



GreenDelta



EVERS



ESA LCA DB End-User Experience

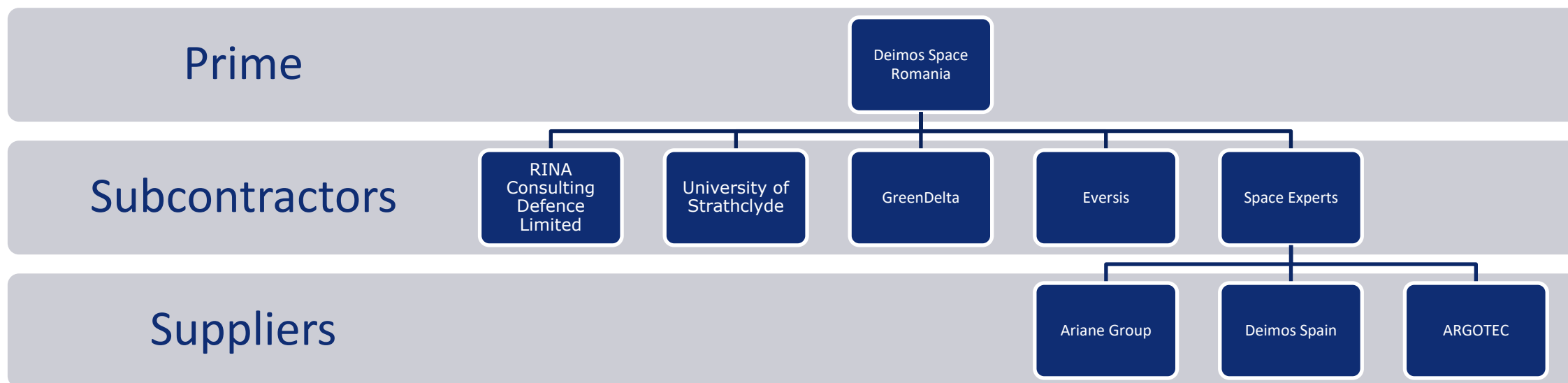
ESA LCA DB Team
11th October 2022

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Overview

1. Project Team
2. Project Objectives
3. Project Status
4. ESA LCA DB – Improvements
5. End Product

ESA LCA DB End-User Experience Project Team



Project Objectives

1. Consolidate the existing ESA LCA database.
2. Quality improvement of existing datasets: define the process and updates.
3. Update the database with new datasets: define the process and updates.
4. Disseminate, promote and offer support services for ESA LCA DB to users.

Consolidate the existing ESA LCA database

- ❑ The **main objective** is to build and maintain a fully operational and up-to-date environmental LCA database to be used by ESA and European stakeholders from ESA member states.
- ❑ Two flavors:
 - Internal ESA LCA DB (unit process, full visibility) – only ESA access
 - External ESA LCA DB (confidential information “black box”/ system process or excluded) – external access
- ❑ Approaches to complete/update the ESA LCA Database, when data quality is found to be lacking within existing datasets:
 - Adding new datasets using supplier data to fill in the gaps,
 - Improving or updating existing datasets.

Quality improvement of existing datasets: define the process and updates

- ❑ Mixed quality between the datasets inside the ESA LCA DB
- ❑ Create procedure for critical analysis of existing datasets
- ❑ Assess DB datasets, attribute scores
- ❑ Improve existing DB datasets by:
 - Requesting additional raw data from suppliers
 - Merging similar datasets
 - Creating generic datasets (when raw data is not available, go to statistics/literature)

Update the database with new datasets: define the process and updates

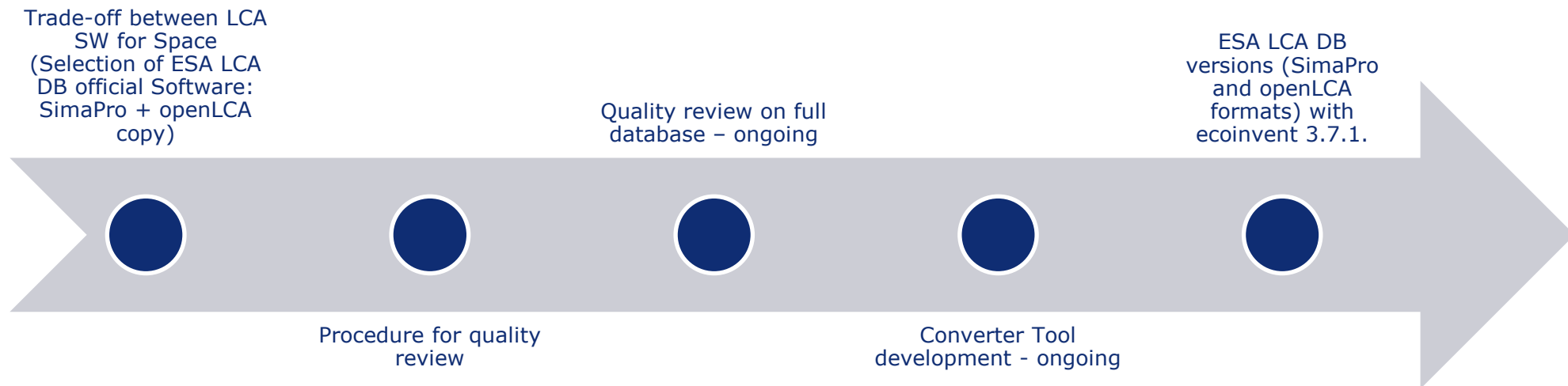
- ❑ Define the step-by-step procedure for updating the ESA LCA DB with new datasets
- ❑ Define guidelines for new datasets format
- ❑ Version control on DB!

Disseminate, promote and offer support services for ESA LCA DB

- ❑ **Web Tool for dissemination**/promotion of the DB releases
- ❑ Support services:
 - **Converter Tool** for dataset conversion between selected common formats
 - **Web Tool for Questionnaire** support

ESA LCA DB End-User Experience Project Status

Activities completed:



ESA LCA DB – Improvements

1. Dataset Quality Review
2. Hotspot and Gap Analysis
3. Methodologies for Data Integration
4. Web-based end-user interface with ESA LCA DB

Dataset Quality Review, Hotspot and Gap Analysis

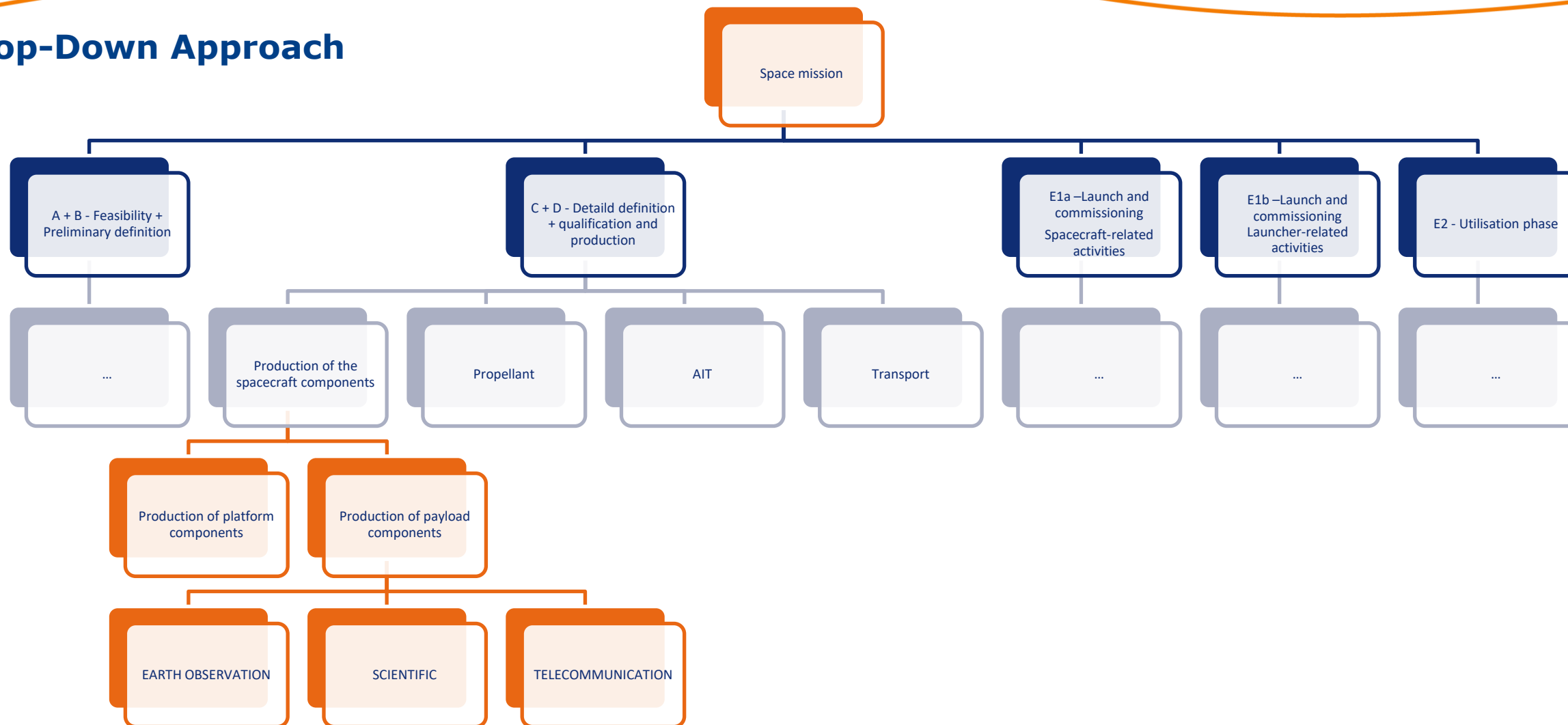
- ❑ Convert the SimaPro LCA DB to openLCA to analyze/filter the data processes and output if something falls outside the standard
 - Building on existing SimaPro csv import in openLCA, a refined API was developed
 - Aim to fully support the SimaPro format as specified, including life cycle stages and their elements
- ❑ Define a critical gap/hotspot analysis methodology of the ESA LCA DB datasets considering the ESA priorities
 - **Top-down approach**
 - aimed at evaluating a generic space mission and identifying all the datasets which are required to model a generic space mission
 - **Bottom-up approach**
 - aimed at evaluating, according to a Bottom-up approach, the manufacturing processes, technologies etc. datasets.
- ❑ Development of a Matrix for Dataset evaluation
- ❑ Validate and test the methodology on selected datasets
- ❑ Involvement of space experts for performing the gap analysis of datasets and identifying proper improvements
- ❑ Full database review

Top-Down Approach

- ❑ Aimed at evaluating a generic space mission and identifying all the datasets which are required to model a generic space mission
- ❑ Provide high-quality datasets:
 - review of the existing datasets and
 - new datasets (gaps in the database)for calculating the environmental impacts at mission level
- ❑ Provide guidelines for Space Mission modelling
- ❑ Baseline scenario: Sentinel 3 (documentation and SimaPro model)
- ❑ Space specific phases, processes, materials, equipment, etc for calculating the environmental impacts of different space missions are defined.

ESA LCA DB End-User Experience Dataset Quality Review

Top-Down Approach

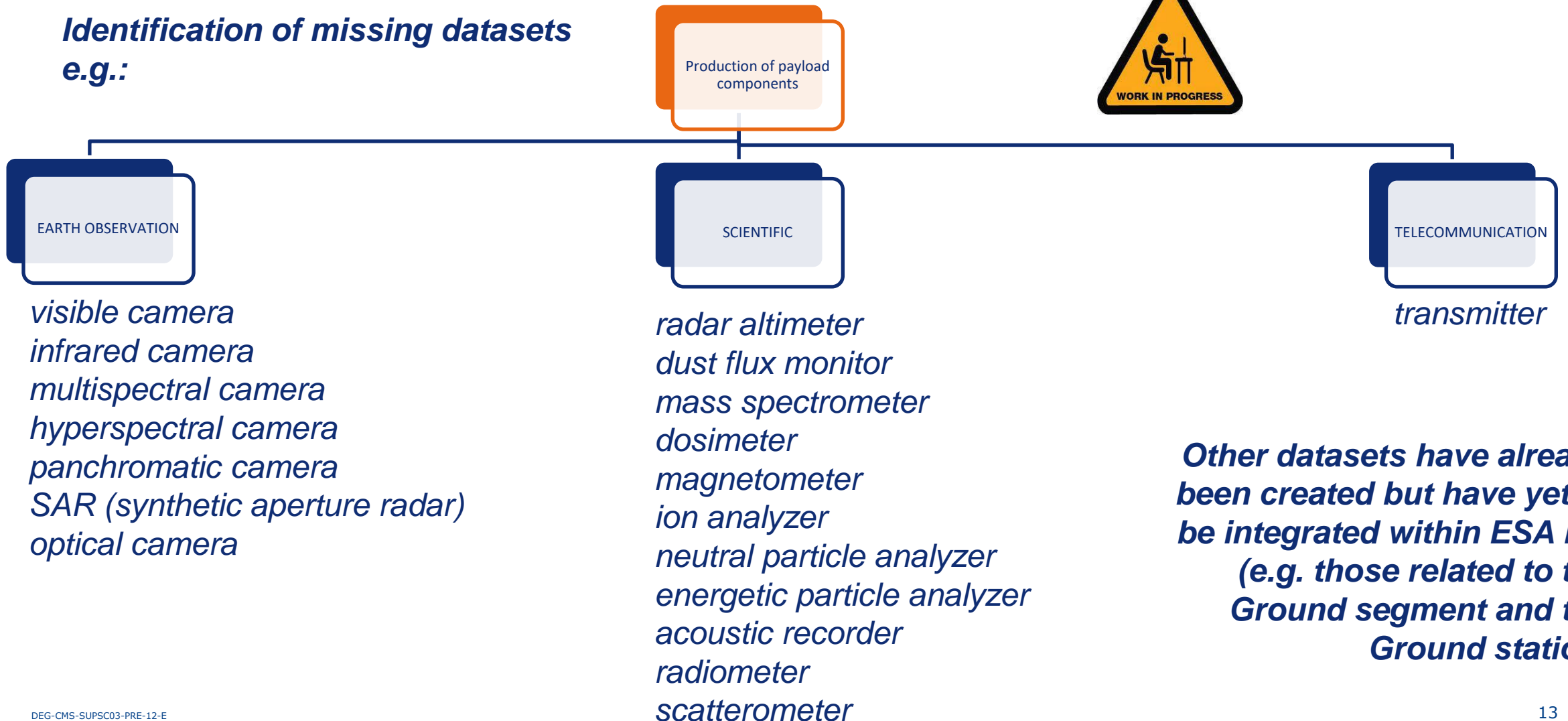


ESA LCA DB End-User Experience Dataset Quality Review

Top-Down Approach

Identification of missing datasets

e.g.:

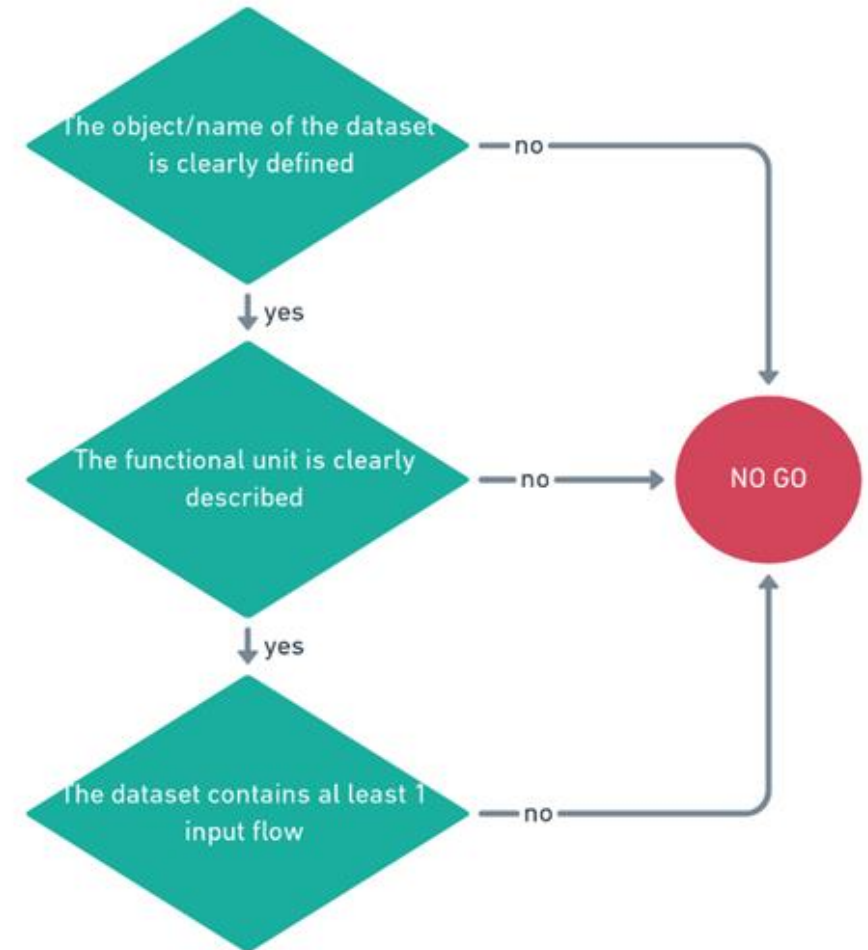


Bottom-up Approach

- ❑ Aimed at evaluating, according to a Bottom-up approach, the manufacturing processes, technologies, etc. datasets.
- ❑ Full database review using the developed methodology and the evaluation matrix
- ❑ Identify and propose approach for improve the existing datasets and create new datasets, based on the identified gaps
- ❑ Two phases:
 - a **preliminary assessment** aimed at evaluating if the datasets meet three **minimum requirements** and at deciding if it is possible to continue (or not) the datasets investigations
 - a **quality assessment** aimed at checking the **overall quality** of the datasets through different criteria, identifying the eventual need for urgent measures to be undertaken for their improvement

Bottom-up Approach – Preliminary assessment

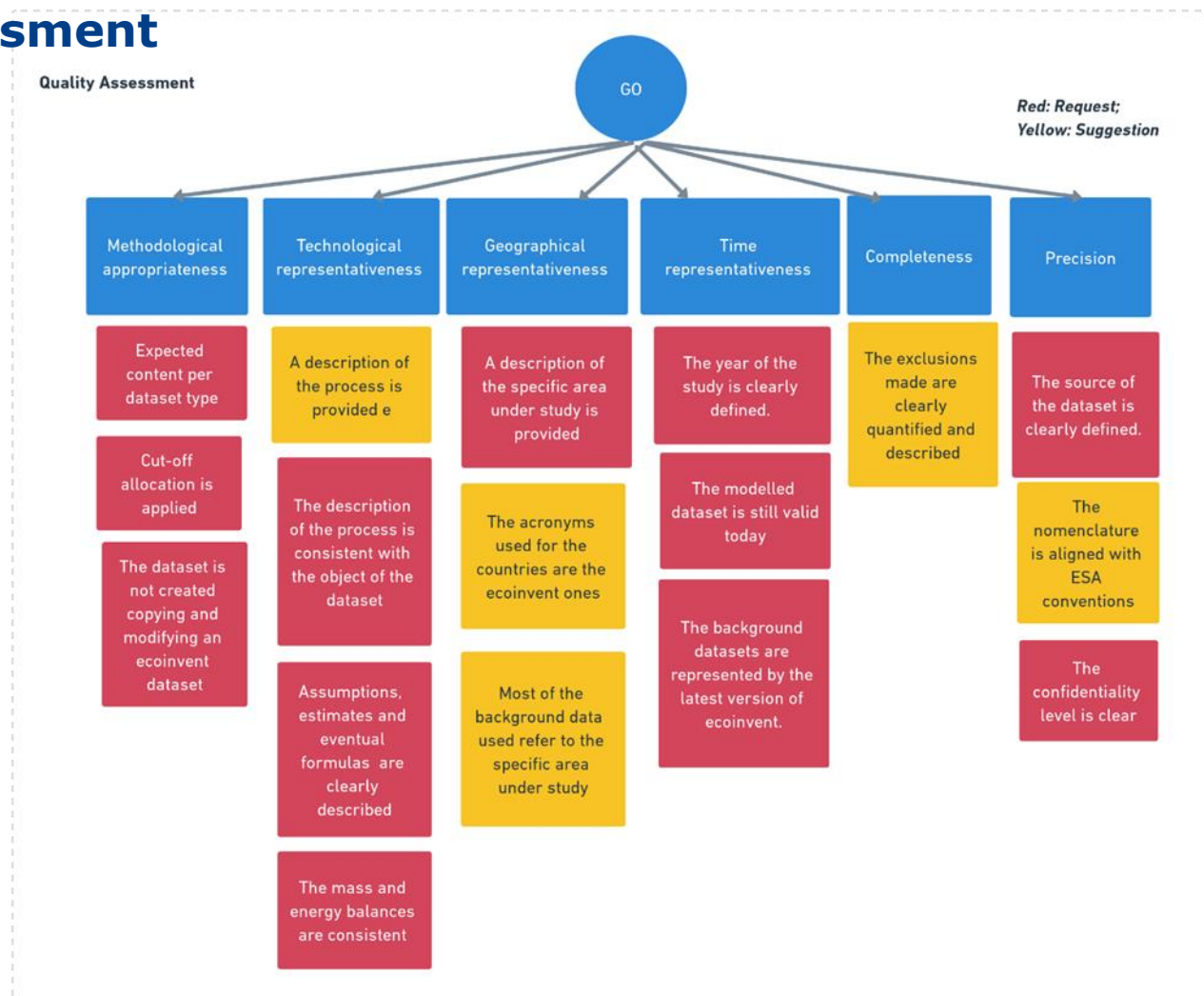
- ❑ Three criteria mandatory for the continuation of the analysis
- ❑ GO/NO GO outcome
- ❑ In case of NO GO – mandatory update dataset



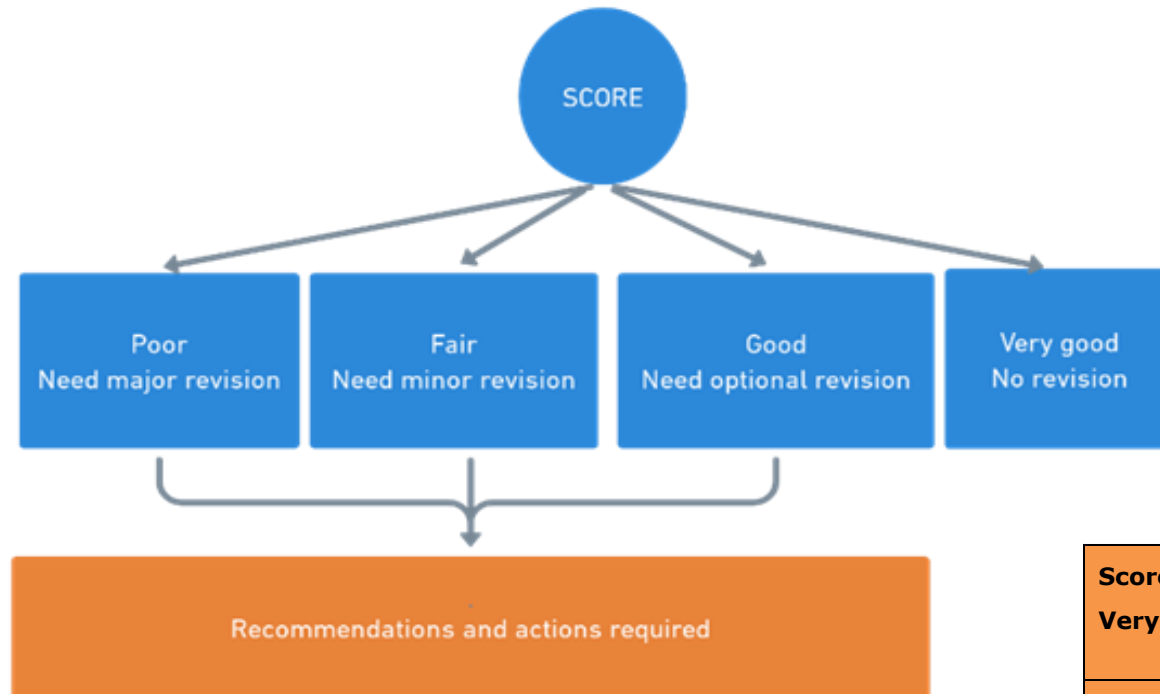
Bottom-up Approach – Quality Assessment

❑ Criteria (with subcategories):

- **M**: modelling methods; input/output flows per dataset type; cut off allocation
- **TeR**: description of the process; mass and energy balance; assumptions, explanation of estimation and eventual formulas
- **GR**: description of the specific area under study; use of the acronyms from ecoinvent
- **TiR**: indication of the year of the study and of the data collection
- **C**: description of the main exclusions and assumptions made
- **P**: indication of the source of the dataset, the level of confidentiality and proper use of ESA nomenclature



ESA LCA DB End-User Experience Quality Assessment – Score



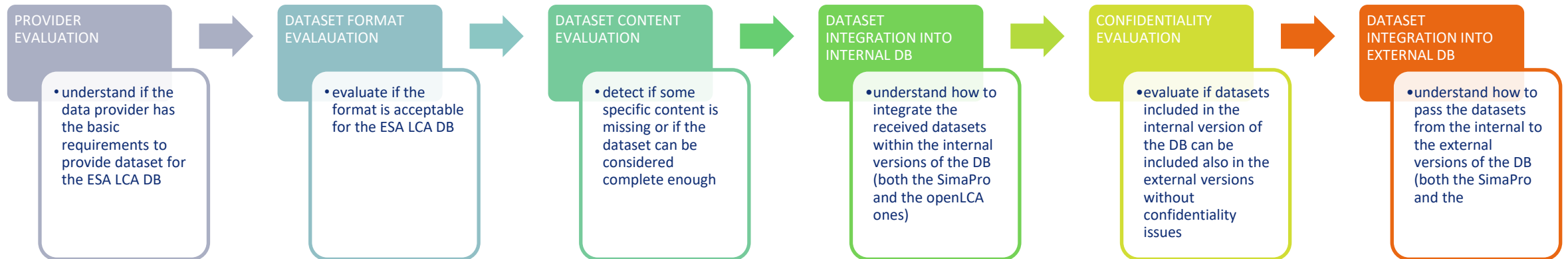
❑ Score calculus:

The assigned **YES/NO answers** contribute to formulate the following final evaluation.

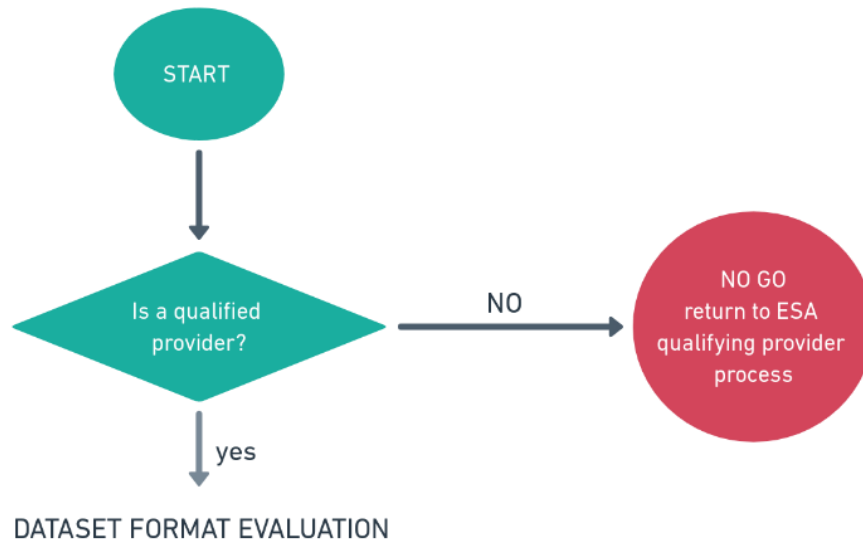
The lowest score (1- Very poor) is awarded if the three criteria of preliminary assessment are not met.

Score 1: Very poor	Score 2: Poor	Score 3: Fair	Score 4: Good	Score 5: Very good
Action: to be updated	Action: need major revision	Action: need minor revision	Action: need optional revision	Action: no revision needed
If the criteria of Preliminary assessment are not met	If more than 2 "requests" are not met	If 1-2 "requests" are not met	If only "suggestions" are not met (the requests are all fulfilled)	If all requests and suggestions are met

Process for updating the database with new datasets

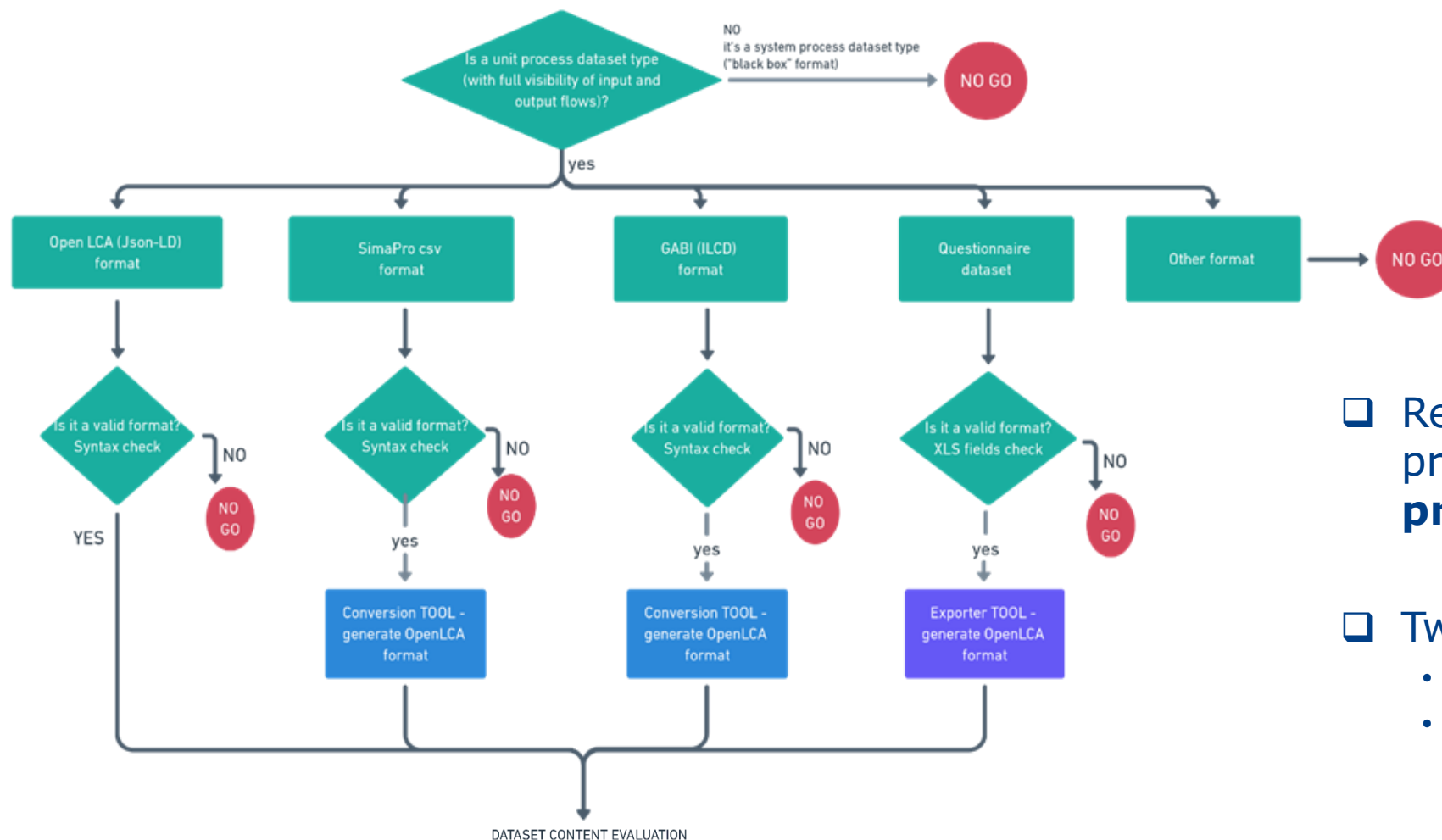


1. Provider Evaluation



- ❑ The Provider must demonstrate to comply with some basic requirements
- ❑ Possible providers:
 - LCA practitioners dealing with space sector projects
 - Space experts, having basic knowledge of LCA or supported by LCA practitioners

2. Dataset Format Evaluation

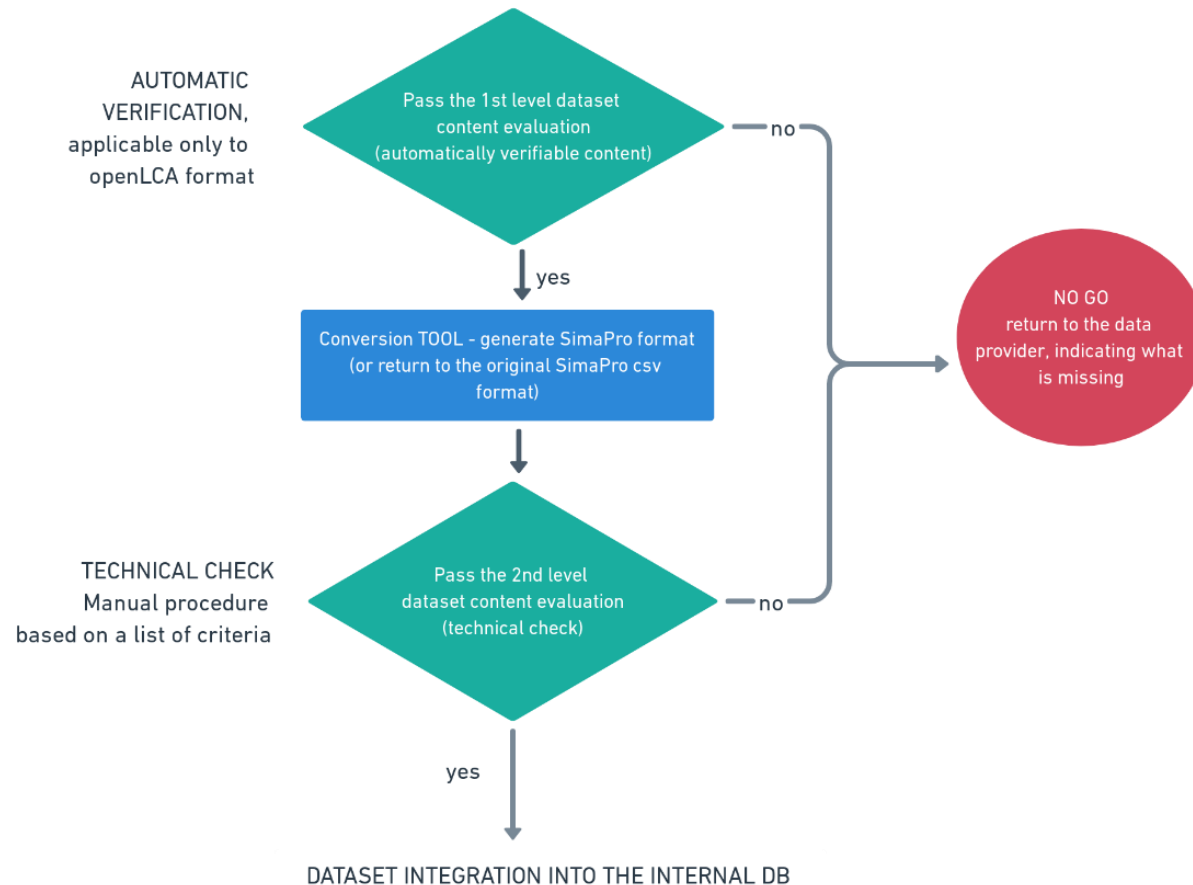


❑ Requirement: all input provided to ESA are **unit process**

❑ Two accepted formats:

- LCA format
- Questionnaire format

3. Dataset Content Evaluation



□ Two main steps:

- An **automatic procedure** to verify some basic requirements, applicable only to json-lc formats
- A **manual procedure**, based on a list of criteria, aimed at performing an additional technical check (the criteria are the same used for the evaluation of the new datasets)

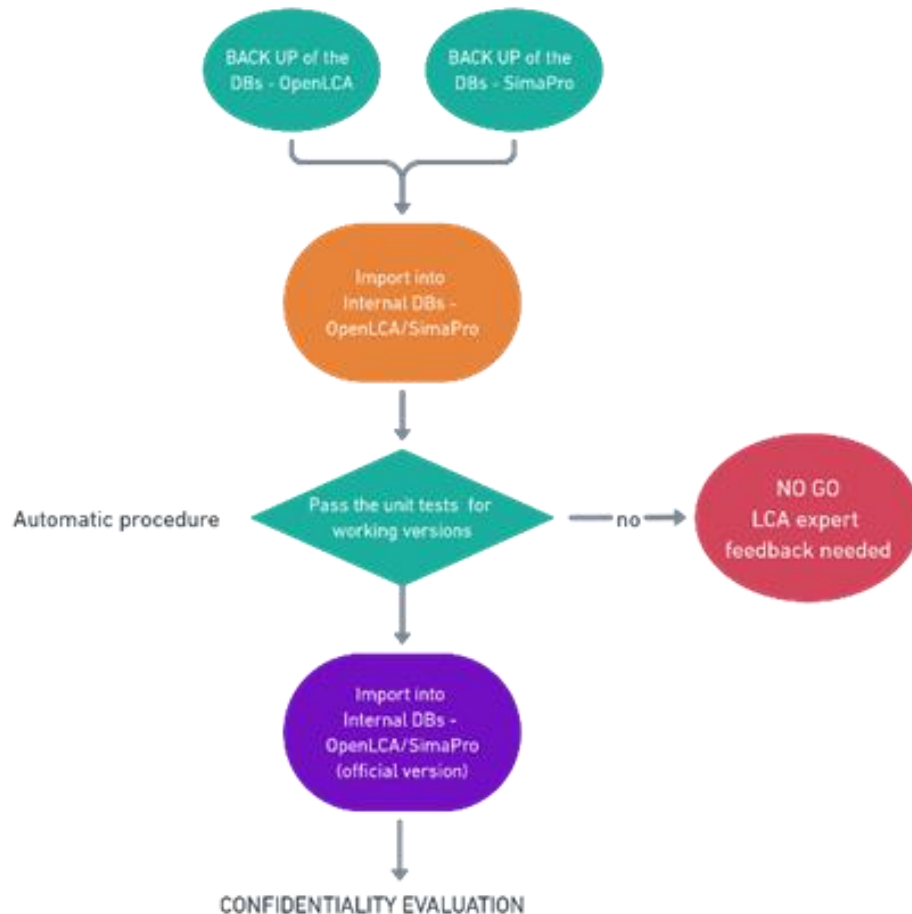
4. Dataset integration into the Internal DBs



□ Two internal DBs:

- SimaPro version
- openLCA version

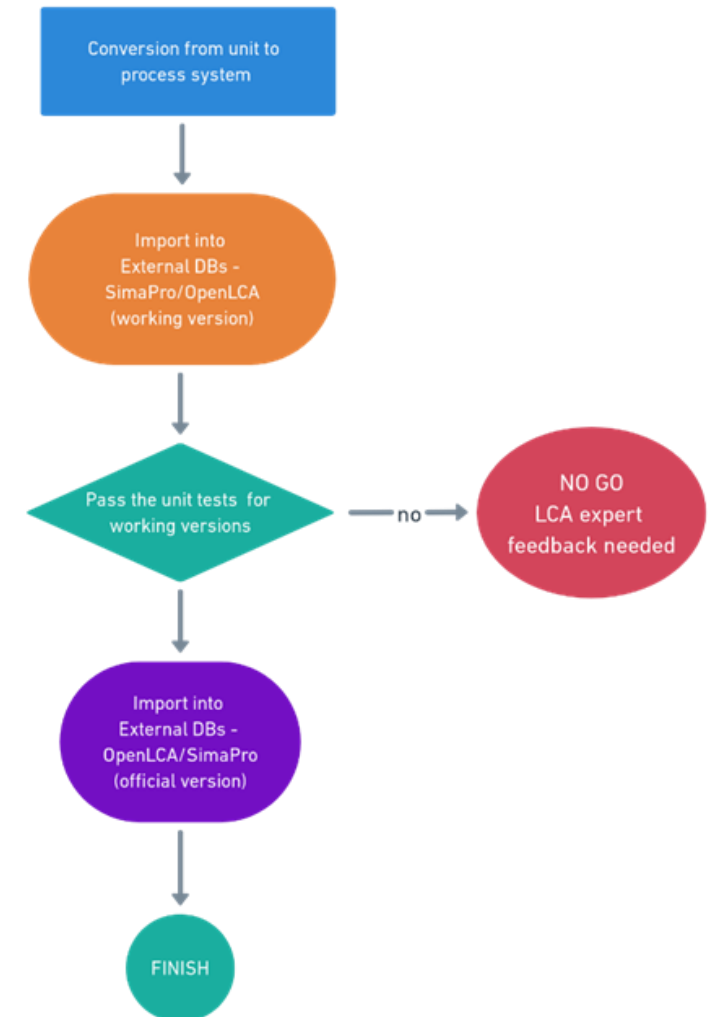
5. Confidentiality evaluation



- ❑ Dataset is included in the external database as **unit process only if accord for external distribution is explicitly expressed in dataset description.**
- ❑ if the dataset can be at least externally shared as “**black box**”, it is possible to convert it to a system process form (which represents an aggregated version of the dataset, where it is not possible to see all the input and output flows) and integrate it within the external DB.
- ❑ otherwise, it is **not possible to import it into the external version** of the DB and it is necessary to stop the process. In this case, the dataset will be visible only in the internal version of the DB.

6. Dataset integration into the External DBs

- ❑ Similar to internal database integration
- ❑ **Extra step aimed at converting from unit to process system, if needed**



Web-based end-user interface with ESA LCA DB

- ❑ Dissemination: ESA Web Tool for dissemination of official ESA LCA DB versions
- ❑ Data collection: Web Tool Questionnaire for guided support in how to complete the questionnaire

ESA LCA DB Product and services

1. Content - DB
2. Services for clients

Content

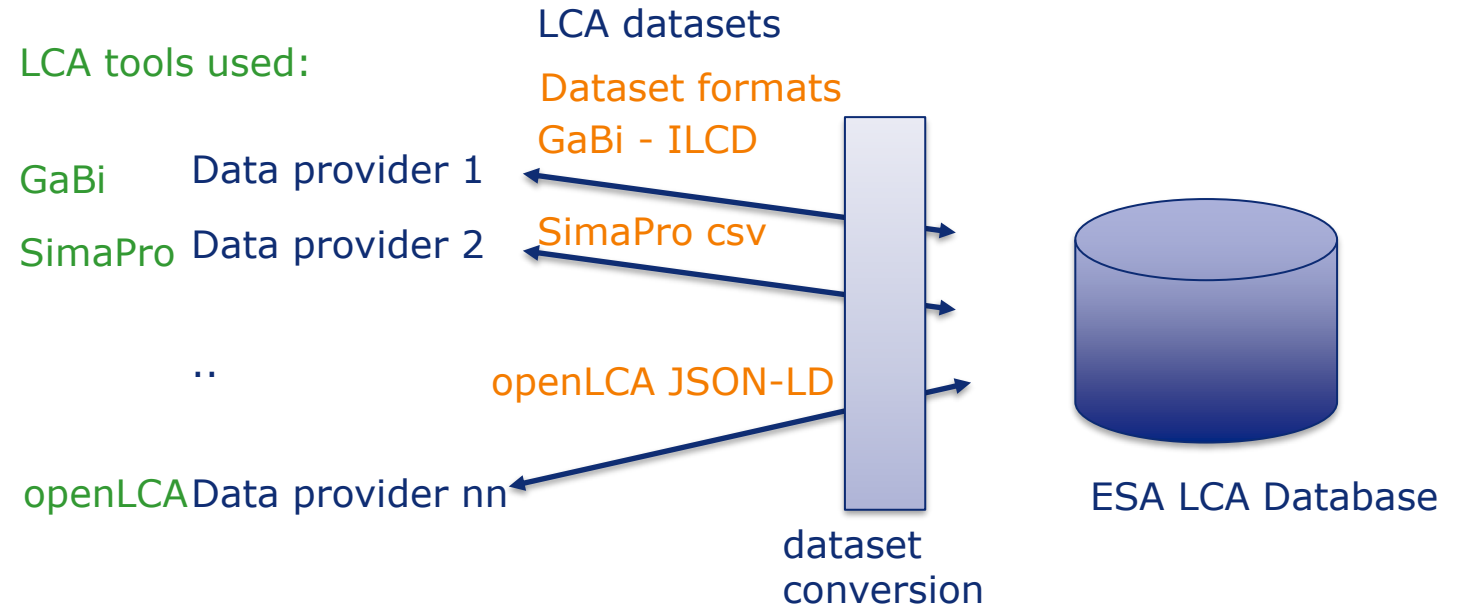
- ❑ Consolidated ESA LCA DB version
- ❑ High quality datasets
- ❑ Guidelines to align new datasets format/content for smooth integration

Services for clients

- ❑ **Converter Tool**
- ❑ **ESA Web Tool** for ESA LCA DB Dissemination
- ❑ **Web Tool Questionnaire** for dataset providers support
- ❑ **Meetings with expected end-users** for assessing needs and prioritizing

Converter Tool

- ❑ Objective: convert between selected representative data formats for “feeding” the ESA LCA database with datasets from data providers and also for providing ESA database content to the data providers, so that existing datasets can be used for new models done by the data providers.
- ❑ Supported data formats:
 - ILCD, csv, JSON-LD
- ❑ Modelling guidance for easier data conversion and integration.



ESA Web Tool

- ❑ Objective: dissemination of ESA LCA DB versions
- ❑ Format similar to known ESA Web Tools, such as the Space Debris User Portal
- ❑ Secured, login-based
- ❑ Full documentation on ESA LCA DB available
- ❑ Official ESA LCA DB releases available, with release notes
- ❑ Visualization of existent datasets in ESA LCA DB release
- ❑ Sample cases

Web Tool Questionnaire

- ☐ Tentative objective: help the data providers to generate correct and complete questionnaires for their prime contractors
- ☐ Provide documentation related to questionnaire creation
- ☐ Provide questionnaire samples
- ☐ Interactive web page for creating/modifying the datasets/questionnaires
- ☐ Save as .xls format on the user device

Meetings with expected ESA LCA end-users

- ❑ Main objective: establish the needs of the end-user and prioritize our work
- ❑ Main activities:
 1. Discuss about the SW used by the end clients
 2. Discuss about the needs they have from the LCA DB
 3. Be aware of their workflow, data formats , confidentiality level for datasets.
 4. Test the integration process: end-user data to be integrated in ESA LCA DB.



Questions?

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Thank you

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