

PLEIADES

Smarter Plant Decommissioning



WASTREAM for supporting the dismantling of nuclear installations

ICEM2023, [William ARSAC](#), Robin THOMAS, Nicolas DELANNAY, Thibaut HELMAN, Tractebel
william.arsac@tractebel.engie.com, robin.thomas1@tractebel.engie.com



This project has received funding from the EURATOM Research & Training Programme 2014-2018 under the Grant Agreement n°899990. The content of this document reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

Agenda:

- 1. Introduction
- 2. Description of main tools :
 - 2.1 PLEIADES platform
 - 2.2 WASTREAM software suite
 - 2.3 Interaction PLEIADES/WASTREAM
- 4. Methodology
- 5. Results
- 6. Conclusion



1. Introduction

- The PLEIADES project aims at connecting digital tools for smarter nuclear decommissioning
 - Databases and ontology
- The WASTREAM software suite (Tractebel)
 - Used as support decommission projects → Estimation of waste fluxes
- The work presented aims at demonstrating how Tractebel developed a synergy between WASTREAM and PLEIADES databases → waste estimation using PLEIADES framework



2.1 PLEIADES platform

- European initiative
- Common data environment for dismantling projects:
 - Structured database (+ dismantling ontology)
 - File database → store any type of file format
 - Identity and access management
 - Connection via web browser or API

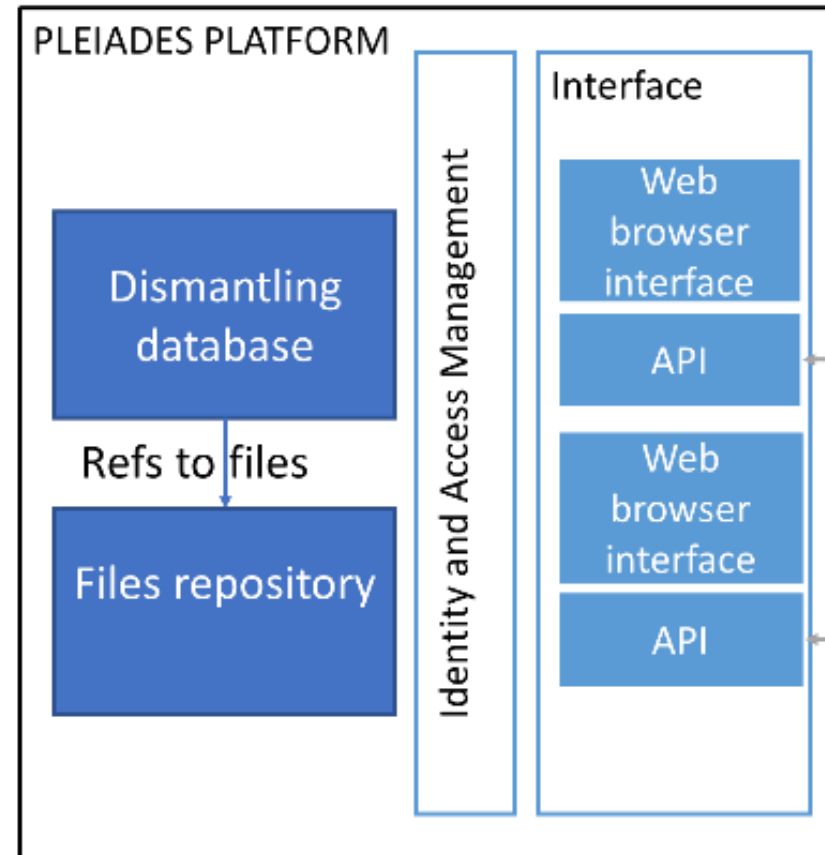


Fig1 : Graphical representation of the PLEIADES Platform



2.2 WASTREAM software suite

- The WASTREAM software suite allows:
 - Define waste stream models
 - Establish the link between the installation physical inventory, the waste streams and the dismantling planning
 - Calculating / analyzing / visualizing the quantities of waste produced
- Fast running and compatible with a wide variety of physical inventory databases / dismantling schedules



2.2 WASTREAM software suite

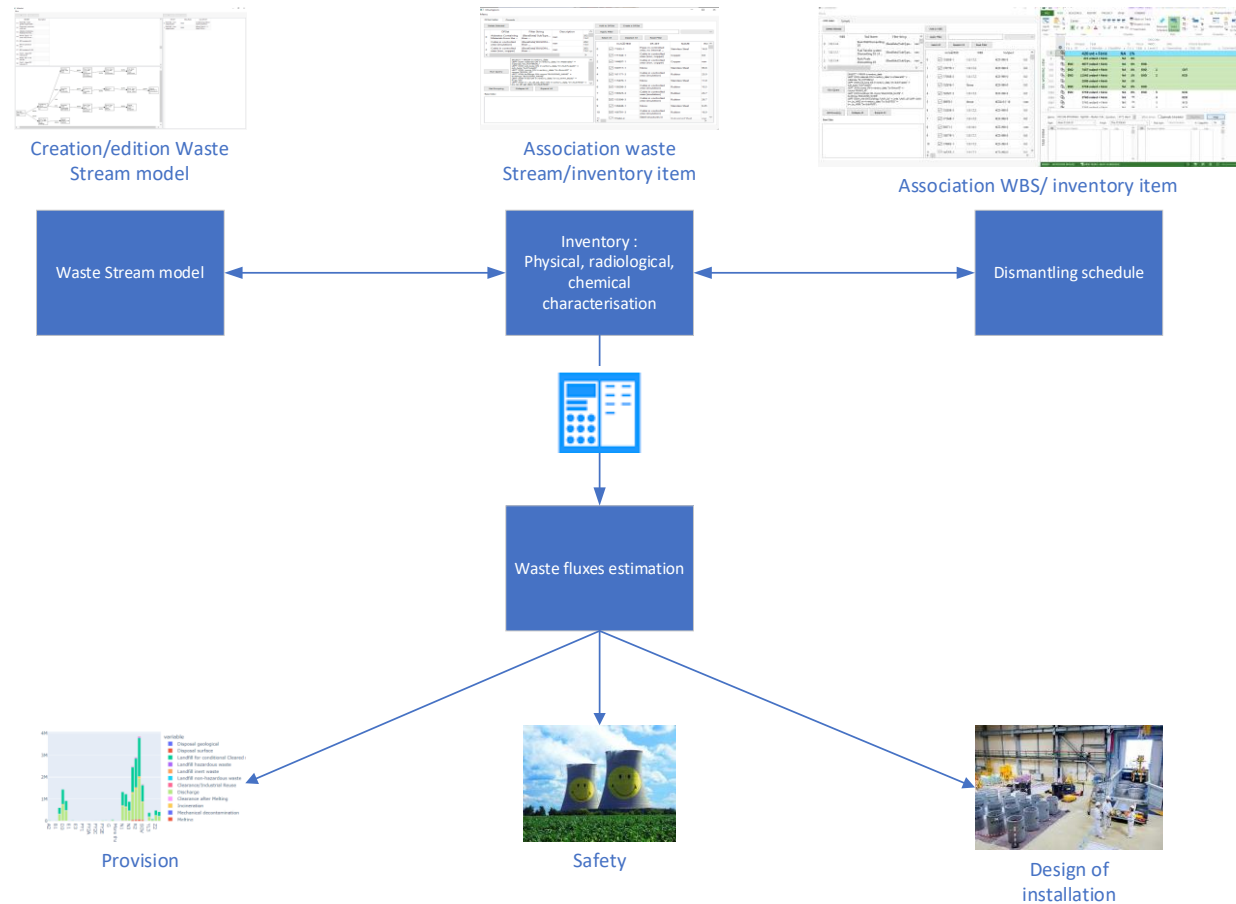


Fig2 : Graphical representation of the WASTREAM software suite



3.1 Interaction PLEIADES/WASTREAM

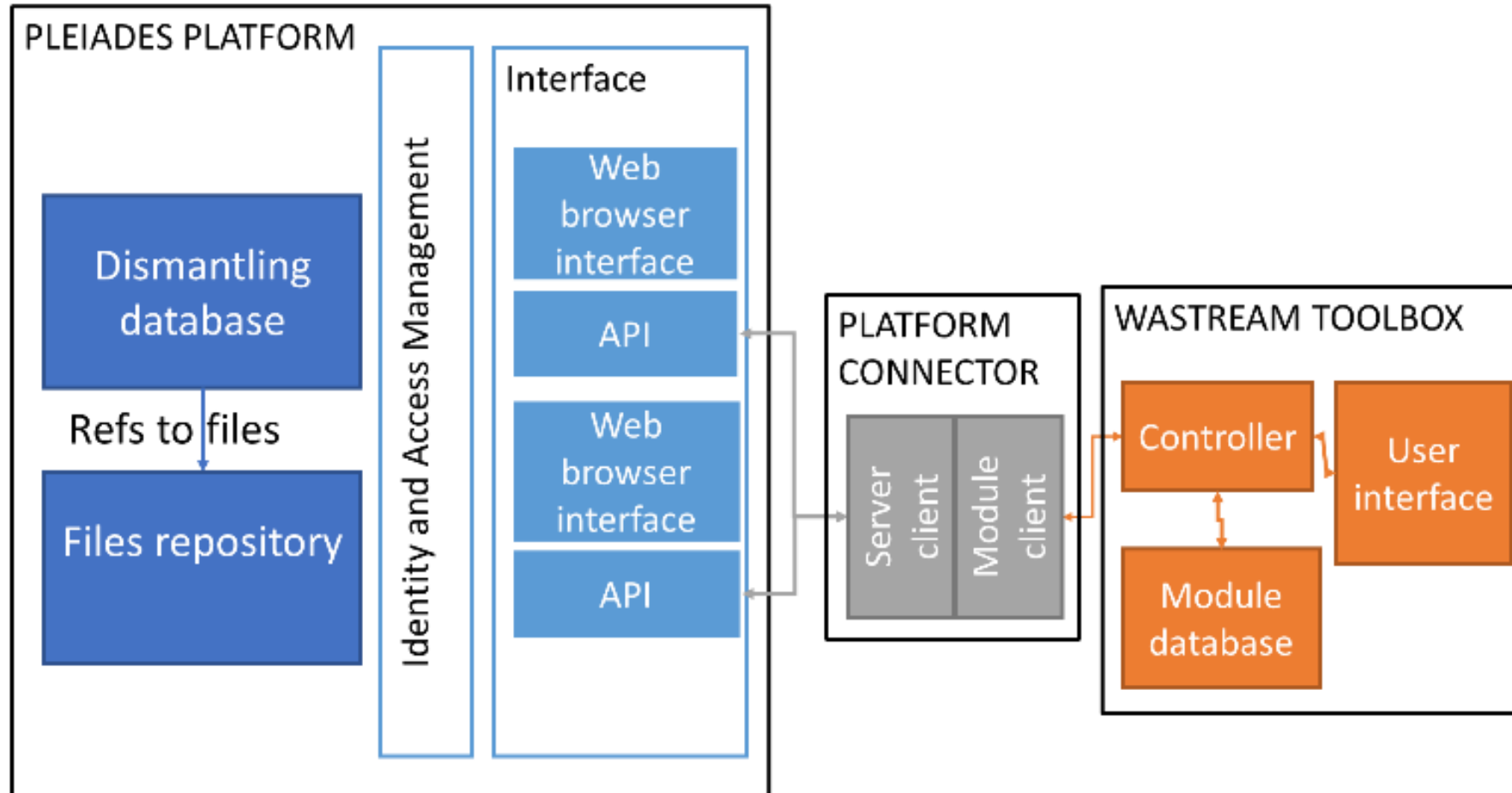


Fig3 : Graphical representation of the interaction PLEIADES/WASTREAM



4. Methodology

- 5 Steps
- Proof of concept using data from other PLEIADES participants
 - Start from IFC 3D model (BIM)
 - Synergy WASTREAM ↔ PLEIADES platform
 - Synergy between EU operators
- Optional: incorporate the results back into the IFC 3D model



4.1 Loading of physical and radiological characterization in PLEIADES database

- Starting point = 3D model containing:
 - Physical characterization
 - Radiological characterization (dose)
 - Activation
 - Contamination
- WASTREAM automates transfer of inventory items to PLEIADES
 - Entries created in PLEIADES structured database
 - Radiological (activity) and physical characterization

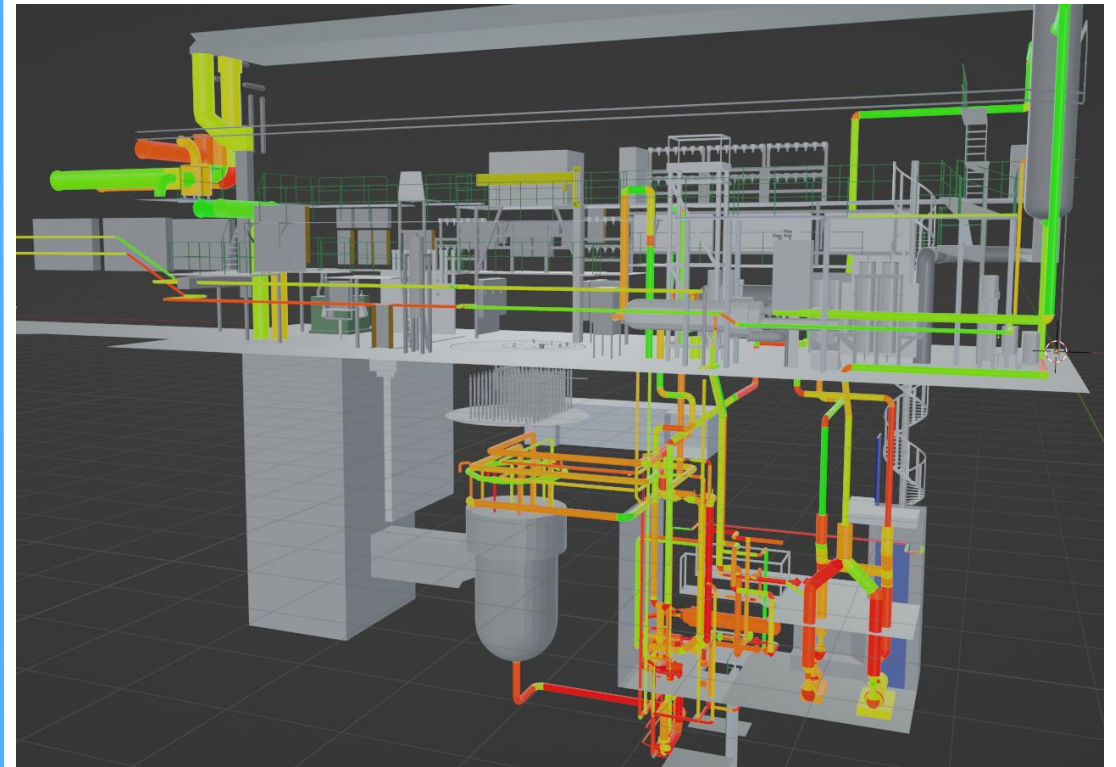


Fig 4 :visualization of pipes activity in HRR model (Green: low activity, Red: high activity. fictive data) [HALDEN]



4.2 Definition of the waste stream model

- Waste stream model defined using WASTREAM:
 - Node (square shape):
 - Entry / treatment / exit
 - Arrows:
 - Link between operation
 - Mass / Activity ratio
- Complete model stored in file database
- Entry points stored in structured database

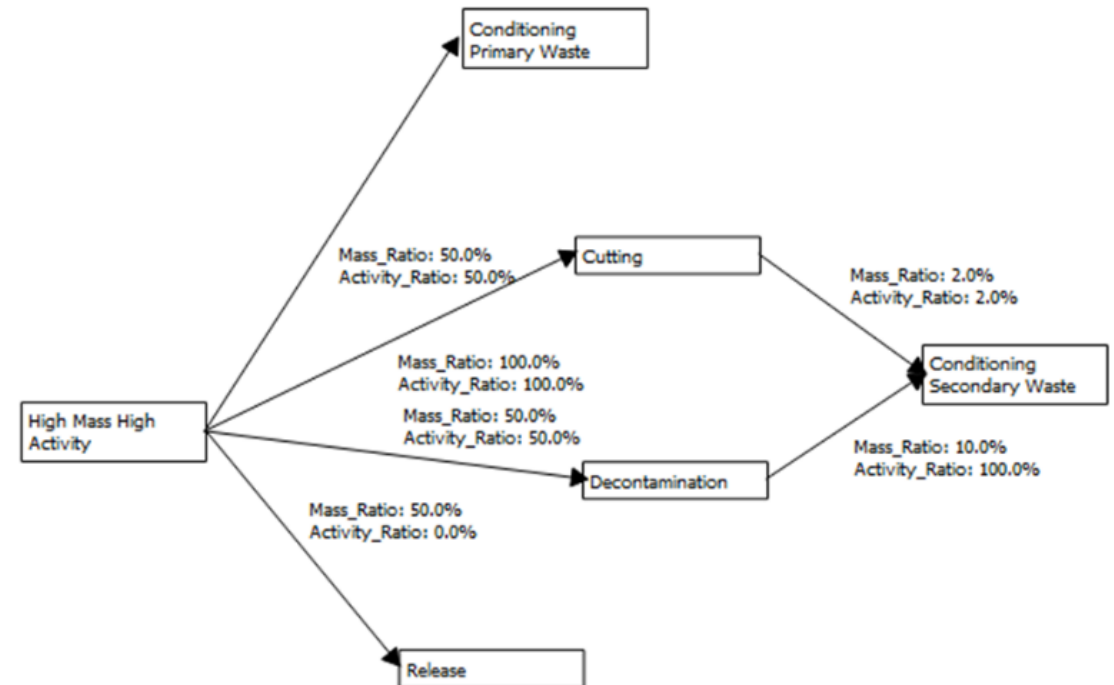
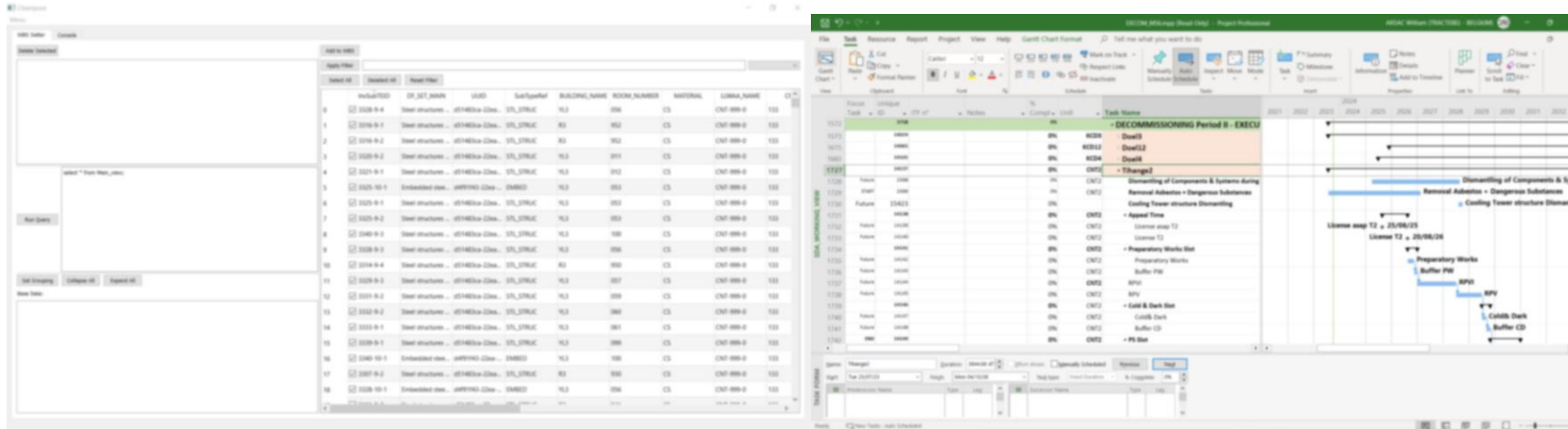


Fig5 : Graphical representation of the waste stream model



4.3 Definition of the planning

- The scheduling of dismantling works defined using software like Microsoft Project
- Following a WBS structure
- Each task are stored in structured database



4.4 Association of assets/waste stream/WBS

- Association performed using WASTREAM
 - Read Pleiades structured database (API)
 - Follow document_id link recursively
 - Produce a flat table
 - Filtering
 - Write association in structured database
- Filter stored in document database (traceability, reuse, ...)

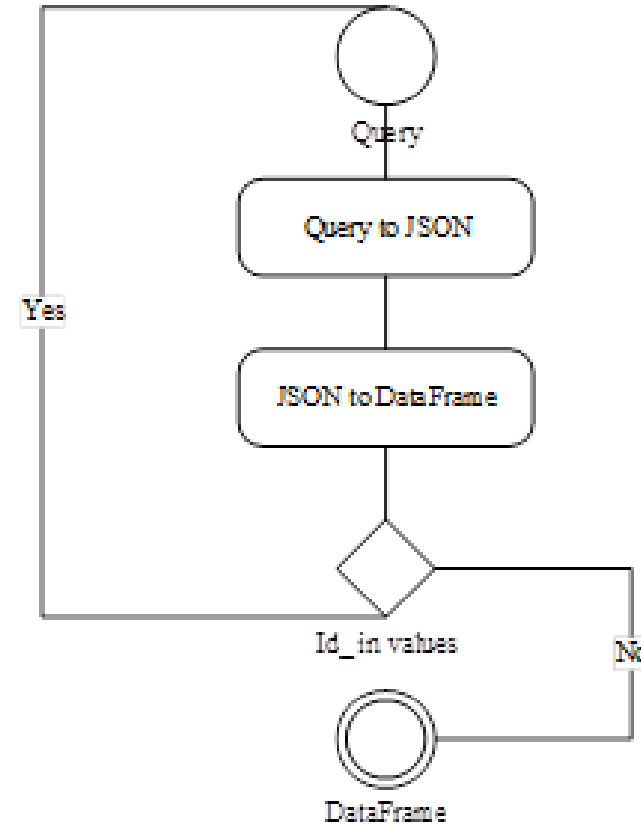


Fig5 : Graphical representation algorithm used to produce a flat table from the structured database

4.5 Calculation (waste estimation)

- Input information stored in document and structured database
 - Document: waste stream model
 - Structured:
 - Characterization data association
 - Waste Stream association
 - WBS (planning) association
- The calculation leverage matrixial operation → fast running
- Results stored in structured database:
 - For each inventory item mass and activity split over all the waste stream model (parent child association)

4.6 Optional: 3D model enrichment

- Estimations obtained from WASTREAM can be pushed back:
 - To other Pleiades structured database
 - To file database
- Initial 3D model can be enriched (BIM) :
 - Waste estimation
 - Dismantling date

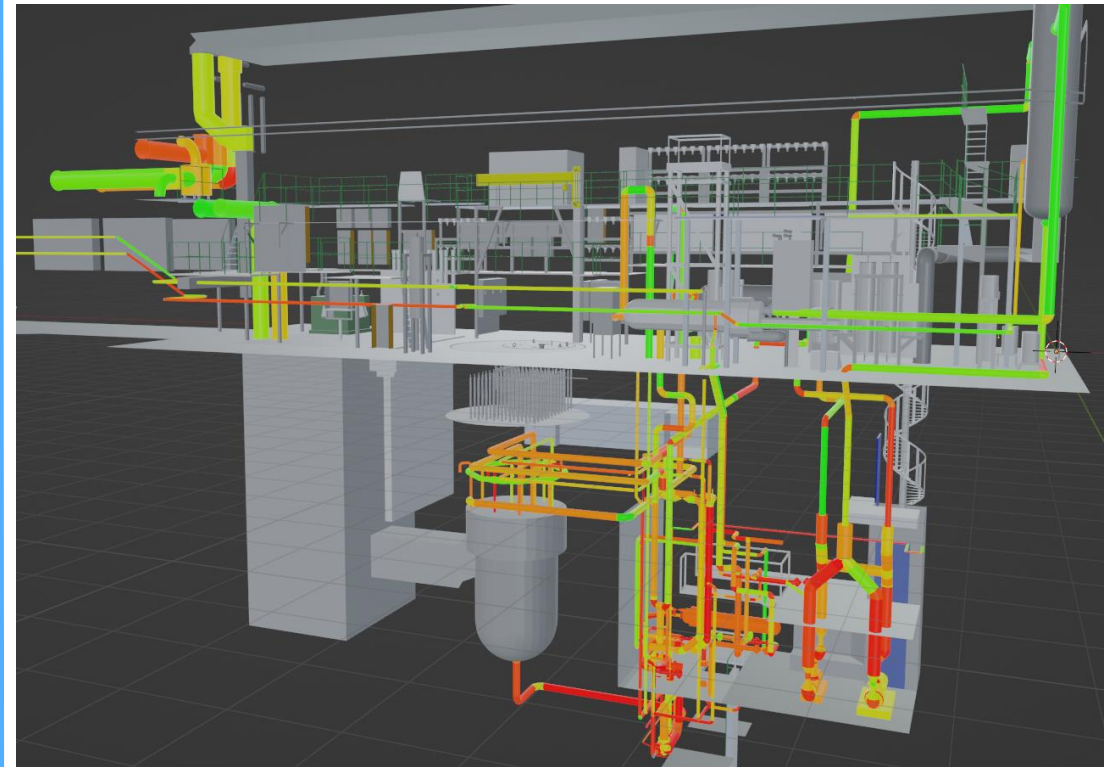


Fig 6 :visualization of pipes activity in HRR model (Green: low activity, Red: high activity. fictive data)

4. Methodology: Summary

- 4.1 Loading of physical and radiological characterization in PLEIADES database
- 4.2 Definition of the waste stream model
- 4.3 Definition of the planning
- 4.4 Association of assets/waste stream/WBS
- 4.5 Calculation (waste estimation)
- 4.6 Optional: 3D model enrichment

5.1 Results: input preparation

- IFC model → structured database
- Tree waste stream:
 - High mass high activity
 - High mass low activity
 - Low mass low activity
- Association with WBS / waste stream

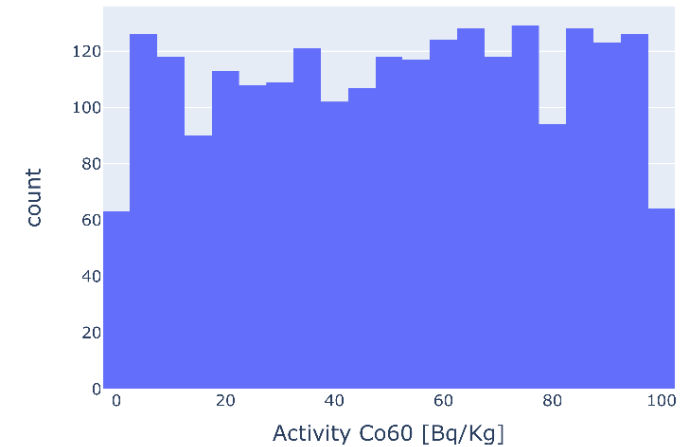


Fig7 : Specific activity distribution in databases

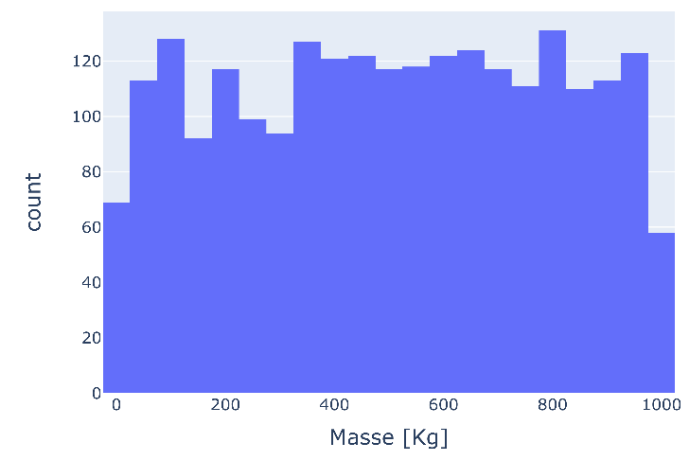


Fig8 : Masse distribution in databases



5.1 Results: input preparation

- IFC model → structured database
- 3 waste stream:
 - High mass high activity
 - High mass low activity
 - Low mass low activity
- Association with WBS / waste stream

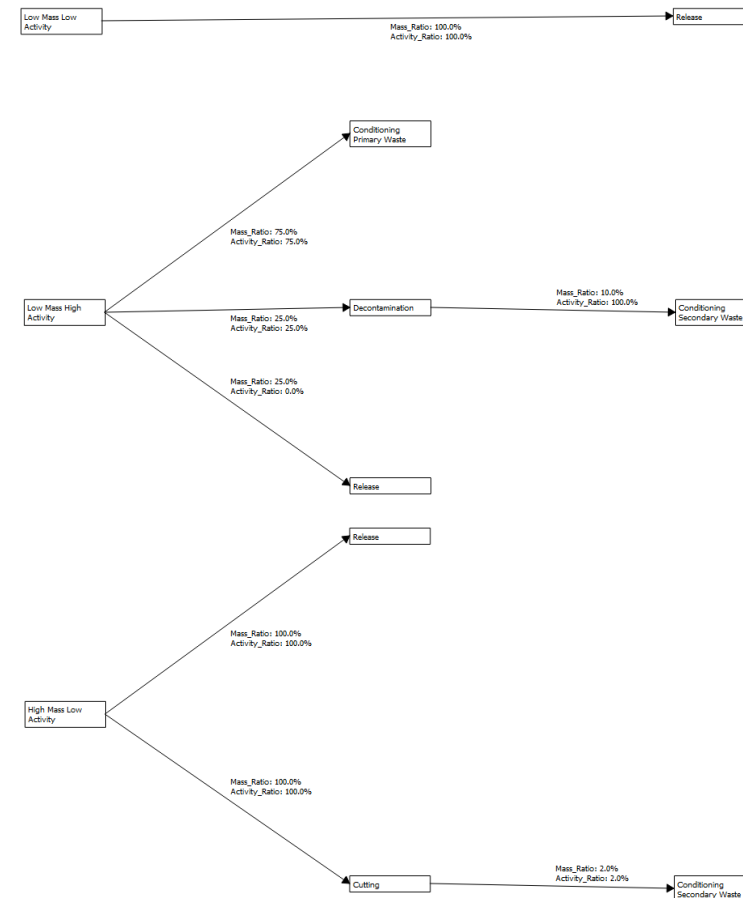


Fig9 : Graphical representation of the waste stream model



5.2 Results: waste fluxes estimation

- Waste stream allows to estimate waste masses / fluxes
- Fast running calculations ease sensitivity studies :
 - Evaluate the impact of specific parameters
 - Comparison of waste fluxes management options
 - Addition of new constraint coming from external stakeholder

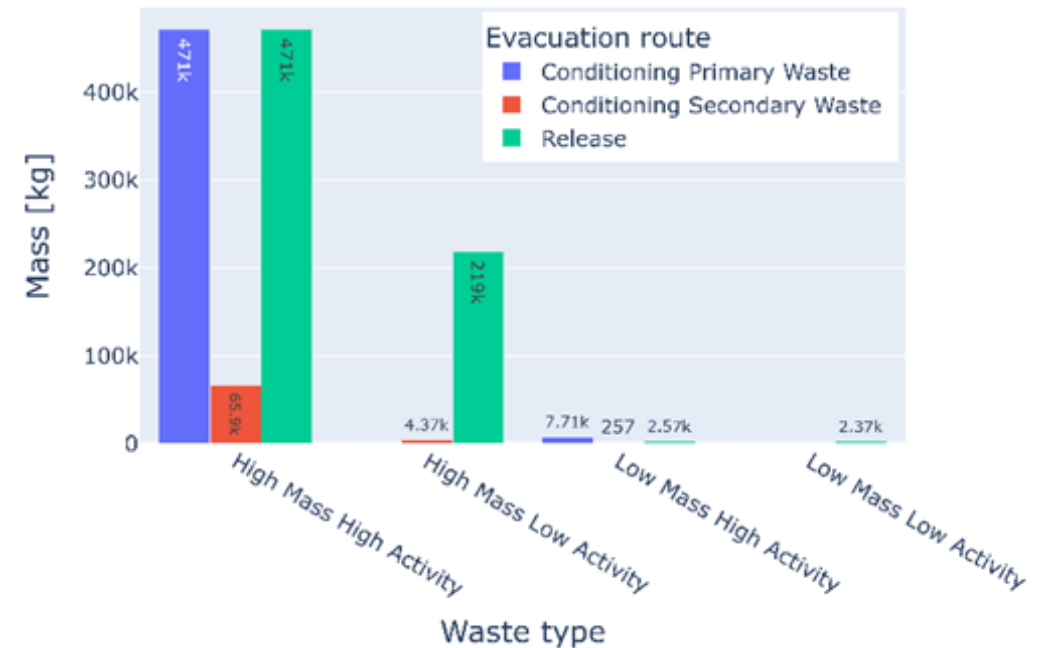


Fig 10 : Waste mass of different types per exit point

5.2 Results: waste fluxes estimation

- Waste stream allows to estimate waste masses / fluxes
- Fast running calculations ease sensitivity studies :
 - Evaluate the impact of specific parameters
 - Comparison of waste fluxes management options
 - Addition of new constraint coming from external stakeholder

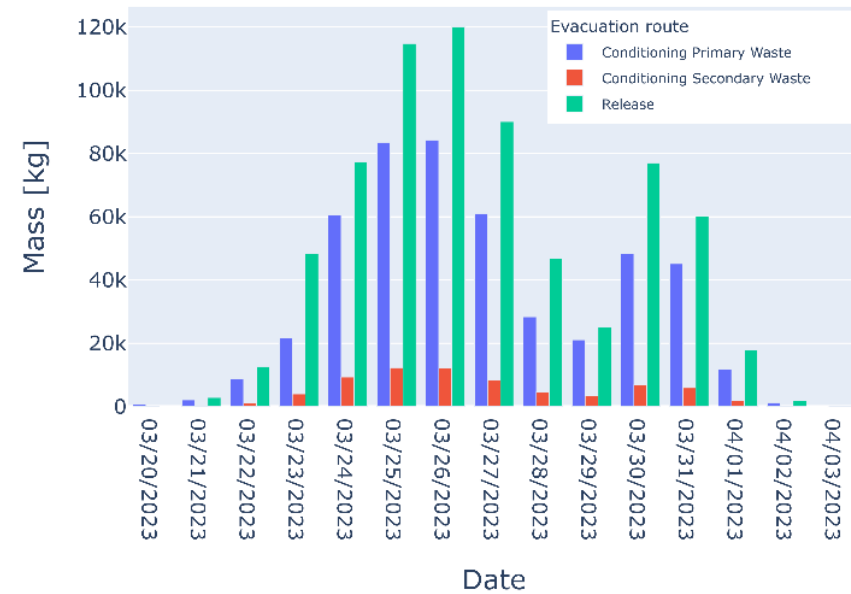


Fig 11 : Waste flux per exit point

5.2 Results: waste fluxes estimation

- Waste stream allows to estimate waste masses / fluxes
- Fast running calculations ease sensitivity studies :
 - Evaluate the impact of specific parameters
 - Comparison of waste fluxes management options
 - Addition of new constraint coming from external stakeholder

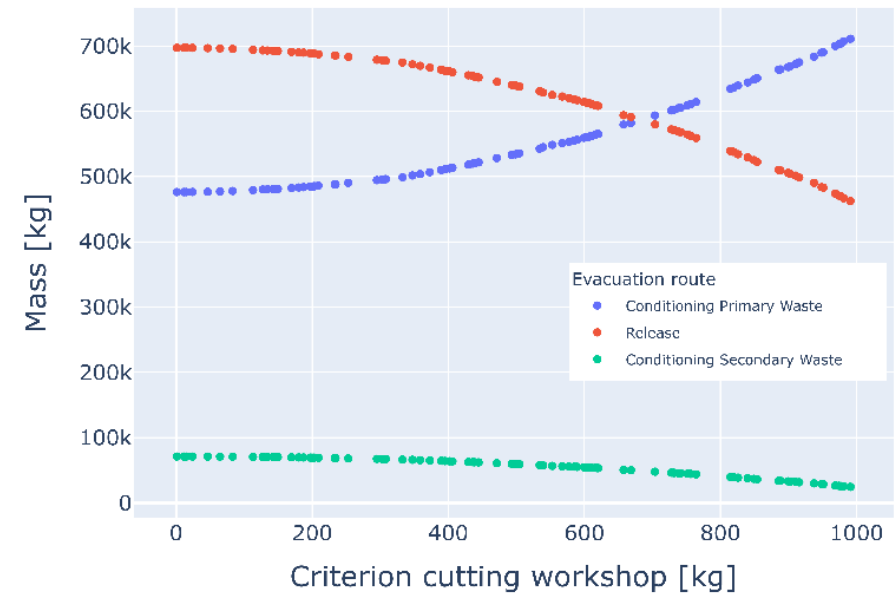


Fig 12 : Waste mass of different types per exit point in function of criterion from cutting workshop

6. conclusion

- Purpose of the study :
 - Test connectivity and adequacy of PLEIADES database structure /platform
- WASTREAM software suite developed by Tractebel is able to connect to PLEIADES platform to:
 - Produce waste estimation calculations
 - Provide guidance to decision makers
 - Support the preparation of dismantling activities/routes
- Validates the PLEIADES data structure and API connectivity, as well as the flexibility of the WASTREAM software suite



Contact:



contact@pleiades-platform.eu



<http://pleiades-platform.eu>



[@pleiades platform](#)

