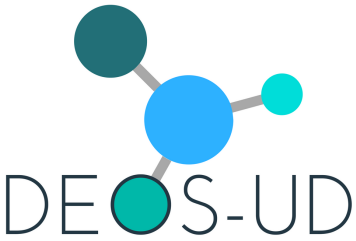

Project DEOS-UD

Disruptive Earth Observation Sensing for Urban Development

Deliverable 1
Project Charter

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Contents

List of Tables

List of Figures

1 Project Charter

1.1 Project Purpose and Justification

Since the first Earth observation (EO) satellite was launched in 1957, the need to gather remote sensed information about planet Earth has been increasing along with its technology. Today, after 60 years, EO has become a key piece of society by providing data for maritime, weather and air quality control together with urban development.

Moreover, modern civilizations are now wanted and required to continue to be developed in sustainable ways and its negative impacts to be controlled and minimized. It is in this area where EO plays a significant role being able to collect data to give awareness as well as to provide information for social well-being and sustainable improvements.

On the other hand, besides the large amount of gathered data and the sophisticated technology used, in the recent years there has been an increasing demand for EO improved technology that allows going further in terms of reliability, size, resolution, efficiency and accuracy along with improved data processing systems with better combined data reliance and capable of give information for a higher number of applications.

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 for data sharing.

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.

Also, 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. 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 Sentinels' 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.

1.1.1 Vision

We are committed to achieving substantial improvements in state-of-the-art EO technologies such as radar and optical systems, leading to a strengthening of Europe's position and competitiveness in this field.

1.1.2 Objectives

The key OBJECTIVES for this project are:

1. Improve EO sensor's 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.

1.1.3 Scope

The SCOPE for this project is:

- State of the art of the current space applications and requirements of the following optical and radar systems:
  - LIDAR
  - Radar
  - Super-spectral
  - Hyperspectral
  - Limb sounders
  - Gravimetry
  - High quantum efficiency photodetectors
  - High precision optical beam scanning and pointing
  - Advanced infra-red technologies
- State of the art of the contributions of current space technologies to urban development.
- Selection of the most promising systems to profit Earth Observation to air composition and terrain analysis.
- Research of the selected systems to determine how can they be improved.
- Development of sensor's preliminary design defining the minimum performance parameters in order to improve the existing technologies.
- Development of a software and interaction platform that treats the collected data and presents the result to its costumers.
- Manufacture of a technology demonstrator by following the preliminary design.
- Testing and validation of the demonstrator in a space simulated environment.
- Design closure of the product.

The following items are considered to be OUT of the SCOPE of this project:

- The launch and deployment of satellites that integrate this new technologies into space.
- The satellites monitoring.
- Communication and transfer of data between the satellite and the ground station.

1.2 Project Description

As stated earlier, the main objective of the project is to enhance the performance of the 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 can they contribute to the sustainable development of cities.

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, treats 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 project is grounded in initiatives such as the Copernicus programme. 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 possible 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.

The different phases that constitute the project are summarized below:

1. STATE OF THE ART

   This phase consists of a search on the state of the art technologies regarding payloads, modular systems and urban development applications of space technologies.

2. PRODUCT DEVELOPMENT

   The product development includes both a preliminary and a final design of the payloads, the modular system and the interaction platform.

3. SIMULATION, TESTING, VALIDATION, AND QUALITY

   This phase includes the manufacturing of a technology demonstrator prototype, the validations of the payloads, the modular system, the interaction platform and the full

system prototype. The quality of the product is also assured.

1.3 High-Level Requirements

1.3.1 Call for proposals requirements

Item	Description
C1	Contribute to the integration of space in society and economy.
C2	Improvement of state-of-the-art technologies in key areas.
C3	Enhancement of capabilities with respect to existing Earth observation missions.
C4	Complementarity with activities already funded by Member States and the European Space Agency
C5	Extend Europe's position in industrial competitiveness in technologies for Earth observation payloads and missions.
C6	Promote industrial cooperation in research actions (including SMEs).
C7	Promote networking between academia and industry, accelerating and broadening technology transfer.

Table 1.3.1: Call of proposal requirements

1.3.2 Technical requirements

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 of the reliability and precision of results compared to current technologies.

Table 1.3.2: Technical requirements

1.4 Acceptance Criteria

The acceptance criteria establish the requirements that must be met for the client to accept the project. These criteria are quantifiable, demonstrable and verifiable in such a way as to demonstrate that the project has been carried out properly, that is why, if these criteria are not met, a deliverable of the project cannot be considered valid.

Item	Description
Management	
Quality	The content of the project documentation must be clear, complete and understandable. Furthermore, it must be well structured, dividing the information into approach, development, and conclusions. All the documentation included in the project must first pass through an inspection of the quality department.
Schedule	The organization must be well structured and the deadlines must be met in a timely manner so that the development of the product is appropriate.
Clarity	The tasks of the project must be well defined, both individually and as a group, in such a way that each of the contributors knows their duty and the duty of their team.

Item	Description
Viability	The project must be viable economically and technically so that its realization is possible. The different parts of the project must be submitted at the individual level to a study that checks if it is possible to do them and, if not, search for an alternative. The budget of the project must comply with the financial requirements of the European Union. Hence, a balance is to be made to ensure that the allowed limit is not exceeded.
Collaboration	It is interesting to obtain a better result to collaborate with legal entities from different countries, like universities and research groups. Moreover, some collaborations with SMEs should be tried, so that they can benefit and grow in the market.
Transparency	In case information about the project is required by part of official organizations of the European Union or by the different stakeholders that participate in it, transparency has to be considered when sharing information.
Legal requirements	The applications and products of this project must have if required, the certification and approval of the different legislative and ethical frameworks.
Technical	
Research and innovation	The project must be ambitious and use all the available resources to obtain the best result. In this way, it must include the most appropriate technology that there is so far and, if it is in the development phase, add a section of research.
Test and validations	The evaluation and validation tests must be carried out periodically and be registered in the project documentation, in such a way that there is a record of the different versions of the application throughout the development. The information of these tests must be presented clearly and refer to the regulations concerned, in addition, to be verifiable. The results of these tests should be used to analyze the service level of the application and improve on later versions.

Item	Description
Technical documents	The application must have a user manual both internally and externally and attach the necessary information for its development. The performance of the final product must be reflected in a data sheet. It must also be included in the documentation the datasheet of the different components that are part of the application.
Performance	
Size	The total volume of the module must not exceed the space allocated to it. Considering that the system can be integrated into several satellites, this volume should not exceed 500 dm^3.
Weight	The system must be light enough to allow it to be put into orbit with ease and not affect the subsequent operation of the satellite in which it will remain during the data collection. In this way and making an estimation of the density of the materials and the maximum volume of the system, a limit weight of 950 kg is defined, which must not be exceeded for the system to be accepted as valid.
Power consumption	Modular system maximum power consumption must be lower than the 50% available onboard.
Accuracy	The accuracy of the equipment should allow the samples to be taken in a way that provides discretized information in the space. Due to the homogeneity of the climatology, the precision for this will be of 1 m^3, whereas in the 3D mapping in which there can be more considerable variations, it will be of 25 cm^3.
Back-up	Back-up system prepared to handle up to two major failures in the system. A major failure can be defined as the loss of a sensor module of the same type.
Transmission velocity	Transmission velocity between modular system and the main satellite communication (SATCOM) system should be able to handle at least 250 Mbit/s of data rate.

Item	Description
Processing time	The time that elapses since the information is captured by the sensors until it is processed and prepared to send to the ground station to be analyzed should not exceed 10 seconds.
Latency	The latency, since the information is prepared in the system located on the satellite to be sent to the ground station until this station is finally processed, should not exceed 300 seconds. The information collected by the system must be available via the Internet in less than 8 minutes. This means that after the processing of information it must be sent in less than 3 minutes for the system to be considered valid.
Social	
Sustainability	The product must be sustainable using renewable energy as much as possible and avoiding excessively polluting emissions. The materials used in the project must be reliable and guarantee the agreed useful life of the product.
Social contribution	The product must be able to solve a current problem and improve the quality of life of people using technology.
Gender equality	The selection process must be fair, based on the knowledge and personal competencies of each person regardless of gender or condition.

Table 1.4.1: Acceptance criteria

1.5 High-Level Risks

Risks allow us to measure the probability of not accomplishing a defined goal and its consequences for the project. Their identification is crucial in order to know in advance the factors that could make the project go wrong.

The determination of the risks is an iterative process because, when the different activities progress through the specified time, new risks or uncertainties can appear. The main structures and departments of the team have to participate in this task in order to spot as many risks as possible. Even stakeholders have to provide additional information and points of view.

The factors that are used in the identification process are: enterprise environmental factors, organizational process assets, the project scope statement and the project management plan.

After analysing these points, risks have been classified in two groups: External risks, which are the ones that our team cannot control, so they are inevitable, and Internal risks, which can be detected in advance and be addressed properly by our own members.

The main identified risks are shown below.

External risks

- **Competitors appearance:** The emergence of other companies that could offer the same product. This could modify the benefits of our company.
- **Delays in external deliverables:** If the products that the company orders do not arrive at the predicted time all the processes can experience a delay, incrementing costs.
- **Economical market issues:** During the period of time that the project is executed, there could be large-scale economic crisis.
- **Exit of a member of the corporation:** For different reasons, a member that had committed to the project could leave it before than expected.
- **Components and raw materials quality:** The ordered equipment or materials could not be in good condition, delaying processes and increasing costs.

Internal risks

- **Delays in deliverables:** The deliverables could not be completed at the time of their corresponding deadlines, leading to an increase of costs and a delay of all the schedule of the project.
- **Cost forecasts are inaccurate:** The financial predictions could be wrong or different issues may occur increasing the total cost of the project.
- **Lack of communication:** The absence of a proper communication method or channel might affect the quality of the product, the fulfilment of the deadlines or a good coordination between members and departments.
- **Lack of technology improvement:** The main goal of the project is to innovate but it could happen that the company did not find the way to improve enough the different technologies.

- **Lack of information:** Discovering new technologies implies working with leading-edge science. It could occur that the team does not have access to the last improvements or patents.
- **Low team motivation:** The team could lose motivation, which would lead the project to take more time and costs to be completed.
- **Unsuccessful quality control:** The quality of some component, product or deliverable may not be as it is expected and established in the acceptance criteria.
- **Lack of responsibilities:** The responsibilities taken by the members of the team or the stakeholders could not be accomplished as expected.
- **Conflicts between members:** There could be a disagreement over the project issues between executive members.
- **Infeasible design:** The design could turn out to be excessively costly or not possible to be built.
- **Technology components have security vulnerabilities:** Security vulnerabilities are unwanted in high-tech projects if some government is interested in using the technology.
- **Organization issues:** The project could be not well organized in terms of timing, activities, etc. and the schedule may be always changing.
- **Stakeholders desertion:** The abandonment of a stakeholder could occur for several reasons, leaving the project without its contribution.
- **Stakeholders conflict:** Different executives of the stakeholders could have a disagreement over the project at an executive level.

When managing risks, both the probability and their consequences have to be considered. During the project, each event will be classified into different types of risks. In a general level, they can be classified into low, moderate and high risks. The following figure represents the classification depending on the probability and the magnitude of impact.

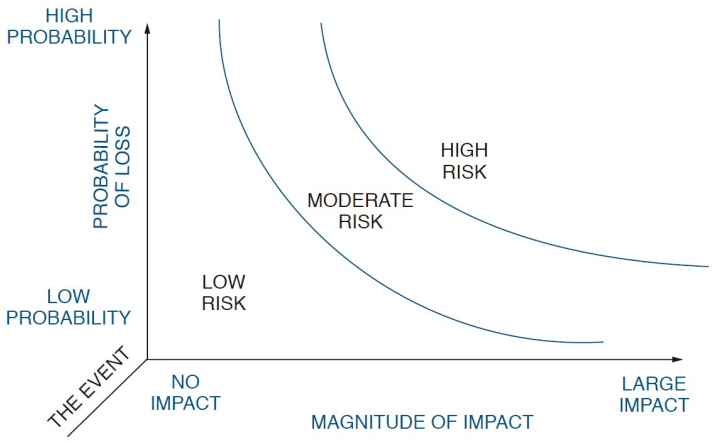


Figure 1.5.1: Overall risk is a function of its components [1].

During the following stages of the project, each risk will be assessed with the Probability and Impact Matrix. It is a tool which allows the team to rate risks on their probability and impact in the project. This gives a quick and clear view of which risk is more important to control.

Probability and Impact Matrix

Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05

Impact (ratio scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization's thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.

Figure 1.5.2: Probability and Impact Matrix [2].

1.6 Project deliverables

t_0 starts with the kick-off meeting date.

Deliverable Name	Description	Estimated due date
Project Management Plan	Document with detailed explanation of the project management strategies, including the Project Charter, stakeholder register, risk, quality and financial plans.	$t_0 + 1$ month
Business Plan	Document containing the market approach details including the selected suppliers and the potential costumers as well as the exploitation strategy.	$t_0 + 1$ month
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).	$t_0 + 1$ month
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.	$t_0 + 2$ month
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.	$t_0 + 4$ month
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.	$t_0 + 6$ month
Payload Preliminary Design	Report determining the payload preliminary design. It contains the research, requirements and preliminary performances parameters of each sensor.	$t_0 + 12$ month

Deliverable Name	Description	Estimated due date
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.	$t_0 + 15$ month
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.	$t_0 + 18$ month
Payload Final Design	Report detailing the final design and technical specifications of each developed sensor.	$t_0 + 22$ month
Modular System Final Design	Report detailing the final design and technical specifications of the modular system.	$t_0 + 26$ month
Sensors Data Fusion Software Report	Report containing the final sensors data fusion software specifications.	$t_0 + 28$ month
Interaction Platform Final Design	Report containing the final design and technical specifications of the interaction platforms.	$t_0 + 30$ month
Data Processing Software Report	Report containing the final data processing algorithms specifications which will allow processing the acquired satellite data.	$t_0 + 33$ month
Validation	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.	$t_0 + 41$ month
Final Report	Final document that includes all the development done through the execution of the project and proper conclusions.	$t_0 + 44$ month

Table 1.6.1: Project Deliverables

1.7 Project milestones

The milestones of the project are shown in Table 1.7.1. It is possible to see that some of them are directly related to the deliverables due to the importance of some of the tasks such as final design and validation.

Milestones Name	Description	Estimated due date
Kick-Off Meeting	First meeting of the project, formation of the development team and first contact with the stakeholders.	t_0 month
Project management plan	Specification of the objectives and scope of the project, organization of the team and distribution of tasks. Stakeholders register and financial, quality and risk plans.	$t_0 + 1$ month
Business plan	Obtaining a potential suppliers list, and negotiating procurement conditions with them, as well as identify and communicate with potential customers.	$t_0 + 1$ month
Communication plan	Development of a website and a social media strategy, as well as looking into participation in meetings and conferences.	$t_0 + 1$ month
State of the art completion	Definition of requirements for the system based on the current state of the art space applications of the payload sensors.	$t_0 + 4$ month
Payload preliminary design	First phase of the design, an optimization of each sensor is done in order to define the preliminary minimum performance parameters.	$t_0 + 10$ month
Modular system preliminary design	Development of the initial parameters of the modular system, as well as the software that will be in charge of the fusion of the sensors data.	$t_0 + 13$ month
Interaction platform preliminary design	Preliminary implementation of the functionalities of the interaction platform.	$t_0 + 16$ month

Milestones Name	Description	Estimated due date
Payload final design	Final design of the entire payload, including the specifications and estimated performance in operation of each sensor.	$t_0 + 23$ month
Modular system final design	Final design of the modular system and the software that will process and register the information received by the payload.	$t_0 + 26$ month
Interaction platform final design	Final design of the interaction platform according to the guidelines established on the preliminary design.	$t_0 + 29$ month
Prototype manufacturing	Manufacturing of the prototype according to the final designs, in order to test its function in the next steps.	$t_0 + 34$ month
Individual systems testing	Performance analysis of each module (payload, modular system, and interaction platform) of the overall system under operational conditions.	$t_0 + 37$ month
Full system testing	Performance analysis of the overall system in operational conditions in order to test the interaction between components.	$t_0 + 41$ month
Project completion	Final report that includes the complete development of the project.	$t_0 + 44$ month

Table 1.7.1: Project Milestones

1.8 Project Objectives

Project Objectives	Success Criteria	Approval Responsible
Scope		
Introduction and demonstration of new technologies, systems and sub-systems for EO	The systems must prove their proper functioning in a relevant environment and be able to provide the user the required data.	Project Manager

Project Objectives	Success Criteria	Approval Responsible
Time		
44 months	After the analysis of project deliverables and project milestones, a period of 44 months seems acceptable. Nevertheless, possible delays may appear during the project development. Hence, proper time-management is necessary to complete the project within the aimed duration.	Project Manager
Cost		
4 million €	The estimated cost of the project is 4M and it is detailed in the next section. Every expense of the project must be controlled and limited to avoid exceeding the budget.	Financial Manager
Quality		
Organised, planned and detailed development with continuous improvement	Elaboration of periodic reports in order to have continuous control over the development of the project. Documentation must be complete, understandable and structured.	Quality Manager

Table 1.8.1: Project Objectives

1.9 Estimated 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 1.9.1 shows the resources required for each stakeholder.

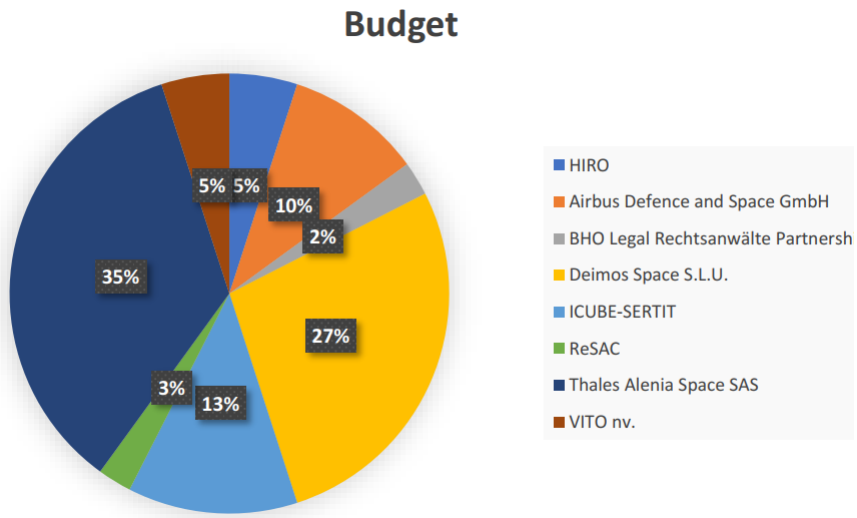


Figure 1.9.1: Percentage breakdown of the project expenses.

The breakdown of the expenses for each organization is shown in more detail in the following tables. Six generic departments are set up for each organization involved: management, engineering, marketing, partnership and networks, contingencies and manufacturing. However, not all the organizations are constituted by all of these departments as each organization has a unique purpose which can make the contributions to departments such as manufacturing inexistent.

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

HIRO	(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
WP1- Management	87,500	6,750	0	23,563	117,813	100	117,813	0
WP2- Engineering	35,000	3,750	2,500	9,688	50,938	100	50,938	0
WP3- Marketing	4,200	750	3,438	1,238	6,188	100	6,188	0
WP4- Partnership and Networks	10,500	2,250	0	3,188	19,375	100	19,375	0
WP5- Contingencies	2,800	1,500	313	1,075	5,688	100	5,688	0
WP6- Manufacturing	0	0	0	0	0	100	0	0
TOTAL	**140,000**	**15,000**	**6,250**	**38,750**	**200,000**		**200,000**	**0**

Table 1.9.2: Cost details in euros for HIRO.

ICUBE-SERTIT	(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
WP1- Management	37,500	39,000	0	19,125	95,625	100	95,625	0
WP2- Engineering	150,000	30,000	0	45,000	225,000	100	225,000	0
WP3- Marketing	12,500	39,000	0	12,875	64,375	100	64,375	0
WP4- Partnership and Networks	31,250	39,000	0	17,563	87,813	100	87,813	0
WP5- Contingencies	18,750	3,000	0	5,438	27,188	100	27,188	0
WP6- Manufacturing	0	0	0	0	0	100	0	0
TOTAL	**250,000**	**150,000**	**0**	**100,000**	**500,000**		**500,000**	**0**

Table 1.9.3: Cost details in euros for ICUBE-SERTIT.

ReSAC	(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
WP1- Management	6,750	8,750	0	3,875	19,375	100	19,375	0
WP2- Engineering	27,000	5,250	0	8,063	40,313	100	40,313	0
WP3- Marketing	3,375	8,750	0	3,031	15,156	100	15,156	0
WP4- Partnership and Networks	6,750	12,250	0	4,750	23,750	100	23,750	0
WP5- Contingencies	1,125	0	0	281	1,406	100	1,406	0
WP6- Manufacturing	0	0	0	0	0	100	0	0
TOTAL	**45,000**	**35,000**	**0**	**20,000**	**100,000**		**100,000**	**0**

Table 1.9.4: Cost details in euros for ReSAC.

Thales Alenia Space SAS	(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
WP1- Management	147,000	70,000	0	54,250	271,250	100	271,250	0
WP2- Engineering	336,000	28,000	0	91,000	455,000	100	455,000	0
WP3- Marketing	84,000	70,000	0	38,500	192,500	100	192,500	0
WP4- Partnership and Networks	84,000	70,000	0	38,500	192,500	100	192,500	0
WP5- Contingencies	42,000	8,400	0	12,600	63,000	100	63,000	0
WP6- Manufacturing	147,000	33,600	0	45,150	225,750	100	225,750	0
TOTAL	**840,000**	**280,000**	**0**	**280,000**	**1,400,000**		**1,400,000**	**0**

Table 1.9.5: Cost details in euros for Thales Alenia Space SAS.

Airbus Defence and Space GmbH	(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
WP1- Management	60,000	18,000	0	19,500	97,500	100	97,500	0
WP2- Engineering	81,000	21,000	0	25,500	127,500	100	127,500	0
WP3- Marketing	4,500	3,000	0	1,875	9,375	100	9,375	0
WP4- Partnership and Networks	11,000	3,000	0	3,500	17,500	100	17,500	0
WP5- Contingencies	3,500	3,000	0	1,625	8,125	100	8,125	0
WP6- Manufacturing	40,000	72,000	0	28,000	140,000	100	140,000	0
TOTAL	**200,000**	**120,000**	**0**	**80,000**	**400,000**		**400,000**	**0**

Table 1.9.6: Cost details in euros for Airbus Defence and Space GmbH.

VITO nv.	(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
WP1- Management	38,250	31,500	0	17,438	87,188	100	87,188	0
WP2- Engineering	29,250	10,500	0	9,938	49,688	100	49,688	0
WP3- Marketing	9,000	10,500	0	4,875	24,375	100	24,375	0
WP4- Partnership and Networks	9,000	14,000	0	5,750	28,750	100	28,750	0
WP5- Contingencies	4,500	3,500	0	2,000	10,000	100	10,000	0
WP6- Manufacturing	0	0	0	0	0	100	0	0
TOTAL	**90,000**	**70,000**	**0**	**40,000**	**200,000**		**200,000**	**0**

Table 1.9.7: Cost details in euros for VITO nv.

BHO Legal Rechtsanwlte Partnership	(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
WP1- Management	45,000	2,500	0	11,875	59,375	100	59,375	0
WP2- Engineering	0	0	0	0	0	100	0	0
WP3- Marketing	0	0	0	0	0	100	0	0
WP4- Partnership and Networks	15,000	1,500	0	4,125	20,625	100	20,625	0
WP5- Contingencies	15,000	1,000	0	4,000	20,000	100	20,000	0
WP6- Manufacturing	0	0	0	0	0	100	0	0
TOTAL	**75,000**	**5,000**	**0**	**20,000**	**100,000**		**100,000**	**0**

Table 1.9.8: Cost details in euros for BHO Legal Rechtsanwlte Partnership.

Deimos Space S.L.U.	(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
WP1- Management	99,000	28,875	0	31,969	159,844	100	159,844	0
WP2- Engineering	198,000	77,000	0	68,750	343,750	100	343,750	0
WP3- Marketing	12,375	9,625	0	5,500	27,500	100	27,500	0
WP4- Partnership and Networks	24,750	38,500	0	15,813	79,063	100	79,063	0
WP5- Contingencies	49,500	67,375	0	29,219	146,094	100	146,094	0
WP6- Manufacturing	111,375	163,625	0	68,750	343,750	100	343,750	0
TOTAL	**495,000**	**385,000**	**0**	**220,000**	**1,100,000**		**1,100,000**	**0**

Table 1.9.9: Cost details in euros for Deimos Space S.L.U.

Many of the budgets assigned have been estimated taking the next table (extracted from the rules under Horizon 2020 and belonging to the Copernicus project) as a reference, by analysing the portion of total budget assigned to the different types of stakeholders.

Participant short name	Funding rate for RTD %	Indirect costs method	RTD/Innovation		Demonstration (50% reimbursement)		Management (100% reimbursement)		Other (100% reimbursement)		Total costs	Requested EU contribution
			Direct costs	Indirect costs	Direct costs	Indirect costs	Direct costs	Indirect costs	Direct costs	Indirect costs		
University A	75	60%	531.250	318.750			175.000	105.000	156.250	93.750	1.380.000	1.167.500
Foundation B	50	20%	625.000	125.000	58.334	11.666			144.896	28.979	993.875	771.375
University C	75	Simplified	481.000	240.500	26.667	13.333			133.334	66.666	961.500	761.125
SME D	75	60%	281.250	168.750	140.625	84.375			43.750	26.250	745.000	520.000
Enterprise E	50	Real	270.270	229.730	162.162	137.838			54.054	45.946	900.000	500.000
SME F	75	Real	390.000	310.000	61.289	48.711			111.433	88.567	1.010.000	780.000
		Total	2.578.770	1.392.730	449.077	295.923	175.000	105.000	643.717	350.158	5.990.375	4.500.000

Figure 1.9.2: Factsheet. Rules under Horizon 2020.

HIRO

HIRO will have as main task the coordination and project management as well as part of research and innovation. For these reasons a 5% budget allocation is decided. Of these 200.000€, most of it is assigned to personnel costs and the rest to other direct costs, indirect costs and a small part to subcontracting for tasks where University department cannot work on.

Airbus Defence and Space GmbH

Airbus Defence and Space GmbH is assigned a 10% of the overall budget, summing a total of 400.000€, a very important part of it dedicated to personnel costs and another important part to other costs derived from the design, development and manufacturing of sensors, communication systems and other components.

BHO Legal

BHO Legal Rechtsanwälte Partnership, as part of the legal and regulatory advisers, and specialised in industry and research institutions, is assigned a 2,5% corresponding to 100.000€, of which the vast majority is for personnel expenses.

Deimos Space S.L.U

Deimos is together with Thales Alenia Space SAS the main industrial partner focused on design, engineering, development and manufacturing of solutions for the aerospace sector. Deimos is responsible for technology implementation in many sectors, from telecommunications to the space sector. Its involvement in many other space projects and the experience and technology available makes Deimos a relevant company for the project when it comes to development and manufacturing. For this reason a total of 1.100.000€ (27,5%) is allocated, with a distribution of 385.000€ to other direct costs, which includes manufacturing, and the rest to personnel costs.

ICUBE-SERTIT

A university-like budget assignation has been decided according to the nature of this stakeholder and its strong links to research and development entities. Thus, a 12,5% of the total budget estimated has been assigned to ICUBE-SERTIT; this means 500.000€ out of 4 million.

Inside ICUBE-SERTIT, given the strong scientific component of the stakeholder, the vast majority of the budget will be assigned to the direct personnel costs of the engineering department (60%). An 8% will be assigned to contingencies and the rest will be approximately equally assigned in between management, marketing and partnership & networks departments.

ReSAC

ReSAC is an SME based in Bulgaria that facilitates implementation and use of remote sensing applications as well as geographic information systems (GIS). Given that it is a small company, a 2,5% of the budget has been assigned to it, a 60% of which will be assigned to the engineering department, management and partnership & networks will be assigned a 15% each and the rest will be distributed in between marketing and contingencies departments.

Thales Alenia Space SAS

Being Thales a multinational specialised in space and aerospace systems and thus being technologically very developed compared to other stakeholders in terms of research, manufacturing and engineering, a total of 1.400.000€ of the total budget has been assigned to it (which represents a 35% of the total budget).

Inside Thales departments, the heaviest weight of the budget has been assigned to the engineering department (40% or 336.000€) given the technological nature of the company. Nevertheless, relatively close behind are the management and the manufacturing departments which receive a 17,5% of the budget each (147.000€). Marketing and partnership & networks departments get a 10% of the budget each and contingencies department gets the rest of the total budget in terms of direct personnel costs.

VITO

VITO is a data provider and sensor researcher and developer, and thus it has been assigned a lower percentage of the budget due to the lack of manufacturing processes that carry behind the need for raw materials or factories. A 5% of the total budget (200.000€) has been assigned to it. Inside VITO's, the majority of the budget is shared between the management and the engineering departments given the strong presence of both components in their daily operations.

1.10 Project organization

1.10.1 Customers

The following customers are defined for this project.

Customer group	Customer representative
CGG: NPA Satellite Mapping Ltd	Jean-Georges Malcor - Chief Executive officer
CloudEO AG	Dr. Manfred Krischke - Co-Founder and CEO
Esri BeLux	Frederik Waûnters - Manager
European Space Agency (ESA)	Lionel Hernandez - Station manager in Spain
Eurosense	André Jadot - CEO
Geomatrix UAB	Gedas Vaitkus - Company Manager
Harris	Ed Zoiss - Electronic Systems
Insar	Martin Leško - Cartography expert
Noveltis	Jeff Vinuesa -Business Unit Manager
SpaceBel	Bernard Plano - International business development
Walphot	Yves Reginster - Account manager

Table 1.10.1: List of customers

1.10.2 Stakeholders

The stakeholders of the project will be classified depending on its role/responsbility. The possible roles and responsibilities are shown in Table 1.10.2.

Roles/Responsibilities	Definition
Interested	Entity with interest in the project or its result without the authority to contribute in it.
Competitor	Entity with similar interest as the ones of the present project without authority to contribute in it but with the probability of working in the same field in other projects.
Consortium member	Entity interested in the project that will actively collaborate in its elaboration as a partner.
Customer	Entity with interest in the results of the project and with authority to request updates and propose modifications.
Investor	Entity that will support the project financially. It has interest in the project and the authority to request updates and propose modifications.

Table 1.10.2: Definition of roles and responsibilities of stakeholders

The key stakeholders in this project are the ones shown in Table 1.10.3.

Stakeholder Name	Roles/Responsibilities
ACRI-ST SAS	Interested
Agroapps PCC	Interested
Air and Space Evidence	Interested
Airborne technologies	Competitor
Airbus Defence and Space GmbH	Consortium member
AnsuR Technologoes	Competitor
Assimila	Interested
Balam Ingeniería de Sistemas	Competitor
BHO Legal Rechtsanwälte Partnership	Consortium member
CGG: NPA Satellite Mapping Ldt	Customer
CloudEO AG	Customer
Deimos Space S.L.U.	Consortium member
DHI-GRAS	Potential customer
Esri BeLux	Customer
European Association of Remote Sensing Companies (EARSC)	Interested
European Comission	Main investor and customer
European Council	Regulation
European Space Agency (ESA)	Customer
Eurosense	Customer
Exelis	Customer
Flyby	Competitor
GAF AG	Competitor
GEOMATRIX UAB	Customer
GEOSYSTEMS	Interested
GISAT	Competitor
Harris	Customer
High Innovative Remote Observation (HIRO)	Consortium member
ICUBE-SERTIT	Consortium member
Insar	Customer
Non-European space agencies	Competitors
Noveltis	Customer
Remote Sensing Application Center (ReSAC)	Consortium member
Space applications services NV/SA	Interested
SpaceBel	Customer
Telspazio	Interested
Thales Alenia Space SAS	Consortium member
VITO nv	Consortium member
Walphot	Customer

Table 1.10.3: List of stakeholders, roles and responsibilities

1.10.3 Roles and responsibilities

The following key roles have been defined for this project:

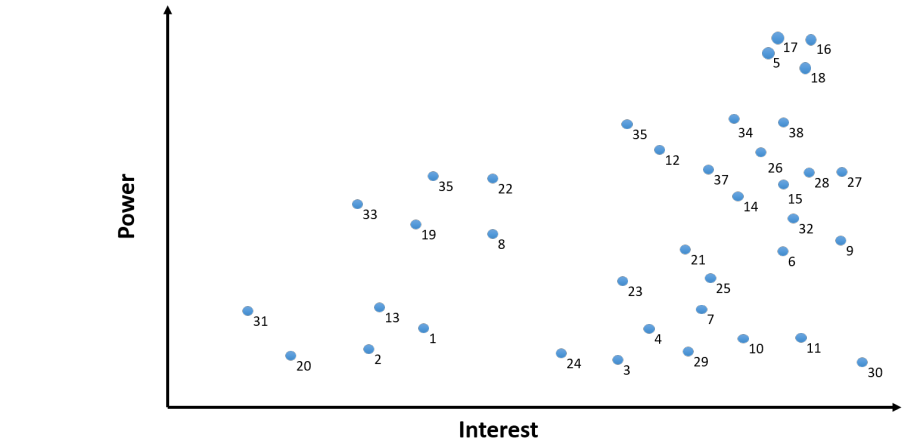
Role	Resource Name	Organization	Responsibilities
Project Sponsor	Luís Manuel Pérez Llera	European Commission	Supervise the project.
Project Manager	Pol Fontanes Molina	HIRO	Manage the project.
Project Secretary	Sílvia González García	HIRO	Administrate the internal documents and information of the group.
Financial Manager	Santiago Lopezbarrena Arenas	HIRO	Estimate and control the costs of the project.
Stakeholders & Procurement Manager	Eva María Urbano González	HIRO	Identify the stakeholders of the project and manage and control their engagement. Plan, conduct and control the procurements of the project.
Scope & Time Manager	Marina Pons Daza	HIRO	Define and control the scope and deadlines of the project.
Risk Manager	Borja Calderón Rosario	HIRO	Identify and manage the possible risks of the project.
Quality Manager	Guillermo Escartín Vivancos	HIRO	Control that the quality requirements of the project are met.
Technical Managers	David Pérez Sánchez, Hamza Nachett, Laura Pla Olea	HIRO	Analyse and control the technical aspects of the project.
Marketing & Communications Managers	Albert Herrando Moraira, María De Benedicto Barba	HIRO	Promote the project and its final product. Search for possible customers. Ensure communication between the different members of the group.
Research & Development assessor	Matthew Perren	Airbus Defence and Space GmbH	Collaboration in the research and production of satellite sensors.

Role	Resource Name	Organization	Responsibilities
Legal & Business Assessor	Oliver Heinrich	BHO Legal Rechtsanwälte Partnership	Business and legal advice.
Research & Development Assessor	Ismael López	Deimos Space S.L.U.	Design and development of satellite sensors and systems.
Application collaborator	Jean-François Rapp	ICUBE-SERTIT	Advice in the application of data provided by EO satellites.
Application collaborator	Vessela Samoungi	Remote Sensing Application Center (ReSAC)	Advice in the application of remote sensing and geographic information systems (GIS) to be used for land cover, land use and urban planning.
Development & Testing collaborator	Philippe Keryer	Thales Alenia Space SAS	Design, development, integration and testing of space systems.
Development & Application collaborator	Steven Krekels	VITO nv	Advice in the use of remote sensing for land use. Development of new remote sensing systems, sensors and platforms.

Table 1.10.4: Roles and responsibilities

2 Stakeholder identification

2.1 Stakeholder analysis graphic



1 ACRI-ST SAS
2 Agroapps PCC
3 Air and Space Evidence
4 Airborne technologies
5 Airbus Defence and Space
6 AnsuR Technologies
7 Assimila
8 Balam Ingeniería de Sistemas
9 BHO Legal Rechtsanwälte Parnership
10 CGG: NPA Satellite Mapping Ldt
11 CloudEO AG
12 Deimos Space SLU
13 DHI-GRAS
14 EARSC
15 Esri BeLux
16 European Comission
17 European Council
18 ESA
19 Eurosense
20 Exelis
21 Flyby
22 GAF AG
23 GEOMATRIX UAB
24 GEOSYSTEMS
25 GISAT
26 Harris
27 HIRO
28 ICUBE-SERTIT
29 Insar
30 Non-european space agencies
31 Noveltis
32 ReSAC
33 Space applications svs
34 SpaceBel
35 Telespazio
36 Thales Alenia Space
37 VITO nv
38 Walphot

Figure 2.1.1: Stakeholder analysis graphic

2.2 Stakeholder register

Name	Role	Contact Information	Requirements	Expectations	Influence	Classification
Airbus Defence and Space GmbH	Consortium member	*+33 562194040*	Innovation in optical sensors and the development of their technology	Obtain new knowledge in optical sensors and in the technology to develop them	Manage closely	Internal/ Supporter
High Innovative Remote Observation (HIRO)	Consortium member	*+34 677261221*	Integration of new EO technologies into the Copernicus Programme	Develop the project	Manage closely	Internal/ Main participant
BHO Legal Rechtsanwälte Partnership	Consortium member	*+49 2212709560* *cologne@bho-legal.com*	Wide legal knowledge	Legal issues management	Manage closely	Internal/ Supporter
Deimos Space S.L.U.	Consortium member	*+34 918063450* *info@elecnor-deimos.com*	Innovation in EO technology	Develop new technology for EO	Manage closely	Internal/ Supporter
ICUBE-SERTIT	Consortium member	*+33 368854645* *sertit@icube.unistra.fr*	Innovation in urban planning	Develop new solutions for urban planning using EO	Manage closely	Internal/ Supporter
Remote Sensing Application Center (ReSAC)	Consortium member	*+359 29800731* *resac@techno-link.com*	Innovation in urban planning	Develop new solutions for urban planning using EO	Manage closely	Internal/ Supporter
Thales Alenia Space SAS	Consortium member	*+33 157778000*	Innovation in EO technology	Develop new technology for EO	Manage closely	Internal/ Supporter

Name	Role	Contact Information	Requirements	Expectations	Influence	Classification
VITO nv	Consortium member	*+32 14335511*	Innovation in optical sensors and their possible uses	Obtain new knowledge in optical sensors and develop new uses for urban planning	Manage closely	Internal/ Supporter
European Council	Regulation	*+32 22816111*	Provide the legal environment for the development of the project	Fulfil the regulations and laws	Keep informed	External/ Supporter
European Comission	Main investor and customer	*+32 22999696*	Provide funding for the project	Evaluate the viability of the project	Manage closely	Internal/ Supporter
CGG: NPA Satellite Mapping Ldt	Customer	*www.cgg.com /en/What-We-Do/GeoConsulting/NPA*	-	Invest in a profitable project	Keep informed	External/ Influencer
CloudEO AG	Customer	*+49 89206021166* *info@cloudeo-ag.com*	-	Invest in a profitable project	Keep informed	External/ Influencer
DHI-GRAS	Customer	*+45 45169100* *gras@dhigroup.com*	-	Invest in a profitable project	Keep informed	External/ Influencer
Esri BeLux	Customer	*+32 24607480* *info@esribelux.com*	-	Invest in a profitable project	Keep satisfied	External/ Influencer
European Space Agency (ESA)	Customer	*+33 153697654*	-	Invest in a profitable project	Keep satisfied	External/ Influencer

Name	Role	Contact Information	Requirements	Expectations	Influence	Classification
Eurosense	Customer	*+32 24607000* *info@eurosense.com*	-	Invest in a profitable project	Keep informed	External/ Influencer
Exelis	Customer	*1-855-477-4272*	-	Invest in a profitable project	Keep satisfied	External/ Influencer
GEOMATRIX UAB	Customer	*www.geomatrix.lt/cms/index.php*	-	Invest in a profitable project	Keep informed	External/ Influencer
Harris	Customer	*1-855-477-4272*	-	Invest in a profitable project	Keep satisfied	External/ Influencer
Insar	Customer	*+421 233006847* *matusbakon@insar.sk*	-	Invest in a profitable project	Keep informed	External/ Influencer
Noveltis	Customer	*+33 0562881111* *contact@noveltis.fr*	-	Invest in a profitable project	Keep informed	External/ Influencer
SpaceBel	Customer	*+32 43618111*	-	Invest in a profitable project	Keep satisfied	External/ Influencer
Walphot	Customer	*+32 81302401* *info@walphot.com*	-	Invest in a profitable project	Keep satisfied	External/ Influencer
Airborne technologies	Competitor	*+43 2622347182 00* *office@airbornetechnologies.at*	-	Be a profitable project	Monitor	External/ Reluctant

Name	Role	Contact Information	Requirements	Expectations	Influence	Classification
AnsuR Technologoes	Competitor	*+47 64009456* *contact@ansur.no*	-	Failure of the project	Monitor	External/ Reluctant
Balam Ingeniería de Sistemas	Competitor	*info@balamis.com*	-	Failure of the project	Monitor	External/ Reluctant
Flyby	Competitor	*+39 0586505016* *info@flyby.it*	-	Failure of the project	Monitor	External/ Reluctant
GAF AG	Competitor	*+49 891215280* *info@gaf.de*	-	Failure of the project	Monitor	External/ Reluctant
GISAT	Competitor	*+42 271741935* *gisat@gisat.cz*	-	Failure of the project	Monitor	External/ Reluctant
Non-European space agencies	Competitors		-	Failure of the project	Monitor	External/ Reluctant
ACRI-ST SAS	Interested	*+33 492967500* *information@acri-st.fr*	-	Get interesting information about project updates	Keep informed	External/ Neutral
Agroapps PCC	Interested	*+30 2310253810* *info@agroapps.gr*	-	Get information about the project	Keep informed	External/ Neutral
Air and Space Evidence	Interested	*+44 7860473172*	-	Get information about the project	Keep informed	External/ Neutral
Assimila	Interested	*info@assimila.eu*	-	Get information about the project	Keep informed	External/ Neutral

Name	Role	Contact Information	Requirements	Expectations	Influence	Classification
European Association of Remote Sensing Companies (EARSC)	Interested	*info@earsc.org*	-	Get information about the project	Keep informed	External/ Neutral
GEOSYSTEMS	Interested	*+48 228511166* *office@geosystems.pl*	-	Get information about the project	Keep informed	External/ Neutral
Space applications services NV/SA	Interested	*+32 27215484* *info@spaceapplications.com*	-	Get information about the project	Keep informed	External/ Neutral
Telspazio	Interested	*+39 08353751* *info@e-geos.it*	-	Get information about the project	Keep informed	External/ Neutral

Table 2.2.1: Stakeholder register

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