D2.2 REPORT OF CUSTOMER REQUIREMENTS FROM ENVISION SERVICES

Project: Monitoring of Environmental Practices for Sustainable Agriculture Supported by Earth Observation

Acronym: ENVISION

Document Information

Grant Agreement Number	869366	Acronym	ENVISION
Full Title	Monitoring of Environmental Practices for Sustainable Agriculture Supported by Earth Observation		
Start Date	1st September 2020	Duration	36 months
Project URL	https://envision-h2020.eu/		
Deliverable	D2.2		
Work Package	WP2		
Date of Delivery	Contractual	28/2/21	Actual	Date of Delivery
Nature	Report	Dissemination Level	Public
Lead Beneficiary	9 – URDG – University of Reading		
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Document History

Version	Issue Date	Stage	Description	Contributor
D0.1	15.2.21	Draft	First draft	URDG
D0.2	18.2.21	Draft	Internal reviewers' comments	LEAF
D0.3	26.2.21	Final	Final draft	URDG

Disclaimer

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1   List of Abbreviations

BiHOCS - Bosnia & Herzegovina Organic Control System
CAP - Common Agricultural Policy
CAPO - Cyprus Agricultural Payments Organisation
CB - Certification Bodies'(CBs)
DRXS – Draxis Environmental SA
EO - Earth Observation
ILVO - Flemish Research Institute for Agriculture, Fisheries and Food
INOS – INOSENS doo Novi Sad
IT - Information Technology
LPIS - Land Parcel Identification System
LV - Flemish Region Payments Organisation
NPA - National Paying Agency of Lithuania
OCS - Doo Organic Control System Subotica
PA - Paying Agencies (PAs)
RRI - Responsible Research and Innovation
URDG - University of Reading

2 Executive Summary

This report details the customer requirements from the ENVISION service and describes the process through which the Paying Agencies (PAs) and Certification Bodies'(CBs) needs were identified.

- Building on the results from D2.1, there is a clearly identified need for Earth Observation based services that can help PAs and CBs to monitor scheme compliance remotely and the best way for these services to be developed to ensure maximal adoption is through co-creation with end users.
- ENVISION will be developed through a co-production process of integrating Design Thinking into Extreme Programming that is based on the e-shape framework (H2020-SC5-2018-2).
- Phase 1 of the co-production process is to establish the key stakeholders and the data-information-usage framework; within ENVISION this involved examining the current inspections workflow for each business case and identifying the needs from the ENVISION platform and services.
- This report details the methodology and results from a series of facilitated workshops between the platform and service developers and the end users for each business case (PAs and CBs) that were hosted using MS Teams and using an online, collaborative whiteboard (Miro).
    - The first consultation round allowed exploration of the 'problem space' and identified specific requirements for the ENVISION models, data products and the platform as well as potential internal and external barriers to uptake to ensure a resilient solution is developed.
    - The second round of consultations allowed exploration of the 'solution space' and discussion around detailed data requirements and level of effort needed to realise each proposed solution.
- A total of 49 individuals (PAs, CBs, and Developers) were involved in these initial consultation rounds.
- The output from these consultations was a detailed, prioritised list of requirements in the form of 31 user stories. Prioritisation was based on urgency and importance to the PAs/CBs and effort and data intensity for the developers.
- An importance to effort ratio was used for the final listing to prioritise the tasks in the first development sprint.
- The potential problems within the PA and CB organisations as well as those relating to external threats are listed here along with the potential actions for their mitigation.
- Overall, these consultation rounds have provided the ENVISION developers with a deep understanding of the user needs from the platform and services and have facilitated the engagement of end users in the ongoing process of co-production.

3 Introduction and Background

3.1 Existing service provision

As the global demand for food and hence production increases, there is a growing need to balance this with environmental protection and to move towards the sustainable intensification of agricultural systems. Successive reforms of the Common Agricultural Policy (CAP) have led towards more sustainable farming approaches, with subsidy payments to farmers being subject to meeting an increasing number of environmental measures. However, more demanding agri-environmental mechanisms can achieve higher environmental standards and voluntary market-based schemes allow farmers to achieve certification to demonstrate their compliance with higher environmental and animal welfare standards.

A literature review and analysis of current service provision to Certification Bodies (CB) and Paying Agencies (PA) was undertaken in Task 2.1. (WP2 ENVISION) which explored the potential for Earth Observation (EO) data services to provide authenticating agencies, such as national PAs and CBs, opportunities to monitor agricultural practices remotely, along with the potential of these services to improve decision making that can facilitate the move towards more sustainable agriculture systems. The key findings from this analysis are summarised in the following subsections.

3.1.1 Remote assessment of compliance

Schemes promoting sustainable agri-environmental practices and policies (i.e. CAP & LEAF Marque), require some form of inspection to ensure compliance with the policy measures and standard requirements. Elements of these inspections can be conducted remotely, with the associated reduction in travel time and costs, through services and products based on EO data. These services are either commercial or are available for free to the end users and can continuously monitor indicators of vegetation health, soil quality/protection, water quality/availability, biodiversity and ecosystem health.

Adoption of these services by PAs and CBs has been slow, but they provide such bodies an opportunity to switch from a single time-point inspection to a continuous, systematic monitoring process ('checks by monitoring') that is automated, across wider areas and covers all beneficiaries, thereby preparing for the post-2020 CAP changes. At the same time, farmers are choosing to adopt new technologies on-farm to assist with agronomic and management decision making; in particular the movement restrictions imposed by COVID-19 have expedited the move to remote auditing which has lead to an increased interest and uptake of these technologies by both CBs and farmers. These new, data-driven, precision agricultural technologies generate large amounts of spatially explicit information, that when analysed and structured, can improve the financial, social and environmental sustainability of their agricultural system. EO based services to arable farmers facilitate the precise and variable application of fertilisers, pesticides and irrigation and can provide yield mapping and predictions to improve production while minimising environmental impact. Livestock farmers can also benefit from animal welfare and tracking and pasture management while also recording indicators of greenhouse gas emissions and other metrics of climate impacts.

These data can be used to provide the farmer with a picture of farm performance but can also provide automated evidence of compliance which aids preparation for inspections. The control system for organic agriculture is due to be strengthened in 2021 and all certification schemes aim to continually improve farming standards, therefore remote, continuous assessment is going to be needed to keep pace with change. COVID-19 has driven this by necessity but changes to operating protocols are needed to ensure long-term and robust solutions.

3.1.2   Current services for PAs

The analysis of the current EO service provision [Task 2.1 – WP2] to PAs (n=14) that could allow remote monitoring showed that they are considered by PAs to be cost-effective solutions that are available both as generic and customised solutions with great potential to reduce non-compliance with agri-environmental policies. They are currently working well to help monitor i) crop classification, ii) the identification of mowing, ploughing and harvesting events and iii) the marking of non-agricultural land to update their Land Parcel Identification System (LPIS), predominantly for compliance checks, but also for systematic checks for financial aid. However, 43% do not have the organisational capacity to adopt them currently despite most of them receiving support from the European Commission.

Weaknesses in these services were identified to be a lack of personnel training and knowledge on how to use them, and the accuracy level of satellite images that limit the number of agricultural practices that can be monitored remotely. The additional services needed by PAs are i) monitoring of Soil Organic Carbon, ii) identification and monitoring of organic crop cultivations, iii) monitoring crop fertilisation and plant protection, and iv) detection and monitoring of grazed grassland, areas under risk of soil erosion, burnt and abandoned land, and crop seeding. Important aspects that need to be addressed before widespread adoption by PAs include; the need for improved rural internet access, the use of a common platform and data format between agencies and farmers that can link up with other Information Technology (IT) management systems, reduced costs for development and implementation of services, and the constant need for adaptation and change. The 2020 European Court of Auditors report showed that those PAs which are already using EO services for compliance checks identified that future changes and uncertainty over rules, small land parcels and inadequate IT systems present the biggest challenges in practical terms.

3.1.3   Services for CBs

The analysis of the current EO service provision to CBs (n=8) showed that they have greater capacity than PAs to adopt novel IT services (88% were positive about adoption) despite receiving less training and support. They are currently using EO services to remotely monitor crop diversity, Soil Organic Carbon, vegetation status, crop growth, grassland management and soil erosion, plus a few other categories, predominantly for compliance checks. A third of CBs reported using geo-tagged photos for monitoring agricultural parcels.

Weaknesses were identified around privacy, technical limitations such as inability to collect and analyse crop, soil, and water samples, observe and assess biodiversity, evaluate crop health, and estimate the usage of fertilisers and pesticides. Opportunities for new service improvement included

an increase of spatiotemporal resolution of relevant data products to facilitate observations of inaccessible plots and for several critical growing periods throughout the year. The additional services they would like include i) resource scarcity and degradation particularly of water and fossil fuels, ii) harmful emissions, iii) insect and fungus related issues (plant health) and crop protection practices, and iv) harvesting. Currently, on-farm inspections are still mandatory in many cases, so a greater acceptance of remote monitoring is required before full scale adoption is possible.

3.1.4 Barriers to uptake

For farmers, the uptake of EO-based services (predominantly as precision agricultural technologies including machine guidance and variable rate technologies) is low across Europe. The cost (both financial and personnel time) of adoption of precision/smart farming technologies is a barrier, data privacy concerns and ethical implications are also important, while there are still issues relating to access to computing technologies, IT skills and low trust in institutional frameworks. Peer-to-peer-sharing and learning is an important approach that can build trust and confidence amongst and between agencies and farmers. In addition, adoption could be improved with the provision of independent informational support and demonstration of the viability of economic return.

3.2 Need for new EO-based services for remote monitoring

The overall conclusion from the review of current services in D2.1 is that there is huge potential to develop novel EO services to help PAs and CBs to monitor scheme compliance remotely and to incorporate on-farm data collected by precision technologies as an evidence source. While uptake of these technologies by PAs and CBs and farmers is currently low, the knowledge gained from bringing these together into one platform could well encourage and promote more sustainable farming systems by providing transparent information towards achieving a common goal.

To ensure uptake, ENVISION needs to build a trusted, robust infrastructure around the EO services to ensure that all data collection/sharing systems can 'talk' to each other. In addition, there needs to be a campaign to increase awareness of the availability and improve accessibility to these EO services alongside development of training and support systems. However, as noted in the response from the CBs, to maximise adoption of the ENVISION services, *all stakeholders need to be involved from the start in co-creation to produce resilient, useful, adaptable, cost-effective services that help to achieve the goal of sustainable agriculture*.

Therefore, this report details the start of the co-production process of identifying user requirements for the ENVISION platform and services. The process involved a series of facilitated, in-depth workshops where end users for each business case discussed their requirements with the developers and explored the diversity of problems and solutions.

4 Co-production of ENVISION

4.1 Customised method of co-production of ENVISION

ENVISION is being developed using a co-production (or co-creation) approach (Voorberg et al., 2014) with end users as active participants in the development of both the platform and EO services. A good definition of co-production is provided by Bovaird (2007) "we define user and community coproduction as the provision of services through regular, long-term relationships between professionalized service providers (in any sector) and service users or other members of the community, where all parties make substantial resource contributions". This process provides a mechanism for social innovation thereby addressing societal needs by fundamentally changing the relationship between stakeholders. Furthermore, an open, participatory process enables public services to be created according to Responsible Research and Innovation (RRI) principles.

4.2 Methodological Framework for co-production process

Design Thinking integrates human, business and technological factors in problem solving and design (see Figure 1). This approach provides a process framework for constant communication between the developers and target users using different tools and methods to collect information on user needs/requirements while also allows the development of novel, creative ideas (Sohaib et al., 2019).
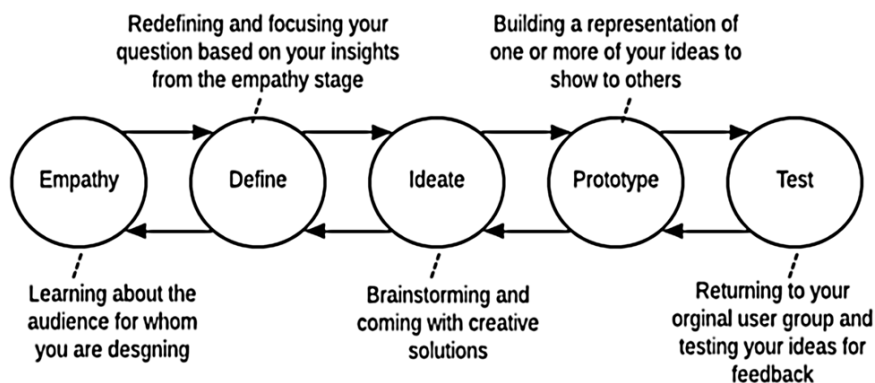

Figure 1: Design thinking process (taken from Sohaib et al. 2019 based on Lindberg et al. 2011; Erickson et al. 2005)

The key features of Design Thinking are; user centricity, iterative learning and development processes and extensive team communication. Design theory can also be applied to a policy making context (Berthet et al., 2016, Pluchinotta et al., 2019) and values early stakeholder engagement and facilitates greater democratisation. Design Thinking builds on the diversity of ideas and allows deep exploration of the 'problem space' and the 'solution space' with an iterative alignment of both spaces (see Figure 2). This differs from *agile* software development as agile avoids divergent thinking and has less emphasis on interdisciplinary collaboration (Lindberg et al., 2011).
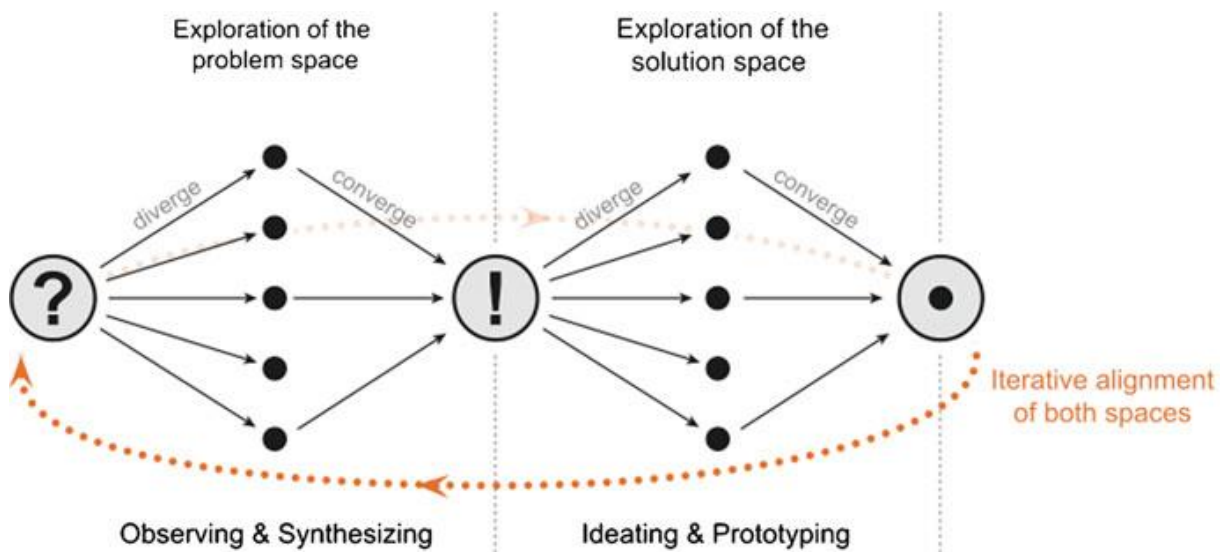
Figure 2: Problem and solution space in design thinking (taken from Lindberg et al. 2011)

Extreme Programming is an agile software development methodology that focuses on user centricity. It improves software development in five ways; communication, simplicity, feedback, respect and courage (Erikson et al., 2005). Design thinking and Extreme Programming share common values Hirschfeld et al. (2011) including;

- Ability to tackle wicked problems
- Facilitate close interactions
- Feedback is of high importance

Extreme programming stresses customer satisfaction by making all involved as equal partners in a collaborative team and empowers developers to respond to changing customer requirements (Wells, 2013). ENVISION will integrate Design thinking into Extreme Programming (XP) using an approach described by Sohaib et al. (2019) (see Figure 3).
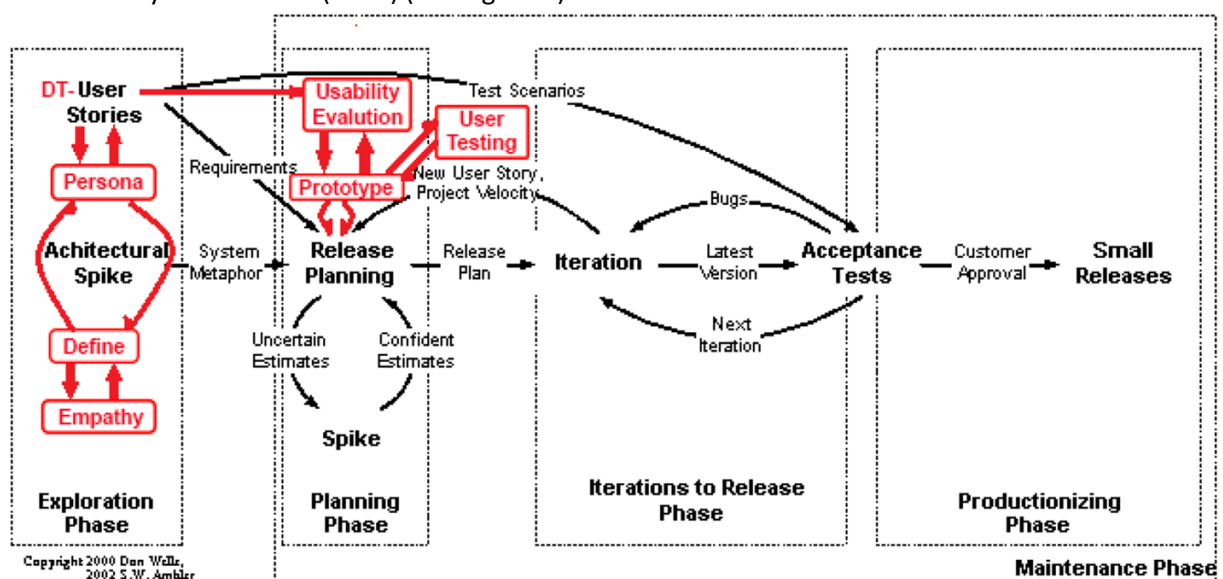

Figure 3: Integrated framework of DT@XP (taken from Sohaib et al., 2019)

4.3   Facilitation

Laudien et al. (2019) listed 7 key learnings from the co-production of the Knowledge Portal for Spatial Adaptation. One of these lessons learnt is that intermediaries (between end users and developers) play a key role in development projects as they can facilitate mutual understanding between the different actors involved. Therefore, the ENVISION workshops were designed and facilitated by the University of Reading to encourage full and open dialogue between the PAs, CBs and the software and service developers.

Design thinking in agile software development requires small teams working closely together (Hirschfeld et al., 2011). Within ENVISION these teams are geographically dispersed and working remotely requires virtual collaboration tools. A good virtual collaboration environment for this activity "includes whiteboards that are unbound in screen estate, persistent, and searchable even after some of the design phases are finished" (Hirschfeld et al., 2011). Therefore, the methodology employed here reflects this remote, distanced way of collaborative working but also provides a permanent, digital, virtual record of discussions that can be utilised throughout the co-production process (into Task 2.3).

4.4   Co-production model (based on e-shape framework)

A co-production method specific to the EO context was developed during the e-shape H2020 project (Barbier, 2019a,b) in recognition that developing services based on EO data must be able to cope with specific challenges, namely;

- *A high level of technical expertise is needed - combining both knowledge on data processing and knowledge on the domain of the final usage;*
- *There is a heterogeneity of actors that might contribute to the successful development of user-centric services - not only users and researchers but potentially all other actors of the ecosystem - related to legislation, platform owners, technical developers etc.*

The finalised e-shape co-design method, based on recent advances in design theory has two phases (Barbier et al., 2019a and refined in Barbier et al., 2019b)

Phase 1: a diagnosis process to identify the co-design needs and the actors to be involved;

Phase 2: the implementation of co-design actions based on this diagnosis.

In this e-shape framework, the co-design of EO-based services is described as a toolbox to support building relationships between data, information and usages with a long-term perspective. In order to develop resilient solutions, the constitutive elements of the co-design process should be designed to guarantee the sustainability of the developed services by ensuring:

(1) information which is "use-generative" (that is having the power of generating multiple usages),

(2) data-information relationships that are able to adapt to future advances and

(3) information-usage relationships that are able to cope with multiple usages.

Through consultation with colleagues regarding the e-shape co-design methodology, ENVISION followed the broad outline steps for Phase 1 in Task 2.2 and will implement Phase 2 in Task 2.3. Here

we summarise the six-step e-shape process in Phase 1 that was adapted to serve the needs of the activities and objectives in ENVISION Task 2.2.

4.5   Adaptation of Phase 1 of the e-shape co-design to meet the needs of ENVISION

The e-shape co-design framework was adapted to fit the needs of the business cases within ENVISION. Table 1 shows the adaptations made and the steps taken in the ENVISION approach; further details are provided in Section 5.

Table 1: Adaptations of the e-shape co-design method for ENVISION

	e-shape steps	Steps adapted for ENVISION
Step 1	The data-information-usage framework is used as a tool to represent the situation of each e-shape pilot. Based on the framework, the conditions needed for a sustainable development of services are examined and blocking or unclear elements are identified.	The current workflow for inspections was used as a framework to explore the current data sources and collection processes [data], the data synthesis and analysis steps [usage] and the requirements for checks and reporting [information].
Steps 2 & 3	Through Confluence (https://www.atlassian.com/software/confluence), this framework is then shared with each pilot. Specific questions are raised based on the identified blocking or unclear elements. These questions are expected to be answered by the pilot on Confluence as far as possible	The developers of the ENVISION platform (Draxis) and services (NOA, ILVO, AgroApps) discussed with each business case the blocks or unclear elements within their current workflow for development and delivery through the ENVISION platform and services. The interactive discussions were hosted in a virtual environment designed by URDG, on the Miro platform (https://miro.com/).
Step 4	A tele conference discussion is then organized with the pilot leader to clarify the elements remaining unclear and further expand on the characterization of the future users' ecosystem, through a story-telling exercise where the pilot leader is asked to take the user's point of view and imagine the sequence of actions conducted by the user to implement the service provided by its pilot.	A workshop for each business case then explored whether the ENVISION platform would; cover the requirements, whether any additional requirements could be fulfilled, what other functions could be added and whether the proposed models and data products meet the needs for; monitoring agricultural practices, whether other practices could be monitored, whether the accuracy of the models could be improved and what other

		data products could be provided. The outputs from these discussions were captured in the form of **User Stories**. [Exploration of problem space]. Potential problems within and external to the organisation were discussed to identify ways to mitigate any problems with adoption.
Step 5	Thanks to these clarifications, the pilot framework is updated and divided into two distinct frameworks - one for the initial state and one for the targeted state and each framework is accompanied with a comparison of the users' characterization and the "design environment" provided by the pilot's members.	A second workshop was convened with the same participants to further clarify the user requirements and data sources needed for the developers (as these have been expressed in the **User Stories**). The developers were encouraged to ask specific questions about data requirements and possible solutions to each user requirement [Exploration of solutions space].
Step 6:	Co-design needs are then identified based on these considerations. For this last step, the method used to identify co-design needs can be better described thanks to the enrichment of our co-design model.	The updated list of **User Stories** (derived from Step 5) was distributed to all participants and developers for the weighting process.

The prioritised list, resulting from Step 6, then feeds into Task 2.3 where the same stakeholders, plus a wider group of potential end-users of ENVISION (Lighthouse Customers), will be engaged to continuously refine the ENVISION platform and services to meet current and future remote monitoring needs of PAs and CBs. The classification of co-design needs in Barbier (2020) will be utilised to characterise each interaction with potential customers of ENVISION.

4.6   Development of User Stories

The first stage in this co-design process is to identify the groups of end users of ENVISION within the PAs and CBs and to establish their requirements through a consultation phase. The exploration phase (Figure 3) will involve developing *User Stories* (Cohn, 2004) with persona-based design and follows the steps in Phase 1 of the e-shape co-design model. User stories are simple, short descriptions that provide information about desired functionality from an individual's viewpoint. It provides information about *who* it is for, *what* is expected and *why*. We used the simple description given below as popularised by Cohn (2004) but through verbal encouragement and refinement by the facilitators we looked to achieve high quality user stories as advocated by Lucassen et al. (2016).

''As a <type of user>, I want <goal>, [so that <some reason>].'' For example: ''As an Administrator, I want to receive an email when a contact form is submitted, so that I can respond to it.''

4.7   Aims and objectives of co-production for ENVISION

This deliverable reports on the first phase of the co-production of ENVISION. The overall aim of the co-production is to improve the quality of the software interface (platform) for the customers and users and for each business case to develop innovative EO-based services that meet their needs – now and in the future.

The aim of Task 2.2 is to identify the needs of the three PAs and one CB who comprise the four ENVISION business cases. The objectives are to:

- Produce a list of the needs of PAs and CBs from the ENVISION platform in the form of customer (or user) stories
- Prioritize the customer (user) stories by considering their importance by effort ratio

The aim of Task 2.3 is to broaden out this consultation, beyond the business case customers, to include the needs of other PAs and CBs (Lighthouse Customers), farmers and developers.

5 ENVISION Methodology for identification of PAs and CBs

In order to achieve the goals of this deliverable, a methodological framework based on virtual consultations / workshops was developed by the University of Reading (URDG). The specific methodological steps (adapted from e-shape) can be summarised in the graph below.

Four consultations of two rounds each were scheduled, corresponding to the four ENVISION business cases (1 business case x 1 consultation x 2 consultation rounds / workshops).

Each business case received an invitation containing introductory material, a detailed workshop agenda and relevant online sources to help participants prepare for the 1st round of consultations.

The 1st workshop was conducted through four interactive discussion sessions. These included specific questions from the developers directed to the participants, a two-way (developers – participants) Q&A session, an interactive "User Story Mapping" session, and two open discussion sessions.

After a two-week period, the same participants attended the 2nd round of consultations. The 2nd workshop took place on the same virtual environment and consisted of three discussion sessions.

The information from both rounds of consultations was then compiled in comprehensive lists, and processed by the facilitators and developers to merge duplicate and/or similar User Stories.

The updated list of User Stories was distributed to all participants and developers for the weighting process.

Finally, the weightings were processed and prioritised lists of user requirements and potential problems for the adoption of ENVISION tools were produced.

Schematic representation of the methodological steps followed in the ENVISION consultations for the identification of user requirements and potential challenges in the adoption of ENVISION services by Paying Agencies and Certification Bodies.

5.1 Facilitators, Developers & Participants

The consultation rounds for this Deliverable were developed with a special consideration towards the four ENVISION business cases (Participating organizations): Cyprus Agricultural Payments Organisation (CAPO), Flemish Region Payments Organisation (LV), National Paying Agency of Lithuania (NPA) and Doo Organic Control System Subotica (OCS). Along with OCS, a representative from the Bosnia & Herzegovina Organic Control System (BiHOCS) attended and actively participated in the respective 2nd consultation round, and therefore was considered as "Participant" for this

Deliverable. During the consultations, each organisation was referred to as "Participants" to distinguish them from the "Developers" and "Facilitators" (paragraphs below) and to highlight their active role at the core of the workshops. The ENVISION partners of each business case, were responsible for inviting their colleagues of relevant expertise within their organization. Specific roles were identified for individuals of the Participating organisation that attended, such as Administrator, IT Expert, Data Analyst, Inspector, and Controller.

The Flemish Research Institute for Agriculture, Fisheries and Food (ILVO), the National Observatory of Athens (NOA), Agro-Apps I.K.E (AgroApps) and Draxis Environmental S.A (DRXS) attended both consultation rounds through the role of "Developers". Specifically, ILVO, NOA and AgroApps were identified as Model Developers, while DRXS was identified as Platform Developers. The developers' main objective through the workshops was to present information relevant to the ENVISION platform and services, and to respond to any potential questions / concerns expressed by the participants. In addition to the consultation rounds, all developers attended a "*Revision and Processing of User Stories"* session and performed a weighting task for each User Story.

URDG acted as the "Facilitator" for both consultation rounds, undertaking several specific tasks. URDG invited all attending parties to the consultations, providing a thorough introduction and preparatory material to each attending organization. They also developed and organised the virtual environment that hosted all interactive discussion sessions and coordinated the interactions between developers and participants particularly through the User Story Mapping and open discussions. Finally, they were responsible for the recording and dissemination of all outputs from both consultation rounds with each organisation. Sections *5.2 Materials*, *5.3 Procedure*, and *5.4 Data Analysis* provide a detailed description of the tasks above.

In the development of the virtual consultations framework, URDG aimed for recruiting a gender balanced sample, and for designing non-biased questions and interactive discussions sessions in terms of gender. At no point during the consultation process was any of the attendees asked to provide gender specific information; all interactive discussion sessions focused on the professional role / expertise of the attendee within their organization.

Table 2: Demographics for Facilitators, Developers and Participants, including the number of attendees per organisation and their role in the workshops / consultations.

Country	Name of organisation	Short name	Organisation expertise	Number of attendees	Individual expertise / role in consultations
Belgium	FLEMISH REGION PAYMENTS ORGANISATION - VLAAMSE GEWEST	LV	Paying Agency	5	Administrators, Inspectors, IT Experts
Belgium	FLANDERS RESEARCH INSTITUTE FOR AGRICULTURE, FISHERIES AND FOOD - EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW	ILVO	Research	2	Model Developers
Bosnia & Herzegovina	ORGANIC CONTROL SYSTEM BOSNIA AND HERZEGOVINA	BiHOCS	Paying Agency	1	Administrator
Cyprus	CYPRUS AGRICULTURAL PAYMENTS ORGANISATION - ORGANISMOS AGROTIKON PLIROMON	CAPO	Paying Agency	12	Administrators, Direct Payments, IT Experts, Inspectors
Greece	AGRO APPS I.K.E.	AgroApps	Software Development	2	Model Developers
Greece	DRAXIS ENVIRONMENTAL S.A.	DRXS	Software Development	2	Platform Developers
Greece	NATIONAL OBSERVATORY OF ATHENS	NOA	Research	3	Model Developers
Lithuania	NATIONAL PAYING AGENCY OF LITHUANIA	NPA	Paying Agency	11	Administrators, Controllers / Inspectors, IT Experts
Serbia	DOO ORGANIC CONTROL SYSTEM SUBOTICA	OCS	Certification Body	3	Administrators, IT Experts
Serbia	INOSENS DOO NOVI SAD	INOS	Software Development	4	Model Developers
United Kingdom	UNIVERSITY OF READING	URDG	Research	4	Facilitators

Table 3 below presents the dates and participants of each consultation round during Task 2.2.

Table 3: Dates and number of attendees for the two rounds of ENVISION consultations.

Business case partner	Date	Consultation round	Facilitators (number of attendees)	Developers (number of attendees)	Participating organisations (number of attendees)
LV	December 16, 2020	First	URDG (4)	NOA (3) AgroApps (1) DRXS (1) ILVO (2)	LV (5)
NPA	January 11, 2021	First	>>	>>	NPA (11)
CAPO	January 18, 2021	First	>>	>>	CAPO (12)
LV	January 21, 2021	Second	>>	>>	LV (5)
NPA	January 22, 2021	Second	>>	>>	NPA (11)
OCS	January 25, 2021	First	>>	>>	OCS (3)
CAPO	January 29, 2021	Second	>>	>>	CAPO (12)
OCS	February 5, 2021	Second	>>	>>	OCS (3), BiH (1)

5.2   Materials

The virtual consultation framework was built using mainly two platforms that are popular to ENVISION partners: Microsoft MS Teams (https://www.microsoft.com/en-gb/microsoft-teams/group-chat-software) and Miro (www.miro.com).

A meeting room was created on MS Teams to facilitate discussion and communication during the workshop (attendees joined with an online invitation – link). The room hosted all verbal communications, offered the potential for written comments and questions (MS Teams chat), and served as the platform where Developers presented material relevant to the ENVISION platform and models.

Miro was used as an online, collaborative, whiteboard platform for the recording of information shared by both the Participants and Developers. Two key features of Miro that were used throughout the interactive discussion sessions were: i) a "timer", which allowed Facilitators to keep track of the proposed workshop agendas, and ii) a "sticky note" function, which allowed Participants and Developers to record their responses in the appropriate space on the virtual whiteboard.

The attendees accessed the platforms on their personal computers and were advised to use two monitors whenever available, to facilitate participation in the interactive Miro sessions while reviewing material presented on MS Teams. Preparatory material was made available to the attendees approximately one week prior to each workshop to help them familiarise with the virtual environment and relevant functions.

5.3 1st Consultation Round Procedure

5.3.1 General Introduction

At the start of the 1st Consultation Round, the Facilitators provided an introduction and overview of the ENVISION project, particularly for the attendees of the Participating organisation that were not aware of the project aims. The General Introduction was presented on Miro and contained information about: i) what is ENVISION and what are its specific aims and objectives, ii) the project partners and lighthouse customers, and iii) what is the specific role and tasks of the Participating organisations within ENVISION.

5.3.2 Aims & Objectives of the 1st Consultation Round

After the General Introduction, the Facilitators explained the specific aims of the 1st consultation round, which were:

- To identify the Participating organisation's requirements specific to the ENVISION platform, the ENVISION models and data products, and the potential problems within the Participating organisations and potential external threats that may hinder the adoption of ENVISION services.
- Produce a prioritised list of requirements and potential problems that will serve as the starting point for the co-production and customisation of ENVISION services.

Then a detailed workshop agenda outlined the different sessions and progression through the 1st consultation round.

5.3.3 ENVISION models, ENVISION platform, and ENVISION services

Establishing a common vocabulary for relevant terminology was a critical step for the successful dissemination and recording of information throughout the consultations. For this purpose, the Facilitators defined early on that the ENVISION models refer to the algorithms which will be developed and to the respective data products that will be provided. The ENVISION platform will host, visualise and allow access to these data products. Finally, the term ENVISION services referred to the six agricultural practices that ENVISION aims to aid with remote monitoring: Crop Type Mapping, Soil Organic Carbon, Vegetation Status, Crop Growth (distinction between Organic / Conventional crops), Grassland Mowing / Ploughing, and Soil Erosion.

5.3.4 User Stories

The Facilitators then defined User Stories and described the process that Participants should follow to record their responses in a User Story format. A User Story was defined as a short piece of text that contains just the essential elements of a requirement, namely the "Who" is it for, "What" is it, and "Why" is the requirement important (Cohn, 2004).

To facilitate the recording of the "Who" information, specific roles were assumed by each individual of the Participating organisations, which were recorded on Miro. The process was guided by the Facilitators that proposed the roles of:

- "Administrator", that encompasses duties of Geo-Spatial Aid Application (GSAA) processing, Direct Payments, and of more senior management posts in the Participating organisation
- "IT Expert", to describe individuals with an IT background and a knowledge of the current Participating organisation's IT infrastructure limitations and capabilities
- "Data Analyst", that processes information similar to the potential ENVISION data products to provide relevant summaries for the Administration
- "Inspector", that performs on-field visits to examine potential ineligibilities of declared parcels
- "Controller", that checks farmer declarations against relevant eligibility criteria throughout the entire GSAA process

The following examples were provided to further help Participants record requirements as User Stories:
- "As an Administrator, I want data storage for 10 years, so that I can refer back and compare past years"
- "As a Data Analyst, I want functions for descriptive statistics, so that I can summarise data and observations"
- "As an Inspector, I want to visualise maps on the platform, so that I can quickly identify potential problem areas"

The introductory part ended with the role assignment task and clarifications regarding the recording of User Stories.

5.3.5   Discussion between Participants and ENVISION platform & model Developers

The first discussion session involved a key activity where ENVISION platform Developers asked the Participants to describe the current workflow that the organisation follows to monitor each of the proposed ENVISION services using current services and on-field visits. The task, led by DRXS, was performed on a separate board in Miro that guided Participants to provide information across the different services and through the steps of "Data sources / collection process", "Synthesis and analysis" and "Requirement check and reporting" (Fig. 4). As in every discussion session throughout the consultations, the Participants were encouraged to discuss internally and in their native language before recording their responses. Both Participants and Developers were encouraged to engage in a more open Questions & Answers (Q&A) session in parallel to the completion of the task above. The Facilitators summarised the main discussion points in brief notes that accompanied the Participants' responses, and which the Participants could review and amend in case of disagreement.

Figure 4: Screenshot of the Miro board for the description of "Cyprus Agricultural Payments Organisation's current workflow for On The Spot Checks" during the first discussion session of the first consultation round. CAPO = Cyprus Agricultural Payments Organisation, OTSCs = On The Spot Checks

A five-minute break followed before the next discussion session started.

During the second discussion session the ENVISION model Developers first shared relevant presentations over MS Teams. Specifically, NOA presented information about algorithms and data products related to the Crop Type mapping, Vegetation Status, Grassland Mowing / Ploughing and Soil Erosion services, AgroApps about Crop Growth (Distinction between Organic and Conventional farming practices) and Vegetation Status, and ILVO about Soil Organic Carbon.

An open Q&A task followed, where Participants were encouraged to ask about potential limitations and additional features of the presented models.

5.3.6 User Story Mapping

The main task of the 1st consultation round was User Story Mapping, which followed the presentations and Q&A tasks of discussion sessions 1 and 2. For this task, Participants were directed to a separate board in Miro (Fig. 5), and were given approximately 15 minutes to record their requirements from the ENVISION platform and models as User Stories.

After the 15-minute exercise, the Facilitators read each User Story out loud, amended the structure whenever necessary to fit the User Story guidelines, and initiated a discussion between the Participants and Developers to identify areas of the User Story that required further clarification. The Facilitators moved to the next User Story only when all attending parties agreed that the one reviewed was understood in the same way by everyone.

When all User Stories were reviewed, Participants were given another 15 to 20 minutes to consider the urgency of each one and to complete a weighting task. For the weighting task, they were told to distribute 100 points in total across the different user stories, with higher weights allocated to more important User Stories according to their opinion. It was clarified to the Participants that some User Stories may get a zero weight, and that if they did not allocate any weights to a User Story that would

also be considered a zero. The purpose of the urgency and weighting exercise was to prepare the Participants for the Prioritisation process that would follow the consultations (Section 5.5).

A five-minute break followed the User Story Mapping exercise.
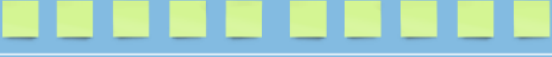
Discussion #1 & #2 - User story mapping		
User Stories	Urgency	Weight

Figure 5: User Story Mapping board in Miro. Participants were asked to record their requirements from ENVISION platform and models following the User Story structure in the left column of the table. After reviewing the different User Story along with the Facilitators and Developers, the Participants discussed about the Urgency of each User Story and weighted each one based on their importance.

5.3.7 Identification of problems for adoption of ENVISION tools, *within* the Participating organisation

The third session was dedicated to an open discussion about potential problems that the Participants could identify within the Participating organisation, which could hinder the adoption and sustainable use of ENVISION tools from the organisation. First, the Participants were given 15 minutes to discuss internally and record their responses in Miro, in a free text (open short essay) format. Then, the Facilitators read each response out loud and all attending parties discussed about potential clarifications required, until the responses were clear to everyone.

5.3.8 Identification of threats for adoption of ENVISION tools, *external* to the Participating organisation

The fourth discussion session followed an identical flow to the previous one but focused on potential threats / problems for the adoption and sustainable use of ENVISION tools by the organisation, that

were external to the organisation, and that could not be eliminated or mitigated with actions undertaken by the organisation.

5.3.9   Summary of 1st Consultation Round

The workshop ended with a brief "Wrap-up" session that aimed to trigger further internal discussions by the Participants, beyond the temporal boundaries of the specific consultation round. The session consisted of three parts: "Wrap-up", "Sustainable use of ENVISION in organisation" and "Next steps".

During the "Wrap-up", the Participants were asked to consider their "Past Experience" from similar projects and how ENVISION compares to it. Then Participants were asked to think about how ENVISION can address gaps and limitations of other similar projects based on the capabilities they reviewed during the workshop ("What I learned"). Finally, the Participants were encouraged to think about the Prioritisation process (Urgency and Importance weighting criteria), as well as potential solutions to the internal problems (Discussion session 3) and external threats (Discussion session 4) identified ("What I need to think"). The Participants were notified that these topics would be reviewed in the 2nd Consultation Round (Section 5.4).

For the "Sustainable use of ENVISION in organisation", the Participants were asked about how ENVISION could improve sustainability of the organisation highlighting innovations in all three pillars of Sustainability, Environment, Economy and Society.

Finally, a roadmap was prepared and presented by the Facilitators to inform the Participants and Developers about the next steps that included the 2nd Consultation Round and the first tasks in the co-production of services process.

5.4   2nd Consultation Round Procedure

The 2nd consultation round took place approximately two weeks (10 working days) after the first workshop, with the exception of the LV business case. Participants and Developers had full access to Miro including the ability to add and amend information, in the period between the two consultations.
An MS Teams link and a Miro virtual environment identical to the 1st consultation round was designed for this stage of the Deliverable, including the user stories and comments from the participants and developers.

5.4.1   Aims & Objectives of the 2nd Consultation Round

The primary aim of the second workshop was the identification of potential solutions to the User Stories, Internal Problems and External Threats recorded in the 1st consultation round. To achieve this aim, the Facilitators coordinated three interactive, open discussion sessions.

5.4.2 Review of User Requirements and identification of Potential Solutions

During the first session and the identification of potential solutions, the Facilitators read each User Story out loud and led a discussion among all parties, with the Developers proposing potential solutions and Participants evaluating the specific suggestions. If all parties agreed on a proposed solution, the discussion moved to the next User Story.

Furthermore, the Developers were asked to consider the Effort (i.e., work hours) and amount of data required to realise each proposed solution. This was a preparatory exercise for the Prioritisation process after the end of all consultations (Section 5.5).

5.4.3 Review of Potential Internal Problems and External Threats for the adoption of ENVISION tools by the Participating organisation

The second and third discussion sessions followed an identical flow. The purpose of these discussions was to eliminate issues that may threaten the viability of ENVISION tools and cannot be resolved by Developers. All parties reviewed the responses that were recorded in the 1st consultation round, and Participants were asked to reflect on them considering the internal discussions they had during the period between consultations. Potential solutions to internal problems were proposed by the Participants, and ways to mitigate the concerns of Participants due to external threats were explored.

5.5 Consolidation and prioritisation of User Stories, Potential Problems and External Threats

After both consultation rounds were performed for each business case partner, the Facilitators collected all the User Stories and coordinated a discussion session with the Developers to merge duplicate user requirements or multiple requirements that could be addressed by a single solution.

The consolidated list was then processed by the Facilitators that removed information relating the User Story to a specific business case partner, to mitigate bias in the Prioritisation process.

For the Prioritisation, two online surveys were developed on Qualtrics XM Platform™ (Qualtrics, Provo, UT). Figures A1 and A2 of the Appendix present the two online surveys. The first one was distributed to each attendee of the Participating organisations (consultations) and contained the following tasks:

- Scoring of each User Story considering their Urgency, on a scale from 1 to 10 with 1 being "Not urgent at all" and 10 being "Extremely urgent"
- Scoring of each User Story considering the Importance of the specific environmental problem or general system requirement they addressed, on a scale from 1 to 10 with 1 being "Not important at all" and 10 being "Extremely important"
- Ranking of the listed Potential Problems for adoption of ENVISION tools within the Organisation
- Ranking of the listed External Threats for adoption of ENVISION tools

The second survey was distributed to each attendee of the Developers' teams and asked them to:

- Score each User Story considering the Effort in work hours required to address the specific requirement, on a scale from 1 to 10 with 1 being "No effort required at all" and 10 being "A lot of effort is required"
- Score each User Story considering the Data Intensity in terms of amount of data / information that needs to be collected by the relevant business case partners, on a scale from 1 to 10 with 1 being "Data is already available" and 10 being "All data needs to be collected/provided by business case partner"

Information about the name of organisation, the name of participant and their specific role within the organisation were requested.

An Importance to Effort ratio was also considered as an indicator of priority for the reported User Stories. The Importance and Effort were identified as the most appropriate weighting factors of the four, to help build the backlog for the starting phase of the co-production process.

5.6 Data Analysis

Throughout the consultation and prioritisation stages, quantitative methods including descriptive statistics were used for the analysis and report of demographics. Responses to open-ended questions and discussion sessions were evaluated following a thematic analysis approach, where the most prevalent categories of responses were identified, reviewed and reported. Text analysis was performed using Text iQ on Qualtrics XM Platform™ or in Microsoft Excel whenever appropriate.

6   Results & Discussion

This section presents and discusses the consolidated list of outcomes from the two rounds of consultations. The Appendix contains an example of the unprocessed participant responses as those were recorded in the Miro platform during the 1st and 2nd consultation rounds.

First a summary of the workshop attendees is presented, including their specific roles and demographic information. Subsequently, the main outcomes are reported starting with the prioritised user requirements from ENVISION platform and models. Then, the potential problems for adoption of ENVISION are presented and categorised as those identified within the organisation and those that are due to external factors. Finally, the discussion closes with a comparison between the broader user needs collected during ENVISION Deliverable 2.1 and the more specific user requirements from this Deliverable, and with a reflection about how this Deliverable contributes to the co-production of services process that will be undertaken in future ENVISION Deliverables.

6.1   Summary of the workshop participants

Forty-nine (49) individuals attended the consultation rounds for ENVISION Deliverable 2.2, with 8.2% represented by the Facilitators, 18.4% by the Developers and 73.4% by the Participants (Participating organisations). Almost half of the attendees from Participating organisations identified themselves as Administrators (47.2%). The second most prevalent role was IT experts (19.4%), followed by Controllers (16.7%), Inspectors (11.1%) and Data Analysts (5.6%). The mixture of roles in the sample allowed for meaningful discussions on several levels, from the very technical to the more strategic. While having members of the senior management and technical units (i.e., IT, Control unit) in the same room enabled the Developers to thoroughly explore potential requirements and challenges for the production of ENVISION services, it may have generated bias in some of the responses, or discouraged participants from fully engaging in the interactive sessions. The effect of such biases on the participant responses will be evaluated through the frequent, more technical meetings during the co-production process (Deliverable 2.3). Perhaps a more balanced sample where different roles could be equally represented would increase participant engagement further.

In total, the representation of female individuals attending the consultations was at 38.3%. More specifically, 41.7% of the Participants, 28.6% of the Developers and 25.0% of the Facilitators were females. The Facilitators addressed all individuals by their expertise and specific role within their organization and did not refer to their gender; all sessions were designed in a gender neutral manner. Despite all precautions, we acknowledge that gender imbalances of the sample may lead to the reduced engagement of participants in interactive sessions. These potential effects will also be further evaluated in the more frequent communications throughout the co-production process.

6.2   User Stories – Requirements

Identifying a prioritised list of user requirements was the core focus of this Deliverable and a critical phase of the co-production of ENVISION tools process. In doing so, it was essential to maintain a structured approach and capture the various requirements in a way that they are easy to comprehend by the Developers and easy to communicate among the different ENVISION partners.

The final User Story list comprised of 31 User Stories, 38.7% of which referred to a Specific Environmental Problem (i.e., need to monitor pesticide use) and 61.3% to General System Requirements (i.e., interoperability of ENVISION platform and models) (Table 4).

Table 4: List of User Stories – Requirements and Potential Solutions as identified through the ENVISION consultations.

User Story - Requirement	Category	Potential solution – Developer response
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid-September)	Specific Environmental Problem	The two-week frequency for output provision is feasible with the smart sampling algorithm that NOA uses
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	Specific Environmental Problem	The two-week frequency for output provision is feasible with the smart sampling algorithm that NOA uses
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	Specific Environmental Problem	The 95% accuracy will be considered as a target value for the cases where the business case partners separate grazing from mowing and apply the classification algorithms to each category to help achieve the higher accuracy
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	Specific Environmental Problem	Further investigation is required by the Developers regarding the current services provided with the EFA Catch Crop Monitoring tool from Sen4CAP, to identify specific requirements for monitoring
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	Specific Environmental Problem	Masking a layer based on the outputs of a service will be feasible and the masked layers could be visualised on the platform
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	Specific Environmental Problem	Distinction between organic and conventional crops will be implemented. Pesticide and herbicide use (malpractices more generally) can be monitored only indirectly through crop growth monitoring
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	Specific Environmental Problem	With Sentinel 2 data giving a 10m resolution, this requirement is feasible. For very narrow / small parcels, further investigation is required for Developers to provide a definitive response in terms of accuracy
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	Specific Environmental Problem	Relevant data on yield is required by the business case partners so that Developers can address the requirement for organic crops

As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots that the organisation inspects)	Specific Environmental Problem	Relevant data on neighbouring parcels is necessary for this requirement to be implemented
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	Specific Environmental Problem	Relevant data on neighbouring parcels is necessary for this requirement to be implemented. Further discussions are required after revision of data availability to estimate whether this requirement can be addressed within the ENVISION lifetime
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	Specific Environmental Problem	Vegetation indices and biophysical parameters visualised as a layer on the top of a map
As an Organisation, we would like to see the colour of crops / plants or parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	Specific Environmental Problem	Vegetation indices and biophysical parameters visualised as a layer on the top of a map
As an Organisation, we need the performance of the system to be fast, to enable quick testing	General System Requirement	The ENVISION platform and relevant operations (data processing) will be reasonably quick, since they will be based on a web application. For the case of Soil Organic Carbon monitoring, the models will not be running on the spot, but relevant outputs will be readily available for visualisation
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	General System Requirement	Some notifications will be sent to the farmers via the mobile application, but further discussions are required to identify the exact way to do this and the list of information/alerts that are most important for the farmers and business case partners
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to	General System Requirement	The requirement for interoperability and potential to download and/or share relevant outputs will be considered by the Developers throughout the development process

transfer/download data)		
As an Organisation, we need all our data to be stored in one place	General System Requirement	All relevant outputs and data will be stored in the ENVISION database for the ENVISION lifetime. Participating organisations will be able to download outputs (i.e., shapefiles, csv files etc.), share via APIs or access the data storage online
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	General System Requirement	This requirement is not feasible for all services. In some instances, pre-trained models will be able to infer outputs for the newly drawn parcel, but still not in "near real-time". It may be more meaningful to do this for a bigger number of parcels, rather for a single parcel at a time. In the case of Soil Organic Carbon, the model will not re-run for specific parcels, but will rather crop an existing layer using the boundaries of the declared polygon.
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	General System Requirement	The specific methodology followed to estimate accuracy of measurements will be well documented on the platform. Accuracy will be provided for the entire service outputs rather than the individual pixels. Further discussions are required for the cases where algorithms may be openly available, or for the level of information that will be available for each service to provide the potential for future modifications
As an Organisation, we want the output of services to be stable and the services set-up for long term use	General System Requirement	The services will be stable and functional for the ENVISION project lifetime. Long term use of services (beyond project lifetime) will be further discussed when the business plan is set
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	General System Requirement	Such notifications will be provided to the user; however the exact method remains to be selected (i.e., through email, through the web application, etc.)
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	General System Requirement	The model could consider additional data (samples) for re-training purposes, to enable corrections of estimates and help increase accuracy, provided that the sampling process follows the same protocol
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	General System Requirement	Indications will be given if values are "Not Available – N.A" for certain pixels or parcels. The organisation should then act upon this information and require additional data to be sampled from specific parcels

As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	General System Requirement	This requirement could be addressed, as the ENVISION platform will be web-based and the user will be able to download / print outputs. Specific protocols may be established for each of the ENVISION services, to facilitate validation using "on the spot check" and model outputs. For example, with Soil Organic Carbon, a potential approach could be with the indication of representative areas for a parcel that would be compared with the mean-median values obtained through the models
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	General System Requirement	The different standard data formats (i.e., shapefiles, raster files, csv data tables) will be made available to the users through the ENVISION platforms. For less popular data formats, further discussions are required with the business case partners
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	General System Requirement	The toolbox will be a web-based and therefore, there is a potential for the services to be featured on DIASes. Further discussions are required with the ENVISION Developers to confirm whether this will be a characteristic of ENVISION platform and models
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	General System Requirement	ENVISION will enhance existing services / features that users are already familiar, without "burdening" the user with entirely new working environments. Features such as interoperability, the ability to download data / share via APIs, and data privacy / security are considered throughout the development of the ENVISION platform and models
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	General System Requirement	This requirement will be addressed, and the algorithms will not focus on specific zones but will be implemented across the entire business case country
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	General System Requirement	Confidentiality agreements will be signed by all ENVISION partners to ensure transparency and security issues are addressed
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	General System Requirement	ENVISION data storage will be accessible throughout the ENVISION project lifetime and therefore, relevant data and outputs could be revisited in the future. Historic trends could be evaluated for as far back as relevant data is available (i.e., from 2015 onwards, due to availability of satellite images

		relevant to the ENVISION services)
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	General System Requirement	While ENVISION Developers will consider this throughout the development of the ENVISION services, the business case partners need to provide sufficient information important for the identification of critical periods (i.e., application periods, submissions, harvest events, etc.) and of the most important eligibility criteria that they need to check (i.e., GAEC 4, GAEC 7, etc.)
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	General System Requirement	For this requirement to be addressed, the business case partners need to provide sufficient information about the specific eligibility criteria they would need to evaluate for each declaration, so that the ENVISION service can return the corresponding alerts / notifications

Identifying directly comparable weighting criteria that represent Participants and Developers in order to prioritise user requirements, is a particularly difficult task mainly due to the thematic variability of the reported User Stories. Here, we asked Participants to consider an Urgency and an Importance criterion, and the Developers to consider the Effort and Data Intensity weighting factors. The Deliverable first reports all scores separately and does not aggregate between the different weighting criteria (Table 5). Then an "Importance to Effort" ratio is reported for each User Story to facilitate prioritisation of the tasks in the starting stages of the co-production process (Table 6).

The most Urgent User Stories according to the Participants referred to their need to receive ENVISION model outputs for declared parcels across the entire country rather than specific zones (9.25, ± 0.89), along with a requirement for highly accurate maps of crop types and grassland management (9.25, ± 1.16). The most Important User Stories were about the Participant requirement to receive grassland management layers with a high frequency and accuracy (9.25, ± 1.36), as well as a requirement for the overall good quality of ENVISION services defined by high security and interoperability features (9.25, ± 2.59). Although Urgent and Important for the Participants, ENVISION Developers scored the above requirements relatively low in terms of Effort and Data Intensity. Specifically, they assigned an Effort score of 5.67 (± 0.58) and 5.33 (± 1.53) for the most Urgent User Stories, and a Data Intensity score of 5.33 (± 2.05) and 5.67 (± 1.70) for the most Important User Stories reported above respectively. Providing ENVISION services through DIASes and other similar platforms were considered to be the most laborious task with an Effort score of 8.67 (± 1.53), whereas a general requirement for availability of time series to evaluate emerging changes ranked high in terms of Data Intensity (8.67 ± 3.74).

The low Effort and Data Intensity weights assigned by the Developers indicate that they were perhaps aware of the specific requirements of the business case partners, and possibly that preparations had already been made to meet them (i.e., collection of necessary data), as a result of exhaustive communications prior to ENVISION Deliverable 2.2.

Table 5: User Story – Requirement weights assigned by the Participants (Urgency & Importance scores) and the Developers (Effort & Data Intensity scores). For all weighting criteria, the scoring system was based on a scale from 1 to 10 (1 – lowest, 10 – highest).

User Story - Requirement	Urgency (μ, ±SD)	Importance (μ, ±SD)	Effort (μ, ±SD)	Data Intensity (μ, ±SD)
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid-September)	8.50 (± 1.60)	7.50 (± 1.04)	5.67 (± 2.08)	6.00 (± 2.05)
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	7.50 (± 2.56)	9.25 (± 1.36)	6.00 (± 2.65)	5.33 (± 2.05)
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	9.25 (± 1.16)	8.00 (± 1.60)	5.33 (± 1.53)	5.67 (± 2.94)
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	8.00 (± 1.20)	8.00 (± 0.89)	5.67 (± 1.15)	5.33 (± 2.94)
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	8.00 (± 1.69)	8.38 (± 1.29)	5.33 (± 0.58)	8.00 (± 2.05)
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	8.38 (± 2.33)	8.75 (± 2.25)	8.00 (± 2.65)	8.33 (± 2.36)
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	8.75 (± 0.89)	7.75 (± 0.92)	8.33 (± 2.89)	5.00 (± 3.68)
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	7.75 (± 2.55)	6.50 (± 2.56)	5.00 (± 3.00)	6.67 (± 0.94)
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots that the organisation inspects)	6.50 (± 3.51)	6.25 (± 3.50)	6.67 (± 2.89)	6.00 (± 2.36)
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic	6.25 (± 3.37)	4.63 (± 3.36)	6.00 (± 3.61)	6.33 (± 2.36)

crops				
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	4.63 (± 3.07)	6.75 (± 3.00)	6.33 (± 2.31)	6.67 (± 1.41)
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	6.75 (± 3.49)	8.75 (± 3.16)	6.67 (± 3.21)	6.33 (± 1.41)
As an Organisation, we need the performance of the system to be fast, to enable quick testing	8.75 (± 1.04)	8.88 (± 0.99)	6.33 (± 2.08)	8.33 (± 1.70)
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	8.88 (± 0.83)	8.25 (± 0.76)	8.33 (± 1.53)	6.67 (± 2.16)
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	8.25 (± 2.38)	7.00 (± 2.39)	6.67 (± 2.52)	5.00 (± 3.68)
As an Organisation, we need all our data to be stored in one place	7.00 (± 3.02)	7.88 (± 3.04)	5.00 (± 3.61)	8.00 (± 1.70)
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	7.88 (± 1.89)	8.00 (± 1.81)	8.00 (± 2.00)	5.67 (± 1.89)
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	8.00 (± 1.60)	8.38 (± 1.51)	5.67 (± 2.31)	5.67 (± 2.94)
As an Organisation, we want the output of services to be stable and the services set-up for long term use	8.38 (± 1.92)	7.50 (± 2.00)	5.67 (± 1.15)	5.00 (± 1.63)
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	7.50 (± 2.56)	8.63 (± 2.59)	5.00 (± 2.00)	5.00 (± 1.63)
As an Organisation, we want to be able to upload information for the enhancement of	8.63 (± 1.19)	6.63 (± 0.76)	5.00 (± 2.00)	6.33 (± 2.16)

ENVISION services. In this context, we would like to also be able to provide in situ-data from fields				
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	6.63 (± 2.77)	9.13 (± 2.67)	6.33 (± 4.04)	6.33 (± 2.16)
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	9.13 (± 0.83)	8.88 (± 0.83)	6.33 (± 4.04)	4.67 (± 1.89)
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	8.88 (± 0.99)	5.75 (± 1.19)	4.67 (± 2.52)	8.67 (± 3.74)
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	5.75 (± 2.38)	7.88 (± 2.45)	8.67 (± 1.53)	5.67 (± 4.03)
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	7.88 (± 2.47)	9.25 (± 2.59)	5.67 (± 1.53)	5.67 (± 1.70)
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	9.25 (± 0.89)	8.38 (± 0.89)	5.67 (± 0.58)	4.00 (± 1.70)
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	8.38 (± 1.19)	8.63 (± 1.31)	4.00 (± 1.00)	6.00 (± 1.70)
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	8.63 (± 1.77)	8.75 (± 1.46)	6.00 (± 1.00)	6.33 (± 1.89)
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	8.75 (± 1.04)	8.38 (± 0.93)	6.33 (± 2.08)	4.67 (± 1.25)
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	8.38 (± 1.92)	7.50 (± 1.96)	4.67 (± 2.08)	6.00 (± 2.16)

Table 6: Prioritised list of User Stories - Requirements based on the "Importance to Effort" ratio. A higher ratio reflects User Stories that are more important for the end-users, than laborious for the developers, and therefore should be prioritised in the agile software development process.

User Story - Requirement	Importance to Effort ratio
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	2.16
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	1.73
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	1.63
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	1.61
As an Organisation, we need all our data to be stored in one place	1.58
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	1.57
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	1.54
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	1.50
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	1.48
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	1.48
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	1.46
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	1.44
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	1.41
As an Organisation, we need the performance of the system to be fast, to enable quick testing	1.40
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	1.40
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	1.33

As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	1.32
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid-September)	1.32
As an Organisation, we want the output of services to be stable and the services set-up for long term use	1.32
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e., borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	1.31
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	1.30
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	1.23
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	1.09
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	1.07
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	1.05
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	1.00
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	0.99
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots that the organisation inspects)	0.94
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	0.93
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	0.91
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	0.77

6.3 Potential problems for adoption of ENVISION within the organisation

Besides the identification of user requirements, another important step in Phase 1 of the co-production process was the identification of potential internal problems that the organisation may face and that may make the adoption of ENVISION tools difficult (Table 7). According to the Participants, the most concerning issues were that of potential delays in data provision and other ENVISION related tasks, caused by Covid-19 related restrictions and lack of resources, primarily financial. The current status of organisations' IT infrastructure and experience regarding similar remote monitoring services was also a particularly concerning issue. However, Participants suggested that they are willing to invest in the improvement of current infrastructure and training of staff that require more relevant experience. Finally, concerns were expressed related to the compatibility of ENVISION tools with applications that the organisations may develop in the future. Maintaining frequent communications with ENVISION Facilitators and Developers, while also disclosing relevant information as early as possible within the co-production process, was proposed to mitigate such issues. Establishing a structured method for communications, such as the one presented here with the methodological framework for virtual interactive discussions, could help resolve also issues of misinterpretation and loss of valuable information.

Table 7: Potential problems within the organisation that may hinder the adoption of ENVISION tools, along with potential actions for their mitigation. The median rank and range are presented as outputs of the Ranking process for each potential problem.

Potential problem	Median Rank (Range)	Action for mitigation
Covid-19 related restrictions have caused an overload of tasks in the organisation and may lead to delays when it comes to ENVISION related deliverables (i.e., data provision from organisation to ENVISION developers)	6.00 (7.00)	Throughout the co-production of ENVISION services process, Facilitators and Developers will aim to provide specific tasks and description of tasks as early as possible to all relevant business case partners, so that they have sufficient time to adjust their schedule to other potential commitments. A communication platform has been set up to enable quick, continuous updates throughout co-production, for all relevant parties
In-situ data collection from the organisation may be limited due to lack of time and money	6.00 (7.00)	While the availability of in-situ data for the training of ENVISION models and validation of ENVISION model outputs is desirable, it is not a restrictive factor for most ENVISION services. In cases where additional data and information is required, the Facilitators and Developers will distribute the specific requirements as early as possible to reduce the risk for potential delays. To mitigate the issue of inability to collect data samples due to financial restrictions, ENVISION developers may resort to alternative, publicly available data sources
Unprepared IT / GIS infrastructure and lack of experience of some members in handling the outputs of projects like ENVISION	5.00 (7.00)	Additional training to individuals that lack experience, and investment for the improvement of IT infrastructure will be provided by the business case partners if this becomes a concerning issue for the adoption of ENVISION services as their development progresses
Information conveyed in the ENVISION meetings may be misinterpreted and misunderstood particularly when reviewed by the different ENVISION partners	4.50 (4.00)	Future communications will feature visual representations of progress (i.e., roadmaps), models and outputs. Summaries and recordings (i.e., video recordings) of such communications will be made available to attendees immediately after each occasion
Compatibility of ENVISION outputs with current data formats that the organisation uses and with potential Geo-Spatial Aid Application submission systems that the organisation may develop	4.50 (5.00)	This concern can be largely mitigated by the Developers consideration towards ENVISION features such as the interoperability and standard data formats of the ENVISION model outputs. In cases where new systems are

		being developed by business case partners, the ENVISION Developers should be notified as early as possible in the co-production process, to avoid potential miscommunications between the ENVISION and other toolboxes
Uncertainty about the cost of using ENVISION tools within the organisation	4.00 (7.00)	The ENVISION platform and services will not require any costs for use within the ENVISION project lifetime. Furthermore, as they will be web-based no additional infrastructure, and therefore costs, should be required. Further discussions are required to provide a response for potential costs beyond the ENVISION lifetime, although as the services could potentially be accessed through DIASes or existing toolboxes this concern could be largely mitigated
The organisation may have to address disputes with famers in cases where ENVISION outputs may disagree with data provided by the farmers	4.00 (7.00)	The ENVISION Developers consider that improving the accuracy of ENVISION model outputs will be an on-going process throughout the co-production of services phase and with the help of business case partners providing additional data and information the frequency of potential disputes could be reduced to a minimum
Uncertainty about the long-term support / development of ENVISION tools within the organisation	2.00 (5.00)	This issue could be mitigated if an organisation was appointed to lead the efforts for support / development of the ENVISION platform / services, instead of only the community as in an open-source format. In the example of Sen4CAP, ESA has committed to the maintenance and updating of the Sen4CAP toolbox

6.4   External threats to the adoption of ENVISION

Many factors external to PA and CB organisations can negatively affect the uptake of new technologies, particularly of ones that rely on large consortia and the agreement between several stakeholders (i.e., software developers, payments organisations, farmers). Table 8 below, presents the most concerning, external threats according to the Participants of the ENVISION consultations.

Participating organisations reported that the disruptions in communications with farmers and other social partners caused by the Covid-19 pandemic are a major concern, as they are important in providing feedback for ENVISION services. Organisations are also concerned that demographics of these classes, such as age and education, may make the adoption of ENVISION tools and the interpretation of their outputs difficult. A potential way to mitigate such impacts may be through an adjustment of the organisations' communication plans, by shifting the priority on frequent and transparent dissemination of relevant information, and even educating the individuals involved in ENVISION related processes.

According to the Participants, uncertainty regarding the long-term support, provision, use and associated costs of ENVISION tools (beyond the ENVISION project lifetime) poses another potential threat. Developing tools that could be integrated and provided through existing, popular platforms (i.e., DIAS), could be a potential way to keep ENVISION related costs for use and support to a minimum.

Finally, the Participants have expressed their concerns regarding the potential for ENVISION to adapt and address new requirements stemming from changes in relevant agri-environmental legislation, such as the post-2020 CAP. As the payments and control organisations (PAs and CBs) are in the forefront of the receiving end of such changes, it is important that they share this knowledge with the ENVISION Facilitators and Developers as early as possible in the co-production process, to ensure viability of the developed services considering the latest requirements. It is critical that all ENVISION partners understand and see co-production as the continuous process it is, that requires a constant flow of relevant information, updates and feedback.

Table 8: Potential threats external to the organisation that may hinder the adoption of ENVISION tools, along with potential actions for their mitigation. The median rank and range are presented as outputs of the Ranking process for each external threat.

External Threats	Median Rank (Range)	Action for mitigation
Covid-19 has caused disruptions in the communications between organisations and farmers / social partners, which are important in providing feedback for the ENVISION services	8.00 (9.00)	Methods for virtual communications, workshops, and discussions with farmers and social partners should be explored
Limited availability of Sentinel images and / or other Earth Observation data that may be necessary for specific ENVISION services	7.50 (9.00)	The ENVISION Developers are aware of such potential issues and have alternative data management plans for the different ENVISION services for their mitigation
High median age of applicants / farmers can make the uptake of new technologies and the interpretation of their outputs quite difficult	6.00 (7.00)	Business case partners could mitigate this issue by adjusting their methods of communication with farmers, particularly in regard to presenting and training stakeholders on ENVISION data products
Uncertainty regarding the long-term provision and maintenance of ENVISION platform and services	5.50 (7.00)	Further discussions between all ENVISION partners are required to propose potential plans for the maintenance and provision of ENVISION services beyond the ENVISION project lifetime
ENVISION services may not be able to adapt to the post-2020 Common Agricultural Policy requirements, or other similar changing legislation	5.00 (8.00)	Business case partners should collect information about the post-2020 requirements of the Common Agricultural Policy and other agri-environmental legislations, as early as possible. The organisations should share this information with ENVISION developers within the co-production process and discuss potential adaptations of the ENVISION services to meet the most recent requirements
Uncertainty about potential increases in the cost of ENVISION tools that may be caused by factors external to the organisation	4.50 (8.00)	The ENVISION platform and services will be developed as web-based applications and further discussions will be made for the potential to provide ENVISION services through DIASes or other platforms, to reduce potential costs for use and maintenance
Remote monitoring may bring up privacy issues and objections from the farmers' side	4.50 (7.00)	The organisations that will adopt ENVISION services for remote monitoring could adjust their communication and training plans

		with farmers to ensure frequent and transparent discussions
Different set of rules apply to different Member States, which may cause inconsistencies in the accuracy and effectiveness of ENVISION services	4.50 (8.00)	Business case partners should collect information about the specific rules of interest that differ between Member States of the European Union, and share this information with ENVISION developers within the co-production process to discuss potential adaptations of the ENVISION services
Recognition of ENVISION tools by relevant authorities (i.e., Ministries of Agriculture for different Member States)	4.50 (7.00)	As ENVISION is a Horizon 2020 project, relevant European authorities will receive ample information and have access to ENVISION Deliverables that will facilitate understanding and recognition the scope of ENVISION
Farmers may not be willing to provide data to improve for remote monitoring and modelling	2.50 (8.00)	Organisations could adjust their communications with farmers and aim to provide education and transparent discussions around the potential benefits and challenges with the adoption of remote monitoring tools

7 Conclusions

The identification of user requirements and potential challenges in the adoption of ENVISION tools, is a fundamental step for the co-production of ENVISION services. The structured method of consultations, as presented in this Deliverable, was critical to record user needs and to ensure that information was processed, shared and stored in a comprehensive and concise manner. This is the starting point from which transparent communication can flow and the outputs can be interpreted and used by all ENVISION partners, as well as external stakeholders.

The Consultations with the four ENVISION business case partners, yielded thirty-one (31) User Requirements specific to the proposed ENVISION Platform and Models in the form of User Stories. These user stories were prioritised by importance and urgency by the business case partners and ranked according to effort and data intensity by the developers. This list will serve as the starting backlog for development of the ENVISION services in WP3 as supported by the ongoing activities of co-production in Task 2.3.

These user stories-requirements highlight the need for ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR. Moreover, emphasis was given regarding the ability of the platform to serve the need for sending notifications when anomalies are detected (at a service or data level). In addition, quite often during the workshops it was mentioned the need for a high-quality platform in terms of ease of use, security and interoperability. Furthermore, it is important that the services meet a high level of accuracy which is monitored via a set of indicators and other tools within the platform. Other issues identified within the user stories refer to the frequency of data collection, type of outputs and level of analysis, crop and farming practice identification, data outputs (i.e., maps, tables, numeric information (indicators)). An important function of the ENVISION platform was identified to be the provision of vegetation status maps which will allow the application of various tests for the type of crop, status, development, farming practices etc. Also, a number of participants referred to the need of the platform being effective independently of the parcel size, receive and deliver information about neighbouring plots, to be a speedy process with the minimum potential errors and high accuracy, to have a country level coverage and to provide data in a time series format.

These user stories have been presented as the needs-requirements of the organisation, the controller, the inspector, the data analyst, the administrator and the IT expert for PAs and CBs. Further to this, important information was collected with regard to factors that may hinder adoption of ENVISION tools by the organisations. Potential solutions and action plans were proposed for the mitigation of such potential problems, whether they referred to problems internal to the organisation or associated with external factors. As a core element of the co-production process, this information will enable the developers to build services that consider the potential limitations of end-users, therefore adding to the commercial value of the ENVISION products.

Considering the effectiveness of the structured methods for interactive discussions presented in this Deliverable in generating user requirements, potential threats for adoption and easily interpretable feedback, the facilitators, developers and members of the participating organisations have agreed to adopt this approach throughout the ENVISION co-production process.

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9   Appendix

9.1   Qualtrics online survey for Prioritisation and Ranking – Participants

The Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats, as distributed to the Participants of the ENVISION consultations, is presented below.

Default Question Block

Which organisation are you part of?

[▾]

Which of the following relates closest to your role within the organisation?

[▾]

Please state your name.

[   ]

On a scale from 1 to 10, with **1 being the lowest** and **10 being the highest**, please select the appropriate **Urgency score according to your opinion** for each User Requirement presented. The term Urgency refers to the **priority in time** you would put on a User Requirement based on your needs and **in relation to the other** User Requirements.

	Not urgent at all - 1	2	3	4	5	6	7	8	9	Extremely urgent - 10
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid September)	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not urgent at all - 1	2	3	4	5	6	7	8	9	Extremely urgent - 10
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots the organisation inspects)	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not urgent at all - 1	2	3	4	5	6	7	8	9	Extremely urgent - 10
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need the performance of the system to be fast, to enable quick testing	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need all our data to be stored in one place	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not urgent at all - 1	2	3	4	5	6	7	8	9	Extremely urgent - 10
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the output of services to be stable and the services set-up for long term use	○	○	○	○	○	○	○	○	○	○
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	○	○	○	○	○	○	○	○	○	○
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	○	○	○	○	○	○	○	○	○	○
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not urgent at all - 1	2	3	4	5	6	7	8	9	Extremely urgent - 10
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	○	○	○	○	○	○	○	○	○	○
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	○	○	○	○	○	○	○	○	○	○
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	○	○	○	○	○	○	○	○	○	○
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	○	○	○	○	○	○	○	○	○	○

On a scale from 1 to 10, with **1 being the lowest** and **10 being the highest**, please select the appropriate **Importance score according to your opinion** for each User Requirement presented. The term Importance refers to **the priority you would put on addressing an underlying environmental problem or general system requirement** as presented in the User Requirement below.

	Not important at all - 1	2	3	4	5	6	7	8	9	Extremely important - 10

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not important at all - 1	2	3	4	5	6	7	8	9	Extremely important - 10
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid September)	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots the organisation inspects)	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not important at all - 1	2	3	4	5	6	7	8	9	Extremely important - 10
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need the performance of the system to be fast, to enable quick testing	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need all our data to be stored in one place	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not important at all - 1	2	3	4	5	6	7	8	9	Extremely important - 10
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the output of services to be stable and the services set-up for long term use	○	○	○	○	○	○	○	○	○	○
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	○	○	○	○	○	○	○	○	○	○
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	○	○	○	○	○	○	○	○	○	○
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	○	○	○	○	○	○	○	○	○	○

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

	Not important at all - 1	2	3	4	5	6	7	8	9	Extremely important - 10
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	○	○	○	○	○	○	○	○	○	○
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	○	○	○	○	○	○	○	○	○	○
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	○	○	○	○	○	○	○	○	○	○
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	○	○	○	○	○	○	○	○	○	○

Please rank the following **Potential Problems Within the Organisation**, with **number 1 being the most concerning issue** that you think **may make difficult the adoption of ENVISION tools from your organisation.**

Figure A 3: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

Uncertainty about the cost of using ENVISION tools within the organisation

Uncertainty about the long-term support / development of ENVISION tools within the organisation

Unprepared IT / GIS infrastructure and lack of experience of some members in handling the outputs of projects like ENVISION

Covid-19 related restrictions have caused an overload of tasks in the organisation and may lead to delays when it comes to ENVISION related deliverables (i.e. data provision from organisation to ENVISION developers)

Information conveyed in the ENVISION meetings may be misinterpreted and misunderstood particularly when reviewed by the different ENVISION partners

In-situ data collection from the organisation may be limited due to lack of time and money

Compatibility of ENVISION outputs with current data formats that the organisation uses and with potential GSAA submission systems that the organisation may develop

The organisation may have to address disputes with famers in cases where ENVISION outputs may disagree with data provided by the farmers

Please rank the following **External Threats**, with **number 1 being the most concerning issue** that you think **may make difficult the adoption of ENVISION tools from your organisation.**

Farmers may not be willing to provide data to improve for remote monitoring and modelling

Uncertainty about potential increases in the cost of ENVISION tools that may be caused by factors external to the organisation

Remote monitoring may bring up privacy issues and objections from the farmers' side

Different set of rules apply to different Member States, which may cause inconsistencies in the accuracy and effectiveness of ENVISION services

Uncertainty regarding the long-term provision and maintenance of ENVISION platform and services

Limited availability of Sentinel images and/or other Earth Observation data that may be necessary for specific ENVISION services

ENVISION services may not be able to adapt to the post-2020 Common Agricultural Policy requirements, or other similar changing legislation

Covid-19 has caused disruptions in the communications between organisations and farmers / social partners, which are important in providing feedback for the ENVISION services

High median age of applicants / farmers can make the uptake of new technologies and the interpretation of their outputs quite difficult

Recognition of ENVISION tools by relevant authorities (i.e. Ministries of Agriculture for different Member States)

Figure A 1: Qualtrics online survey for the prioritisation of User Requirements and ranking of potential problems and external threats

9.2 Qualtrics online survey for Prioritisation – Developers

The Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations, is presented below (Fig. A2).

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	No effort required at all - 1	2	3	4	5	6	7	8	9	A lot of effort is required - 10
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots the organisation inspects)	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	No effort required at all - 1	2	3	4	5	6	7	8	9	A lot of effort is required - 10
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need the performance of the system to be fast, to enable quick testing	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need all our data to be stored in one place	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the output of services to be stable and the services set-up for long term use	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	No effort required at all - 1	2	3	4	5	6	7	8	9	A lot of effort is required - 10
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	○	○	○	○	○	○	○	○	○	○
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	○	○	○	○	○	○	○	○	○	○
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	○	○	○	○	○	○	○	○	○	○
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	No effort required at all - 1	2	3	4	5	6	7	8	9	A lot of effort is required - 10
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	○	○	○	○	○	○	○	○	○	○
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	○	○	○	○	○	○	○	○	○	○
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	○	○	○	○	○	○	○	○	○	○

On a scale from 1 to 10, with **1 being the lowest** and **10 being the highest**, please select the appropriate **Data Intensity score according to your opinion** for each User Requirement presented. The term Data Intensity refers to **the amount of data/information that you would require each business case partner to provide in order to address each User Requirement.**

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As a Controller, I would like to receive data of crop type maps every two weeks from the middle of April to the middle of August (ideally mid September)	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like grassland mowing and grazing layers every two weeks from June till November with more than 85% accuracy	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As a Controller, I would like to receive crop type and grassland mowing maps that are at least 95% accurate compared to in situ data	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive vegetation status maps with a priority on EFA catch-crop fields and all fallow land fields	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to be able to mask layers of interest with information from ENVISION outputs, for example to check parcels which intersect with soil erosion results, or to link crop type maps with grassland mowing layers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to identify and distinguish between organic and conventional crop, and to monitor pesticide use on the declared plots because this is an important objective in many agri-environmental policies	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to receive information about the specific crop types even in very small and narrow parcels, or at least a coarser level of classification with a group of possible crop types	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get ENVISION outputs per parcel, especially for information on yield of each crop	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to get information once a year about the crops of neighbouring plots that are not involved in organic production (neighbouring to the plots the organisation inspects)	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As an Organisation, we would like to get data once a year for the crop types of conventional plots that belong to the same farmers that are involved also in organic production, even if the organisation's primary target is monitoring the farmer's organic crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to track reductions in the number of plants through several times of the year, because this could be an indication of potential damages to crops that can result to events such as the re-cultivation of different crops on the same parcel, which is illegal	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to see the colour of crops / plants on parts of parcels (i.e. borders) for several times of the year, because changes in colour could indicate pesticide/herbicide use and can also help track events of illegal burning of crops	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need the performance of the system to be fast, to enable quick testing	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the system to provide us with errors against legislation that we can communicate to farmers	○	○	○	○	○	○	○	○	○	○
As an Organisation, we need to be able to integrate services in our own applications. It is important to us that the ENVISION toolbox features as many standards as possible and that the various outputs are downloadable or easy to share via APIs so that we can analyse them in our own existing systems (interoperability and potential to transfer/download data)	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As an Organisation, we need all our data to be stored in one place	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the services to process information about newly declared parcels in bulk and efficiently, to be able to receive outputs for such new parcels	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to have an idea of the accuracy of the output of a service through relevant indicators and sufficient documentation of the methodology, as well as to receive notifications when the accuracy degrades throughout the cultivation period	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want the output of services to be stable and the services set-up for long term use	○	○	○	○	○	○	○	○	○	○
As an IT expert, I want the ENVISION platform to monitor itself and notify me if there is a problem, so I can be confident that everything is ok if I am not notified	○	○	○	○	○	○	○	○	○	○
As an Organisation, we want to be able to upload information for the enhancement of ENVISION services. In this context, we would like to also be able to provide in situ-data from fields	○	○	○	○	○	○	○	○	○	○
As an Administrator, I need to know when ENVISION services' outputs are not available so I can warn the respective farmers that they need to provide the relevant information themselves	○	○	○	○	○	○	○	○	○	○
As an Inspector, I want the results from ENVISION's remote monitoring services to be reliable and verifiable on the spot	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As an Organisation, we need to receive outputs both as maps/layers and relevant tables/numeric information, as well as to receive time series of various indicators to study changes and emerging problems	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want the toolbox to be installed on DIASes, or that DIASes offer the tools as a service so it is preinstalled there, accessed and even maintained by the DIAS	○	○	○	○	○	○	○	○	○	○
As an IT Expert, I want good quality to characterise the ENVISION platform services, in terms of ease of use, security and interoperability	○	○	○	○	○	○	○	○	○	○
As a Controller, I would like to receive data for declared parcels across the whole country and not only specific zones	○	○	○	○	○	○	○	○	○	○
As a Controller, I want ENVISION to be transparent regarding data sharing legal issues in the context of intellectual property and GDPR	○	○	○	○	○	○	○	○	○	○
As an Organisation, we would like to be able to visualise historic data and all relevant to a plot information on the platform, for as far back in time as possible	○	○	○	○	○	○	○	○	○	○
As an Administrator, I would like to receive ENVISION outputs from the time of submission and throughout the entire application period, in order to help applicants and explain possible implications of wrong declarations / ineligibility of plots, considering the eligibility criteria / rules for multiple agri-environmental schemes	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

	Data is already available - 1	2	3	4	5	6	7	8	9	All data needs to be collected/provided by business case partner - 10
As an Inspector, I would like to see through the ENVISION platform what is important to check for each plot, according to a farmer's declaration. This is important as it will clarify the reason why certain parcels need to be checked according to the organisation's sample	○	○	○	○	○	○	○	○	○	○

Figure A 2: Qualtrics online survey for the prioritisation of User Requirements as distributed to the Developers of the ENVISION consultations

9.3   Miro 1st Consultation Round Example

The section below presents a populated example of the Miro platform as designed and used in the 1st consultation round with one of the business case partners.

1st Workshop – NPA

Identifying NPA's requirements from ENVISION

Facilitated by URDG, ENVISION WP2 leaders.

University of Reading, UK, 16/12/2020

What is ENVISION?

Horizon 2020 Innovation Project

Project Title: Monitoring of Environmental Practices for Sustainable Agriculture Supported by Earth Observation

Project Topic: Development of commercial activities and services through the use of GEOSS and Copernicus data
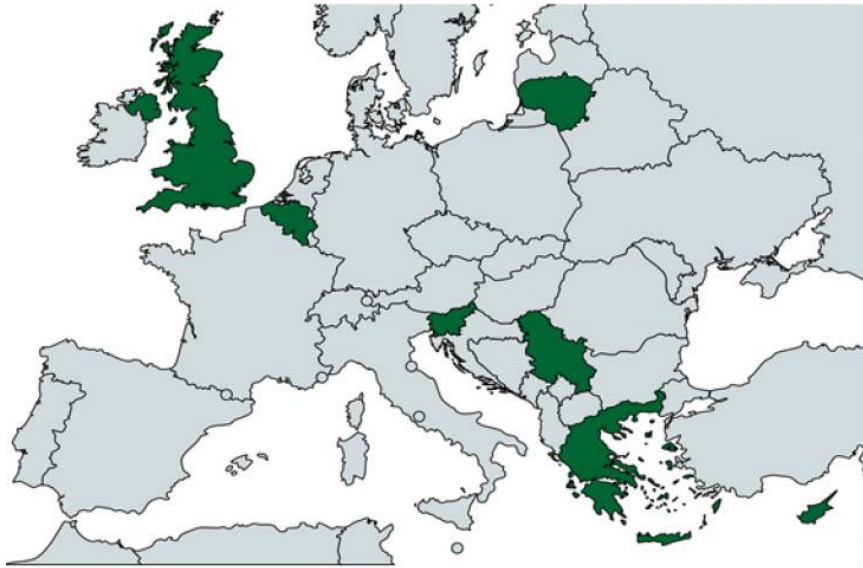
Aims of ENVISION

- Fulfil the need for remote, continuous and systematic monitoring of agricultural land and agricultural practices

- Develop a fully automated and scalable toolbox, to facilitate monitoring of
  - Cultivated Crop Types
  - Soil Organic Carbon
  - Vegetation Status
  - Crop Growth (distinction of organic – conventional farming)
  - Grassland Mowing / Ploughing
  - Soil Erosion

Role of NPA?

Business cases: LV, CAPO, NPA, OCS
Active role in co-production of ENVISION tools

Identifying user requirements and issues with regards to platform, models and data products

Testing demos of platform, models and data products

Providing feedback to developers for updates
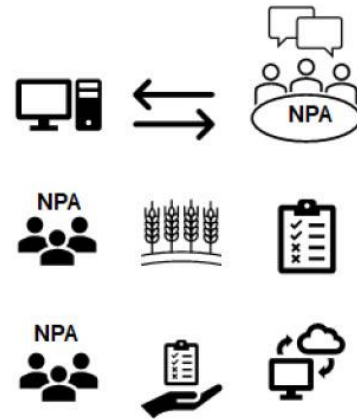
Role of NPA?

Testing and reporting

Feedback and updating

Aims of workshops

1st Workshop – January 11th, 2021

- Identify NPA's requirements and potential challenges specific to:
    - The **platform**
    - The **models and data products**
    - **Adoption** of ENVISION tools **within NPA**
    - **Threats for adoption** of ENVISION tools **external to NPA**

- A prioritised list of requirements and challenges will be produced to feed in the ENVISION service customisation undertaken by WP4

Aims of workshops

2nd Workshop – Date To Be Decided

- A prioritised list of specific solutions to problems identified in 1st Workshop, will be produced

- "User stories" – critical in agile software development

Workshop agenda Overview

- 9:00 – 9:15 (CET) Introduction **led by URDG**

- 9:15 – 11:30 (CET) Discussion sessions #1 & #2 **led by DRAXIS, NOA & ILVO**

- 11:30 – 12:10 (CET) Discussion session #3 **led by URDG**

- 12:15 – 12:50 (CET) Discussion session #4 **led by URDG**

- 12:50 – 13:00 (CET) Wrap-up and next steps

Role of each participant in the workshop

University of Reading URDG	DRAXIS Environmental S.A.	National Observatory of Athens NOA	EV ILVO	Lithuanian National Paying Agency	
Georgios Pexas Facilitator g.pexas@reading.ac.uk	Panagiota Syropoulou Platform developer syropoulou.p@draxis.gr	Vasilis Sitokonstantinou Model developer vsito@noa.gr	Panos Ilias Model developer panos.ilias@ilvo.vlaanderen.be	Aušrius Kučinskas CONTORL UNIT ausrius.kucinskas@nma.lt	Edvinas Aglinskas CONTROL UNIT edvinas.aglinskas@nma.lt
Yiorgos Gadanakis Facilitator g.gadanakis@reading.ac.uk	Stavros Tekes Platform developer stavros@draxis.gr	Mariza Kaskara Model developer kaskara@noa.gr	Fabio Castaldi Model developer fabio.castaldi@ilvo.vlaanderen.be	Martynas Rimgaila CONTROL UNIT martynas.rimgaila@nma.lt	Enrika Raibytė SUPPORT ADMINISTRATION enrika.raibyte@nma.lt
Alice Mauchlin Facilitator a.l.mauchline@reading.ac.uk					Beata Naruševič-Sevruk IT ANALYST beata.narusevic@nma.lt
Simon Mortimer Facilitator s.r.mortimer@reading.ac.uk					Giedrė Valbasytė SUPPORT ADMINISTRATION giedre.valbasyte@nma.lt
					Dovilė Paužė IT ANALYST dovile.pauze@nma.lt
				Edvinas Kripaitis IT ANALYST edvinas.kripaitis@nma.lt	
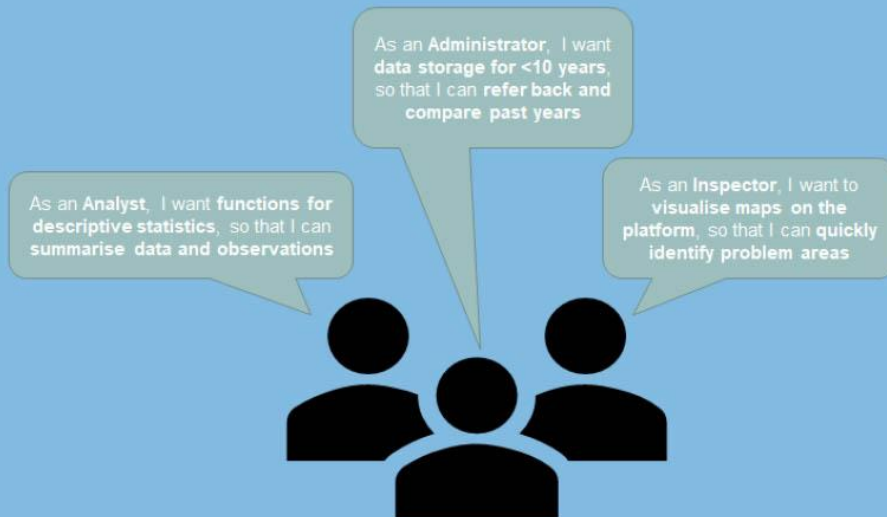
IMPORTANT NOTES

CONSISTENCY in responses is important because:
- compare with other organisations
- revisit in the future

PRIORITIZATION of user stories through:
- ranking
- weight-to-effort ratio (weight indicates importance)
- urgency

PRIORITIZATION is critical because:
- ordered tasks for development of platform, models and data products
- detailed back-log to review and reflect on in the future

Workshop agenda
Discussion session #1

- **9:15 – 9:30** Presentation of platform (website, phone app) **by DRAXIS**

DRAXIS	NPA
Speakers	**Active listeners:** *How does the platform cover my requirements? What other requirements do we identify? Any issues raised?*

- **9:30 – 9:45** 1st Q & A session. **DRAXIS – NPA**

DRAXIS	NPA
Active listeners: *Can additional requirements be fulfilled? What other functions can be added? Weight-to-effort ratio*	**Speakers**
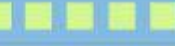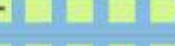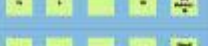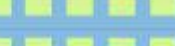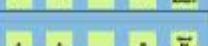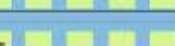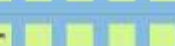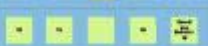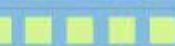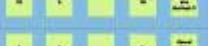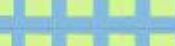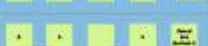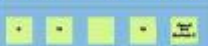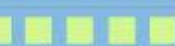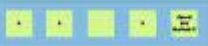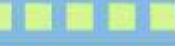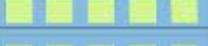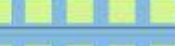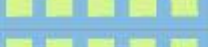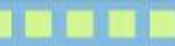
- **9:45 – 9:55** Summary and Feedback

Q & A session - Session notes

QUESTIONS FROM DRAXIS	ANSWERS TO QUESTIONS FROM DRAXIS
QUESTIONS FROM PARTICIPANTS	ANSWERS TO QUESTIONS FROM PARTICIPANTS
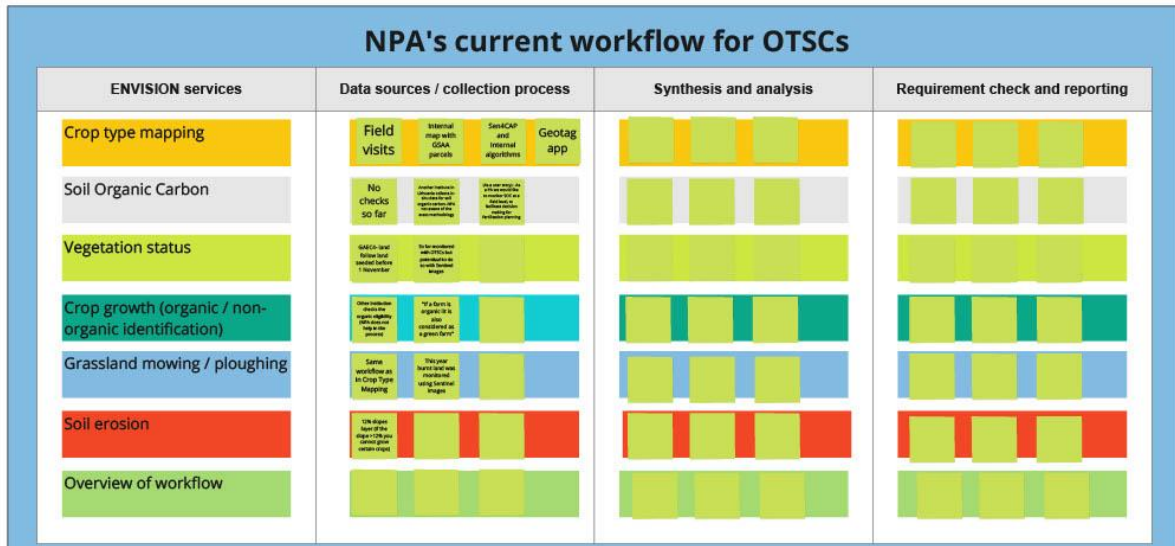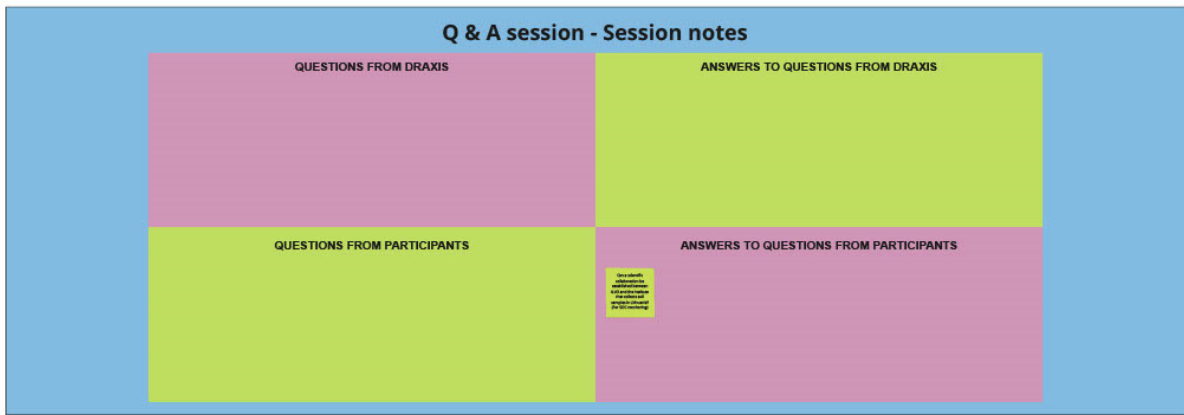
Discussion #1 - User story mapping

User Stories	Urgency	Weight	Weight

Workshop agenda
Discussion session #2

- **10:00 – 10:15** Presentation of models (algorithms) and data products **by NOA & ILVO**

NOA & ILVO	NPA
Speakers	**Active listeners:** *Do the proposed models and data products meet our needs for monitoring of cross-compliance? What other practices would we like to monitor?*

- **10:15 – 10:45** 2nd Q & A session. **NOA & ILVO – NPA**

NOA & ILVO	NPA
Active listeners: *Can accuracy of the models be improved? What other data products can be provided? Weight-to-effort ratio*	Speakers

- **10:45 – 10:55** Summary and Feedback

Workshop agenda
Discussion session #3

- **11:00 – 11:45** Limitations and problems for adoption of ENVISION tools, **within NPA**

Problems specific to:	NPA
Usability of services by NPA	
IT infrastructure and knowledge	
NPA - farmers relationship (i.e. privacy issues)	

- **11:45 – 11:55** Summary and Feedback

Discussion #3 - User story mapping

User Stories	Urgency	Ranking	Weight

Workshop agenda
Discussion session #4

- **12:00 – 12:45** Threats to adoption of ENVISION tools, **external to NPA**

Topics	All participants
Threats to usability of services by end users (i.e. access to platform)	
Threats to effectiveness of services (i.e. changes in requirements for monitoring)	
Threats to cost-effectiveness of services	

- **12:45 – 12:55** Summary and Feedback

Discussion #4 - User story mapping

Wrap-up

Past experience	What I learned	What I need to think

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