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opEn interOperable Platform for unified access and analysis of Earth
 observation data
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D2.2

User Requirements

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Abstract	

The main purpose of this document is to describe the User Requirements attained from stakeholders, the identification of those stakeholders, along with the method of collection and the results of stakeholder surveys and questionnaires that have been conducted.

User Requirements provide the fundamental underpinning of the EOPEN platform; by the interpretation of survey's results and the collection of specific datasets, technical partners will be able to produce the customised product set that is one of the EOPEN project aims.

With each Use Case study providing different scenarios, the consortium has developed a common survey structure that can be adapted by each PUC leader to meet each case study.

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Executive Summary

This deliverable D2.2: User Requirements, builds upon the previous WP2 deliverable, D2.1: Use Case Design. It provides a full report on stakeholders and their functional and non-functional requirements, in relation to their Use-Case, that will underpin the development of the EOPEN platform.

Deliverable D2.2 specifically describes the results, as well as the methods and rationale behind collecting, collating, interpreting and elaborating User Requirements, following discussions with key stakeholders.

This document contains:

- The identification and description of key stakeholders;
- The results and subsequent analysis of stakeholder interviews and questionnaires;
- The identification of initial user requirements for each use case;
- The identification of data sets to support these requirements.

Starting with the description of the contact methods, based on email or formal invitation, in line with the procedure described in D 9.1, the document provides the description of the whole survey.

Questionnaires submitted to stakeholders have a common structure and a specific part for each case study. EOPEN acquired information from more than 40 stakeholders, all questionnaires were elaborated and the most important information was elicited.

Most important pieces of information coming from the questionnaires include the availability of internet connections, of technological instruments and the level of expertise of stakeholders with EO data.

From the results, it emerges that stakeholders are familiar with satellite imagery, early warning systems and climate forecasts and they consider very important the improvement of those tools. They consider the possibility to acquire satellite data the real engine for the development of these systems.

This document at its conclusion provides an evidence base of User Requirements, ready to be translated into EOPEN technical requirements.

As deliverable D2.2 is a living document, this first version will be enriched and enhanced in subsequent iterations, taking into account the further analysis work to be undertaken on the Current Operating Model, and following feedback from stakeholders.

Keeping this deliverable as a living document allows the EOPEN solution to have the necessary scope to react to changes in the environment and stay relevant to the stakeholders supporting the design process.

Abbreviations and Acronyms

ARD	Association of public service broadcasters in Germany
BMCO	Broadcast Mobile Convergence
COM	Current Operating Model
CES	Community Environmental Support
DAML	DARPA Agent Markup Language
DID	Digital Item Definition
DII	Digital Item Identification
DRM	Digital Rights Management
EBU	European Broadcast Union
EO	Earth Observation
ETSI	European Telecommunications Standards Institute
EWS	Early Warning System
FTIA	Finnish Transport Infrastructure Agency
ICF	Informed consents form
IS	Information sheet
IEEE	Institute of Electrical and Electronics Engineers
IP	Integrated Project
IPTC	International Press Telecommunications Council
IST	Information Society Technologies
JDGI	Joint Decision & Information Governance
JPEG	Joint Photographic Experts Group
MAF	Multimedia Application Format
MoSCoW	Must have, Should have, Could have, Would like but Won't get
MPEG	Moving Picture Experts Group
NITF	News Industry Text Format
NoE	Network of Excellence
OWL	Ontology Web Language
OWL-QL	Ontology Web Language Query Language
OWL-DL	Ontology Web Language Description Language
RDF	Resource Definition Framework
RSS	Really Simple Syndication
STREP	Specific Targeted Research Projects
W3C	World Wide Web Consortium
XML	eXtensible Markup Language
SWRL	Semantic Web Rule Language
TOM	Target Operating Model

Table of Contents

1	INTRODUCTION	8
	Background and context	8
	Definitions	8
	Purpose of this Deliverable	8
2	DESCRIPTION OF USE CASES	10
	Scope of Use Cases	10
3	METHOD OF ANALYSIS OF COM AND TOM.....	12
	Elaboration of the COM and TOM	12
	3.1.1 CES journey & COM.....	12
	3.1.2 MOSCOW Analysis & Delta Map.....	14
	3.1.3 TOM process flow(s)	15
	3.1.4 Adaptation and Pilot	15
4	IDENTIFICATION OF STAKEHOLDERS	16
	Description of stakeholders	16
	4.1.1 PUC1 Flood Risk Assessment and Prevention.....	16
	4.1.2 PUC2 Food Security through Earth Observation dataset.....	17
	4.1.3 PUC3 Monitoring the Climate Change through Earth Observation.....	18
5	SURVEY METHOD AND MATERIAL PROVIDED	19
	Information and dissemination material	19
	5.1.1 PUC1 - Flood Risk Assessment and Prevention.....	19
	5.1.2 PUC2 - Food Security.....	20
	5.1.3 PUC3 – Climate Change.....	20
	How stakeholders were engaged	21
	5.1.4 PUC1 - Flood Risk Assessment and Prevention.....	21
	5.1.5 PUC2 - Food Security.....	23
	5.1.6 PUC3 – Climate Change.....	24
	Feedback from Stakeholders	24
	5.1.7 PUC1 - Flood Risk Assessment and Prevention.....	24
	5.1.8 PUC2 - Food Security.....	25
	5.1.9 PUC3– Climate Change	26
6	SURVEY REPORT	27
	Results.....	27

6.1.1	PUC1 Results	27
6.1.2	PUC2 Results	31
6.1.3	PUC3 Results	33
7	USER REQUIREMENTS FROM STAKEHOLDERS	37
	Results for PUC1, general and specific Requirements	37
	Results for PUC2, general and specific Requirements	39
	Results for PUC3, general and specific Requirements	41
	CONCLUSION	43
8	ANNEXES:.....	44
	Questionnaire from PUC1	44
	Questionnaire from PUC2	49
	Questionnaire from PUC3	57

1 INTRODUCTION

Background and context

The activities under Work Package 2 (WP2) in EOPEN are devoted to the community needs of environmental data into the EOPEN “Joint Decision & Information Governance” (JDIG) Architecture, demonstrating the robustness and flexibility of the overarching EOPEN Platform. It therefore defines a framework for integration of EOPEN in its various dimensions: organisations, processes, technology, information and systems. The aim is to support the EOPEN system for real-life scenarios that include specific local policies, environments and communities. We approach our Use Cases with a ‘Storyboard’ scenario that describes through narrative: who and what is involved; the timings and sequences and how the story starts, plays out and ends. The three Use Cases described here, allow us to move towards giving place to specific EOPEN instances, as overviewed in the figure below:

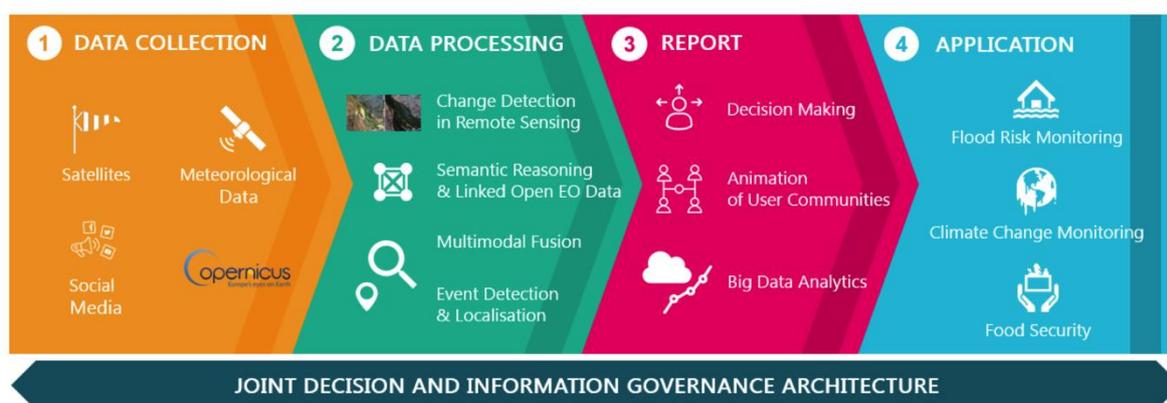


Figure 1.a Background and context of WP2

Definitions

This section provides a list of definitions of the most relevant terms defined in EOPEN and used in the course of this document:

Joint Decision & Information Governance (JDIG): The EOPEN JDIG Architecture will support better informed decision making by end users involved in understanding how EO data, integrated into the wider data mix, is more effectively and efficiently used in support of sole or joint decision making. This objective will provide essential underpinning to support the innovation, technical and scientific objectives, and, ensure a shared and collective approach to achieving the benefits that EOPEN will bring for decision making that incorporates EO data into the wider data mix.

Current Operating Model (COM): The Current Operating Model (COM) for EOPEN is the defined and agreed model of the end users in each Use Case, and how they are currently undertaking the CES activities as described in their provided scenarios.

Target Operational Model (TOM): The Target Operating Model (TOM) for EOPEN is the defined, agreed end model of CES, which from the Use case, delivers to end users, improvements over their Current Operating Model (the COM) of CES. The EOPEN TOM has been achieved through several iterations: a process of iterative dialogue described within this deliverable, with the stakeholders that represent CES in each Use Case. Then adapted to their local context, validated through their Use Case Validation then tested and refined through their test bed.

Purpose of this Deliverable

The main purpose of this document is to describe the User Requirements attained from stakeholders, the identification of those stakeholders, along with the method of collection and the results of stakeholder surveys and questionnaires that have been conducted.

User Requirements provide the fundamental underpinning of the EOPEN platform; by the interpretation of survey's results and the collection of specific datasets, technical partners will be able to produce the customised product set that is one of the EOPEN project aims.

With each Use Case study providing different scenarios, the consortium has developed a common survey structure that can be adapted by each PUC leader to meet each case study.

This deliverable provides the foundation for understanding what potential end users want in an EOPEN platform, in the context of their use case.

This document contains:

- The identification and description of key stakeholders;
- The results and subsequent analysis of stakeholder interviews and questionnaires;
- The identification of initial user requirements for each use case;
- The identification of data sets to support these requirements.

2 DESCRIPTION OF USE CASES

Scope of Use Cases

Three use cases have been defined, addressing respectively Flood Risk Assessment & Prevention, Food Security, and Climate Change. They have been designed to provide complex multi-organisational problems, which traditional methods and past technologies have struggled to successfully resolve. The ability of the EOPEN platform to address and mitigate these problems to any significant degree, will be considered a successful intervention and validate the value of the EOPEN solution.

Use cases are a critical element to the success of the EOPEN project; stakeholders that are the actors of each use case will also be users and testers of the EOPEN platform. To ensure that the platform has longevity and utility after the end of the project, it is critical for it not only to address the current stakeholder needs, but also to be flexible enough to adapt to future challenges.

By understanding what in the COM doesn't work well, or where areas increase risk, as defined through each individual Use Case, we need to understand what alternative or additional information stakeholders need for their Target Operating Model (TOM). It is foreseen at the end of the project, that the stakeholders will evaluate the EOPEN platform based upon its success in realising their expectations, helping to overcome issues identified in the COM.

A summary of the Use Cases, also referred to as Community Environment Support (CES) storyboards, addressed within EOPEN is provided in Table 1: *Summary of the Use Cases*. For further details on the use cases, we refer readers to D2.1: *Use Case Design*.

Table 1: Summary of the Use Cases

Use Case	Description
UC1: Flood risk assessment and prevention	The area within the Italian Eastern Alps river District is regularly affected by critical flooding from the Bacchiglione River and its tributaries. Planned flood defences remain largely unfinished, and a high risk of flooding therefore persists. Flood in the cities led to high levels of water in the streets, causing many problems such as the drowning of people, building damage and traffic problems. As indicated in the Flood Directive (2007/60/CE) water authorities should plan measures in order to aim at reducing risks by minimizing the possible damages effects and losses that may result.
UC2: Food Security	The "Food Security" challenge comprises several different components (food access, distribution, food supply stability, use of food), and all come down to the fact that by 2050, the world must feed 9 billion people, thus the demand for food will be 60% greater than it was in 2016. Hence, a dedicated Sustainable Development Goal (SDG) has been promoted by United Nations (UN) "Zero Hunger", aiming to end hunger, achieve food security and improve nutrition to people. The food crises mainly arise from weather extremes, natural disasters, societal crises, and other reasons such as population growth and cultivation restrictions that require fast and efficient communication for effective and timely decision making. Within the scope of EOPEN's food security pilot, the focus is on South Korea which has experienced rapid population growth due to urbanization, commercialization of the food chain and changes in diet. In principle, South Korea has low food self-sufficiency rate among

	<p>OECD¹ countries mainly relying on imports of most major grains. In case of an international grain supply failure, the country is exposed to a food security crisis due to its high dependence on major grains and limited exporting countries. Specifically, Statistics Korea² announces the results of Korea's annual rice production forecasts in October each year. According to the Ministry of Agriculture, Food and Rural Affairs (MAFRA)'s key statistics on agriculture, forestry and food, in 2014, Korea's food self-sufficiency rate was 49.8% and grain self-sufficiency rate was 24%. Major grains, except for rice, depend more than 90% on imports. Since 2000, rice supply has been constantly oversupplied, and it is estimated that the annual supply of rice is over 280,000 tons. Therefore, the government's market intervention is inevitable. One of the main reasons for the overproductions of rice is the <u>government's agricultural policy</u> and <u>active market intervention concentrated on rice</u>. The government would isolate the market if the price falls below the target price and pay 85% of the price decreased. Apart from the central government, local governments also have a lot of support policies for rice farmers. Producers prefer rice farming because of the relatively lower labour input due to high mechanization and stable income compared to other crops.</p>
<p>UC3: Climate Change</p>	<p>In the present and future climate change environment, the average temperature in Finland is rising / will rise more (2°C by 2040), and precipitation will increase faster (5–10% by 2040) than the global average. The changes are affecting winters more than summers with the largest changes in the northern part of the country: Finnish Lapland. Since the early 2000s, Finland has taken a pro-active role in managing the Climate Change situation nationally, with mitigation and adaptation plans. The activities of the Transportation sector runs deeply through the sectors: sustainable industry, land use planning and construction, tourism and recreation as summers become warmer, wetter and longer and snow packed regions shift northward. Our use case begins with historical snow and temperature data, supplemented by EO data, which support Finnish Transportation Infrastructure Agency (FTiA)'s current and future road maintenance for the Finnish drivers and riders. Our Use Case continues with temperature and snow data support for the Finnish Lapland communities who are, and will be, experiencing the greatest climate change.</p>

¹ Organisation for Economic Co-operation and Development (<https://en.wikipedia.org/wiki/OECD>)

² Statistics Korea: <http://kostat.go.kr/portal/eng/index.action>

3 METHOD OF ANALYSIS OF COM AND TOM

Elaboration of the COM and TOM

To provide readers context to the Use Case evaluation process to attain requirements, in addition to the stakeholder interviews and questionnaires, a brief overview of the COM/TOM process follows. For further information we refer readers to deliverable, D2.1: *Use Case Design*.

3.1.1 CES journey & COM

The CES JDIG Journey, seen in Figure 3.b below and CES Storyboard seen in Figure 3.c, gives the foundation for the full development of the Joint Decision & Information Governance Architecture, the JDIG (D2.3). The JDIG is the framework from which the TOM is created and in which it resides. The CES JDIG Journey has been based upon the research carried out by each of the EOPEN partners and in a previous successful H2020 project (Unity).

It provides a unified, common and transferable view of the key stages that make up the end-to-end activities of CES in each Use Case. As the analysis on the COM & TOM is still ongoing, the inputs and outputs of the JDIG Journey below are still to be confirmed. An updated version will be included in the next releases of this deliverable.

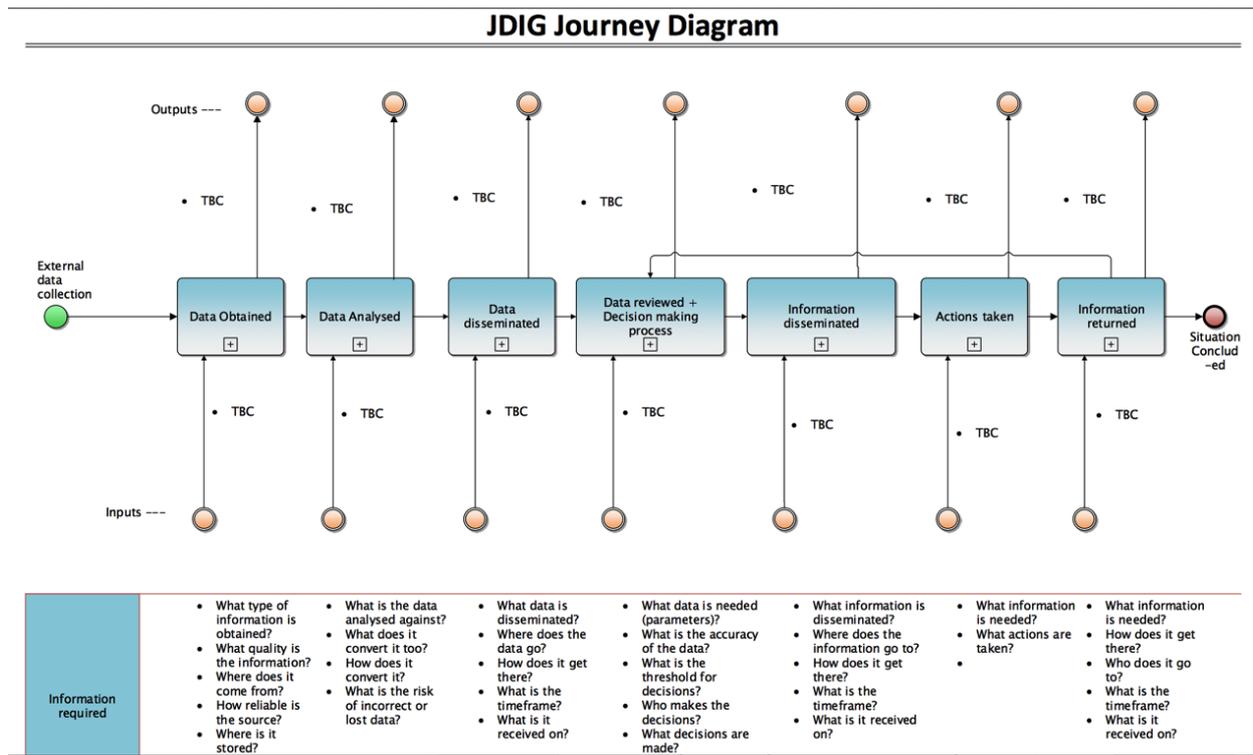


Figure 3.b. The CES JDIG Journey

EOPEN JDIG Development 'From COM to TOM'

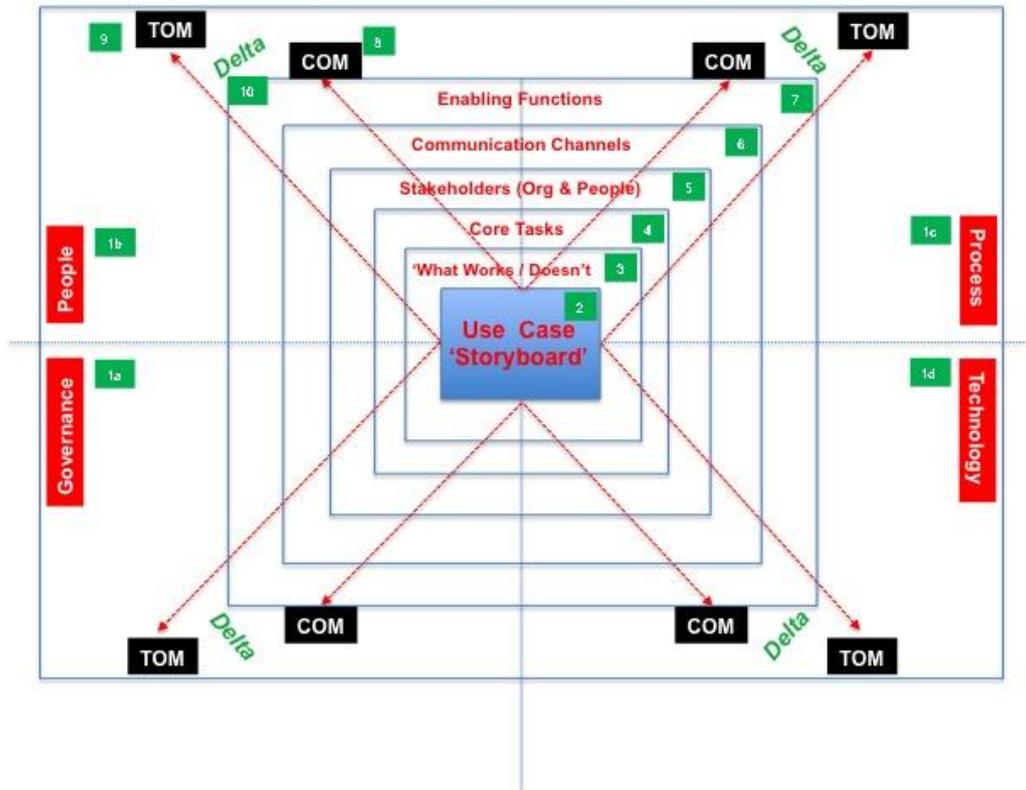


Figure 3.c: Use Case Storyboard

A description of each of the terms in the multi-dimensional Figure 3.c follows on the next page.

In relating the CES JDIG Journey with the CES Storyboards, EOPEN will understand the context of the wider community policies using multi-mode EO data. Data, in which the EOPEN TOM must eventually sit and in which it must function; and thereby, how the outputs from the EOPEN TOM can integrate downstream and form part of the 'Big Data' Use Case lifecycle.

This CES Journey provides the means for scalability and transferability both across the EOPEN partners and across the EU as a whole. Our plan to achieve this goal is to deconstruct the three Use Cases into a set of common key activities against the goals of the project.

For example, in each CES Journey and Storyboard is a set of environment conditions that signal community actions by individuals, institutions and government bodies, which mitigate the environmental hazard. EOPEN, as a platform to integrate satellite and social media environment data, can better prepare a community with longer preparation time for such a hazard. Communication with the communities and stakeholders about our available EOPEN tools are included in our basic mandate.

No	Heading	Description
1. a-d	Capability Areas	These 4 capability areas – Governance (1a), People (1b), Process (1c) and Technology (1d) are the top level capabilities that represent all tasks, functions and activities needed by any one individual organisation or, multiple organisations, working collaboratively in undertaking their roles and responsibilities in relation to the planning, preparedness, response and recovery to flood resilience. For each of the following headings below, each of the capability areas needs to be considered as to how they support, are supported or interact with the subject heading.
2	Use Case 'Storyboard'	The Use Case 'Storyboard' or scenario, is the script that describes through narrative what the Use Case that supports the pilot is going to do; who and what is involved; the timings and sequences and how the story starts, plays out and ends. It's akin to a script in a play – all of the words and storyline are written down – the actors, props, stage (lighting, scenery, special effects etc) which are found in the following headings, then need to be integrated together on stage and rehearsed.
3	What Works / What Doesn't	With all stakeholders in the storyboard identified (along with their roles and tasks), a subjective and objective review and analysis of the storyboard is carried out jointly with the stakeholders to identify and validate what works and what doesn't work in the storyboard – where issues, challenges, risks and failures need to be overcome or addressed and where areas that do work can be improved upon.
4	Core Tasks	These are the core tasks, activities, functions and activities within the storyboard that are carried out detailing by whom they are carried out, with what, when and how.
5	Stakeholders (Orgs & People)	These are the stakeholder organisations and individuals within them or elsewhere as identified within the storyboard who are taking part and involved in heading 4. It documents their roles, responsibilities, hierarchies and interactions. What do they do and what roles do they play and how.
6	Communication Channels	To meet the headings detailed above, these are the communication channels (physical and/or virtual) that take place and are used to carry out the heading 4 core tasks as described by the storyboard. It details the exchange that takes place, the information that is used and communicated, the sources of such information and how that information (both source, transfer and communication) is governed and managed and the constraints attached.
7	Enabling Functions	The enabling functions is intended as a 'catch-all' for anything not picked up in the other headings - the enabling functions being: the governance & policies, processes & procedures, technology & systems, people & information involved to enable all of the above identified in the storyboard to happen.

Figure 3.c: COM Table

3.1.2 MOSCOW Analysis & Delta Map

The TOM described above, through the “What Works... Analysis” is used to identify the User, Data & System requirements, which provide a view of the entirety of the desired Target Operating Model as defined by the stakeholders within the CES journey.

This view however, has to be set in context with the reality of what can actually be achieved within the parameters of the EOPEN project (e.g. cost and time) and by any constraints that exist within such areas as policy, economics, legislation etc. A Subsequent analysis: MoSCoW is used to shape the User, Data & System requirements into this more realistic TOM.

- The MOSCOW analysis is an acronym of **M**ust have, **S**hould have, **C**ould have and **W**ant/**W**on't have and has been used in conjunction with the Delta mapping to provide the basis for our unified, common and amalgamated TOM which each Use Case partner will then adapt to enable their Use Case.

The Delta Map has two axis, the COM and the TOM as described above. Once populated, the grid enables the relationship, or Delta, between the CES COM and the Realistic TOM to be seen. This Delta, provides the means to carry out a gap analysis to understand the similarities or differences between the two, and what actions need to be taken going forward. The components that populate this Delta are then subject to a further capability mapping analysis, providing the understanding to realise the TOM operationally.

- **Capability Mapping:** The CES journey and the COM and TOM process flows, are the JDIG, which acts as a golden thread throughout all CES activity.

Underpinning the JDIG, and all other functions and activities, whether CES or other, are five core capability areas. These together, provide the Enabling Functions for the EOPEN outputs, as described by the TOM, to become operational downstream. These 5 capability areas are: Governance (Procedures, Legislation & Policy); Business Operations; System & Infrastructure; Organisations & Personnel and Data/Information.

The capability mapping has looked at where the outputs from the Delta map and analysis sit, in relation to the Information Value chain and its five capability areas, to identify where the subsequent process flows that make up the TOM also sit.

Outputs also drive the high level functional requirements for the project's technology aspects. Together with the IT user requirements being undertaken in WP2, D2.2, this will refine what technology enables the TOM and how it is used.

3.1.3 TOM process flow(s)

From the combined capability mapping and MoSCoW analysis that takes place in the Delta map as described above, a process flow(s) giving more granularity to describe an achievable TOM (based upon acceptable project and external factor constraints), is produced. This represents a generic, amalgamated view of CES produced for review and comment by the EOPEN Use Case partners in advance of their planned pilot events.

3.1.4 Adaptation and Pilot

In undertaking the review, as described above, of the 'achievable', common and amalgamated TOM, each pilot partner seeks to identify and understand how it would, could or should work in relation to their own specific scenario(s) of CES and their own existing (i.e. Current) and/or desired (i.e. Target) operational models, structures and procedures.

The final version of the TOM used for each Use Case Test Bed, will be reviewed against the findings and output from the Test Bed, updated where required to provide the basis, alongside the technology elements of EOPEN, for the Test Beds post pilot.

4 IDENTIFICATION OF STAKEHOLDERS

Description of stakeholders

To ensure stakeholder expectations and needs are taken into account from an early stage, it was imperative that they be involved in the initial process of requirement elicitation. Therefore, once the use cases were defined, the first task has been to identify the key stakeholders and gain their support.

The tables below contain the name and description of the key identified stakeholders involved in the interview or survey process. Stakeholders were contacted by the partner responsible for the management of that Use Case; the means and material used for contact is described below in chapter 5: *Survey Method and Material Provided*.

4.1.1 PUC1 Flood Risk Assessment and Prevention

Stakeholder	Description
ARPAV	This administration is the environmental agency of Veneto Region; inside this office there is also the Copernicus contact person for Veneto Region
Regione Veneto Difesa Suolo	This Administration is the office of Veneto Region Administration responsible of land use, water, environmental planning, waste management. This office is also responsible for cartography.
Regione Veneto Protezione Civile	This Administration is the office of Veneto Region Administration responsible of Civil Protection Volunteer (at regional scale, so about formation, guidelines etc.), for Bulletins (Alert bulletins)
Genio Civile di Vicenza	This Administration is the operative office of Veneto Region Administration in water management (river maintenance, river project, dikes etc.)
Corpo Nazionale dei Vigili del Fuoco di Vicenza	The firefighters of Vicenza.
Provincia di Vicenza protezione Civile	This is the provincial office of Civil Protection, similar to Veneto Region Civil Protection office but at province level.
Comune di Vicenza	Municipality of Vicenza.
Consorzio APV	This Administration is a Land reclamation authority responsible for "Alta Pianura Veneta" basin.
Consorzio Brenta	This Administration is a Land reclamation authority responsible for "Brenta" basin.
AAWA (Autorità di Bacino dei fiumi Isonzo Livenza Piave Brenta-Bacchiglione)	This Administration is the higher water authority in Veneto, Trentino-Alto-Adige and Friuli region; it is also responsible for some international basins like Timavo Basin (Slovenia). It is an office directly dependent from the Italian Environmental Ministry.

4.1.2 PUC2 Food Security through Earth Observation dataset

Stakeholder	Description
Korea Rural Economic Institute	A national agricultural policy research institute focused on the development of agriculture, rural areas and the food industry. The institute is responsible for agricultural monitoring, Free Trade Agreements, World agriculture information, agricultural policies, Overseas crop market information, returning to farm support, international cooperation such as the Korean Agricultural Policy Experiences for Food Security(KAPEX). It carries over 30 different projects per year.
Rural development Administration	A central government organization responsible for extensive agricultural research and services in Korea. The organization has 4 different Research and Development institutes: National Institute of Agricultural Science, National Institute of Crop Science, National Institute of Horticultural and Herbal Science, National Institute of Animal Science. The administration is focused on agendas such as basic agricultural science and technology and development of steady supply of food and state-of-art technology.
Korea Rural Community Corporation	A national corporation which focus on rural community development such as stable food production, development and management of agricultural infrastructures. KRC has been contributing to the stable food production for about 50 million people of the nation through the development and management of agricultural infrastructures such as reservoirs and pumping stations, and have also been improving the living standard of rural and fishing villages. Major project of the corporation includes food, water, climate, safety, research and training.
APEC Climate Centre	The APEC plays an important role in the region in providing climate information products and services based on a multi-model ensemble prediction system. APEC Climate Centre aims to contribute to economic growth in the APEC region and support the protection of lives and property, the reduction of economic losses, and enhance economic opportunities. The mission of APEC is to enhance the socio-economic well-being of member economies by utilizing up-to-date scientific knowledge and applying innovative climate prediction techniques through climate prediction, interdisciplinary research, climate information services and international cooperation.

4.1.3 PUC3 Monitoring the Climate Change through Earth Observation

Stakeholder	Description
Finnish Transport Infrastructure Agency	The Finnish Transport Infrastructure Agency (FTIA), is a Finnish government agency responsible for the maintenance of Finland's road, rail, and waterway systems.
Reindeer-grazing associations (from 5 different geographical areas).	These contacts represent reindeer herding practitioners.
University of Lapland, Arctic Centre.	Represents reindeer herding research. Their research topic is related to the changing operational environment of reindeer herding.
Natural Resources Institute Finland (Luke).	Represents reindeer herding research. Their research is related to the pastures (conditions, usability etc.).
Lapland University of Applied Sciences.	Represents education and development of reindeer herding.
Reindeer Herders' Association.	Represents education and development of reindeer herding.
Centre for Economic Development, Transport and the Environment (Lapland Area).	Represents the administration of reindeer herding.

This list of stakeholders represents the starting point from which to develop the requirements to be implemented inside EOPEN; within this living document, this list of stakeholders will also be updated as and when new stakeholders are identified.

Stakeholders also represent the users of the platform, therefore it is critical, as with the purpose of the project, the platform is tailored to their needs and they are kept informed of the project's progress.

5 SURVEY METHOD AND MATERIAL PROVIDED

EOPEN partners decided that the most appropriate way of gaining initial user requirements from stakeholders, was to devise an easily accessible survey. This survey was devised to not require any previous knowledge of Earth Observation (EO) data, but instead, focused on their role, and information stakeholders currently use for their specified Use Case. This also identified what additional or alternative information they would require, plus any non-functional requirements specific to the use or uptake of any new system.

To achieve the scope of the user requirements survey, and to collect requirements from stakeholders. PUC leaders contacted these to explain the EOPEN project; our goals, objectives and foreseen benefit for the stakeholders, and to receive feedback on their needs and ideas for the development of the platform.

The method of contact, the survey and other information provided are described below, based also on the D 9.1.

Information and dissemination material

To ensure that stakeholders were correctly informed on the purpose of the project, PUC leaders provided material to stakeholders, directly from the leaflet and the EOPEN poster, as already approved by the consortium. Any other information considered necessary by PUC leaders, was provided to stakeholders from already approved deliverables.

Ensuring stakeholders had the correct background knowledge to the purpose and objectives of the EOPEN project, was the first step to ensure the correctness of subsequent data collected by the survey. This information was tailored to the stakeholders based upon their specific use case, and external factors such as common language of their audience and previous exposure to EO data.

A list of used materials for each use case can be seen below.

5.1.1 PUC1 - Flood Risk Assessment and Prevention

PUC1 provides to its stakeholders:

- The leaflet of EOPEN;
- The poster of EOPEN;
- The ICF (informed consent form, fig. 5.a) module and the IS (information sheet), which included a description of EOPEN's purpose, project overview, the financial method, and important additional information.

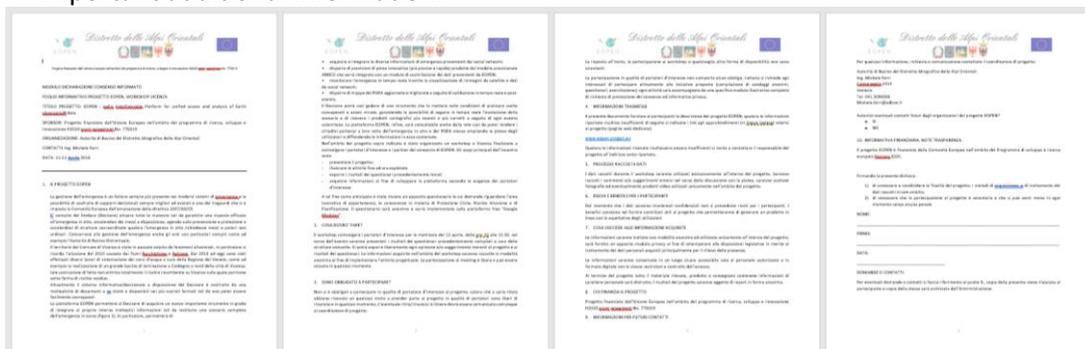


Figure 5.d

The invitation letter also included a brief description of the project to ensure that stakeholder’s had oversight of what EOPEN wanted to achieve, at the initial stage.

5.1.2 PUC2 - Food Security

For PUC2, stakeholders were provided with the EOPEN leaflet and poster, and a concise document that introduces EOPEN in the Korean language. The contents for the document in question were derived from the EOPEN’s Description of Work (Grant Document) and were then translated to Korean. All material was disseminated via e-mails.

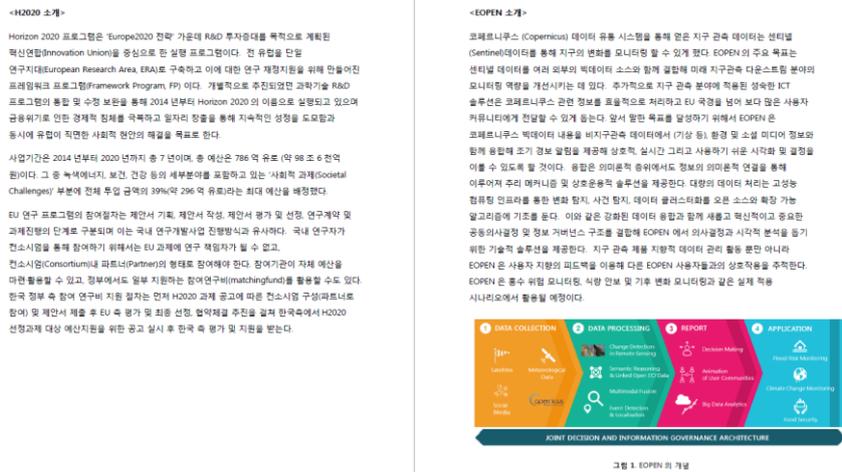


Figure 5.b

5.1.3 PUC3 – Climate Change

Several FMI members first, informally, and verbally, informed and engaged the stakeholders. At first, one FMI member for the largest stakeholder: FTIA, of what is EOPEN. Then, another FMI member verbally engaged in a conversation with another: University of Lapland. Who, in turn, verbally informed other stakeholders.

The invitation letter in Finnish follows. It’s translated in English in section 5.1.6, where we discuss how we furthered our communication.

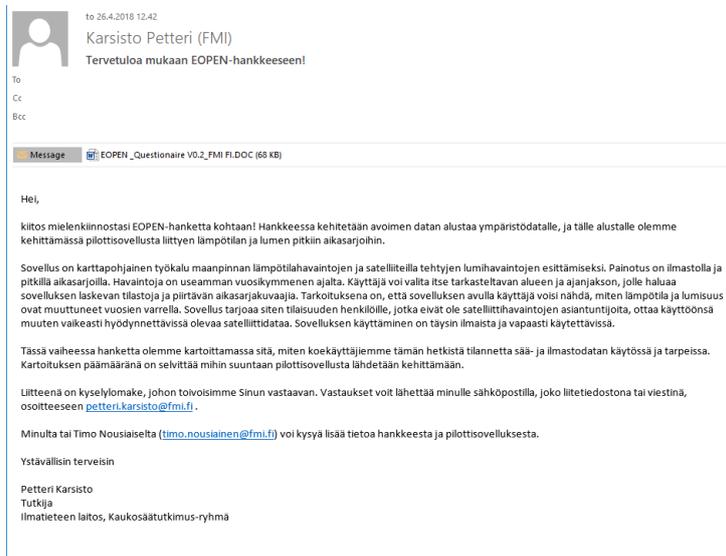


Figure 5.c

How stakeholders were engaged

Stakeholders were contacted based upon their specific business role and relevance to the use case; the methods of identification and contact varied by PUC, but all were conducted by the respective PUC leader.

Commonly across each PUC, there were an initial informal contact, to explain the purpose of the project and to ask their availability to participate and contribute to EOPEN.

After informal contact there was a formal invitation to contribute to EOPEN; the modalities of this invitation varied from PUCs.

5.1.4 PUC1 - Flood Risk Assessment and Prevention

PUC1 firstly identified from the emergency management plan for Vicenza, a list of all possible stakeholders between the administrations involved in emergency management. This was therefore an accurate reflection of this plan. From there all stakeholders were sent a formal invitation, in Italian, to take part in EOPEN, as seen below.



Figure 5.d Invitation sent to PUC1 stakeholders

Inside the invitation there was a short description of the EOPEN project, the date of the Vicenza meeting, and also the request of a reference person for each administration to maintain contacts after the Vicenza meeting.

After this formal invitation, AAWA sent to all stakeholders also an informal email with a more precise description of the project, the link to the surveys and a request to complete them.

At the end, to ensure and collect participation to the Vicenza meeting, there was multiple communications by phone between the administrations' involved, in EOPEN and AAWA.

PUC1 shared survey questions to stakeholders, through a common platform (Google Forms).

Questionnaires are organized in 4 parts:

- Introduction;
- General questions;
- Use case specific questions;
- Privacy.

The introduction contained all information about the project, aligned with the material approved by the consortium (leaflet and poster and other documents).

The aim of the generic questions was to understand information on the stakeholder completing the questions; information on the systems/technologies they use or have available; information on their role and tasks undertaken; and, their familiarity with satellite images. This information draws the initial framework for what stakeholders would like to see in an EOPEN platform.

The following section on Use Case specific questions, was to understand the stakeholder's knowledge in different disciplines such as planning, satellite datasets, and other technology infrastructures already available (e.g. early warning systems). This part allows us to understand what current information they use and what elements we need to integrate into the EOPEN platform.

Last part dealt with the authorization aligned with privacy Italian legislation.

Questionnaires were focused on the request of stakeholders to start drafting their expectations for a platform; administrations were contacted again to develop aspects linked with the more technical part of the survey (the needing of stakeholders concerning datasets); at the same time in parallel the concept of the JDIG COM and TOM are being developed based upon process analysis work and specific questions sent directly to stakeholders.

The report on the JDIG COM & TOM, is not set for completion until month 19 & 35 respectively.

5.1.5 PUC2 - Food Security

PUC2 first made a list of possible stakeholders which was screened internally by KU-eGISRS. After choosing the most suitable stakeholders, a mail was sent to ask their consent in participating in the survey or to introduce other fitting stakeholders, based on their understanding of EOPEN's scope.

When the possible stakeholders showed willingness to participate or introduced another possible stakeholder, a follow up e-mail was sent with the dedicated EOPEN survey (Questionnaire).



Figure 5.e Email sent to stakeholders in Korean language

For PUC2, stakeholders were first provided with the information about the EU Horizon 2020 program and then introduced to EOPEN's topic "EO Big data shift"³. Then, the Food Security pilot's scope and time plan were provided, along with a guide in Korean that supported stakeholders to fill in the questionnaire. Additionally, specific information about EOPEN were delivered to the stakeholders in person (during the one-to-one interviews) since the utilization of Copernicus service in the food security domain is little known in Korea.

The questionnaire was based on the PUC1 case and was then appropriately modified to the PUC2 requirements and subsequently translated to the Korean language. Then, the revised questionnaire was circulated to those who have agreed to participate, achieving, in one week, to have 8 responses by 4 different institutions/organizations.

The first iteration was also limited in the number of participation due to numerous short answer questions which hindered active participation. To have more samples for the user requirements, the second iteration is under process. According to the answers and comments received from the first iteration, the questions were revised to include a large portion of multiple answer questions. The second iteration was made end of April by sending out the Google forms link (browser's URL) to the participants to ease the process of both receiving answers from greater number of stakeholders and also for the analysis and the result generation. The second iteration aims to receive results from at least 15 different individuals from the listed PUC2 stakeholders.

³ <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/eo-2-2017.html>

5.1.6 PUC3 – Climate Change

PUC3 first generated a list of different livelihoods with potential stakeholders for the use case. These livelihoods were selected based on two criteria: first, climate change will affect the livelihood in the future, and second, practitioners in these livelihoods would benefit from having EO data with high spatial coverage more readily available for them. After these livelihoods were identified, FMI informally approached organizations and private companies representing the livelihoods by email and phone calls and queried if these contacts would be interested in supporting the EOPEN project as stakeholders. At this point these contacts were provided with a short description of EOPEN and PUC3. Some of the contacts also agreed to distribute the informal query within their organization or to their other connections.

After FMI had identified enough interested stakeholders (both organizations and individual people), an email was sent to them. The email included a short description of EOPEN and the PUC3 and a questionnaire as an attachment. The questionnaire was based on PUC1 questionnaire with modifications to better suit the PUC3 and translated to Finnish. The stakeholders were asked to fill in their answers and send the questionnaire back to FMI by email. The answers were then translated from Finnish to English by FMI.

Feedback from Stakeholders

5.1.7 PUC1 - Flood Risk Assessment and Prevention

During the entire survey collection process and during the Vicenza meeting (User requirements meeting, led by AAWA with Italian stakeholders) stakeholders showed considerable interest in the platform, providing useful feedback.

What emerged from these discussions was a confirmation of the user requirements previously drafted with questionnaires and a detailed view of how practically the stakeholders could use it.

Basically, stakeholders underlined the importance of having satellite data both available for technicians and for decision makers; as of now this type of datasets are marginally known, even if available freely (e.g. access to Copernicus data only requires the registration of the user). Satellite data also needed to be combined with existing monitoring technologies that use weather data and social media information from citizen observations.

Satellite datasets can show the entire situation (the whole picture) of a specific matter, with products available, costly sustainable and very accurate. The availability of these products can greatly improve the work of many stakeholders and improve the methods to combat a variety of environmental variables. This is important for the aims of PUCs, especially when linked with real-time social media information and weather data for early warning generation.

For Italian stakeholders, the most important feature is to have a full view of the situation that could function on normal personal computers; specifically, Italian stakeholders underline the need of a robust platform not 100% internet dependent. It must also be user friendly with all data available in real-time, to manage correctly the emergency and also to ensure an effective and rapid recovery phase.

One issue during an emergency that emerged from the discussions, was the timing of reconstruction and damage survey that is resource and time intensive. It was noted by decision makers that to have a precise and reliable damage report as soon as possible after an emergency, is key to reaching quicker normality after an event, which will have economic and social benefits in addition.

Another important feedback from Italian stakeholders, involved the activity of administration; new datasets can improve, as said, the functionality of offices but also can improve important tools already developed by each administration. These would be in environmental monitoring matters, planning and urbanistic matters and also economic matters such as agriculture and industry.

5.1.8 PUC2 - Food Security

It has to be clarified that stakeholders' feedback and acceptance of participation was made verbally through a phone call, for the case of the first iteration of the questionnaire. However, an official document was written and sent to the institutions of the stakeholder for the second iteration.

In the case of Korea Rural Economic Institute (KREI), a letter of support has already been signed at EOPEN's proposal stage. It is expected that the engagement of other stakeholder organizations will be at the level of individual experts, as they belong to governmental institutions and the process of receiving an institutional level of support is very complex.

As it has been already highlighted, the results for the first iteration of the questionnaire were received through email. Then, as shown in the figure below, the answers to each question were organized in an Excel sheet. The second iteration of the questionnaire and the results will be assisted by the Google Forms service, to easily extract all the needed information.

Questions	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	Respondent 7	Respondent 8
Which Organisation do you work for?	Rural Development Administration	Rural Development Administration	Rural Development Administration	Korea Rural Community Corporation	University	University	University	Korea Rural Economic Institute
What Industry do you operate in?	Public Administration	Public Administration	Public Administration	Agro Consultants	Public Administration	University	University	Public Administration
What is your role on Food security related aspects?	crop monitoring method development using remote sensing data	crop monitoring method development using remote sensing data	crop monitoring	Agriculture related project research	Agriculture related project research	Agriculture related project research	Agriculture related project research	Agriculture related project research
What tasks do you undertake for food security related issues?	crop monitoring method development using remote sensing data	crop monitoring method development using remote sensing data	crop monitoring method development using remote sensing data	Improving agricultural water quality, developing substitute energy source	crop stress resistance improvement and selection	regional nutrition management of agricultural land	food production soil research	international cooperation, food security issue solution through climate change adaptation
What technology or systems do you currently use to tackle food security related issues?	In field inspections, Statistical projections of crop yield, Remote sensing services, In-situ	In field inspections, Statistical projections of crop yield, Statistical assessment of crop yield, Climate Projections, Advanced visualization systems, Remote sensing services, In-situ	In field inspections, Statistical projections of crop yield, Remote	In field inspections, In-situ	Extreme	nutrition reduction technology field research in order to solve over-nutrition problems in		Food supply and demand metrics, Statistical

Figure 5.f Organized results

In addition to the online circulation of questionnaires, a thorough understanding of the food security issue is necessary, defining as much as possible uses'/stakeholders' needs. Therefore, an in-depth

interview with 3 to 5 (i.e. KREI, RDA, APCC) relevant stakeholders will be conducted in parallel with the second iteration of the questionnaires.

The stakeholders will be questioned about:

- their role in the chain of food security related decision making, if they are having a mandate for food security related matters such as production projections that are used for final strategic decisions,
- the type of services they are currently offering (e.g. crop yield estimations, rice area mapping),
- the means of disseminating the results and outputs of their researches and services, not only the encoding of the information (e.g. Excel, shapefile, KML/KMZ, WMS/WFS, GeoJSON) that will be shared but also the means of visualization/delivery (e.g. over a platform, software tool, file sent over email etc.), along with
- the characteristics of the output information they provide in terms of resolution (e.g. parcel specific, zone specific, municipality specific), accuracy (e.g. rice extent map product using in situ samples of validated ground truth information), frequency of provision (e.g. yearly, seasonally, per quarter etc.), and scale of application (from local to national).

The interview questions are currently under development, but they will be based on the above points. The interview results are planned to be organized and shared early June.

5.1.9 PUC3– Climate Change

The PUC3 stakeholders' information from three respondents so far was returned and collected in email after verbal conversations as described earlier. Follow-up phone calls were made to continue the collection. The gathered data was transferred to an Excel-formatted spreadsheet for further analysis.

PUC3 does not yet have letters of support from its stakeholders. The format and content is being discussed inside of FMI.

6 SURVEY REPORT

Below are the results of our analysis work conducted against the returned questionnaires. We chose to elaborate the results in both a detailed graphical interface and verbose manner, our final results have also been summarized in tables.

Results

6.1.1 PUC1 Results

Number of questionnaires filled by stakeholders: 21

As shown below, stakeholders come from multiple offices with different roles and needs related to the use case. Mostly stakeholders belong to Public Administration, but SME's were also interviewed.

From the survey's it emerged that information the stakeholders received was not sufficient for 1/3 of participants and there is need for access to alternative or additional datasets.

Another important question dealt with internet connection; it was confirmed that all partners have internet available during an emergency.

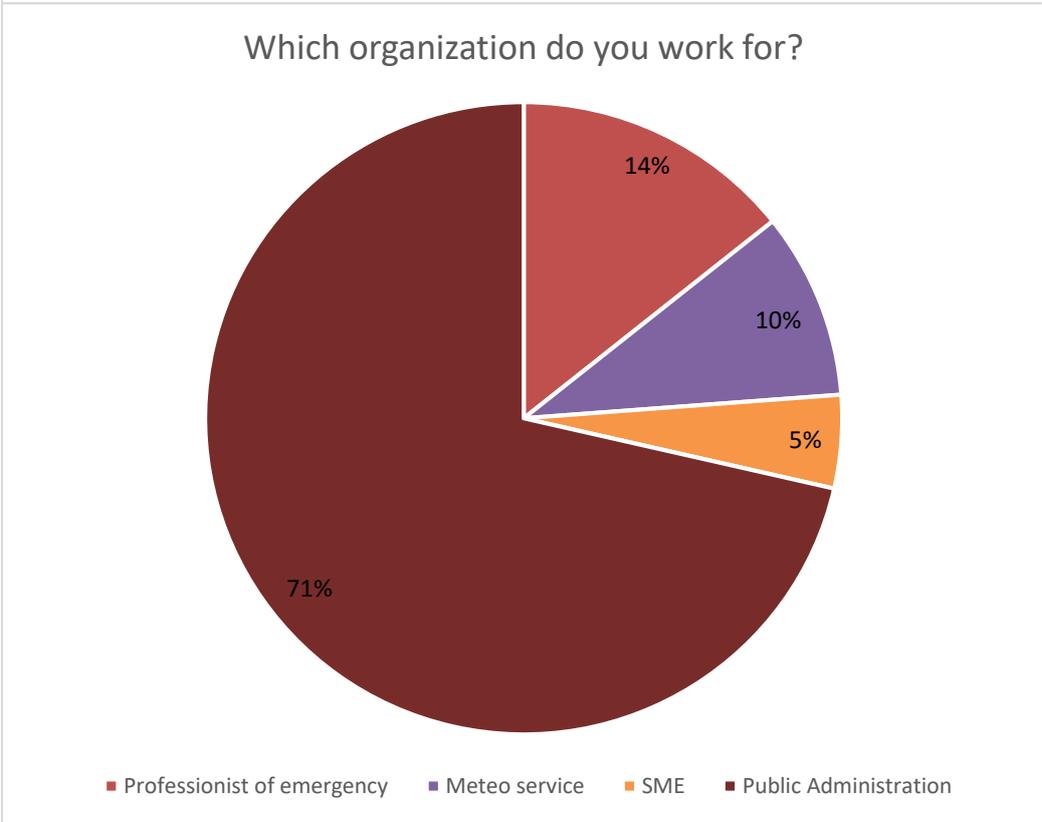
Partners confirmed the importance of an early warning system (EWS) such as the current AMICO from AAWA, and how it was important to integrate it with existing services. Stakeholders confirmed it was important to develop this system further and EOPEN was a great solution for it.

During the user requirements meeting in Vicenza other important points were added to the requirements tables (see Chapter 7); most of stakeholders are familiar with weather forecast, satellite imagery (mostly optical RGB images); they considered those data as very important for the development of a common strategy before, during and after an emergency because with those instruments land surveys are precise, less time and money consuming, and simpler.

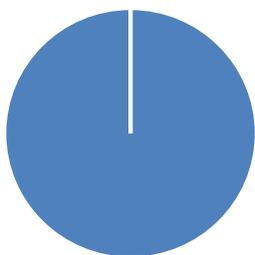
From the survey it emerged the idea of a platform with multiple services, user friendly operation, with the availability of original datasets, to also be processed and integrated in other programs like EWS.

Finally, it emerged that stakeholders are quite familiar with social networks and technologies; technologies are always available (PCs, printers, smartphones) and social media is widely used. Therefore, the knowledge and technological gap between the current state and the uptake of the EOPEN solution can be perceived as small. The use of social media information was considered to give a strategic advantage, to give decision makers a view of the public's perception, of the area of interest in real time.

Report of the survey:

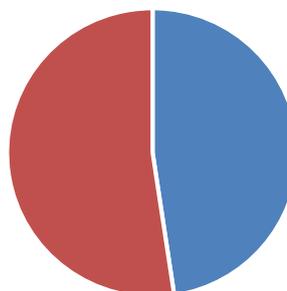


Do you have access to the internet during an Emergency?



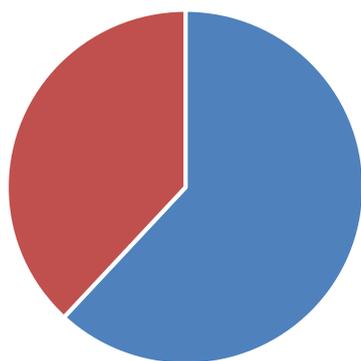
■ yes ■ no

Is this information sufficient to perform your role?



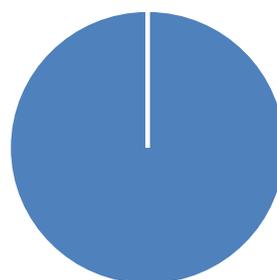
■ yes ■ no

Do you know what is an early warning system?

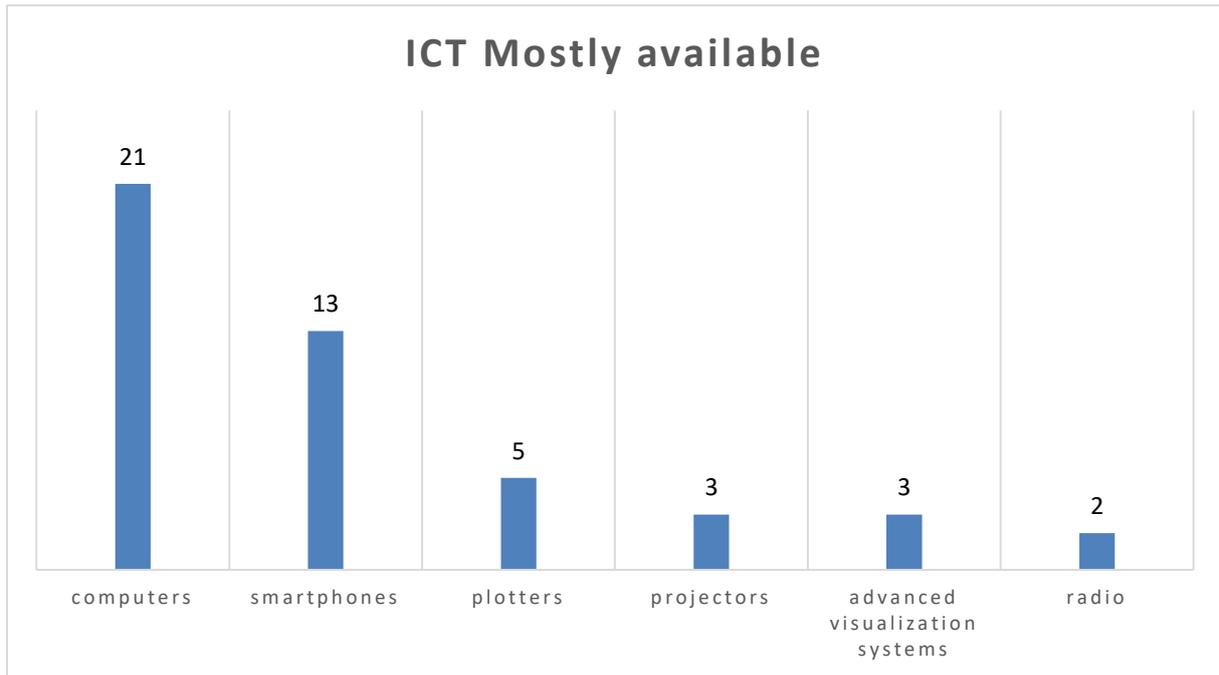


■ yes ■ no

You think that early warning system results are useful for the emergency management?



■ yes ■ no

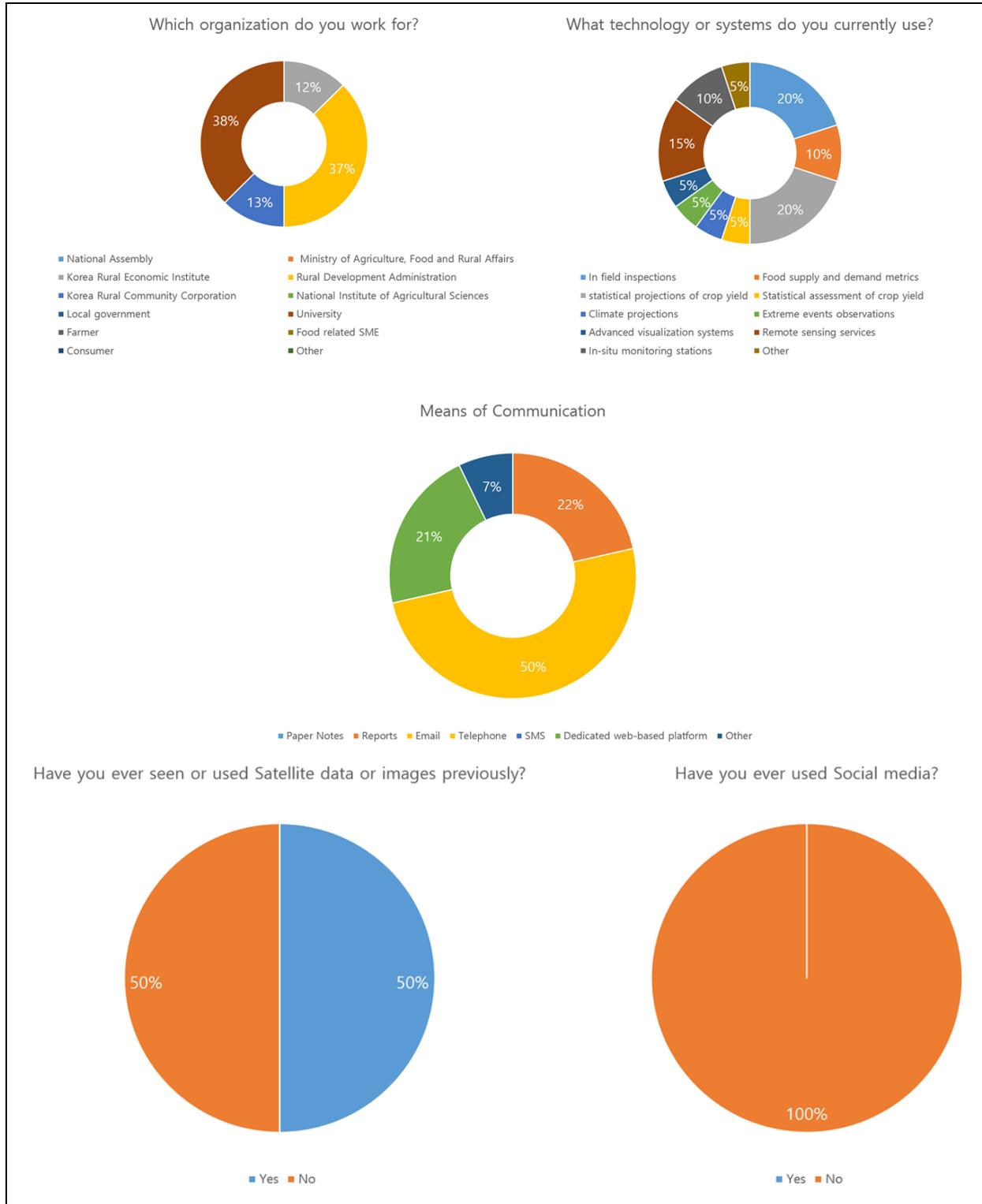


Results Summary PUC1

- From questionnaires it emerged the importance of EWS and the need to develop these technologies;
- The end users are already familiar with social media and meteorological data;
- Emerged also the importance of real time monitoring and damage report, using satellite data combined with data from the public. I.e. social media.
- Data should be «open format», free and available for elaborations, both for EWS (as input) and for stakeholders for land survey, measurements etc.
- The interface should be intuitive, robust.

6.1.2 PUC2 Results

For the first iteration of the questionnaires for the Food Security use case (PUC2), we have received eight (8) responses. The following figure illustrates the results of this first iteration.



Results Summary PUC2

Some important general notes:

- The most common means of communication for research findings, statistics and other food security related information are e-mails, reports and dedicated web-based platforms.
- GEOGLAM, which is a GEO (Group on Earth Observations) initiative for the Global Agricultural Monitoring, was little known or was used for networking purposes only.

Common requirements:

(a) Crop monitoring and estimation system which includes earth observation data; (b) Crop monitoring platform; (c) National Institute of Agricultural Sciences provide a system called "Soil Atlas" but this system shows the agricultural land area according to land usage which does not show the actual crop production area and location. The GIS data of "soil atlas" should be overlaid with earth observation data; (d) More targeted (in terms of spatial resolution and thematic specificity) cultivated area mapping and crop production statistics systems; (e) agricultural models, pattern recognition analysis and yield estimation techniques; (f) Different platforms need to integrate to the governmental statistics system.

6.1.3 PUC3 Results

Number of questionnaires filled by stakeholders: 3. Additional telephone calls were made with the stakeholders to fill in gaps and clarify the responses in the questionnaires or to specific Stakeholders who will be the first users.

General introduction:

Our three responders so far represent administrative government and public research. They are involved in making policy, implementing policy, maintenance and research. They must make decisions based on yearly trends in weather and climate and they conduct climate research. In their work related to climate and weather, they research changing climate in the North and its effects on reindeer herding, they plan courses of action for winter road maintenance, and prepare their budget for sufficient road maintenance funding.

Technology and Systems Questions

Our responders are familiar with technology and the latest operating systems. They use mostly remote sensing data, model forecasts, with in-situ sensors, apps on smart phones or tablets, they collect empirical data and data archives, they develop weather and climate research. They are familiar with Internet use. The research-oriented entities feel that their performance with climate and weather tasks would improve with mobile sensing, improved weather models, more quality measurements and more comprehensive satellite observation data, improved weather radar observations.

Information and Communication Questions:

Our responders communicate with/by the web, smartphone apps, data registries, paper, email, newspaper, and also none of these. They communicate with other Finnish road maintenance workers, with other climate researchers, with practitioners who herd reindeer, with weather data providers such as FMI, and with other researchers and climate modelers.

When they are performing their job, they receive weather events by registers, weather observations, model results, research results, which are 'mostly' sufficient for them to perform their job. However, there are unusual weather phenomena, which are difficult to locate in the observational data. There are also the cases of a mismatch between model results and observed weather of some unusual phenomenon, where we would like more observed data.

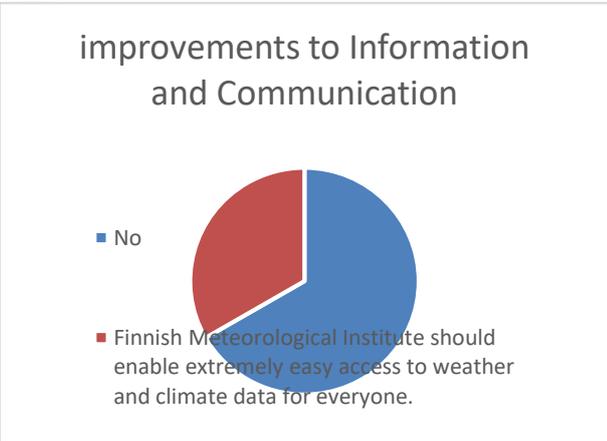
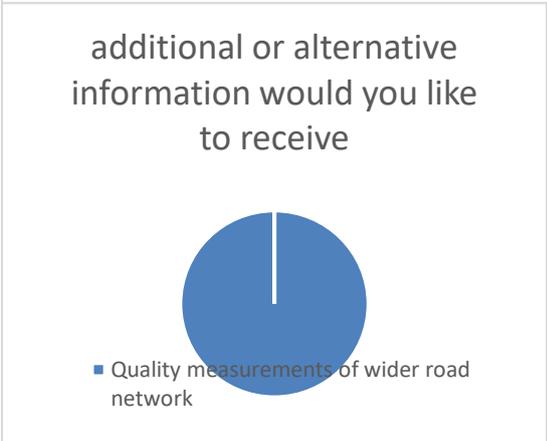
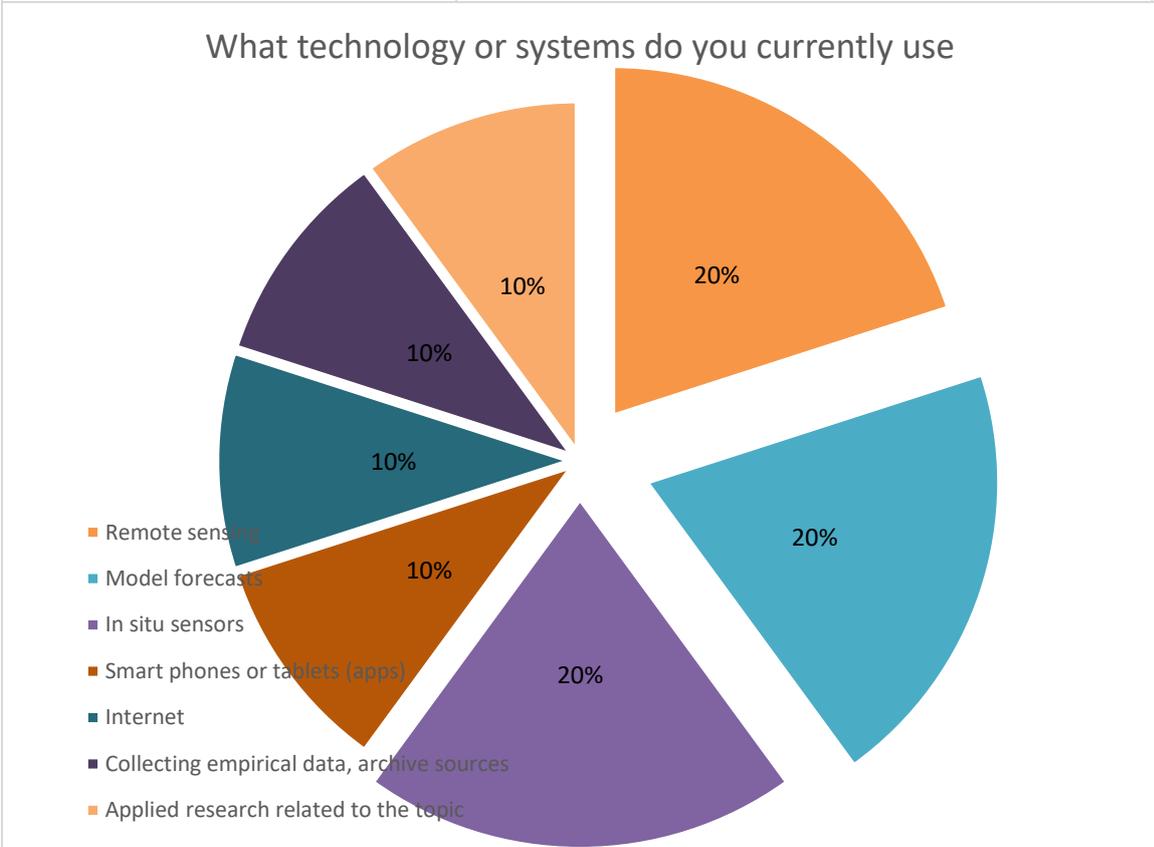
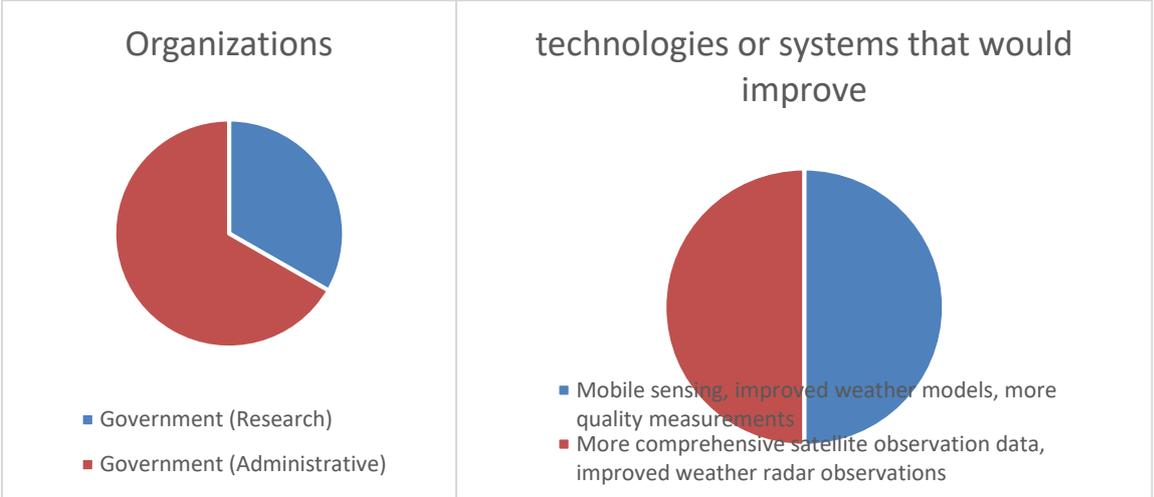
Additional or alternative information that would be helpful to perform their work are high quality climate/weather of the wider Finnish road network, in a time series and in analysed climate research results. One suggestion is for FMI to enable extremely easy access to weather and climate data for the public.

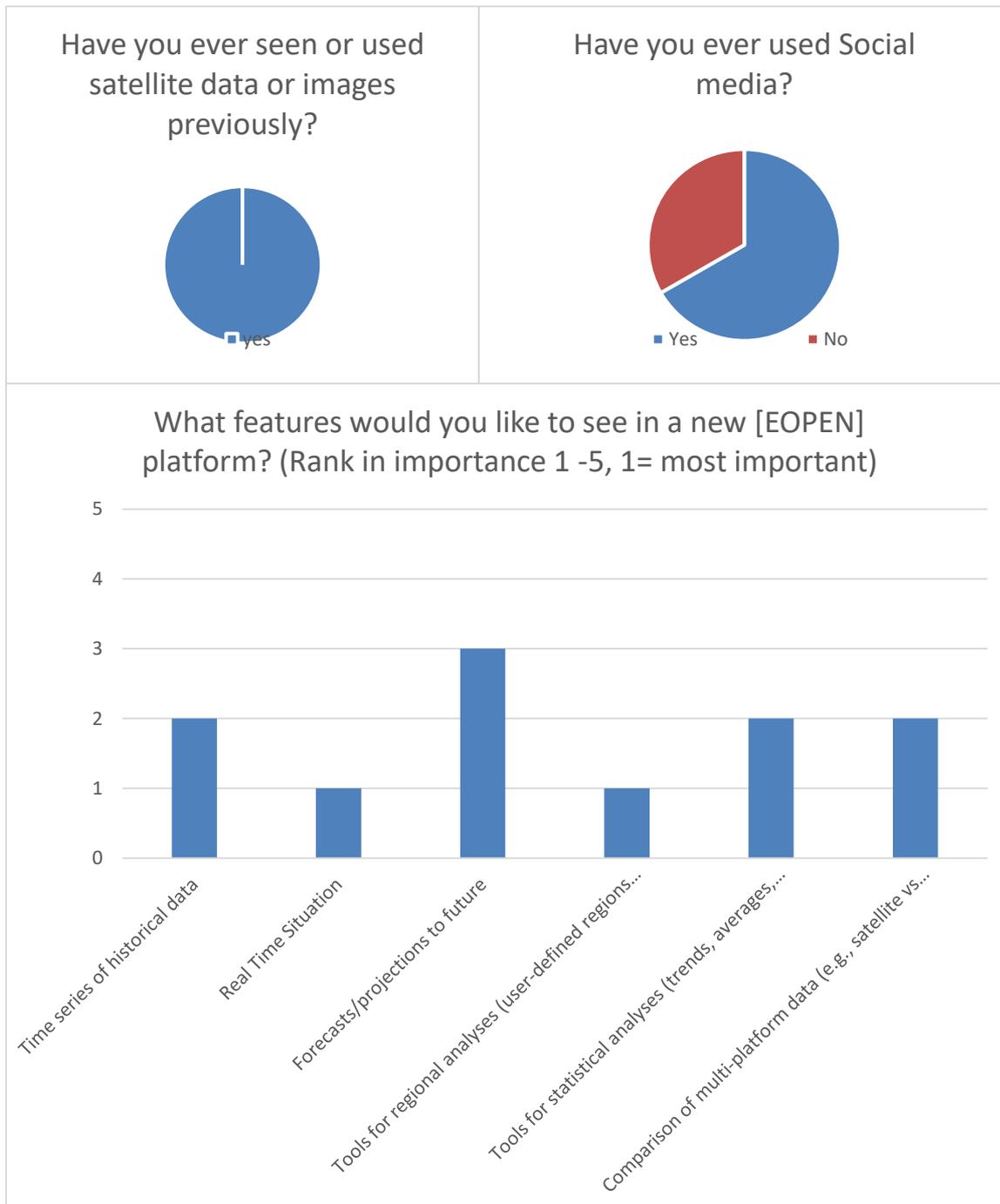
Planning and legislation:

The respondents were mostly not aware of Finnish climate change legislation and the responsibilities of the different actors. Climate change legislations were not relevant to their work. If they needed to be informed, the best way would be through traditional media.

Decisions and Tasking:

The respondents decision-making responsibilities were not directly related to climate and weather. If they had additional information, one respondent said that research conclusions would be more accurate and easier to utilize in practice.





[EOPEN] Requirements:

All of the respondents had previously seen or used satellite data / images. Most of the respondents had previously seen or used ground-based weather observations. The government administrator for supporting reindeer herding had not used social media, but suggested that the deep environmental knowledge of the reindeer herders could be utilized more and in social media.

The respondents each provided thoughtful ideas about how images or ground-based weather observations could be used to address climate and weather issues in their work. One asked for better coverage of weather events of lower class roads. The administrators of the reindeer herders said that the observations or data are used by the reindeer practitioners daily. Also that such data or observations would allow them to see the phenomena which negatively affect the northern livelihoods such as accumulation of snow over non-frozen soil. Such data or observations are used in

their research results too, such as freezing of pastures, snow conditions, snow melt and rainfall accumulation.

The reindeer researcher at the Arctic Centre, University of Lapland, with whom we followed up in an interview in early May described more of their needs: historical time series of snow with their snow modelling, which they use to correlate to the herders' own records/experience for snow conditions. The herders have a much more nuanced experience of the climate conditions than anyone else, which trigger decisions about caring for and moving the herds. The herders themselves need historical- 10 years at least, of snow and temperature data in order to compare current extreme events and legally ask for government compensation. The FTIA manager with whom we followed up in early May directed us to their recently updated road maintenance guidelines, which provided schedules for particular maintenance actions dependent on temperature or snow accumulation. They also need the historical data to estimate future conditions, which in turn require updated financial support.

Features in the new EOPEN Platform

In the perspective of the stakeholders, the features that are most important in the new EOPEN platform, ranked in importance are:

- 1 Real Time Situation;
- 1 Tools for regional analyses (user-defined regions instead of predefined);
- 2 Time series of historical data;
- 2 Tools for statistical analyses (trends, averages, variances, etc.);
- 2 Comparison of multi-platform data (e.g., satellite vs satellite, satellite vs ground);
- 3 Forecasts/projections to future.

An additional feature is an estimation for how uncommon/exceptional a given event or weather condition is.

Functionalities in the new EOPEN Platform

The functionalities that are most important to the stakeholders who have answered up to now are:

- 1 Data integration;
- 1 Data management;
- 2 Easy usage;
- 3 Attractive Layout;
- 4 Offline utilization;
- 5 Social media integration.

Use Case Specific Questions: (Climate monitoring)

With respect to PUC3, our stakeholders are responsible for organising response to Climate Change and weather. They use FMI weather data, typically by downloading it from FMI's web pages. Half of them have heard of Earth Observation data being used in their field and in snow related research.

7 USER REQUIREMENTS FROM STAKEHOLDERS

This chapter focuses on the summary of all the user requirements identified from stakeholders; results are summarized by Use Case and come directly from the survey's collected by each Use Case Leader (AAWA, FMI, NOA Ku-eGISRS). Separately will be provided also specific use cases, more technical and specialized, requested not by decision makers but by the offices and administrations. This second round of requirements will ensure the EOPEN platform is able to integrate and operate inside other tools and vice versa.

During the Vicenza meeting, it was also explained by Serco the potential of satellite image processing; since that point was also acquired by the stakeholders, it will be reflected in more technical and detailed requirements.

This version is an initial view of the User Requirements and will be updated in subsequent iterations following further discussions with stakeholders, and upon completion of the JDIG COM/TOM analysis work.

Results for PUC1, general and specific Requirements

The EOPEN Platform needs to provide, according to the stakeholders' feedback an intuitive interface, and not be internet dependent. This is to ensure that when (e.g. during emergency) the internet is unavailable, core functionality still remains. For PUC1 stakeholders' reliability on the platform is vital, because they will use this product during floods and crisis situations, therefore unreliable data or functionality, could result in serious consequences. One of the major requests dealt with the geo-localisation of social data to provide a real time monitoring of the situation.

Stakeholders are very interested in the concept of merging EO and non-EO data, many of them underline the importance of acquiring information from social media; social media is used by a multitude of people and during an emergency, this aspect becomes an uninterrupted flow of information that could cover the whole territory. The collection of this data could provide to decision makers both real time critical information for incident command as well as for future decisions on post incident reflection and review.

From the user requirements meeting in Vicenza, it also emerged from stakeholders an interest in the possibility to spread alert and other messages via social networks, with the possibility to monitor the diffusion of those messages. This would allow a wide spread of information in a short period of time, which current processes struggle to achieve.

Another problem that emerged from the questionnaires, that the proposed EOPEN platform should be able to overcome, is the merging of different datasets from various sources (e.g. AAWA flood risk maps, Civil Protection Plan of Vicenza, maps from Copernicus). EOPEN should provide an open platform with the possibility to upload and download documents and files (e.g. shapefiles or rasters), ready to be elaborated with other software, such as early warning systems (provided e.g. by AAWA).

Development and improvement of the current EWS system was seen as a priority amongst stakeholders, the EOPEN platform should either combine the EWS output with forecast and satellite data or become an outright EWS system that will supersede the current system.

Another important concept to be developed in the EOPEN platform is an interactive archive of emergency information; all datasets from EO and non-EO sources should be stored to be able to maintain a "history of emergency". The platform should also be able to produce reports for decision makers for the post emergency phase that contain information about social data, maps, and other data ingested into, and generated by the EOPEN platform during the rescue phase of emergency.

On the specific datasets, to improve EWS it is necessary to include a wide variety of inputs like the geometry of land (mesh of model), weather forecasts, specific datasets from water authorities, land cover and various others. To ensure the availability of data PUC1 checked the request of specific

datasets from stakeholders (mainly Veneto Region, Firefighters, Municipality of Vicenza, AAWA and Land reclamation authorities) with Copernicus services.

What emerged from this crosscheck is summarized in the table below (specific dataset).

These specific datasets are also needed by stakeholders for the forecasting phase, an example for land reclamation authorities, AAWA and Veneto Region deal with water management both in emergency and during day-to-day operations. The availability of snow maps provides them with the capability to manage droughts and prevent damage. During flood emergency it becomes a fundamental parameter for the management of floods; the same for soil moisture maps and forecasts. Land cover maps are useful not only for AAWA for the calculation of exposure for EWS, and for planning but also for the Veneto Region or for the Municipality of Vicenza, to ensure that their cartography and maps are updated and correctly represent the geography of their constituencies.

It was noted however that the most important dataset, that is also a Copernicus service, is the EMS mapping service that is fundamental during an emergency.

Summary tables:

Use case G-id	Users of the EOPEN platform:
PUC1_GA1	Must be provided with capabilities for data dissemination and integration of EO data, weather information and relevant social media text and images.
PUC1_GA2	Must be allowed geo-localisation of social data and real time control.
PUC1_GA3	Should be provided with an intuitive online platform with the possibility to visualise EO data (e.g. from webcam or mobile phone) and possibility to send text message (e.g. SMS or tweet) and analyse its semantics for meaningful automatic decision-making.
PUC1_GA4	Must be enabled to merge different administrative database and formats in a unique platform with all data shared.
PUC1_GA5	Should be enabled to implement EWS and add maps in the platform.
PUC1_GA6	Should be provided with an intuitive and robust interface.
PUC1_GA7	Must be provided with an interactive archive of each event; all data from social network communities and from satellites should be stored in a specific database to provide a history of each event.
Use case D-id	List of Datasets requested by stakeholders
PUC1_DA1	DEM/DSM 1m (e.g. Airbus Pleiades) from Copernicus
PUC1_DA2	Snow maps with a resolution < 20m
PUC1_DA3	Soil moisture maps with resolution < 10m
PUC1_DA4	Flood maps
PUC1_DA5	Damage maps
PUC1_DA6	Water presence maps
PUC1_DA7	Bathymetry of coast, lakes, rivers
PUC1_DA8	Orthophoto with resolution of 50 cm (e.g. WorldView4)
PUC1_DA9	Vegetation presence
PUC1_DA10	Land cover
PUC1_DA11	LAI and other vegetation indexes
PUC1_DA12	Other maps (thermal or multispectral data ready to be processed) with high resolution
PUC1_DA13	Weather forecast

Results for PUC2, general and specific Requirements

Following the stakeholders'/users' results and in order to ease the process and better formalize the above information into some more structural format (Stakeholders'/users' requirements) it was necessary to group the answers into the following 3 categories [i) **data requirements**, ii) **Service/feature interface & main functionalities**; iii) **Accuracy/Reliability of Service**]:

- **Data requirements:** What data do the stakeholders'/users' want?

The results were able to cover the experts from national institutions such as KREI, RDA, Korea Rural Community Corporation and University. Most of the government, agricultural and educational institutions share relative high degree of understanding on EO information. They also share a high relevance to the food security domain in activities like project planning and management. However, the subject of food security varies from water quality, energy, monitoring, crop estimation, genetic resource, soil and nutrition, overseas cooperation to climate change. This highlights the need for a **Focused Group Interview**.

Although, the current food security issue mainly involves on-site verification and crop yield statistical estimation, there is high level of demand for remote sensing services. The stakeholders do not make use of farmers' statements because they prefer an objective, specific and reliable data. There are also limitations of not being able to share the research data without the approval of the project responsible institution. In conclusion, the integration of the RDA's current Soil Atlas (see figure below) together with other geospatial information, such as crop monitoring and estimation system, is needed.

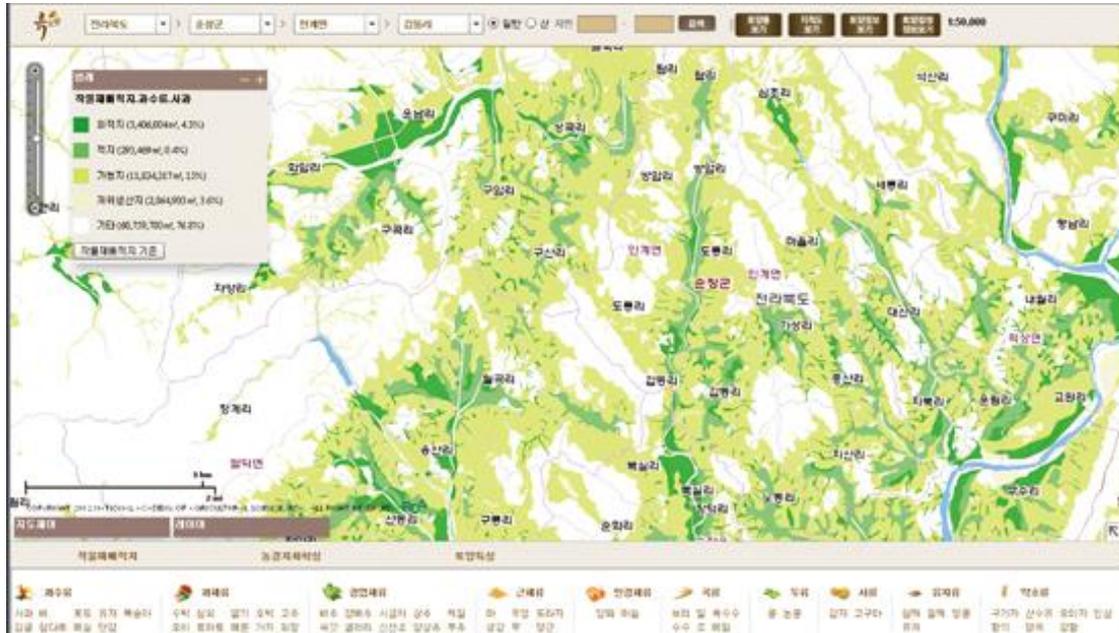


Figure 7.e RDA's Soil Atlas

- **Service/feature interface & main functionalities:** How should the service/feature interfaces be configured, and what should be the main functionalities of the service/feature?

The information, that is helpful for the performance of the day-to-day operations, is the basic statistical data such as **crop forecasting**, **production statistics**, **fertilizer usage** through the

exploration of remote sensing techniques. Therefore, it is of paramount importance to integrate the existing (statistical) information along with the vital spatial information.

With regard to information, inconsistency is one of the major issues as it makes it difficult to correlate and combine different types of information, such as the statistical data with field data and other geospatial data (e.g. Land cover, EO data), and it makes it even harder as in some cases the data itself are for proprietary use. Last and most importantly, lack of spatial data to accompany most of the already available food security related statistical information is a major issue. Additionally, there is a high demand for functionalities related to disasters such as warning alarms and weather alerts. Stakeholders' data management and data integration needs are high, so the core contents should enclose and preserve these needs, allowing also the users to easily interact with existing data.

- **Accuracy/Reliability of Service:** Which is the expected accuracy of the food security service that could be acceptable, along with the reliability rate of the service system?

Both need to be secured. Since there are few cases with experience using spatial information-based data, it is considered important to ensure compatibility between spatial data and existing statistical data.

Use case G-id	User of the EOPEN platform:
PUC2_GB1	Must be provided with an agriculture monitoring system (based on earth observation data) that will provide more accurate cultivation area mapping and production estimates coupled with statistical data.
PUC2_GB2	Must be provided with a crop monitoring solution/platform that will integrate spatial and statistical data.
PUC2_GB3	Should be enabled to overlay the GIS data of “soil atlas” with remote sensing data. Hint: <i>National Institute of Agricultural Sciences provide a system called “Soil Atlas” but this system shows the agricultural land area according to land usage which does not show the actual crop production area and location.</i>
PUC2_GB4	Should be provided with services that account for big data handling, meteorological data coupling with statistical yield estimations and satellite data.
PUC2_GB5	Must be enabled to integrate different platforms to the governmental statistics system.
PUC2_GB6	Must be provided with data at farm level (e.g. crop type classification, etc.)
PUC2_GB7	Must be enabled to download agriculture related information through web.
PUC2_GB8	Should be enabled to receive agriculture related information through reports.
PUC2_GB9	Should be enabled to integrate the produced agriculture related information into the national statistics system.
Use case D-id	List of Datasets requested by stakeholders
PUC2_DB1	High resolution remote sensing imagery
PUC2_DB2	Detailed meteorological observation & forecasting data
PUC2_DB3	In field inspection data
PUC2_DB4	Farmers’ claims data
PUC2_DB5	Accurate yield statistics
PUC2_DB6	EO based production status
PUC2_DB7	Statistical data on national fertilizer usage

PUC2_DB7	Statistical data on crop yields
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Results for PUC3, general and specific Requirements

From our survey so far, all of the meteorological data, which our use case needs, is available from FMI's open data or satellites (multiple providers).

Reindeer herders would like to have the historical data on moldy pastures, but that kind of data doesn't exist (or is too sparse). Maybe we can find another data proxy for mold on lichen in reindeer pastures.

FTIA is interested in utilizing their road maintenance classification for snow removal and sanding together with weather and climate data.

Currently all of the Finnish weather data is freely available from FMI Open data, GlobSnow and Freeze/Thaw products (satellites). Also, FMI provides the weather information through public services (i.e. television, newspapers, radio and websites) to the general public. However, retrieving available data is another issue. Public services don't provide the data in an easy-to-use electronic format nor access to detailed historical data. Open data API's on the other hand do, but they're not very user-friendly. Such (Open Data + API) requires specific knowledge to download and process the data into a useable format, which is often dependent on the intended use. And then the average end-user must still perform the data analysis.

Use case G-id	User of theEOPEN platform:
PUC3_GC1	Should be provided with a user friendly interface.
PUC3_GC2	Should be provided with easy access and management of datasets.
PUC3_GC3	Must be provided with data integration capabilities.
PUC3_GC4	Must be enabled to overlay satellite and ground observation data over a map background.
PUC3_GC5	Should be provided with the capability to select a user-defined area of interest.
PUC3_GC6	Should be enabled to visualize real time situation (most recent data).
PUC3_GC7	Must be enabled to browse historical observations.
PUC3_GC8	Should be provided with tools for statistical analyses of selected area, time period and dataset(s).
PUC3_GC9	Should be provided with tools for visualizing time series of datasets and statistical analyses.
PUC3_GC10	Should be provided with time series trend analysis and future projections capabilities.
PUC3_GC11	Must be enabled to compare multi-platform data (e.g. satellite vs satellite, satellite vs. ground observation).
PUC3_GC12	Should be provided with access to relevant tweets with specific key words through the platform.
Use case D-id	List of Datasets requested by stakeholders
PUC3_DC1	Snow cover observations
PUC3_DC2	Ground (soil) temperature data
PUC3_DC3	Air temperature at 2 meter height
PUC3_DC4	Snow accumulation maps
PUC3_DC5	Climatological data for meteorological observations
PUC3_DC6	Social media
PUC3_DC7	Climate change scenario projections
PUC3_DC8	Weather observation time series
PUC3_DC9	Numerical weather prediction forecasts

PUC3_DC11	Herding area borders
PUC3_DC12	Road maintenance classification

In particular, the origin of these data products are the following:

PUC3_DC1, Snow cover observations: GlobSnow SWE

PUC3_DC2, Ground (soil) temperature data: SMOS Level 3 Freeze-Thaw and Sentinel LST maps

PUC3_DC3: Air temperature at 2 m height: Gridded pre-computed maps

PUC3_DC4: Snow accumulation maps: Gridded pre-computed maps, GlobSnow SWE

PUC3_DC5: Climatological data for meteorological observations: FMI Open Data

PUC3_DC7: Climate change scenario projections: FMI Open Data

PUC3_DC8: Weather observation time series: FMI Open Data

PUC3_DC9: NWP model forecasts: FMI Open Data

PUC3_DC10: Region and municipality borders

PUC3_DC11: Herding area borders

PUC3_DC12: Road maintenance classification: FTIA Open Data

CONCLUSION

This document provides clearly the process conducted by EOPEN partners to collect user requirements from both existing and potential future stakeholders. This was important to ensure that all possible stakeholders, who could potentially uptake the system upon completion, were directly involved in the development process.

Since EOPEN should be a platform tailored to the requests from end users, the content of the questionnaires was carefully elaborated to produce a list of requirements both dealing with the idea of the interface (intuitive) and with specific datasets that should be accessible through the EOPEN platform.

The expectations from stakeholders are very high, because as said for example during the Vicenza meeting, EOPEN could change the method of monitoring the soil and land and must give to decision makers an important instrument to ensure that all decision come as the result of an informed process.

The high expectations previously mentioned, are underlined by the number of surveys that came back from stakeholders; more than 40 questionnaires were filled by administrations and SME's from Italy, Greece, Korea, and Finland. This not only shows the active participation and interest for the platform already gained by EOPEN partners, but also that a wide array of needs is being taken into consideration.

Continuous communication with stakeholders is key to ensure their ongoing support and participation in the EOPEN project. It was recognised we need the ability to adapt the EOPEN solution, therefore this deliverable will be a living document, to take into account any additional needs stakeholders may have, or to account for changes in the environment. This allows the EOPEN solution to stay relevant and not become irrelevant come project end, which also raises the opportunity of successfully delivering an exploitable product.

As such, this document will be iteratively updated after subsequent discussions with stakeholders, at key project milestones, and following completion of the COM/TOM analysis work as part of the JDIG.

8 ANNEXES:

Questionnaire from PUC1

General introduction:

Which Organisation do you work for?

- Municipality of Vicenza
- Veneto Region Civil Protection Department
- Veneto Region Administration
- National corps of Firefighters
- Civil protection of Vicenza Province
- Civil protection volunteer group
- Water Authorities (specify) _____
- Other (specify) _____

What Industry do you operate in?

- Public Administration
- Municipalities management, decision maker (Mayors or other politic role)
- Professional of emergency (Fire fighters, Rescuers)
- Utility Company (Electricity, Gas, Water, Sewage, ...)
- Provider of Weather Forecasts
- Media Outlet (Radio, TV, ...)
- Civil protection volunteer
- Other (Please specify) _____

What is your role during an Emergency? (Context specific, i.e. flooding for Vicenza)

What tasks do you undertake during an Emergency? (Context specific, i.e. flooding for Vicenza)

Technology and Systems Questions

What technology or systems do you currently use during a Civil Protection Emergency?
(Please tick all that apply)

- Personal Computers
- Smartphone
- Radio
- Plotters

- Electronic boards (LIM)
 - Advanced visualization systems
 - Projector
 - Other (please specify)
-

What technology or systems do you have available but do not use during an Emergency and why? (please

tick all that apply)

- Personal Computers
- Smartphone
- Radio
- Plotters
- Electronic boards (LIM)
- Advanced visualization systems
- Projector
- Other (please specify)

Why?: _____

Do you have access to the internet during an Emergency?

- Yes
- No

Is there anything you would change with your current technology and systems that would help you perform your role better in an Emergency?

Information and Communication Questions:

What communication channels do you currently use during an Emergency? (please tick all that apply)

- Paper notes
- Email
- Radio (Oral communications)
- Registry (on file)
- Registry (on paper)
- Voice recorders
- Telephone
- SMS
- Other (specify)

Who do you communicate with during an Emergency?

What sort of information do you currently receive during an Emergency?

Is this information sufficient to perform your role?

- Yes
 - No (Please elaborate)
-

What additional or alternative information would you like to receive to help you perform your role?

How would you prefer to receive this information?

Is there anything you know about, that currently restricts you getting this information?

- No
 - Yes (Please Specify What & How)
-

Is there any other improvements to Information and Communication you would suggest?

Planning and legislation:

Are you aware of the current Civil Protection plan for your area? (Context specific, i.e. flooding for Vicenza)

- Yes
- No

Are you aware of the current chain of command during an Emergency?

- Yes
- No

Are you aware of the risk management plan used within your area? (Context specific, i.e. flooding for

Vicenza)

- No
- Yes (Please specify) _____

Is there any way you would improve current plans for your area?

If you are not aware of any current plans, how would be best to Inform you of these?

Decisions and Tasking:

Are you responsible for making decisions or organising others during an Emergency?

- Making decision
- Organizing

Is there anything you would improve in how you make decisions or organise others if you had additional Information or a different system? If so what?

Is there any task you would improve or do differently if you had additional information or a different system? If so what?

EOPEN Requirements:

Have you ever seen or used Satellite data or images previously?

- Yes
- No

Have you ever used Social media?

- Yes
- No

How do you think Satellite images could be used to improve natural hazard prevention and protection in your area?

How do you think Social Media information could be used to improve natural hazard prevention and protection in your area?

What features would you like to see in a new [EOPEN] platform? (Rank in importance 1 -5, 1= most

important)

- Damage overview
- Real Time Situation
- Warning alerts
- Meteorological information
- Updated Maps
- Map overlays
- Public perception

Is there any other additional features you would like to see? (Rank also please)

What functionalities would be most important in adopting a new [EOPEN] platform? (Rank in importance 1

-5, 1= most important)

Data integration

Easy usage

Data management

Attractive Layout

Offline utilization

Integration with other tools (specify) _____

Is there any other additional functionalities you would find important? (Rank also please)

Specific Question for Italian Stakeholders:

Do you know what is an early warning system (if no skip next 4 questions)?

Yes

No

Have you ever heard about early warning systems in Vicenza?

Yes

No

If yes, could you name a system you know?

You think that early warning system results are useful for the emergency management?

Yes

No

If yes, would you improve it/what would you see?

Have you ever heard about PGRA Maps (Flood risk management plan) (if no skip next 2 questions)?

Yes

No

PGRA Maps are “user friendly” in your opinion?

Yes

No

How you would improve these maps?

- o Online availability
- o Unique interface
- o People involved
- o Early warning system results
- o PGRA Maps with real time data
- o Damage reports

Questionnaire from PUC2

General introduction:

Which Organisation do you work for?

- o Government administrative institute
- o Government research institute
- o Local government
- o Public company
- o Private company
- o University
- o Farmer
- o Consumer
- o Other (specify)_____

What is your role on Food Security related aspects?

- o Policy proposal/making
- o Policy implementation
- o Food security related decision making
- o Trade related task
- o Trade related research
- o Food security monitoring
- o Crop monitoring
- o Food security evaluation
- o Food security related statistics
- o Food security related research
- o Farmer
- o Other (Please specify)_____

What tasks do you undertake for food security related issues? (Context specific)

Technology and Systems Questions

What technology or systems do you currently use to tackle food security related issues (monitor, early warning, assess, added value information)? (Please tick all that apply)

- In field inspections
- Food supply and demand metrics
- Statistical projections of crop yield
- Statistical assessment of crop yield
- Climate Projections
- Extreme events observations
- Advanced visualization systems
- Remote sensing services
- In-situ monitoring stations
- Other (please specify)

What technology or systems do you have available but do not use for Food security related issues and why? (please tick all that apply)

- GEOGLAM services (e.g. Asia Rice)
- KREI Outlook & Agricultural Statistics Information System (OASIS)
- KREI Overseas Grain Market Information
- KERI Agriculture Observation Division's web research system
- RDA Soil Atlas
- RDA Nongsaro
- RDA Agricultural meteorology information service
- Korea Meteorological Administration National meteorological comprehensive information
- Proprietary services for crop estimation and monitoring
- Farmers' claims
- Disaster related products (e.g. Earth Observation disaster assessment)
- Other (please specify)

Why do you not use the available technology or systems?

- Technical limitation
- Policy limitation
- Lack of region-specific data
- Lack of accurate statistics

- Inconvenient layout
- Slow update
- Other

Are you using Earth Observation data for Food security related issues?

- Yes
- No

Is there anything you would change with your current technology and systems that would help you perform your role better in Food security related matters?

Information and Communication Questions:

[In case you are providing Food Security related information] Please specify What communication channels do you currently use for sharing Food Security related information? (please tick all that apply)

- Newspaper, magazine
- Newsletter, email
- SMS
- Reports
- Dedicated web-based platform
- Smartphone application
- SNS(Kakaostory, Facebook, Twitter, Blog, etc)
- Other (specify)
- None of the above

[In case you are receiving Food Security related information] Please specify by which means such information are delivered to you? (please tick all that apply)

- Newspaper, magazine
- Newsletter, email
- SMS
- Reports
- Dedicated web-based platform
- Smartphone application
- SNS (Kakaostory, Facebook, Twitter, Blog, etc.)
- Other (specify)
- None of the above

Who do you communicate to the Food Security related information (e.g. Warnings, Maps, Statistics, Reports, etc.)?

- Government officials
- Organization members (colleagues)
- Farmers
- SNS
- Friends
- Others
- None of the above

What sort of information do you currently receive as Food Security related information?

- Law
- Directives
- Mandates
- Suggestions
- Guidance
- Warnings
- Maps
- Statistics
- Reports
- None of the above

Is this information sufficient to perform your role?

- Yes
- No (Please elaborate)

What additional or alternative information would you like to receive to help you perform your role?

- On/offline training
- High resolution satellite image
- Meteorological data
- Field survey data
- GIS based information
- SNS information

- Statistics
- None of the above

How would you prefer to receive this information?

Is there anything you know about, that currently restricts you getting this information?

- No
- Yes (Please Specify What & How)

Are there any other improvements to Information and Communication you would suggest?

Planning and legislation:

Are you aware of the current Food Security action plan for your area? (Context specific, i.e. Strategy, Law, Directive, Mandate, Measures)

- Yes
- No

Are you aware of the current chain of command for Food Security related matters?

- Yes
- No

Are you aware of the risk management plan used within your area? (Context specific, i.e. Food Security in South Korea)

- No
- Yes (Please specify) _____

Is there any way you would improve current plans for your area?

If you are not aware of any current plans, how would be best to Inform you of these?

Decisions and Tasking:

Are you responsible for the following tasks for Food Security related matters?

- Making decision
- Organizing
- All of the above
- None of the above

Is there anything you would improve in how you make decisions or organise others if you had additional Information or a different system? If so what?

Is there any task you would improve or do differently if you had additional information or a different system? If so what?

EOPEN Requirements:

Have you ever seen or used Satellite data or images previously?

- Yes
- No

Have you ever used Social media*?

*Social Media is an online platform that people use to build social networks or social relations with other people who share similar personal or career interests, activities, backgrounds or real-life connections such as Facebook, Twitter, Kakao, etc.)

- Yes
- No

How do you think Satellite images could be used to improve food security monitoring and protection in your area?

- Cross-national data management
- Big data usage for users from all domains
- Real-time food security monitoring
- Basic data for preventive response
- Crop analysis
- Others (Please elaborate)

How do you think Social Media information could be used to improve food security monitoring in your area?

- Cross-national data management
- Real-time food security monitoring
- Region-specific data production and collection
- Others (Please elaborate)

What features would you like to see in a new [EOPEN] platform? (Rank in importance 1 -5, 1= most important)

- Damage overview
- Real Time Situation
- Warning alerts
- Meteorological information
- Updated Maps

Map overlays

Are there any other additional features you would like to see? (Rank also please)

What functionalities would be most important in adopting a new [EOPEN] platform? (Rank in importance 1 -5, 1= most important)

Data integration

Easy usage

Data management

Attractive Layout

Offline utilization

Integration with other tools (specify)_____

Are there any other additional functionalities you would find important? (Rank also please)

Use Case Specific Questions: (Food Security)

Are you aware of any Food Security monitoring related service?

Yes

No

Have you ever heard about Asia-Rice Crop Estimation & Monitoring component for the GEO Global Agricultural Monitoring (GEOGLAM) initiative?

Yes

No

If yes, could you name a system and/or procedure that uses the above information?

Have you ever heard about any other service that it is based on Earth Observation data and provides information related to Agriculture monitoring (e.g. Crop monitoring, Yield estimation etc)?

Yes

No

If yes, could you name a system and/or procedure that uses the above information?

You think that Asia-Rice and/or other services results are useful for Food Security?

Yes

No

If yes, would you improve it/what would you see?

Have you ever seen a crop identification map based on Earth Observation data?

- Yes
- No

If yes, please give reference and/or elaborate more, fiving more information?

Have you ever seen crop yield estimate maps based on fused Earth Observation and other (e.g. meteo, in-situ) data?

- Yes
- No

If yes, please give reference and/or elaborate more, fiving more information?

Have you ever seen any other Food Security service that it is based on Earth Observation data?

- Yes
- No

If yes, please give reference and/or elaborate more, fiving more information?

How you would improve these maps and services?

If yes, please give reference and/or elaborate more, fiving more information?

Questionnaire from PUC3

General introduction:

What type of organisation/enterprise do you work for?

- Government (administrative)
- Government (research)
- Local administration/department
- Public company
- Private company
- Education
- Union or interest group
- Private citizen
- Other (specify)

What industry/activity do you operate in?

- Policy proposal/making
- Policy implementation
- Maintenance planning/resourcing
- Maintenance
- Monitoring
- Damage mitigation
- Insurance
- City planning
- Tourism
- Other (Please specify)

What is your role in your organization regarding your work related to climate and weather?

What tasks do you undertake in your work related to climate and weather?

Technology and Systems Questions

What technology or systems do you currently use if your work in climate & weather-related issues (monitoring, communication, data assess, etc.)? (Please tick all that apply)

- Remote sensing data
- Model forecasts
- In situ sensors
- Smart phones or tablets (communication)
- Smart phones or tablets (apps)
- Heavy machinery
- UAV's
- Internet
- Public radio and television broadcasts
- Other (please specify)

Are there technologies or systems that would improve your performance with climate & weather related issues that are not currently available to you?

Are there technologies or systems available to you, relevant for your work with climate & weather related issues, that you do not use in your work? Why?

Information and Communication Questions:

What communication channels do you currently use when working with climate and weather related issues? (Please tick all that apply)

- Paper notes
 - Email
 - Radio
 - Registry
 - Newspaper
 - SMS
 - Dedicated web-based platform
 - Smartphone application
 - Social media
 - Other (specify)
 - None of the above
-

With whom do you communicate when working with climate and weather related issues?

What sort of information do you currently receive while working with such issues?

Is this information sufficient to perform your role?

- Yes
- No (Please elaborate)

What additional or alternative information would you like to receive to help you perform your role?

How would you prefer to receive this information?

Is there anything you know about that currently restricts you getting this information?

- No
- Yes (Please Specify What & How)

Is there any other improvements to Information and Communication you would suggest?

Planning and legislation:

Are you aware of any legislation related to climate and weather issues in Finland?

- Yes
- No

Are you aware of the responsibilities of different actors related to such issues?

- Yes
- No

Are these legislations relevant for you in your work?

- No
- Yes (Please specify)
- I don't know

If you are not aware of any current legislation, how would be best to Inform you of these?

Decisions and Tasking:

Are you responsible for making decisions or organising others with issues related to climate and weather?

- Making decision
- Organising
- Both
- None of the above

Is there anything you would improve in how you make decisions or organise others if you had additional Information or a different system? If so what?

Is there any task you would improve or do differently if you had additional information or a different system? If so what?

[EOPEN] Requirements:

Have you ever seen or used satellite data or images previously?

- Yes
- No

Have you ever seen or used ground-based weather observations previously?

- Yes
- No

Have you ever used Social media*?

**Social Media is an online platform that people use to build social networks or social relations with other people who share similar personal or career interests, activities, backgrounds or real-life connections such as Facebook, Twitter, Instagram, etc.*

- Yes
- No

How do you think satellite images or ground-based weather observations could be used to improve addressing climate and weather-related issues in your field of work?

How do you think Social Media information could be used to improve addressing climate and weather-related issues in your field of work?

What features would you like to see in a new [EOPEN] platform? (Rank in importance 1 -5, 1= most important)

- Time series of historical data
- Real Time Situation
- Forecasts/projections to future
- Tools for regional analyses (user-defined regions instead of predefined)
- Tools for statistical analyses (trends, averages, variances, etc.)
- Comparison of multi-platform data (e.g., satellite vs satellite, satellite vs ground)

Are there any other additional features you would like to see? (Rank also please)

What functionalities would be most important in adopting a new [EOPEN] platform? (Rank in importance 1 -5, 1= most important)

- Data integration
- Easy usage
- Data management
- Attractive Layout
- Offline utilization
- Social media integration
- Integration with other tools (specify)_____

Are there any other additional functionalities you would find important? (Rank also please)

Use Case Specific Questions: (Climate monitoring)

Are you aware of any Climate monitoring related service?

- Yes
- No

Are you currently using any service providing data on climate and weather?

- Yes
- No

If yes, could you shortly describe what data are provided and how it is used?

Have you ever heard Earth Observation data being used in your field of interest?

- Yes
- No

If yes, could you shortly elaborate?