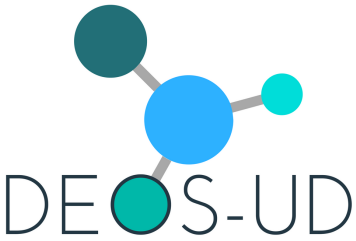

Project DEOS-UD

Disruptive Earth Observation Sensing for Urban Development

Deliverable 6
European Comission Template

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0 List of Participants

Participant No.	Participant organisation name	Short name	Country
1	Airbus Defence and Space GmbH	ADS	Germany
2	BHO Legal Rechtsanwälte Partnership	BHO	Germany
3	Deimos Space S.L.U.	DS	Spain
4	High Innovative Remote Observation (HIRO)	HR	Spain
5	ICUBE-SERTIT	IS	France
6	Remote Sensing Application Center (ReSAC)	RSAC	Bulgaria
7	Thales Alenia Space SAS	TAS	France
8	VITO nv	VT	Belgium

Table 0.0.1: List of Participants

1 Excellence

1.1 Objectives

Overall, the main objective of the project is to enhance the performance of Earth Observation (EO) systems so as to use the information derived from data to build a greener future. More specifically, the focus is on the improvement of both optical and radar systems and how they can contribute to the sustainable development of cities. Accordingly, in order to implement this solution some specific objectives have to be accomplished.

In fact, the key objectives for this project are:

1. Improve EO sensors technologies in terms of reliability, size, resolution, efficiency and accuracy.
2. Manufacture a technology demonstrator prototype.
3. Simulate, test and validate the demonstrator prototype manufactured in relevant environment.
4. Develop a data processing software with machine learning algorithms focused on urban sustainable development applications.
5. Develop a web based server for data sharing.
6. Provide a technology that helps urban sustainable development, improving the European society.

1.2 Relation to the work programme

The current proposal relates to the topic "Earth Observation technologies" whose identifier is: LC-SPACE-14-TEC-2018-2019. More specifically it addresses the subtopic "Disruptive technologies for remote sensing".

Hence, this project aims to research and improve the existing EO technologies for remote sensing, develop a data processing software along with it containing machine learning algorithms focused on urban sustainable developments such as pollution and gas emission control, traffic monitoring, weather prediction, management of urban areas, regional and local planning, tourism development and cityscapes designs, and develop a web based server for data sharing.

To begin with, a research on the current technologies is carried out. This study makes it possible to determine which systems are more susceptible to further improvement. In order to demonstrate the advances in the aforementioned systems a prototype has to be manufactured and tested. Moreover, in the scope of this project, it has been included the development of a software that, once the data has been collected and received, processes the data in order to enable a more user-friendly data treatment on the final application and a web-based server for data sharing.

The implemented data processor will provide information sets about sustainable development issues such as geospatial indicators, pollution levels or gas emissions that will benefit companies and initiatives from world-wide and local organisations to carry out social and green actions, and will support the United Nation projects: UN 2030 Agenda for Sustainable Development and The Paris Agreement on Climate Change [1]. Furthermore the project sharing web will allow the public to interact, enriching and contributing in the integration of space in economy and society.

Additionally, the attainment of the improved sensors and data processing software is expected to help process the data gathered by the Sentinel satellites in order to benefit the current on-going Copernicus programme missions so as to equip them with better remote sensing technologies in the near future.

1.3 Concept and methodology

Earth observation is a field with a great potential that has not been taken into account until the last decade. Important space agencies like the European Space Agency are promoting the enhancement of capabilities with respect to Earth Observation due to the fact that society and the planet itself would benefit from the many applications it has. Besides, Earth Observation can have many applications, so it is crucial to focus on the enrichment of some of them to guarantee the development of the desired sensor abilities. Indeed, as the goal is to apply EO sensing for Urban Development to integrate space into society, the abilities to enhance are the following ones:

- Detection of greenhouse gases.

- Detection of weather patterns.
- High precision performance of terrain 3D mapping.

On the one hand, systems like LiDAR, which combines technologies like laser and radar, enable to target a wide range of materials including clouds and molecules. Consequently, it is possible to develop a sensor that identifies the composition of the air to secure our environment by having a monitoring of either the greenhouse gases or the weather patterns for proper weather forecasting applications. On the other hand, 3D mapping of the terrain is useful to control the land and guarantee an optimum growth and development of the city. All in all, one of the most important aspects that have to be taken into account is that the sensors resulting from this project have to ensure at least a 15% increase of the reliability and precision compared to the current ones.

To achieve the project goal and implement much better sensors than the already existing ones, a state-of-the-art of the current space requirements of several optical and radar systems will be performed. The limitations and the possibilities of the different technologies such as LiDAR, RADAR, Gravimetry, Hyperspectral, Superspectral and more will be determined, and then a decision will be taken in order to work with the most promising ones. Furthermore, the preliminary design will take into account several criteria to obtain competitive sensors. Launching any payload to space has very high costs, then it is essential to ensure the endurance of the overall systems in order to maintain the payload in space for a long time and avoid any replacements. To accomplish it, the materials used to build the components of the sensor, including antennas, photo-detector, optics, laser and electronics, have to be accurately chosen.

In addition, a step that is necessary for this kind of projects is the testing of the product. Once the preliminary design is finished and accomplishes all the requirements of the project, a first prototype will be built and tested in a space simulated environment to make sure that it performs as expected. Notice that the testing is not done in space itself because launching the prototype to space is too expensive and out of this project budget; fortunately, there are other methods that are cheaper and properly simulate the space conditions. Finally, once the designed prototype fulfils all the expectations, it is considered that the results are attained and the product design is ready for closure.

1.4 Ambition

As stated earlier, an improvement of the state-of-the-art technologies used for EO sensing is a key factor to promote and advance in the Earth Observation field. In other words, this project is not in charge of developing new launching systems or designing satellites, its objective is to provide the existing and the next generation of space technologies with disruptive sensors. In

fact, one of the priorities of this project is to ensure the complementarity with other activities or programs such as Copernicus funded.

Hence, the accomplishment of the project will demonstrate significant knowledge and enhancements concerning reliability, size, resolution, efficiency and accuracy among others of the current remote sensing technologies that will not only allow to gather better and more specific EO data, improving the results on their application fields, but it will also represent a step forward in all those areas involving remote sensing from which the European society will benefit.

The project is grounded in initiatives such as the Copernicus programme [2]. The Copernicus services aim at delivering nearly real-time data on a global level. This information allows us to better understand the planet we live in and secure a sustainable management of the environment. In fact, in context of the Copernicus, one of the previous H2020 calls has been involved in identifying potential evolutions of its space observation capabilities in order to build a climate resilient future. This call was focused on monitoring either the Polar Regions, agriculture or forests.

Among other things, Copernicus obtains data thanks to a set of dedicated satellites named Sentinel. Each of them has been developed for a specific need to provide accurate observation in each case. Nowadays, there is a total of six families of Sentinel. Hence, the idea is to take them a further step forward by equipping them with better remote sensing technologies.

2 Impact

2.1 Expected Impacts

The following table shows how DEOS-UD will contribute to each of the expected impacts mentioned in the work programme:

Impact	Description
Improvement in state-of-the-art technologies	DEOS-UD project will introduce machine learning philosophy, artificial intelligence, big-data collection and treatment to Earth Observation systems in order to achieve a better resolution and reactivity of observations. This will foster new technological research that will mean an improvement of the current state-of-the-art of that systems related to key areas of Earth Observation such as: • Innovative LiDAR and radar instruments (including cost-effective wide-swath altimetry and imaging systems). • Super-spectral and hyperspectral payloads with wide spectral and/or coverage, limb sounders and gravimetry payloads. • High quantum efficiency photo-detectors and high-precision optical beam scanning and pointing. • Advanced infrared (IR) technologies (optical filters, detectors and electronics).
Enhancement of Earth Observation capabilities	The improvement in state-of-the-art technologies for remote sensing will extend Earth Observation systems capabilities. DEOS-UD will especially advance in the fields of miniaturisation, power reduction, precision and efficiency.

Impact	Description
Synergy among Earth Observation Constellations	All progress or development of the DEOS-UD project will be compatible with any of the current Earth Observation constellations. Moreover, the improved systems will be able to adapt to new possible EO constellations by using capabilities of machine learning and big data.
Improvement of Europe's industrial competitiveness in Earth Observation technologies	DEOS-UD actively participates in the growth of the European industrial sector of Earth Observation since the stakeholders working on the project are European.
Greater industrial relevance of research actions	In the DEOS-UD project research will be conducted in the fields of payload, modular systems and Urban Development Applications with Space Technologies, including Weather forecast, urban planning (3D models) and greenhouse emissions reduction (pollution). The involvement of some of the stakeholders in this research will be necessary. Hence, results will be considered to be of greater relevance.
Better interrelation between academia and industry	Project research will not only have an influence from the industry but will also have the support of university researchers, always maintaining a rapid transfer of information and strengthening links between business and academia.

Table 2.1.1: Expected impact mentioned in the work programme

2.1.1 Impact on market

As said in the previous chapter, the result of this project is intended to play an important role in the performance of potential users belonging to urban development, such as the construction industry and governmental institutions. Its impact on the market in various fields is described below:

Impact	Description
Innovative service	The call H2020 aims for a product that is innovative and contains an added value in environmental terms. This project will allow cities to grow in a sustainable way.
European industry	This proposal is a novelty in weather forecast, urban planning (3D models) and greenhouse emissions reduction (pollution), and will help cities to develop correctly, this being a concern that has increased in the recent years. This project is expected to lead this field.
City development	The incorporation of the platform will allow cities not to be affected by future environmental restrictions in the field of emissions. In this way, by using the platform, cities will be able to avoid future taxes or limitations that prevent them from developing properly.
Social	Because the construction industry has a relevant weight in the world and cities are constantly growing, it is expected that this platform will be extended to a large number of countries, creating new jobs.
Efficiency	The possibility of being able to track the emissions of cities and to build new scenarios will allow cities to grow in a more efficient way, optimizing their expansion within the allowed limits.
Environment	The use of this application will allow a precise tracking of emissions in cities, so that as cities continue to grow, they do it in a way that does not harm the environment, reducing the effects of climate change.

Table 2.1.2: Expected impact on market

2.1.2 Barriers and frameworks conditions

Like any other project, DEOS-UD has to face a series of barriers or framework conditions that may affect its development or even prevent the project from being carried out. The following are the main barriers that can be found:

Barrier	Description
Commercial	Since DEOS-UD is an innovative project that has just begun, its relevance will be weak at first, because the construction market is conservative and may take time to understand and accept the product. In this aspect a good commercial management is important, to guarantee that the potential clients see in the product a way to cover a need.
Technology	The project depends on the current state of various technologies, including satellite technology. It can happen that the required technological level of the project exceeds the one that currently exists, creating a problem in this aspect. It is important that the engineering department knows how to compensate these limitations and to comply with the requirements with the available technology.
Budget	The project corresponds to the call H2020, in which there is a financial threshold for its realization. It is important to keep in mind that, because the budget is higher than the proposed for this call, it is necessary to pay attention not to exceed it, taking special care in the part destined for contingencies.
Regulation	The aim of the company's quality department is to study all the regulatory frameworks in which the project operates. It is important to understand that there must be a regulation that can be more or less flexible, so it is necessary to adapt the project to it as much as possible or try to evolve it in the desired direction. However, due to the nature of the project, it is not expected to have too many drawbacks in this field.

Table 2.1.3: Expected barriers and frameworks conditions

2.2 Measures to maximise impact

2.2.1 Dissemination and exploitation of the results

One of the most important parts of the project is the maximization of the impact of the products. This can be achieved by carrying out an exhaustive dissemination and exploitation of the results. Through a proper Dissemination Management Plan, the actions, needs and requirements in order to obtain satisfactory results are defined.

Dissemination Management Plan

The Dissemination Management Plan is designed in order to fulfil the dissemination and exploitation of the results of the project. The actions to be performed are defined from the starting point of the project to the last stages after the project. It contains information about internal, stakeholders and external communication.

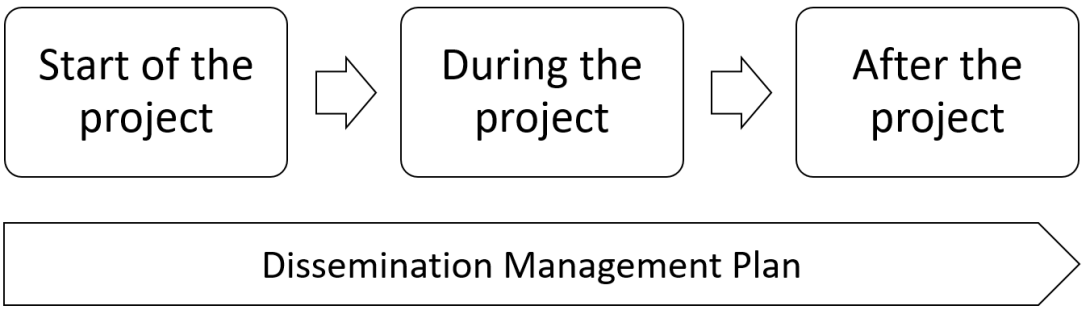

Figure 2.2.1: Dissemination diagram

Although internal communication is very important for the proper development of the project, it should not be forgotten that external communication is also crucial in a project of this magnitude. Having a good dissemination plan involves explaining how the outcomes of the project will be shared with stakeholders, relevant institutions, organisations, and individuals.

In order to achieve the proposed objectives in terms of external communication, the process of dissemination will be focused in two different ways depending on whether it is expected to reach the general public or the aerospace sector.

General public

It is important to find an adequate channel to reach the less specialized public in the aerospace field. In order to achieve the maximum diffusion of the project in this sector, the following resources will be used.

- **Social Networking.** Social networks are the best way to reach the widest possible audience. Posting regularly is also crucial to keep people interested in the project. Some of the platforms that will be used during the project development are: Twitter, LinkedIn, Facebook, and Instagram. There will be at least one update a week in order to keep people informed of the progress of the project.
- **Website.** A project website is one of the most versatile dissemination tools and will help to reach people unfamiliar with social networks. It can contain information intended to different profiles. As in the previous case, it has to be updated regularly.

Aerospace sector

- **Trade shows.** Trade shows, fairs, and exhibitions are a great way to get in close contact with people from other regions and countries that would ordinarily never be face to face with HIRO. They are also helpful in terms of finding new prospects, nurture current client relationships and stay up to date on the latest industry developments.
- **Conferences.** National and international conferences will help to share the achievements of the project with specialists in the field.
- **Journal Articles.** To promote project ideas and results in scientific research.

Information Management

Question	Description
What types of data will the project generate/collect?	This project will generate sensors data, ranging from pure images to maps for analysing different aspects in each pixel.
What standards will be used?	EU sensors manufacturing standards will be used.
How will this data be exploited and/or shared/made accessible for verification and re-use?	Data will be post-processed in order to extract valuable information. It will be shared along internet encrypted connection. Part of the data will be kept protected because it may be strategically sensible, hence it involves key urban maps.
How will this data be curated and preserved?	It will be preserved on a protected server.
How will the costs for data curation and preservation be covered?	The costs of data preservation will be covered with the clients payments, in this case, EU budget for the project.

Table 2.2.1: Information Management

Knowledge Management

Knowledge management is the process of creating, sharing, using and managing the knowledge and information of an organisation. In the case of this project, the produced information has been classified into three groups that are explained below.

The first one consists on the public information of the project such as social media publications, the overall status of the project, open conferences, etc. The second will have the project status reports and deliverables and will be available to all the stakeholders. Finally, the third one, and the most restrictive, will contain confidential information, for instance, the technical methodologies and systems.

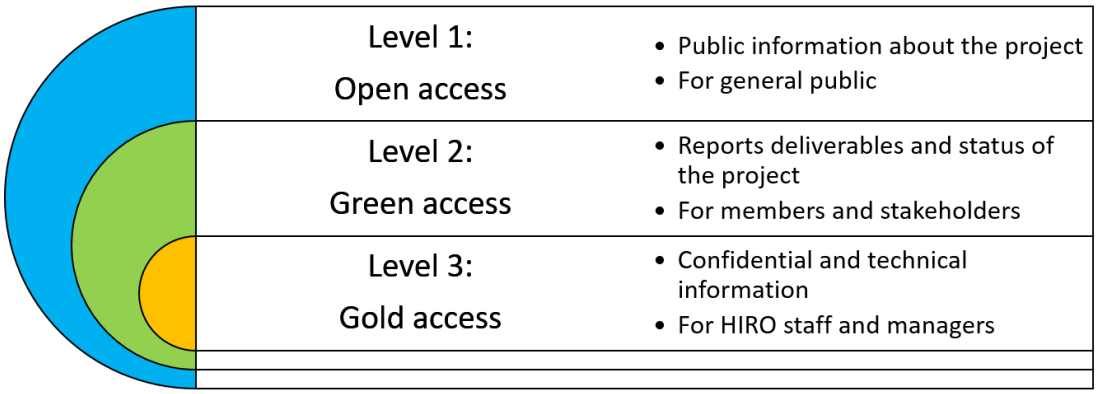

Figure 2.2.2: Levels of confidentiality

All this information will be located in a private server and published in the project website. Green and Gold level groups will have their own password to access the information.

2.2.2 Communication activities

The following table shows the main communication actions in order to ensure a proper dissemination. It is also presented the medium, frequency, audience, owner, deliverable and format.

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Social Networking	Share any updates on the project	Facebook, Twitter, Instagram	Weekly	General Public	Marketing and Communication Manager	Online Posts	Online
Website	Contains varied information about the project	Website	Updated with any change	General Public	Marketing and Communication Manager	Online Posts	Online
Trade Shows	Face to face contact with potential customers as well as finding new prospects, nurture client relationships and stay up to date with latest developments	On-site stands	Scheduled	Potential Customers, General Public and Industry Professionals	Marketing and Communication Manager	None	Face to Face
Conferences	Sharing achievements with industry specialists	Conferences	Scheduled	Industry Professionals	Project Manager	Presentation	Face to Face

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Journal Articles	Promoting project ideas, concepts and results in scientific and applied research communities and getting feedback from relevant stakeholders	Digital and written platforms	When available	Potential Customers, General Public and Industry Professionals	Project Manager	Journal Article	Hard Copy

Table 2.2.2: Communication management plan matrix

3 Implementation

3.1 Work plan — Work packages, deliverables

The present section accounts for an accurate description of the different steps and milestones that need to be accomplished by DEOS-UD in order to succeed in the development of the project. The reader will find here information related with the overall structure of the project, the different Work Packages and their timings along with the list of deliverables and milestones expected for the project. In addition to the information described, an approach to the interrelation between components will be displayed in order for the reader to better understand the complexity of the project.

3.1.1 Overall Structure

The DEOS-UD project is composed by 7 different work packages which are interrelated as shown in Figure 3.1.1. WP1 deals with project management and will ensure the proper coordination of project activities and the achievement of project objectives. WP2 is related to the quality and the administration of the project in terms of human resources, documentation management and quality, periodic monitoring and will also establish the financial plan of the project. WP3 will study the current baseline designs for the studied technologies (payload, modular system and urban development application) in the sector and will establish the potential areas of improvement and the requirements that need to be achieved by the new technologies proposed. WP4 is in charge of designing the output products of the project. This WP is strongly related to WP5, which is in charge of manufacturing and validating the prototype. Good intercommunication between these WPs is needed in order to obtain a final product that meets the requirements imposed by WP3. WP6 aims to create a methodology to enable the future use of the new technologies developed during the project, assuring their continuity. Finally, WP7 will ensure the project results are communicated and disseminated to the appropriate audiences, establishing this new knowledge into the society.

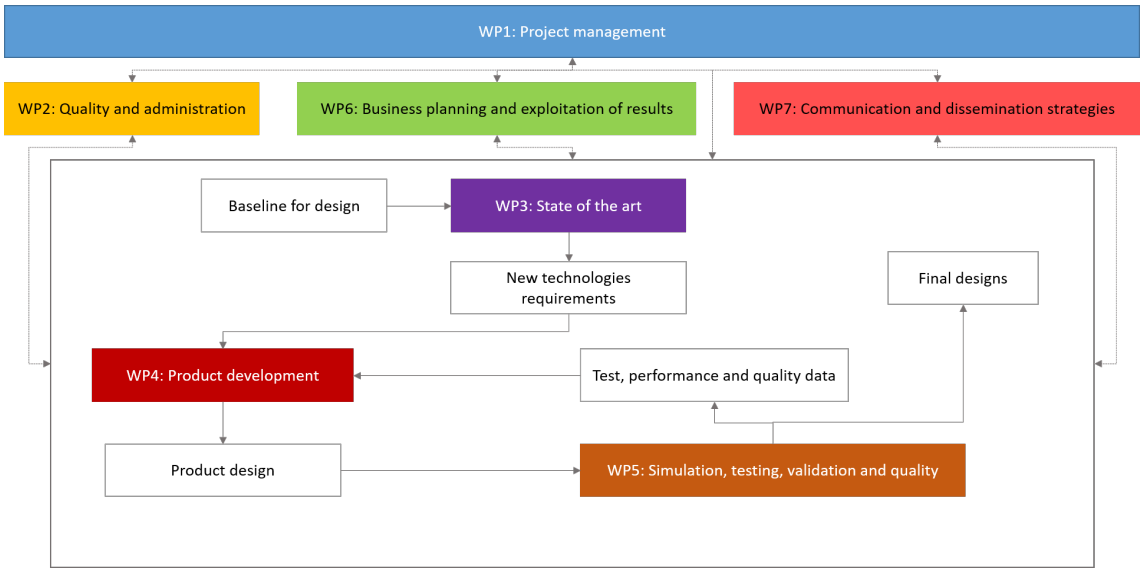

Figure 3.1.1: DEOS-UD overall structure diagram.

3.1.2 Timing of the Work Plan

The following Gantt diagram contains all the tasks planned for the project, with their chronological order and duration. The Gantt diagram serves as a base for the project resource planning and time management.

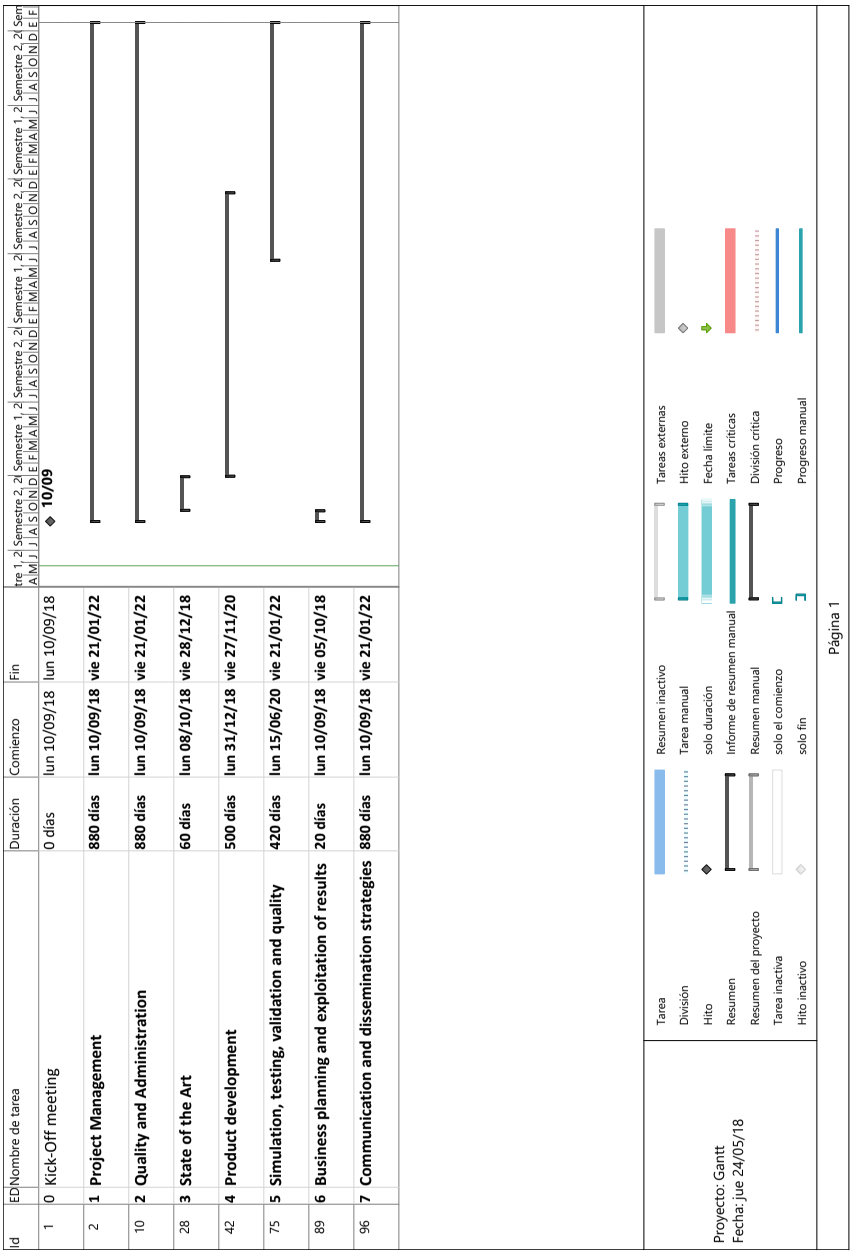

Figure 3.1.2: Gantt chart

3.1.3 Description of Work Packages

Work Package No.	Work Package Title	Lead Participant No.	Lead Participant Short Name	Person Months	Start Month	End Month
1	Project management	4	HR	16	M1	M44
2	Quality and administration	4	HR	26	M1	M44
3	State of the art	1	ADS	34	M1	M3
4	Product development	1	ADS	119	M4	M29
5	Simulation, testing, validation and quality	7	TAS	27	M22	M43
6	Business planning and exploitation of results	2	BHO	16	M1	M2
7	Communication and dissemination strategies	4	HR	21	M1	M44

Table 3.1.1: List of work packages

Work Package Number: 1				**Lead beneficiary:** HIRO				
Work Package Title: Project management								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	0	0	0	16	0	0	0	0
Start Month: M1				**End month:** M44				

Objectives:

The aim of WP1 is to ensure a good coordination and management of the project covering technical, administrative, ethical and financial issues. The specific aims are:

- Coordinate DEOS-UD project providing the partners with the needed organization, supervision and leadership.
- Manage and monitor the project progress.
- Understand the overall project together with its risk and determination of mitigation and contingency plans for the proper development of the project.

Description of work:

Task 1.1: Development of project management plan. *Leadership: HR*. Elaboration of all the documentation that states the strategy of the management and organization of the project through its duration.

Task 1.2: Monitoring of the project. *Leadership: HR*. Gathering of the members of the project to inform each other of the progress. Tracking of the active tasks and scheduling.

Task 1.3: Annual reporting. *Leadership: HR*. Every year that the project lasts will call for the elaboration of an internal report with the aim of keeping up to date with the progress done.

Task 1.4: Project implementation of risk management. *Leadership: HR*. Study of all the potential risks and how will they be managed so that their affectation to the project stays to a minimum.

Deliverables: D1.1: Project management plan: Document with detailed explanation of the project management strategies, including the Project Charter, stakeholder register, risk, quality and financial plans. Due date: M1 D1.2: Final Report: Final document delivered, that includes all the development done through the execution of the project. Due date: M44

Table 3.1.2: WP1 description

Work Package Number: 2				**Lead beneficiary:** HIRO				
Work Package Title: Quality and administration								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	0	11	15	0	0	0	0	0
Start Month: M1				**End month:** M44				

Objectives:

The aim of WP2 is to manage the human resources of the project in order to supply the amount of them needed to perform the project. It is also in charge of developing and controlling the financial feasibility study and seek funding to achieve the project objectives. Documentation management and periodic monitoring will also be done in this WP, assuring the quality of the deliverables and other documentation.

Description of work:

Task 2.1: Human resources. *Leadership: HR*. Definition of the number of employees necessary and employment of them. Administration of all the employees needed to fulfill the different tasks of the project.

Task 2.2: Financial plan. *Leadership: HR*. Lay down of all the fix and variable costs of the project and the expected funding. Study on the economic feasibility of the project, monitoring of the evolution of the project finances and search for the additional funding for the project.

Task 2.3: Documentation management. *Leadership: HR*. Establishment of the guidelines for the redaction of all documents, revision of all the documents of the project and rectification of the documents that do not meet the project requirements. Approval of the reviewed and rectified documents.

Task 2.4: Periodic monitoring. *Leadership: HR*. To ensure the quality of the project, a periodic monitoring of all the activities will be carried out.

Deliverables:

D2: Quality and Administration plan: Document with detailed explanation of the project quality and administration plan that will be elaborated before the design and manufacturing stages start in order to assure the quality of the processes. Due date: M1.

Table 3.1.3: WP2 description

Work Package Number: 3				**Lead beneficiary:** Airbus Defence and Space GmbH				
Work Package Title: State of the art								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	8	0	3	3	6	4	6	4
Start Month: M1				**End month:** M3				

Objectives:

The aim of WP3 is to do a state of the art for the technologies that want to be studied and improved during the project. The final objective is being capable of seeing the possibilities of these technologies and the potential areas of improvement to specify the requirements needed to achieve by the next-generation sensors, systems and applications.

Description of work:

Task 3.1: Payloads. *Leadership: ADS. Participants: DS, TAS and HR.* Search for the current space applications and definition of the requirements for the sensors.

Task 3.2: Modular system. *Leadership: TAS. Participants: DS, ADS and HR.* Search for the current modular systems with space applications and definition of the requirements for the modular system developed in the project.

Task 3.3: Urban development applications with space technologies. *Leadership: IS. Participands: VT, RSAC and HR.* Search for current applications similar to those that want to be implemented in this project in the areas of weather forecast, urban planning and greenhouse emissions reduction. Definition of the requirements of the applications.

Deliverables:

D3.1: Payload state of the art: Report containing the state of the art of current EO remote sensors as well as the sensors to improve selection and the first requirements definition. Due date: M4

D3.2: Modular system state of the art: Report containing the state of the art of current modular systems with space applications and its first requirements definition. Due date: M4

D3.3: Space applications state of the art: Report containing the state of the art of current urban development space applications and first interaction platforms requirements definition. Due date: M4

Table 3.1.4: WP3 description

Work Package Number: 4				**Lead beneficiary:** Airbus Defence and Space GmbH				
Work Package Title: Product development								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	40	0	10	6	25	5	25	8
Start Month: M4				**End month:** M29				

Objectives:

The aim of WP4 is to do the design of the sensors and systems that will be created by the project. This include the three main branches of the project: sensor, modular system and data application for urban development. A preliminary design according to the specified requirements will be done and then, based on simulations and testing, the final design will be created.

Description of work:

Task 4.1: Preliminary design. *Leadership: ADS. Participants: DS, TAS, HR, VT, RSAC, IS*. Research for the payload preliminary design and development of it. Modular system preliminary design, definition of SATCOM application domains and development of: physical framework for sensor block, systems interactions and applications, sensor data fusion software. Preliminary design of the interaction platform and implementation of web-based servers for sharing sensors data and processing algorithms based on applications.

Task 4.2: Final design: *Leadership: ADS. Participants: DS, TAS, HR, VT, RSAC, IS*. Final design and technical specifications of the payload sensors. Final design of the modular system, specifically the sensors data fusion software. Final design and implementation of the interaction platform, including the web servers for data sharing and the processing algorithms.

Deliverables:

D4.1 Payload preliminary design: Report determining the payload preliminary design. It contains the research, requirements and preliminary performances parameters of each sensor. Due date: M16

D4.2 Modular system preliminary design: Report detailing the modular system preliminary design. It includes a first review of the sensors blocks physical framework and sensors data fusion software requirements as well as the initial definition of the SATCOM application domains. Due date: M16

D4.3 Interaction platform preliminary design: Report detailing the interaction platform preliminary design. It includes the predesign of data sharing servers and platforms as well as the definition of the initial implementation of data processing algorithms. Due date: M16

D4.4 Payload final design: Report detailing the final design and technical specifications of each developed sensor. Due date: M29

D4.5 Modular system final design: Report detailing the final design and technical specifications of the modular system. Due date: M29

D4.6 Sensor data fusion software report: Report containing the final sensors data fusion software specifications. Due date: M29

D4.7 Interaction platform final design: Report containing the final design and technical specifications of the interaction platforms. Due date: M29

D4.8 Data processing software report: Report containing the final data processing algorithms specifications which will allow processing the acquired satellite data. Due date: M29

Table 3.1.5: WP4 description

Work Package Number: 5				**Lead beneficiary:** Thales Alenia Space SAS				
Work Package Title: Simulation, testing, validation and quality								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	5	0	3	4	1	4	8	2
Start Month: M22				**End month:** M43				

Objectives:

The aim of WP5 is to manufacture and validate the sensors designed. This includes the manufacture, simulation, testing and validation of all the products developed in the three main branches of the project ensuring the quality of the product.

Description of work:

Task 5.1: Technology Demonstrator Prototype Manufacturing. *Leadership: TAS. Participants: ADS, DS, HR.* Manufacturing of the sensors, the module and the interaction platform of the prototype in order to be tested in the following activities.

Task 5.2: Payload Validation. *Leadership: TAS. Participants: ADS, DS, HR.* Validation of the performance of the sensors mounted on the system.

Task 5.3: Modular System Validation. *Leadership: TAS. Participants: ADS, DS, HR.* Validation of the modular system performance, of the systems interaction, of the sensors data fusion software, of the satellite communications applications domains and also of the physical framework for sensor blocks.

Task 5.4: Interaction Platform Validation. *Leadership: RSAC. Participants: HR, VT, IS.* Validation of the interaction platform to check if it develops all its functions properly.

Task 5.5: Full System Prototype Validation. *Leadership: HR. Participants: ADS, TAS, RSAC.* Validation of the whole system using the prototype in order to test its performance.

Task 5.6: Quality of the Product. *Leadership: HR. Participants: DADS, TAS, RSAC.* Quality control of all the subsystems of the product and all the methodologies applied on its manufacturing and validation.

Deliverables:
D5 Validation Report: Report that gathers the tests and validations with the obtained results of all the payload sensors, the modular system and the interaction platform, as well as the full system performing. Due date: M45

Table 3.1.6: WP5 description

Work Package Number: 6				**Lead beneficiary:** BHO Legal Rechtsanwälte Partnership				
Work Package Title: Business planning and exploitation of results								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	0	12	0	4	0	0	0	0
Start Month: M1				**End month:** M2				

Objectives:

The aim of WP6 is develop and implement a business plan by evaluating the purchase and procurement of resaurces and by performing a study in order to acknowledge the companies interested in the project.

Description of work:

Task 6.1: Market Approach. *Leadership: BHO. Participants: HR.* Perform a study of the possible companies interested in the project as well as negote the conditions of resources procurement and purchase of the resources required for the project.

Task 6.2: Exploitation and Business Plan. *Leadership: BHO. Participants: HR.* Implementation of the business plan of the product to exploit its economic potential.

Deliverables:

D6 Business Plan: Document containing the market approach details including the selected suppliers and the potential costumers as well as the exploitation strategy. Due date M1

Table 3.1.7: WP6 description

Work Package Number: 7				**Lead beneficiary:** HIRO				
Work Package Title: Communication and dissemination strategies								
Participant number	1	2	3	4	5	6	7	8
Short name of participant	ADS	BHO	DS	HR	IS	RSAC	TAS	VT
Person Month per Participant	2	4	2	5	1	2	2	3
Start Month: M1				**End month:** M44				

Objectives:

The aim of WP7 is to develop a communication plan including the implementation of an internal communication (within the team project) strategy as well as the implementation of an external communication by means of dissemination strategies in order to promote the product .

Description of work:

Task 7.1: Dissemination and Communication Plan. *Leadership: HR. Participants: ADS, BHO, DS, IS, RSAC, TAS, VT*. Definition of the strategies planned for the dissemination of the final product.

Task 7.2: On-line Dissemination/Communication Activities. *Leadership: HR. Participants: ADS, BHO, DS, IS, RSAC, TAS, VT*. Development of the web site to promote the product and management of the social media used in the dissemination plan of the project.

Task 7.3: Off-line Dissemination/Communication Activities. *Leadership: HR. Participants: ADS, BHO, DS, IS, RSAC, TAS, VT*. Attendance to conferences in order to disseminate the product to possible stakeholders and to meetings to promote the product inside the market.

Task 7.4: Production of Dissemination Materials. *Leadership: HR. Participants: ADS, BHO, DS, IS, RSAC, TAS, VT*. Production of technology demonstrators and all the visual material needed for the dissemination and promotion of the product.

Deliverables:

D7 Communication Plan: Document containing all the planned dissemination strategies, such as the online communication (including website development and social media management), the offline communication (participation in meetings and conferences) and the dissemination materials (technology demonstrators). Due date: M1

Table 3.1.8: WP7 description

3.1.4 Deliverables

Table 3.1.9 gathers the information related to the deliverables to be presented along the project development.

Regarding the type of deliverable, the following abbreviations have been used:

- R: Document, report (excluding the periodic and final reports).
- DEM: Demonstrator, pilot, prototype, plan designs.
- DEC: Websites, patents filing, press & media actions, videos, etc.
- OTHER: Software, technical diagram, etc.

And regarding the dissemination level, the following abbreviations have been used:

- PU = Public, fully open, e.g. web.
- CO = Confidential, restricted under conditions set out in Model Grant Agreement.
- CI = Classified, information as referred to in Commission Decision 2001/844/EC.

Deliverable No.	Deliverable Name	Work Package No.	Lead Participant Short Name	Type	Disemination Level	Deliverable Date
D1.1	Project Management Plan	WP1	HR	R	CI	M1
D2	Quality and Administration Plan	WP2	HR	R	CI	M1
D6	Business Plan	WP6	BHO	R	CI	M1
D7	Communication Plan	WP7	HR	R	CI	M1
D3.1	Payload State of the Art	WP3	ADS	R	PU	M4

Deliverable No.	Deliverable Name	Work Package No.	Lead Participant Short Name	Type	Disemination Level	Deliverable Date
D3.2	Modular System State of the Art	WP3	TAS	R	PU	M4
D3.3	Space Applications State of the Art	WP3	IS	R	PU	M4
D4.1	Payload Preliminary Design	WP4	ADS	R	CI	M16
D4.2	Modular System Preliminary Design	WP4	ADS	R	CI	M16
D4.3	Interaction Platform Preliminary Design	WP4	ADS	R	CI	M16
D4.4	Payload Final Design	WP4	ADS	R	CI	M29
D4.5	Modular System Final Design	WP4	TAS	R	CI	M29
D4.6	Sensors Data Fusion Software Report	WP4	TAS	R	CI	M29
D4.7	Interaction Platform Final Desing	WP4	IS	DEC	CI	M29

Deliverable No.	Deliverable Name	Work Package No.	Lead Participant Short Name	Type	Disemination Level	Deliverable Date
D4.8	Data Processing Software Report	WP4	IS	R	CI	M29
D5	Validation Report	WP5	HR	R	CI	M41
D1.2	Final Report	WP5	HR	R	CI	M44

Table 3.1.9: List of Deliverables

3.1.5 Inter-relation between components

Next page shows the inter-relation between the components of the project. A simplified network diagram has been thought as the most suitable option for this purpose.

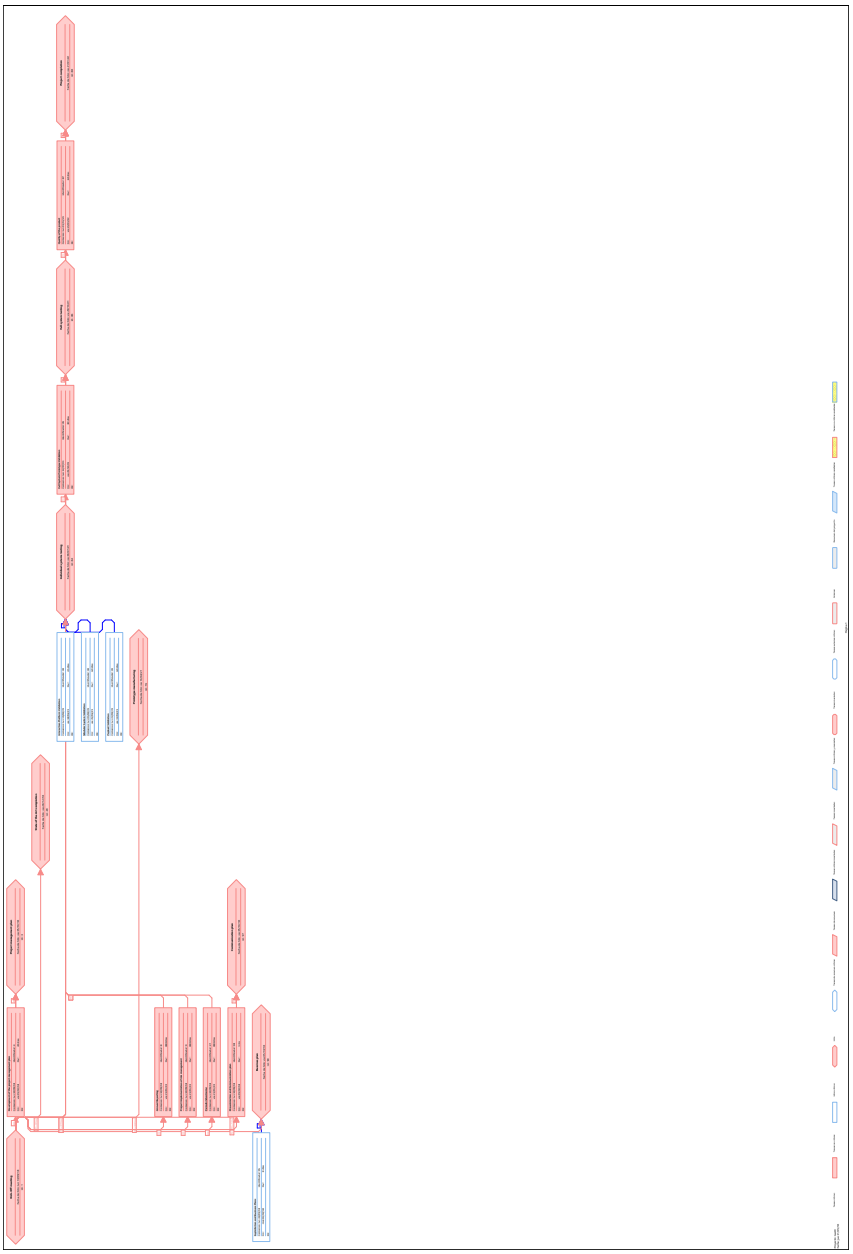

Figure 3.1.3: Network diagram

3.2 Management structure, milestones and procedures

3.2.1 Organisational Structure

A complex organizational structure has been established given the complexity and scale of the project. On top of the organizational chain, a steering committee has been created and it will provide DEOS-UD with strategic command and solutions to problems that affect a significant part of the stakeholders in order to ensure a correct and efficient development of the project.

Hand-to-hand with the steering committee, the advisory committee will provide the project leaders with tailored assistance in order to assure time and cost-efficient decisions are taken. There is also a business project team which will be in charge of assuring an economical resources correct management by providing careful tracing in the use of the budget along with a proper staff training in means of economic performance; the team is also ought to keep the steering committee updated with the latest information on earned value management parameters so that appropriate decisions are taken. Reinforcing the organizational structure of the project, a technical project team has been created as well in order to provide control over technical decisions in the project.

An organizational structure directed by a steering committee is specifically designed to fit such a large-scale and long-term project as this one is. The experience, capacities and diversity of the members it is composed by will play a key role in the outcome of the project while maintaining an efficient use of time and resources. The steering committee will take major decisions involving a significant fraction of the stakeholders. The business project team will be in charge of assessing the decisions involving budget modification or inter-department budget redistribution.

Finally, decisions involving a modification or significant change in the technologies used during DEOS-UD progress will be in hands of the technical project team. Smaller affairs along with local inconveniences will be solved by the specific group affected by them. By having such a decision making distribution, DEOS-UD ensures a correct importance of the decision to experience ratio and thus assuring a more efficient time usage by providing every person within DEOS-UD with fitted responsibilities.

The milestones to accomplish are detailed in the following section.

3.2.2 Acceptance Criteria and Milestones

Based on the deliverables shown in section 3.1.4, the following criteria when stating a specific work package is established:

- **WP1**: Management
- **WP2**: Quality and administration
- **WP3**: State of the art
- **WP4**: Product development
- **WP5**: Simulation, testing and validation
- **WP6**: Business planning
- **WP7**: Communication and dissemination
- **WPx**: All Work Packages

The following table summarizes the milestones, including the work packages to which they are related, their due date and means of verification.

Milestone No.	Milestone Name	Related WP	Due Date	Means of Verification
1	Kick off meeting	WPx	10/09/2018	Agenda and Meeting Minutes
2	Project management plan	WP1	05/10/2018	Archived soft copy and management team evaluation meeting
3	Business plan	WP6	05/10/2018	Archived soft copy and business team evaluation meeting
4	Communication plan	WP7	05/10/2018	Archived soft copy and marketing and communication team evaluation meeting
5	State of the art completion	WP3	28/12/2018	Archived soft copy and management and technical team evaluation meeting
6	Payload preliminary design	WP4	14/06/2019	Technical documents review and technical team evaluation meeting

Milestone No.	Milestone Name	Related WP	Due Date	Means of Verification
7	Modular system preliminary design	WP4	06/09/2019	Technical documents review and technical team evaluation meeting
8	Interaction platform preliminary design	WP4	29/11/2019	Technical documents review and technical team evaluation meeting
9	Payload final design	WP4, WP2	12/06/2020	Technical documents review and technical team evaluation meeting
10	Modular system final design	WP4, WP2	04/09/2020	Technical documents review and technical team evaluation meeting
11	Interaction platform final design	WP4, WP2	27/11/2020	Technical documents review and technical team evaluation meeting
12	Prototype manufacturing	WP4	16/04/2021	Prototype testing
13	Individual systems testing	WP5	09/07/2021	Systems testing
14	Full system testing	WP5	29/10/2021	Full system testing
15	Project completion	WPx	21/01/2022	Evaluation of all technical and non-technical documentation as well as prototype testing reports

Table 3.2.1: List of milestones

3.2.3 Quality Management

The Quality management Plan defines the quality levels that must be achieved in order to accept the final product developed and the methods to ensure these levels. In this section the

quality management plan is defined together with methods and tools to assure, control and improve it.

3.2.3.1 Quality Assurance Approach

One of the most important parts of the project is to ensure high quality levels in all its sections in order to provide a final product that meets the expectations of the possible future customers. In this section, the procedures and methods to ensure this high quality are detailed.

At this point, it is important to recall high-level technical requirements defined previously in the Project Charter:

Item	Description
T1	Ensure the endurance of the overall system.
T2	Readiness for operational services.
T3	Ability to detect greenhouse gases.
T4	Ability to detect weather patterns for proper weather forecasting applications.
T5	Ability to perform a high precision terrain mapping for urban applications.
T6	The system must have a program for automatic updates and self-revision of possible issues.
T7	Availability of real-time information with a maximum delay of 1 second.
T8	15% increase in the reliability and precision of the results compared to current technologies.

Table 3.2.2: Technical requirements

The quality assurance will be applied in the different steps of the project in order to obtain the desired results. These steps are:

- Before manufacturing the prototype. Quality procedures must be applied over the final design to ensure it meets the requirements of the project. These quality procedures include individual part structural and assembly testing (ISO 10786:2011), electrical testing (ISO 17.220.20) and equipment laboratory testing according tho standarised norms.

- During the manufacture. The procedures applied in the manufacturing of the prototype must be validated to guarantee that they are suitable for the manufacturing of the product according to ISO 10794:2011.
- Final product validation. The final product must be revised to ensure it fulfils the expected specifications. These validations will contain methods to check the quality of the software and the hardware of the project according to ISO 9000:2005 validation requirements.

Now that the quality needed has been specified, in the following sections the methods to control the quality and to improve the quality plan will be described.

3.2.3.2 Quality Control Approach

The quality control approach of the project is divided in three main areas:

- Documentation quality plan
- Technical quality plan
- Software quality plan

Documentation quality plan

All the documentation of the project has to follow a strict quality plan in order to ensure that no information is lost. To do so, there is a series of steps that have to be followed:

1. Definition of the document
    - Define the type of document and its content as well as the standards that it has to follow.
    - Define the responsible of the document, the team that is going to work on it and the team that is going to verify it.
    - Define the deadline for the document as well as any milestone that may be related to it.
2. Redaction of the document: There may be some periodic quality controls while the document is in progress to ensure that the quality plan is met.
3. Review and approval: Once the document is finished, the responsible of that deliverable should perform the following tasks regarding the document:

- Grammatical revision.
- Consistency.
- References up to date.
- Check that the deliverable follows the acceptance criteria.

Then, the document can be delivered to the quality department. It will verify that the documentation follows the quality standards defined by the company. With the aim of guaranteeing a complete and trustful review, there should be at least two independent reviewers and they should not have been involved in the making of that document. If there is any review comment, it should be communicated to the deliverable responsible, since they have the final responsibility that the document meets the acceptance criteria.

This documentation quality plan refers to the deliverables but also to the internal documents of the company.

Technical quality plan

Since part of the project consists of the design and construction of a prototype, it is necessary to ensure that it meets all the quality requirements to guarantee its proper operation. In order to do that, the following steps are defined:

1. Definition of the quality plan: Before beginning with the design, a quality plan has to be done in order to define the acceptance criteria.
2. Design: Once the plan is finished and the design phase starts, some quality controls have to be done periodically to guarantee that the design complies the requirements and follows the quality plan previously defined.
3. Prototype and validation: During the construction of the prototype all the components and the production stages have to meet the acceptance criteria defined in the quality plan. Then, when the prototype is ready, a validation must be done in order to check that it fulfills all the requirements of the project as well as to verify that it complies the quality plan. This validation process has to follow the standards given by the industry.

Software quality plan

The project not only consists of a prototype that should be constructed, but it also has a software that has to be verified. The following steps are defined to guarantee a satisfactory design of the implementation platform:

1. Definition of the quality plan: Before starting with the coding, a software quality plan has to be defined. This document will set some standards that will have to be followed

in the making of the interaction platform, such as coding and comment standards, to ensure a correct flow of information between the people who work on it as well as to avoid possible errors. It will also define the acceptance criteria that have to be met by the interaction platform.

2. Coding phase: During the design phase, every modification of the code will have to be registered indicating the date and a description of the changes. Then, a review of the latest modifications should be done before making them definitive. If an error is detected, it has to be immediately reported to the responsible of the software development. Then, an engineer will be assigned to solve it, and he/she will report it once the problem is solved.

3. Implementation and validation: Once the interaction platform is operative, a validation has to be performed in order to ensure that it fulfils all the requirements of the project as well as to verify that it complies the software quality plan. This validation process has to follow the standards given by the industry.

3.2.3.3 Quality Improvement Approach

Quality improvement (QI) is a formal analysis of practice performance and efforts done in order to improve the performance of the project with the main objective of increasing its efficiency. The information shown about QI models and tools has been extracted from [3] and [4]. A proper QI process requires some basics to succeed. These basics are the following ones:

- Establish a culture of quality in the project: Creation of QI teams, QI meetings, and QI goals.
- Determine and prioritize potential areas of improvement: Define, according to the acceptance criteria of the project, the main areas of improvement.
- Collect and analyse data: Determine the type of data to be collected and analyse it properly according to the project objectives.
- Communication of results: Quality improvements should be transparent to the stakeholders in order to keep them satisfied.

In this project, the six-sigma working philosophy will be implemented in order to improve quality. The objective of this philosophy is to adjust the existing processes in order to improve the quality and minimize the variability by reducing defects and irregularities. The model related to six-sigma philosophy that will be used is DMAIC. This model includes the following steps:

- Define: Set the objective of the problem or the existent defect. In this project, this definition will be done according to the acceptance criteria. The improvement of the quality plan is one of the objectives that will need to be taken into account.
- Measurement: Measures are needed in order to have values for the problem or defect. In this project the measurements according to the effectiveness of the quality plan are:
  - Number of iterations of a document/design to be approved.
  - Stakeholders satisfaction
  - Time needed to approve a document/design.
  - Number of defects detected by the quality department
- Analyse: Figure out the causes of the problem or defect and propose solutions.
- Improve: Implement the approved solution.
- Control: Control the implementation of the improvement, assure continuity and success.

3.2.3.4 Quality Roles and Responsibilities

In the following table, the quality roles for this project will be stated and its responsibilities defined. These roles are important so they will be the ones to control the implementation of the quality assurance, control, and improvement.

Role	Responsibilities
Project Manager	Final responsible for the quality of the project. Schedules meetings with the Quality Department in order to discuss the quality aspects of the project. Approves the quality plans of the project.
Project Manager Secretary	Helps the Project Manager in the tasks that he/she delegates.
Quality Manager	Main quality responsible of the project. Fixes the quality standards that all documents are required to fulfil. Reviews all the deliverables to make sure they fulfil the required quality. The same documents are also reviewed by the Quality Manager Assessor.

Role	Responsibilities
Quality Manager Assessor	Helps the Quality Manager in the tasks that he/she delegates. Reviews all the deliverables to make sure they fulfil the required quality. The same documents are also reviewed by the Quality Manager.
Technical Manager	Coordinates the work done by the engineers and technicians. Defines the technical quality plan and the software quality plan. Performs periodic quality controls on the design of the product. Reviews the technical aspects of the deliverables before approving them. Monitors the quality control procedures of both the prototype and the final product. Monitors the quality control procedures of the interaction platform.
Engineers and technicians	Make sure that the design of the product follows the technical quality plan. Perform quality control procedures over the prototype and over the final product. Make sure that the design of the interaction platform follows the software quality plan. Validate that the interaction platform fulfils the quality standards.

Table 3.2.3: List of quality roles and responsibilities

3.2.4 Risk Management Plan

The present section will identify the risks threatening a project's correct development, the Work Packages that will be involved in such risks and will suggest a mitigation solution for

each and everyone of them. The described information is found in the following table. The previously defined Work Packages apply for this section too.

Description of risk	Level of Likelihood	Work package(s) involved	Proposed risk-mitigation measure
Deliverable delays	Medium	WPx	Dedicate more resources than expected.
Inaccurate cost forecast	High	WP1, WP2	Consider new funding sources and revise the financial management plan.
Lack of communication	High	WPx	Periodical meeting and use of collaborative software.
Lack of technology improvement	Low	WP4	Guarantee the development with thorough search of state of the art technologies.
Lack of access to project needed information	Very Low	WPx	Previous accurate research is needed before the development of the project.
Low team motivation	Medium	WPx	Personnel control and team building projects.
Unsuccessful quality control	Low	WPx	Improve or increase quality controls.
Conflicts between members	High	WPx	Personnel conflict resolution meetings.
Infeasible design	Low	WP4	Periodical reviews with experts and managers.
Techonolgical components with security vulnerabilities	High	WP3, WP4, WP5	Check for possible security problems during development through specialised companies.
Organization issues	Very High	WPx	Demand for external companies specialised advice in project management.

Description of risk	Level of Likelihood	Work package(s) involved	Proposed risk-mitigation measure
Stakeholder desertion	Low	WPx (Except WP7)	Transfer responsibilities to other stakeholders when possible or contract new ones.
Competitors appearance	Very Low	WP6, WP7	Improvement of the quality-to-price ratio of the service.
Delay in external deliverables	Medium	WPx	Control the delivery schedules and change provider if necessary.
Economical market issues	Low	WPx	Control cost evolution due to external changes throughout the project.
Components or raw material quality	Low	WP4, WP5	Have exhaustive and regular quality controls to avoid problems in components in the final test.

Table 3.2.4: Critical risks for implementation

3.2.5 Communication Management

Communication management has been effectively synthesized in a table where each and every type of communication process inside DEOS-UD is concisely described. This section will set an expanded overview regarding communication during the project, and will be helpful for all departments seeking for standardized guidance when trying to communicate results, problems or suggestions to other departments or to the general public.

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Internal Business Status Meetings	Discuss assignments, activities and sharing information	Face to Face	Weekly	Business Team	Financial Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website
Technical and Business Status Meetings and Reports	Discuss assignments, activities, sharing information and reporting the project status	Face to Face	Weekly	Project Manager, Business Team, Technical Team, Project Secretary	Project Manager	Agenda, Meeting Minutes, Status Reports	Soft copy archived on SharePoint site and project website
Advisory Committee Meetings	Review progress, risks and issues	Face to Face	Monthly	Advisory Committee, Project Stakeholders, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Steering Committee Status Meetings	Enhance communication and coordination of the project	Face to Face	Monthly	Steering Committee, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website
Status Meetings and Reports to Stakeholders	Report the status of the project including activities, progress, costs and issues	Face to Face or Video Conference	Monthly	Stakeholders, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes, Status Reports	Soft copy archived on SharePoint site and project website
Project Status Reports	Provide Stakeholders information on the status and progress of the project	Email	Monthly	Project Stakeholders, Stakeholder and Procurement Manager, Project Manager	Stakeholder and Procurement Manager	Project status, schedule, budget and cost tracking, status of issues and risks, health status, status of action items, future or planned activities	Soft copy archived on SharePoint site and project website

Table 3.2.5: Communication management plan matrix

3.3 Consortium as a whole

The consortium in charge of developing the DEOS-UD project has been chosen accurately in order to assure the capability of developing the project properly.

The consortium is made up of 8 different partners distributed in 5 different countries as shown in Figure 3.3.1. The members of the consortium have a wide knowhow and expertise in the areas covered in the project:

- Research in space technology and innovative design: HIRO, Aribus Defence and Space, ICUBE-SERTIT.
- Development, testing and validation of space systems: Airbus Defence and Space, Deimos Space, Thales Alenia Space.
- Data application for urban development: ReSAC and VITO.

Apart from the technical aspects of the project, there are also partners with high expertise in project management, intellectual property management, data protection and exploitation and business plan specialized in space systems and applications (HIRO and BHO Legal Rechtsanwälte).

The consortium is well-structured and balanced among different experimented organisation and people who will bring the best expertise for each of the project objectives development.

During the project each partner has a well-defined role to play and no overlapping of activities will happen. However, the consortium is strong and would be capable of achieving the project expectations in case one partner leaves the project because another partner might perfectly be in charge of the remaining tasks. The consortium is characterised by a major presence of industrial organisation (3 large and 1 SME) guarantees the succes of the DEOS-UD project development and the presence of research specialized organization (ICUBE-SERTIT, ReSAC, HIRO and VITO) assure the innovation needed will be achieved. The balance between different organisations with different complementary knowledge areas is the most suitable for the development of the purpose of the project.

Figure 3.3.1: Consortium partners.

3.4 Resources to be committed

In this section the number of person/month over the whole planned work duration for each workpackage and participant is stated (see Table 3.4.1).

Notice that the text in bald indicates the participant who is leading the work package.

Participant No./Short Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total Person Month per Participant
1 ADS	0	0	**8**	**40**	5	0	2	55
2 BHO	0	11	0	0	0	**12**	4	27
3 DS	0	0	3	10	3	0	2	18
4 HR	**16**	**15**	3	6	4	4	**5**	53
5 IS	0	0	6	25	1	0	1	33
6 RSAC	0	0	4	5	4	0	2	15
7 TAS	0	0	6	25	**8**	0	2	41
8 VT	0	0	4	8	2	0	3	17
Total Person Month	16	26	34	119	27	16	21	

Table 3.4.1: PM per WP and participant

3.5 Budget

The financial resources required for the completion of the project are expected to be covered by the contribution of the EU Commission.

The estimated budget is 4,000,000.00 €, which is calculated taking into account the requirement for each stakeholder in order to complete the parts assigned to it. The table **??** shows the resources required for each stakeholder.

Participant short name	(A) Direct Personnel costs	(B) Other Direct Costs	(C) Direct costs of sub-contracting	(F) Indirect costs	(H) Total estimated eligible costs	(I) Reimboursement Rate (%)	(J) Max. EU Contribution	(K) Requested EU Contribution
HIRO	140,000	15,000	6,250	38,750	200,000	100 %	200,000	200,000
Airbus Defence and Space GmbH	200,000	120,000	0	80,000	400,000	100%	400,000	400,000
BHO Legal Rechtsanwälte Partnership	75,000	5,000	0	20,000	100,000	100%	100,000	100,000
Deimos Space S.L.U.	495,000	385,000	0	220,000	1,100,000	100%	1,100,000	1,100,000
ICUBE-SERTIT	250,000	150,000	0	100,000	500,000	100%	500,000	500,000
ReSAC	45,000	35,000	0	20,000	100,000	100%	100,000	100,000
Thales Alenia Space SAS	840,000	280,000	0	280,000	1,400,000	100%	1,400,000	1,400,000
VITO nv.	90,000	70,000	0	40,000	200,000	100%	200,000	200,000
TOTAL	**2,135,000**	**1,060,000**	**6,250**	**798,750**	**4,000,000**		**4,000,000**	**4,000,000**

Table 3.5.1: Breakdown of the project budget (units in euros).

4 Members of the consortium

4.1 Participants

All the members of the consortium are listed in Table 4.1.1, which states the name of the company, its short name, its country of origin and the type of business. Regarding the last column, the following abbreviations have been used:

- SME: Small and medium-sized enterprise.
- MNC: Multinational corporation.
- R&D: Research and development centre.

#	Participant legal name	Short name	Country	Type
1	Airbus Defence and Space GmbH	ADS	Germany	MNC
2	BHO Legal Rechtsanwälte Partnership	BHO	Germany	MNC
3	Deimos Space S.L.U.	DS	Spain	SME
4	High Innovative Remote Observation (HIRO)	HR	Spain	SME
5	ICUBE-SERTIT	IS	France	R&D
6	Remote Sensing Application Center (ReSAC)	RSAC	Bulgaria	R&D
7	Thales Alenia Space SAS	TAS	France	MNC
8	VITO nv	VT	Belgium	R&D

Table 4.1.1: List of participants

N°1	AIRBUS DEFENCE & SPACE	**Organisation name:** Airbus Defence and Space GmbH **Website:** http://www.geo-airbusds.com	Type: MNC

Overall description
Airbus Defence and Space is a division of Airbus, the largest aeronautics and space company in Europe. It is the world's second largest space company in the world. Their work comprises different departments: Earth Observation, Telecom Satellites, Human Spaceflight, Launchers, Satellite Navigation, Space Exploration, Space Equipment and Space Data Highway. Regarding Earth Observation, Airbus Defence and Space has built and delivered almost 50 satellite systems since 1986, accumulating over 300 years of in-orbit operation. None of these missions has ever failed in orbit. Some of their work includes meteorology satellites, sensing satellites and data intelligence services.
Role within the project
The main role of the company in the project is the research, development and production of the space systems, including the satellite sensors and systems.
Previous R&D Experience relevant to the project
Airbus Defence and Space has over 25 years of experience of working with the European Space Agency, developing missions such as SMOS, CryoSat-2, GOCE and Swarm.
Key persons assigned to the project
Matthew Perren (male) received his Physics and Electronics degree from the Brunel University in 1986. He then studied a MSc in Satellite Communications at the University of Surrey in 1992. After working several years in other companies, he became head of Future Programmes, Earth Observation Navigation and Science Div. at Airbus Defence and Space in 2014.
Selected publications or products/services relevant to the project
-
Participation in relevant National or European research projects
Airbus is a known supplier of the European Space Agency. It also is a driving force of the project Copernicus, since it has developed and built the Sentinel Satellites and several of their instruments.
Equipment involved
Facilites of Airbus Defence and Space.

Table 4.1.2: Participant N°1

N°2		**Organisation name:** BHO Legal Rechtsanwälte Partnership **Website:** http://www.bho-legal.com	Type: MNC
Overall description			
BHO Legal is a law firm with focus on aerospace and high-technology projects. Its areas of expertise are international space law, EU regulatory law, procurement, IT, data protection, R&D and contract law. They are currently focused on satellite navigation, Earth Observation and related R&D projects.			
Role within the project			
The main role of the company in the project is to provide legal and business advice to develop a business plan that takes into account intellectual property management, data protection and exploitation of the product.			
Previous R&D Experience relevant to the project			
BHO Legal has worked as a legal advisor for projects related to satellite for communications, navigation and Earth Observation, as well as for different ESA projects and EU research programmes (for example, the Copernicus programme).			
Key persons assigned to the project			
Oliver Heinrich (male) specialises in the legal management of large projects. He also advises on questions concerning national, European and international procurement law. Among Oliver's clients are international and medium-sized companies mainly from the Aerospace, Telecommunications and Navigation Industry. Furthermore, he advises large research institutions. Oliver is Member of the Board of Directors of UVS International, Member of the Extended Board of UAV DACH where he is head of the association's expert group "Air Law and Insurance" and head of its legal working group. He got his degree in Anglo-American Law from Trier University in 1997.			
Selected publications or products/services relevant to the project			
-			
Participation in relevant National or European research projects			
Prior to working as a full-time attorney, Oliver was a project manager for the European Satellite Navigation System Galileo at the German Aerospace Centre DLR. As authorised officer of TeleOp GmbH and legal advisor to the international consortium for the Galileo concession he gathered extensive practical experience in large international projects.			
Equipment involved			
Facilities of BHO Legal Rechtsanwälte Partnership.			

Table 4.1.3: Participant N°2

N°3		**Organisation name:** Deimos Space S.L.U. **Website:** http://www.deimos-space.com/en/	Type: SME
Overall description			
Deimos Space specialises in the design, engineering and development of solutions and systems integration in the aerospace, satellite systems, remote sensing, information systems and telecommunications network sectors. They are manufacturers, software developers, data providers and data processing experts.			
Role within the project			
The main role of the company in the project is the design and development of the space systems, including the satellite sensors and systems.			
Previous R&D Experience relevant to the project			
Deimos Space coordinates different projects regarding Earth Observation: SIMOcean, NextGEOSS and EO-ALERT. In June 2014 they launched the Deimos-2, a satellite designed by them. It provides near-real time image tasking, downloading, processing and delivery to the end user.			
Key persons assigned to the project			
Ismael López (male) received his Telecommunications Engineering degree from the University of Sevilla in 2001. After working some years as a Project Engineer, he became Project Manager in Deimos in 2010.			
Selected publications or products/services relevant to the project			
• Satellite Operations Strategies and Experience in DEIMOS-1 and DEIMOS-2 Missions. • Collision Avoidance Operations of DEIMOS-1 and DEIMOS-2 Missions.			
Participation in relevant National or European research projects			
A subdivision of Deimos Space named Deimos Engenharia leads a Horizon 2020 Project called NextGEOSS. It proposes a centralised hub for Earth Observation data, where users can connect to access data and deploy EO-based applications. Deimos also coordinates another H2020 project named EO-ALERT, which aims to achieve very high throughput and very low latency in the delivery of Earth observation images, moving beyond the state of the art. Finally, they also collaborate with the Portuguese government in the SIMOcean project, which provides aims to create a national marine database.			
Equipment involved			
Facilities of Deimos Space S.L.U.			

Table 4.1.4: Participant N°3

N°4	HIRO	**Organisation name:** High Innovative Remote Observation **Website:** http://www.hiro.com	Type: SME

Overall description
HIRO is a European organization centred in the development of aerospace projects. Their main goal is to use space technologies to solve Earth problems. They plan to use Remote Sensing and Earth Observation data to develop sustainable plans for land use, natural disasters management, natural resources control, climatology, infrastructure and urban development, etc.
Role within the project
HIRO is going to perform the research in space technology and the design of the product. It is also the company's role to manage and administrate the project.
Previous R&D Experience relevant to the project
-
Key persons assigned to the project
Pol Fontanes (male) studied Aerospace Engineering in the Polytechnic University of Catalonia and he is currently studying a MSc of Aerospace Engineering. He has experience as a researcher in the UPC Lightning Research Group and he is also a Integrated systems developer.
Selected publications or products/services relevant to the project
• Measurement of electric potential of isolated vertical conductive wires pulled by a drone under fair weather conditions. • Validation of an Experimental Cloud Infrastructure for Earth Observation Services. • Cloud Architecture for Processing and Distribution of Satellites Imagery. • Validation of an experimental on-demand cloud infrastructure for Earth Observation Web Services.
Participation in relevant National or European research projects
-
Equipment involved
Facilities of Hiro.

Table 4.1.5: Participant N°4

N°5		**Organisation name:** ICUBE-SERTIT **Website:** http://sertit.u-strasbg.fr/	Type: R&D

Overall description
SERTIT (SErvice Régional de Traitement d'Image et de Télédétection) is a platform of the ICube laboratory that is part of the University of Strasburg. Their aim is to extract and format information from image data produced by Earth Observation systems, delivering products in natural resources monitoring, land management, urban planning, environmental survey and natural disaster and risk management. They refer to themselves as an intermediary between space research, digital technologies and operational user needs. They specialise in remote sensing R&D activities.
Role within the project
The main role of the company is to provide advice in the application of data provided by EO satellites.
Previous R&D Experience relevant to the project
SERTIT is a pioneer in the rapid mapping of natural disasters, covering hundreds of activations worldwide. They are currently working with ESA in the Sentinel satellite constellation in the development of land surface monitoring services with the data obtained by the satellites.
Key persons assigned to the project
Jean-François Rapp (male) got both his degree and his master from the University Louis Pasteur in Strasbourg. He works as Quality Manager of ICube, Research Engineer in a research team dedicated to methods and tools adapted to Innovative Design and Business Developer.
Selected publications or products/services relevant to the project
• Evaluation of Future Internet technologies for processing and distribution of satellite imagery.
Participation in relevant National or European research projects
SERTIT is a service provider accompanying the French and ESA satellite development programs. It is currently involved in developing land surface monitoring services using ESA's Sentinel satellite constellation (Copernicus programme). They are also part of European Rapid Mapping (RM), a service that provides geospatial information to be used in emergency management activities.
Equipment involved
Facilities of ICUBE-SERTIT.

Table 4.1.6: Participant N°5

N°6		**Organisation name:** Remote Sensing Application Center **Website:** http://www.resac-bg.org/	Type: R&D

Overall description

ReSAC is a non-profit organization that applies remote sensing in decision making for agricultural and environmental management, land use, soil and forestry inventory, water resources, environmental hazards and urban planning. It was part of the Bulgarian Aerospace Agency (BASA) until 2005. They offer services in distribution of satellite data, image processing and photogrammetric mapping and processing among others.

Role within the project

The main role of the company in the project is to provide advice in the application of the data obtained by EO satellites for its use in urban development.

Previous R&D Experience relevant to the project

Since its foundation in 1998, ReSAC has participated in more than 40 projects, most of them related to the flood risk assessment or land cover mapping. For instance, in the recent years they have participated in the preparation of Floor Hazard Maps and Flood Risk Maps in different European areas. Regarding land study, for example, in 2012 they collaborated in the Romania-Bulgaria Cross Border Cooperation Programme, a project that designed a strategy for the sustainable spatial and economic development of the Romanian-Bulgarian Cross-Border area.

Key persons assigned to the project

Vessela Samoungi (female) is a physicist graduated from the University of Sofia. She also has a MSc in satellite Meteorology from that University. She has more than 8 years experience in EO at ReSAC and ASDE-Ecoregions NGOs and, currently she is a PhD student at SRTI-BAS in the field of SAR processing of PolInSAR in forestry studies.

Selected publications or products/services relevant to the project

- Monitoring of the risk of farmland abandonment as an efficient tool to assess the environmental and socio-economic impact of the Common Agriculture Policy
- High Nature Value farmland identification from satellite imagery, a comparison of two methodological approaches.

Participation in relevant National or European research projects

After leaving BASA, ReSAC has collaborated in many projects of the Bulgarian government, such as the Biodiversity and ecosystems programme (2015), in which did a mapping and assessment of the Bulgarian fresh water ecosystem services, or the quality analysis of the Land Parcel Identification System of Bulgaria (2013). They have also been part of European programmes, like Geoland2, a project that focused on land cover change, environmental stress and global vegetation monitoring in Europe.
Equipment involved
Facilities of ReSAC.

Table 4.1.7: Participant N°6

N°7	ThalesAlenia Space	**Organisation name:** Thales Alenia Space SAS **Website:** http://www.thalesgroup.com	Type: MNC

Overall description

Thales Alenia Space SAS is Europe's largest satellite manufacturer. It designs, develops, integrates, tests, delivers and operates space systems worldwide. A joint venture between Thales and Leonardo, Thales Alenia Space offers services in telecommunications, earth observation, science and space exploration, navigation and orbital infrastructure and space transport. In the earth observation field, they specialise in high and very-high resolution optical and radar payloads, used in military and civilian applications: intelligence gathering, target designation, mapping, crisis management, meteorology, oceanography, climatology, etc.

Role within the project

The main role of the company in the project is the design, development, testing and integration of space systems.

Previous R&D Experience relevant to the project

Thales Alenia Space is the exclusive supplier of all high and very-high resolution optical instruments for French intelligence satellites. They have also collaborated with space agencies. For example, building the Poseidon altimeters for the CNES/NASA Topex-Poseidon mission, which mapped the ocean surface topography; or developing the Siral very-high-resolution interferometry altimeter for ESA's CryoSat satellite.

Key persons assigned to the project

Philippe Keryer (male) got his degree of Electronic Engineer from the École Supérieure d'Électricité. As President of Networks group, leads a global, 20,000 people, multi-billion dollar telecoms organization and negociates with service providers, start-ups, and telecom leaders worldwide on products, services and intellectual property.

Selected publications or products/services relevant to the project

- Testing Cloud Computing for Massive Space Data Processing, Storage and Distribution with Open-Source Geo-Software.

Participation in relevant National or European research projects

Thales Alenia Space is part of the Copernicus programme, having developed the "water colour" instruments that are on board of Sentinel-3, MERIS and OLCI. They were also the prime contractors for the Egnos augmentation system, the precursor to Galileo.

Equipment involved

Facilities of Thales Alenia Space S.A.S.

Table 4.1.8: Participant N°7

N°8	vito vision on technology	**Organisation name:** VITO nv **Website:** https://vito.be/en/land-use	Type: R&D

Overall description
VITO is an independent Flemish research organisation in the area of sustainable development. They perform research and develop products in the fields of energy, environment and materials. In the environment field, VITO uses Remote Sensing and Earth Observation processes to perform studies on water, air and climate and land use. Regarding the use of land, they focus on 3D geological modelling, deep geothermal energy applications and land use policy analyses.
Role within the project
The main role of the company in the project is to provide advice in the use of remote sensing for urban development applications.
Previous R&D Experience relevant to the project
In the recent years, VITO has collaborated in river basin management and infrastructure sustainable development projects in India. They also collaborate in ESA's Eagle Space program, a study that aims for the integration of space based capabilities such as EO satellites to help combat natural flooding and wildfire disasters.
Key persons assigned to the project
Steven Krekels (male) finished his studies of Telecommunications in De Nayer Instituut in 1995. Steven Krekels has been the manager of VITO's Remote Sensing unit since November 2014. VITO Remote Sensing develops and operates space- and airborne-based earth observation systems that translate raw data into consumable information about population, growth, urban development, agriculture and vegetation, natural disasters, and more.
Selected publications or products/services relevant to the project
• Toward Big Data in Green City • Green Energy for a Green City—A Multi-Perspective Model Approach • Advances in Sensors for Sustainable Smart Cities and Smart Buildings
Participation in relevant National or European research projects
VITO collaborates in different ESA projects, such as Eagle Space or SSMART, a project that that wants to provide solutions for monitoring and managing transports of dangerous goods.
Equipment involved
Facilities of VITO nv.

Table 4.1.9: Participant N°8

4.2 Third parties involved in the project

Airbus Defence and Space GmbH
No third parties involved

Table 4.2.1: Third parties involved with Airbus Defence and Space GmbH

BHO Legal Rechtsanwälte Partnership
No third parties involved

Table 4.2.2: Third parties involved with BHO Legal Rechtsanwälte Partnership

Deimos Space S.L.U.
No third parties involved

Table 4.2.3: Third parties involved with Deimos Space S.L.U.

High Innovative Remote Observation (HIRO)	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Third party: ESA Task: Quality of the product Reason: An entity external to the project must do the quality tests. Third parties: Intechnic, Llungelizard Task: Web site development Reason: Quick launch of the project professional website. Third party: Bureau Veritas Task: Auditing Reason: External company for auditing and supervising	
Does the participant envisage that part of its work is performed by linked third parties	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)	N

Table 4.2.4: Third parties involved with High Innovative Remote Observation (HIRO)

ICUBE-SERTIT
No third parties involved

Table 4.2.5: Third parties involved with ICUBE-SERTIT

Remote Sensing Application Center (ReSAC)
No third parties involved

Table 4.2.6: Third parties involved with Remote Sensing Application Center (ReSAC)

Thales Alenia Space SAS	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Third parties: Neptec Technologies, Satellite Imaging Corporation Task: Manufacturing of payload sensors Reason: Create sensors with the designed parameters, using high performance industry standards. Third party: Curtis-Wright Solutions Task: Manufacturing of modular system Reason: Use sensor interface specific outsource facilities for manufacturing the modular system.	
Does the participant envisage that part of its work is performed by linked third parties	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)	N

Table 4.2.7: Third parties involved with Thales Alenia Space SAS

VITO nv
No third parties involved

Table 4.2.8: Third parties involved with VITO nv

5 | Ethics and Security

5.1 Ethics

The main ethical concerns that this project may arise are discussed in this section, following the ethics self-assessment provided by the h2020 guidelines.

THIRD COUNTRIES	YES/NO
Does your research involve non-EU countries?	NO
Is it planned to use local resources (*e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.*)?	NO
Is it planned to import any material - including personal data - from non-EU countries into the EU?	NO
Is it planned to export any material - including personal data - from the EU to non-EU countries?	NO

Table 5.1.1: Ethical concerns regarding the participation of non-EU countries in the project.

ENVIRONMENT & HEALTH AND SAFETY	YES/NO
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	NO
Does your research deal with endangered fauna and/or flora / protected areas?	NO
Does your research involve the use of elements that may cause harm to humans, including research staff?	NO

Table 5.1.2: Ethical concerns regarding the potential affectations to the environment, health and safety of the project.

POTENTIAL MISUSE OF RESEARCH RESULTS	YES/NO
Does your research involve have a potential for misuse of research results?	NO

Table 5.1.3: Ethical concerns regarding the misuse of the research results of the project.

The next table includes all the information related with the ethical assessment regarding collecting or processing personal data. First of all, it is important to define the concepts of 'personal data' and 'processing of personal data'. Personal data includes any information about an identified person. 'Processing of personal data' includes all the operations done using personal data of a person.

PERSONAL DATA	YES/NO
Does your research involve personal data collection and/or processing?	NO
Does your research involve further processing of previously collected personal data?	NO

Table 5.1.4: Ethical concerns regarding the collection or processing of personal data.

DUAL USE	YES/NO
Does this research involve dual-use items in the sense of Regulations 428/2009 or other items for which an authorisation is required?	NO

Table 5.1.5: Ethical concerns regarding the dual use of the technology developed in the project.

EXCLUSIVE FOCUS ON CIVIL APPLICATIONS	YES/NO
Could your research raise concerns regarding the exclusive focus on civil applications	NO

Table 5.1.6: Ethical concerns regarding the exclusive focus on civil applications.

The project would be developed in order to offer service to the population, therefore only civil applications are taken into account from our part.

5.2 Security

- Do the activities or results of the project raise any security issue? YES
- Is EU-classified information part of the background or results of the project? YES

6 | Bibliography

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