Implementing Life Cycle Thinking and Ecodesign in ESA space projects

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ESA Industry Days 2026

EUROPEAN SPACE AGENCY

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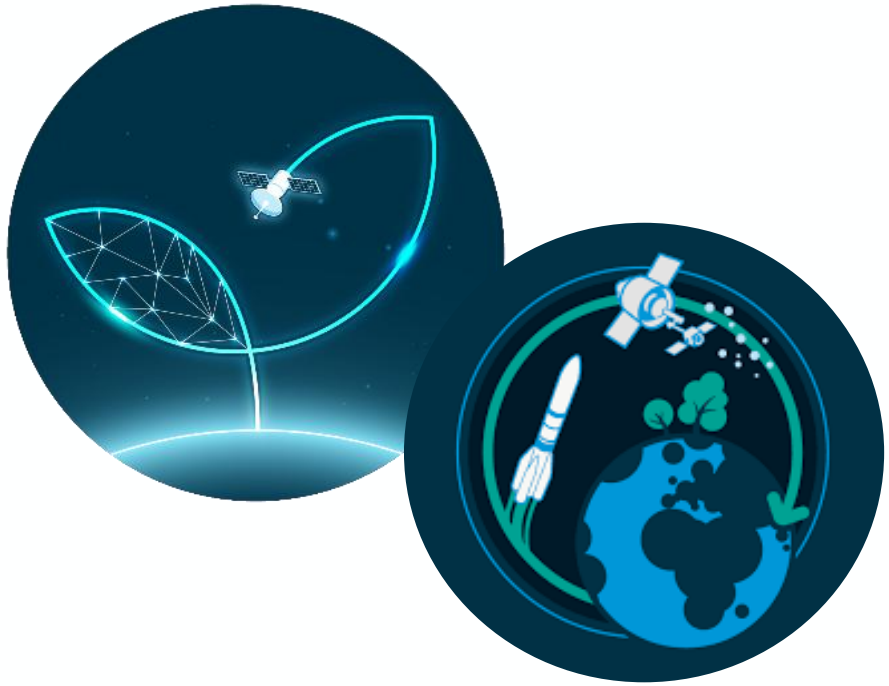
Implementing life cycle thinking and ecodesign in ESA space programmes

- Context
- What is the ESA Green Agenda?
- ESA approach towards Ecodesign
- ESA Ecodesign ambition, objectives and principles
- Support to stakeholders
- Conclusion & take away



Context

Growing pressure

Space activities are increasing. More missions. More launches. More technology. This growth puts pressure on the environments where the space sector operates, on Earth, in orbit and beyond.

The challenge

How do we design space missions while minimising our environmental impact on Earth?

Opportunities

Ecodesign to enhance resilience, reputation, competitiveness, responsibility and long-term success.

What is the ESA Green Agenda?

The **ESA Green Agenda (EGA)** supports ESA's long-term **commitment to sustainability on Earth**, mobilising the agency and the space sector to contribute to the climate neutrality of Europe while **increasing competitiveness**.

The ESA Green Agenda

1 Minimise Environmental Impacts

By 2030:

- **- 46%** GHG emissions for **operational activities**
- **- 28%** for activities executed by **suppliers**

2 Maximise Sustainability Benefits

In line with **Strategy 2040**'s vision + **Objective 1.1** "Benefiting humanity and nurturing a sustainable, inclusive, and prosperous future in space and on Earth"

A cross-directorate approach

Building on 10 years experience in LCA, measuring impacts, ESA is moving from analysis to action

"By 2030, **reduce GHG emissions by 46% for our operational** activities and **28% for the activities executed by our suppliers**."

From goal setting to action plan | Ecodesign ambition

LEARNINGS & COMMITMENTS

Industrial activities accounted for 85% of the ESA GHG assessment in 2019

ESA has pledged to **reduce it by 28% by 2030**

APPROACH

- ✓ **Understanding** key environmental impacts along programmes life cycle
- ✓ **Implementing** – early in design – optimised mitigation solutions to reduce space programmes' environmental impacts

GOAL

Make the European space sector a **role model for ecodesign implementation** in space projects

HOW

By **implementing systematically ecodesign and LCA in ESA space projects**

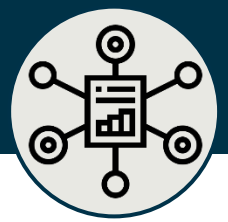
Ecodesign – a three-pronged approach to reduce scope 3 emissions

Increase of the **environmental performance** of space systems is based on the simultaneous and **continuous use and improvement** of key items

Providing **Technical Guidance**

Space Systems LCA Guidelines*

Space LCA Database**



Developing the **Ecodesign Technical Roadmap**

Key R&D technologies, products and processes targeting environmental hotspots

Implementing the **ESA Ecodesign Policy**

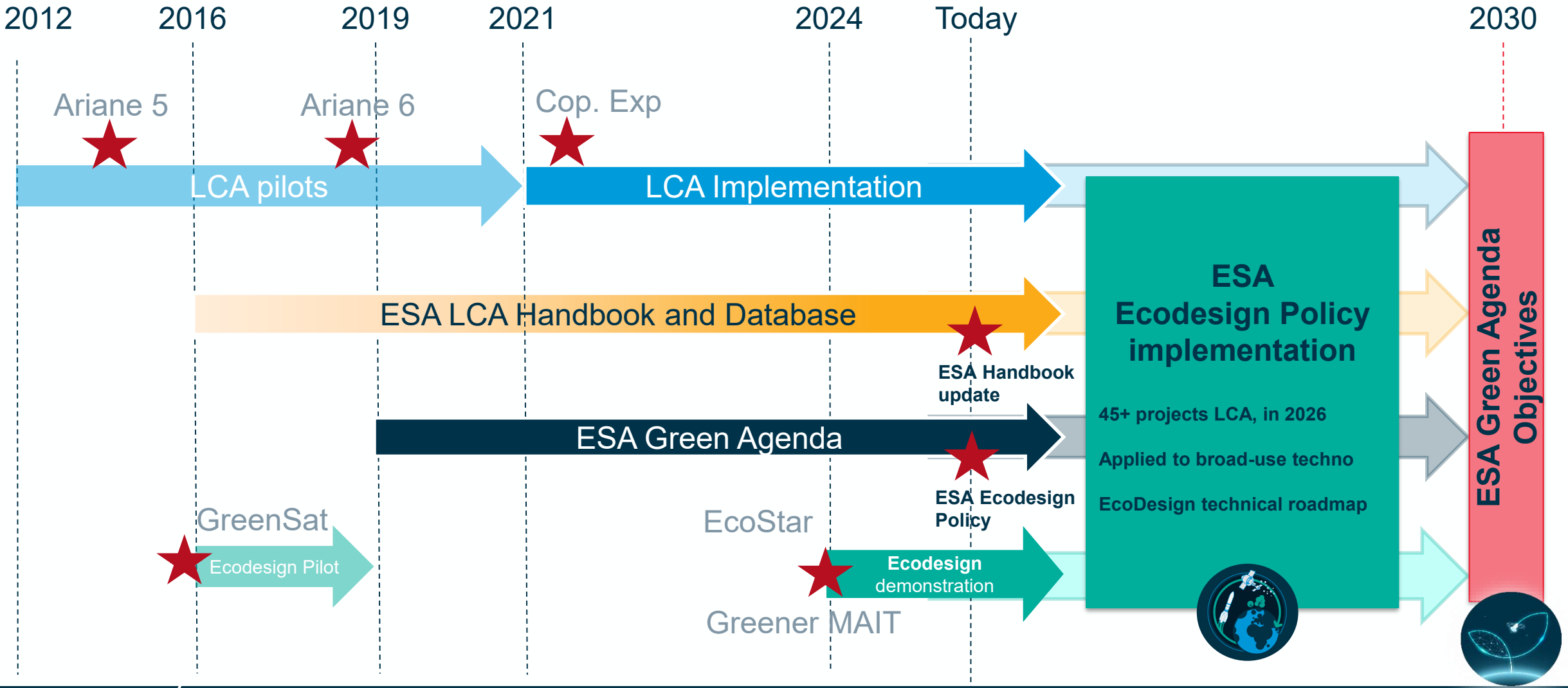
Early simplified LCA to identify hotspots

Identification of alternative solutions (ecodesign)

*Open to all

** Open to Member states' organizations, need an ecoinvent license

The Big Picture: ESA LCA past and future



ESA Ecodesign Policy | Objectives

From **measuring impacts** to **acting on them** through ecodesign solution identification and implementation

Definition of the scope of application

1. ESA space systems, ESA contributions to international collaborations on space systems
2. Design and development services of specific new equipment
3. ESA R&D activities selected in the Ecodesign Technical Roadmap
4. Space system-related services

ESA Ecodesign Policy | Principles

Space Systems & Technologies

Early phases (A/B1) / Low TRL: Simplified LCA

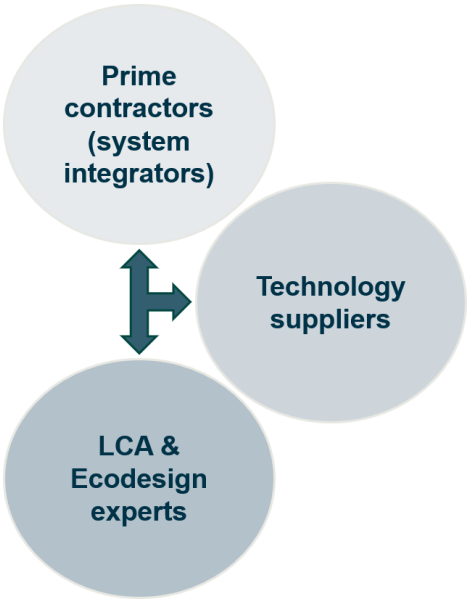
- **Estimate** environmental hotspots
- **Identify** ecodesign measures
- **Optimize** data collection for later phases

Advanced phases (B2/C/D/E) / High TRL: LCA

- **Minimize** environmental impact of the project
- **Report** on environmental performance
- **Enhance** Ecodesign Technical Roadmap, Ecodesign Lessons Learned Repository and ESA LCA Database for future projects

Main stakeholders | Where do you stand?

	Space System Launcher integrator	Technology supplier	LCA Practitioner
Life Cycle Assessment	• **Report** on environmental impacts of the space systems • **Propose** possible ecodesign solutions • **Collect** and consolidate supplier data and manage inconsistencies	• **Provide** detailed component data through supplier data questionnaires	**Conduct** environmental assessments using heterogeneous data and assumptions to support both technology-level and system-level LCA and Ecodesign tasks
Ecodesign	• **Implement** selected ecodesign solutions • **Justify** the achievements	• Might need to **perform** LCA and Ecodesign for new activities*	



***Note:** Ecodesign will be mandatory for selected activities in different ESA technology programmes

Support to stakeholders | Training

Registration are opened !

7-9 October 2026
ESAC, Spain

Useful materials & Contacts

ESA LCA Handbook

ESA LCA Database

Ecodesign policy webinar recording

For any question:
esa.sustainability@esa.int &
cleanspace@esa.int

Ecodesign webpage

Our LinkedIn pages

- ESA Responsibility & Sustainability LinkedIn
- ESA Clean Space LinkedIn

Take away

Ecodesign as a major lever for **ESA Green Agenda**

Building on 10 years experience in LCA, measuring impacts, **ESA is moving from analysis to action**

New !
ESA Ecodesign Policy and integration of simplified LCA

Stakeholder engagement is a priority !
(webinar, training etc. being organized)

Complementary with other key initiatives !

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→ THE EUROPEAN SPACE AGENCY

Q&A session

Meet us in Conference Hall B

10:20 – 10:45

THANK YOU!

esa.sustainability@esa.int

cleanspace@esa.int

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Back-up slides

Policy shift in a nutshell

Policy shift: from late measurement to earlier, actionable ecodesign measures across missions

	FROM		TO
PURPOSE	Reporting	→	**Mitigating & reporting impacts**
TIMING	Late LCA	→	**Simplified LCA in early phases and LCA in later phases**
ADOPTION	One-off studies	→	**Systematic application in space systems and selected technologies**
DATA	Systematic data collection	→	**Optimised and tailored data collection**
EFFORT	Fixed requirements	→	**Implementation effort proportional to mission type**

Why a simplified approach to LCA in early phases ?

CURRENT SITUATION

LCA related ISO norm leads to:

- Complex data collection (complex supply chain)
- Complex modelling (complex systems)
- Hight quality data required

Hight effort is required in different levels of the supply chain

Specific expertise is required

Simplified LCA in early phases suited to provide quick and cost-effective assessment

ESA ECODESIGN APPROACH

Systematic ecodesign implementation in space programs rely on:

- Simplifying LCA approach
- Reducing complexity for SME's
- Lower Cost impacts
- Lower effort and support scheme to SMEs
- Improving guidance and tools

Implementation in contracts started!

ESA Support to industry: ecodesign and LCA key technical drivers

Guidance

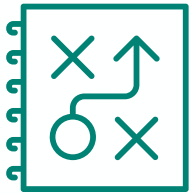
ESA Space Systems LCA Guidelines
Update including a simplified approach and template for data collection

Open to all
V2 in 2025

Data

ESA **space specific LCA database**
continuous improvement

Open to Member states' organizations
(need an ecoinvent license)
Last update in 2025



Roadmap

Ecodesign Technical Roadmap
Technology development programme for ecodesign solutions

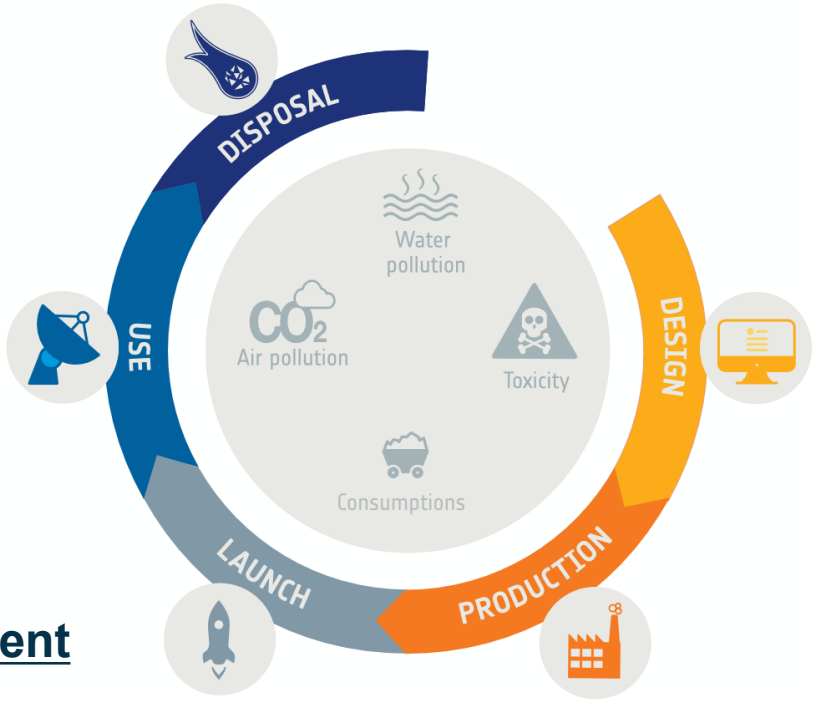
Continuous update taking into account latest LCA knowledge

Ecodesign and Life Cycle Assessment

Ecodesign considers environmental aspects at all stages of the system's life cycle, with the objective of addressing significant environmental concerns

The main objectives of **ecodesign** are to:

- ✓ **Improve the environmental performance** of systems through the assessment of their environmental impacts
- ✓ Assess and adapt **early in the design phase**
- ✓ Maintain the **programme's quality or performance**.

It relies on a **Life Cycle Thinking mindset** and aims to **avoid the shift of burdens** between project's stages or environmental impacts

Main and ISO-certified methodology for ecodesign is **Life Cycle Assessment**