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PREFACE

In 2022, a European Consortium[1] has been selected by the European Commission to implement the project *"Instantaneous Infrastructure Monitoring by Earth Observation" (IIMEO)*. The project is funded by the European Union under the Horizon Europe programme as an innovation action with €2.8 million and runs until 30 November 2025. It aims to develop and demonstrate key technologies for the global monitoring of critical infrastructures from space in near real time. A pilot application will be the monitoring of railway lines.[2]

"Energy supply, communications, transportation – our globalised society is highly dependent on functioning infrastructures. Typical examples are roads and railway lines, but also water pipelines, data cables and power lines," explains OHB project coordinator Daro Krummrich. "Just how critical these infrastructures are for daily life becomes particularly apparent when disruptions occur. These can be caused by natural disasters, extreme weather events or deliberate manipulation. In order to be able to restore the functionality of critical systems promptly after an incident, it is important to quickly gain an overview of the overall situation. This is why IIMEO is about detecting infrastructure malfunctions automatically, across large areas and in near real time, regardless of local weather and lighting conditions."
To this end, a satellite system is to be developed within the framework of the project. The intended use case calls for the principles of New Space: Since global coverage and revisit times of less than one hour are required for infrastructure monitoring, the project partners assume that a suitable constellation in low Earth orbit (500 to 900 kilometers altitude) will consist of at least 24 small satellites. Synthetic Aperture Radar (SAR) imaging radar instruments are to be used as payloads, which will be supplemented by sensors for the wavelength range of visible light (VIS). This will enable high-resolution images to be generated even at night and under heavy cloud cover.

Figure 1: Schematic of IIMEO's objectives

Another focus of the project is the development of algorithms. Since continuous global monitoring of infrastructure with SAR and VIS sensors produces gigantic amounts of data, it is necessary that these are already processed on board the satellites. This is to avoid the data downlink being a bottleneck in the system. Davide Di Domizio, Research Programme Administrator at the European Health and Digital Executive Agency (HaDEA) and in charge of IIMEO, explains: "In 2022, the Horizon Europe work programme set the ambitious goal of demonstrating the performance of key technologies for future Earth observation systems by 2028. With the development of the planned on-board data processor, IIMEO is well positioned to make an important contribution to this mission."

Once the development phase is complete, all relevant key technologies will initially be combined into an airborne technology demonstrator. The goal of the flight campaign planned for 2025 is to demonstrate the end-to-end prototype downstream service, including on-board data processing. The automated detection of obstacles on railway tracks is to serve as an example application. The national company for the management of railway infrastructure in Serbia was won as a cooperation partner and pilot user. Slobodan Rosić, Serbian Railway Infrastructure Risk Manager, points out: "A satellite-based automatic monitoring system makes it possible to collect high-quality information about the condition of the infrastructure in real time without having to interrupt regular traffic and without the need for personnel on site." The next demonstration mission, currently planned for 2026 and 2027, will go one step further: it will demonstrate that the system developed in the course of IIMEO is also suitable for the global monitoring of railway lines from space.

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[1] The project is being coordinated by *OHB Digital Connect GmbH* (OHBDC), a subsidiary of space and technology group OHB SE. *Antwerp Space N.V.* (AWS) brings its expertise to the on-board data processor. The *Institut für angewandte Systemtechnik Bremen GmbH* (ATB) brings its expertise in the implementation of european projects and the definition and management of requirements. The *Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V.* (Fraunhofer / FHR) brings its expertise on SAR-data acquisition and processing. The *Fondazione Brunno Kessler* (FBK) brings its expertise on real-time capable fully automated detection methods based on AI. The *Univerzitet U Nis* (NIS) brings its expertise on railways and fully automated detection methods based on AI.

[2] LinkedIn: https://www.linkedin.com/company/iimeo-europe/

Table of Contents

PREFACE 1

1 INTRODUCTION 3

2 PROJECT WEBSITE 4

2.1 Structure 4
2.1.1 Landing page 4
2.1.2 Objectives 5
2.1.3 Library 7
2.1.4 News 8
2.1.5 About us 9
2.1.6 Contact 10
2.1.7 Implementation 10

3 PROJECT PRESENTATION 11

4 BROCHURE 12

1 INTRODUCTION

This deliverable contains and describes the initial release version of the IIMEO public project website as well as project-related communication material that has been created as part of the project's communication kit to address the general audience and interested stakeholders, i.e. a brochure/leaflet and a project presentation. The presented versions demonstrate and promotes the project vision, designed to reflect the advancements and future plans of the project.

The main objectives of the presented communication material is to

- build the project's visual identity
- raise awareness about the project and promote user involvement
- communicate the project's findings, outcomes and best practices
- create the link to the project's social media channels

2 PROJECT WEBSITE

Web presence is the central element in the dissemination activities of the IIMEO project. This document describes the structure, the content and the update process for the IIMEO website. The website is published at www.iimeo.eu, a first version of the website was made publicly available at M4.

2.1 Structure

The structure of the website is presently divided into the following main headings.

2.1.1 Landing page

The landing page frames the larger IIMEO project vision and describes the high-level project objectives. It is structured into different sections with corresponding images, trying to provide an intriguing perspective to the website visitors about the content and objectives of the project, as well as latest activities. In the footer (this happens in all sections), informs to the reader that the project is funded by the European Commission's Horizon Europe programme and contains the appropriate EU logo.

Figure 2: Landing Page

2.1.2 Objectives

The objective page contains a list of the main objectives and technologies that we want to achieve during the project lifetime.

Figure 3: Objectives Page

Figure 4: Technology Description Example

2.1.3 Library

The library contains a list with downloadable material that has been published by the project (e.g. promotional material, public deliverables).

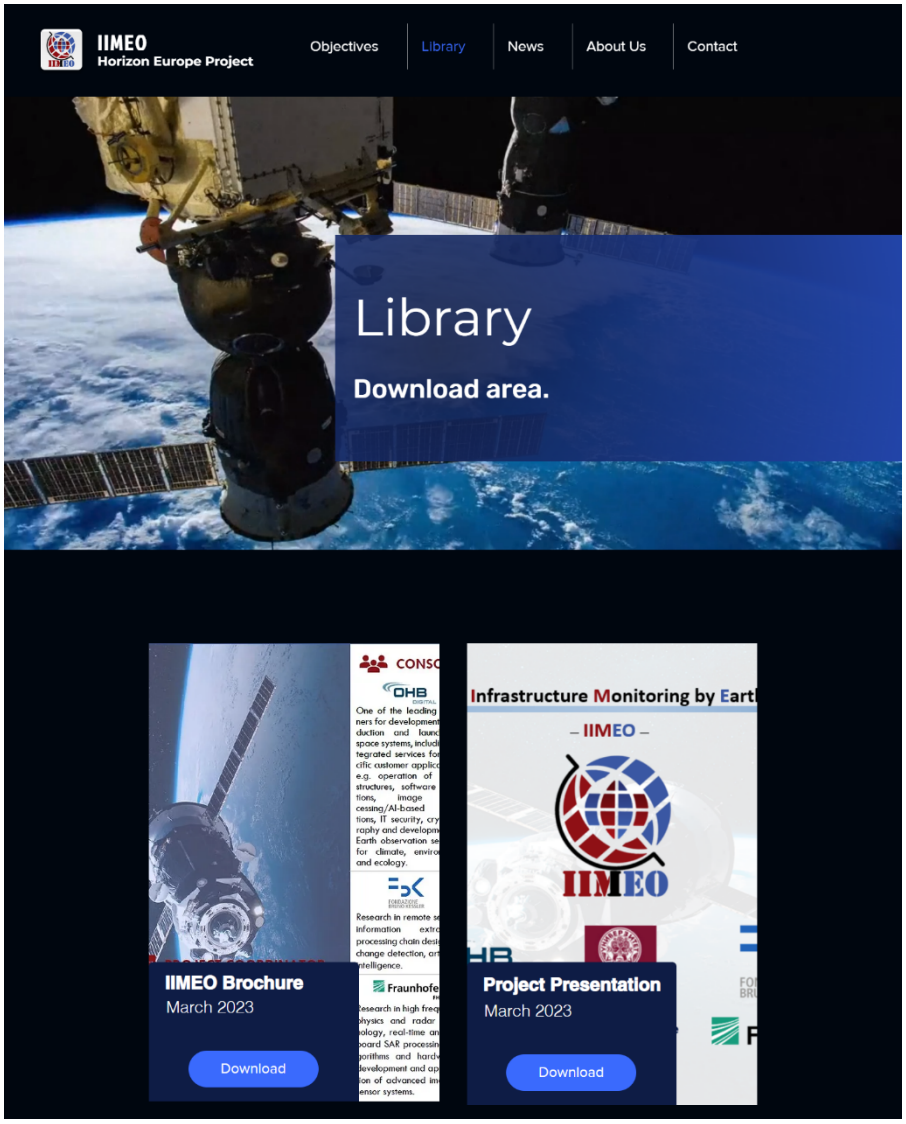


Figure 5: Library Page

2.1.4 News

The news page currently monitors all important and recent developments related to the project. Moving forward, there is potential for a more advanced magazine to be introduced, which could cover a variety of topics related to the project through a range of engaging stories.

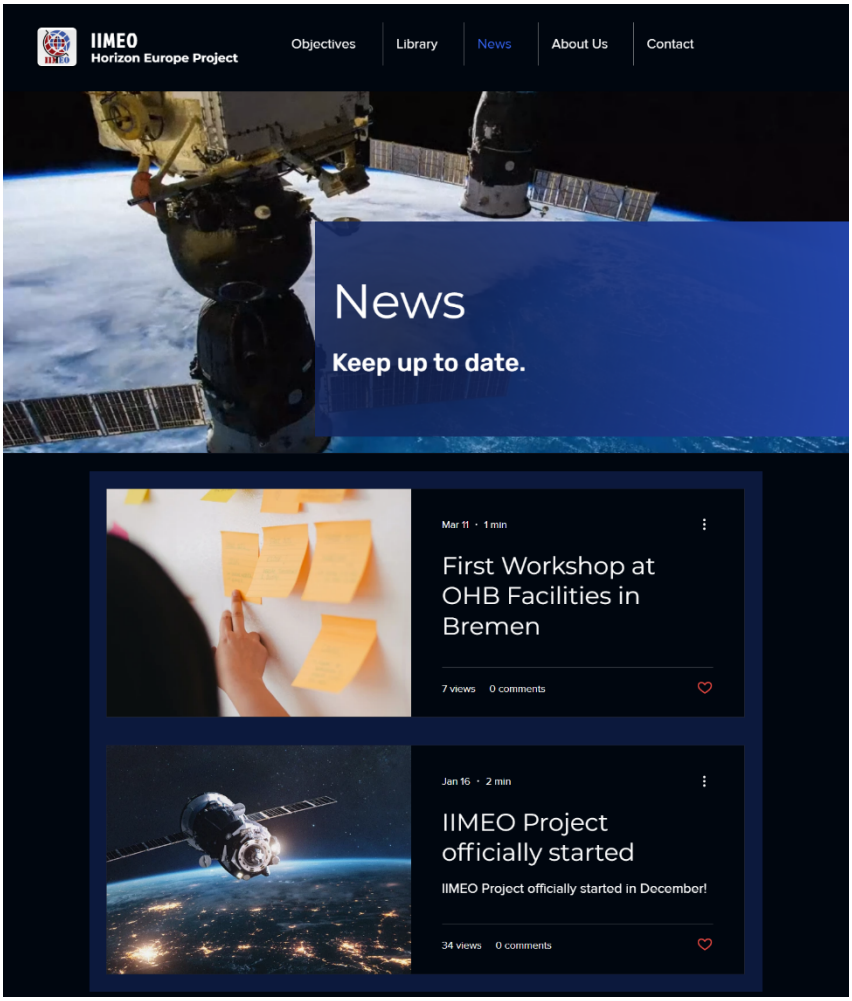


Figure 6: News Page

2.1.5 About us

The About us page presents the complete list of partners and links to their institutional websites as well as introduces the key individual contributors to the project via short biographical sketches.

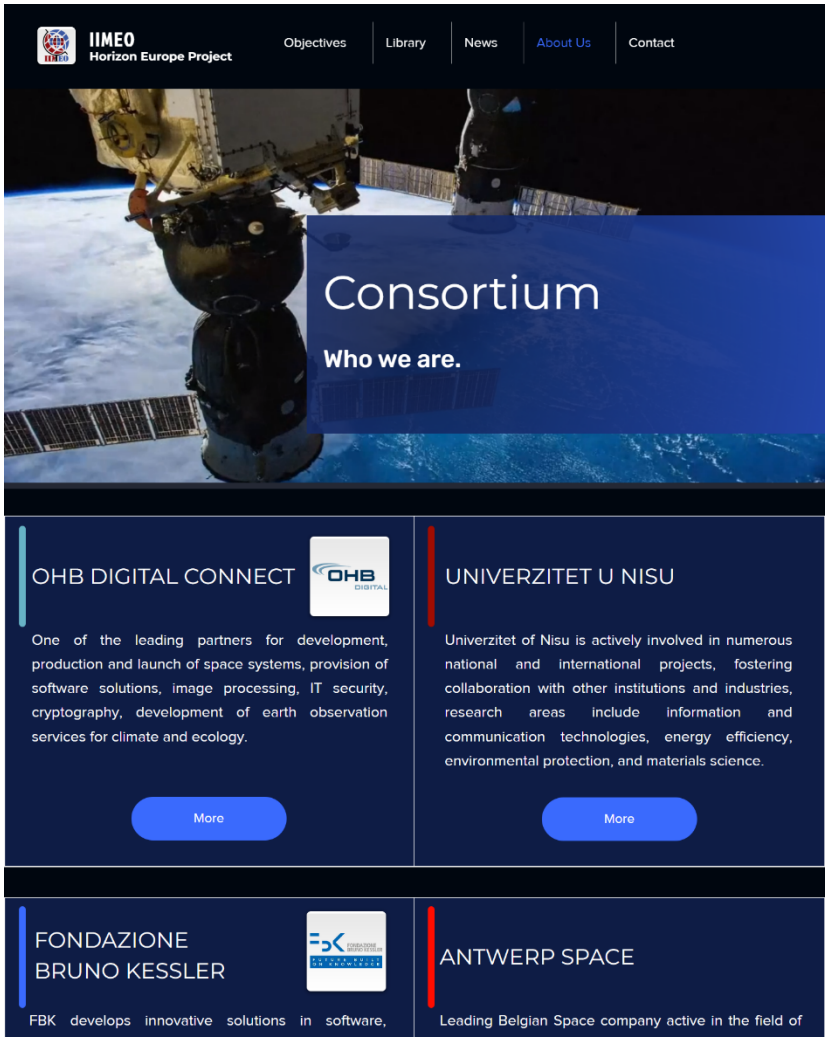


Figure 7: About Us

2.1.6 Contact

The Contact page provides a contact form for interested audience to get in contact with the project or as specific questions.

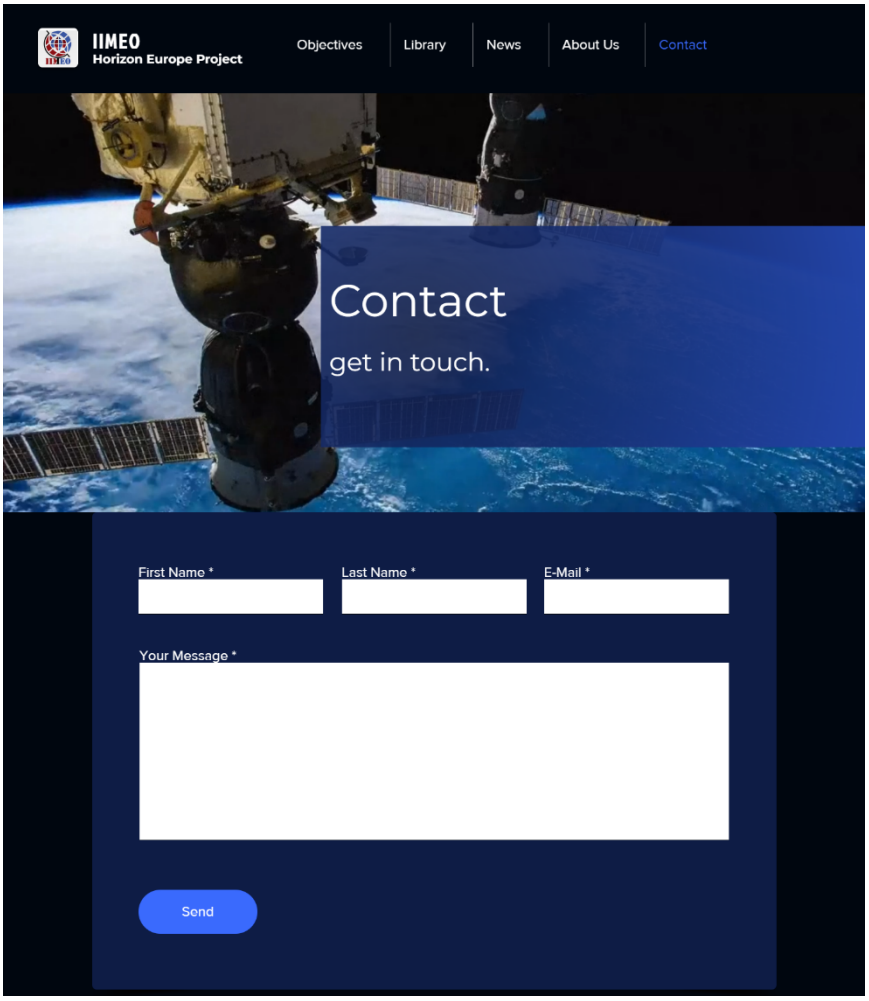


Figure 8: Contact

2.1.7 Implementation

The IIMEO project website (www.iimeo.eu) has been implemented by ATB, who is also acting as its main contact and webmaster. The appearance of the website reflects the corporate image of the project through a clean and functional design and a simple logo.

The initial version of website has been created with the support of the *Wix* website building system (www.wix.com). This gives us the possibility to have a solid set of tools for design and a content management system, which allows maximum flexibility with the installation of plugins, themes, etc.

3 PROJECT PRESENTATION

The objectives of this public project presentation are to introduce the IIMEO project, its goals, and the technology being developed. The presentation aims to highlight the challenges of monitoring critical infrastructures and the potential of satellite constellations for real-time, high-resolution monitoring. The presentation will also showcase the innovative technologies being developed as part of the project and the pilot user involved in the project. Finally, the presentation will discuss the roadmap for the project and the potential for future commercial applications and markets.

The presentation is publicly available on our project website (www.iimeo.eu). The following Figure 9 and Figure 10 show 2 example slides. The presentation will be updated with fresh content as the project advances.

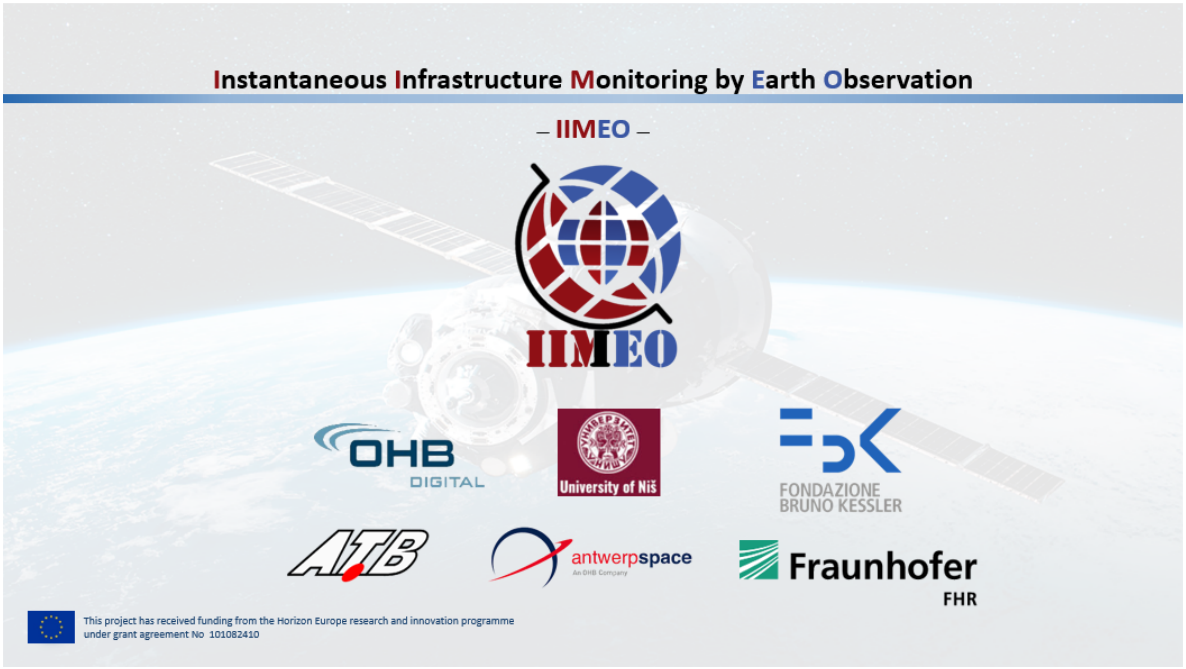


Figure 9: Project Presentation Title Slide

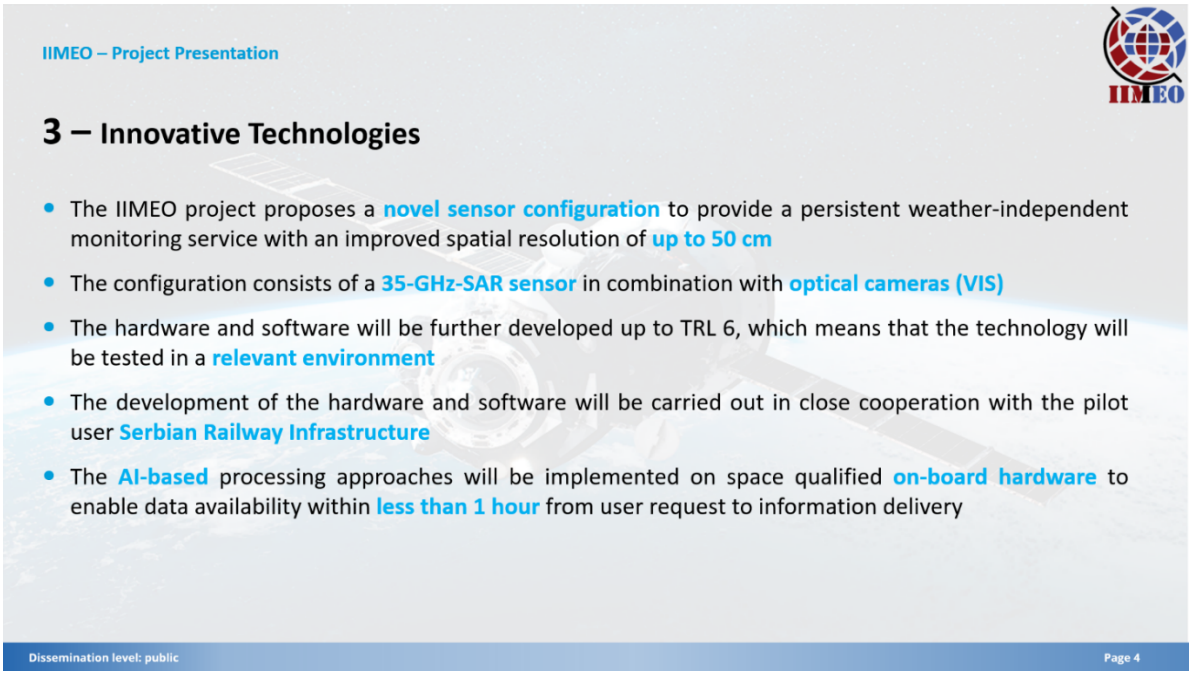


Figure 10: Project Presentation Example Slide

4 BROCHURE

The Project brochure in its current state promotes the project vision in the form of a leaflet. It has been designed to reflect the advancements and future plans of the project. The purpose of the brochure is to give an overview of the main objectives, project motivation, technologies and a description of the main pilot use case, as well as a first draft of the IIMEO system architecture. As the project will advance, at minimum one updated version of the brochure will be produced and published.

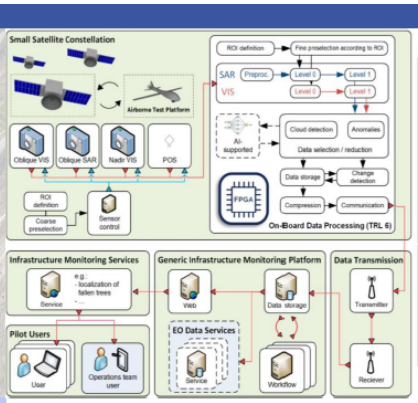
This document has been prepared as a file to be both downloaded at the IIMEO website (www.iimeo.eu) and printed for distribution purposes. It will be used as communication material to be distributed at future IIMEO events, as well as in events involving project partners.

The leaflet is presented within the following Figure 11 and Figure 12.

Figure 11: Project Leaflet Side 1

OVERVIEW

IIMEO aims to create a new satellite-based Earth observation (EO) system with advanced capabilities for real-time monitoring of infrastructures. The project focuses on two main areas: 1. developing a powerful processing unit that will be installed aboard the satellite, and 2. creating a unique sensor configuration. The ultimate goal of IIMEO is to demonstrate the technological advancements of this system and its ability to provide instant and accurate monitoring of infrastructure in near real-time.



This figure summarises the IIMEO system concept. For demonstration and testing purposes, a pilot infrastructure monitoring service will be implemented and made available to a pilot user.

OBJECTIVES

- Work towards *improving the safety and reliability* of critical European infrastructure with EO satellites
- *Build a system* which demonstrates that special infrastructure monitoring by Earth observation actually works by *providing a real user with real railway monitoring data* from a satellite platform (i.e. plane)
- *Keep track of development process* to facilitate similar future projects
- *Develop a plan to deploy IIMEO on an actual LEO constellation*

IIMEO is open for any use case involving critical infrastructure, for instance pipelines, high voltage power lines etc.

POTENTIAL PILOT USER

SRI JSC (Serbian Railway Infrastructure)

- *Effective monitoring* is the basic requirement for developing a proactive maintenance strategy for rail infrastructure
- *Risks from the environment* (natural disasters, unauthorized access to infrastructure, etc.) have become the dominant risks in railway traffic in recent years, and due to climate and social changes, this trend is expected to continue

MAIN TECHNOLOGIES

For the IIMEO project, SAR and VIS sensors serve as the primary data sources. SAR sensors are capable of providing high-resolution data regardless of weather or time of day. The oblique VIS sensor is aligned with the SAR sensor with the intention to provide service users with more accessible data of sites of interest.

The technological innovation focuses on *the payload* that is intended for future deployment on a *constellation of LEO satellites*. EO missions in LEO utilize lower-cost small satellites and are capable of providing high-resolution data, but in turn require numerous units for global coverage. To avoid data transfer bottlenecks associated with data volume, a promising approach is to perform *crucial processing operations on-board*. This is referred to as *edge computing*.

We will *choose and/or adapt candidate algorithms* for the on-board processor to be in line with the planned time goal of image availability within one hour.

IImeo.eu

Figure 12: Project Leaflet Side 2