned in almost every region of the mapping. Being characterised in comparison with average local temperatures, they remain globally hotter in more southern regions; however, they also come on top of climate challenges in regions that are generally cooler (from the northeast of France to the southern half of Finland) as local populations are much less used to dealing with abnormally high temperatures, both biologically and in terms of housing design, insulation and equipment. In many cases, e.g. in Spain and in parts of Italy, heatwaves and degradation of air quality (as well as increase in allergens such as pollens, often linked to northbound migration of vegetal species, and in infectious diseases gaining ground) are coupled and amplify each other's negative impact on human health.<br><br>One other frequently recurring challenge is the growing risk of flooding in urban areas, coming from heavy rainfall or from river overflow, marine submersion or sea level rise, often aggravated by soil degradation, itself amplified by droughts. Almost every province in Belgium and in the Netherlands is affected, as are some Greek, Italian, Polish and inland French regions.<br><br>Swelling and shrinking soils are also an increasingly common consequence of hydrogeological instability, for instance in southern France and in Italy: they primarily affect agriculture and land use but also create vulnerability for building foundations in urban areas, and sometimes landslide risks.<br><br>Flooding risks are mentioned in almost all coastal regions, associated with sea level rise (French Mediterranean coastline, Liguria, Andalusia, Balearic Islands, but also northern Germany and Poland, Asturias, Friuli Venezia Giulia), marine submersion (North and Baltic seas, Cantabria, Liguria, Provence Côte d'Azur), extreme rainfall, thunderstorms and gales (Poland, Cantabria), combinations of those factors (e.g. northern Germany, northern |



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| | Spain, Netherlands, Lithuania, French Atlantic coast), general hydrogeological instability (western and eastern Italy) combined with more frequent droughts and change in rainfall regime (e.g. Liguria).<br><br>Coastal water issues include risks of salinization and freshwater & drinking water shortages (western France, Emilia-Romagna, Spain, the Netherlands…), decreased water quality (Lithuania, Tuscany, bathing water quality in the Netherlands). Effects of climate change are also seen inland: higher risks of land subsidence and of peat oxidation (northern Netherlands), of landslides (Pomerania), biodiversity loss, affected endorheic ecosystems, eutrophication of water bodies, damaged ecosystem services (Asturias, Emilia-Romagna, Galicia, Bremen). Systemic issues are highlighted, such as the increasing tension between urbanisation and vulnerable natural environments. |
| Possible scopes (cross-analysis) | - illegal waste dumping<br>- use of satellite-based evidence to identify perpetrators and as evidence before courts |
| Relevant EU legislation (T1.1.1) | Likely forbidden by national laws. |
| Companies offering EO-based CS in similar domains (T1.3) | MEOSS<br>SENSORTEC<br>YNSAT |
| Possible topics for PCP (cross-analysis) | **Illegal waste dumping** |



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| Showcase title (cross-T1.5) | **Building and restoring climate-resilient infrastructure** |
| Domain (cross-analysis) | Civil security and protection<br>(also: Sustainable urban communities, Energy and utilities) |
| Explanation (cross-analysis) | Infrastructure is, ideally, built to last. Nonetheless, the current best practices do not always take into consideration the latest and future evolution of the climate crisis, thus not accounting for the increased number and frequency of extreme events when building or restructuring resilient infrastructure. |
| Concerned climate challenges (T1.1.2) | Some challenges are very widely shared across countries and regions, notably those related to flooding risks and a range of others, separately or in combination: heavy rainfall, storms and hailstorms, sea level rise, groundwater rise, river overflow, marine submersion, landslides, mudflows, avalanches… affecting land use, urbanised areas and built environments, critical infrastructures, energy and water production, transportation and mobility; to severe droughts and acute water scarcity; to forest fires; to increasingly intense, frequent and longer heatwaves, which can also trigger cascading effects and disrupt key value chains; to swelling and shrinking soils. |
| Possible scopes (cross-analysis) | - planning of new resilient infrastructure<br>- making existing infrastructure more climate-change-resilient<br>- monitoring of multiple (integrated) risks |
| Relevant EU legislation (T1.1.1) | The European Green Deal aims to transform Europe into a greener, more sustainable, and climate-resilient continent by promoting the efficient use of resources, reducing greenhouse gas emissions, protecting the environment, and fostering sustainable innovation and economic development, while ensuring a just and inclusive transition for all stakeholders. |



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| Companies offering EO-based CS in similar domains (T1.3) | CloudEO<br>SARWind<br>EOMAP Water Quality<br>FIC/ENSEMBLES<br>geopredict/CLIMFOR<br>HD Rain for Energy<br>Hydroclimat<br>Steadysun/Steadycast<br>SUEZ/Dynamic management of coastal waters<br>Ticinum Aerospace/Deep Property<br>YNSAT<br>CLS / FLOODAM, LITTOSCOPE<br>DIGINOVE / TeleCense<br>GECOSistema / SaferPlaces<br>GMV / EOCLIMA<br>Hydroclimat<br>MEEO / FRIEND<br>PREDICT SERVICES / EWS4ALL<br>SUEZ France / Dynamic management of coastal waters<br>Thales Services Numériques / Flood4Kast<br>(WASDI / Floods) |
| Possible topics for PCP (cross-analysis) | **integrating data to anticipate and react to cascading effects as energy demand rise**<br><br>**also as above: integrating real time analytics and mapping on a relevant range of risks: flooding, sea level rise, marine submersion, extreme rainfall and storms/gales, coupled data between above risks and infrastructural risks** |



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| Showcase title (1.5) | **Detecting climate vulnerability in agriculture and planning resilience** |
| Domain (cross-analysis) | AFOLU |
| Explanation (cross-analysis) | The climate crisis is putting more and more and more pressure on agricultural species. Information and forecasting of the environmental conditions, combined with other data can be a valuable input for mitigation actions. |
| Concerned climate challenges (T1.1.2) | Climate change will hit productivity. Agricultural yield may decrease in very different contexts (Centre-Val de Loire, Saarland, Berlin, Hessen, Mecklenburg-Vorpommern, Emilia Romagna, Liguria, Marche, Sardinia, Tuscany, the Netherlands, Castilla-Leon, Murcia…), linked with higher evaporation (southern Spain), shorter crop maturation due to higher average temperatures (Galicia), higher risk of loss of nutritional value (Sardinia). Plants and animals may reach their adaptation limits (e.g. Hessen, Saxony). Impacts on agriculture will often depend on species. A risk on fruit and vine already observed with increasing frequency is linked to frost risk during flowering, which can trigger earlier harvests (e.g. PACA). Other challenges come from thinner snow cover (alpine Italian regions), higher volatility of snow cover and vegetation periods (Lithuania), negative consequences on permafrost (Trentino Alto Adige). Generally, there are fears of more inadequacy of precipitation cycles to seasonal agricultural needs (e.g. in Poland). Forests shall suffer as well with degradation risks (e.g. PACA, Saarland), high vulnerability of species to droughts and parasites (Wallonia, Grand Est, Île-de-France, Pays de la Loire); in contrast, forests are expected to extend further in Lappi, which may provoke albedo reduction. Higher risks of infectious diseases, pests, fungi, also invasive species are foreseen everywhere, linked |



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| | or not to the migration of species (e.g. Grand Est, Galicia, Bavaria, North Rhine-Westphalia, Saxony, Thuringia, northern Italy, regions across Spain – Aragon, Asturias, Canary Islands, Extremadura, Navarra, Valencian Community); longer wet periods and modified climate patterns will probably increase diseases, mosquitoes and pests (the Netherlands). Other negative developments concern eutrophication in the summer (e.g. Saarland), increased oxidation by ozone and high concentrations of ozone and air pollutants in dry seasons that can also affect plant growth (Île-de-France, Saarland), risks on pasture lands (PACA), even threats to reindeer husbandry (Lappi – the rest of Finland expects mixed or overall slightly positive effects of climate change).<br>Biodiversity threats are also more and more emphasised (Antwerp, Brussels, most French regions and half of Spanish regions including Canary Islands, Lower Saxony, Emilia Romagna, Liguria, Aosta Valley…); more broadly, biodiversity displacement and change, migration of alien species, combined with other phenomena such as tropicalisation, might have more mixed impacts (Bavaria, North Rhine-Westphalia, Saxony, Thuringia, Friuli Veneto Giulia, Piedmont, Murcia, Poland…). Other expected changes whose effects have yet to be further assessed include changes in seasonal rhythms, modification of flowering cycles (e.g. Centre-Val de Loire), potentially longer and more productive agricultural seasons as well as timber production expected to increase but more vulnerable to the extreme weather events (Aosta Valley), extension of the growing period and vegetation cycles (eastern Slovakia, Poland). |
| Possible scopes (cross-analysis) | - decrease of agricultural yield<br>- plant and animals hitting their adaptation limits, lower tolerance to pests and parasites<br>- thinner snow cover<br>- biodiversity risks |
| Relevant EU legislation (T1.1.1) | A Farm to fork strategy<br>New CAP (2023-2027) |
| Companies offering EO-based CS in similar domains (T1.3) | Will depend on narrower / more clearly defined scope |
| Possible topics for PCP (cross-analysis) | **Increased coordination on data for land use between sectoral public bodies, EO and climate/weather services and stakeholders/users across scales** |

The above showcases are only exemplative. However, they attest to several possible, and complementary, ways forward to progress towards relevant PCP preparations by the end of the project.

# 2. Way forward

The specific needs mentioned above will be further explored with the procurers who pushed them forward. Consortium members shall investigate whether organisations in their respective networks (in particular regional and metropolitan or municipal authorities) could share a common interest for the same needs and could be willing to engage in a dialogue to understand similarities and differences in their respective place-based perception of these needs, with the aim to increase the critical mass of procurers interested and their aggregated capacity to reach out to the market.

The needs will be linked with broader patterns and clusters of regions identified through the mapping of regional challenges. This may help approach more proactively public procurers across regions that



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share common priority climate challenges related to the above-mentioned needs, while potentially widening the scope of CS applications around those needs, which could help engage further units and stakeholders once interested procurers are found and consolidate demand, increasing benefit for procuring organisations and visibility for providers.

This work to consolidate demand and benefits for both the procurer and the provider sides will be further informed and refined by going back in greater detail to the relevant regional plans and surveys and EU, national and regional regulations. This shall be crossed with findings on national procurement legal frameworks, providing guidance to procurers interested in pursuing work towards possible PCPs while navigating more efficiently and effectively the possibilities of, or barriers to joint cross-border procurements linking the countries of the identified procurers.

Conversely, in the second and last year of the PROTECT project, we shall seek to surface other granular needs in thematic areas where the analysis of climate challenges and risks across regions, complemented by findings from other sections of this document, suggest strong potential added value for PCPs to unlock climate service development and use. The same steps as above shall be used to confirm or infirm the capacity to gather viable groups of public procurers to work on possible such PCPs.





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