



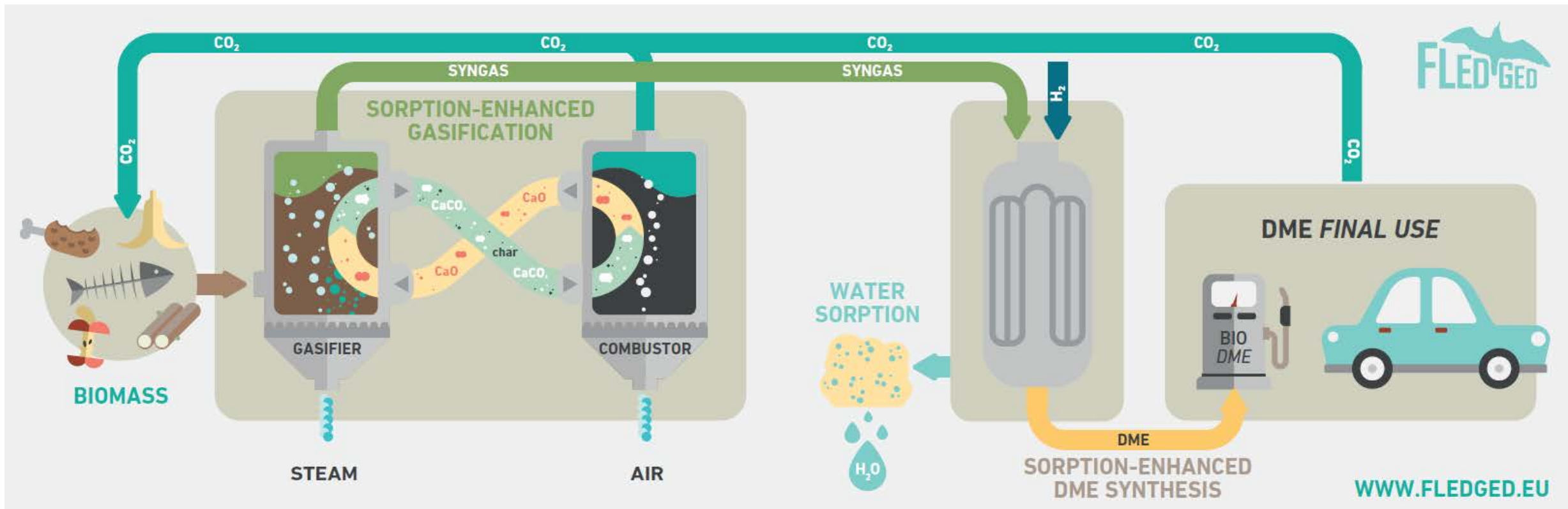
**FLEXIBLE DIMETHYL ETHER PRODUCTION FROM
BIOMASS GASIFICATION WITH SORPTION
ENHANCED PROCESSES**



The FLEDGED project

The **FLEDGED** project aims at delivering two technologies *validated in industrially relevant environment (TRL5)* for the production of **Bio-Dimethyl Ether (DME) from biomass gasification**:

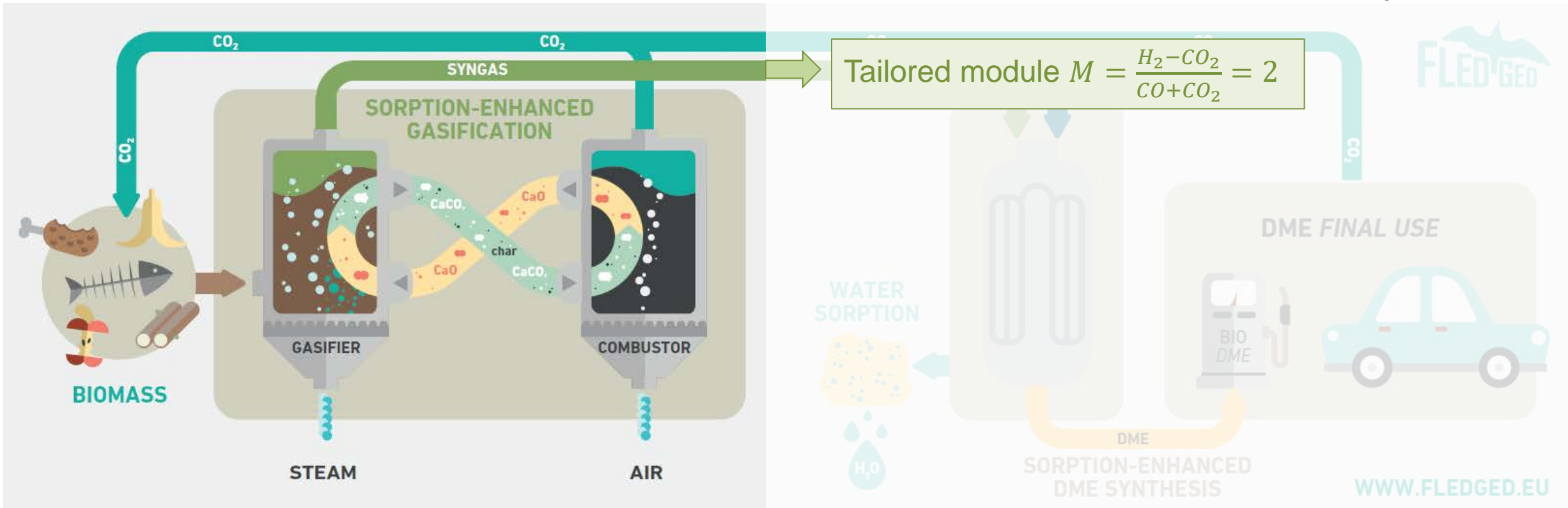
- Process intensification
- Process flexibility



Sorption Enhanced Gasification (SEG)

In *Sorption-Enhanced Gasifier*, CaO-rich sorbent circulates between a gasifier-carbonator and a combustor-calciner to produce:

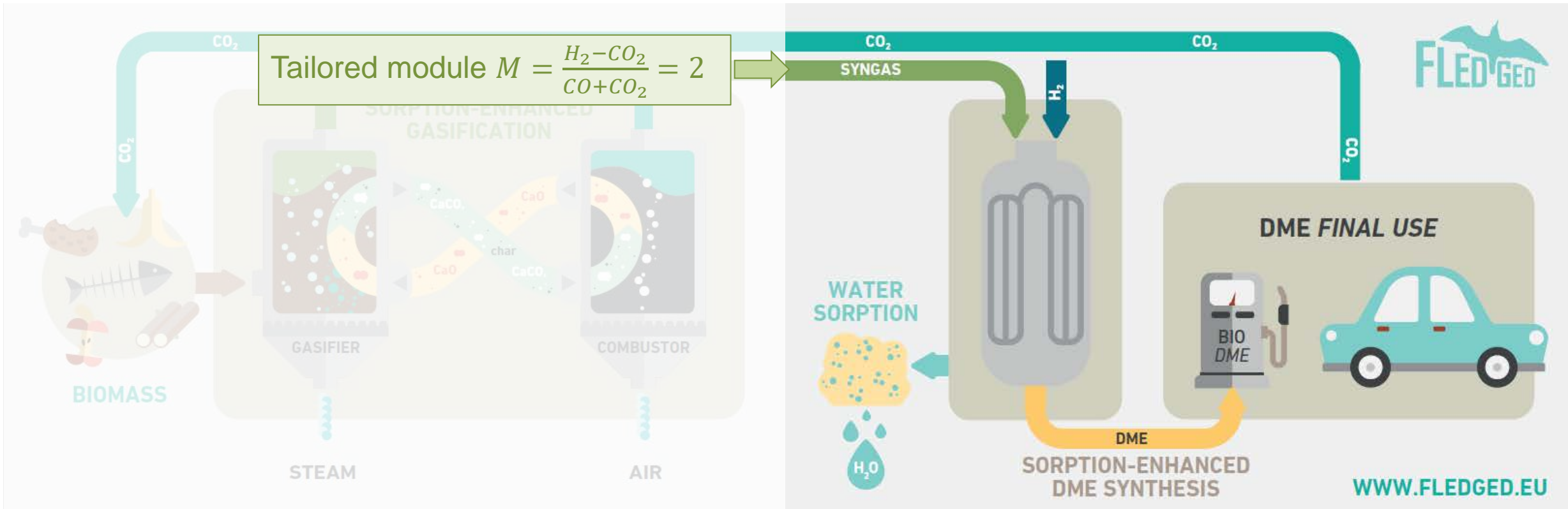
- a **N₂-free syngas** with **no need of air separation unit** (*indirect gasification*)
- a syngas with **tailored module “M”** thanks to **in-situ CO₂ separation** by reaction: $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$



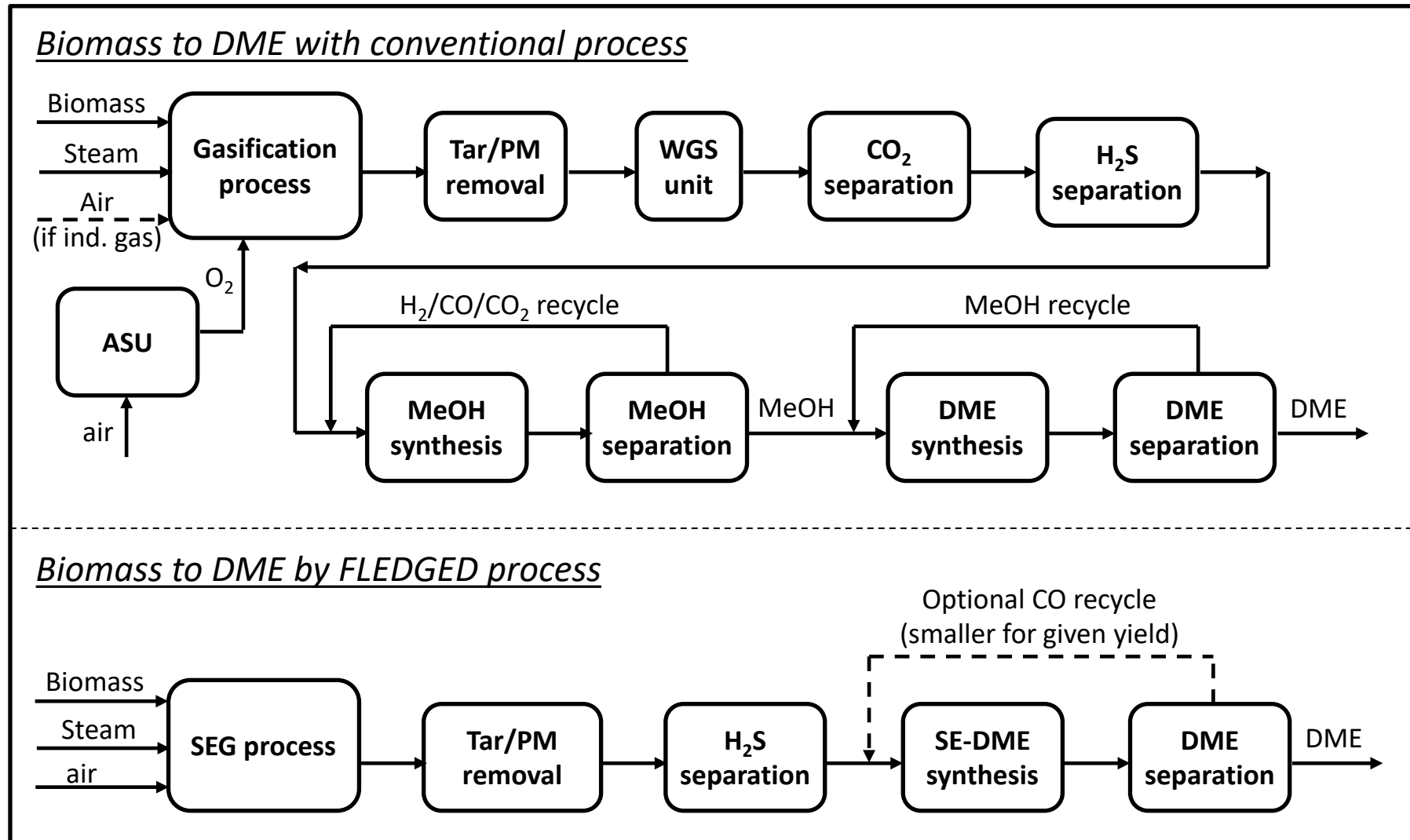
Sorption Enhanced DME Synthesis (SEDMES)

Sorption-Enhanced DME Synthesis is a direct DME synthesis process using sorbent for **in-situ water sorption**:

- **high per-pass DME yield**, thanks to the reduced thermodynamic limitation of methanol dehydration reaction
- **insensitivity on the CO/CO₂ ratio in the feed** (if module M ≈ 2)

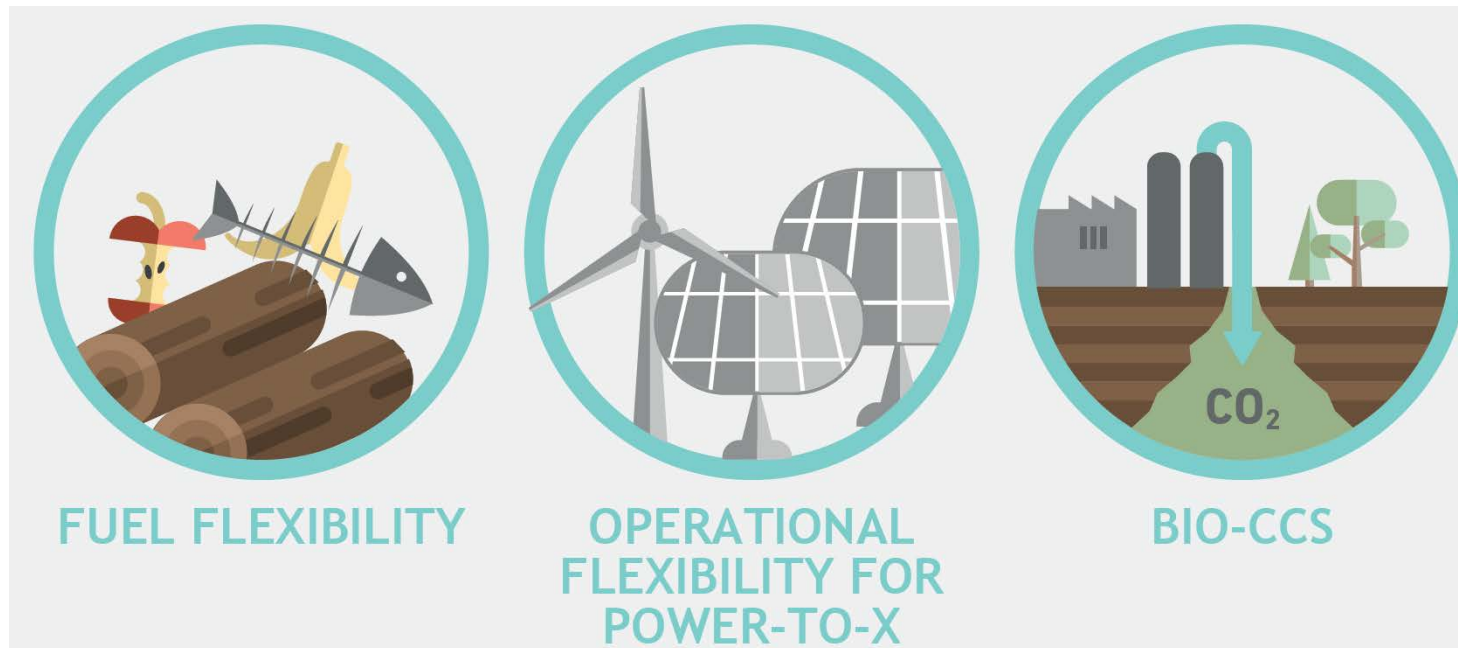


Process intensification



Process flexibility

- **Fuel flexibility:** SEG exploits the fuel flexibility typical of fluidized beds and is tested with woody biomass, agricultural waste, municipal solid waste as feedstocks.
- **Operational flexibility:** by changing the solids circulation in the SEG unit, CO₂ separation can be reduced, allowing the integration with intermittent H₂ from electrolysis for energy storage via power-to-DME
- **Bio-CCS:** with an O₂-blown SEG combustor, concentrated CO₂ stream is produced, suitable for geologic storage, delivering a negative emission system



The FLEDGED project



Components development and experimental screening at TRL4



SEG and SEDMES validation at TRL5



Process modelling and integration study



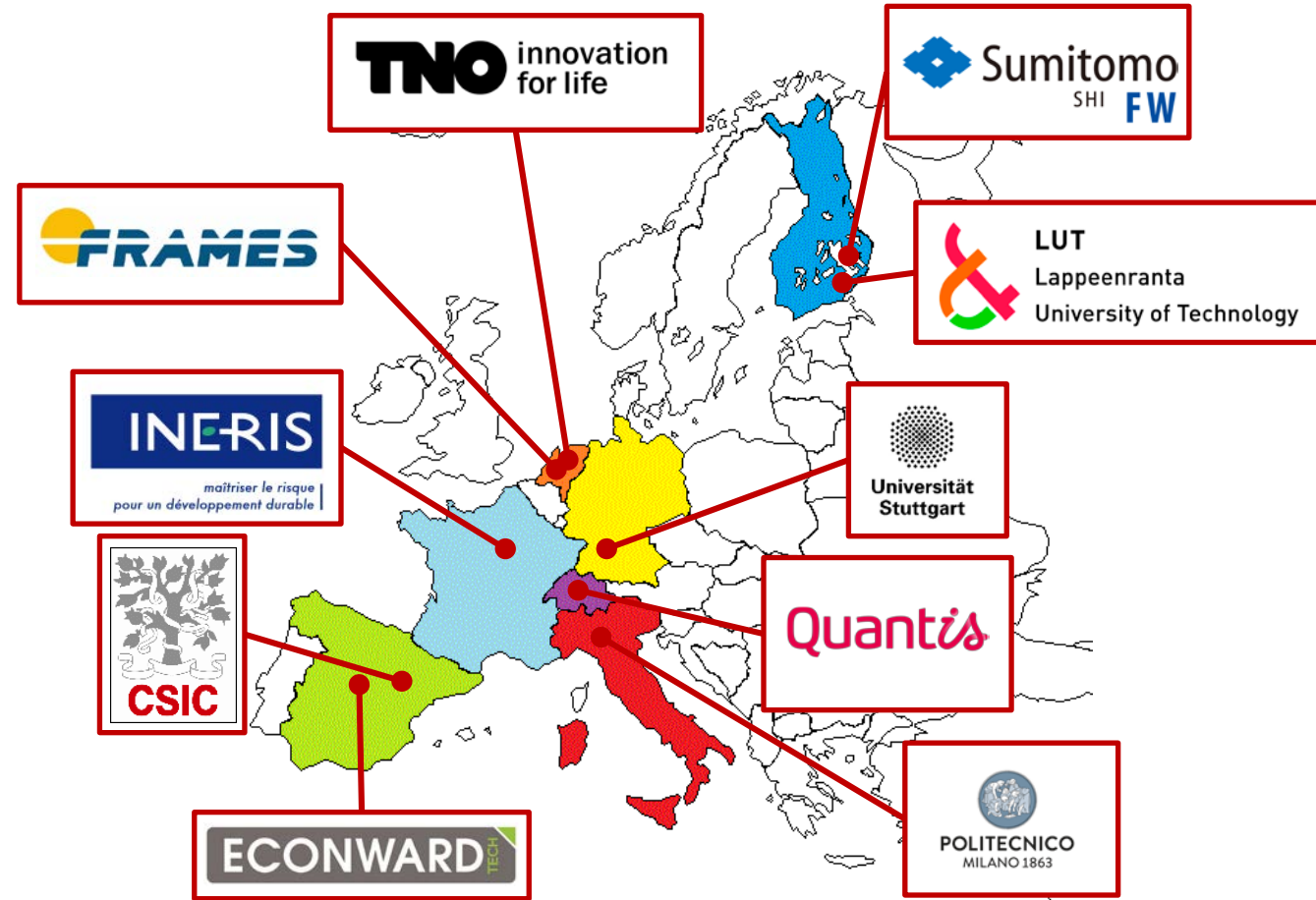
Scale-up and economic analysis



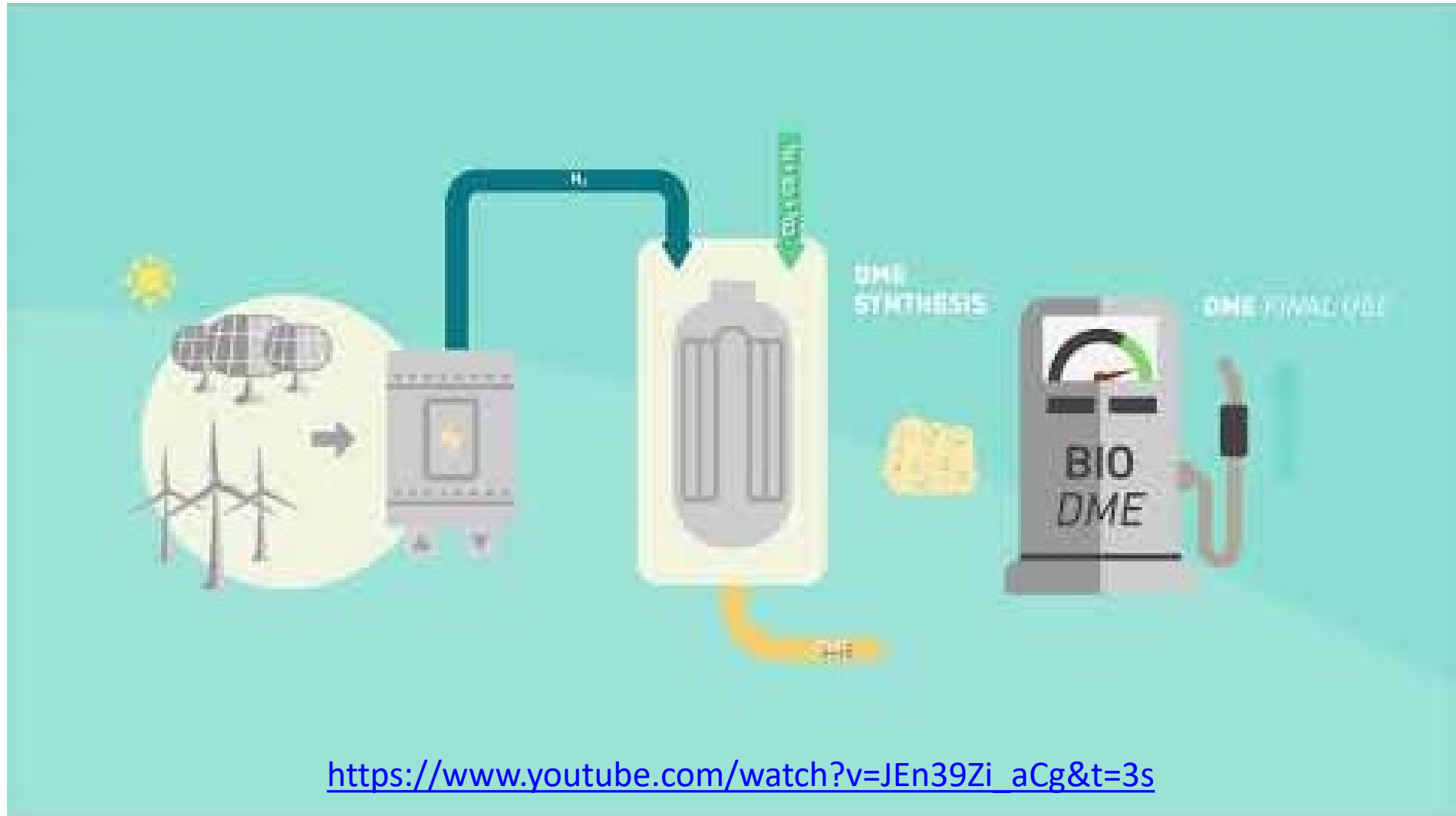
Risk and sustainability analysis



Exploitation



The FLEDGED project



https://www.youtube.com/watch?v=JEn39Zi_aCg&t=3s





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Fledged H2020 Project



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