COLOSSUS
COLLABORATIVE SYSTEM OF SYSTEMS

DELIVERABLE D 2.1

Identification of Stakeholders and Definitions

Author(s): Dr. **Martin Spieck**
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Project coordinator name & organisation:
Prajwal Shiva Prakasha
DLR - German Aerospace Center Institute of System Architectures in Aeronautics | Aviation System Design and Assessment
Tel: +49 40 2489641-322
E-mail: prajwal.prakasha@dlr.de

Project website address: https://colossus-sos-project.eu/

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Role	Name	Company	Date
WP Leader	Kristian Amadori	SAAB	28.06.2023
Coordinator	Prajwal Shiva Prakasha	DLR	28.06.2023

REVIEWERS

Role	Name	Company	Date
Coordination Team	Nabih Naeem and Nazlican Cigal	DLR	28.06.2023
WP 3 Lead	Luca Boggero and Jasamin Akbari	DLR	23.05.2023

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LIST OF AUTHORS

Full Name	Organisation
Dr.-Ing. Martin Spieck	Thelsys GmbH

DISTRIBUTION LIST

Full Name	Organisation
COLOSSUS Consortium	-

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GLOSSARY

Acronym	Signification
ADAM	Advanced Air Mobility
AI	Artificial Intelligence
CS	Constituent Systems
EVE	Eco-friendly air vehicles for multiple operating environments
eVTOL	Electric Vertical Take-Off and Landing
SoS	System of Systems

ABSTRACT

In order to define needs and requirements for the two use cases ADAM (Advanced Air Mobility) and EVE (eco-friendly air vehicles for multiple operating environments), this deliverable identifies and defines the involved stakeholders, from authorities, private actors and end-users. The outcomes are the definition and identification of the different stakeholders and their role in the envisioned ecosystem.

1. EXECUTIVE SUMMARY

1.1 Introduction

This deliverable addresses the objective to define the stakeholders which are involved in the two COLOSSUS use cases and their role in the envisioned ecosystem, which is a complicated system consisting of many different people, processes, activities, technologies, technical equipment of all kinds, and the way that they affect each other.

This will serve as an input to the development of associated key performance indicators (KPIs) and to scenario creation and the business model and technology assessment to be performed in the further course of the project.

1.2 Brief description of the work performed and results achieved

1.2.1 The system of systems approach

Viewing a system as a *system of systems* (SoS) can provide several benefits that may facilitate overall understanding and the development of new systems. One of the main benefits is that a more holistic perspective is achieved. This can give a more comprehensive understanding of the dependencies and complex interactions that are found between the involved systems that make up the overall system. Such a holistic perspective can, for example, aid in the early identification of risk and uncertainty which subsequently can be avoided or mitigated.
The involved systems, hereafter referred to as constituent systems (CS), are collaborating within an SoS to achieve unique capabilities. This means that the CS needs to be coordinated to meet the collective goal of an SoS. An SoS view will thereby highlight the collaboration between CS so that the desired outcome is achieved in an effective and efficient manner.

An SoS view consequently puts more emphasized focus on the collaboration aspects between involved systems, and how these can be optimized to efficiently work together to achieve more than singular systems can on their own. Individual optimizations of CS may otherwise lead to sub-optimal performances in an SoS context. In this sense, an SoS view also tends to focus more on capabilities than requirements. SoS typically involve long-term evolving requirements that thereby creates a desire for being able to deliver capabilities over time and throughout changing circumstances, instead of the typical optimizations against fixed sets of requirements found in singular systems. Better anticipation, response, and adaptability to changing environments and conditions can thereby be achieved by viewing a system as an SoS. [1].

1.2.2 The stakeholders approach

Stakeholder is a neologism, derived from the expression “shareholder”, and refers to a concept of strategic management that broadens the view beyond the traditional economic roots. Stakeholders in this context can be defined as any group or individual who is affected by or can affect the achievement of the objectives of an endeavour. The purpose of stakeholder management is to offer a strategic approach to consider and manage all relevant groups and relationships that may affect the success and performance of the endeavour (e.g. business activity, joint project, policy implementation, etc.).

In the context of COLOSSUS, primary stakeholders are groups or individuals which are actively engaged in transactions with the endeavour, such as selling an aircraft for profit or using a service as a travelling customer. Secondary stakeholders do not engage in direct exchange, but are affected from the endeavour or can affect its

conduct or outcome, for example people living in the vicinity of airports (noise complaints) or citizens who are protected against wildfires (outspoken support for implementation).

Complex systems and SoS often include a wide variety of stakeholders with different interests, expertise, and levels of understanding. This allows to develop a broader and more robust understanding of the interconnections, interdependencies, influences and other favorable or adverse effects the SoS, or products or services embedded in this SoS, will be exposed to in real-world applications.

Thus, an SoS view can here facilitate the management and coherence of the various stakeholders. This, in turn, necessitates a systematic approach to identifying, considering and managing the relevant stakeholders and their needs. This deliverable is the first step of such a systematic process: the identification and mapping of stakeholders for the two use cases of COLOSSUS.

1.3 Deviation from the original objectives

1.3.1 Description of the deviation

The definition part has been transferred to an additional document. The purpose of this part is to define important terminology in a clear an unambiguous manner. This part is an important prerequisite of a joint European research project, as experience has shown that assuring a common understanding and joint view within the project team ensures high efficiency, and avoids costly re-iterations and late adjustments which are the result of undetected, possibly minor differences in the individual perceptions of the team's researchers and scientists.

However, this specific section has been designed as a rolling working document, and it is intended for internal use as a hand-on guideline and reference for the practical work in COLOSSUS.

1.3.2 Corrective actions

Deliverable D2.1 contains the definition of stakeholders, along with the clarification of nomenclature and terminology as far as it is necessary for the understand of the document. This part has the dissemination level "public".

The definition part was transferred to a new document with the dissemination level "confidential".

2. DESCRIPTION OF THE COLOSSUS USE CASES

2.1 Use case development

The project plan defines two use cases:

Use Case 1: Creating a business model for sustainable 4D-intermodal mobility and evaluating the concept for performance, competitiveness, environmental impact and life cycle footprint.
For clear distinction, this use case was named **ADAM** (advanced air mobility)

Use Case 2: Developing an integrated fast-response approach for preventing, detecting and fighting wildfires by combining latest developments in the fields of aircraft design and technology, automation, AI and digitalisation. This use case was named **EVE** (eco-friendly air vehicles for multiple operating environments)

For commencing work in a coordinated and efficient manner, it was necessary to further detail and describe the use cases. In an online WP2 brainstorming meeting, both use cases were discussed with all participating partners giving their individual understanding, their focus and their opinion of the problem-to-be-solved and the use cases' boundary conditions. The results of the brainstorming session led to a detailed description of the COLOSSUS use cases. (see Figure 1 and Figure 2)

Figure 1: Interactive canvas for use case ADAM during the online brainstorming session

Figure 2: Interactive canvas for use case ADAM during the online brainstorming session

2.2 The use cases ADAM and EVE

2.2.1 Content

Use case 1 (ADAM) shall create a business model for sustainable 4D-intermodal mobility and evaluate the concept for performance, competitiveness, environmental impact and life cycle footprint. The use case shall comprise one or more realistic scenarios that allow to analyse the operational performance at the various levels of the SoS (these could e.g. be business model, operator, customer, vehicle, environment, society, etc.).

ADAM will introduce two new products, an eVTOL short distance vehicle for passengers and freight and a multi-role seaplane with hybrid propulsion, and investigate (analyse & optimise) their performance in a multi-modal environment.

Use case 2 (EVE) shall develop an integrated fast-response approach for reducing the risk and damage of wildfires. This includes existing and novel approaches to prevent, detect and fight wildfires, and to use latest developments in the fields of aircraft design and technology, automation, AI and digitalisation.

EVE will make use of the same novel air vehicles, the eVTOL and the seaplane. However, the conceptual layout of these aircraft in EVE may be different to ADAM in order to best meet the operational requirements of the respective use case.

2.2.2 Methodological Approach

ADAM will follow a product-push paradigm, where new technology enables new products and services for business models to fulfil societal needs.

EVE will follow a product-pull paradigm, where societal needs require new services and new products, including new or advanced technology to meet those needs.

While ADAM can be considered to use a bottom-up approach, and EVE to be rather top-down, it is important to note that COLOSSUS is researching for agile and permeable solutions and the scenarios are dealt with in a holistic, integrated and iterative manner.

2.2.3 Expected outcomes

Both use cases shall demonstrate the achieved advances in SoS capabilities. These are in particular complexity management, dealing with uncertain and/or fuzzy parameters and data, agility and efficiency in toggling between the various levels of the SoS, breadth and depth of the developed SoS framework and its tools. The success criteria are: time & effort needed for setting up a holistic SoS for aviation research & technology development, ability to include new technology at the various levels of the SoS, ease with which information can propagate through the SoS (e.g. from business concept to disciplinary design, or from vehicle performance to customer usage).

3. IDENTIFICATION OF STAKEHOLDERS

3.1 Preliminary list of stakeholders and tentative ranking

The concept of stakeholder management is to consider all actors who may influence the course and outcome of the use cases. While several stakeholders are quite evident, such as the manufacturers who will produce the novel air vehicles, others are perhaps less obvious but may nevertheless have an important impact on the use case, e.g. local/regional authorities whose regulations may be prohibitive for operating seaplanes within their jurisdiction. For the COLOSSUS stakeholder management, the approach was to identify all possible actors from a broad point of view, to generate a detailed list of primary and secondary stakeholders and to create a “map of stakeholders” as a visual representation of their interrelation within the respective use case.

In the further course of the project, the development of business models and analysis of role and impact in the overall SoS will start with a focused view on stakeholders which have a direct and immediate impact on the use case. The process will then gradually develop in two directions: the scope will be broadened to include a growing number of stakeholders (breadth), and dominant stakeholders will be modelled and assessed in more detail (depth).

3.2 List of stakeholders

A first draft list of stakeholders was set up in WP2 and circulated in the project team with the request to estimate the relevance of each stakeholder in four different “sectors”:

providers of products / services	customers, users	regulators, policies	society, environment

Table 1: The four sectors as areas of activity/influence for COLOSSUS stakeholders

The relevance could be ranked in five valuation levels: very important, important, useful, minor importance, no relevance. The order of stakeholders was randomised to make the ranking as “neutral” as possible. It should be noted that a stakeholder may be of no relevance in three sectors, but a major actor in the fourth, e.g. the aircraft manufacturer as a provider of an essential product.

The answers were then compiled into a file and an average “level of relevance” derived. It should be noted that this “ranking” is, and was used as, a first, rough indicator only to facilitate the further proceedings. A representation of a stakeholder’s role and impact in an SoS can hardly be given by a simple number or grade. Considering the complexity and multi-dimensionality of an SoS, the development of a more refine, and meaningful ranking system can be described as an “exercise in futility”, possibly resulting in an “impression of accuracy” rather than an accurate, robust assessment.

Thus, in a consecutive step, the stakeholders were re-evaluated and interactively positioned on a stakeholder map during a WP 2 meeting held at Linköping University. The resulting draft map was then processed further to the two stakeholder maps for ADAM and EVE shown in Section 3.3.

3.2.1 Use case ADAM: list of stakeholders

Air traffic management
Air traveller - commuting
Air traveller - inner city
Air traveller - long distance
Airline - major/long disctance
Business - inner city
Car owners / drivers
Digital society
Downtown communities
European aviation industry - digital transformation
European economy
Flight operator - regional/local
Fuel suppliers
Higher education (HES)
Investors
Maintenance, repair, overhaul (MRO)
Mobility as a service
OEM - eVTOL
OEM - seaplane
Pilots
Policy makers
Public transportation - established providers
Public transportation - general
Public transportation - new service providers
Railway
Regulators - European level
Regulators - national/regional
Research institutes (REC)
Residents - cummuter belt
Residents - inner-city
Residents - rural areas
Rural communities
Seaports
Start-ups / new businesses
Start-ups / new businesses - intermodal mobility
Suburban communities
Supplier - eVTOL
Supplier - seaplane
Taxi / Uber / other urban transport
Tourism
Tourism - established touristic centres
Tourism - new destinations
Vertiports

3.2.2 Use case EVE: list of stakeholders

Air traffic management
Air traveller - commuting
Air traveller - long distance
Airline - major/long disctance
Digital society
Disaster relief - European level
Disaster relief - national/supra-regional
European aviation industry - digital transformation
European economy
Fire departments - regional/local
Fire detection
Flight operator - regional/local
Fuel suppliers
Higher education (HES)
Investors
Maintenance, repair, overhaul (MRO)
OEM - eVTOL
OEM - seaplane
People living/owning property in risk areas
Pilots
Policy makers
Regulators - European level
Regulators - national/regional
Research institutes (REC)
Residents - cummuter belt
Residents - rural areas
Rural communities
Start-ups / new businesses
Start-ups / new businesses - disaster relief
Suburban communities
Supplier - eVTOL
Supplier - seaplane
Tourism
Tourism - established touristic centres
Tourism - new destinations

3.3 Stakeholder maps

The maps of relevant stakeholders with their main interconnections are shown on the following figures:

- ADAM stakeholders Figure 3 (green background)
- EVE stakeholders in Figure 4 (yellow background)

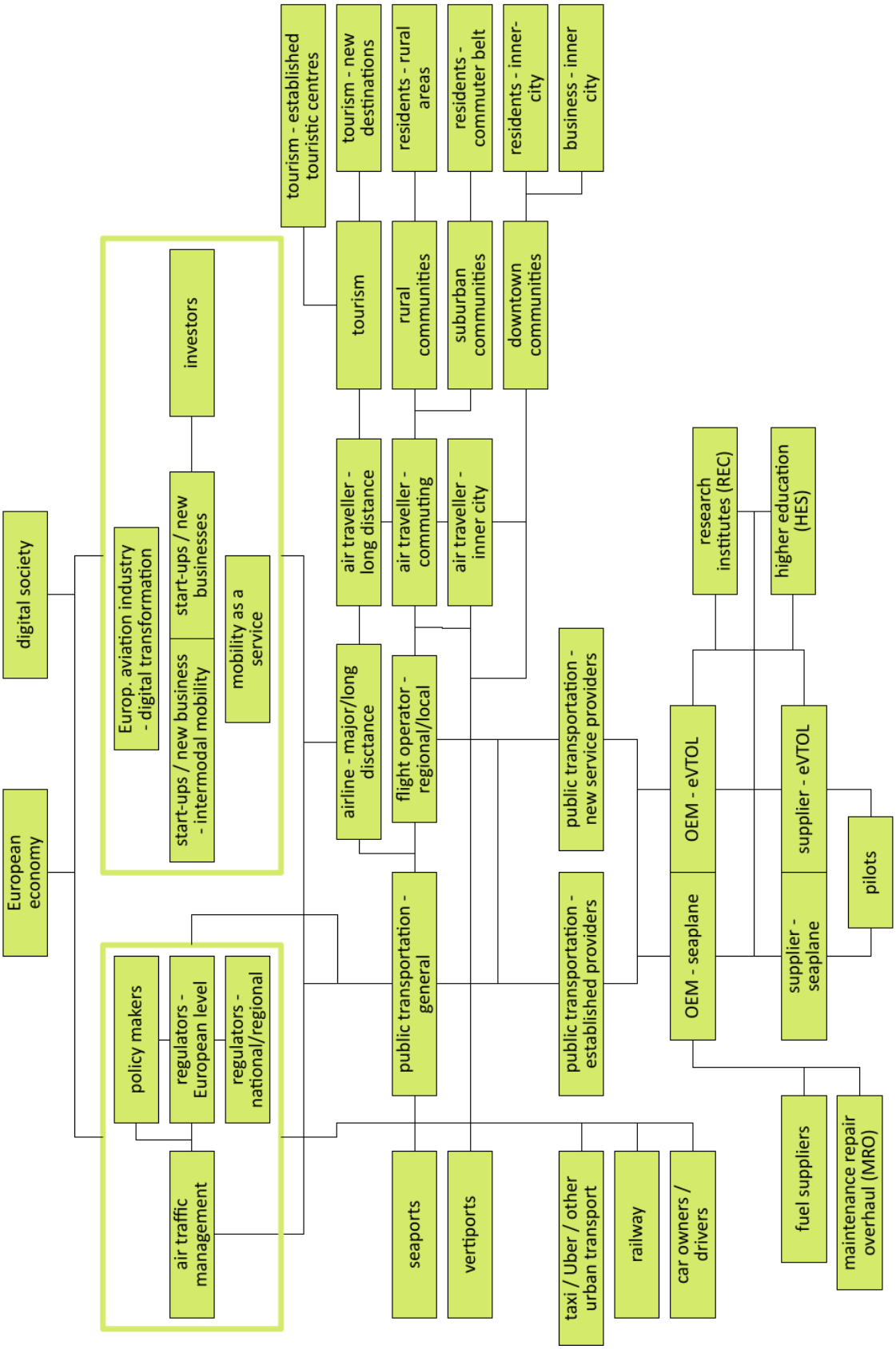

Figure 3: Stakeholder map for use case ADAM

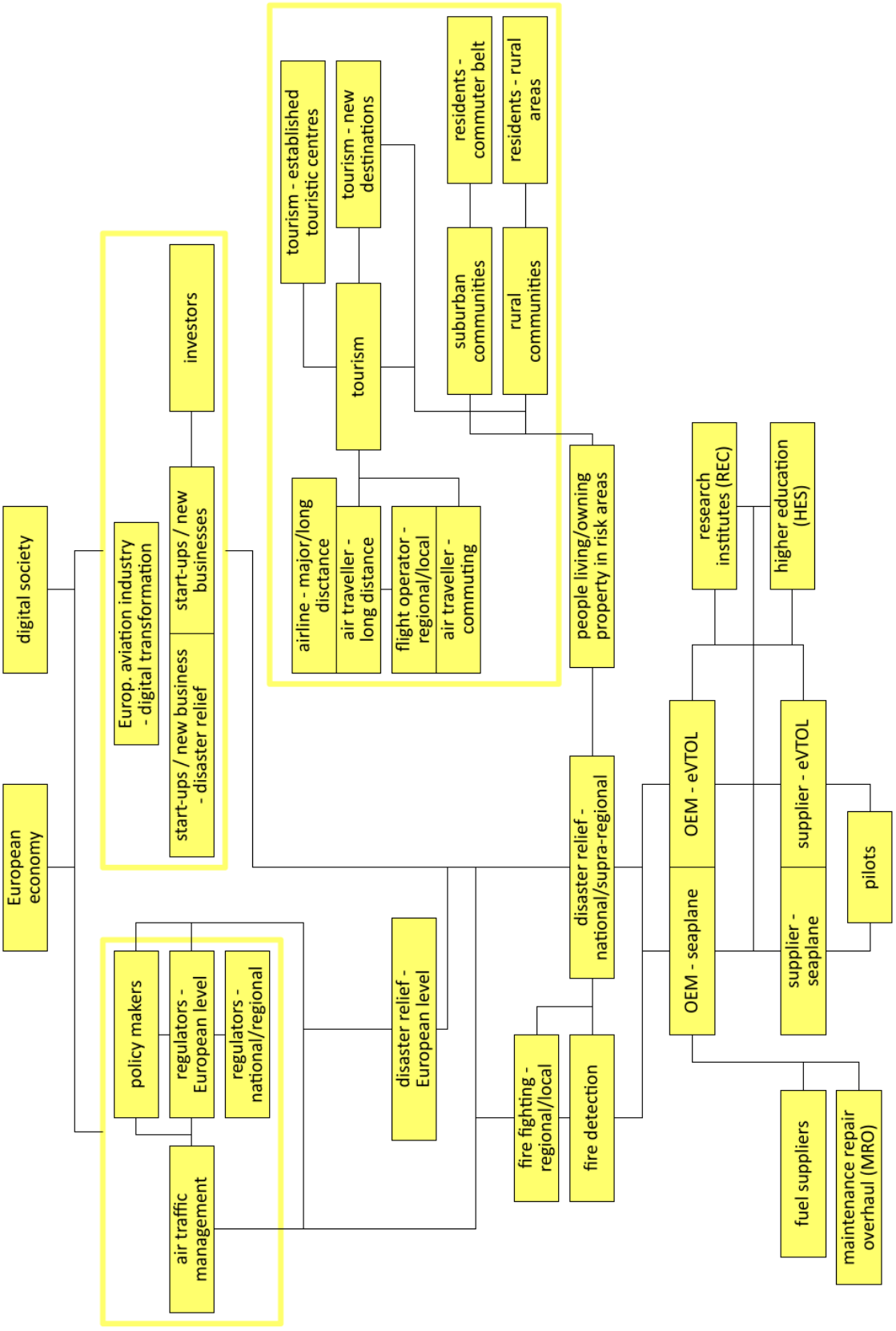

Figure 4: Stakeholder map for use case EVE

4. REFERENCES

[1] Franzén, L. K. (2023). A System of Systems View in Early Product Development: An Ontology-Based Approach. Linköping University, Faculty of Science & Engineering. Linköping, Sweden, 2023.