



Project DEOS-UD

Disruptive Earth Observation Sensing for Urban Development

Deliverable 1 Project Charter

Authors:

Calderón Rosario, Borja
De Benedicto Barba, Maria
Escartín Vivancos, Guillermo
Fontanes Molina, Pol
Franch I Ruiz, Sergi
González García, Sílvia
Herrando Moreira, Albert
Lopezbarrena Arenas, Santiago

Nachett, Hamza
Pérez Sánchez, David
Pla Olea, Laura
Pons Daza, Marina
Ramón Costa, Fernando
Sellart Combalia, Ana Maria
Serra Moncunill, Josep Maria
Urbano González, Eva María

Tutor: Pérez Llera, Luís Manuel

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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 in 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.

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. |

| Item | Description |
|------|---|
| 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 are important to define the performance requirements and the essential conditions that the deliverables of the project must attain. They are quality parameters and

their fulfilment indicates that the client's needs have been accomplished.

| Item | Description |
|-------------------------|---|
| 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. |
| Quality | <p>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.</p> <p>All the documentation included in the project must first pass through an inspection of the quality department.</p> |
| Test and validations | <p>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.</p> <p>The information of these tests must be presented clearly and refer to the regulations concerned, in addition to be verifiable.</p> <p>The results of these tests should be used to analyze the service level of the application and improve on later versions.</p> |
| Technical documents | <p>The application must have a user manual both internally and externally and attach the necessary information for its development.</p> <p>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.</p> |
| Viability | <p>The project must be viable economically and technically, so that its realization is possible.</p> <p>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.</p> <p>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.</p> |

| Item | Description |
|--------------------|--|
| Performance | The systems used in the project must be able to guarantee the right functioning of the application. An important aspect of the project is its performance, in this way, as it progresses, it aims to increase the efficiency and quantify this increase in the different phases. |
| 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 organisations 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. |

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.

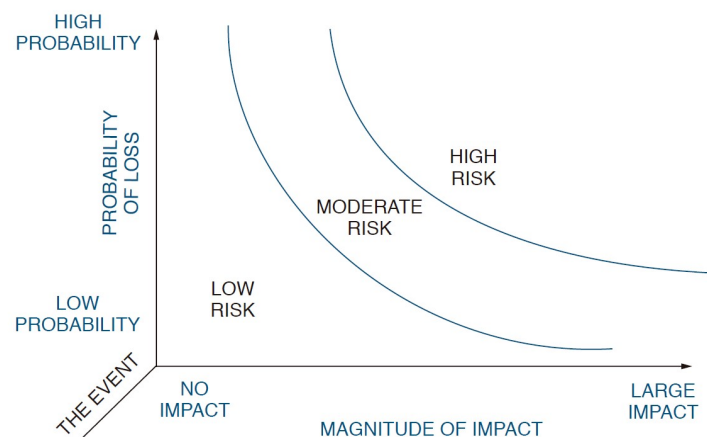


Figure 1.5.1: Overall risk is a function of its components [1].

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 detailing the market approach, including the selected suppliers, the identified costumers and the exploitation strategy. | $t_0 + 1$ month |

| Deliverable Name | Description | Estimated due date |
|---------------------------|---|--------------------|
| 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 |
| State of the art report | Report detailing the current state of the art and the study of requirements for each system of the project. | $t_0 + 4$ month |
| Preliminary design report | Report determining the preliminary performance parameters of each sensor, as well as the technology necessary for the overall system. | $t_0 + 16$ month |
| Mid-term project report | Document used to check the current state of the project, in order to inform all the participants, including the stakeholders, of the progress. | $t_0 + 22$ month |
| Final design report | Report detailing the final design and technical specifications of each sensor developed, the software of the system and the interaction platform. | $t_0 + 29$ month |
| Validation report | Report gathering the results obtained from the fabrication and testing of all the payload sensors, the modular system and the interaction platform, as well as the full system testing. | $t_0 + 41$ month |
| Final report | Final document delivered, that includes all the development done through the execution of the project. | $t_0 + 44$ month |

Table 1.6.1: Project Deliverables

1.7 Project milestones

| 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, the organization of the team and the distribution of tasks, a stakeholders register and a 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 identifying and communicating 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 |

| Milestones Name | Description | Estimated due date |
|---|--|--------------------|
| Interaction platform preliminary design | Preliminary implementation of the functionalities of the interaction platform, such as the machine learning algorithms. | $t_0 + 16$ month |
| Payload final design | Final design of the entire payload (sensors), 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 |
| 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.

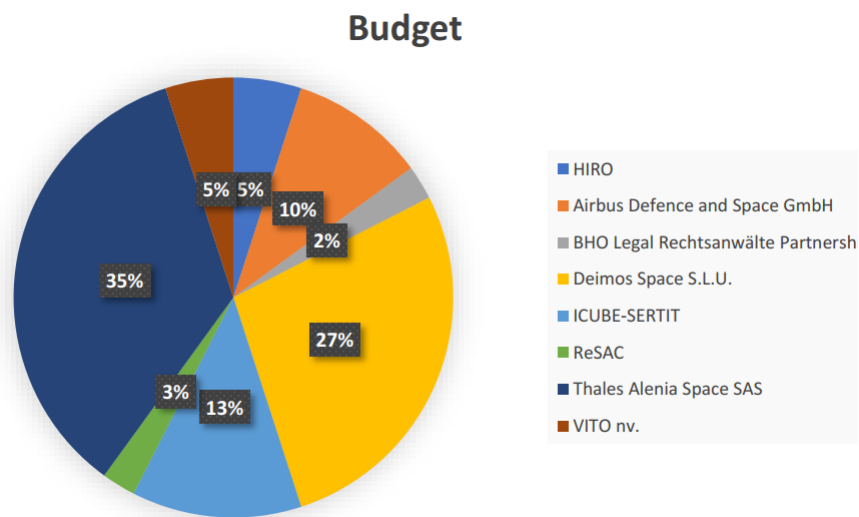


Figure 1.9.1: Percentage breakdown of the project expenses.

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 costs | Personnel | (B) Other Direct Costs | (C) Direct costs of sub-contracting | (F) Indirect costs | (H) Total estimated eligible costs | (I) Reimbursement 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 costs | Personnel | (B) Other Direct Costs | (C) Direct costs of sub-contracting | (F) Indirect costs | (H) Total estimated eligible costs | (I) Reimbursement 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 costs | Personnel | (B) Other Direct Costs | (C) Direct costs of sub-contracting | (F) Indirect costs | (H) Total estimated eligible costs | (I) Reimbursement 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) Reimbursement 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) Reimbursement 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) Reimbursement 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) Reimbursement 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 Rechtsanwlt Partnership | (A) Direct Personnel costs | (B) Other Direct Costs | (C) Direct costs of sub-contracting | (F) Indirect costs | (H) Total estimated eligible costs | (I) Reimbursement 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 Rechtsanwlt 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) Reimbursement 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/responsibility. 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 Technologies | Competitor |
| Assimila | Interested |
| Balam Ingeniería de Sistemas | Competitor |
| BHO Legal Rechtsanwälte Partnership | Consortium member |
| CGG: NPA Satellite Mapping Ltd | 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 Commission | 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

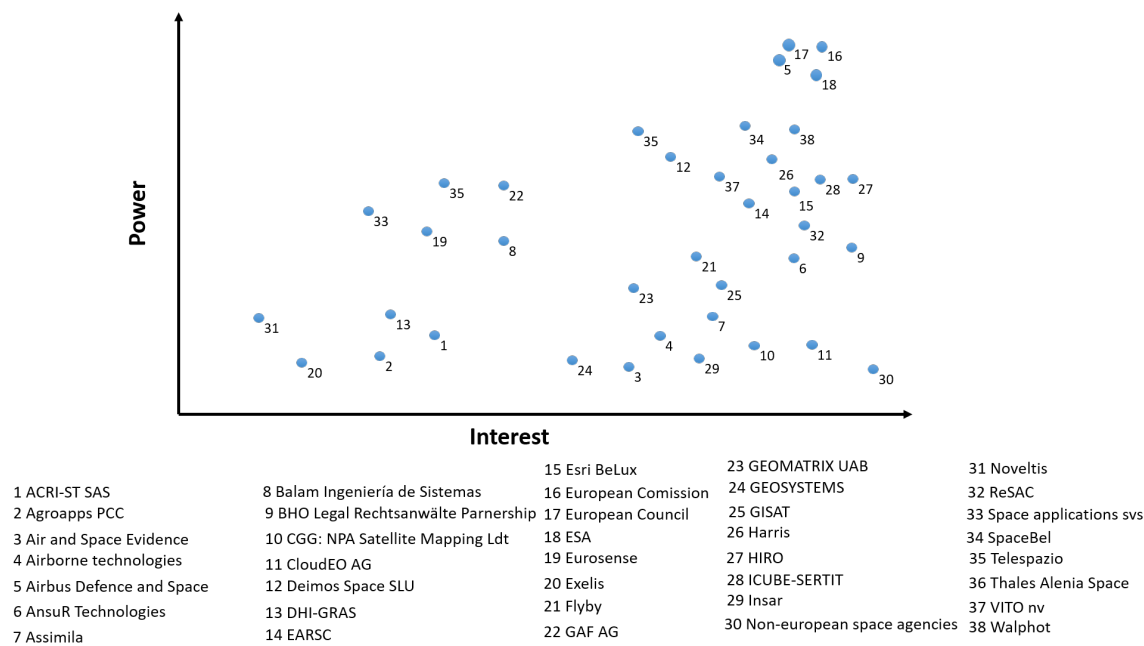


Figure 2.1.1: Stakeholder analysis graphic

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 Partnerschaft | 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@eurosen se.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.geomat rix.lt/cms/in dex.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@nov eltis.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@airbo rnettechnolog ies.at | - | Be a profitable project | Monitor | External/ Reluctant |

| Name | Role | Contact Information | Requirements | Expectations | Influence | Classification |
|------------------------------|-------------|--|--------------|---|---------------|------------------------|
| AnsuR Technologies | 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 | <i>info@earsc.org</i> | - | Get information about the project | Keep informed | External/Neutral |
| GEOSYSTEMS | Interested | <i>+48 228511166</i> <i>office@geosystems.pl</i> | - | Get information about the project | Keep informed | External/Neutral |
| Space applications services NV/SA | Interested | <i>+32 27215484</i> <i>info@spaceapplications.com</i> | - | Get information about the project | Keep informed | External/Neutral |
| Telspazio | Interested | <i>+39 08353751</i> <i>info@e-geos.it</i> | - | Get information about the project | Keep informed | External/Neutral |

Table 2.2.1: Stakeholder register

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