Innovation and Capacity building

in Agricultural Environmental and Rural UAV Services

ICAERUS

D 6.1: Platform Design & System Requirements

WP6: ICAERUS Platform

Responsible Author: Alexandros Fournarakos (AUA), Panagiotis Stamatelopoulos (AUA)

Funded by the European Union

Grant agreement N° 101060643

Document Information

Grant Agreement No.	101060643
Project Acronym	ICAERUS
Project Title	Innovation and Capacity building in Agricultural Environmental and Rural UAV Services
Type of action	RIA - Research & Innovation Action
Horizon Europe Call Topic	HORIZON-CL6-2021-GOVERNANCE-01-21: Potential of drones as multi-purpose vehicle – risks and added values
Project Duration	01 July 2022 – 31 June 2026 | 48 months
Project Website	icaerus.eu
EU Project Advisor	Alessandra Sasso
Project Coordinator	Spyros Fountas
Address	75 Iera Odos, 11855 Athens, GR | Agricultural University of Athens
Reply to	sfountas@aua.gr

Work Package	WP6: ICAERUS PLATFORM
WP Lead Beneficiary	Agricultural University of Athens (AUA)
Relevant Task(s)	T6.1: ICAERUS Platform Design & Specifications
Deliverable | Version | Status	D6.1: Platform Design & System Requirements | V1.0 | Final
Deliverable Lead Beneficiary	Agricultural University of Athens (AUA)
Responsible Authors	Panagiotis Stamatelopoulos (AUA)
Reply to	*pstamatel@aua.gr*
Deliverable type | Dissemination level[1]	R – Report | PU – Public
Due Date of Deliverable	30 June 2023
Actual Submission Date	29 June 2023
Version | Status	Final
Contributors	All ICAERUS partners
Reviewer(s)	Giacomo Carli (OU), Kristen Reid (OU), Despoina Filiou (OU)

[1] *Deliverable type R: Document, report; DEM: Demonstrator, pilot, prototype, plan designs; DEC: Websites, patents filing, press & media actions, videos, etc.; DATA: Datasets, microdata, etc; DMP: Data management plan; ETHICS: Deliverables related to ethics issues; SECURITY: Deliverables related to security issues; OTHER: Software, technical diagram, algorithms, models, etc. Dissemination level: PU – Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page); SEN – Sensitive, limited under the conditions of the Grant Agreement; Classified R-UE/EU-R – EU RESTRICTED under the Commission Decision No2015/444; Classified C-UE/EU-C – EU CONFIDENTIAL under the Commission Decision No2015/444; Classified S-UE/EU-S – EU SECRET under the Commission Decision No2015/444*

Document History

Version	Changes	Date	Contributor
0.1	Initial structure; Table of Contents	07/11/2022	Panagiotis Stamatelopoulos (AUA)
0.3	Initial feedback - meeting with WP leaders	08-10/11/2022	Panagiotis Stamatelopoulos, Aikaterini Kasimati (AUA) All ICAERUS WP leaders: Joao Valente, Jurrian Doornbos (WU), Dimitris Fotakidis Maja Radisic, Mackenzie Baert (FSH), Viara Bojkova, Stratos Arampatzis (NSWR), Kostas Grigoriadis (GS), Paula Oses, Salvador Calgua (NMN), Giacomo Carli (OU)
0.4	WPs dedicated Surveys	30/03/2023	Panagiotis Stamatelopoulos, Hercules Panoutsopoulos, Alexandros Fournarakos, Penny Zafiraki (AUA)
0.5	Input provided by WP leaders	07/04/2023	All ICAERUS WP leaders
0.6	Analysis of the results of the survey	10/05/2023	Aikaterini Kasimati, Alexandros Fournarakos, Penny Zafiraki (AUA)
0.8	D6.1 First draft	20/06/2023	Panagiotis Stamatelopoulos, Hercules Panoutsopoulos, Alexandros Fournarakos, Penny Zafiraki (AUA)
0.9	Internal Review	28/06/2023	Giacomo Carli (OU), Kristen Reid (OU), Despoina Filiou (OU)
1.0	First Version | Final	29/06/2023	Panagiotis Stamatelopoulos (AUA)
1.0	First Version | **RP1 Revised** | Final	28/05/2024	Alexandros Fournarakos (AUA)

Participants	Contact
Agricultural University of Athens (AUA), Greece	**Spyros Fountas** sfountas@aual.gr
Wageningen University (WU), Netherlands	**João Valente** joao.valente@wur.nl
Foodscale Hub (FSH), Greece	**Grigoris Chatzikostas** gchatzikostas@gmail.com
Noosware BV (NSWR), Netherlands	**Efstratios Arampatzis** sa@noosware.com
GeoSense IKE (GS), Greece	**Dimitrios Ramnalis** ramnalis@geosense.gr
Noumena Design Research Education SL (NMN), Spain	**Aldo Sollazzo** aldo@noumena.io
Institut De l'Elevage (IDELE), France	**Jean-Marc Gautier** jean-marc.gautier@idele.fr
ART21 UAB (ART), Lithuania	**Laurynas Jukna** laurynas@art21.lt
Ecological Interaction (EI), Estonia	**Jonathan Minchin** jonathan@ecologicalinteraction.org
Hellenic Crop Protection Association (HCPA), Greece	**Francesca Ydraiou** fydraiou@esyf.gr
Agrifood Lithuania DIH (AFL), Lithuania	**Valdas Rapševičius** vrapsevicius@gmail.com
AgFutura Technologies (AGFT), North Macedonia	**Blagoja Mukanov** blagoja.mukanov@agfutura.com
The Open University (OU), United Kingdom	**Giacomo Carli** giacomo.carli@open.ac.uk

RP1 General Project Review – Revision

Expert opinion on deliverable/ Comment	Steps towards addressing it
For better transparency and traceability, requirements MUST all be given an individual ID.	Functional Requirements were given an individual identifier in the form of FR##.
D6.2 refers to an annex to D6.1, which is not present.	Annexes updated, with Annex II now containing the full list of functional requirements.
Also, (as is stated on page 20) there MUST be a link of requirement to a user need. Now the needs are not referenced. Is that supposed to come from D1.3? That does not provide any useful user needs (only global needs, and even they are unnumbered and unreferenced). Please make clear tables of user needs (maybe derived from the personas and use cases), derive user requirements (functional / system / etc.) from that but provide a back-and-forth linkage for traceability.	New chapter of the deliverable (User Personas and Identified Needs) was added. User personas based on the 5 ICAERUS Use Cases were relayed, with their identified platform expectations being transcribed to user needs. Moreover, associated needs from D1.3 of the project and AW-Drones project's Deliverable 6.3 were transcribed in relation to the ICAERUS Platform as user needs. Finally, an association of the identified needs and functional requirements is provided in Table X of chapter "Functional Requirements".

Executive Summary

The present document is the Software Requirements Specification (SRS) document for the ICAERUS platform developed for fulfilling the needs of the ICAERUS project's Deliverable 6.1 “Platform Design & System Requirements”. The purpose is to provide documentation of the platform’s scope, functional and non-functional requirements, intended audience, user and software interfaces, as well as technical constraints to be considered. These specifications and design elements were collected as part of Task 6.1 “ICAERUS Platform Design & Specifications”.

The ICAERUS platform is a one-stop web-based interactive platform to be used as the central node for information dissemination, communication, and collaboration to increase the use of drones for sectoral and societal purposes. It will be comprised of the following six (6) elements: 1) The Drone Market Landscape, a repository of current drone market intelligence, including actors, needs and innovations, standards, regulations, and risks; 2) The Drone Data Analytics Library, a library comprised of drone data analytics models; 3) the ICAERUS Use Cases’ (UCs) and Open Call Trials’ (OCTs) including their advancements and outcomes; 4) Socio-economic and Environmental Impact Assessment (SEIA) Results; 5) Inclusive Business and Governance Models, and 6) the ICAERUS Academy, a free, open-access capacity building programme including value-added services.

This SRS document serves as a reference point for all parties involved to ensure understanding of what the platform should accomplish. Any functionality not listed in this document cannot be expected to be available in the produced platform. This document may change throughout the lifespan of the project and can be updated to include future functionalities and/or restrictions that may apply.

Table of Contents

Table of Figures

Table of Tables

1. Introduction

In this first introductory section, readers are presented with the purpose of the document within the scope of the ICAERUS project, the intended audience, conventions, and any possible prerequisites there may exist and deemed crucial for the understanding of this document.

1.1 Purpose

The present document is the Software Requirements Specification (SRS) document for the ICAERUS platform developed for fulfilling the needs of the ICAERUS project's Deliverable 6.1. The purpose is to provide documentation of the platform's scope, functional and non-functional requirements, intended audience, user and software interfaces, as well as technical constraints to be considered.

This document will serve as a reference point for both the technical team in lead of the platform's design and implementation (namely, the Agricultural University of Athens) and platform stakeholders including, but not limited to, the project coordinator and the partner organisations involved in the consortium.

More specifically, the aim of this SRS document is to:

1. **Define Requirements**: The document outlines the functional and non-functional requirements of the platform, capturing the needs and expectations of the stakeholders. It serves as a reference point for all the parties involved to ensure understanding of what the system should accomplish.
2. **Establish a Basis for Development**: This SRS document provides a foundation for the development team to plan, design, and implement the software system. It acts as a blueprint, guiding the development process by outlining the system's features, interfaces, performance requirements, and constraints.
3. **Manage Expectations**: The present SRS document aims to serve as a tool responsible for communicating the platform's scope, functionalities, and constraints. This way, it may ensure that all the parties involved have a shared vision of the platform to be developed and what is expected from the platform to accomplish and deliver.
4. **Design Quality Assurance and Testing protocols**: The present SRS document defines the expected behaviour and performance of the software system, enabling AUA's quality assurance team to plan and execute effective testing strategies. It serves as a basis for creating test cases, verifying system functionality, and validating that the software meets the specified requirements.

1.2 Abbreviations

A table explaining all the abbreviations found in this document is relayed for ease:

Table 1: Abbreviations & Definitions

Abbreviation	Definition
AES	Advanced Encryption Standard
API	Application Programming Interface
CTA	Call to Action
FAQ	Frequently Asked Questions
GUI	Graphical User Interface
HTML	Hypertext Markup Language
HTTPS	Hypertext Transfer Protocol Secure
OCT	Open Call Trials
PDF	Portable Document Format
R&I	Research and Innovation
RGB	Red, Green, Blue
SEIA	Socio-economic and Environmental Impact Assessment
SQL	Structured Query Language
SRS	Software Requirements Specification
UAV	Unmanned Aerial Vehicle
UC	Use Case
UI	User Interface
UX	User Experience
WCAG	Web Content Accessibility Guideline

1.3 Intended audience

The main target audience of this document is the software development team responsible with the task to design, develop and validate the ICAERUS platform. Additionally, this document can serve as an expectations management tool throughout the ICAEURS consortium partners/members showcasing and defining what the ICAERUS platform is, what it will provide in terms of functionalities/capabilities and how it will look and feel.

A list of potential audience outside the scope of the consortium may also include:

- Software Development community
- Project Managers (individuals involved in the management of software-oriented projects.)
- Consortia of other EU-funded, R&I projects involved in similar software development work.
- Drone industry stakeholders (researchers, private sector, agri-rural communities, public authorities).

The rest of the ICAERUS platform SRS document is structured as follows: **Section 2** provides information about platform functionalities, the environment the platform will operate in, as well as constraints to be considered. **Section 3** relates to user and system interfaces, style guides, and dependencies on third-party software. Functional and non-functional requirements are detailed in **Sections 4 and 5** respectively.

1.4 Platform scope

The ICAERUS platform is one of the main results of ICAERUS, an EU-Funded R&I project which aims to explore opportunities and provide a more complete and interconnected account of the potential and impact of drones as multi-purpose vehicles in EU agriculture, forestry, and rural areas. The aim of the ICAERUS project is to showcase and support, through application, the effective, efficient, and safe deployment of drones as well as, identify the risks and added values associated with their use.

To effectively achieve its goals and objectives, the ICAERUS platform must incorporate six (6) different but equally important sources of information related to the drone ecosystem: 1) *Drone market landscape*, 2) *Drone Analytics Library*, 3) *Use cases and open call trials*, 4) *Socio-economic and Environmental Impact Assessment (SEIA) results*, 5) Inclusive *Business and Governance Models* and 6) *the ICAERUS Academy*.

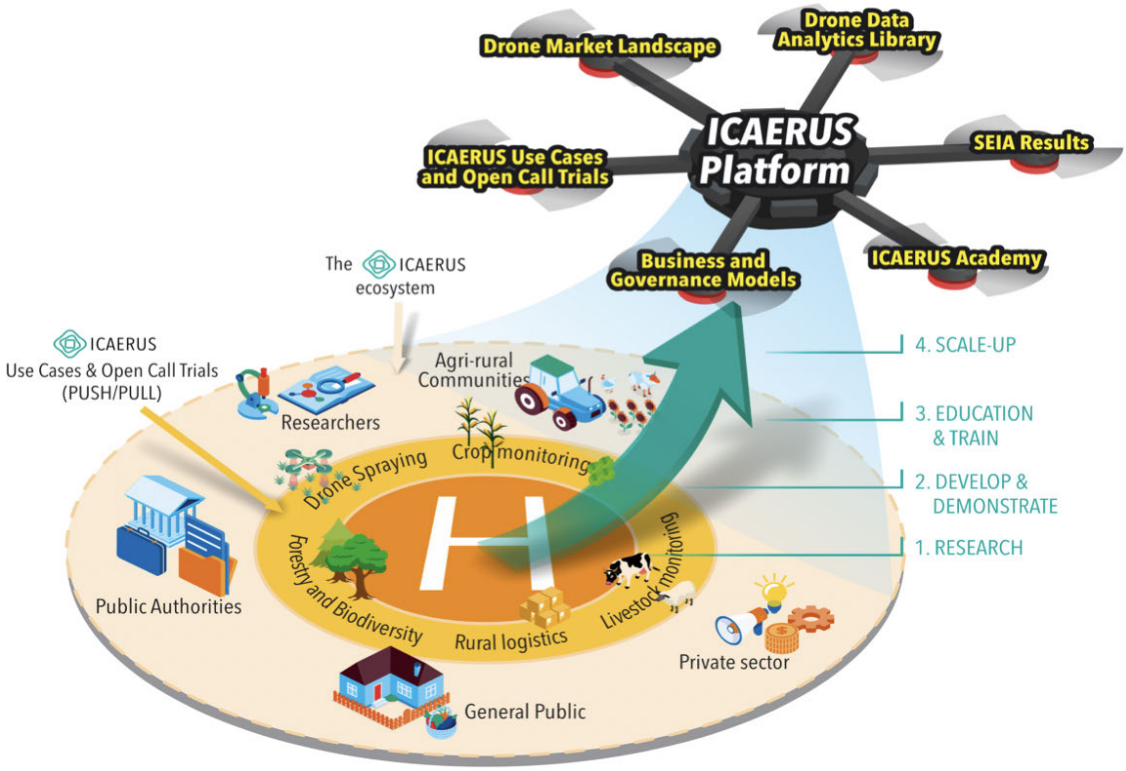

Figure 1: The Six Elements of the ICAERUS project.

2. Overall description

This section of the document describes the context and origin of the platform to be developed and this SRS targets. It also contains a high-level summary of the major functionalities the platform must perform, it identifies the various user classes that are anticipated to use it, it describes the environment this platform will operate in and any design/implementation constraints that need to be considered.

2.1 Product Perspective

Context

The ICAERUS platform is a standalone, self-contained and independent platform positioned in the larger context of the ICAERUS EU-Funded project. Table 2 below lists information related to various aspects of the EU drone landscape that will need to be integrated into the platform and which is indicative of the major components/modules of the ICAERUS digital platform.

Table 2: Aspects of the ICAERUS platform.

Drone market landscape	Current drone market intelligence, including actors, needs and innovations, standards, regulations, and risks.
Drone Analytics Library	Drone data analytics models and algorithms fulfilling the needs and requirements of end-users.
ICAERUS Use Cases' (UCs) and Open Call Trials' (OCTs)	Large-scale multi-actor experiments and demonstration events where drone technology (hardware and software systems) will be optimised, tested and demonstrated, to showcase multiple ways in which drones can be applied, whilst assessing and reducing associated risks.
Socio-economic and Environmental Impact Assessment (SEIA) Results	An assessment of the factors influencing the decision-making process when adopting drone technologies, the economic benefits of the multi-purpose use of drones, and the environmental impacts associated with uptake of drones.
Inclusive Business and Governance Models	Access to inclusive business and governance models, empowering people to explore the opportunities of using drones and facilitate better informed decision-making processes, as well as helping to shape future policy design.
ICAERUS Academy	The capacity building element of the ICAERUS Platform. It aims to strengthen capacities through 1) a free, Open-Access online training course, 2) onsite learning workshops, and 3) value-added services for Open Calls beneficiaries.

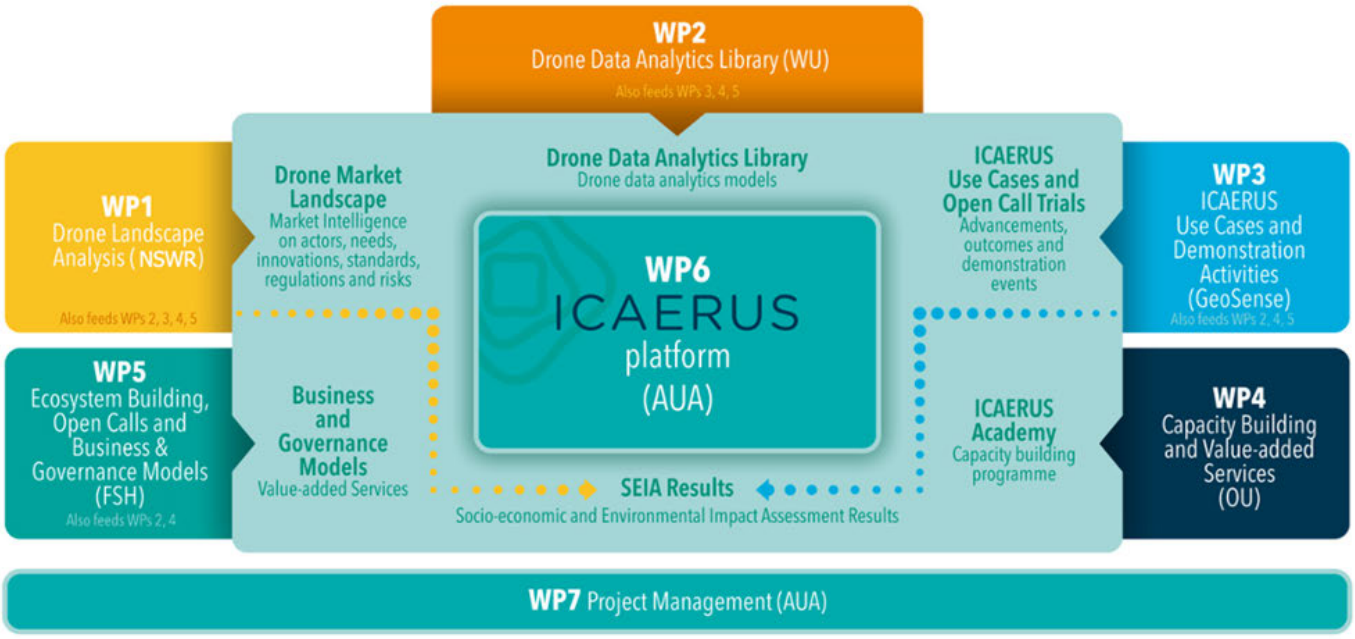

Figure 2: The links between the ICAERUS Consortium Work Packages and the Digital Platform

User interfaces

Users are expected to interact with the ICAERUS digital platform via Graphical User Interfaces (GUIs). Section 3.1 outlines all the user interfaces that are expected to be utilised in the scope of the ICAERUS platform.

Software Interfaces

The ICAERUS platform will interface with several external entities, such as the project's public GitHub repository to retrieve models and algorithms, as well as database infrastructure to manage the platform datasets. Section 3.2 outlines all the software interfaces that are expected to be utilised in the scope of the ICAERUS platform.

2.2 Product Functions

This section presents the list of the major functionalities that the ICAERUS digital platform should perform. The detailed list of functional requirements of the platform is presented in section 4 of this SRS document.

General

- The platform should allow users to register and log in with their credentials and roles, as well as view their profile and delete it upon command.
- The platform should allow users to share content provided by the platform to their social media accounts.
- The platform should allow users to access a feedback form.

Drone Market Landscape

- The platform should allow users to access drone-related intelligence and filter them by available metadata and/or area of application.
- The platform should allow users to access details related to drone technologies.

- The platform should allow users to access interests and requirements related to drone technologies.
- The platform should allow users to access information on standards and regulations.

Drone Data Analytics Library

- The platform should allow users to access the list of models and algorithms, as well as the details of each entry.
- The platform should allow users to filter models and algorithms based on the available metadata.
- The platform should allow users to access the Use Cases associated with the models and algorithms.

Use Cases and Open Call Trials

- The platform should allow users to access information regarding the Open Call Trials.
- The platform should allow users to access participation links to the Open Call Trials.

Socio-Economic and Environmental Impact Assessment

- The platform should allow users to access factsheets created from the results of the SEIA assessment.

Business and Governance Models

- The user should be able to access the Business and Governance models that are to be developed from the specified methodology during the project's lifespan.

ICAERUS Academy

- The platform should allow users to access a list of the suggested training resources provided and an overview of each course.
  The platform should allow users to access a link to the Open Learn Online Platform, where they can participate in the courses provided on the platform.

2.3 User Classes and Characteristics

The project's outreach includes the stakeholders for different groups of the drone market; drone manufacturers, service providers and entrepreneurs are part of the platform's users in terms of a technology and business network. They specialise in different industries and frequently work together to develop innovative drone technologies.

Each of the above categories are some of the end-users that have different needs regarding the navigation and information provided through the platform. Some of them can be considered as contributors of models or datasets, and consumers of models, datasets and courses. Other users, such as researchers, look for building professional networking, collaboration on research projects with colleagues and experts in the field from different organisations, open access to research articles and data. Agri-rural communities, farmers and foresters may need specific functions regarding the platform, such as market information (including local and global market trends), resources for precision agriculture and forestry, training and knowledge materials, and ways to connect with other farmers and foresters, access to relevant and practical agricultural information, sustainable and ecological farming practices. Finally, formulation and implementation of policies to address societal challenges, citizen engagement and participation, and citizen involvement in decision-making processes are the responsibility of public authorities as end users, who look for legislative and regulatory information.

2.4 Operating Environment

The ICAERUS web platform must be designed to operate within a specific operating environment to ensure optimal performance and compatibility. The platform requires a modern web browser such as Google Chrome, Mozilla Firefox, or Microsoft Edge with JavaScript and cookies enabled. It is recommended to have a stable internet connection with sufficient bandwidth for a seamless user experience. These browsers have versions available for all major operating systems, including Windows, macOS, and Linux, making the platform accessible and compatible across different platforms.

The ICAERUS web platform should also be fully responsive, providing an optimal user experience and compatibility across a wide range of modern devices. Users can access the platform from desktop computers, laptops, tablets, and smartphones. The platform dynamically adjusts its layout, content, and navigation to accommodate various screen sizes, resolutions, and orientations, enabling users to effortlessly interact with the platform on their preferred devices.

Regular updates and compatibility checks should be conducted frequently to ensure continued support for new devices and technologies.

2.5 Design and Implementation Constraints

The design and implementation of the platform outlined in this Software Requirements Specification (SRS) document are subject to certain constraints that need to be taken into consideration during the development process.

Technology Constraints

No major constraints exist on the selection of the web development tools/stack.

Performance Constraints

Response time is one of the most important factors, and therefore constraint, for every web application. To maintain user engagement and provide the best possible user experience, the ICAERUS platform must respond to user actions within 2 seconds at the most. Progressive web application, database query optimization and caching techniques should be used to accomplish this.

Scalability Constraints

ICAERUS platform will serve as a repository of different data sources. All data must be hosted on a local database. No major scalability constraints are expected, though, provision for large data volume and concurrent active users should be made.

Language constraints

The ICAERUS platform should be made available and fully support the English language. Source code and database design provisions should be made to allow for more languages support to be available upon request and within a logical time and resource frame.

Security considerations

The most important asset of the ICAERUS platform is its content. Therefore, frequent database backups should be made in a secure location. Furthermore, the source code produced under the scope of the project should be hosted on a Git platform (i.e., GitLab, GitHub) and be periodically backed up.

Usability constraints

Following the Web Content Accessibility Guideline (WCAG), the ICAERUS platform should provide tools to assist users with disabilities. These tools include keyboard accessibility, support for screen readers and provision for alternative texts for the assets (images, videos) of the platform.

Delivery time constraints

The 1st version of the ICAERUS platform should be made available to the public within six (6) months after the release of this document. Updated versions of the platform will exist as the project progresses.

2.6 User Documentation

While no end-user documentation is currently available, a User Guide will be developed for the platform. This is a detailed handbook that includes instructions and recommendations for using the ICAERUS platform. It may include details on using the platform's features, adjusting its settings, and troubleshooting. Additionally, Frequently Asked Questions (FAQ) is a page or section that provides short answers to queries regarding using the platform, its features, and troubleshooting that are commonly requested. In these terms, the following are examples of typical formats and distribution standards for user documentation: Portable Document Format (PDF) a popular format that makes user guides and instructions simple to distribute and view and HTML (Hypertext Markup Language) as a web-based documentation that can include interactive features and multimedia material and is accessed through web browsers.

2.7 Assumptions and dependencies

For the development of the ICAERUS platform, the following assumptions and dependencies should be considered.

External libraries and frameworks

It is assumed that any third-party library and framework that may be used during the development of the platform will be fully accessible, licensed to be used (where needed) and in line with the requirements of the system.

Consumption of third-party services and APIs

External services and APIs may be used by the ICAERUS platform to retrieve content and support several functionalities. It is assumed and required for these services and APIs to be available, licensed (where needed), properly configured and easily adjustable to support future revisions. Coding patterns should be used to make sure that future changes in the vendor of the service/API can be supported with the minimum effort possible.

Data Availability

The most valuable asset of the ICAERUS platform is its data. Therefore, it is assumed that the data (internal and external) should be always available and towards that end, system architecture design should handle diverse scenarios, such as content provider crashes or no lack of availability for any reason.

3. User Personas and Derived User Needs

3.1 User Personas

The ICAERUS project features five core use cases, serving to garner application-driven insights from their activities in the complex drone landscape. Namely, these five Use Cases cover the following fields of application: 1) **Crop monitoring**; 2) **Drone spraying**; 3) **Livestock monitoring**; 4) **Forestry and biodiversity monitoring**; and 5) **Rural logistics**. Through the ICAERUS platform's vivid ecosystem, encompassing a wide range of tools and valuable information, the project's UCs will strive to meet their desired objectives, supported by the wealth of drone-related information found there. To this end, some user personas were created, in order to illustrate the expectations of the UCs from the platform, and needs derived from said expectations.

Table 3: Personas derived from the ICAERUS Use Cases.

Use Case	Crop Monitoring	Crop Spraying	Livestock Monitoring
Persona	Carmen	Dale	Patrick
Background	Vineyard manager	Drone operator interested in crop protection applications	Owner of grazing animals
Use Case Objective	• Demonstrate the capacity of drones in disease and plant stress identification, and weed detection in vineyards, building on existing and implemented solutions and avoiding duplication of effort. • Assess drones as a 3D canopy reconstruction tool in vineyards, using aerial (top) with ground (side) image acquisition • Develop a user-friendly dashboard as a decision support system (DSS), for drone data analysis, visualisation and actions recommendations.	• Test and assess spraying configurations for optimal drone spraying applications in field conditions. • Compare existing conventional with drone spraying practices regarding their efficiency and environmental impact. • Identify risks and develop mitigation strategies related to drone-based plant protection applications.	• Evaluate drone solutions on monitoring different grazing cattle and sheep systems, building on existing and implemented solutions and avoiding duplication of effort. • Assess their labour-reduction capabilities for drone-based herd monitoring • Examine governance models and drone adoption brakes and leverages.
Platform Expectations	**Up-to-date Market Intelligence**: Needs access to current information about drone technologies, including platforms and payloads used for crop monitoring. **Advanced Data Analytics**: Requires models and algorithms to process drone-captured data for disease, stress, and weed detection.	**Regulatory Compliance**: Navigate the complex regulations surrounding drone spraying applications. **Standards of practice**: View information on standards and specifications of practices. **Impact Assessment Insights**: Needs comprehensive assessments of the socio-economic and environmental	**Access Demonstration Results**: Needs access to data and results from applications of other cases, pertinent to livestock drone monitoring. **Governance and Policy Recommendations**: Needs access to governance models promoting the uptake of drone technologies and applications in livestock monitoring.

	Impact Assessment Insights: Needs detailed assessments of the socioeconomic and environmental impacts of implementing crop monitoring in vineyards.	impacts of using drones crop spraying operations.	
Derived User Needs	Access to current information on drone technologies, including platforms and payloads, used for a specific thematic (e.g., crop monitoring, crop spraying). Access algorithms and models to facilitate UAV analytical applications. Access results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).	Access regulations and view descriptions of their status. View standards related to drone practices and applications. Access results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).	View workshops and demonstration events results. Access governance models and policy recommendations related to drone applications.

Use Case	Forestry and Biodiversity	Rural Logistics
Persona	Ivanna	Brooke
Background	Biodiversity researcher	Drone Operator interested in DAAS Applications
Use Case Objective	• Monitor forest tree health through the use of drones, satellites and data science • Identify and inspect areas of potentially high fire risk • Monitor ecosystems and assess biodiversity and wildlife populations • Evaluate the capacity of drones to manage or prevent the expansion of infectious diseases affecting both feral and domestic animals.	● Design and develop an innovative drone-delivery fleet management system ● Automate drone navigation operations by integrating state-of-the-art technologies ● Assess three types of drones on delivery parcel size/weight and distance ● Implement Drone as Service (DAAS) model principles
Platform Expectations	**Advanced Data Analytics**: Requires sophisticated analytics tools and algorithms to process drone-captured data revolving around forest health. **Impact Assessment Insights**: Needs comprehensive assessments of the socioeconomic and environmental impacts of using drones biodiversity observation operations. **Training and Capacity Building**: Wants to strengthen skills and knowledge through training courses and workshops on forestry and biodiversity related to drone applications.	**Drone specifications** : Needs access to accurate drone specifications, including payload capacity, control system and communication range. **Advanced Data Analytics**: Requires data and models evaluating drone performance based on specifications. **Business Modelling**: Wants to ameliorate insights on feasibility of solutions based on existing DAAS endeavors.
Derived User Needs	Access algorithms and models to facilitate UAV analytical applications. Access training material. Access results of the socioeconomic impact assessment related to specific drone activities (e.g., forestry).	Access business models so as to gain insights in drone benefits in specific topics (e.g., rural development). Access algorithms and models to facilitate UAV analytical applications. Access accurate descriptions on drone specifications (e.g., payload capacity).

3.2 Derived User Needs

The needs of users associated with the ICAERUS platform have been derived by drawing insights from the personas presented in the previous section, based on the ICAERUS project's Use Cases. Moreover, key findings based on the work of the AW-Drones project have been leveraged, namely the identified market gaps related to drone standards, as documented in the project's Deliverable 6.3[2] "Second yearly release of AW-Drones Repository". Additionally, Global End-User Needs identified and prioritized in D1.3 "Comparative Analysis Comparative Analysis and Needs" that align with the platform's derived needs are provided as well. Below, a table with the derived user needs, alongside their description is relayed. The presentation of user needs adheres to a standardized format, featuring a unique identifier in the format of "UN##".

Table 4: List of Derived User Needs

Platform Element	User Need	Notes
Drone Market Landscape	**UN01:** As a user of the platform, I want to have access to current information on drone technologies, including platforms and payloads, used for a specific thematic (e.g., crop monitoring, crop spraying).	
	UN02: As a user of the platform, I want to have access to accurate descriptions on drone specifications (e.g., payload capacity).	
Standards and Regulations	**UN03:** As a user of the platform, I want to have access to regulations and descriptions of their status.	
	UN04: As a user of the platform, I want to view standards related to drone practices and applications.	
	UN05: As a user of the platform, I need to quickly find and access standards and regulatory information, reducing the time spent on collecting data from different sources.	Alignment with Need 4: "EU policy directives, regulations, and compliance"
Models and Algorithms	**UN06:** As a user of the platform, I want to have access to algorithms and models to facilitate UAV analytical applications.	Alignment with Need 6: "Software development and algorithms"
SEIA	**UN07:** As a user of the platform, I want to have access to the results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).	
Business and Governance Models	**UN08:** As a user of the platform, I want to view governance models and policy recommendations related to drone applications.	
	UN09: As a user of the platform, I want to have access to business models so as to gain insights in drone benefits in specific topics (e.g., rural development).	
ICAERUS Academy	**UN10:** As a user of the platform, I want to have access to training material related to drone applications.	Aligned with Need 1: "Training of personnel"
	UN11: As a user of the platform, I want to view the results of workshops and demonstration events.	
General	**UN12:** As a user, I want to be able to comprehensively search and intuitively	Needs

[2]https://www.aw-drones.eu/resources/

Navigation	navigate links to facilitate quick information retrieval.	derived from AW-Drones perspectives
	UN13: As a user, I need easy identification and access to all available material.	
	UN14: As a user, I need to be able to access detailed information on the entries of my liking.	

4. External Interface Requirements

This section focuses on the user and software interfaces that need to be designed/developed for the purposes of the platform. For the user interfaces, sample screen images, style guides, layout constraints and components are defined, where, for the software interfaces, third party software/applications (i.e., database, operating systems, libraries) that are necessary for the operations of the platform are explicitly clarified.

4.1 User Interface

Visual Design and Branding

The UI/UX design should adhere to the project's branding guidelines and visual identity, including colour schemes, typography, and logos, as presented in D5.1: Plan for dissemination & exploitation including communication activities[3]. The use of appropriate visual cues, such as icons and graphics, will enhance the overall user experience and aid in quick recognition and understanding.

The UI should be designed with a responsive approach, ensuring compatibility across different devices and screen sizes. The layout and content will adapt dynamically to provide an optimal experience on desktop computers, laptops, tablets, and mobile devices.

Accessibility

The user interface should be designed and developed with accessibility in mind, adhering to relevant standards and guidelines, such as WCAG 2.0[4]. The design must incorporate features like sufficient colour contrast, adjustable/resizable text, support for keyboard navigation, alternative text attributes for images to make the platform compatible with specialised software that supports end-users with disabilities.

UI/UX feedback

Usability feedback mechanisms will be available to the end-users throughout the lifespan of the project. This feedback will be crucial towards identifying the areas/components of the platform that are unclear or need improvement, thus ensuring that ICAERUS platform meets the users' needs and expectations.

User interface components/modules

The ICAERUS platform will consist of several pages/screens and multiple components to provide all of the features described in the Functional Requirements (Section 4) of the current document. Any specific user interface restrictions/guidelines targeting a functional requirement is defined in the equivalent section, whereas this section focuses on the layout design components.

The ICAERUS platform should follow the well-known and widely used layout structure that divides the content into three distinct sections: the header, the body, and the footer. This layout provides a clear and consistent framework for presenting information and elements on a web page.

Header

The header will always be located at the top of every web page and should contain the logo of the project, and the main navigation menu in which, links in the form of menu items will allow users to easily navigate between different sections and features of the platform.

[3] https://icaerus.eu/deliverables/
[4] https://www.w3.org/WAI/standards-guidelines/wcag/

The navigation menu should be persistent as the user scrolls within the boundaries of a page and responsive to support the variety of screen sizes with the use of a “menu-burger” icon.

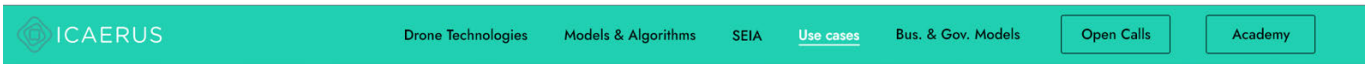

Figure 3: The Header of the ICAERUS platform.

Body

The body section of the layout will contain the main content area where each page can present the appropriate information to the end-users. Multiple sub-sections and components will be made available on the body section of each page. Examples of these components are presented in the functional requirements section (Section 4) of this document.

Footer section

The footer section should always be available on all pages of the ICAERUS platform showcasing the partners involved in the ICAERUS project, the logo of the project, the EU-Funding badge with the Grant agreement number and a form for users to subscribe to the ICAERUS newsletter.

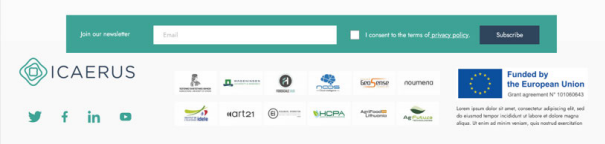

Figure 4:The footer section of the ICAERUS Platform.

4.2 Software Interfaces

The Software Interfaces section of this SRS document summarises the external and internal interfaces/components that the platform needs to interact with. These interfaces enable communication, data exchange, and integration with other software components, systems, or external services.

Based on the information and specification gathered so far, the following interfaces should be considered:

Application Programming Interfaces

ICAERUS platform will leverage several Application Programming Interfaces (APIs) to enable seamless integration and communication with external systems and services. These APIs play a crucial role in facilitating data exchange and enhancing the functionality of the web application.

The following representative examples highlight the APIs that will be utilised:

GitHub API

The ICAERUS platform should integrate the GitHub API to retrieve information on the models and algorithms of the *Drone Data Analytics Library* via the public repository hosted at *https://github.com/ICAERUS-EU/ddal* . This integration will allow the application to fetch the latest code updates, access pre-trained models, and leverage algorithms for processing data. The GitHub API integration will involve authentication, fetching repository information, retrieving files, and managing version control. Detailed information on how to consume the GitHub API can be found on their official documentation *here*.

EU-FarmBook API

In the scope of the ICAERUS project there exists a contractual obligation that states:

"*The project will guarantee that the main outcomes will feed the project funded under the topic "HE-CL6-2021-GOV-01-24" that will collect the main outputs of multi-actor projects and develop a dedicated API interface to showcase them.*"

To that end, the ICAERUS platform should implement the API developed under the EU-FarmBook project and push its collection of information. The integration will involve sending data in the required format, authenticating with the EU-FarmBook API, and handling responses to ensure seamless information exchange.

During the time that this deliverable is being written, the EU-FarmBook API has not been made available to the public. It is scheduled to be released later during the project's span, rendering this functionality inapplicable for the first launch of the ICAERUS platform. The AUA team is also involved in the EU-FarmBook development process, monitoring its progress and will ensure the implementation of the API as soon as it is published and fully functional.

Self-API

The ICAERUS platform will feature its own API, allowing external users to consume its content and access specific functionalities. This "self-API" will provide programmatic access to various features, such as retrieving data, performing searches, and interacting with specific application components. The API will adhere to defined authentication mechanisms, request/response formats, and rate-limiting policies to ensure secure and controlled access.

Social Media API

The platform may leverage social media APIs, such as Facebook Graph API[5] or Twitter API[6], to enable users to connect their social media accounts, share content, or interact with social media platforms from within the application. This integration will involve authentication, fetching user profile data, posting updates, and retrieving social media feeds.

Email Delivery API

The platform may integrate with an email delivery API, such as *SendGrid API*[7] or *Mailgun API*[8], to send transactional emails or notifications to users. This API integration will involve composing email messages, specifying recipients, sending email requests, and handling delivery statuses.

The ICAERUS platform will establish these API integrations by following the specifications and guidelines provided by each API provider. It will handle authentication, make API requests, process responses, and handle errors or exceptions as necessary. By leveraging these APIs, the web application will enhance its functionality, extend its reach to external systems, and provide seamless access to valuable algorithms, models, and information.

Newsletter API

The platform should implement a newsletter delivery API, such as *MailChimp API*[9] that allows users to manage newsletter subscriptions, send email campaigns, and track engagement metrics directly from within the system.

[5] https://developers.facebook.com/docs/graph-api/
[6] https://developer.twitter.com/en/docs/twitter-api
[7] https://docs.sendgrid.com/for-developers/sending-email/api-getting-started
[8] https://documentation.mailgun.com/en/latest/api_reference.html
[9] https://mailchimp.com/developer/tools/

Analytics API

The platform should implement an analytics API, such as the *Matomo API*[10] or the *Google Analytics API*[11], in order to collect user analytics.

Database interfaces

The ICAERUS platform will interact with at least one database to store, retrieve and manipulate data. These database interfaces facilitate the seamless integration and efficient management of data within the application. The following representative example highlights the database interface that the web application will utilise:

MySQL database interface

The platform will utilise a MariaDB[12] database to store and manage structured data. The interface with the MariaDB database will involve establishing a connection using appropriate credentials, executing SQL queries to perform operations such as inserting, updating, or retrieving data, and handling database transactions. The web application will leverage MariaDB-specific libraries or drivers to interact with the database efficiently.

The MariaDB database interface will ensure reliable data storage, retrieval, and manipulation within the platform. It will handle database connection pooling, query optimization, and transaction management to enhance performance and data integrity. The interface will adhere to MariaDB's syntax, data types, and security measures to ensure proper handling of data within the database.

Hardware interfaces

No hardware interfaces are expected to be implemented within the scope of the ICAERUS platform.

[10] *https://developer.matomo.org/api-reference*
[11] https://developers.google.com/analytics/devguides/reporting/core/v4
[12] https://mariadb.org/

5. Functional Requirements

This section lists and illustrates all the functional requirements of the ICAERUS platform by system features/capabilities and services. This is an in-depth analysis of the functionalities that must be provided to the end-users by the platform, accompanied by description, purpose and priority. Functional requirements are presented using an identifier of the form FR##, accompanied by the appropriate number, title and description.

According to Wiegers and Beatty[13]:

> ***"Functional requirements describe the behaviours and features of the software that satisfy user needs. They define what the software will do and how it will do it."***

FR01: Access list of drone technologies

Description

The platform should allow the user to access a list of drone technology related intelligence. This list includes the drone platforms and mounted technological components to assist in better understanding, developing, and integrating the technology implemented in agricultural production, forestry and the development of rural communities globally. In addition, information on the types of drone applications, such as key drone components and tools (drone modularity, payloads, ground control stations, UAV Control Systems), drone categories (e.g., fixed-wing, rotary-wing), drone data acquisition (e.g., RGB, multispectral, hyperspectral, thermal cameras), datasets released and related software will also be included.

Stimulus/Response Sequences

A dedicated menu item in the main navigation component should exist and upon selection, the user will be navigated to the list of drone technologies page. In the body section of the page, a list of technologies will be presented (Figure 6). By selecting any of the available drone technologies, the details of the selected technology will appear as described in Functional Requirement 4.4 (Access Details of Drone Technologies).

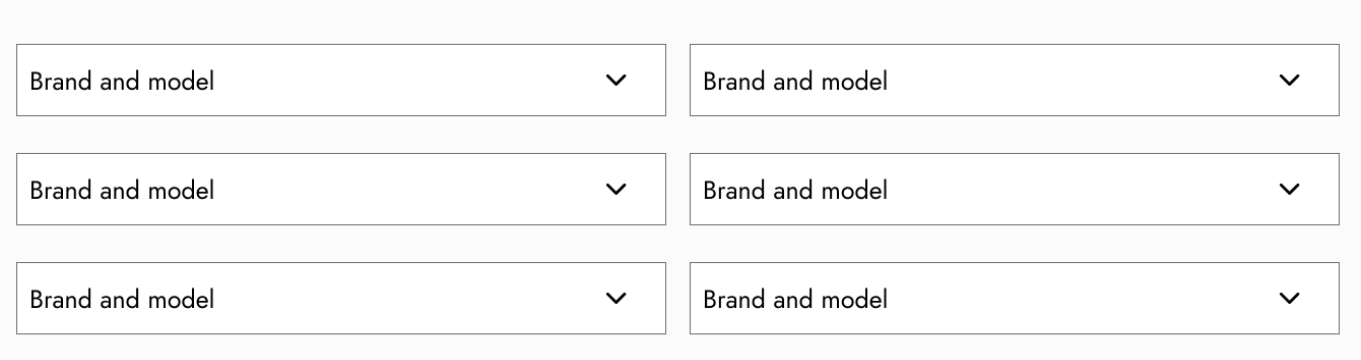

Figure 5: List of Technologies

FR02: Filter drone technologies list by available metadata

Description

The platform should provide the ability to apply filters to the list of drone technologies and components provided to limit the results. These filters will return results depending on the categories chosen (e.g., Use

[13] Wiegers, K., & Beatty, J. (2013). Software Requirements (3rd ed.). Microsoft Press.

Cases). The system shall also provide an option for clearing all the filters and resetting the lists of components to their original state.

Stimulus/Response Sequences
Based on the screen size of the device, the filters should always be accessible to the end-users.

On large screens (laptops and above), the filters should be visibly located on the left side of the screen and persistent, meaning that they will remain on that location as the user scrolls down. Upon selection of a filter, the platform will update the list of technologies and components in real time. A loading indicator should appear upon filter selection to let the users know of the ongoing update procedure. Users should be able to deselect a filter by "clicking" on it, where the same loading indicator should be visible to the user.

The following image can be regarded as a wireframe on how it is expected for the filters to be presented to the users on normal and large screen sizes.

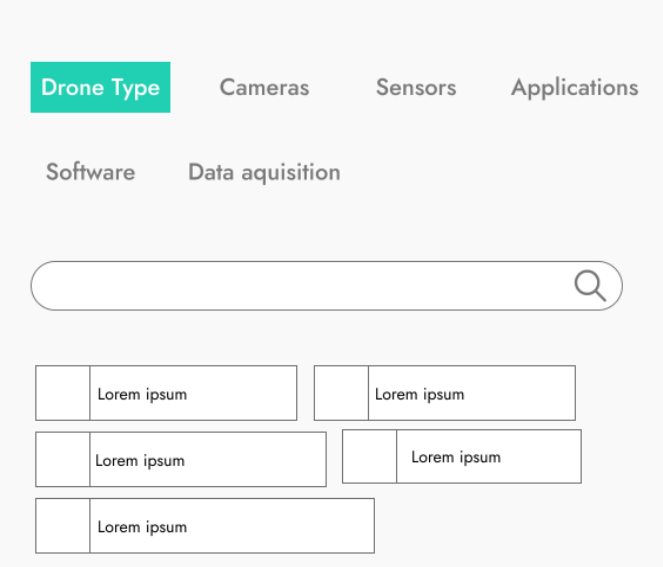

Figure 6: Drone technology filters.

For smaller screen sizes (tablets and smartphones), the filters should be hidden on page load and a filters floating icon should be located and persistent at the bottom of the page. By clicking on this button, the list of filters will be presented in full screen and allow the user to select the desired options. To perform the filtering of the results, the user will have to click on a button with the label "Apply Filters". A numeric value, showcasing the number of results of the selected filters should be visible next to the button.

FR03: Filter drone technologies by area of application

Description
ICAERUS covers five (5) appropriately selected drone application areas, which represent the most important sectoral and societal drone usage purposes in Europe: crop monitoring, drone spraying, livestock monitoring, forestry and biodiversity, and rural logistics. Visitors to the drone technologies page should be able to filter the results based on the selection of one or more of the previously mentioned application types.

Stimulus/Response Sequences

In the body area of the page, before the list of technologies, users will be able to access the five applications in the forms of cards accompanied by a representative image as presented in Figure 8. By selecting any of the available applications, the platform will filter the results accordingly.

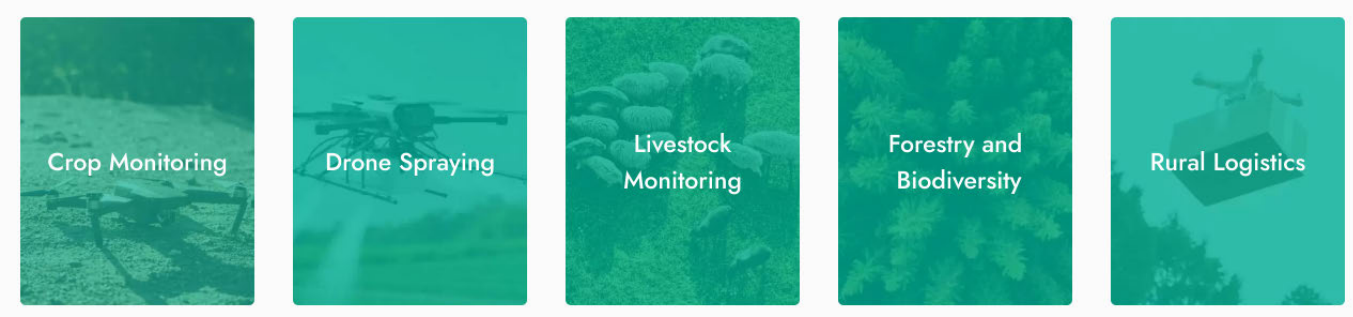

Figure 7: Associated applications with drone technologies.

FR04: Access details of drone technologies

Description

The platform should provide the ability to select and view details of selected drone technologies and components provided. The platform shall provide details of the specified item, including, among others, its name, description, category, and associated use cases.

Stimulus/Response Sequences

Upon selection on any result available on the technology list, the platform will present to the user the details section where all of the relevant information will be presented as depicted in Figure 9.

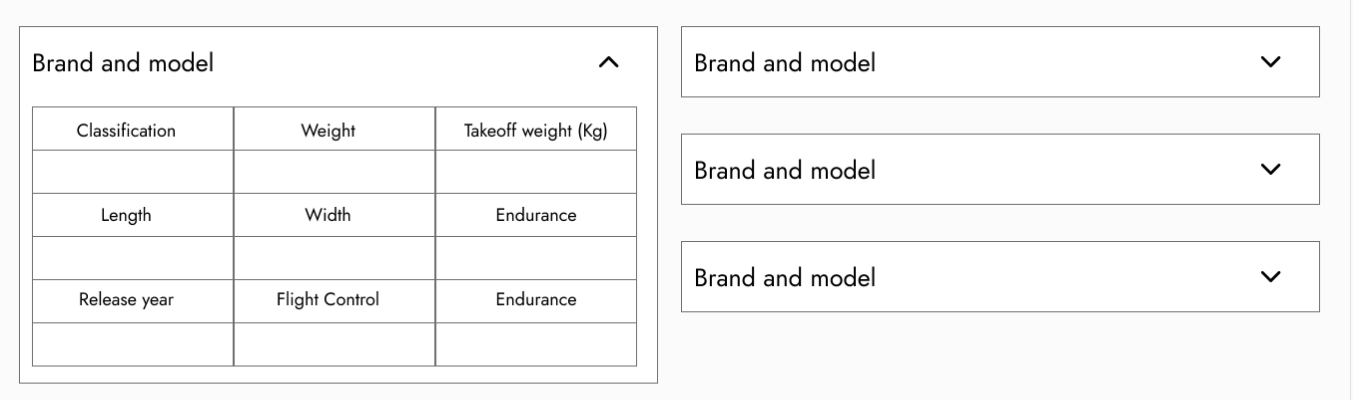

Figure 8: Details of Drone Information.

FR05: Access information on technology associated use cases

Description

When a user is in a drone technology details view/page, the platform should provide information and links for the Use Cases that have made use of the presented technology and/or component. This information should be visualised in the form of a list showing information on use case target (i.e., crop monitoring) and country it took place at.

Stimulus/Response Sequences
The list of associated use cases should always be visible (on all screen sizes) at the technology details section. Upon user selection of a Use Case, the platform should navigate to the specific page with all the details/findings of that UC.

FR06: Access needs, interests, and requirements

Description
The platform should provide the ability to access needs, interests, and requirements of the end-users, presented against products, services, and needs of innovators and technology providers. The system shall display graphs, images, and other media to provide easily digestible content for this topic.

Stimulus/Response Sequences
On the technology details section, users will be able to access links for the needs, interests and requirements information for the selected technology.

FR07: Access standards and regulations information

Description
The platform shall provide the ability to access information related to existing standards and regulations, that may support the potential for rapid growth, mostly in the form of reports with some graphics mapping the relationships between stakeholders. AW-Drones results on the categorisation, assessment and validation of existing standards will also be displayed.

Stimulus/Response Sequences
A dedicated menu item should be present in the main navigation area regarding this functionality.

FR08: Access list of Models and Algorithms

Description
The platform shall provide the ability to view the most significant existing and emerging drone data analytics models and algorithms according to the requirements of the end-users. The library will allow the users to access various models including Photogrammetry techniques with 3D Digital Elevation Models, Statistical models, Machine Learning/Deep Learning Algorithms & Data Mining techniques, Vegetation Indices calculation, autonomous routing and fleet management optimisation algorithms.

Stimulus/Response Sequences
A dedicated menu item should exist in the main navigation area that will present the visitors with this page. By clicking on it, end-users will access the list of models and algorithms as presented in Figure 10.

Figure 9: Menu of models and algorithms.

FR09: Access details page for a specific model or algorithm

Description

The platform should allow visitors to access details for a selected model and/or algorithm, where all of the information needed will be presented accompanied by a link/button that will redirect users to the equivalent GitHub repository of the project where they may access the relevant code.

Stimulus/Response Sequences

When a user selects a model from the list, the platform will navigate to the details page as presented in Figure 11. On this page, all the information included in the README file of the selected project will be presented to the user. When the user clicks on the "*Go to GitHub*" button, the platform should redirect accordingly in a new tab.

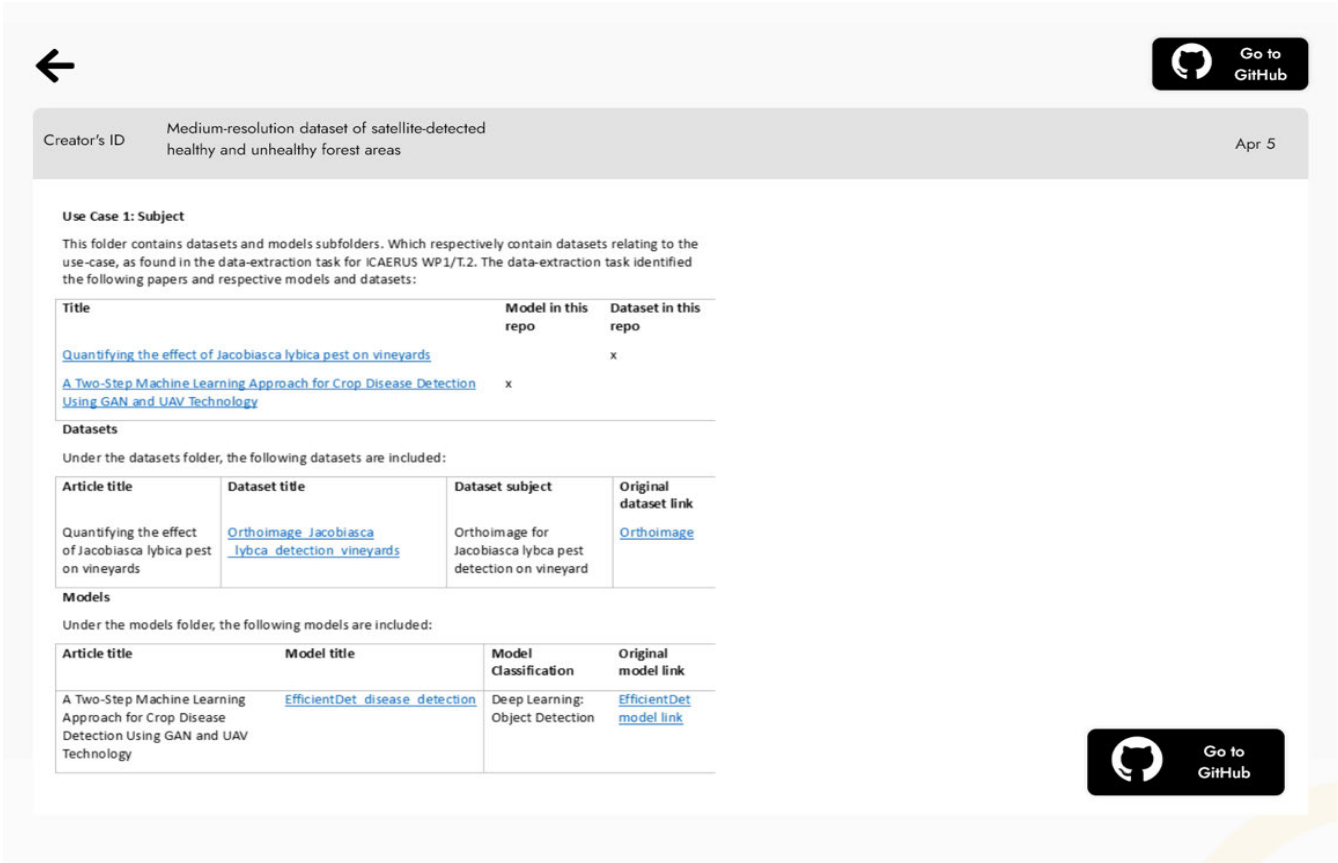

Figure 10: GitHub Menu related to the models.

FR10: Filter models and algorithms based on metadata

Description

The platform should allow users to filter the list of the models and algorithms based on the metadata associated with them.

Stimulus/Response Sequences

For consistency and optimal user experience purposes, the filtering capability of the models and algorithms must follow the example set in functional requirement "*Filter drone technologies list by available metadata*" (Functional Requirement 4.2) as presented in Figure 12 and functional requirement "*Filter drone technologies by area of application*" (Functional Requirement 4.3) as presented in Figure 13.

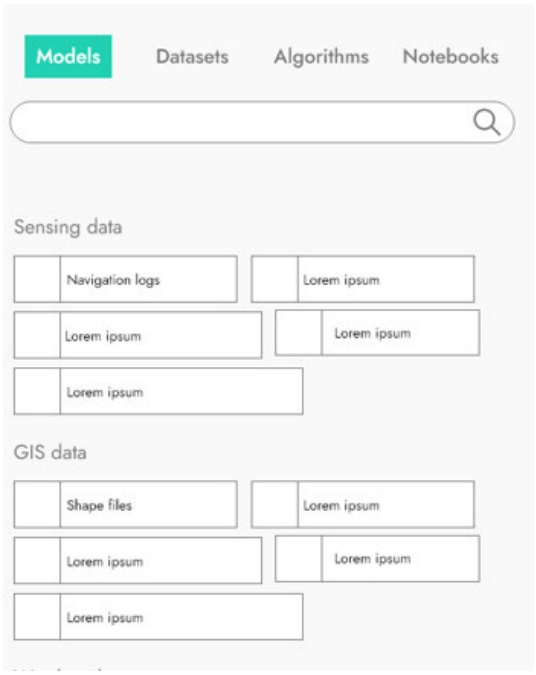

Figure 11: Metadata filtering options.

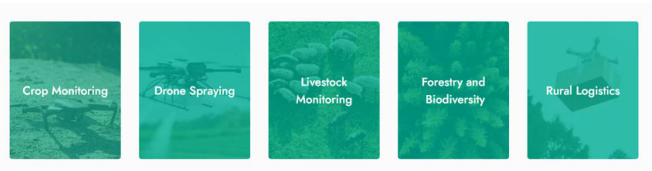

Figure 12: Area of Application filtering options.

FR11: Access associated use cases for selected model or algorithm

Description

The platform should provide the ability to view a list of the use cases that applied the selected model and/or algorithm.

Stimulus/Response Sequences

The associated use cases will always be visible on every model and algorithm details page and users should be able to access this when navigated on a details page.

FR12: Access information on open call trials

Description

The platform should allow visitors to access information regarding current, future and past open call trials. Besides the description of the process and the appropriate dates, a list of the winning participants from each trial should also be presented.

Stimulus/Response Sequences

A dedicated menu item will be present in the main navigation area that will navigate the visitors to the open call trials page. Within the body of this page, visitors should be able to access the following information:

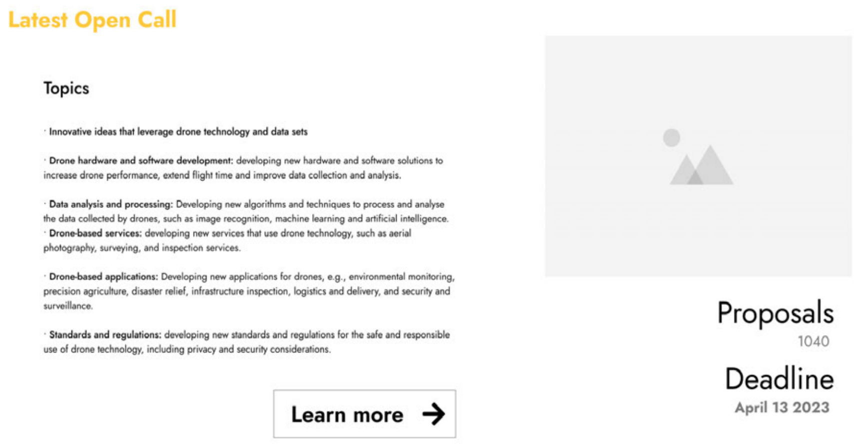

Figure 13: Information on latest Open Call.

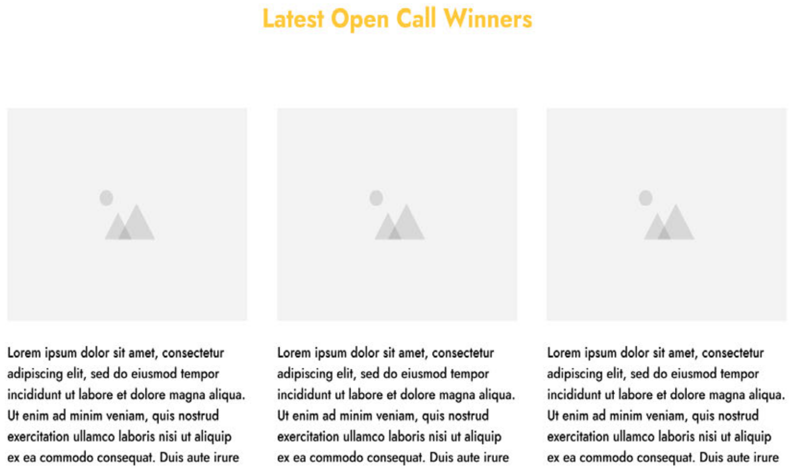

Figure 14: Information on latest Open Call winners.

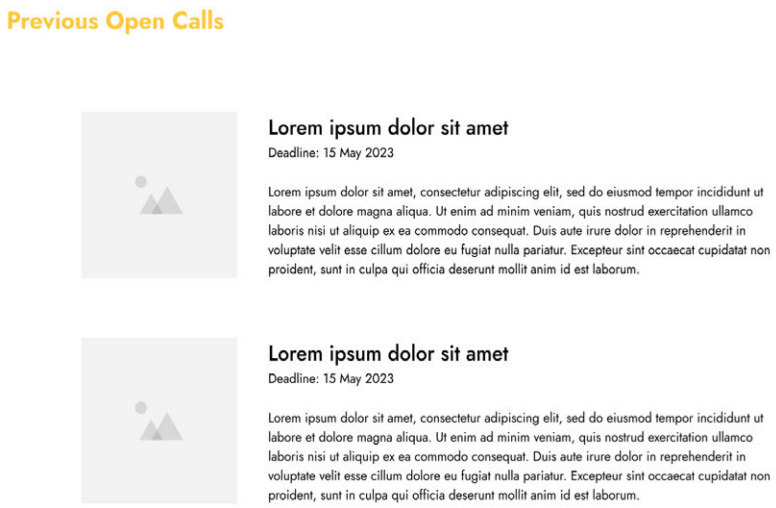

Figure 15: Information on previous Open Calls.

FR13: Link to access/participate on open call trials

Description

The platform should allow visitors to access the open call trials for participation.

Stimulus/Response Sequences

On the open call trials details page of the ICAERUS platform, a link in the form of a call to action (CTA) button should be present and allow users to navigate to the dedicated open call trials platform in a new tab.

FR14: Access Socio-economic and Environmental Impact Assessment (SEIA) Results

Description

The platform shall provide the ability to view the datasets produced in the scope of the Socio-economic and Environmental Impact Assessment (SEIA), provided in the form of factsheets. Based on the feedback taken by the responsible partners, these factsheets will not be available in the first iteration of the platform, since they are scheduled to be produced at the end of the project. For the first release of the platform (2023), the methodology that the SEIA will be built upon will be presented instead.

Stimulus/Response Sequences

A dedicated menu item will be present in the main navigation area that will navigate the visitors to the assessment results page. The methodology will be presented to the users in the form of a timeline as depicted in the following figure:

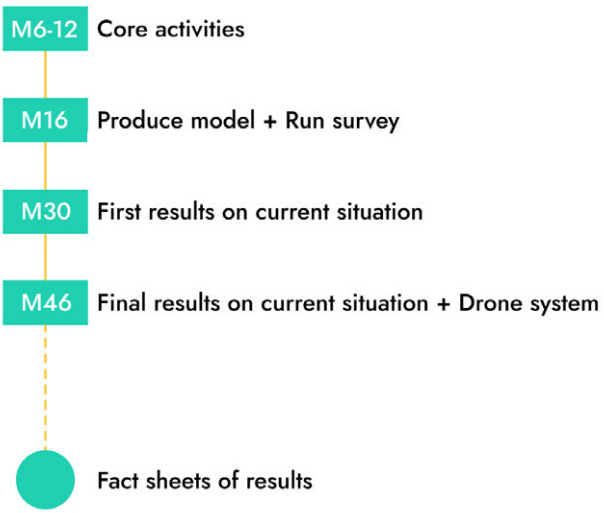

Figure 16: The methodology of the SEIA.

FR15: Access list of open courses (ICAERUS Academy)

Description

The platform should allow visitors to access the list of courses that will be created in the scope of the ICAERUS project. Information regarding the title of the course, a summary text and a representative image should be presented for each lesson.

Stimulus/Response Sequences

A dedicated menu item will be present in the main navigation area that will navigate the visitors to the courses list page, where each course should be visualised as a card with an image, title and summary as presented in Figure 18.

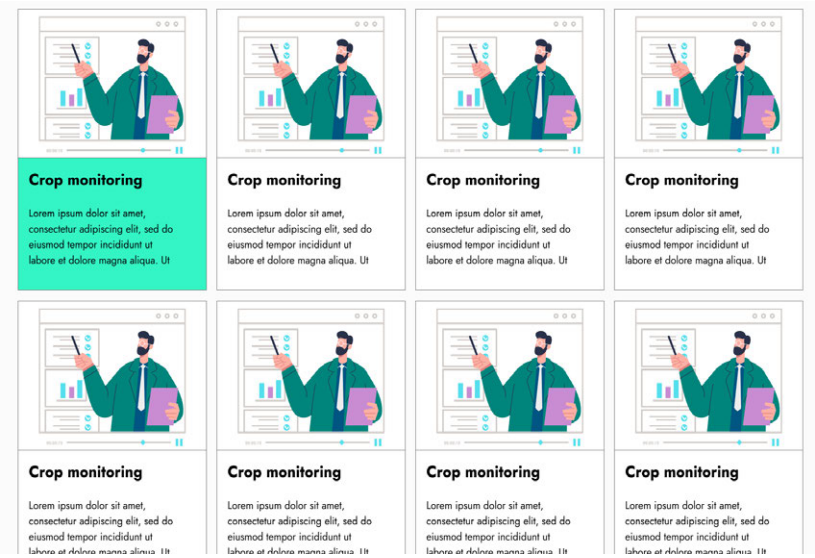

Figure 17: Overview of a course.

FR16: Filter/Search the list of courses (ICAERUS Academy)

Description

The platform should allow visitors to filter and search the list of available courses with predetermined categories and/or keywords.

Stimulus/Response Sequences

On the list of available courses, visitors should be able to access the search/filter mechanism as presented in Figure 19. By selecting one of the predefined filters (i.e., Technical, Legal, Business-related), or by placing a search parameter on the equivalent input field, the platform will update in real time the results in the list that follows. A loading indicator should be presented to the visitors whenever an update procedure takes place.

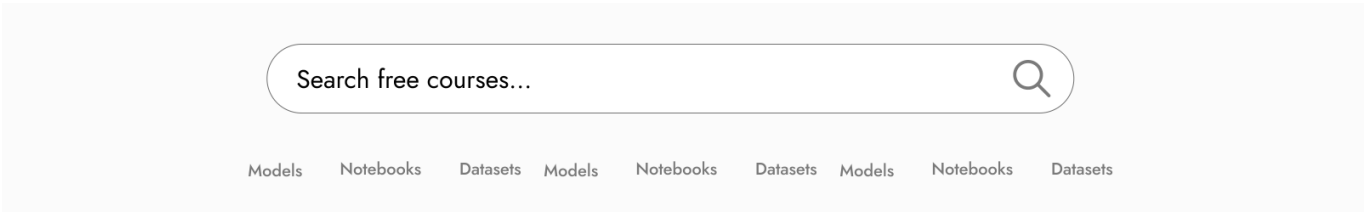

Figure 18: Course search function of the platform.

FR17: Access course details

Description

The platform should present to visitors detailed information on each suggested training material, including a short description, the expected outcomes, level, and duration.

Stimulus/Response Sequences

Upon selection of a training material from the list, the platform will navigate visitors to the course details page where all the information previously mentioned on the description section of this functionality will be presented.

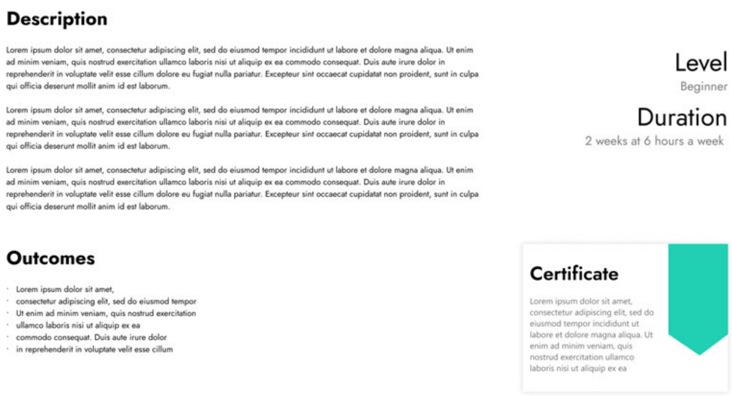

Figure 19: Detailed description of a course.

FR18: Access the Open Learn Online Platform (ICAERUS Academy)

Description

The system should enable access to the Open Learn Online Platform, where users can have access to the material of the course and are able to participate in.

Stimulus/Response Sequences

A dedicated CTA button will be available to the visitors within the course details page, as presented in Figure 21.

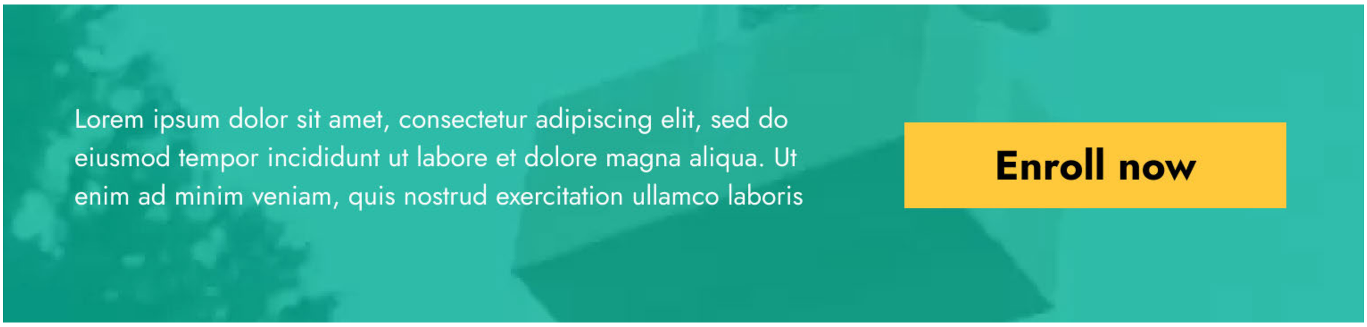

Figure 20: The CTA button.

FR19: Access Added Value Services

Description

The system should provide the ability for the beneficiaries of the Open Calls to access the value-added services dedicated to providing knowledge and education to stakeholders through online consulting on how to apply the business and governance models. These value-added services will include accessible economic tools (e.g., ROI calculators) and templates designed to further equip stakeholders with knowledge on how to execute their business plans more efficiently and effectively and remain competitive in the marketplace.

Stimulus/Response Sequences

Considering the timeline of the project, the value-added services will be developed after this deliverable is being completed. The responsible partner is will provide specific details and requirements for the added value services and will provide the necessary information in due course. Once the responsible partner provides the required details, the project can proceed with implementing the added value services as planned.

FR20: Access Business and governance models

Description

The platform should provide access to inclusive business and governance models, empowering people to explore the opportunities of using drones and facilitate better informed decision-making processes, as well as helping to shape future policy design. In total 10 models will be produced (five for business and five for governance) and will be presented in the form of graphical representations. Based on the responsible partner's input, these models will not be completed for the first release of the ICAERUS platform and will be uploaded when completed (no draft versions)

Stimulus/Response Sequences

Upon completion and delivery of the models from the responsible partner, an analysis of the given data, format and visualisation method should be made to determine the optimal presentation and stimulus mode for this information.

FR21: Links to relevant projects

Description

As part of a contractual obligation, the Platform should link to other projects to exchange relevant content, such as AW-Drones.

Stimulus/Response Sequences

Dedicated links in the form of menu items should be present in a secondary navigation area (i.e., footer section) that will allow visitors to access the relevant projects. Furthermore, a deeper level of linkage should be investigated during the development of the ICAERUS platform that will allow it to leverage and feed content from the other platforms as well. This specification analysis is moved at a later stage, until all the internally generated datasets are presented to the AUA team to use as the basis of linkage for optimum user experience.

FR22: Access to Self-API and Documentation

Description

The platform should feature its own API, allowing external, third-party users to consume its content and access specific functionalities. A detailed documentation on the APIs available calls/requests, accompanied by representative examples of inputs and expected outputs should also be available.

Stimulus/Response Sequences

A dedicated menu item in a secondary navigation menu (i.e., footer) should be always present and upon selection, the platform should redirect visitors to the API documentation page. For the documentation of the API, Swagger[14] open-source tools should be used. The ICAERUS API should be free and open to use to any stakeholder but for security purposes user authentication should be required.

[14] https://swagger.io/

FR23: Access to EU-FarmBook API

Description

The platform should integrate the API developed under the EU-FarmBook project and push its collection of information. The integration will involve sending data in the required format, authenticating with the EU-FarmBook API, and handling responses to ensure seamless information exchange.

Stimulus/Response Sequences

This functional requirement will not be triggered by the visitors of the platform. The administrator of the platform should be able to sync the ICAERUS database with the EU-FarmBook repository when deemed appropriate.

FR24: View List of Workshops

Description

The platform should allow the display of the list of on-site workshops conducted under the ICAERUS project.

Stimulus/Response Sequences

On every use case details page, a list of the workshops planned and completed will be presented to the user as presented in Figure 22.

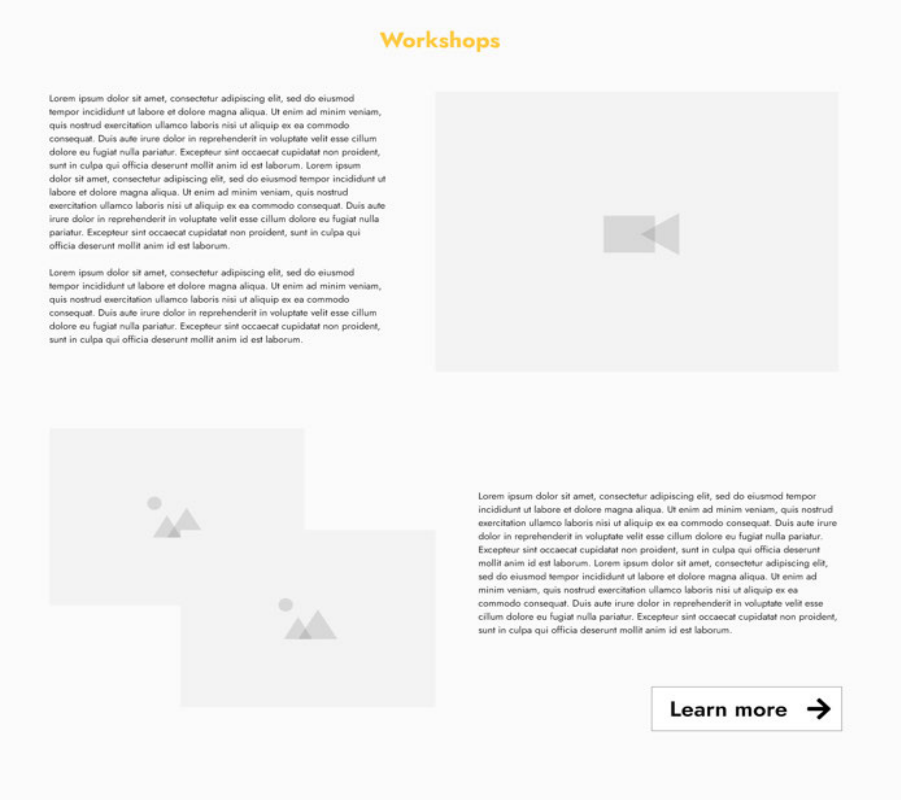

Figure 21: List of workshops presented on the platform.

FR25: Access recordings of workshops

Description

The platform should present the recordings of the on-site workshops in high quality video resolution. Any GDPR concerns on the recordings will be taken care of by the partner responsible for capturing the video on-site.

Stimulus/Response Sequences

On every workshop detail page, the recording of the event will be presented in a video format. The exploitation of YouTube to host the videos which will then be embedded in the platform will leverage the size of the videos (YouTube compression algorithms are high-end) and the optimal use of bandwidth, resulting in a better user experience.

FR26: Access agenda of Workshops

Description

The platform should present the agenda of each workshop prior, during and after the workshop has taken place.

Stimulus/Response Sequences

In the workshop details page, users will be able to access the agenda in a tabular format (i.e. table). A download CTA button should also be available for users to download the agenda in PDF format.

FR27: View Downloadable Material of Workshops

Description

The platform should present to its visitors all the downloadable material in all available formats (PDF, images, videos) of each workshop.

Stimulus/Response Sequences

Users should be able to access the downloadable material on the workshop details page in the form of a list. By selecting/clicking on any material, users will be able to download it.

FR28: Registration to the ICAERUS Platform

Description

The platform should allow users to register a profile on the ICAERUS platform, by entering a valid email address and providing a password of their choice. By creating an account, users will be able to personalise their experience on the platform.

Stimulus/Response Sequences

A dedicated menu item will be available to the users to access the register form. By accessing the registration form, users will be asked to provide their email and preferred password. Validation mechanisms should be present, forcing users to create strong passwords and ensuring no duplicate emails exist on the platform. Passwords should be stored encrypted in the database.

FR29: Logging in to the ICAERUS Platform

Description

The platform should allow users to log into the system by providing the appropriate email and password.

Stimulus/Response Sequences
A dedicated menu item will be available in the header area of the platform, allowing users to access the login form. When logged in, the section on the header area will present the email indicating the account under which the user is authenticated into the system, where a logout link should also be present.

FR30: Access user profile

Description
The platform should allow authenticated users to access the profile page and modify the registered information.

Stimulus/Response Sequences
Authenticated users will be able to access their profile page by selecting their email as shown in the header area. Validation mechanisms on the profile form should ensure that no required field is left empty, and the information provided by the users are valid.

FR31: Deletion of ICAERUS Platform Profile

Description
The platform should provide the ability to delete the user's profile alongside all its associated data and resources.

Stimulus/Response Sequences
Authenticated users will be able to request for their account to be deleted through a dedicated link to their profile page. For security reasons, when a user has requested the deletion of their account on the platform, an email will be sent via email with a link to confirm or reject the action. Only upon email confirmation the account will be deleted. All the information stored in the database of the ICAERUS platform regarding the user should be purged.

FR32: Share to social media platforms

Description
The platform should allow for users to share pages and any publicly available material on their social account of preference.

Stimulus/Response Sequences
Users will be able to share ICAERUS platform pages and any of its public material by access to the social component. This component will be visible on every page of the platform with the social channel logos as links as presented in Figure 23.

Figure 22: Example of social media to be used for content sharing.

FR33: Access feedback form

Description

The platform should allow users to access a feedback form, through which they will be able to report issues they may face with the platform, comments and any kind of feedback they would like.

Stimulus/Response Sequences

A floating icon should be present on the bottom area of the platform. Users should be able to select it and a popup will appear with the feedback form. Upon successful completion of the form an email will be automatically sent to the administrators of the platform to notify them.

Association of User Needs and Functional Requirements

User needs and functional requirements are tightly interrelated elements, whose alignment is crucial to effectively design and develop the ICAERUS Platform. Below, a table presenting the association between the user needs presented in chapter 3 of this document is presented.

Table 5: List of Functional Requirements

FR No.	Functionality	Associated User Need	Notes
FR01	Access list of drone technologies	**UN01**: As a user of the platform, I want to have access to current information on drone technologies, including platforms and payloads, used for a specific thematic (e.g., crop monitoring, crop spraying).	
FR02	Filter drone technologies list by available metadata	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	
FR03	Filter drone technologies by area of application	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	

FR04	Access details of drone technologies	**UN02**: As a user of the platform, I want to have access to accurate descriptions on drone specifications (e.g., payload capacity). **UN14**: As a user, I need to be able to access detailed information on the entries of my liking.	
FR05	Access information on technology associated use cases	**UN01**: As a user of the platform, I want to have access to current information on drone technologies, including platforms and payloads, used for a specific thematic (e.g., crop monitoring, crop spraying).	
FR06	Access needs, interests, and requirements	**UN03**: As a user of the platform, I want to have access to regulations and descriptions of their status. **UN05**: As a user of the platform, I need to quickly find and access standards and regulatory information, reducing the time spent on collecting data from different sources.	
FR07	Access standards and regulations information	**UN04**: As a user of the platform, I want to view standards related to drone practices and applications. **UN05**: As a user of the platform, I need to quickly find and access standards and regulatory information, reducing the time spent on collecting data from different sources.	
FR08	Access list of Models and Algorithms	**UN06**: As a user of the platform, I want to have access to algorithms and models to facilitate UAV analytical applications.	
FR09	Access details page for a specific model or algorithm	**UN06**: As a user of the platform, I want to have access to algorithms and models to facilitate UAV analytical applications.	
FR10	Filter models and algorithms based on metadata	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	
FR11	Access associated use cases for selected model or algorithm	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval. **UN13**: As a user, I need easy identification and access to all available material.	
FR12	Access information on open call trials	None	Information on the OCTs deemed important by the consortium, therefore included and updated as the Open Calls
FR13	Link to access/participate on open call trials		

			progress.
FR14	Access Socio-economic and Environmental Impact Assessment (SEIA) Results	**UN07**: As a user of the platform, I want to have access to the results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).	
FR15	Access list of open courses (ICAERUS Academy)	**UN10**: As a user of the platform, I want to have access to training material related to drone applications.	
FR16	Filter/Search the list of courses (ICAERUS Academy)	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	
FR17	Access course details	**UN14**: As a user, I need to be able to access detailed information on the entries of my liking.	
FR18	Access the Open Learn Online Platform (ICAERUS Academy)	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	
FR19	Access Added Value Services	**UN09**: As a user of the platform, I want to have access to business models so as to gain insights in drone benefits in specific topics (e.g., rural development).	
FR20	Access Business and Governance models	**UN09**: As a user of the platform, I want to have access to business models so as to gain insights in drone benefits in specific topics (e.g., rural development).	
FR21	Links to relevant projects	**UN12**: As a user, I want to be able to comprehensively search and intuitively navigate links to facilitate quick information retrieval.	
FR22	Access to Self-API and Documentation	None	API will be developed in following iterations of the platform.
FR23	Access to EU-FarmBook API	None	Platform will be linked to the EU-Farmbook through its API as soon as it becomes available.

FR24	View List of Workshops	**UN11**: As a user of the platform, I want to view the results of workshops and demonstration events.	
FR25	Access recordings of workshops	**UN11**: As a user of the platform, I want to view the results of workshops and demonstration events.	
FR26	Access agenda of Workshops	**UN11**: As a user of the platform, I want to view the results of workshops and demonstration events.	
FR27	View Downloadable Material of Workshops	**UN11**: As a user of the platform, I want to view the results of workshops and demonstration events.	
FR28	Registration to the ICAERUS Platform	None.	These requirements facilitate smooth platform operation and provide standard functionalities.
FR29	Logging in to the ICAERUS Platform		
FR30	Access user profile		
FR31	Deletion of ICAERUS Platform Profile		
FR32	Share to social media platforms		
FR33	Access feedback form		

6. Non-functional Requirements

This section lists and describes all the non-functional requirements that evolve around the “behind the scenes" operations/conditions that need to be met in order for the ICAERUS platform to perform as expected and provide the best possible user experience to its users.

According to Wiegers and Beatty[15]:

"*Nonfunctional requirements describe the properties and constraints that the system must exhibit to its users. They place restrictions on the product being developed, such as the performance, usability, reliability, security, and supportability characteristics of the software.*"

In essence, non-functional requirements are the criteria that describe the qualities, characteristics, and constraints of a software system or product, rather than its specific behaviours or functions. These requirements specify how the system should perform, rather than what it should do.

[15] Wiegers, K., & Beatty, J. (2013). Software Requirements (3rd ed.). Microsoft Press.

In the scope of the ICAERUS platform, this document investigates the non-functional requirements in the frame of performance and security.

6.1 Performance requirements

The Performance Requirements section of this SRS document summarises the criteria and expectations under which the platform should operate on. These criteria focus on the ability of the platform to perform its operations in an efficient and effective way, meeting the needs of its users and operational environment.

Response time

Response time can be defined as the maximum acceptable time it takes for the platform to respond to a user action/request. The ICAERUS platform should work as a progressive web application providing fast response time to user actions and requests such as page load, transaction processing, search query execution and more.

Requirement	The platform should have a maximum response time of 2 seconds and normal response time of 1 second.
Validation	The response time of the platform can be validated through real-time monitoring of the requests on the production server.

Throughput

Throughput can be defined as the number of concurrent user requests the platform should be able to handle within a specified timeframe.

Requirement	The platform should be able to process a minimum throughput of 1000 user requests per second
Validation	Load testing can be used to validate the throughput of the platform in the production server.

Resource Utilisation

Resource utilisation can be defined as maximum allowed consumption of system resources in terms of CPU, memory, disk usage and network bandwidth.

Requirement	ICAERUS platform should certain that utilisation of CPU will remain below 70%, memory utilisation below 80% and disk usage below 70% within normal operations
Validation	Resource utilisation can be validated via real-time system monitoring and performance testing.

Availability

Availability can be defined as the desired uptime percentage that indicates the amount of time the system should be accessible and operational for the end-users.

Requirement	The web platform should have a minimum availability of 99.9% during a calendar month
Validation	Availability can be validated via monitoring tools that record uptime and downtime events. Analysing these events can produce the actual availability percentage and compare it with the target requirement.

6.2 Security Requirements

The Security Requirements section of this SRS document summarises the specific security measures that need to be addressed during the design and implementation phase of the software development process. These measures focus on protecting the system, its data, and its users from unauthorised access, data breaches, and other security threats.

Authentication

The ICAERUS platform should implement an authentication mechanism to verify the identities of end-users and ensure that only authorised individuals can access specific operations of the system.

Requirement	Username and password will be requested for the authentication procedure, where strong hash algorithms should be used to safely store sensitive user information to the database.
Validation	Testing and security assessment procedures can be used to validate this requirement.

Authorisation and Access Control

Authorisation and access control mechanisms allow for systems to restrict access to specific sets of functionalities/operations, data and or resources based on a set of rules and policies set by the system owner.

Requirement	The platform should enforce appropriate authorization and access control policies to restrict user access to specific functionalities, data, or resources based on their roles and privileges.
Validation	Testing and security assessment procedures can be used to validate this requirement.

Data confidentiality

The platform should protect sensitive data by implementing appropriate encryption mechanisms, both during transit and storage. This includes using secure protocols (e.g., HTTPS) for data transmission and encryption algorithms (e.g., AES) for data at rest to prevent unauthorised access and data breaches.

Requirement	Implement security protocols.
Validation	Security assessments and audits (i.e., penetration testing) can be used to validate this requirement.

Data integrity

The ICAERUS platform should ensure data integrity by implementing mechanisms to detect and prevent unauthorised or unintended modifications to data, ensuring its accuracy and reliability.

Requirement	Implement data integrity mechanisms
Validation	Data integrity can be validated via testing and audits during data input, validation processes, backup and recovery tests.

Secure coding practices

The source code of the platform should follow secure and best coding practices to avoid or at least mitigate common vulnerabilities (i.e. SQL injection, cross-site scripting etc) and ensure the overall security of the system.

Requirement	Implement best coding practices
Validation	The effectiveness of secure coding practices can be validated through code reviews, static code analysis, security testing, and vulnerability scanning.

Access Logs

The platform should maintain extensive audit logs of user activities and events in a secure location. These logs should be monitored to detect and respond to security (or any other) incidents or suspicious activities.

Requirement	Log all user activities and monitor
Validation	The effectiveness of audit logging and monitoring can be validated through periodic reviews of log entries, incident response drills, and audits of security controls.

Security Updates

The platform should regularly receive and apply security updates to address known vulnerabilities, software bugs, and emerging security threats. The updates should be obtained from reliable sources and applied in a timely manner to ensure the platform's security remains up to date.

Requirement	Perform security updates on software and database
Validation	Security updates can be validated through vulnerability scanning, penetration testing, and security assessments

7. Conclusions

This document aimed to describe the ICAERUS digital platform's several aspects and functionalities in detail. A broad overview of the audience, scope, functional and non-functional requirements was presented, to serve as a baseline for the development of the platform in the future. By creating this baseline, a better understanding of what the platform aims to achieve can be obtained.

This document will act as a living document that may be changed and amended as deemed necessary, to reflect updates made to the platform during the project's duration. Functionalities not listed in this document may not be expected to be implemented to the platform.

References

1. Wiegers, K. E., & Beatty, J. (2013). Software requirements 3. Microsoft Press, U.S.

Annexes

Annex I: Mock-ups

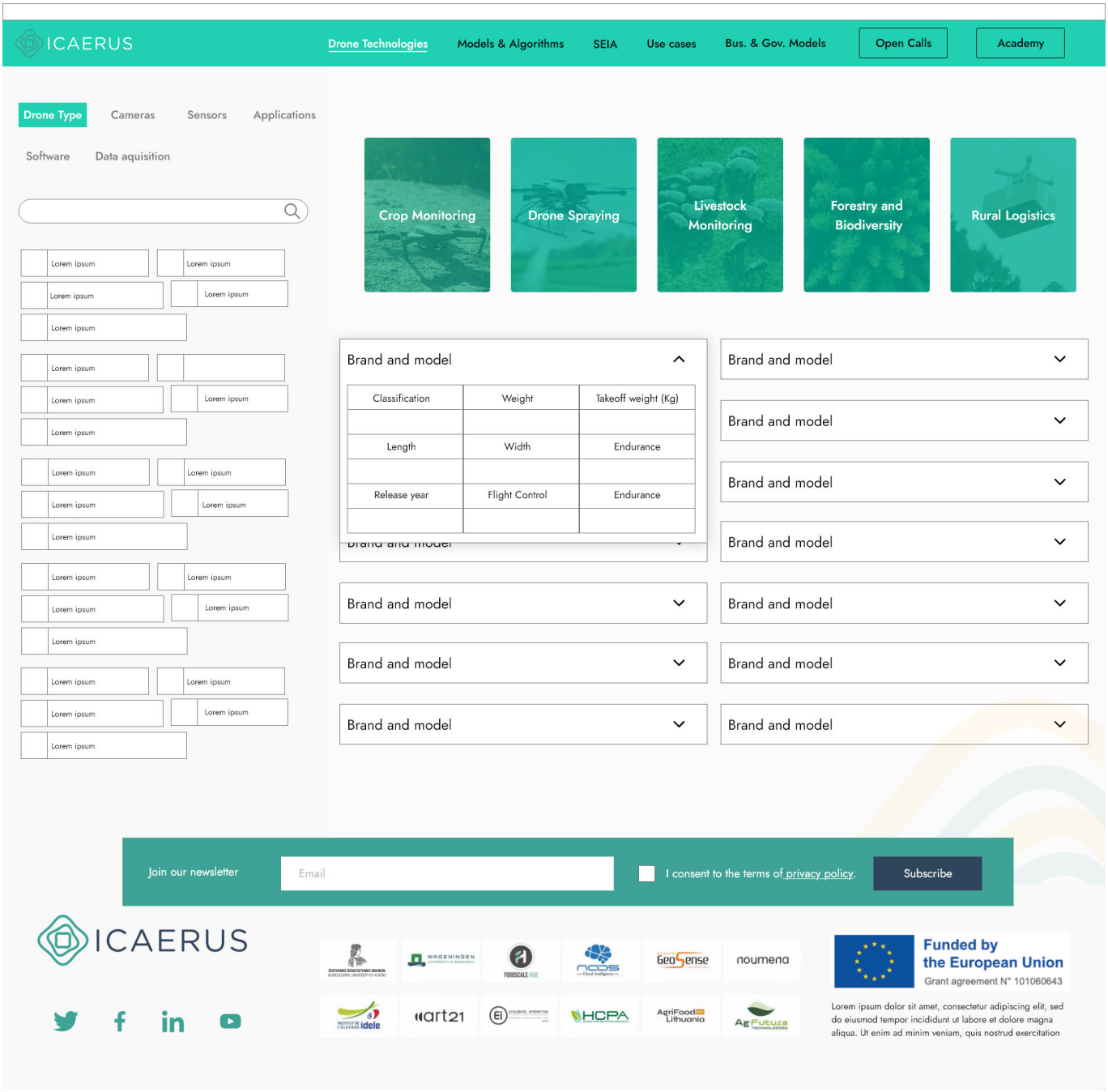

Figure 23: Drone Technologies list and filters page. Download here.

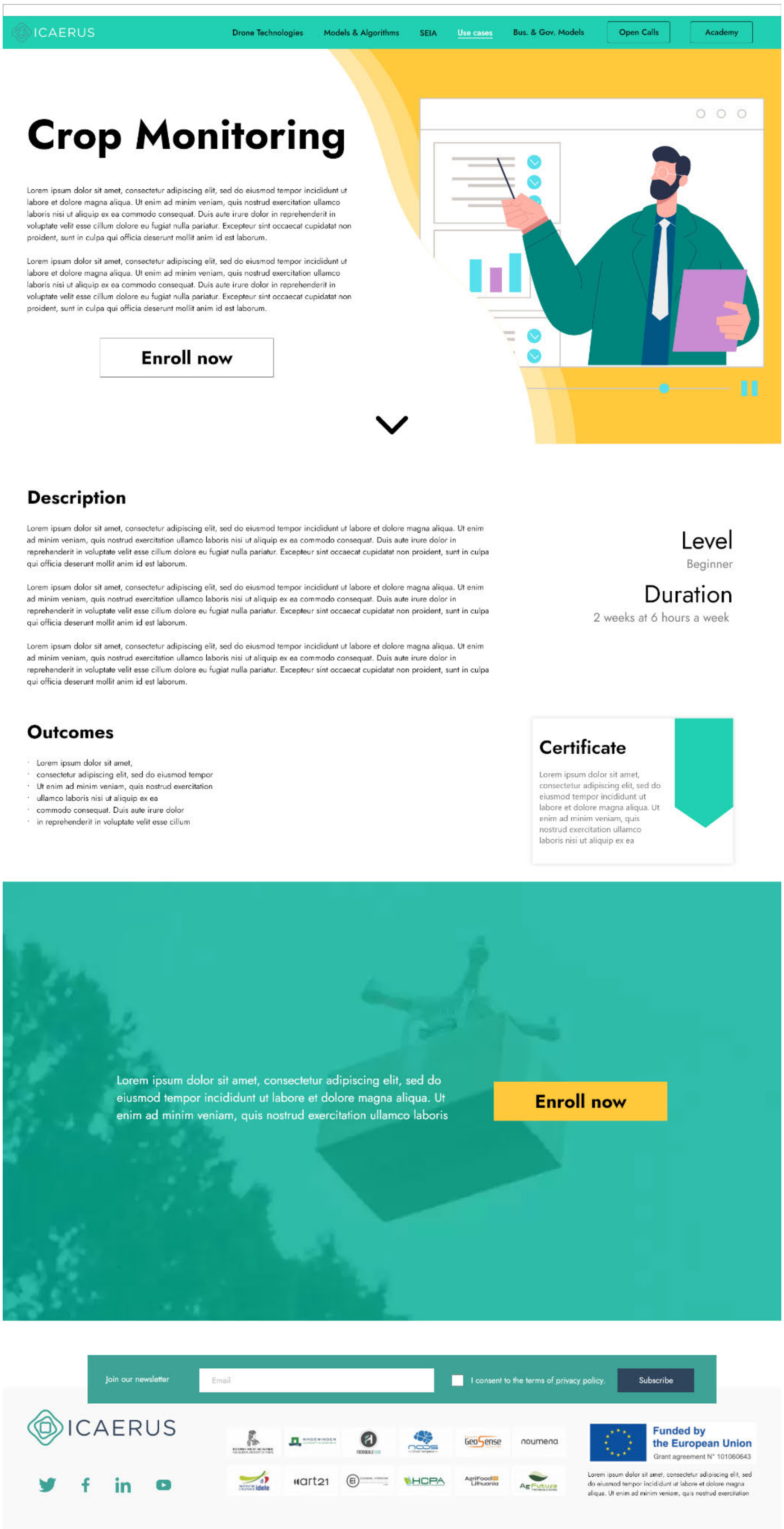

Figure 24: ICAERUS Academy course details. Download here.

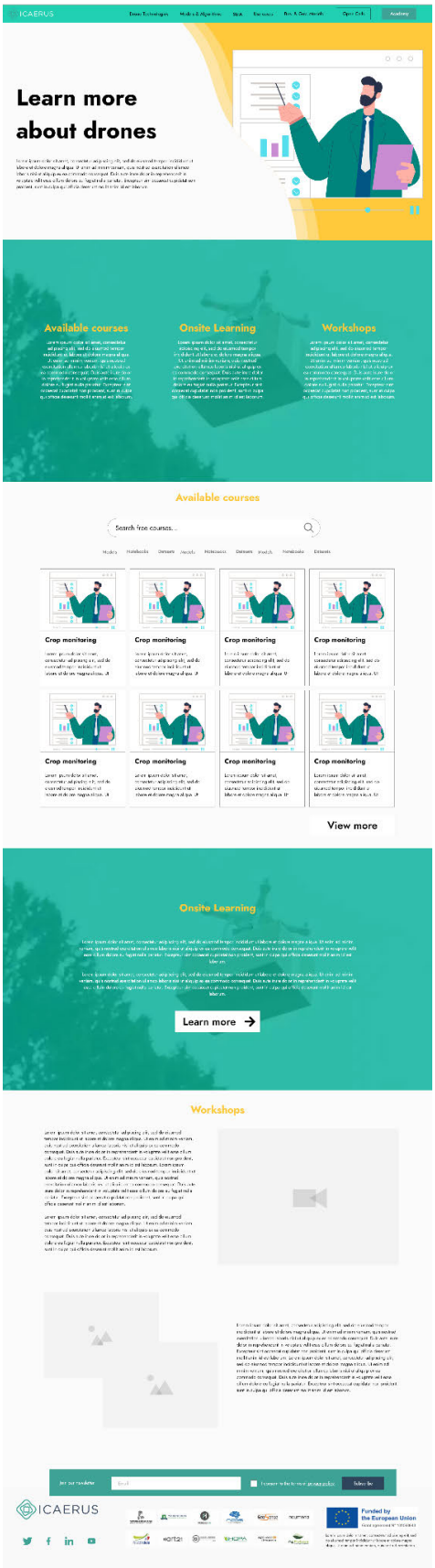

Figure 25: ICAERUS Academy list of courses. Download here.

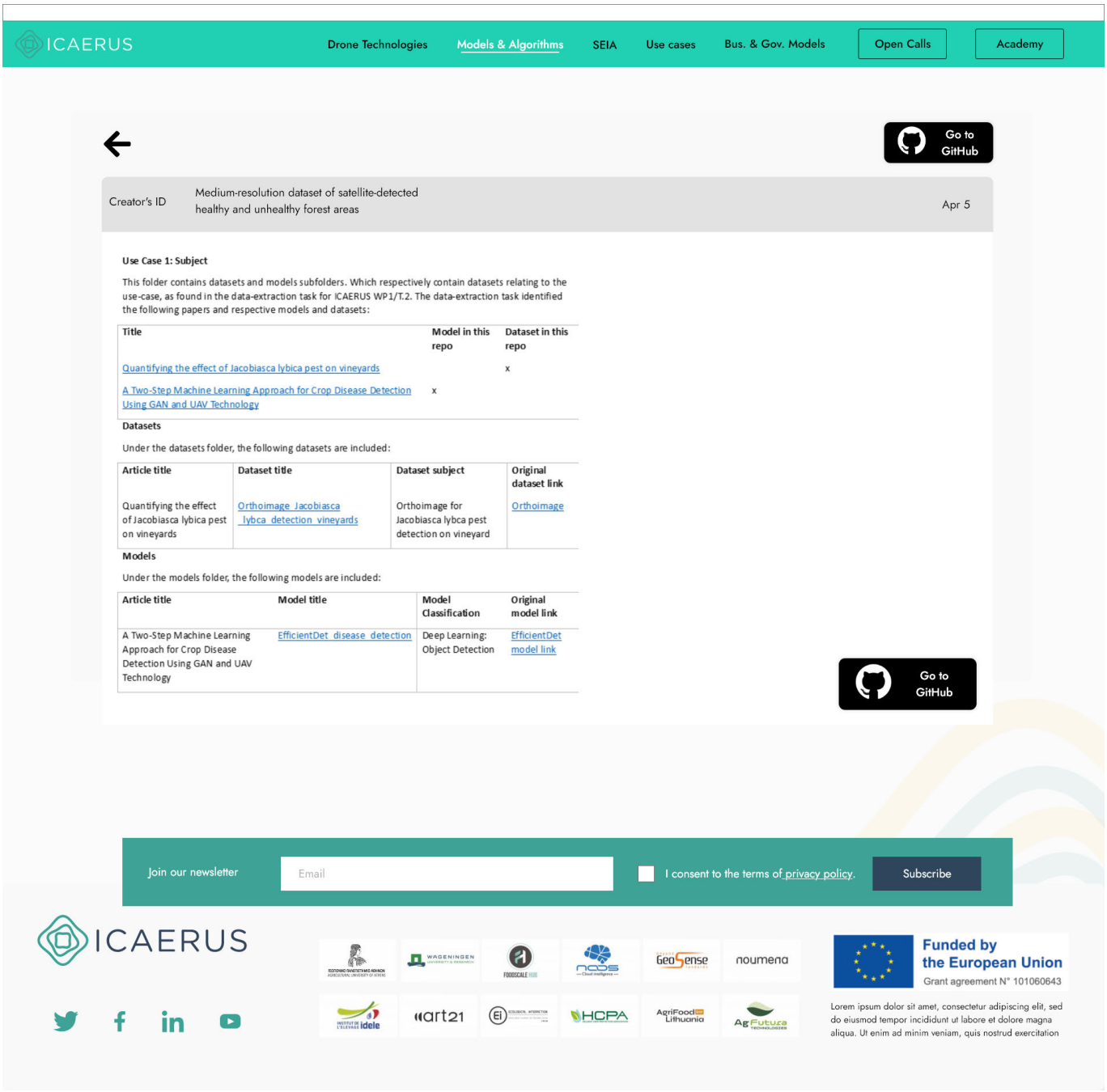

Figure 26: Models and algorithms details page. Download here.

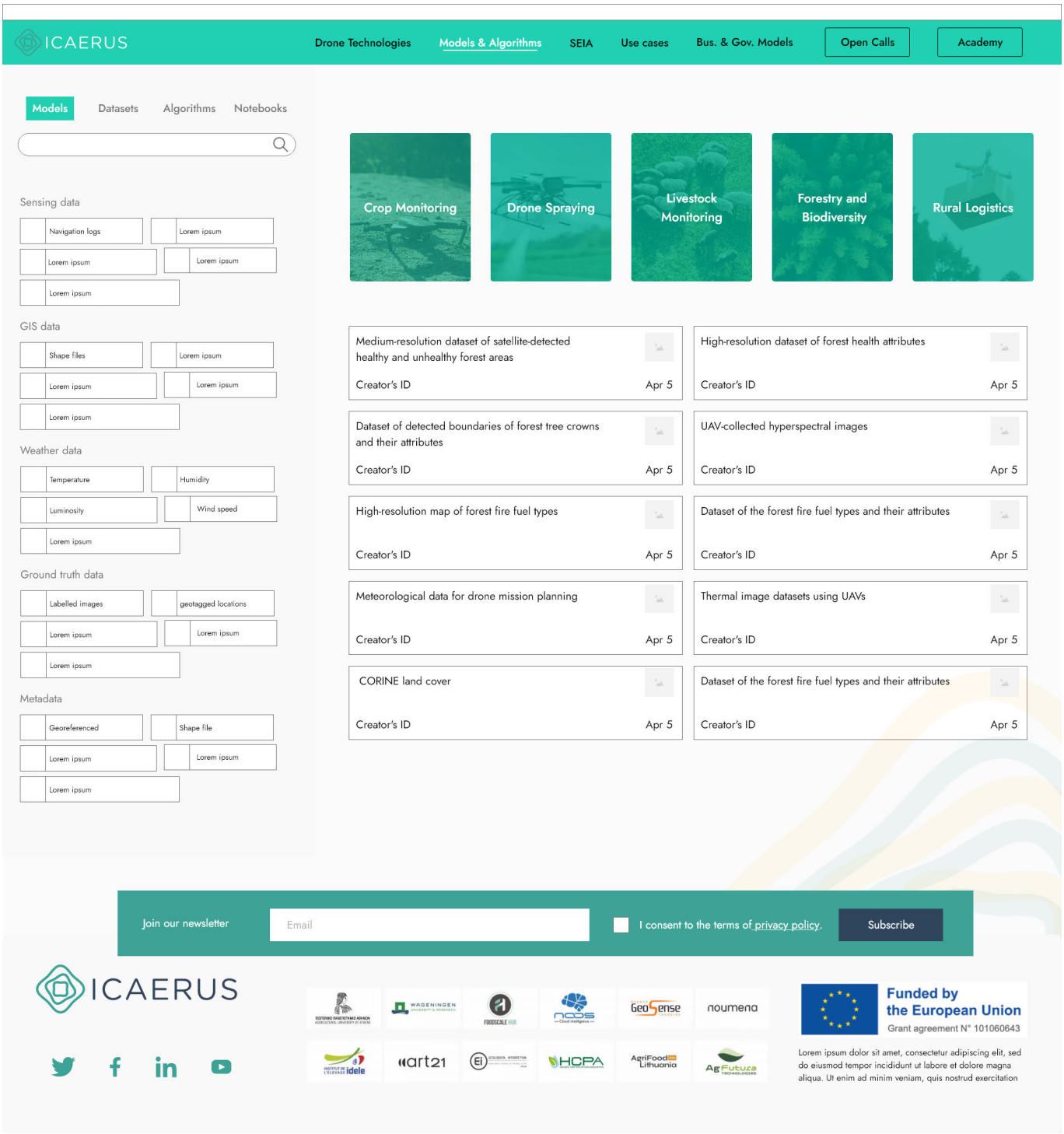

Figure 27: Models and algorithms list and filters. Download here.

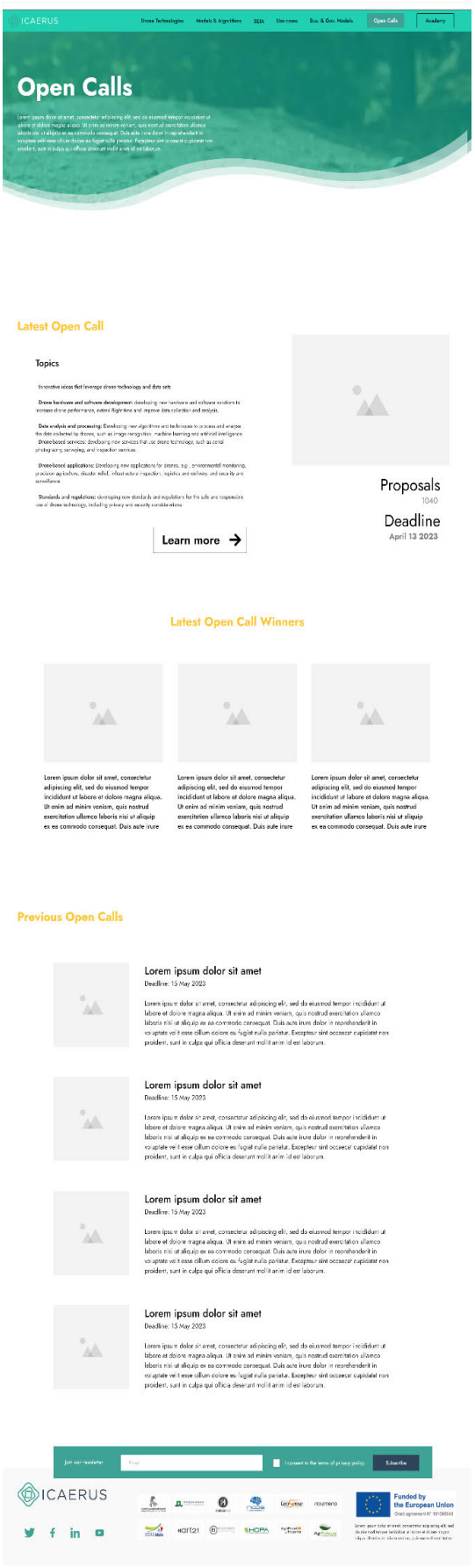

Figure 28: Open calls. Download here.

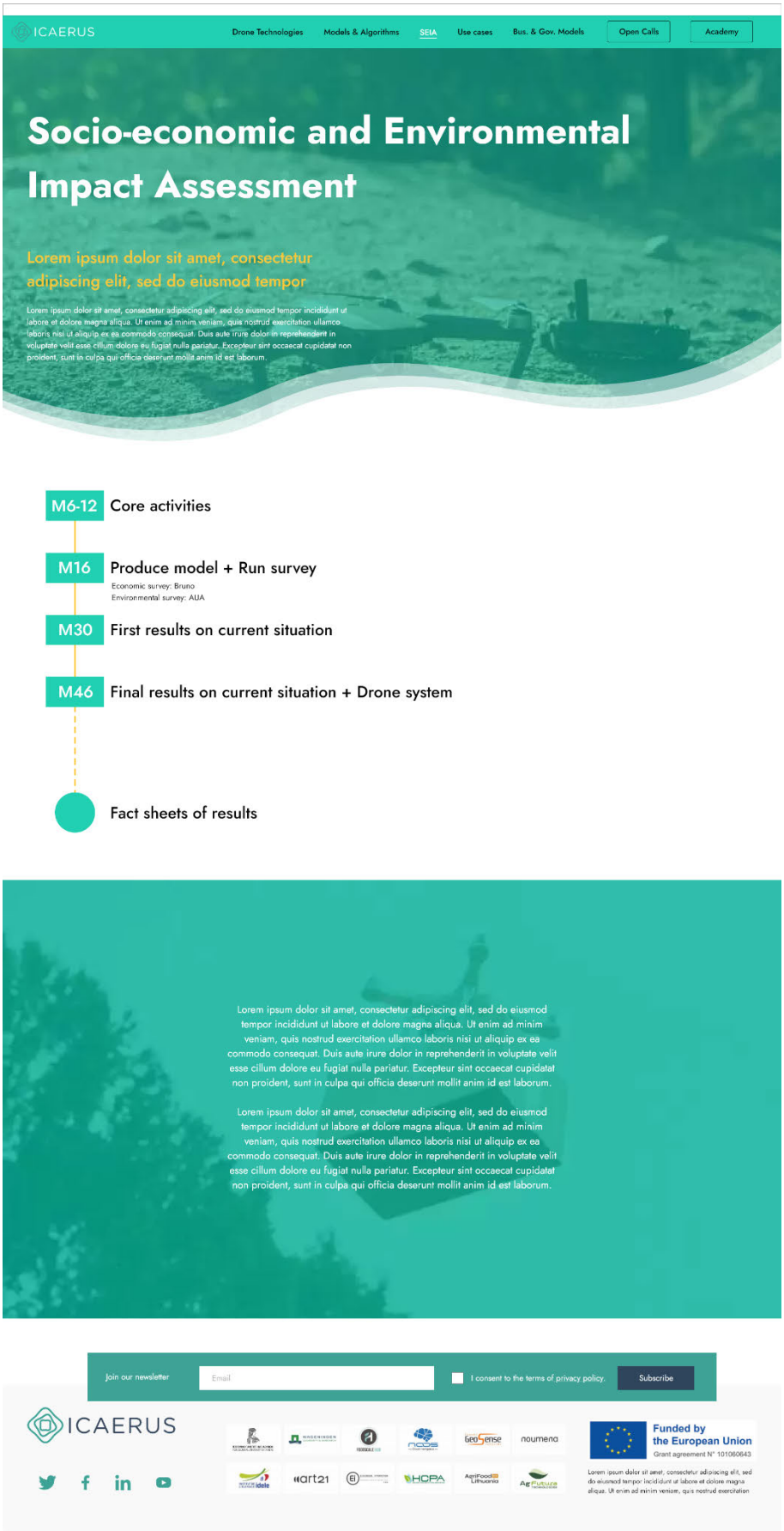

Figure 29: SEIA Methodology. Download here.

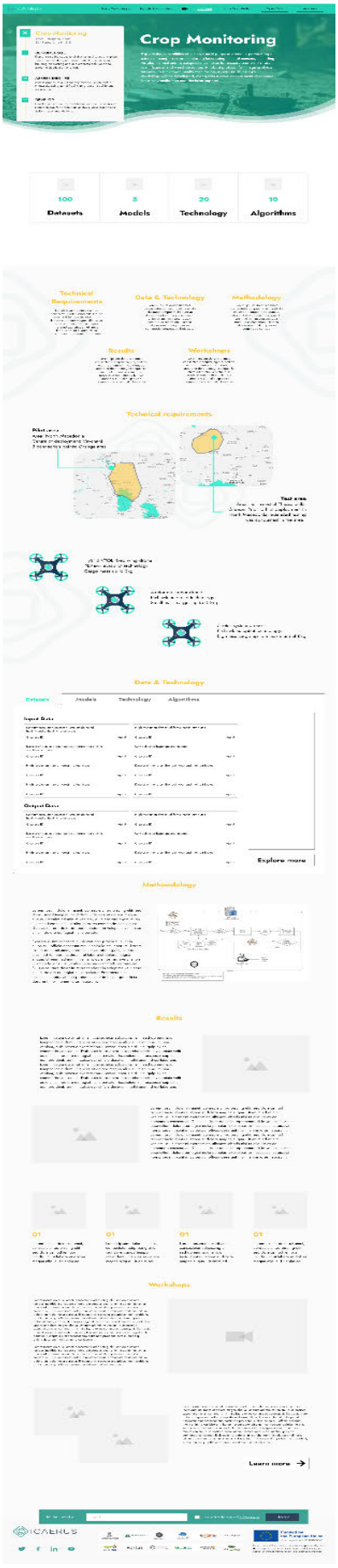

Figure 30: Use case details. Download here.

Figure 31: Use cases overview. Download here.

Annex II: List of functional requirements

FR No.	Functionality
FR01	Access list of drone technologies
FR02	Filter drone technologies list by available metadata
FR03	Filter drone technologies by area of application
FR04	Access details of drone technologies
FR05	Access information on technology associated use cases
FR06	Access needs, interests, and requirements
FR07	Access standards and regulations information
FR08	Access list of Models and Algorithms
FR09	Access details page for a specific model or algorithm
FR10	Filter models and algorithms based on metadata
FR11	Access associated use cases for selected model or algorithm
FR12	Access information on open call trials
FR13	Link to access/participate on open call trials
FR14	Access Socio-economic and Environmental Impact Assessment (SEIA) Results
FR15	Access list of open courses (ICAERUS Academy)
FR16	Filter/Search the list of courses (ICAERUS Academy)
FR17	Access course details
FR18	Access the Open Learn Online Platform (ICAERUS Academy)
FR19	Access Added Value Services
FR20	Access Business and Governance models
FR21	Links to relevant projects
FR22	Access to Self-API and Documentation
FR23	Access to EU-FarmBook API
FR24	View List of Workshops
FR25	Access recordings of workshops
FR26	Access agenda of Workshops
FR27	View Downloadable Material of Workshops
FR28	Registration to the ICAERUS Platform
FR29	Logging in to the ICAERUS Platform
FR30	Access user profile
FR31	Deletion of ICAERUS Platform Profile
FR32	Share to social media platforms
FR33	Access feedback form

Annex III: User Personas

The user personas created are illustrated below.

Crop Monitoring

Use Case Objectives

- Demonstrate the capacity of drones in disease and plant stress identification, and weed detection in vineyards, building on existing and implemented solutions and avoiding duplication of effort.
- Assess drones as a 3D canopy reconstruction tool in vineyards, using aerial (top) with ground (side) image acquisition
- Develop a user-friendly dashboard as a decision support system (DSS), for drone data analysis, visualisation and actions recommendations

Platform Expectations

Up-to-date Market Intelligence: Needs access to current information about drone technologies, including platforms and payloads used for crop monitoring.

Advanced Data Analytics: Requires models and algorithms to process drone-captured data for disease, stress, and weed detection.

Impact Assessment Insights: Needs detailed assessments of the socioeconomic and environmental impacts of implementing crop monitoring in vineyards.

User Needs

Access to current information on drone technologies, including platforms and payloads, used for a specific thematic (e.g., crop monitoring, crop spraying).

Access algorithms and models to facilitate UAV analytical applications.

Access results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).

Crop Spraying

Use Case Objectives

• Test and assess spraying configurations for optimal drone spraying applications in field conditions.

• Compare existing conventional with drone spraying practices regarding their efficiency and environmental impact.

• Identify risks and develop mitigation strategies related to drone-based plant protection applications.

Platform Expectations

Regulatory Compliance: Navigate the complex regulations surrounding drone spraying applications.

Standards of practice: View information on standards and specifications of practices.

Impact Assessment Insights: Needs comprehensive assessments of the socio-economic and environmental impacts of using drones crop spraying operations.

User Needs

Access regulations and view descriptions of their status.

View standards related to drone practices and applications.

Access results of the socioeconomic impact assessment related to specific activities (e.g., crop spraying).

Livestock Monitoring

Use Case Objectives

- Evaluate drone solutions on monitoring different grazing cattle and sheep systems, building on existing and implemented solutions and avoiding duplication of effort.
- Assess their labour-reduction capabilities for drone-based herd monitoring
- Examine governance models and drone adoption brakes and leverages

Platform Expectations

Access Demonstration Results: Needs access to data and results from applications of other cases, pertinent to livestock drone monitoring.

Governance and Policy Recommendations: Needs access to governance models promoting the uptake of drone technologies and applications in livestock monitoring.

User Needs

View workshops and demonstration events results.

Access governance models and policy recommendations related to drone applications.

Forestry and Use Case Objectives

- Monitor forest tree health through the use of drones, satellites and data science
- Identify and inspect areas of potentially high fire risk
- Monitor ecosystems and assess biodiversity and wildlife populations
- Evaluate the capacity of drones to manage or prevent the expansion of infectious diseases affecting both feral and domestic animals.

Platform Expectations

Advanced Data Analytics: Requires sophisticated analytics tools and algorithms to process drone-captured data revolving around forest health.

Impact Assessment Insights: Needs comprehensive assessments of the socioeconomic and environmental impacts of using drones biodiversity observation operations.

Training and Capacity Building: Wants to strengthen skills and knowledge through training courses and workshops on forestry and biodiversity related to drone applications.

User Needs

Access algorithms and models to facilitate UAV analytical applications.

Access training material.

Access results of the socioeconomic impact assessment related to specific drone activities (e.g., forestry).

Rural Logistics

Use Case Objectives

- Design and develop an innovative drone-delivery fleet management system
- Automate drone navigation operations by integrating state-of-the-art technologies
- Assess three types of drones on delivery parcel size/weight and distance
- Implement Drone as Service (DAAS) model principles

Platform Expectations

Drone specifications : Needs access to accurate drone specifications, including payload capacity, control system and communication range.

Advanced Data Analytics: Requires data and models evaluating drone performance based on specifications.

Business Modelling: Wants to ameliorate insights on feasibility of solutions based on existing DAAS endeavors.

User Needs

Access business models so as to gain insights in drone benefits in specific topics (e.g., rural development).

Access algorithms and models to facilitate UAV analytical applications.

Access accurate descriptions on drone specifications (e.g., payload capacity).

END OF DOCUMENT