CSID 2023: Ecodesign overview

ESA Clean Space - Ecodesign Team

17/10/2023

Welcome to 2023 edition of the CSID!

ESA Clean Space Team

The Ecodesign Team

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PHILIPP GRUENING

Clean Space Intern

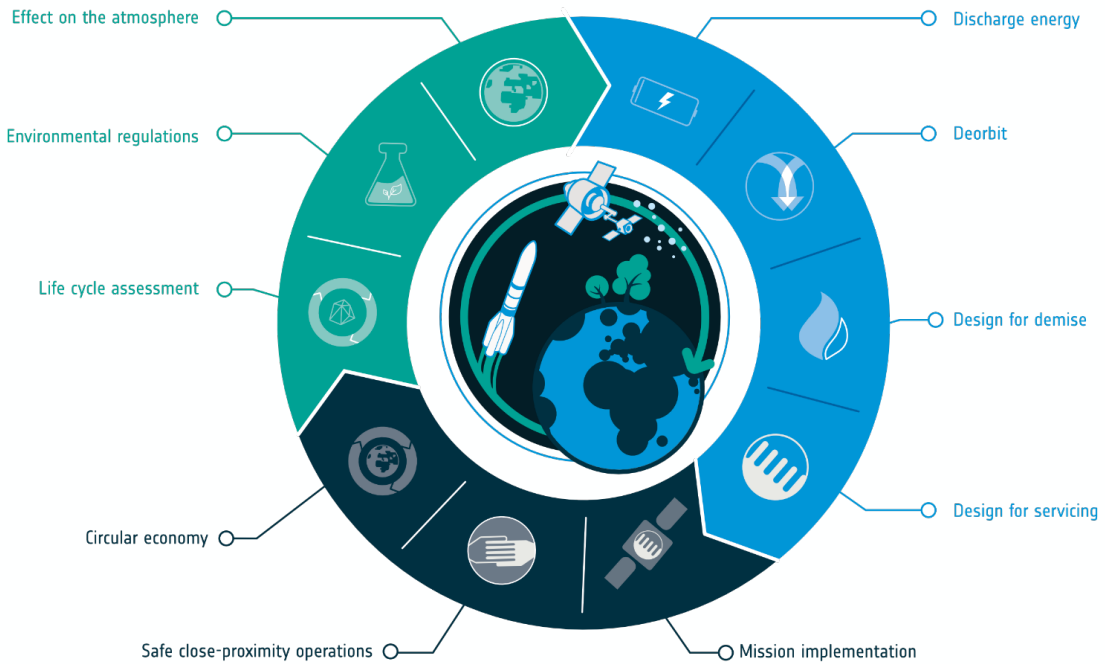
+ Support from many other ESA experts (materials and processes, electronics, testing, etc)

ecodesign

→ ENVIRONMENTAL IMPACTS REDUCTION

management of end of life

→ ZERO DEBRIS



in-orbit servicing

→ ACTIVE DEBRIS REMOVAL

EcoDesign Scope

How much space activities “pollute” on Earth?

Are there alternatives to reduce the environmental impacts?

LCA (Life Cycle Assessment)

Assessing the environmental impacts of the whole life cycle of the space missions

Eco-design

Identifying alternative processes or technologies that can be used to reduce these impacts

Environmental regulation

Finding alternatives to abide by legislations and avoid costly disruptions

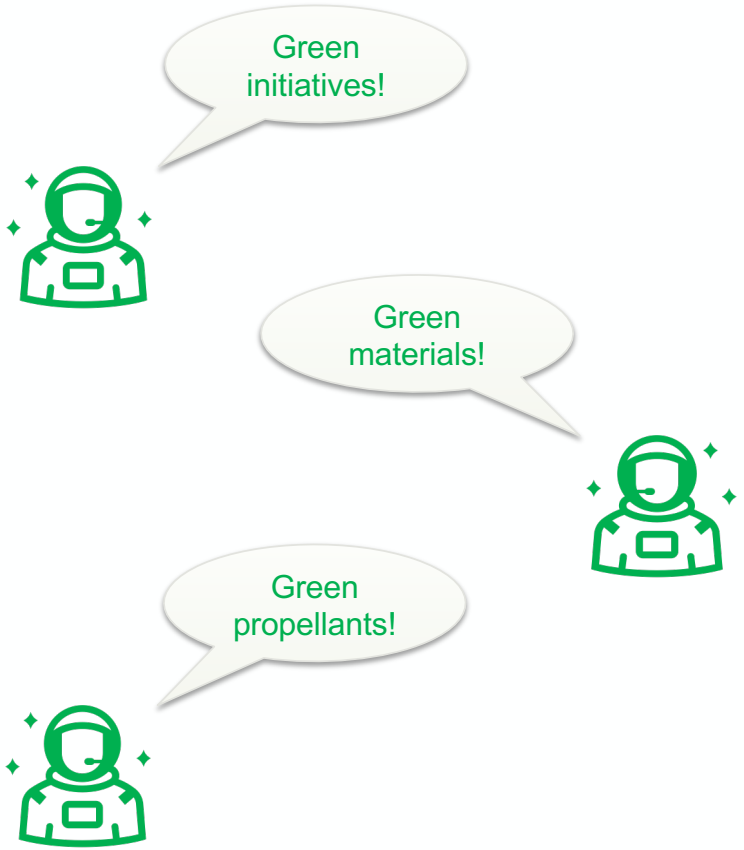
International context

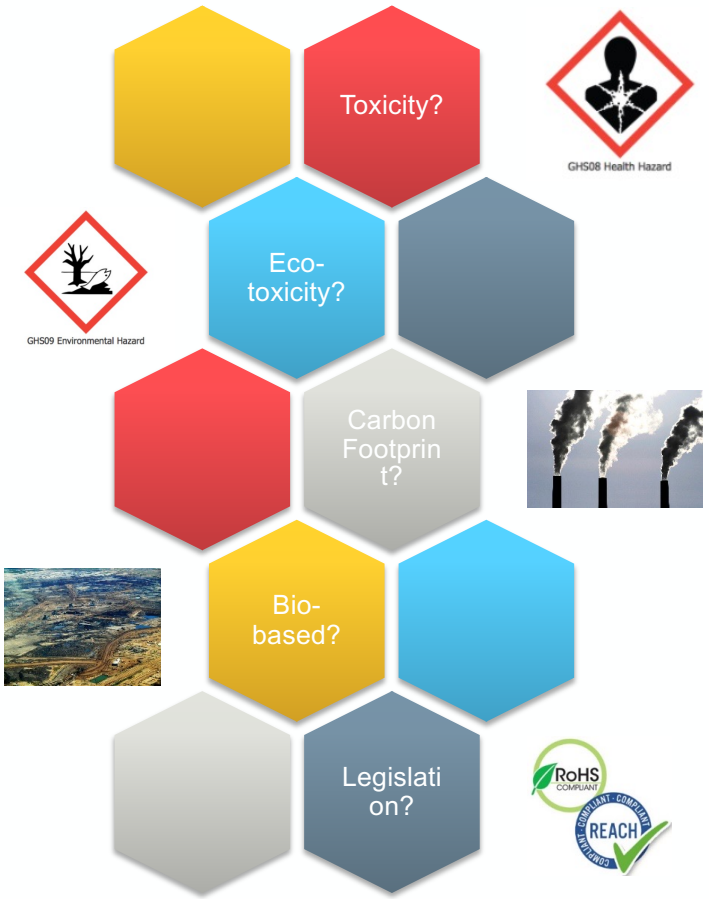
ESA Agenda 2025

ESA Director General's Agenda 2025 reiterated that **making ESA "a greener organisation" is a priority**, to support the implementation of the Paris Agreement and the European Green Deal to the fullest extent

To achieve this objective, a systematic inclusion of environmental performance indicators in the early phases of **ALL ESA projects approved at CM22** by **performing an LCA or a simplified LCA** was requested

Assessment of the environmental performance





EUROPEAN GREEN DEAL

Reliable, comparable and verifiable information also plays an important part in enabling buyers to make more sustainable decisions and reduces the risk of 'green washing'. **Companies making 'green claims' should substantiate these against a standard methodology to assess their impact on the environment.** The Commission will step up its regulatory and non-regulatory efforts to tackle false green claims. Digitalisation can also

Brussels, 11.12.2019
COM(2019) 640 final

Life Cycle Assessment – Definition

Multi-steps

Raw Materials

Energy Consumption

LCA is an ISO-standardised tool to quantitatively assess the potential environmental impacts of product, process or service

Emissions to air

Emissions to water

Emissions to soil

Waste

- Fossil resource depletion
- Mineral resource depletion

- Global warming
- Ozone depletion
- Air acidification
- Photochemical ozone formation
- Eutrophication
- Ionising Radiation
- Eco-toxicity
- Human toxicity

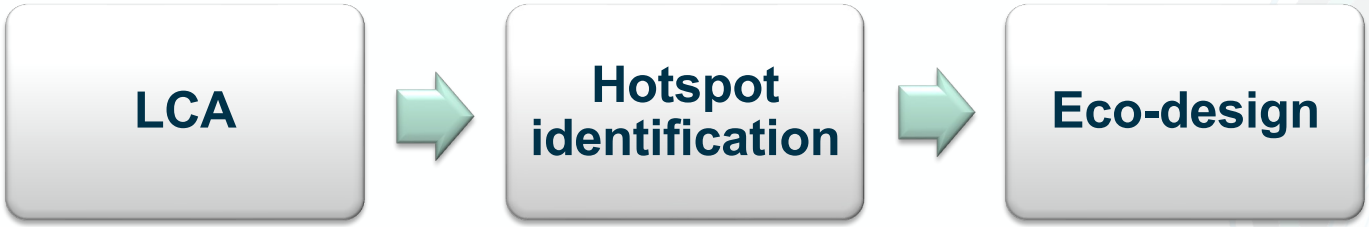
Multi-criteria

Eco-design definition

> *"**Eco-design** considers environmental aspects at all stages of the product development process,* ***striving for products which make the lowest possible environmental impact throughout the product life cycle"***

The main objective of eco-design is:

- ✓ To **improve the environmental performances** of products and services through the assessment of their environmental impacts
- ✓ Starting from **the design phase** and this,
- ✓ **Without reducing their final quality or performance**.

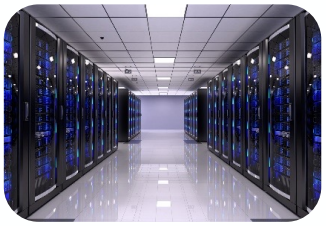


Summary of the Challenges

Defining the functional unit

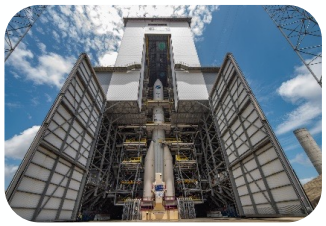
Impact of testing

Impact of R&D



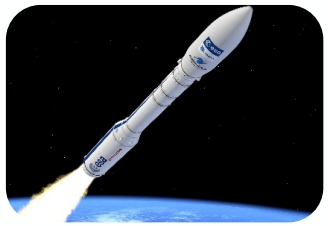
Data management

Spacecraft demise into the atmosphere

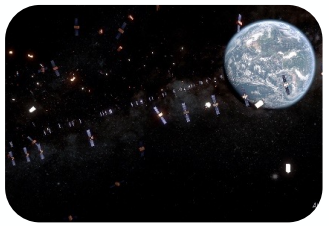


Impact of infrastructure

Impact of office work



Launch event impact on the atmosphere



Impacts on space environment

Deep Sea Impact

ESA LCA FRAMEWORK

LCA launch segment

LCA space segment

LCA ground segment

ESA LCA Handbook

Published in 2016

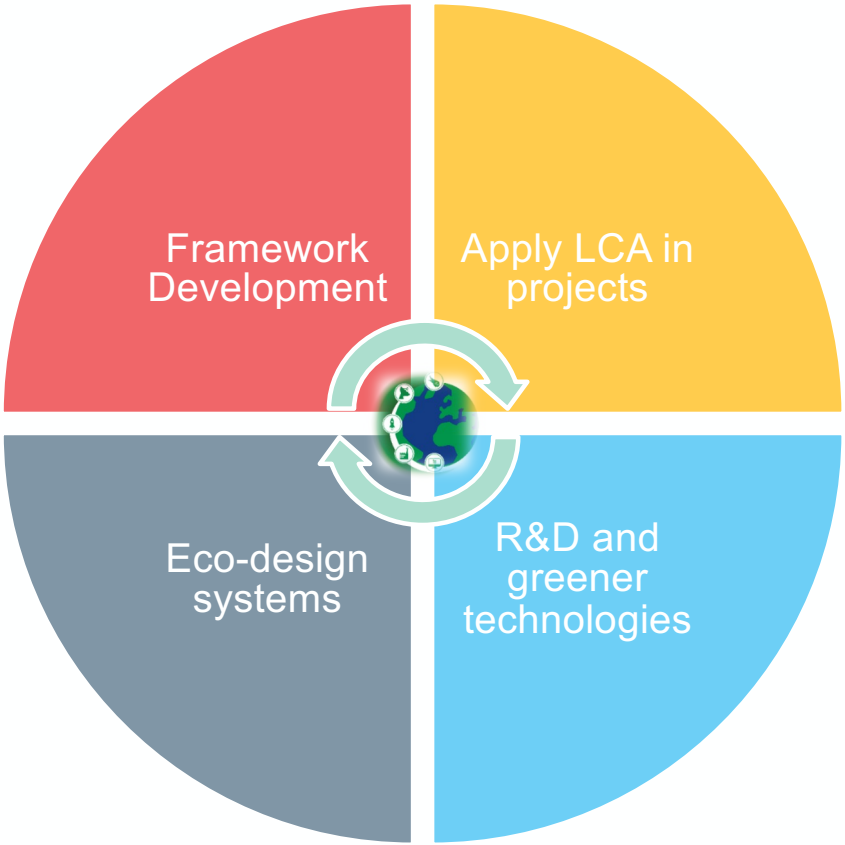
Available under request

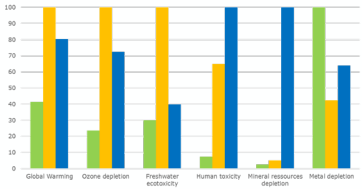
ESA LCA Database

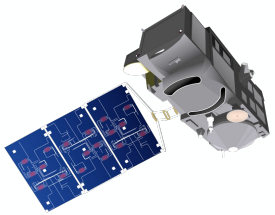
Available for ESA member states*

*under certain conditions

LCA approach







Ecodesign roadmap

LCA

LCA Launch segment

LCA Space segment

LCA implementation in ESA projects

Ariane 6
Earth Explorer 9 & 10
Copernicus Expansion Missions
Galileo 2nd generation
…

LCA Ground segment

LCA Launch segment - update

Framework

Framework definition
- LCA Handbook
- LCA DataBase

Framework update
- LCA Handbook
- LCA DataBase

Framework consolidation

Eco-Design

GreenSat
First Eco-design implementation

Green technologies roadmap

First **Green Technologies** development

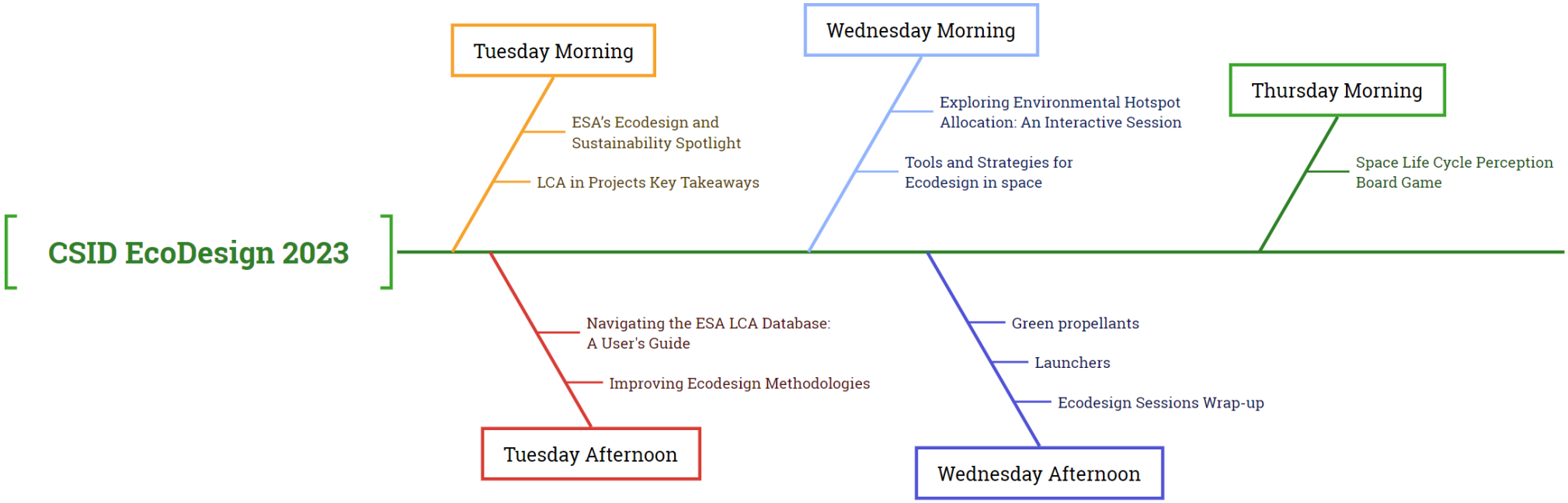
Eco-design implementation in ESA projects

2012 2015 2018 2021 2025 2030

What is new this year

- Improvement of methodology for assessment and allocation procedures
- Data quality rating (Technical Note for assessment)
- Develop generic datasets and associated Technical Notes (e.g. System Level testing)
- Update of the Database & web tool release
- Tools for preliminary LCA for launchers under development
- Continue with LCA application in projects: 1st and 2nd LCA iterations on-going (e.g. Copernicus and Galileo)
- Harmonisation/Standardisation of requirements for LCA implementation
- Inclusion of requirements in other missions' types and directorates (NAV, CSC and HRE)

Agenda for Ecodesign at CSID 2023

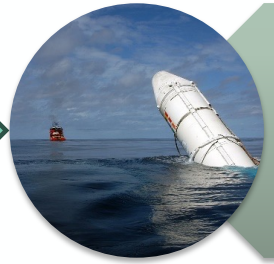


Thursday Afternoon
Planetary Boundaries Fresk
Organised by: ESA CSR & ADS

Re-entry impact on Earth environment

What are the impacts on Earth caused by the re-entry?

Atmospheric Impact



Ocean Impact

Land Impact

Propose your ideas in OSIP!

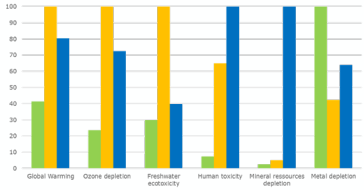
LCA application in ESA projects

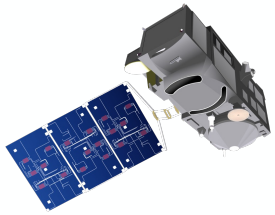
- Update HB from return of experience in projects
- Maintain DB with new datasets from projects

Framework Development

Apply LCA in projects

- LCA assessment of space systems
- Hot-spot identification
- Benchmarking





Eco-design systems

- Application of greener solutions in projects
- Project support
- Return of experience

R&D and greener technologies

- Development of greener technologies
- Support to research
- Return of experience

Conclusion

- Environmental impacts shall be considered from the conception to be able to mitigate the impacts
- LCA allows us to quantify the impacts, avoid burden shifting and validate ecodesign solutions
- Iterative and step by step approach is needed to implement Ecodesign
- The LCA Handbook and Database are essential tools and need to be maintained
- Uncertainties still exist to characterize the impact of space systems