



PIISA

Piloting Innovative Insurance
Solutions for Adaptation

D2.2: Pilot process and technical requirements guideline for piloting, pilots' analysis and Loops performance, including iteration steps

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guideline for piloting, pilots' analysis and Loops performance, including iteration steps

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Table of contents

Introduction	8
1 General approach	9
1.1 The Pilot process	9
1.2 Guidelines for climate-service co-creation	10
2 The Living documents: a snapshot on PIISA Pilots	11
2.1 Cities and Well-Being	11
2.1.1 Green roofs	11
2.1.2 Climate adaptation dashboard	22
2.2 Food and Agriculture	34
2.3 Forests and Forestry	46
2.3.1 Development based on existing insurance	46
2.3.2 New insurance schemes	59
Conclusion	71

Summary

Deliverable 2.2 - Pilot process and technical requirements guideline for piloting, pilots' analysis and Loops performance, including iteration steps collects the result of the first activities of Task 2.2, in the period M1-M6. Task 2.2 is part of Work Package 2 (WP2) that focuses on innovation in adaptation and climate services for insurance. In particular, it translates the end-user needs identified in both WP1 - Innovations in insurance solutions and WP3 - Pilots into sound scientific and technical requirements for service development. These requirements must meet the needs of the users and consider what is reasonable and feasible from a scientific point of view. Such requirements will feed T2.3 where the services for the Pilots are actually co-developed with users.

This document provides an overview of the current understanding of the Pilots, including the general context, the problem statement, the possible approach to overcome the problem, and the foreseen climate service to support the solution. The results are presented within the Living documents of each Pilot. Living documents are “dynamic” documents shareable among partners and continuously updated during the bimonthly meetings to be planned with all the Pilot leaders. These documents will track the evolution of products and services during the lifecycle of the PIISA project.

The Living documents have been used until now to collect information about our current understanding on the Pilot context and objectives, and to plan the first period of activities. It proved itself useful to gather information in a structured, comprehensive and general way. It also supports the splitting of the work in small chunks, called Phases, that help an effective monitoring of the activities and an early identification of risks and delays. Moreover, it includes clear checkpoints to draw conclusions and plan the work ahead. Finally, it facilitates the cooperation with other WPs and other projects.

Keywords

Climate services, climate change adaptation, piloting, co-creation, insurance.

Abbreviations and acronyms

Acronym	Description
WP	Work Package
GA	Grant Agreement
EB	Executive Board
TRL	Technology Readiness Level
KPI	Key Performance Indicator
EU	European Union
CMCC	Fondazione Centro Euromediterraneo sui Cambiamenti Climatici
BSC	Barcelona Supercomputing Center
FMI	Finnish Meteorological Institute (Ilmatieteen Laitos)
PoliMi	Politecnico di Milano
Tyrsky	Tyrsky-Konsultointi oy

Introduction

PIISA, which stands for Piloting Innovative Insurance Solutions for Adaptation, is an innovative project which seeks to develop cutting-edge insurance products promoting a virtuous interaction between risk sharing and reduction.

Within this framework, Work Package 2 (WP2) focuses on innovation in adaptation and climate services for insurance. In particular, it aims to identify the users' expectations to create new products for the insurance sector, determine the technical and scientific requirements of the services for each Pilot, including specific climate indices and methodologies to be applied, co-design and co-develop services that meet the users' needs of each Pilot, and cooperate with the Risk Data hub for the integration of new datasets. As such, WP2 is tightly connected with WP3. WP3 manages the PIISA Pilots, i.e., advanced products and services, or new innovative concepts that evolve through iterative development work. In PIISA, Pilots are organised into three distinct categories covering the following sectors: Cities and Well-being, Agriculture, and Forests. A common key effort in each pilot is to collect feedback through surveys, interviews, and workshops in the areas where the pilot is developed as well as in regions with potential for growth, replication and other amplification processes for wider uptake within the EU.

Task 2.3 translates the end-user needs identified in both WP1 and WP3 into sound scientific and technical requirements for service development. These requirements must meet the needs of the users' and consider what is reasonable and feasible from a scientific point of view. The foreseen outputs are a set of at least 3 climatic indicators, taking into account the role of extreme events and compound extreme events, and innovative climate analysis methods, spanning bias correction, downscaling and methods to identify extreme events. Such outputs will feed T2.3 where the services for the Pilots are actually co-developed with users.

Deliverable 2.2 collects the result of the first activities of Task 2.2, in the period M1-M6. T2.2 will then continue until M33. This document entails the guidelines for piloting and goes hand in hand with D3.1 on Pilot process and technical requirements guideline for piloting, pilots' analysis and documents and coordinated approach for surveying. D2.2 provides an overview of the current understanding of the Pilots, including the general context, the problem statement, the possible approach to overcome the problem, and the foreseen climate service to support the solution. The results are presented within the Living documents of each Pilot. Living documents are "dynamic" documents shareable among partners and continuously updated during the bimonthly meetings to be planned with all the Pilot leaders. These documents will track the evolution of products and services during the lifecycle of the PIISA project. On the other hand, D3.1 entails the guidelines to set-up, plan and manage the Pilots, including the description of how to use the Living Documents.

The deliverable is organised as follows: after the introduction, Section 1 delves into the rationale behind this deliverable. Section 2 presents the overview of our current understanding of the Pilots and the actions planned for the first period of activities. Finally, the conclusions section summarises information collected in the document.

guideline for piloting, pilots' analysis and Loops performance, including iteration steps

1 General approach

This section presents the general approach for piloting, pilot analysis and co-creation steps. For a comprehensive overview of the guidelines for Pilots, we refer to D3.1. In particular, we concentrate on the description of the Pilot process, including iteration steps, and the ground rules for co-creating climate services that are the focus of WP2.

1.1 The Pilot process

PIISA Pilots are organized in three topical themes: Cities and Well-being, Food and Agriculture and Forests and Forestry. Each theme has one or two pilots co-created in different biogeographical climate risk zones in Europe, and their applicability is evaluated in other zones. Pilots are advanced in development cycles (e.g., concept design and testing, subsystem development, testing in relevant environment, demonstration) that include feedback collection to refine products, services and concepts. These development cycles are customised to best serve each pilot and they are called Loops in PIISA.

The overall structure of a pilot in the PIISA project is designed to facilitate its development through iterative processes. This structure includes Loops and Phases to ensure a systematic and adaptable approach to pilot implementation.

PIISA Pilots will mature in Technology Readiness Levels (TRL) in development cycles known as Loop 1, Loop 2 and Loop 3. These loops represent stages in the pilot evolution, each building upon the insights and progress gained in the previous loop. Feedback is collected on pilots from cities, countries, and regions where the pilot was originally developed, as well as from areas with potential for growing, replication, and broader adoption within the EU.

During the first Loop, we expect to learn about the insurance potential, what is missing, and what solutions are fit for purpose. Then in the second Loop, we apply the concept to new areas to learn how the solutions, products, and risk modelling can help the other regions. In parallel, we aim to develop a totally novel dashboard which will benefit all the Loops and feedback from the stakeholders, public, and sectoral users who are invited to help us. During the third year, we will already reach TRL which is higher than in the beginning. In the most mature cases, we expect it to be on the level of 7-8.

Loops are organised into distinct Phases, which provide a common framework for all the Pilots while remaining flexible and adaptable to the specific needs of each Pilot.

The three phases that can be included in the co-creation process within the PIISA project are the following:

- **Co-design:** the process of working with stakeholders to design the objectives, activities and scope of the pilot. This phase refines the understanding of the problems, needs and requirements, and lays the groundwork for the following activities.
- **Co-development:** the process of working with stakeholders to put into practice what was designed in the previous phase by developing new knowledge, tools, products or outcomes as joint effort by experts and relevant stakeholders. The co-development phase includes the iterative collection and taking into consideration the feedback from the stakeholders.

guideline for piloting, pilots' analysis and Loops performance, including iteration steps

- **Co-delivery:** the process of collaborating with stakeholders and end-users to apply and test aspects of the created solution. Depending on the maturity level of the solutions, they will be tested and validated in controlled to operational environments. The co-delivery phase includes the iterative collection and implementation of feedback from the stakeholders.

1.2 Guidelines for climate-service co-creation

By definition, the process of co-creation consists of continuous interaction with end-users to ensure that the solution is fit for purpose. This is particularly useful for highly innovative solutions, such as climate service. Climate services are defined by WMO as “a decision aid derived from climate information that assists individuals and organizations in society to make improved ex-ante decision-making”¹. It has been demonstrated that the involvement of stakeholders in the creation of such services can frame issues in ways that are more accurate, provide information that creates more relevant solutions, and potentially increase the legitimacy of processes^{2,3}. This, in turn, enhances or supports the definition of adaptation plans and actions. However, the co-creation process depends on the specific context in which it is applied, and needs to be tailored to the users' experience and expectations.

In PIISA, we employ the co-creation process to the Pilots. This applies to the adaptation measures, the insurance solutions, and, of course, the climate services. Climate services cannot be disentangled from the Pilots to ensure that they are usable and useful for the Pilot stakeholders. Since the PIISA Pilots span a wide range of topics, geographic scope and maturity levels, it is key to have a common strategy that is flexible enough to ensure its adaptability to the different contexts. Moreover, it is key to keep track of the advancements in the Pilots to enhance cross-fertilisation among them and to mitigate upcoming risks early enough.

For these reasons, we designed the *Living Documents*. Such documents have been used until now to collect our current understanding of the Pilot context and objectives, and to plan the co-design phase (see 1.1). In the remainder of this document, we report the current status Living documents of the PIISA Pilots. For the structure of the Living document beyond the co-design phase, we refer to D3.1. Such documents will be continuously updated and discussed during the bimonthly meetings by the Pilot leaders. They provide a general framework to keep track of the evolution of Pilots, have clear checkpoints at the end of each Phase and Loop to draw conclusions and plan the work ahead, and facilitate the cooperation with other WPs (including WP2).

¹<https://public.wmo.int/en/bulletin/what-do-we-mean-climate-services#:~:text=A%20climate%20service%20is%20a,ex%2Dante%20decision%2Dmaking>.

² Meadow, A. M., et al. "Moving toward the deliberate coproduction of climate science knowledge." *Weather, Climate, and Society* 7.2 (2015): 179-191.

³ Vincent, K., et al. "What can climate services learn from theory and practice of co-production?" *Climate Services* 12 (2018): 48-58.

2 The Living documents: a snapshot on PIISA Pilots

2.1 Cities and Well-Being

2.1.1 Green roofs

Pilot ID

Partners involved	Leader: Institute for Environmental Studies (IVM), VU University Amsterdam; Participants: Climate Adaptation Services (CAS), Finnish Meteorological Institute (FMI), Lähi-Tapiola Palvelut Oy (LocalTapiola), Tyrsky-Konsultointi Oy (Tyrsky), Politecnico di Milano (Polimi)
Pilot location	 The Netherlands



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Pilot description as in the proposal	In this first pilot of Task 3.2 (Cities and well-being), we aim to develop a European business model for stimulating the adoption of NBS through insurance in cities, focusing on Green Roofs. We will start with several cities in the Netherlands, where IVM and CAS will evaluate a climate adaptation strategy, implemented by the Dutch insurer Interpolis, which aims to encourage policyholders to adopt green roofs. IVM is focused on conducting cost-benefit analyses, while CAS serves as a broker and organizer for co-creation activities involving Dutch insurer Interpolis and various stakeholders like municipalities, water authorities, and real estate institutions. Moving to Loop 2, we will explore the applicability of green roofs as adaptation measures to be stimulated by insurers in other cities in the Boreal region (Helsinki, Tampere, and three other cities). Finally, the costs and benefits of green roofs as an adaptation strategy are further quantified and tested for cities in the last loop, which will focus on the Mediterranean region.
Context	Climate change is projected to increase the frequency and intensity of natural disaster events in the future. As a result, the extent of insured losses may rise which puts a strain on insurance market solvency capital requirements. To cope with the impacts of climate change insurers may implement solutions to stimulate the adoption of adaptation measures by policyholders. One such measure is the implementation of green roofs that, in addition to climate adaptation benefits (e.g., lower flood risk), provide mitigation benefits via insulation and reduced energy use. Green roofs also provide a range of aesthetic, biodiversity and recreational benefits that contribute to societal values.
Problem statement	At the European scale, even though in recent decades there has been an increased recognition of the benefits of green infrastructure, green roofs remain a niche technology and are, with a few exceptions, not yet widely implemented. Loop 1 of the pilot takes place in the Netherlands, where Interpolis is actively encouraging its policyholders to adopt green roofs as part of climate change adaptation efforts. The adoption of green roofs in the Netherlands also occurs at a small scale, and there is an inquiry into whether enhanced financial arrangements and incentives can facilitate broader adoption. Furthermore, the pilot seeks to explore whether similar approaches can be applied in insurance markets beyond the Netherlands, particularly in other European regions, to encourage policyholders to embrace green roof initiatives.
Objectives	Cost-benefit analyses will be provided of green roofs in the main pilot location in the Netherlands, including a broad range of environmental and societal benefits, like recreational and biodiversity values that will be elicited using choice experiments in surveys. The effectiveness of insurance solutions to stimulate the adoption of green roofs will be tested in experiments as well, e.g., information provision and insurance premium discounts. The enablers and barriers to the uptake of green roofs will also be examined in these experiments. Moreover, public-private partnerships will be identified to investigate sustainable finance arrangements that stimulate investments in green roofs. Moreover, business models for the European insurance industry will be developed for the upscaling of

analysis and Loops performance, including iteration steps

	nature-based solutions for climate risk. The main detailed quantitative analysis focuses on the Netherlands where the green roofs initiative of Interpolis takes place. Moreover, using expert interviews and workshops it will be examined how these results are transferable to the other pilot regions in loops 2 and 3, using qualitative analysis.
Target stakeholders	Insurers, e.g., Interpolis, will be involved in the co-creation process. (Potential) policyholders will be respondents to the economic experiments within which the (biodiversity, flood risk reduction, etc.) values of green roofs and the effectiveness of insurance solutions to stimulate the adoption of green roofs will be tested. Insurers, municipalities, water authorities and real estate institutions will be involved in the identification and development of public-private partnerships of sustainable finance arrangements for investments in green roofs. City policymakers and insurers are interviewed and included in workshops in other areas than the Netherlands to examine how costs and benefits of green roofs differ, and whether additional barriers and enablers should be considered in the scaling up of green roofs as an insurance solution.
Aims of each Loop	<u>Loop 1:</u> In Loop 1, IVM and CAS are working together to evaluate an innovative climate adaptation strategy by Dutch insurer Interpolis, i.e., an insurance solution that encourages policyholders to adopt green roofs in the Netherlands. Additionally, the pilot examines the wider societal advantages of green roofs, including recreational and biodiversity benefits, which are quantified for cost-benefit analyses. The distribution of these benefits among various stakeholder groups is also a focal point. Furthermore, the pilot identifies public-private partnerships and explores sustainable finance arrangements that can incentivize investments in green roofs. Ultimately, the pilot aims to develop business models that can be adopted by the European insurance industry to scale up nature-based solutions for climate risk, benefiting both insurers and their clients. <u>Loop 2:</u> The primary objective is to extract valuable insights that can be applied beyond the Netherlands to benefit other European countries. The applicability of green roofs as an adaptation measure for other cities in the Boreal region is examined by organizing a webinar that presents the lessons learned from Loop 1. Interviews with city policymakers and insurers are conducted to examine how costs and benefits of green roofs may differ, and whether additional barriers and enablers should be considered when scaling up green roofs as an insurance solution. Lessons learned will be included in the improved recommendations for scaling up of green roofs in other EU regions.

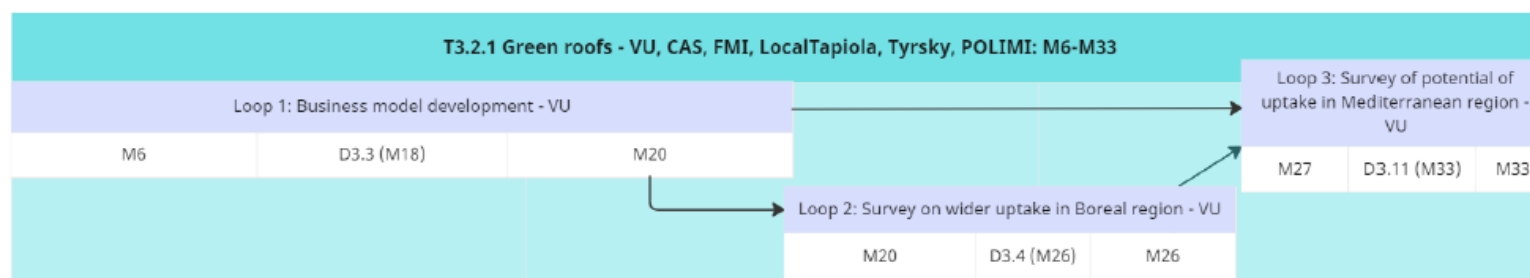
analysis and Loops performance, including iteration steps

	<u>Loop 3:</u> The costs and benefits of green roofs as an adaptation strategy are further quantified and tested for cities in the Mediterranean region (e.g., Milan, Barcelona), for instance, by assessing their cooling benefits by accounting for the local urban heat island effect. A workshop with policymakers and insurers will be organized to in more detail assess the barriers and enablers for green roof adoption and identify local sustainable finance mechanisms for the scaling up of green roofs.
Related adaptation measures	In general, insurance supports risk management by spreading risk geographically, across individuals residing in very high and low risk regions. Insurers like Interpolis can support risk management and adaptation by homeowners by offering financial incentives (e.g., insurance premium discounts) to policyholders who adopt climate-resilient measures like green roofs. This encourages policyholders to invest in adaptation strategies that reduce climate risks to their properties. Moreover, a lower frequency of catastrophic losses due to policyholders investing in climate adaptation reduces the risk of insurer insolvency in the future due to extreme rainfall events.
Related climate services	Climate services such as the dissemination of localized information on the impact of climate change on the frequency of extreme rainfall events can assist in decision-making by helping insurers and policyholders assess the benefits of implementing green roofs as an adaptation measure. The pilot will include climate scenarios of return period of precipitation in the risk assessment and cost-benefit analyses.
Initial TRL	The Technology readiness level (TRL) of green roofs as an adaptation measure to be stimulated via insurance is TR2 since the concept has been formulated, yet the experimental proof and validation of the concept are lacking.

analysis and Loops performance, including iteration steps

Co-creation

For this specific pilot, Loop 1 will include all the phases of co-creation. The results will be transferred to the Boreal region in Loop 2 where we expect to carry out only the co-design and co-development. Finally, Loop 3 will entail the co-design of a solution for the Mediterranean region.



Loop 1

Phase 1 – Co-design

Overview	
Period	This phase will run from M6 to M9.
Objectives of phase 1	The co-design phase of loop 1 will focus on the evaluation design of the climate adaptation strategy of Interpolis to stimulate the adoption of green roofs by policyholders. Namely, the outcomes of structured interviews among stakeholders will identify current possible enablers and barriers of the green roofs initiative. Strategies for how these barriers may be overcome will also be established. These aspects will inform the design of our surveys and embedded economic experiments that assess whether certain interventions can be used to stimulate policyholders to invest in green roofs.

analysis and Loops performance, including iteration steps

Methodology of phase 1	The method of co-design adopted is structured interviews among stakeholders.	
KPIs	KPI description	Target value
KPI1	Number of identified enablers and barriers identified to be included in evaluation design.	>5
KPI2	Number of identified strategies to overcome barriers.	>2
Support expected from the other WPs	None.	
Partners involved	CAS	
Stakeholders involved	Interpolis	
Output	Identification of enablers and barriers of the uptake of green roofs.	

analysis and Loops performance, including iteration steps

This table should be used to take minutes of the bimonthly joint virtual meetings of all Pilots, taking place every 2 months. This template will be copied and pasted hereafter: one copy for each meeting. We will ask the responsible partner to fill in the table prior to the meeting, with the support of the involved partners, to facilitate discussion.

Update – DD/MM/YY		
Activity logbook	Partners involved	Description
	<i>Who is taking care of the activities?</i>	<i>What activities have been carried out?</i>
Threats	Description	Mitigation actions
	<i>Are there any problems or threats that might affect the Loop / Pilot?</i>	<i>Can we envision a solution?</i>
Tech. req. for climate services	Status of the service:	
	Data:	
	Climate indicators:	

analysis and Loops performance, including iteration steps

	Methods to analyse data:	
	Service outputs:	
KPIs	KPI evolution	Comments
<i>KPI number and name</i>	<i>KPI at the time being / KPI target value</i>	<i>Please add any comment concerning the evolution of the activities. Is it as envisioned? Is it better / worse than expected? Do we need to think of adjustment?</i>
Support needed from	Partner interested in the support	Requests
WP1	<i>Partner that needs support</i>	<i>What support is needed, in what context, and by when. Please remember to include any actions to be carried out in the "To-do list" below.</i>
WP2		
WP4		
WP5		

analysis and Loops performance, including iteration steps

Sister projects and other activities	Partner – source of information	News from sister projects and other activities
Project / activity	<i>Please specify who obtained the information. Moreover, please include what was the occasion: was it a personal communication? If so, with whom and when? Was it through the participation in an event? If so, which event, and when did it take place? If there are references (e.g., deliverables), please include them too.</i>	<i>Please briefly summarize the key information useful for the PIISA project.</i>
To-do list (for the next 2 months)	Responsible partner	Activities
	<i>Who is taking care of the future activities?</i>	<i>What do we plan to do in the upcoming months?</i>

analysis and Loops performance, including iteration steps

This table summarises the results of the activities of Phase 1.

Final outcomes		
Results	<i>What did we achieve in Phase 1? The results should supposedly map or extend the objective stated in the overview of the Phase 1.</i>	
Challenges	<i>What are the challenges we had to face? Are any of these still unsolved?</i>	
KPIs	KPI description	KPI final value
<i>KPI number and name</i>	<i>Short description of the Key Performance Indicators as in the overview of the Phase 1.</i>	<i>Final value of the KPI.</i>
Data	<i>What data did we use? What data do we need to use for the following activities?</i>	
Climate services	<i>What are the climate services we plan to co-develop?</i>	
Adaptation measures	<i>What are the adaptation measures we plan to support or implement?</i>	
Partners involved	<i>Which partners have been involved?</i>	

analysis and Loops performance, including iteration steps

Stakeholders involved	<i>Which external stakeholders have been involved?</i>
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analysis and Loops performance, including iteration steps

2.1.2 Climate adaptation dashboard

Pilot ID

Partners involved	Leader: 2DII; FMI, LocalTapiola, BSC, AXAC, LGI
Pilot location	Loop 1 will focus on Lyon, the capital city in France's Auvergne-Rhône-Alpes region, which sits at the junction of the Rhône and Saône rivers. In Loop 3, the replication of the dashboard to homeowners in EU regions susceptible to clay soil shrinkage will be evaluated. 
Pilot description as in the proposal	In Task 3.2.2, the focus of the pilot addresses homeowners and the risks associated with shrink-swell clay soils. Our goal is to create a comprehensive dashboard that empowers citizens across Europe to adapt and manage their financial risks from gaps in insurance coverage effectively. The dashboard development process begins in Lyon, France, where we will collaborate closely with local authorities and homeowners. Lyon serves as our starting point, and from there, we will expand our efforts to broaden our scope to other EU countries. As we progress to the third loop, which includes cities like Helsinki, we will organise workshops with city authorities

analysis and Loops performance, including iteration steps

	and planners to refine and implement the concepts we have developed. Our overarching objective is to address at least 2 cities with a population exceeding 300,000 inhabitants.
Context	This pilot is initially located in the city of Lyon, which has a population of over 500,000 inhabitants. Lyon is facing a significant and rapidly growing risk associated with shrinkage-swell clay soils. This risk is compounded by the effects of climate change, which leads to an increase in cases of drought, which, in turn, can cause clay soils to shrink. This phenomenon poses a substantial threat as it has the potential to destabilise buildings and their foundations, eventually causing structural collapse. More than a third of French soil is composed of clay, making the issue a widespread concern (an estimated 10,4M houses could be at risk in France). This issue is particularly pressing for Lyon, given that a substantial proportion of its buildings are built on such land. Despite this, insurers do not currently offer insurance products to mitigate the risks associated with the shrink-swell clay soils. This gap represents a significant challenge that needs to be addressed to improve the city's resilience towards this growing danger.
Problem statement	In the city of Lyon, and across France and Europe, a significant challenge lies in the lack of understanding regarding the potential financial implications associated with the shrink-swell clay soils hazard. This risk is rising rapidly and can potentially lead to large financial losses for homeowners. However, currently, there is no comprehensive data on this risk and no insurance product available to effectively cover this risk, leaving homeowners without adequate risk mitigation measures in place, unless the “<i>catastrophe naturelle</i>” regime triggered by the state in specific situations, which cannot be ex ante ascertained for individuals. In the event of a building collapse due to the shrink-swell clay soils hazard, the financial impact is equivalent to the value of the entire building. If the damage caused by this hazard is less severe and does not lead to a complete collapse, the financial impact would be associated with the costs of repairs and maintenance required to restore the structural integrity of the building. Consideration should also be given costs associated with adaptation measures. The main limitation in the provision of insurance products for the risk of shrinkage and swelling of clay soils is the lack of a standardized methodology to evaluate the potential financial consequences associated with this hazard. A further complicating factor relates to indemnities from the French state in the event of a ‘catastrophe naturelle’.
Objectives	During PIISA, our main objectives are the following: • Develop a robust methodology for assessing potential financial losses in the event of shrink-swell clay soils risk materialization.

analysis and Loops performance, including iteration steps

	• Design of a web application for homeowners to make decisions on insurance cover that employ the previously mentioned methodology. • Create a guide for homeowners on how to prepare their next appointment with their insurance advisor to ask for adequate insurance coverage. The pilot will result in a web application and accompanying guide, and its replication will be tested in other contexts and locations facing similar soil-related hazards.
Target stakeholders	In the context of addressing shrink-swell clay soils risk and developing appropriate insurance products, we plan to involve homeowners in Lyon, as they will be the primary beneficiaries of the project, and local authorities and organisations which can improve our outreach to homeowners in Lyon and are essential for regulatory and policy support. Additionally, we plan to have at least one insurer.
Aims of each Loop	<u>Loop 1:</u> The main undertaking is to develop the methodology to transform the level of vulnerability and exposure to climate risks into financial assessment which will underpin a pilot of a comprehensive dashboard that empowers citizens to manage their financial risks from gaps in insurance coverage effectively. The methodology will be based upon open access data sets that cover a variety of domains. The tests will be run on risks linked to shrink-swell clay soils. Data to be explored include e.g., geological risks, climate information, location, type and price of real estate, type of damages observed for different types of buildings, and refurbishment prices. Our ambition is to provide end users with a €-denominated potential loss range. When the methodology is secured, the pilot of the web application will be tested to assess user experience and the ability of end users to understand messages conveyed and make decisions on insurances. <u>Loop 2:</u> Based upon the results of Loop 1, we will refine the climate adaptation dashboard to allow homeowners from a district of the city to assess the financial risk they bear in relation to the level of risk of shrink-swell clay soils they are exposed to. The adaptation dashboard adds to the existing open-source dashboards by assessing a potential financial loss in case of materialization of the risk, which is not yet proposed to homeowners. This would be complemented by a guide to homeowners to prepare their next appointment with their insurance advisor to ask for adequate insurance coverage.

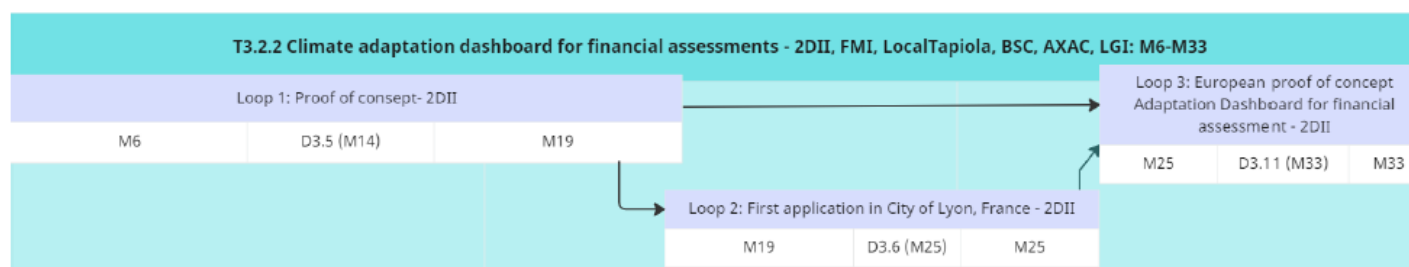
analysis and Loops performance, including iteration steps

	<u>Loop 3:</u> Based upon the results of Loops 1 and 2, the climate adaptation web Dashboard for financial assessments will be refined, and the applicability of the dashboard to homeowners in the boreal regions (Turku) or/and the Mediterranean region (Barcelona) will be evaluated. A webinar to present the web dashboard and the lessons learned will be organized for a group of stakeholders defined by Tyrsky, FMI, LocalTapiola and AXAC. After the webinar, the potential for replication, barriers, and enablers will be worked out in a workshop.
Related adaptation measures	This pilot directly enhances homeowners' existing risk management strategies by designing an innovative method to quantify and reveal to homeowners their risk in relation to clay soil shrinkage risk. The linked adaptation measure is indeed the suggested insurance cover.
Related climate services	The pilot will explore the opportunity to include climate scenarios to consider climate change in the risk assessment. It is expected the gravity of the phenomenon to increase with the decrease in forecasted precipitation reduction.
Initial TRL	Between TRL2 and 3.

analysis and Loops performance, including iteration steps

Co-creation

In this specific case, Loop 1 coincides with the co-design phase and the beginning of the co-development phase. In Loop 2, it is envisioned to finalise the co-development phase and to carry out the co-delivery of the solution. Loop 3 includes exploratory activities to scale and transfer the developed solution. For this reason, it includes only the co-design of a solution targeting other cities in Europe to be determined during the project.



Loop 1

Phase 1 – Co-design

Overview	
Period	M6-M12
Objectives of phase 1	Carry out desk-based research in relation to the framework for receiving an indemnity from the French state in the context of a 'catastrophe naturelle' and its relevance to clay soil shrinkage risk and review typical insurance cover policies in relation to clay soil shrinkage risk to develop a more comprehensive assessment of the financial risk to homeowners associated with clay soil shrinkage;

analysis and Loops performance, including iteration steps

	• Research relevant databases in relation to home-ownership and home-evaluation; • Research relevant databases in relation to climate risk and impacts and soil topography in France; • Interview insurance experts in relation to standard approaches to home insurance cover; • Interview actuarial and insurance experts in relation to how home insurance models might be adapted in the context of clay-soil shrinkage risks; • Assess GDPR implications which arise in the context of homeowners providing personal information; • Contact web-interface, software development organisations etc. for advice and to identify a sub-contractor to develop the climate adaptation dashboard; • Conduct outreach to relevant stakeholders in the Lyon area (in particular: Lyon Place Financière, Mairie de Lyon etc.); • Conceptual development of the methodology to assess potential financial losses stemming from the materialisation of shrink-swell clay soils risk	
Methodology of phase 1	The methods we will adopt include: • Desk-based research; • Interviews (e.g., with actuarial and insurance experts); • Stakeholder outreach.	
KPIs	KPI description	Target values
KPI1	# of relevant database identified	4
KPI2	# of interviews to insurers and actuaries	12
KPI3	# of key stakeholder organisations engaged	3
Support expected from the other WPs	Especially from WP1, we would appreciate being put in contact with actuarial and insurance cover experts in the networks of consortium members.	

analysis and Loops performance, including iteration steps

Partners involved	2DII, FMI and LGI
Stakeholders involved	• Actuarial and insurance cover experts • In relation to outreach in the Lyon metropolitan area we initially plan to contact Lyon Place Financière and Mairie de Lyon and anticipate that these will identify further stakeholders to contact. • Web-interface, software development etc. organisations. • End-users in the form of focus groups to gather feedback on ergonomics
Output	The anticipated results at the end of the co-design phase will be comprehensive background research in relation to defining all aspects of the methodology underpinning the climate adaptation dashboard.

analysis and Loops performance, including iteration steps

This table should be used to take minutes of the bimonthly joint virtual meetings of all Pilots, taking place every 2 months. This template will be copied and pasted hereafter: one copy for each meeting. We will ask the responsible partner to fill in the table prior to the meeting, with the support of the involved partners, to facilitate discussion.

Update – DD/MM/YY		
Activity logbook	Partners involved	Description
	<i>Who is taking care of the activities?</i>	<i>What activities have been carried out?</i>
Threats	Description	Mitigation actions
	<i>Are there any problems or threats that might affect the Loop / Pilot?</i>	<i>Can we envision a solution?</i>
Tech. req. for climate services	Status of the service:	
	Data:	
	Climate indicators:	

analysis and Loops performance, including iteration steps

	Methods to analyse data:	
	Service outputs:	
KPIs	KPI evolution	Comments
<i>KPI number and name</i>	<i>KPI at the time being / KPI target value</i>	<i>Please add any comment concerning the evolution of the activities. Is it as envisioned? Is it better / worse than expected? Do we need to think of adjustment?</i>
Support needed from	Partner interested in the support	Requests
WP1	<i>Partner that needs support</i>	<i>What support is needed, in what context, and by when. Please remember to include any actions to be carried out in the "To-do list" below.</i>
WP2		
WP4		
WP5		

analysis and Loops performance, including iteration steps

Sister projects and other activities	Partner – source of information	News from sister projects and other activities
Project / activity	<i>Please specify who obtained the information. Moreover, please include what was the occasion: was it a personal communication? If so, with whom and when? Was it through the participation in an event? If so, which event, and when did it take place? If there are references (e.g., deliverables), please include them too.</i>	<i>Please briefly summarize the key information useful for the PIISA project.</i>
To-do list (for the next 2 months)	Responsible partner	Activities
	<i>Who is taking care of the future activities?</i>	<i>What do we plan to do in the upcoming months?</i>

analysis and Loops performance, including iteration steps

This table summarises the results of the activities of Phase 1.

Final outcomes		
Results	<i>What did we achieve in Phase 1? The results should supposedly map or extend the objective stated in the overview of the Phase 1.</i>	
Challenges	<i>What are the challenges we had to face? Are any of these still unsolved?</i>	
KPIs	KPI description	KPI final value
<i>KPI number and name</i>	<i>Short description of the Key Performance Indicators as in the overview of the Phase 1.</i>	<i>Final value of the KPI.</i>
Data	<i>What data did we use? What data do we need to use for the following activities?</i>	
Climate services	<i>What are the climate services we plan to co-develop?</i>	
Adaptation measures	<i>What are the adaptation measures we plan to support or implement?</i>	
Partners involved	<i>Which partners have been involved?</i>	

analysis and Loops performance, including iteration steps

Stakeholders involved	<i>Which external stakeholders have been involved?</i>
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analysis and Loops performance, including iteration steps

2.2 Food and Agriculture

Pilot ID

Partners involved	Leader: BSC CNS; LocalTapiola, FONDAZIONE CMCC, AMIGO SRL, FMI, POLIMI, AXA CLIMATE SAS, Tyrsky
Pilot location	 Loop 1: Finland (& France) Loop 2: Mediterranean Region Loop 3: Europe

analysis and Loops performance, including iteration steps

Pilot description as in the proposal	The pilot related to Food and Agriculture begins with Loop 1 in the Boreal region in Finland, with the objective of exploring the potential of weather insurances and derivatives in the Finnish context. While these financial instruments are currently rare or totally non-existent in Finland, they might be of great benefit for Finnish farmers in the future, where climatic extreme events, already happening today in Central and Southern Europe, could happen. Additionally, we evaluate carbon farming practices in France, leveraging simulations to assess potential yield reductions and developing insurance and financing strategies to mitigate yield variability. In the subsequent phase, Loop 2, we extend our analyses to the Mediterranean region, applying the lessons learned from our Boreal operations. We develop an early warning system that will be showcased across all of Europe in Loop 3 and it will cover timescales of impacts: from short-term weather forecasts (up to the next days; FMI), passing through medium-term seasonal predictions (up to several months into the future; BSC) to long-term climate change projections (up to mid-century; FMI). We will work closely with farmers to co-develop indicators related to droughts, heatwaves, and severe convective weather.
Context	Finland had a national Crop Damage Compensation (CDC) system until 2015. Studies showed that the CDC contained serious moral hazard problems. A small number of farms specialized in collecting crop damage compensation. Two insurance companies developed market-based crop insurance from 1996. In these cases, compensation was based on crop loss recognized on the farm. For the products of both companies, the payment of insurance compensation was conditional on total crop loss. Market demand for these insurances has proven to be weak. Another insurance company has given up selling the insurance product. Insurances based on the observations made by the inspector on the farm were proven too costly and slow to implement. Index insurance could bring cost savings and speed to sales and claim handling. In the context of Finnish agriculture, several perils are of significant concern to farmers: drought, shortening of the growing period, frost within the growing season, excessive rain within the harvest period.

analysis and Loops performance, including iteration steps

In the context of the insurance industry, Finland has a well-established framework, including traditional insurance products. However, the availability of specialized weather index insurances and derivatives is limited, particularly in rural areas. Farmers often lack access to these crucial risk management tools, leaving them exposed to the uncertainties of climate change.

The Mediterranean region, known for its diverse climate and susceptibility to climate-related risks, has witnessed the growing relevance of parametric insurance. The region faces a range of perils, including droughts, wildfires, and severe storms, which pose significant threats to agriculture and other sectors.

The Mediterranean region has established regulatory frameworks that govern insurance practices. National regulatory authorities in Mediterranean countries oversee insurance matters to maintain compliance with legal requirements.

The Mediterranean region has been actively investing in climate data and technology to improve the accuracy of parametric triggers. This ongoing investment helps ensure that triggers are well-calibrated to the unique climatic conditions of the Mediterranean. Recent research effort has been directed to analysing potential parametric insurance solutions for covering earthquake risk in Romania and Greece, using the Earthquake Early Warning (EEW) system.

In general, the entire Europe faces increasing climate-related risks, such as extreme weather events, flooding, and droughts. It is vulnerable to nearly all types of natural disasters. Parametric insurance is particularly relevant for the EU's agricultural sector, which is sensitive to weather variations. Farmers can use parametric insurance to protect their crops and income against droughts, frost, and other weather-related perils. For example, in Spain, where droughts can impact crop yields, parametric insurance tailored to rainfall levels can offer a safety net to farmers.

The EU has a well-established regulatory framework for the insurance industry. Parametric insurance products must adhere to these regulations. For instance, the Insurance Distribution Directive (IDD). The European Insurance and Occupational Pensions Authority (EIOPA) is the primary regulatory body in the EU. In addition, individual EU member states have their respective regulatory bodies governing insurance matters.

The EU and its various agencies, such as the European Space Agency (ESA) and the European Centre for Medium-Range Weather Forecasts (ECMWF), have been investing in climate data and technology to improve the accuracy of parametric triggers. This includes collaborations with meteorological agencies and the development of specialised indices.

analysis and Loops performance, including iteration steps

Problem statement	Currently, one of the contributing factors to the challenges faced by Finnish farmers is the lack of accessible weather index insurance within the country. This leaves Finnish farmers vulnerable to unpredictable and often extreme weather conditions which can significantly impact their crops and livelihoods. Weather index insurance entails specific challenges. In fact, being area-based, it does not measure, capture, or use any actual crop production data. Hence, an eligible producer may experience a production loss and not receive an indemnity payment. On the other hand, it is also possible for an eligible producer to receive an indemnity payment without actual production loss. This phenomenon, known as <i>basis risk</i>, is a constant presence in parametric insurances. The challenge lies in mitigating this basis risk and ensuring that the selected weather parameters are not only effective in assessing the risk but are also readily accepted by the farmers. Legal issues are also a significant obstacle to the development and implementation of weather index insurance products. Existing legislation or company rules may not be conducive to these innovations. However, if there is substantial acceptance and demand for these products, it may become possible to change regulations or internal policies to accommodate them.
Objectives	The primary goal during PIISA is to establish a weather index insurance system that is not only effective but also easily understood and comprehensible for end-users. To this end, we need to ensure that the selected indices at the basis of the insurance entail a basis risk that is acceptable by the end users, i.e., the farmers. In Finland, it is key to engage the farmers in the development process and collect their specific needs. In fact, weather index insurance is not yet employed in Finland and the concept of basis risk is relatively unfamiliar in the Finnish farming and insurance culture.
Target stakeholders	For Loop 1, Young farmers (Manu) in MTK. The Central Union of Agricultural Producers and Forest Owners (MTK). MTK is an interest organization representing farmers, forest owners and rural entrepreneurs in Finland. MTK has over 316 000 members in local agricultural producers' organisations and regional forest management associations. All of the occupations and businesses of MTK members are based on renewable natural resources and their utilisation in a sustainable and economical way. For Loop 2 and 3, other (associations of) farmers to be identified in the relative geographical areas during the PIISA project.
Aim of each loop	<u>Loop 1:</u> The aim of Loop 1 is to measure the market potential of weather index insurances and derivatives in Finland. We connect with farmers in Finland and work closely with them to understand their needs concerning climate-related insurances in the early stage of the project, which bring insights on the agroclimatic indicators. The interaction with farmers will also be very valuable for the co-development process of potential insurance products with LocalTapiola. The results will be presented to Finish farmers to obtain

analysis and Loops performance, including iteration steps

	feedback. This Loop will be run in parallel to T2.3 to assure the co-development and iteration among PIISA partners and farmers. Several joint seminars or workshops will be carried out to ensure the co-creation, to share and discuss knowledge and experiences on potential parametric insurances for the Finnish market. Co-creation process and assessment of potential for new insurance products will be summarised. <u>Loop 2:</u> Loop 2 aims to assess the replicability of Loop 1 over a European region with climatic conditions different to Finland, specifically the Mediterranean area. By engaging with farmers who are working on some of the Mediterranean food systems particularly in Spain, Italy, or France, the pilot seeks to understand their specific climatic requirements, gather their feedback and including it in the co-development process of WP2 with LocalTapiola. The experiences in this loop will be collected in the living document and will be key for further developments and the legacy of the project. <u>Loop 3:</u> Based on the experiences gathered in Loops 1 and 2, the role of Loop 3 is to operationalise the climate services co-developed in the previous two loops and further extend them to a European level. During the last year of the project, real-time seasonal climate predictions (BSC) and Climate Change Projections (FMI) from Copernicus Climate Change Service (C3S) will be transformed into agro-climatic risks and delivered to both farmers and insurers. To facilitate the uptake of the climate information and risks, several climate outlooks will be demonstrated to users in close collaboration with WP4, with the aim of incentivizing possible adaptation measures in the agriculture sector. The main output of the three Loops will be summarized in the form of an insurance case study to be included in the C3S collection of use cases.
Related adaptation measures	Insurance can support risk management by assessing the market potential of weather insurances and derivatives in Finland. Insurance providers like LocalTapiola can work closely with farmers to co-develop insurance products that address specific climate-related risks, ensuring that the solutions are well-suited to the needs of farmers.
Related climate services	Climate services can provide agroclimatic indicators that help insurers and farmers to better understand climate-related risks. This data informs the development of parametric insurances.
Initial TRL	TRL2

analysis and Loops performance, including iteration steps

Co-creation

In this specific Pilot, Loop 1 entails all the three phases of the co-creation process. Loop 2, starting from a lower maturity, will most likely include only the co-design and co-development phase. Similarly, Loop 3 coincides with the co-design of a scalable solution based on the results of Loop 1 and 2, and additionally will co-develop complementary climate predictions and projections for farmers' adaptation.



Loop 1

Phase 1 – Co-design

Overview	
Period	M6-M12
Objectives of phase 1	- Understand what makes a parametric insurance acceptable by clients - Pinpointing the willingness to pay of clients for this type of products - Identifying the barriers in the regulations for parametric insurance

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Methodology of phase 1	• Survey • Focus groups • Statistical methods for analysing surveys, i.e., K-means, PCA • Desk study	
Support expected from the other WPs	From WP1, this pilot needs support to identify the regulatory barriers for parametric insurance. Furthermore, examples of existing parametric insurance are needed to introduce farmers to the basic concepts of parametric insurance. From WP2, the pilot will need support for the definition of climate indices and the data management.	
KPIs	KPI description	Target value
KPI1	# people involved in the survey	200
KPI2	# publication like working report	1
Partners involved	Local Tapiola, BSC, AXA, FMI, Amigo	
Stakeholders involved	Young farmer organisation, farmer organisation (MTK)	
Output	• Market potential of the parametric insurance. • A report with the analysis of the survey	

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Threats	Description	Mitigation actions
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Tech. req. for climate services	Status of the service:	
	Data:	
	Climate indicators:	

analysis and Loops performance, including iteration steps

	Methods to analyse data:	
	Service outputs:	
KPIs	KPI evolution	Comments
<i>KPI number and name</i>	<i>KPI at the time being / KPI target value</i>	<i>Please add any comment concerning the evolution of the activities. Is it as envisioned? Is it better / worse than expected? Do we need to think of adjustment?</i>
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WP1	<i>Partner that needs support</i>	<i>What support is needed, in what context, and by when. Please remember to include any actions to be carried out in the "To-do list" below.</i>
WP2		
WP4		
WP5		

analysis and Loops performance, including iteration steps

Sister projects and other activities	Partner – source of information	News from sister projects and other activities
Project / activity	<i>Please specify who obtained the information. Moreover, please include what was the occasion: was it a personal communication? If so, with whom and when? Was it through the participation in an event? If so, which event, and when did it take place? If there are references (e.g., deliverables), please include them too.</i>	<i>Please briefly summarize the key information useful for the PIISA project.</i>
To-do list (for the next 2 months)	Responsible partner	Activities
	<i>Who is taking care of the future activities?</i>	<i>What do we plan to do in the upcoming months?</i>

analysis and Loops performance, including iteration steps

This table summarises the results of the activities of Phase 1.

Final outcomes		
Results	<i>What did we achieve in Phase 1? The results should supposedly map or extend the objective stated in the overview of the Phase 1.</i>	
Challenges	<i>What are the challenges we had to face? Are any of these still unsolved?</i>	
KPIs	KPI description	KPI final value
<i>KPI number and name</i>	<i>Short description of the Key Performance Indicators as in the overview of the Phase 1.</i>	<i>Final value of the KPI.</i>
Data	<i>What data did we use? What data do we need to use for the following activities?</i>	
Climate services	<i>What are the climate services we plan to co-develop?</i>	
Adaptation measures	<i>What are the adaptation measures we plan to support or implement?</i>	
Partners involved	<i>Which partners have been involved?</i>	

analysis and Loops performance, including iteration steps

Stakeholders involved	<i>Which external stakeholders have been involved?</i>
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analysis and Loops performance, including iteration steps

D2.2 Pilot process and technical requirements guideline for piloting, pilots'

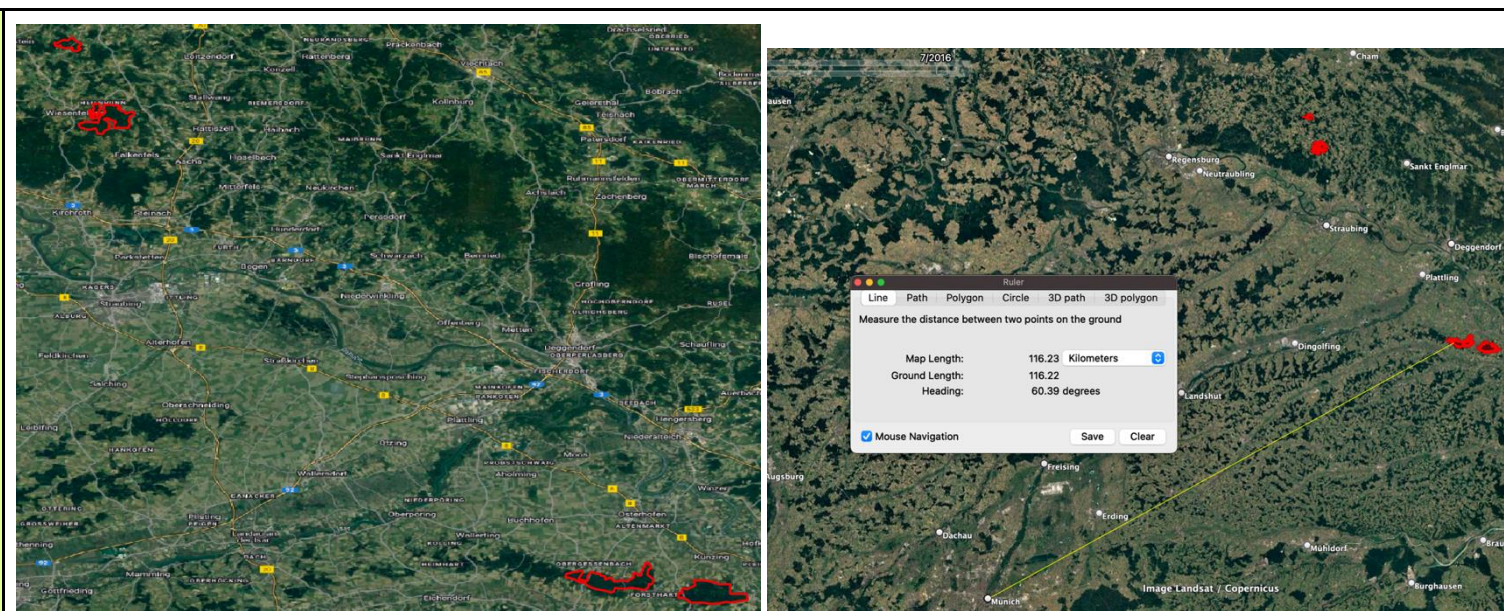
2.3 Forests and Forestry

2.3.1 Development based on existing insurance

Pilot ID

Partners involved	Leader: AXA Climate; FMI, CMCC, AXA Germany, Tyrsky, LocalTapiola
Pilot location	The location is situated in Bavaria, north west of Munich (Germany). The indicative plots are indicated in red, but the exact location of the pilot areas is still to be validated. The area includes 3 parcels or blocks of about 500 ha. The remaining 500 ha are several smaller compartments between 5 to 90 ha.

analysis and Loops performance, including iteration steps

	 The image consists of two side-by-side satellite maps of a forested region in Germany. The left map shows a large red-outlined area. The right map shows a zoomed-in view of a specific area with a yellow line connecting two points and a measurement window. The measurement window displays the following data: <table><tr><th>Measure</th><th>Value</th><th>Unit</th></tr><tr><td>Map Length</td><td>116.23</td><td>Kilometers</td></tr><tr><td>Ground Length</td><td>116.22</td><td></td></tr><tr><td>Heading</td><td>60.39</td><td>degrees</td></tr></table> The window also includes a 'Mouse Navigation' checkbox, 'Save', and 'Clear' buttons.	Measure	Value	Unit	Map Length	116.23	Kilometers	Ground Length	116.22		Heading	60.39	degrees
Measure	Value	Unit											
Map Length	116.23	Kilometers											
Ground Length	116.22												
Heading	60.39	degrees											
Pilot description as in the proposal	This is the first of the two pilots belonging to task T3.4, related to forests and is based on development based on existing forest insurance schemes. This pilot begins with Loop 1 in Germany, where we focus on developing an innovative multi-peril coverage. The exact risks to be covered will be identified during Phase one, potentially: wildfire, drought, pest (bark beetle), and carbon credit insurance if relevant. Different insurance structures will be tested, indemnity, parametric and hybrid insurance. Our approach involves microclimatic scales, to be able to send insurance pay-out as fast as possible about risks related to wildfire risks and specific pest and disease threats. Moving to Loop 2, a test series for broader uptake will be designed and carried out in close collaboration with AXA Germany. On the one hand broader scoped surveys will be used to map levels of interest and key characteristics of forest and owners driving new insurance acceptance probability. On the other hand, interactive choice experiments will be conducted with the assistance of local												

analysis and Loops performance, including iteration steps

	organisations to further detail and tune the insurance products. With the feedback and evaluation of the results presented, we improve the developed concepts and respond to service type requirements and evaluate its scalability potential. In the final Loop, a webinar to present the new insurance schemes and the lessons learned from the Loops 1&2 will be organised to a group of stakeholders identified by Tyrsky, FMI and LocalTapiola. After the webinar, a workshop is organised on how insurances can be used to encourage forest owners to take actions to reduce current abiotic and biotic hazards, and plan adaptation actions against intensifying hazards in future climate in Finland
Context	Forests are recognized as a crucial natural asset both for its biodiversity and climate action, as well as provisioning services, with an increasing demand of wood from the construction industry, for instance. To attract more interest of public and private investors and encourage forest managers, de-risking solutions such as insurance can be a facilitator. Yet, forests in the European Union are facing a critical lack of insurance cover to effectively combat the challenges posed by climate change. Therefore, we propose to investigate climate-related forest insurance in this pilot.
Problem statement	Despite the growing threats like fire, pests, disease and more, these natural assets remain significantly underinsured. In Germany, for instance, it is estimated that only 15% of private forests, (about 50% of the total) are currently covered by insurance. Between 2000 and 2020, Germany experienced a net change of only - 0.012% (Loss: 9,8% Gain: 9,733%) of forest cover (source: Global Forest Watch). The main drivers of losses are due to drought, pest related diseases and windstorm. But this could worsen in the coming years, and resilience-increasing mechanisms such as insurance should be anticipated. Even in areas where the situation with respect to the health of forests is still optimal, the risk for forests is expected to harshen with climate change. This is, for instance, the case of the boreal forest. In particular, in Finland, wind damage risk will increase because of the shortening of the soil frost period, increasing drought in summer will boost the risk of large-scale forest fires, and the warmer climate increases the risk of bark beetle outbreaks.
Objectives	Our pilot aims to actively engage forest owners and stakeholders in exploring various forest insurance products. These products include options such as indemnity insurance and parametric insurance (or hybrid insurance which is a combination of both), each offering distinct features such as different risk thresholds and premium structures based on the adoption of adaptation measures.

analysis and Loops performance, including iteration steps

	The new insurances would consider evolving climate risks and potentially adaptation measures undertaken by the client. The insurance products developed aim to consider evolving adaptation levels of the client's forest area as well as of the surrounding forest areas.
Target stakeholders	• Forest managers (e.g.: German partner) • Other forest insurers (e.g.: AXA Germany) • If need be, other stakeholders active in the forest industry (e.g.: wood off-takers) in particular for loop 3
Aim of each loop	<u>Loop 1:</u> This Loop focuses on developing a climate change-sensitive forest insurance in Germany, primarily targeting private forest owners. It involves identifying current AXA forest insurance clients who fit the profile, considering factors like evolving climate risks and the client's adaptation measures. The risks addressed include forest fire, drought, and pests, such as the bark beetle. Various insurance products, including parametric components, will be tested to cover these risks. The project will assess evolving risk levels, inform clients of future projections, and analyse adaptation levels. Engaged forest owners will be offered different insurance variations, considering threshold levels, adaptation level discounts, and risk-sharing options. <u>Loop 2:</u> In Loop 2, a comprehensive test series for broader uptake will be designed and carried out in close collaboration with AXA Germany. This phase will involve extensive surveys to assess levels of interest and key characteristics of forest and owners driving new insurance acceptance probability. Additionally, interactive choice experiments will be conducted with the support of local organizations to refine and tailor the insurance products. <u>Loop 3:</u> In Loop 3, surveys will be conducted to assess the potential for the adoption of new forest insurance schemes in the Boreal region. A webinar will be arranged to introduce the new insurance schemes and share insights gained from Loops 1 and 2. This webinar will be attended by a group of stakeholders identified by Tyrsky, FMI, and LocalTapiola. After the webinar, a workshop will be organized to explore how insurance products can encourage forest owners to take measures reduce current abiotic and biotic hazards, and plan adaptation actions against intensifying hazards in future climate in Finland.

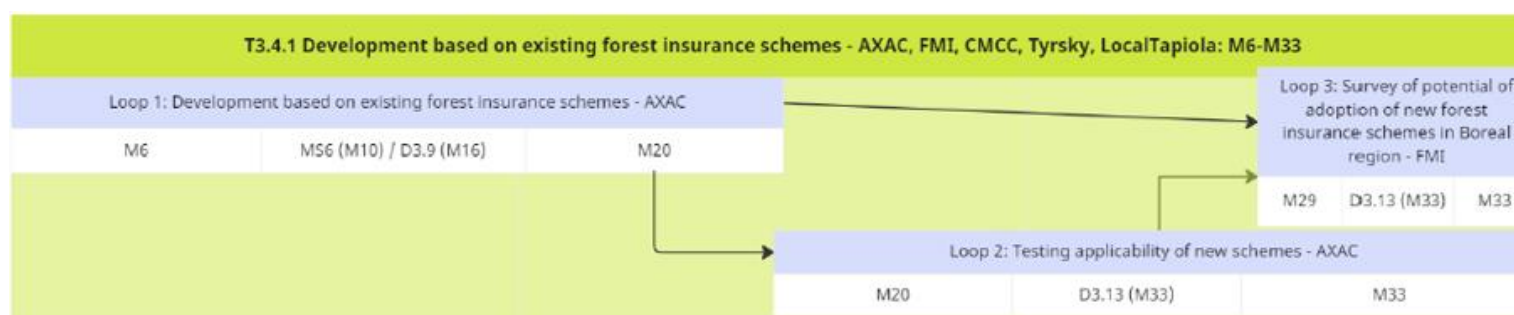
analysis and Loops performance, including iteration steps

Related adaptation measures	Insurances can support risk management and adaptation by enabling forest owners to transfer the financial burden of climate-related risks, such as forest fires, droughts, and pests, to the insurance companies. This reduces the direct financial impact on forest owners in case of damage or losses, encouraging them to invest in risk reduction and adaptation measures.
Related climate services	Climate services could support decision-making and risk management in the context of climate change adaptation by providing access to climate forecasts and projections to forest owners, that can use this information to make informed decisions about forest management, such as adjusting planting and harvesting times based on anticipated climate conditions.
Initial TRL	For parametric solutions only: TRL 3 for wind TRL 3 for wildfire TRL 0 for drought TRL 0 pest At this stage, we do not know the TRL of indemnity products, but we can assume this is TRL 3 at least as the products are already on the market.

analysis and Loops performance, including iteration steps

Co-creation

In the particular case of this pilot, the co-design phase is carried out at the beginning of Loop 1. The co-development phase takes place between Loop 1 and 2, while the co-delivery phase is performed at the end of Loop2. Loops 3 includes exploratory activities to scale and transfer the developed solution. For this reason, it includes only the co-design of a solution targeting Finland.



Loop 1

Phase 1 – Co-design

Overview	
Period	This will take place during M6 and M12 for a 6-month period.
Objectives of phase 1	Phase 1 will consist in: Securing the pilot areas by onboarding the local stakeholders

analysis and Loops performance, including iteration steps

	- Gathering information necessary to the co-development phase: review of available forest insurance products (from AXA Climate and AXA Germany), identification of potential limitations for the forest managers - Estimation of parametric pricings on the pilot area with “classic” structure on wind, wildfire, pest etc. - Wrap-up and gap analysis between what exists today and the inputs coming from WP 1 and 2.	
Methodology of phase 1	- Interviews and co-design workshops with the pilot stakeholders (i.e., German partner, AXA Germany, LocalTapiola, Tursky, FMI etc.) 1 online workshop per month is anticipated to carry on with phase 1. The agenda of each meeting and content will be sent one week in advance so all participants will have time to review and make comments.	
KPIs	KPI description	Target value
KPI1	Number of plots studied	3-5
KPI2	Number of insurance design realized on the pilot areas	8 (i.e., 2 per peril)
Support expected from the other WPs	The inputs coming from the other WPs, and the delivery date to be integrated into the pilot development, for instance coming from the following tasks: - Task 1.1: mapping review and assessment of insurance solutions regarding forest asset across EU Member States - Task 2.2: This task will translate the new end-user needs identified in both WP1 and T2.3 into sound scientific and technical requirements for service development Task 2.3, which involves co-developing services for the pilots. This analysis encompasses mapping future climate risks and identifying potential adaptation measures for the forestry sector to integrate into the insurance	
Partners involved	AXA CLIMATE SAS, FMI, FONDAZIONE CMCC	

analysis and Loops performance, including iteration steps

Stakeholders involved	• Arco-Zinneberg'sches Forstamt (German Forest Partner) • AXA Germany • To be confirmed: Members from SWIFTT EU project working on the bark beetle model
Output	• Gather information on existing insurance products (e.g.: AXA Germany for Indemnity and AXA Climate for Parametric) • Evaluate and compare the different existing options for the pilot plots: guarantees, structure, pay-out, premiums. • Alignment of partners on the design phase: which perils will be integrated in the construction phase, when, what tests are to be conducted, how adaptation solutions will be integrated into the product

analysis and Loops performance, including iteration steps

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analysis and Loops performance, including iteration steps

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WP2		
WP4		
WP5		

analysis and Loops performance, including iteration steps

Sister projects and other activities	Partner – source of information	News from sister projects and other activities
Project / activity	<i>Please specify who obtained the information. Moreover, please include what was the occasion: was it a personal communication? If so, with whom and when? Was it through the participation in an event? If so, which event, and when did it take place? If there are references (e.g., deliverables), please include them too.</i>	<i>Please briefly summarize the key information useful for the PIISA project.</i>
To-do list (for the next 2 months)	Responsible partner	Activities
	<i>Who is taking care of the future activities?</i>	<i>What do we plan to do in the upcoming months?</i>

analysis and Loops performance, including iteration steps

This table summarises the results of the activities of Phase 1.

Final outcomes		
Results	<i>What did we achieve in Phase 1? The results should supposedly map or extend the objective stated in the overview of the Phase 1.</i>	
Challenges	<i>What are the challenges we had to face? Are any of these still unsolved?</i>	
KPIs	KPI description	KPI final value
<i>KPI number and name</i>	<i>Short description of the Key Performance Indicators as in the overview of the Phase 1.</i>	<i>Final value of the KPI.</i>
Data	<i>What data did we use? What data do we need to use for the following activities?</i>	
Climate services	<i>What are the climate services we plan to co-develop?</i>	
Adaptation measures	<i>What are the adaptation measures we plan to support or implement?</i>	
Partners involved	<i>Which partners have been involved?</i>	

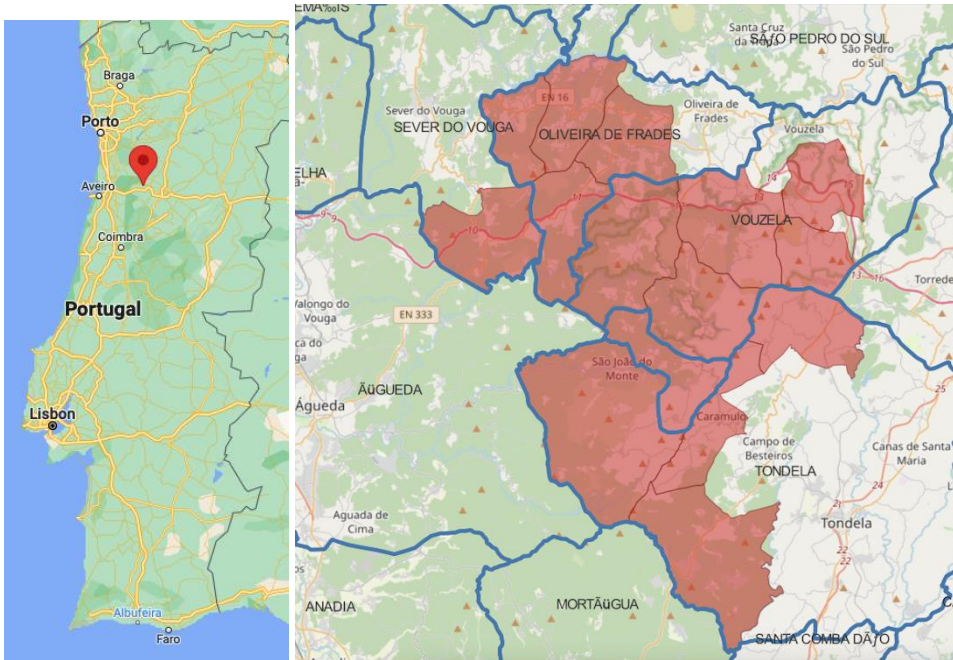
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Stakeholders involved	<i>Which external stakeholders have been involved?</i>
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2.3.2 New insurance schemes

Pilot ID

Partners involved	Leader: AXA Climate; FMI, FONDAZIONE CMCC, Tyrsky
Pilot location	
Pilot description as in the proposal	This is the second of the two pilots belonging to the task related to forests. This pilot begins with Loop 1, where we will first define a study region in Portugal in collaboration with the Central Regional Coordination and Development Commission and their regional fire

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	management commission. We will plan interviews with the local partner in order to find a location where the exposure for wildfires is high, while being also representative in term of socio-economic aspect. Once the study region is defined, we will collect and harmonize all data necessary for map the current wildfire risk. Then, we will identify the adaptation measures to wildfire relevant to central Portugal context, based on the National Adaptation Plan (NAP) of Portugal and by the Central Regional Coordination and Development Commission and their regional fire management commission to build different scenarios of wildfire mitigation. In Loop 2, we will evaluate the implementation of household wildfire insurance, exploring cost reductions through pooling, and evaluating the changes in the premiums to adapted households. To do so, the identified mitigation measure in the rural fire management plan will be tested and simulated to measure the effect on wildfire risk mitigation. Additionally, we will explore the potential of combining these with innovative insurance instruments to incentivize adoption of the most cost-effective adaptation measures. We will compare the cost-effectiveness of publicly funded insurance premiums with full compensation, considering different mitigation scenarios. Moreover, we will review cost-effective risk reduction measures for forest and propose a parametric wildfire insurance scheme with decreasing premiums as risks diminish.
Context	Wildfire is a major hazard in Europe, causing extensive economic and ecological losses. The European continent presents an overall high population density, with high economic activity, distributed in a mosaic of landscapes. Wildlands are the mainland cover type (39%) presenting most of the fuel load (i.e., burnable surface), followed by agriculture (33%), whereas urban settlements occupy a small share of the total area (3%) (European Environment Agency., 2017). Europe faces growing fire risk due to increasing population, expansion of wildland-urban interface, and land-cover changes, which influence wildfire frequency and intensity. Portugal is one of the most fire prone regions in Europe (Galizia, 2021) which can result in important damages and casualties. The 2017 fires events in Portugal (June and October) produced 100 deaths and 442,000 hectares of land burned. An intense heat wave preceded the fires, with many areas of Portugal seeing temperatures more than 40°C. This traumatic year pushed the public authorities to react, in particular with the creation of AGIF (Agency for Integrated Rural Fire Management is a public body under the supervision and oversight of the Prime Minister) whose mission is to deploy anti-fire management system and reduce the impacts of wildfire. For this pilot, we will partner with this central body (AGIF). In addition, Insurance Industry is not very developed there.
Problem statement	Currently, the increasing risk of wildfires, driven by more favourable climate conditions, poses a significant challenge. Communities, individuals, and forests are ill-prepared to cope with these increasing fire risks. Effective adaptation measures are crucial for reducing vulnerability, and there is a pressing need to accelerate these efforts. Furthermore, favourable insurance schemes are essential to encourage and support adaptation, as they can help transfer the residual risk to insurance companies, thereby promoting resilience in the face of these climate-related hazards.

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	At the household level, there is currently little incentive to insure nor adapt to wildfire risk given that the government fully compensates impacted households for reconstruction costs. Forest insurance is often considered costly by both insurers and policyholders due to a limited knowledge about wildfire risk and the lack of a quantifiable framework for assessing it.
Objectives	The purpose is to develop innovative wildfire insurance to incentive adaptation measures at household and forest association levels. This will be done first by identifying the adaptation measures to wildfire relevant to central Portugal context, based on the National Adaptation Plan (NAP) of Portugal and by the Central Regional Coordination and Development Commission and their regional fire management commission. Second, we will develop innovative forest insurance concepts to support wildfire prevention and management including adaptation measures in Portugal. Lastly, we will test the replicability and transferability of what developed in Portugal in other areas in Europe.
Target stakeholders	• CCDRD - Central Regional Coordination and Development Commission as soon as possible as they are financing the AGIF which would be a key partner for us, and also be incremental to design the subsidies' potential structure. • AGIF (Agency for Integrated Rural Fire Management) is a public body whose mission is to deploy anti-fire management system and reduce the impacts of wildfire.
Aims of each Loop	<u>Loop 1</u>: The adaptation measures in Portugal's NAP that have the potential to be combined with innovative insurance instruments are identified. One of the key criteria is the ability to incentivize adoption of the most cost-effective adaptation measures. Measures will be targeted at two levels: the forest level and individual household level with pilot candidates put forward in the Central region, which is most impacted by wildfires, by the Central Regional Coordination and Development Commission (CCDR) and their regional fire management commission. The AGIF offers their guidance through External Advisory Board support. <u>Loop 2</u>: this loop consists in designing new insurance instruments, under two levels of action: development of insurance solutions tailored to individual households to incentivize and support wildfire prevention measures and exploration of holistic insurance packages designed for forest. <u>Loop 3</u>: in this loop, the potential applicability of the developed solutions will be tested in other regions of Europe. A webinar to present the developed wildfire insurance concepts as well as the lessons learned from the Loops 1&2 will be organized to a group of

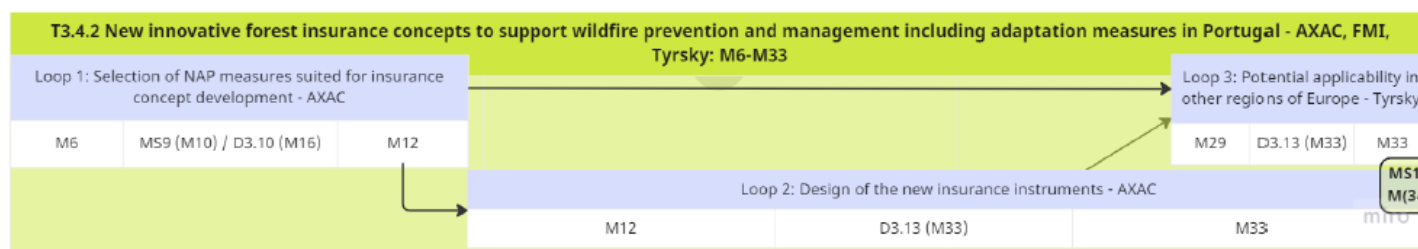
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	stakeholders defined by WP4. Thanks to the webinar, potential for replication, barriers and enablers will be identified with active participants in a workshop.
Related adaptation measures	Adaptation measure may include the construction of fire breaks and decrease in the amount of forest biomass available to burn the in most exposed regions. This is expected to decrease the fire frequency and intensity, and consequently the risk and impacts of wildfire.
Related climate services	<u>M</u> onitoring wildfire risk and its impacts could be implemented in climate services. Information such as the Fire-Weather Index at high resolution, as well as burned surfaces and burn severity could be included in a specific platform to support the expansion of the parametric insurance framework in Europe.
Initial TRL	TRL 2

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Co-creation

In the particular case of this pilot, the co-design phase coincides with Loop 1. The co-development and co-delivery phases take place in the beginning of Loop 2. Loops 3 includes exploratory activities to scale and transfer the developed solution. For this reason, it includes only the co-design of a solution targeting other regions in Europe, to be identified during the PIISA project.



Loop 1

Phase 1 – Co-design

Overview	
Period	M6 (December 23) to M12 (June 24). However, we already started to onboard external partners.
Objectives of phase 1	The objective of this phase is to understand the baseline – or the current situation in Portugal regarding wildfire: • Securing the pilot areas with onboarding the local stakeholders • Gathering of information necessary to the development phase: harmonise all data necessary for wildfire simulations • Map the current wildfire risk in the study area

analysis and Loops performance, including iteration steps

	- Identify the types of mitigation measure implemented in the region based on the NAP - Build mitigation scenarios	
Methodology of phase 1	- Interviews with AGIF experts to understand central Portugal challenges and National Adaptation Plan - Desktop study on historical fires in the area with AXA Climate current wildfire insurance tools 1h workshop every three months with PIISA members involved in that task to present the intermediate results and findings	
KPIs	KPI description	Target value
KPI1	Scenarios of wildfire mitigation	3
KPI2	Number of interviews with AGIF	3
KPI3	Number of wildfire mitigation measure periodized for different levels of wildfire mitigation	3-5
Support expected from the other WPs	Expected results from: - Task 1.1 Challenges, barriers, and opportunities to reduce insurance protection gap and accelerate adaptation and resilience - Task 1.2 Gather all the data and map the current wildfire risk - Task 1.3 Prioritisation of the wildfire mitigation measures with the local partner - Task 1.4 Build wildfire mitigation scenarios for risk modelling - Task 2.1 Actuarial Risk Modelling, state-of-the art, challenges and innovation potential. - Task 2.2 Framework for harmonized sharing of risk and losses data Task 2.4. Co-development of the services for the pilots	
Partners involved	AXA CLIMATE, Fondazione CMCC, FMI	

analysis and Loops performance, including iteration steps

Stakeholders involved	AGIF
Output	• Gather information about historical wildfires, climate and vegetation in the study area • Map current wildfire risk at plot level • Identify and prioritize the mitigation measures that are going to be used in modelling the scenarios • Build the wildfire mitigation scenarios

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This table should be used to take minutes of the bimonthly joint virtual meetings of all Pilots, taking place every 2 months. This template will be copied and pasted hereafter: one copy for each meeting. We will ask the responsible partner to fill in the table prior to the meeting, with the support of the involved partners, to facilitate discussion.

Update – DD/MM/YY		
Activity logbook	Partners involved	Description
	<i>Who is taking care of the activities?</i>	<i>What activities have been carried out?</i>
Threats	Description	Mitigation actions
	<i>Are there any problems or threats that might affect the Loop / Pilot?</i>	<i>Can we envision a solution?</i>
Tech. req. for climate services	Status of the service:	
	Data:	
	Climate indicators:	

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	Methods to analyse data:	
	Service outputs:	
KPIs	KPI evolution	Comments
<i>KPI number and name</i>	<i>KPI at the time being / KPI target value</i>	<i>Please add any comment concerning the evolution of the activities. Is it as envisioned? Is it better / worse than expected? Do we need to think of adjustment?</i>
Support needed from	Partner interested in the support	Requests
WP1	<i>Partner that needs support</i>	<i>What support is needed, in what context, and by when. Please remember to include any actions to be carried out in the "To-do list" below.</i>
WP2		
WP4		
WP5		

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analysis and Loops performance, including iteration steps

Stakeholders involved	<i>Which external stakeholders have been involved?</i>
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Conclusion

The document presents a general approach for piloting within PIISA, and the current status of the Pilots. To collect the information, a general framework, called Living document, has been created. Such document will be continuously updated during the bimonthly meetings. The guidelines to use this document and, more generally, carry out a PIISA Pilot are reported in D3.1.

The Living document proved itself useful to gather information in a structured, comprehensive and general way. It also supports the splitting of the work into small chunks, called Phases, that help an effective monitoring of the activities and an early identification of risks and delays.

In conclusion, the technical requirements for the PIISA climate services are reported hereafter.

- **Cities and well-being - Green roofs:** the envisioned climate service might consist of the provision of the return period of extreme precipitation calculated on the bases of the climate scenarios of the Coupled-Model Intercomparison Project (CMIP) to be included in the risk assessment and cost-benefit analyses.
- **Cities and well-being - Climate adaptation dashboard:** the envisioned climate service entails climate scenarios of droughts and precipitation reduction from CMIP to include the effect of climate change in the risk assessment of shrink-swell clay soils.
- **Food and agriculture:** the envisioned climate services can provide agroclimatic indicators for the most impactful climate-related risks. This data informs the development of parametric insurances. Furthermore, the potential of seasonal forecasts will be explored.
- **Forests and forestry - Development based on existing insurance:** the envisioned climate services will encompass both seasonal forecasts and climate projections of the climate conditions that influence forest-management decision-making.
- **Forests and forestry - New insurance schemes:** the envisioned climate service could be the provision of data and/or the visualisation through maps or a visual interface of high-resolution wildfire-related indicators, such as Fire-Weather Index, as well as burned surfaces and burn severity.

Such technical requirements will be better defined during the co-creation process applied within the PIISA Pilots (starting at M6). The Living document will ensure the discussion will focus on this important topic as well as the general status of the Pilot activities and the cooperation with other WPs and projects.



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