



SEEDS tool
a Simplified Ecodesign Evaluation for new
Development in Space

DEFENCE AND SPACE

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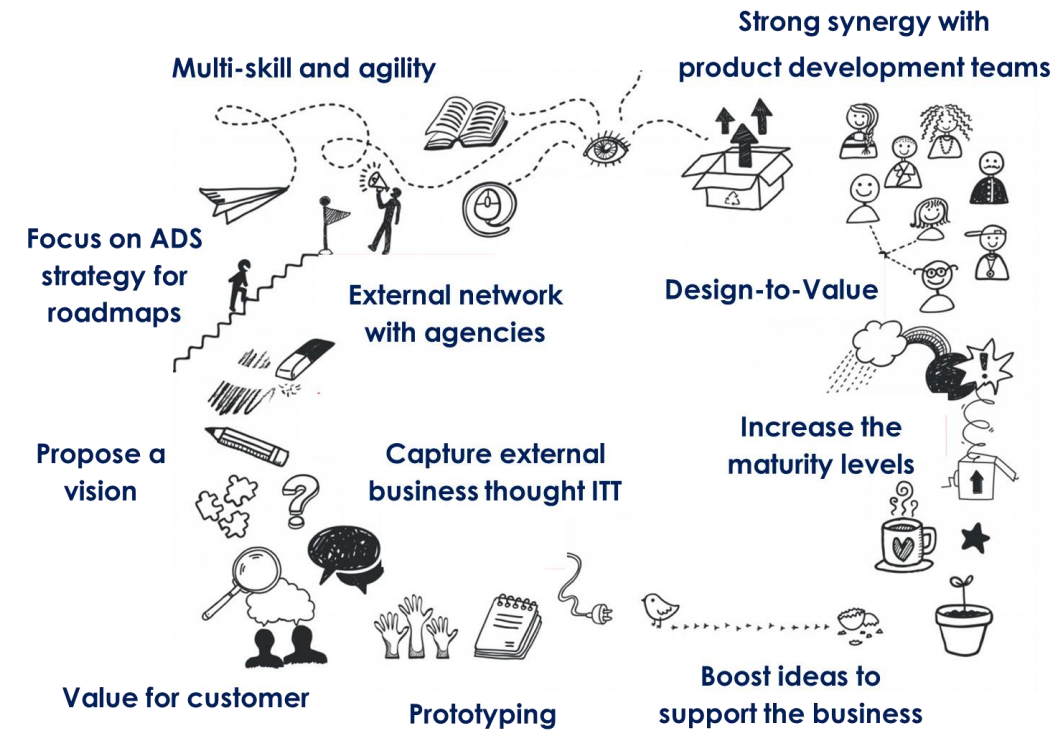
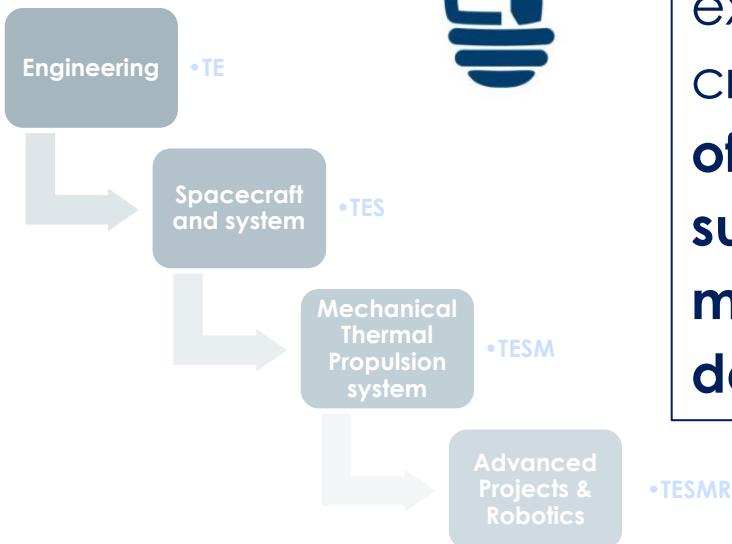
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Goal of the methodology and tool

To define a methodology to estimate the **environmental impact** of a product from its **low level of maturity without applying** a formal and complex life cycle assessment (LCA), to monitor the evolution of **indicators** and to **guide the decisions** with respect to sustainability during the **design phase for Mechanical and Thermal Products**.

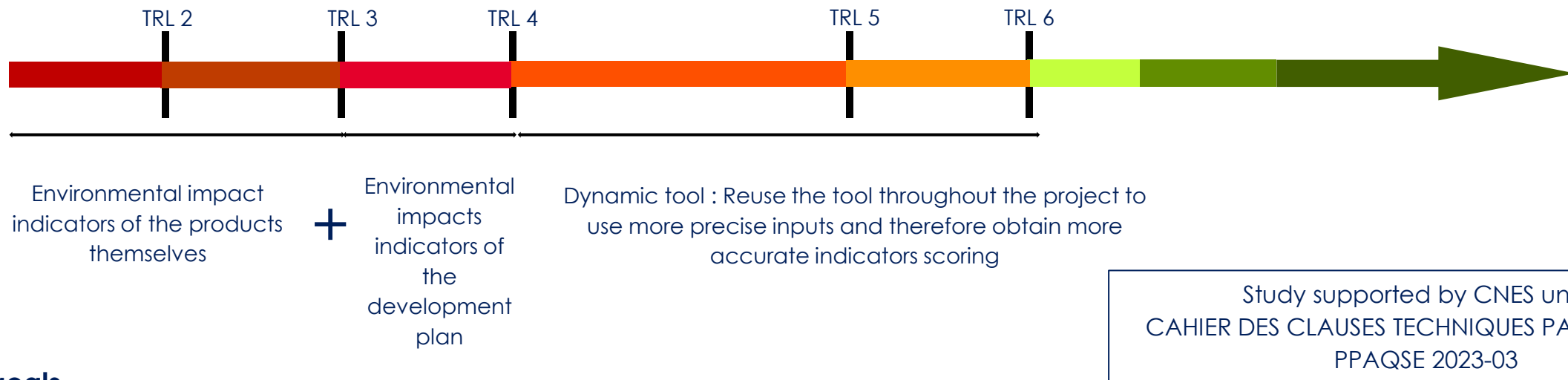


Fostering **Ecodesign** in **innovation teams** to enable fast application, experimentation and creation of **new sources of value** related to **sustainability into mechanical and thermal developments**.



A methodology and tool :

- Used by the designer in the **advanced project team in Engineering (Mechanical Thermal Propulsion)**
- Easy-to-use to save time and money
- Require as little inputs as possible
- Allow the designer to not use the lifecycle assessments (LCA) and to evaluate both product and associated development plan
- Display the accuracy of the study/indicators results

**Main goals**

- **Output ecodesign indicators to be used during trade-offs and development as decision support**
- **Progressive and dynamic tool to monitor the evolution of the ecodesign indicators**

Progress of the study supported by CNES

Start in March 2023

Today

Next phase

Biblio – state of the art
Exploitation of existing
ADS LCA products

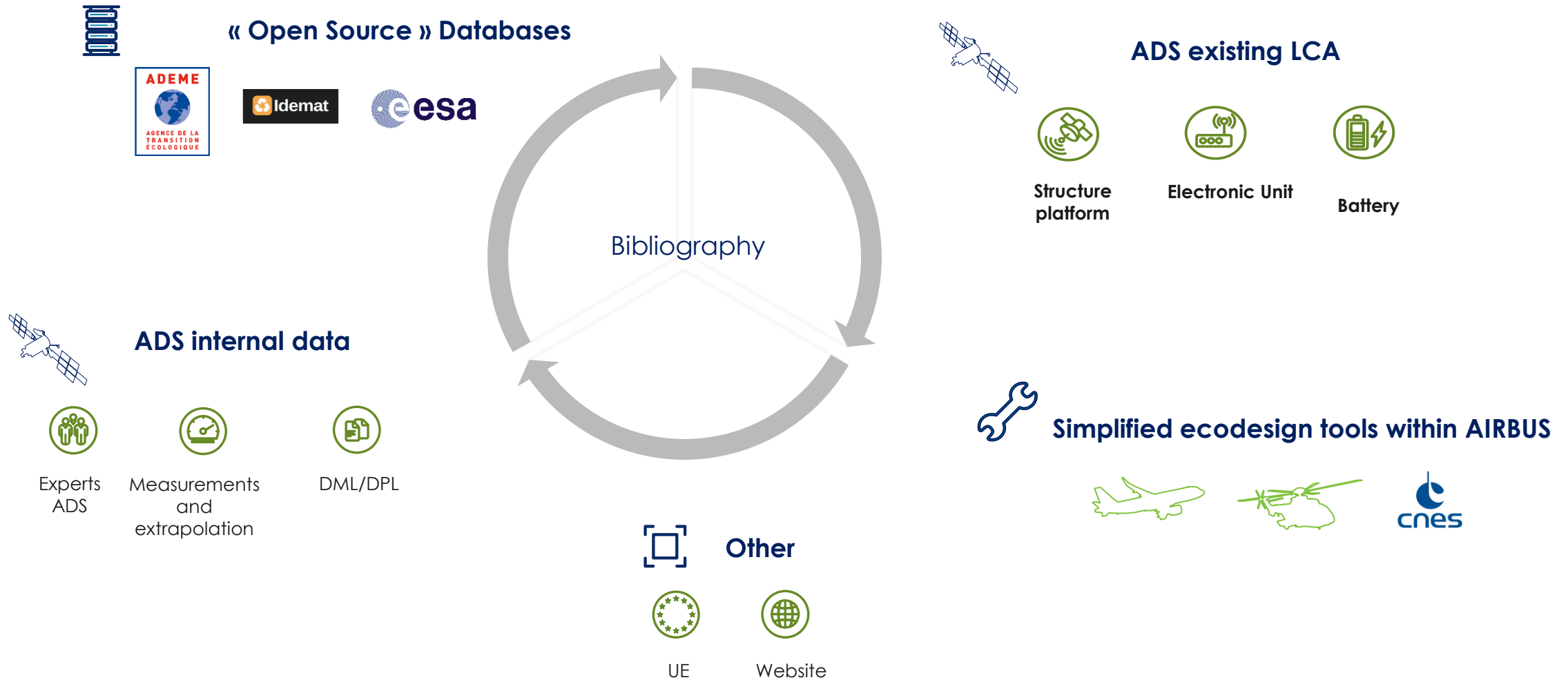
- ESA LCA Guidelines
- Identify the hot spots
- Identify the improvement axis to consider since low TRL
- Select the indicators
- Simplify the product tree: grouping by categories

Define an Ecodesign
methodology for low TRL
projects

- Decision support
- Monitoring of the evolution / indicators
- Sustainability awareness
- Simplified input forms
- Assessment of the development plan (analyses, tests, demonstrators, breadboards...)
- Tool creation (Excel)

Improvement of tool
Use cases Acceptance
tests

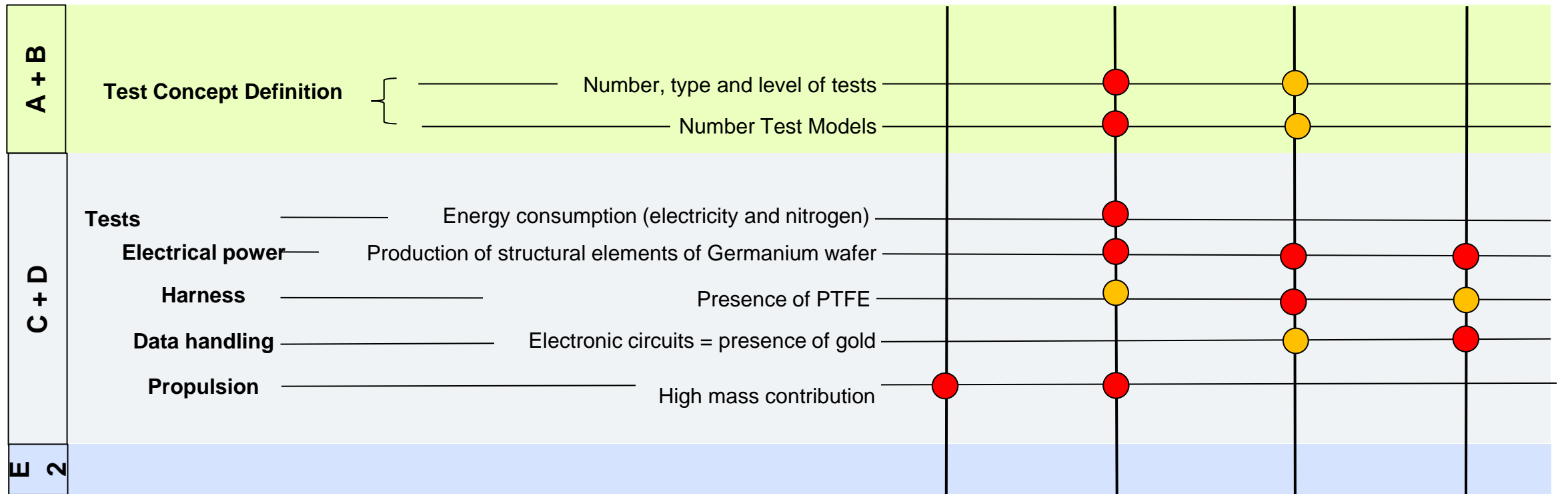
- Test and improve the tool on “acceptance cases” and on several projects with TRL<6 :
 - ✓ Deployable mast
 - ✓ Cryostat
 - ✓ Proposals
- Database improvement to be able to evaluate more projects/products:
 - ✓ Propulsion
 - ✓ Tests



Hot spots Standard EO Platform Study

TOOL

SimaPro (v9.0) software
Ecoinvent v3.3



* Average contribution to 18 environmental impact indicators

● High contribution ● Significant contribution

LCA Standard environmental impact indicators list (18)

3. Climate change : CO2 emission

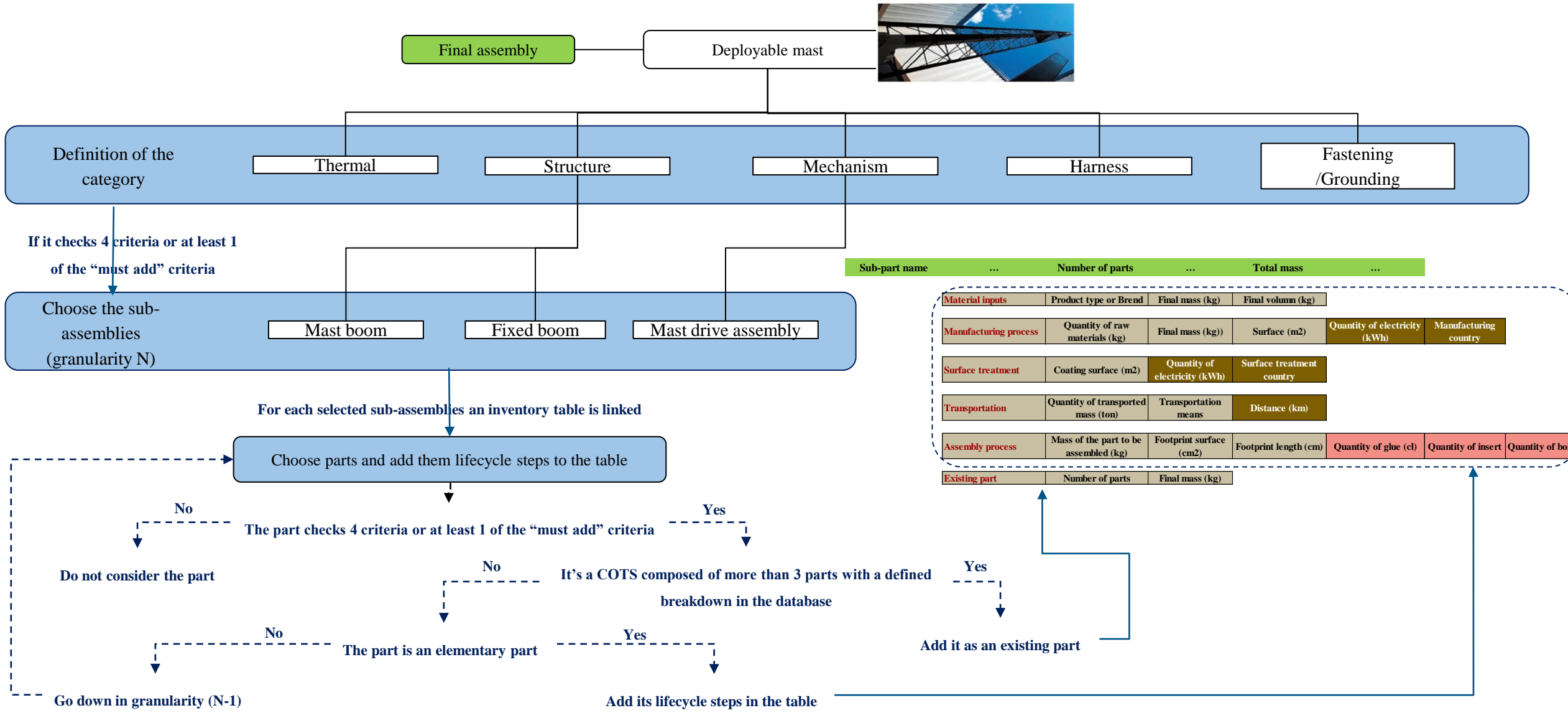
1. Hazardous material
and substance

2. Critical Raw Material

4. Circularity

Environmental impact indicator	Unit	LCIA method
Climate change	kg CO2 eq	For all life-cycle phases except launch event: baseline model of
Ozone depletion	kg CFC-11 eq	For all life-cycle phases except launch event: Steady-state ODPs 1999 as in WMO assessment
Human toxicity, non-cancer effects	CTUh	USEtox
Human toxicity, cancer effects	CTUh	USEtox
Particulate matter	kg PM2.5 eq	ReCiPe
Ionizing radiation HH	kBq U235 eq	ReCiPe
Ionizing radiation E (interim)	CTUe	ReCiPe
Photochemical ozone formation	kg NMVOC eq	ReCiPe
Acidification	molc H+ eq	CML2002
Terrestrial eutrophication	molc N eq	ReCiPe
Freshwater eutrophication	kg P eq	ReCiPe
Marine eutrophication	kg N eq	ReCiPe
Freshwater ecotoxicity	CTUe	USEtox
Land use	kg C deficit	ReCiPe
Mineral, fossil & ren resource depletion	kg Sb eq	ReCiPe
Marine ecotoxicity	kg 1,4-DB eq	CML2002
Metal depletion	kg Fe eq	ReCiPe
PRENE	MJ	Ecoinvent, Cumulative energy demand

Product tree simplification methodology



SEEDS user interface in Excel

Description Describe the functional unit of the assembly

Name the product assembly Total mass (taken into account) kg Number of flight models

The user will have to fill 3 separate **modules** to enter all the project information : **Elementary Parts**, **Product Assembly** and **Development Plan** (work office, analysis, breadboards/EM, tests)

MODULE 1 Elementary part / Sub-assembly

Name the sub-assembly or elementary part Total mass kg Number of parts

Existing element

or

New element

MODULE 2 Product assembly

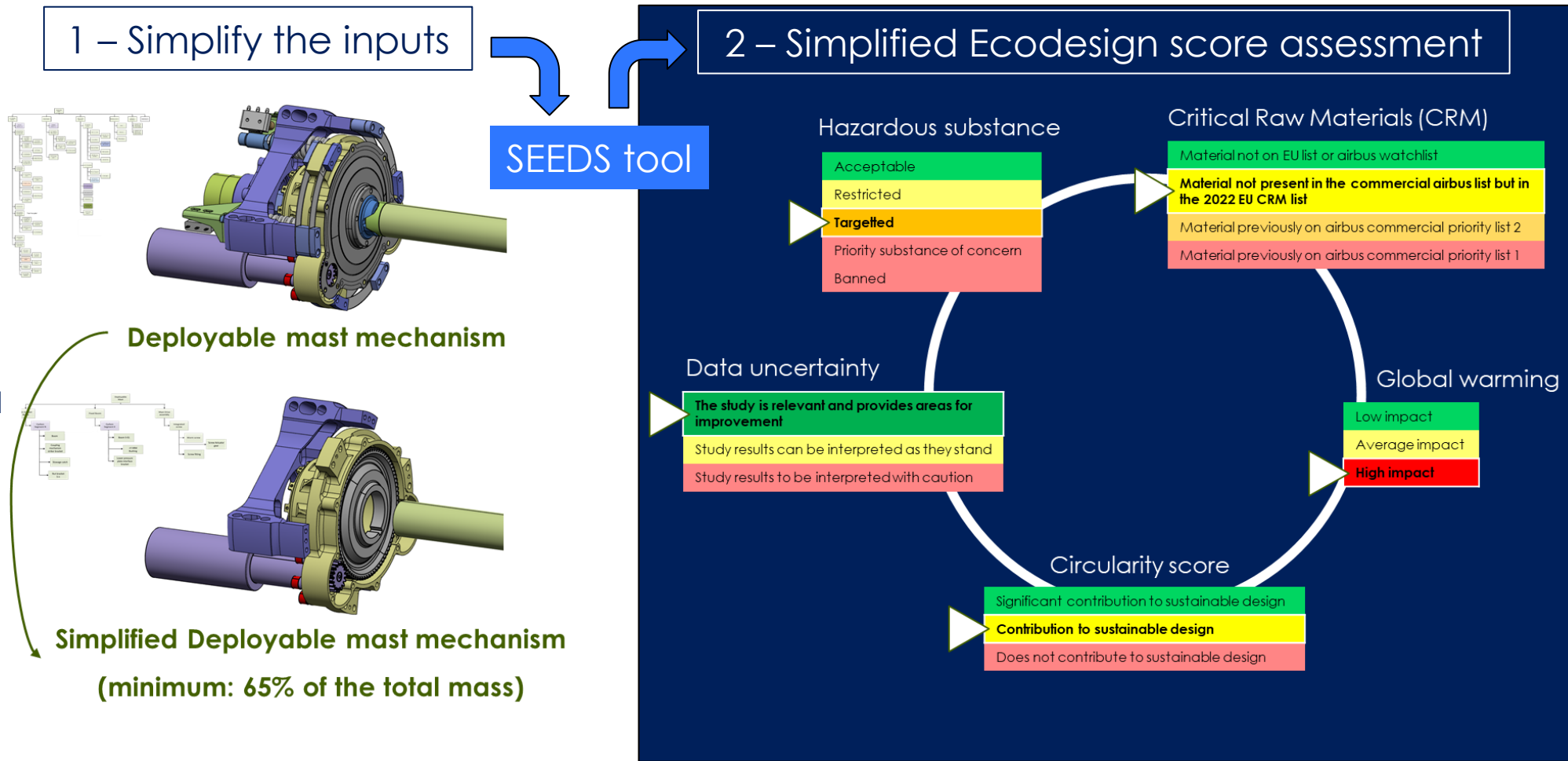
MODULE 3 Development plan

SEEDS : a simplified ecodesign assessment tool

SEEDS is developed within a Mechanical and Thermal Advanced Projects team and aim to offer simplified assessment of the environmental impact of a future product including both its definition and its development plan.

The simplification is achieved through 3 steps

- Simplification of the Product tree
- Simplification of the inputs (categorization limited to relevant database for Mechanical and Thermal Products)
- Monitoring of only 5 indicators : 4 scoring and 1 computed indicators



Thank you, questions ?

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