CSID 2022: Ecodesign overview

ESA Clean Space - Ecodesign Team

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The Team

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ecodesign

→ REDUCING IMPACTS

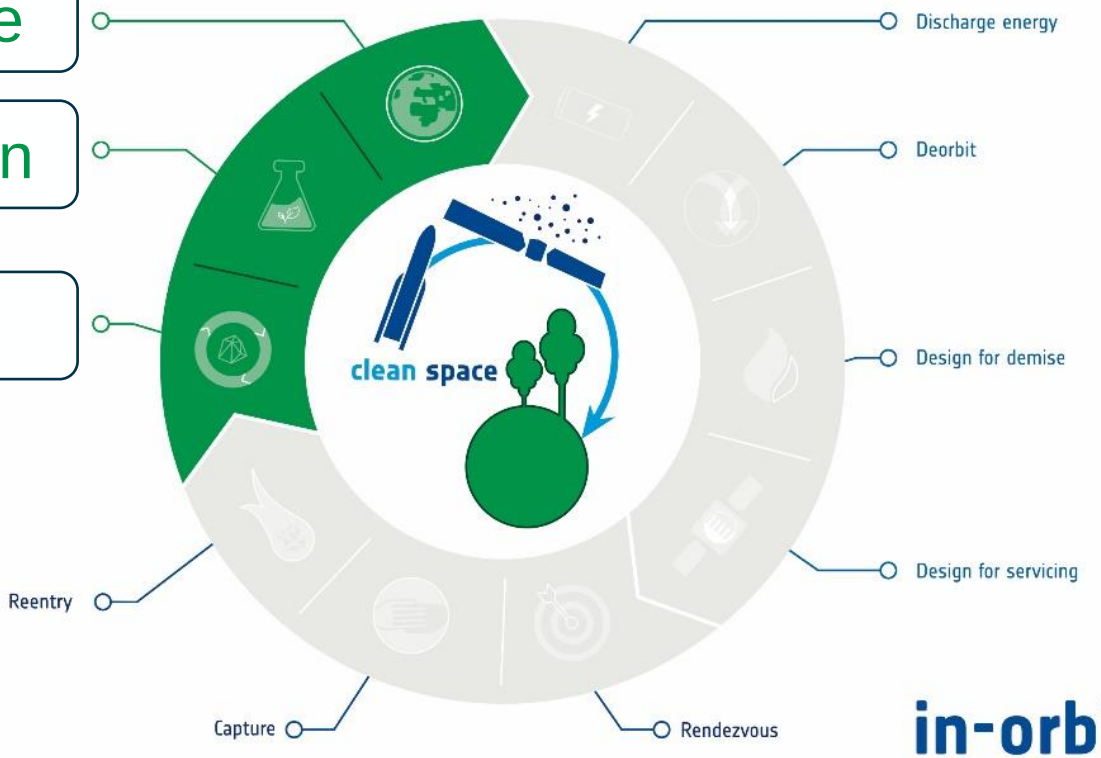
management of end of life

→ SPACE DEBRIS REDUCTION

Effect on the atmosphere

Environmental Regulation

Life Cycle Assessment



in-orbit servicing

→ ACTIVE DEBRIS REMOVAL

Context: Space sector at international level

United Nations

General Assembly

Committee on the Peaceful Uses of Outer Space

Scie

Fifty

Vien

27.3 States and international intergovernmental organizations should promote the development of technologies that minimize the environmental impact of manufacturing and launching space assets and that maximize the use of renewable resources and the reusability or repurposing of space assets to enhance the long-term sustainability of those activities.

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

EcoDesign Branch

EcoDesign

Is necessary to understand how much space activities pollute on Earth and to identify 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

Enuironmental regulation

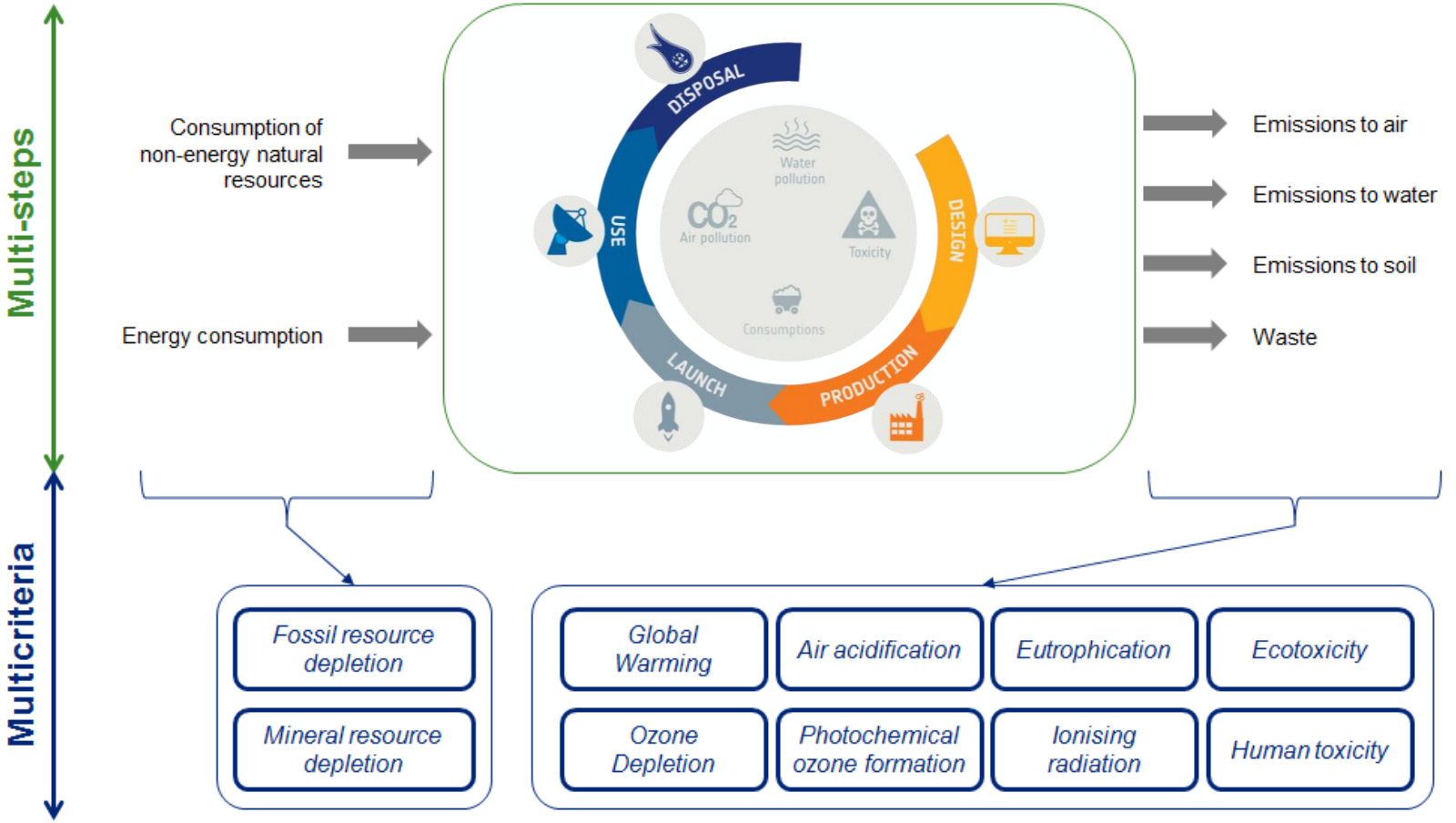
Finding alternatives to abide by legislations and avoid costly disruptions

Life Cycle Assessment – Definition

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

- ✓ **Multi-step analysis**
  The environmental impacts are assessed across all stages of existence.

- ✓ **Multi-criteria analysis**
  The outcomes are expressed with several quantified environmental indicators (impact categories).



Life Cycle Assessment – Application to Space

Specificities of the space sector

- Low production rates
- Use of specific materials and components not included in standard databases
- Direct emissions into all layers of the atmosphere
- Specific and power demanding tests
- Relatively short use phase
- Long time needed for research and development

Adaptation of the LCA had to be performed and specific tools were developed

Eco-design definition and approach

"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**.

ecodesign
→ REDUCING IMPACTS

LCA → **Hotspot identification** → **Eco-design**

ROADMAP

LCA

LCA Launch segment

LCA Space segment

LCA Ground segment

LCA Launch segment - update

LCA implementation in ESA projects

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

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

Challenges for LCA and Ecodesign applied to space

- Defining the Functional Unit
- Data Management challenge
- Impact of Testing
- Impact of Infrastructure
- Impact of R&D
- Impact of Office Work
- Spacecraft demise impact on atmosphere
- Launch events impact on atmosphere
- Impact on Deep Sea
- Space Debris

Conclusion

Apply LCA to space system is not an easy task

The LCA Handbook and Database are essential tools and need to mantained

Uncertainties still exist to characterize the impact of space systems

LCA and EcoDesign in certain cases might be requested to comply with National and International environmental legislations

Contribution to space sustainability

Environmental communication and public awareness need to be further developed

SHARING IS CARING

Thank you for submitting the abstracts and joining us at the CSID

Agenda for Ecodesign at CSID 2022