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RESEARCH DAYS

15-16 NOVEMBER



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SH2E

# Sustainability Assessment of Harmonised Hydrogen Energy Systems:

Guidelines for Life Cycle Sustainability Assessment and Prospective Benchmarking

Javier Dufour

IMDEA Energy

<https://sh2e.eu/>

[javier.dufour@imdea.org](mailto:javier.dufour@imdea.org)

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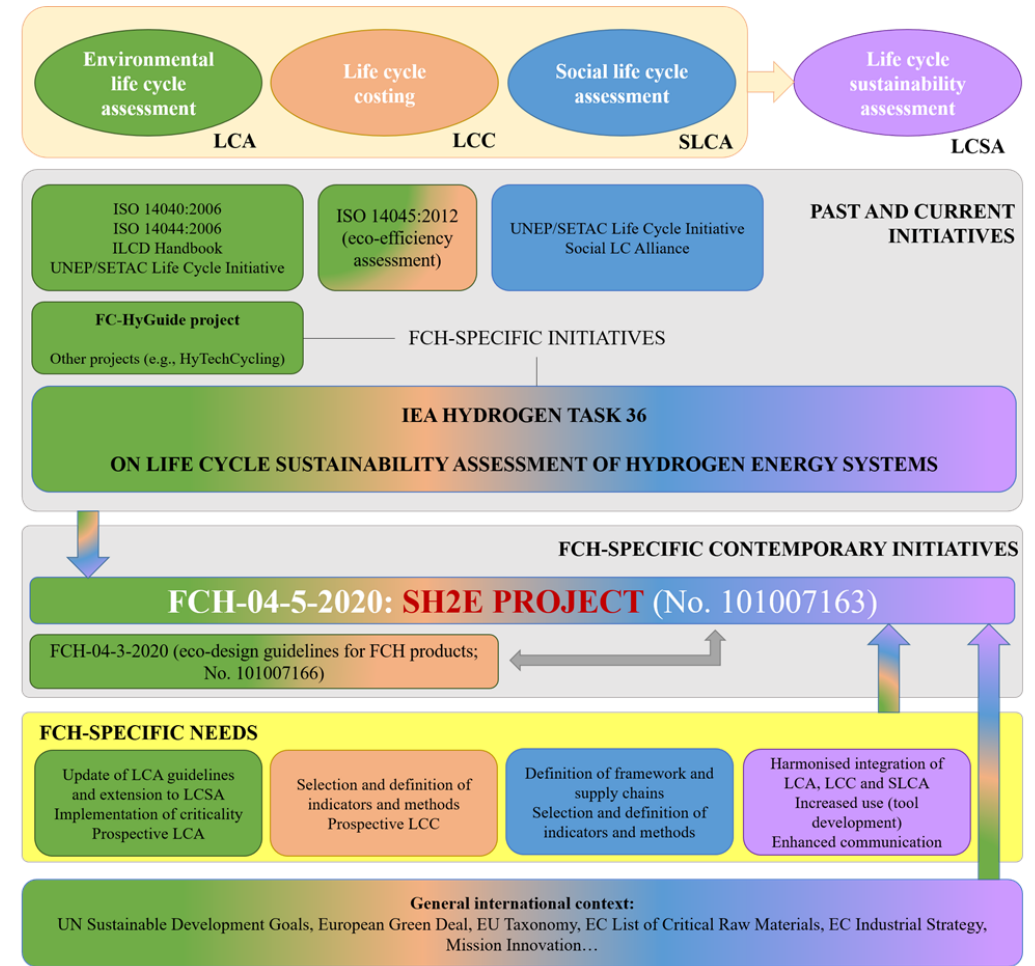
# Project Overview

- Call year: 2020
- Call topic: FCH-04-5-2020 — Guidelines for Life Cycle Sustainability Assessment (LCSA) of fuel cell and hydrogen systems
- Project dates: 1<sup>st</sup> Jan 2021 — 30<sup>th</sup> Jun 2024
- % stage of implementation 01/11/2023: 85 %
- Total project budget: 2,142,778.75 €
- Clean Hydrogen Partnership max. contribution: 1,997,616.25 €
- Other financial contribution: 145,162.50 €
- Partners: GD, FZJ, CEA, FHa, SYMBIO France, IAE, IME

# Project Summary

- To provide a well-defined, validated and practical framework for LCSA of FCH systems.
- To facilitate robust decision-making processes in the field of FCH by adding sustainability criteria to the characterisation and benchmarking of FCH systems.
- Development and application of specific guidelines for the environmental, economic and social life cycle assessment of FCH systems, and their consistent integration into a sound LCSA framework.

<https://www.youtube.com/watch?v=UWgCjLK9QHI>



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# FCH-LCSA guidelines



Achievement to-date

0 docs

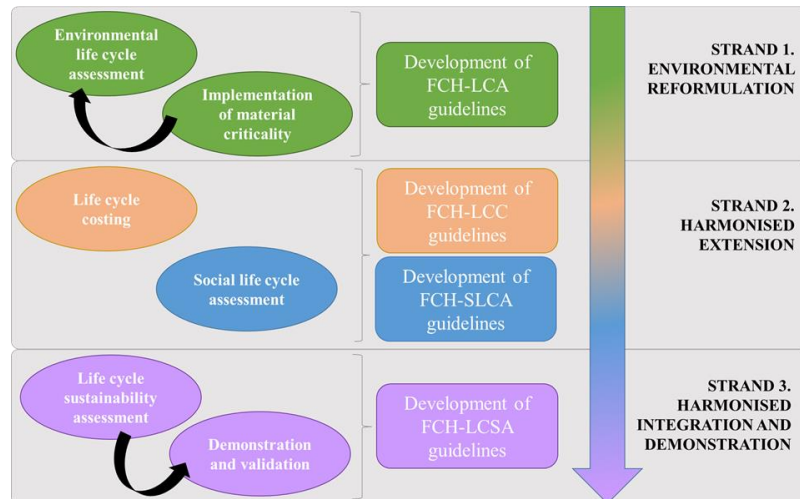


1 doc

25%

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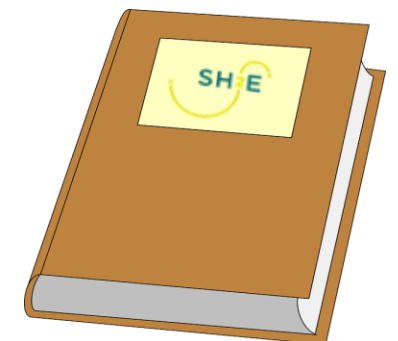
75%



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From FCH-LCA guidelines, through FCH-LCC and SLCA guidelines, to robust FCH-LCSA guidelines and tools

- 1 document of FCH-LCA guidelines
- 1 material criticality indicator
- 1 document of FCH-LCC guidelines
- 1 document of FCH-SLCA guidelines
- 1 document of FCH-LCSA guidelines



# FCH-LCSA tool

## Achievement to-date

0 tools



1 tool

- 1 integrated FCH-LCA/LCC/SLCA/LCSA software tool

FCH-LCA tool

### Prospectivity

Prospectivity

Is the technology modelled at early stage of development?

Yes

No

< Back

Next >

Finish

Cancel

FCH-LCA tool

### System boundaries

System boundaries

Please select the system boundaries of the hydrogen system to be modelled

Hydrogen production

Hydrogen use

Hydrogen production and use

< Back

Next >

Finish

Cancel



# FCH-LCSA tool



## Achievement to-date

0 tools



1 tool

25%

50%

75%

- 1 integrated FCH-LCA/LCC/SLCA/LCSA software tool

FCH-LCA tool

End-of-life

Please select the choice of end-of-life modelling approach

Cut-off approach

Recycling approach

Circular footprint formula

Other approach, please state:

< Back Next > Finish Cancel

FCH-LCA tool

Select a template

Please select a matching template and a top-category under which the template should be stored

Category

Select a template:

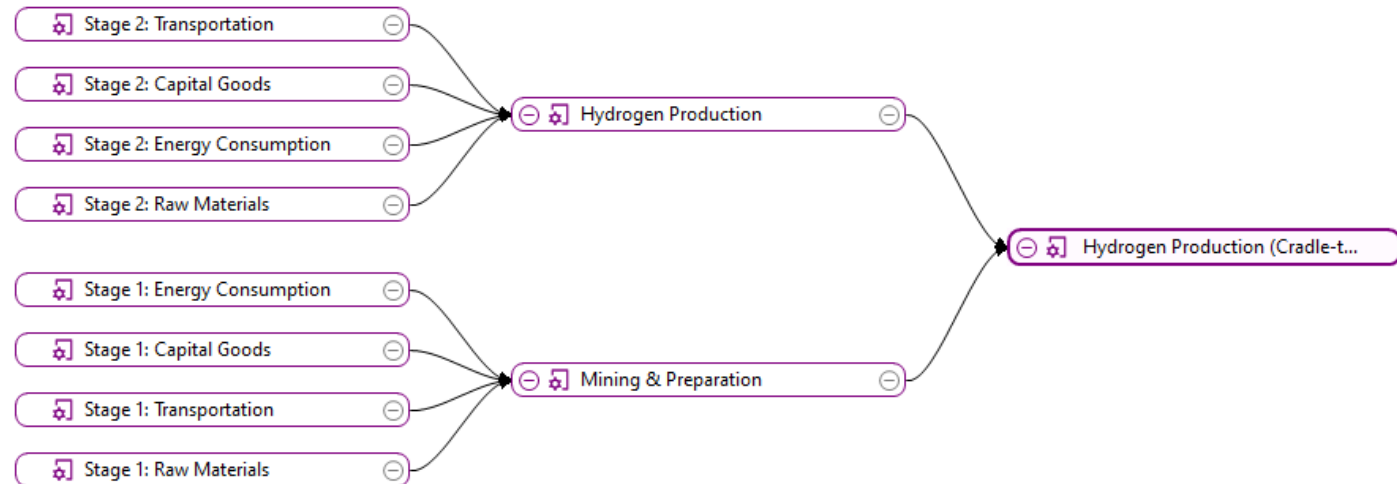
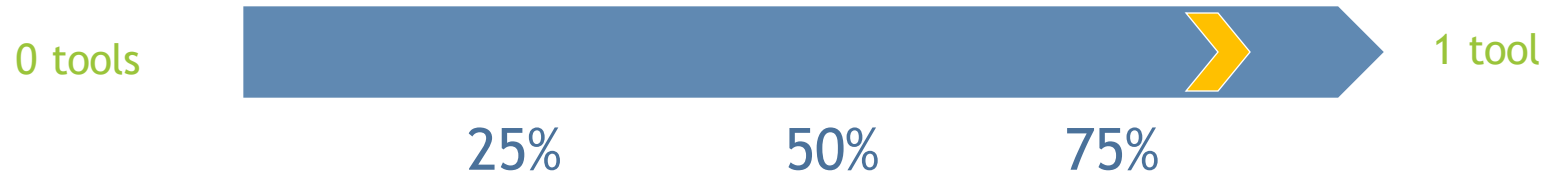
Cradle-to-gate 1 (hydrogen production) (kg of H<sub>2</sub>)

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# FCH-LCSA tool

## Achievement to-date

- 1 integrated FCH-LCA/LCC/SLCA/LCSA software tool

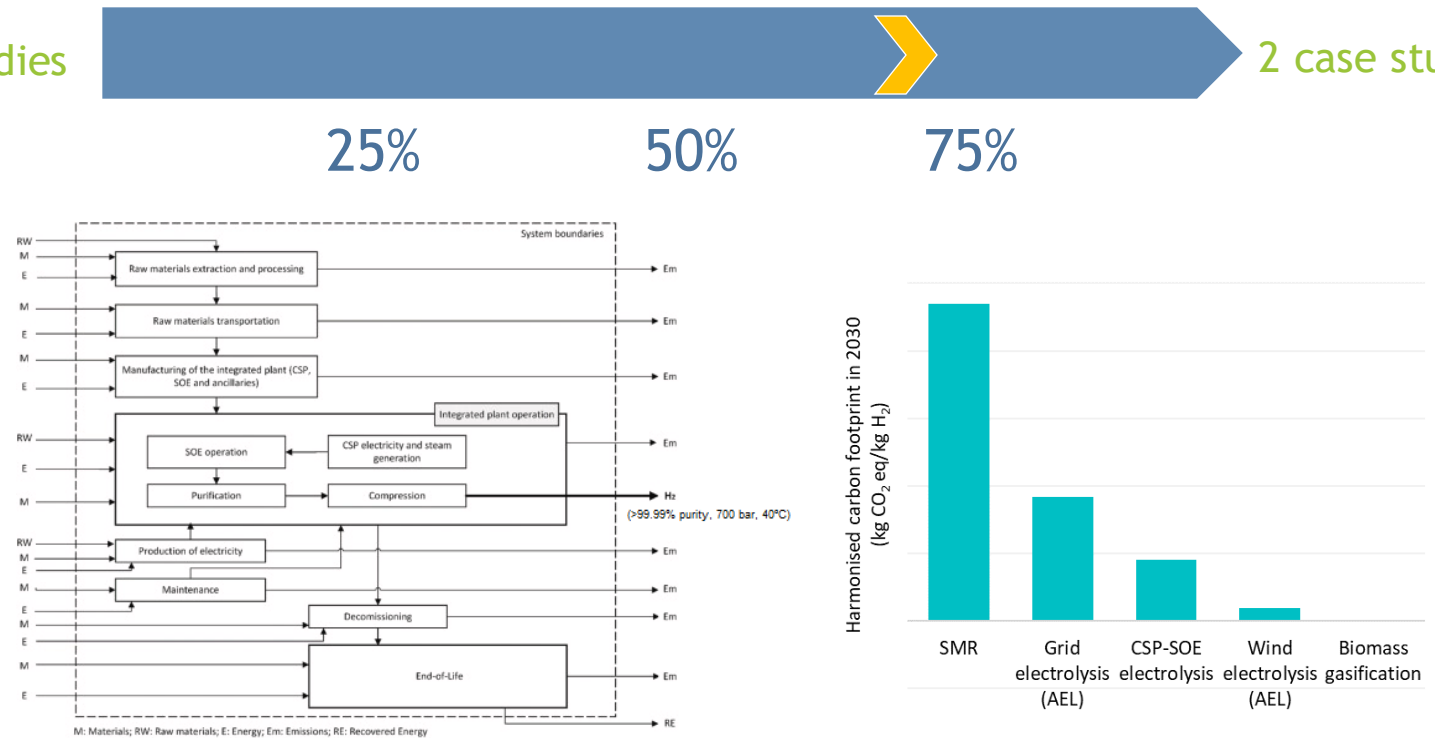




# FCH-LCSA case studies



- 2 FCH systems being assessed and benchmarked from a life-cycle sustainability perspective:
  - Hydrogen production through solid oxide electrolysis coupled with a concentrated solar power plant
  - Hydrogen use in a proton-exchange membrane fuel cell electric car



<https://doi.org/10.1016/j.renene.2022.07.066>

# FCH-LCSA case studies



## Achievement to-date

0 case studies



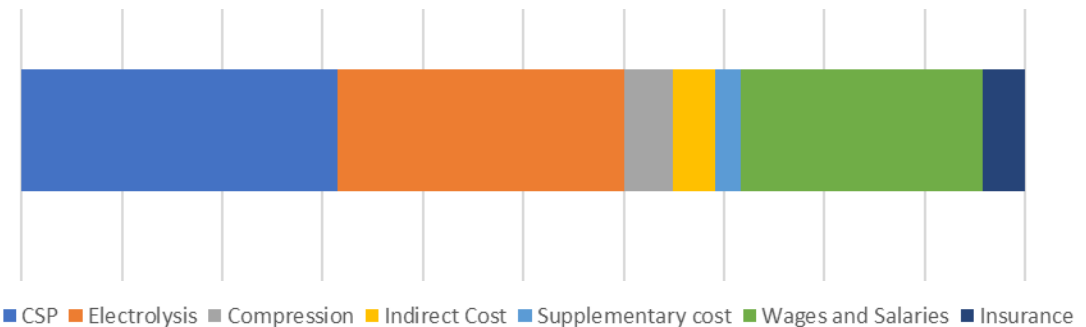
2 case studies

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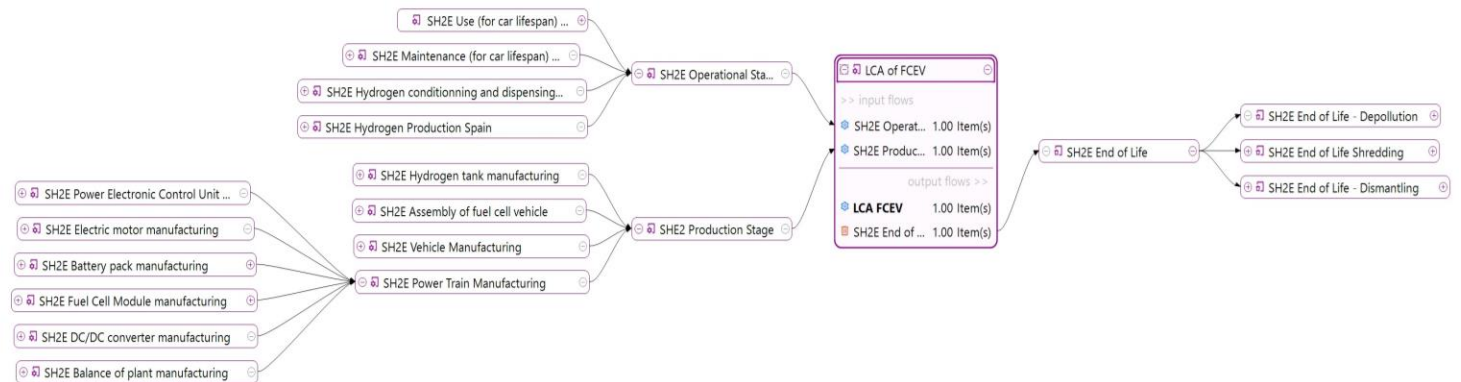
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# FCH-LCSA case studies



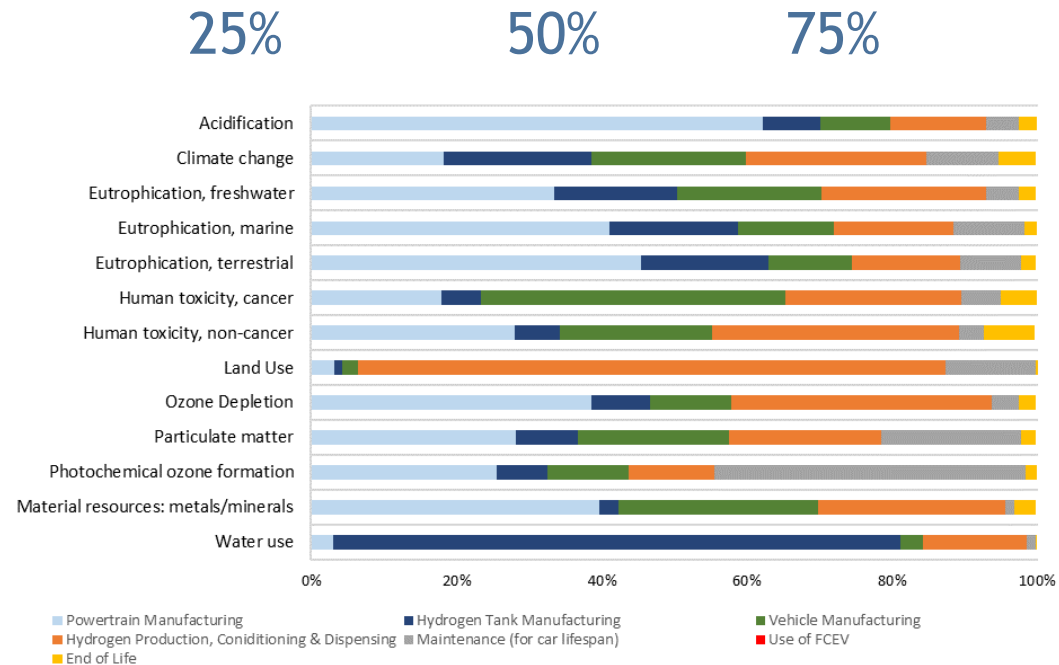
## Achievement to-date

0 case studies

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2 case studies



# Risks, Challenges and Lessons

- No deviations
- Challenges:
  - Widespread use → upcoming dissemination events (EHEC2024, URJC Summer School, etc.)
- Next steps:
  - Final version of the guidelines
  - Final version of the tool
  - Final version of the case studies
  - Third-party review



# Exploitation Plan/Expected Impact

## Exploitation

- RCS strategy for LCSA of FCH systems
  - Guidelines
  - Tool
- Exploitation plan (June 2024)



## Impact

- Robust framework for a transparent, harmonised and up-to-date LCSA of FCH systems as well as for a fair comparison between competing technical solutions
- ↓
- Robust decision-making processes





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