

# CASE STUDIES ON THE ENVIRONMENTAL AND SUSTAINABILITY IMPACT OF SELECTED ESA ACTIVITIES WITH LCA

Activity 1-12088

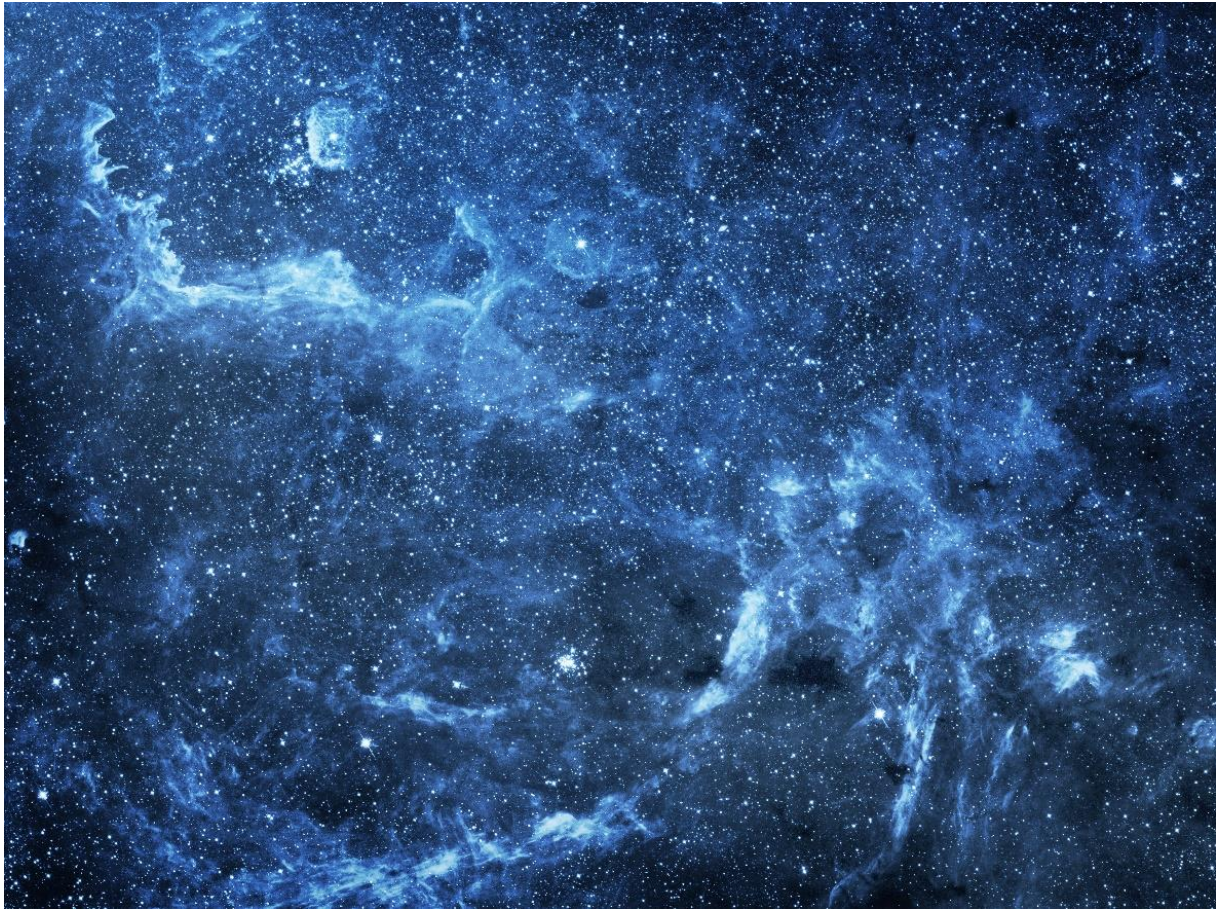
Clean Space Days – October 9<sup>th</sup>, 2024



Context and objectives of the project

Overview of LCA case studies

Methodological approach



# What is the ESA Green Agenda?

The ESA Green Agenda is a programme mobilising all of ESA and the space sector to contribute to the climate neutrality of Europe while increasing competitiveness.



## Maximise Sustainability Benefits

Increase the contribution of space projects to the sustainable development of society.

“Ensure that ESA and European space programmes contribute to the Paris Agreement and the European Green Deal.”

## Minimise Environmental Impacts



Decrease the environmental impact of the space sector’s activities.

“By 2030, reduce emissions by 46% for its operational activities and 28% for the activities executed by its suppliers.”

# What specific actions are being implemented?

To achieve the Agenda 2025 targets, ESA Green Agenda focuses on five different areas of action.



# What specific actions are being implemented?

**Activity “Case studies on the environmental and sustainability impact of selected ESA activities”**



Through 16 case studies, the objectives are to:



Develop the expertise in assessing environmental and sustainability impacts of ESA projects and activities



Identify the key environmental hotspots and potential benefits of ESA projects and activities



Develop a conceptual framework to evaluate all ESA projects and activities



# Sustainability Impact Studies - Partners



10 LCA case studies in a Consortium of LCA experts

6 non-LCA case studies by Deloitte only

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Marcello CASA  
Ilaria HINRICHSEN  
Elena ROCCO  
Giorgio URBANO



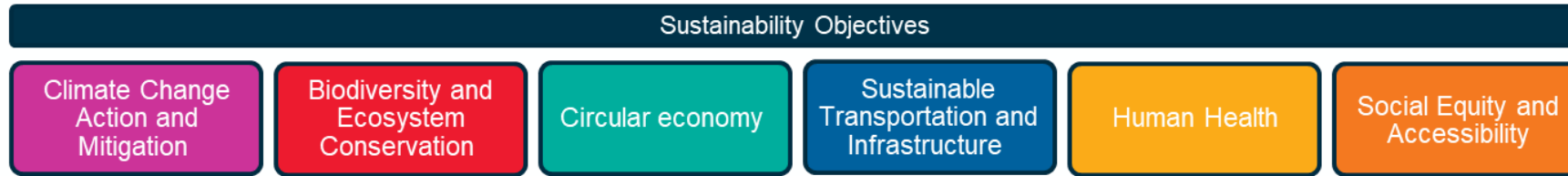
Olivier JAN  
Lily NAHON  
Romain RADZIMINSKI  
Romain TISON  
Natacha WONNEBERGER

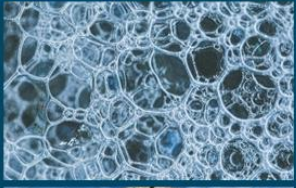





Kévin LE BLEVENNEC  
An VERCALSTEREN



# Sustainability Impact Studies – Case studies



		Case study		Case study			
	<b>OPS</b>	ZERO DEBRIS		GTIF		<b>EOP</b>	
		SOLAR POWER IMPLEMENTATION		SMOS			
	<b>HRE</b>	MELISSA		PLASTIC LITTER DETECTION		<b>TEC</b>	
		FOAMS AND EMULSIONS RESEARCH		BIOSPACE			
	<b>CIC</b>	OWASIS		GRETA		<b>STS</b>	
		SIM		HYGUANE			
	<b>NAV</b>	GREENER ASPHALT		GREENER PROPULSION		<b>CSC</b>	
		FREEP		IRIS			



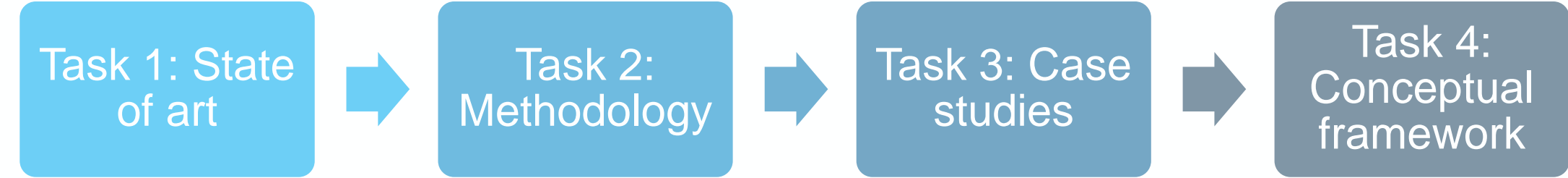
# Sustainability Impact Studies - Activity workflow



June  
2024

Today

March  
2025



Objectives

Literature review of existing studies  
Data needs & gaps

Definition of LCA and sustainability methodology  
Preliminary data collection approach

Assessment of environmental and sustainability impacts of the 16 case studies

Development of a conceptual framework for the environmental and sustainability impacts of ESA activities





## “Technology” case studies

Case studies that consider a **reference technology** for which there is an **alternative technology** which is supposedly more environmentally friendly.

#	Case study	Lead
2	Greener propulsion	Deloitte
4	MELiSSA	VITO
7	Solar power at ground stations	Deloitte
8	GRETA	Deloitte
9	HYGUANE	RINA
10	BioSpace	Deloitte



## “Space mission” case studies

Case studies that consider a **reference scenario** for a given sector or application, without the use of space systems. The **alternative scenario** includes a **full space mission** which enables several applications (monitoring, air traffic management, transport optimisation, etc).

#	Case study	Lead
1	SIM	RINA
3	IRIS	Deloitte
5	FREEP	VITO
6	Greener asphalt	RINA

# LCA case study #7 - Solar power at ground stations

## Solar power at ground stations

Operations (OPS)

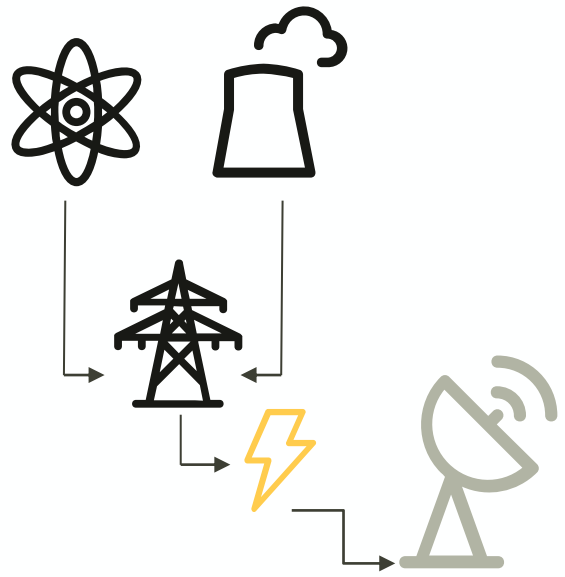


New Norcia deep space ground station (AUS)



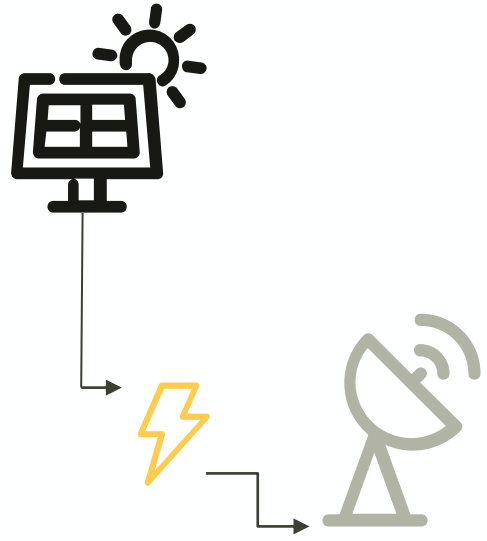
Cabreros deep space ground station (ESP)

### Reference scenario



VS

### Alternative scenario



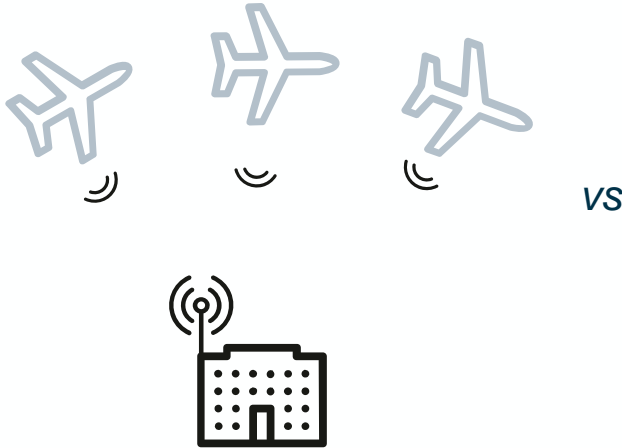
## Iris air traffic management

Connectivity and Secure Communication (CSC)



Artist's impression of Iris technology

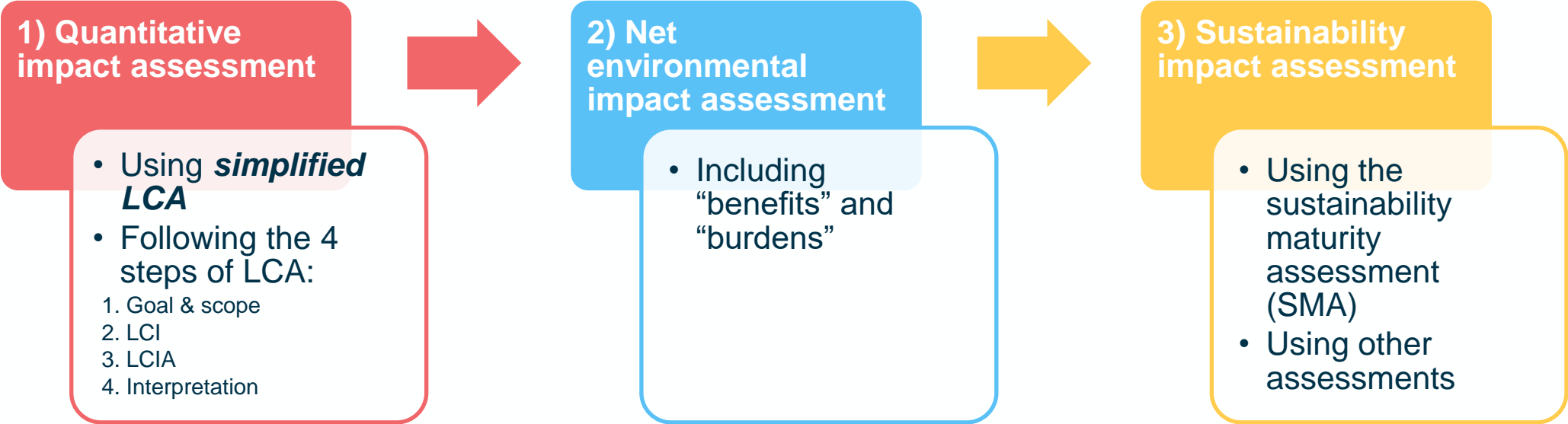
### Reference scenario



### Alternative scenario



The methodology to assess the environmental and sustainability impacts follow 3 main steps:






# Concept of so-called “simplified” LCA

To meet the required timeline of the project, the case studies will be quantitatively assessed through **simplified LCA**

Simplifying an LCA is “**accepting to lose some precision** (and therefore reduce the effort) in the results of a study, **without changing the conclusions**: the aim is to deliver an appropriate work (neither too much nor too little) compared to the goal of the study.”

Source: ScoreLCA

In this activity, LCA simplifications are on:

-  Scope and system boundaries
-  Data collection
-  Interpretation



Where can LCA be simplified?



How to allocate the impacts of a space mission to one service?



How to deal with limited data availability?



How to evaluate the environmental “benefits”?

To be continued...



# BACK-UP SLIDES

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