

# WP6: Techno-Economic & Sustainability Assessment

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# Goal of WP6



To produce a robust and representative assessment of the **economic viability and the sustainability** of the seaweed-derived fuel production chain. This will use a multi-criteria approach, considering:

- techno-economic;
- environmental;
- EH&S;
- social and regional aspects; and
- risks.

In other words...



# Goal of WP6



...evaluate **competitiveness** of biofuels from seaweed compared to current fuels (fossil and biofuels).

This encompasses considering:

- the entire supply chain (or full life cycle); and
- all relevant parameters.



Cultivation



Harvesting &  
transport



Storage



Biofuel  
production

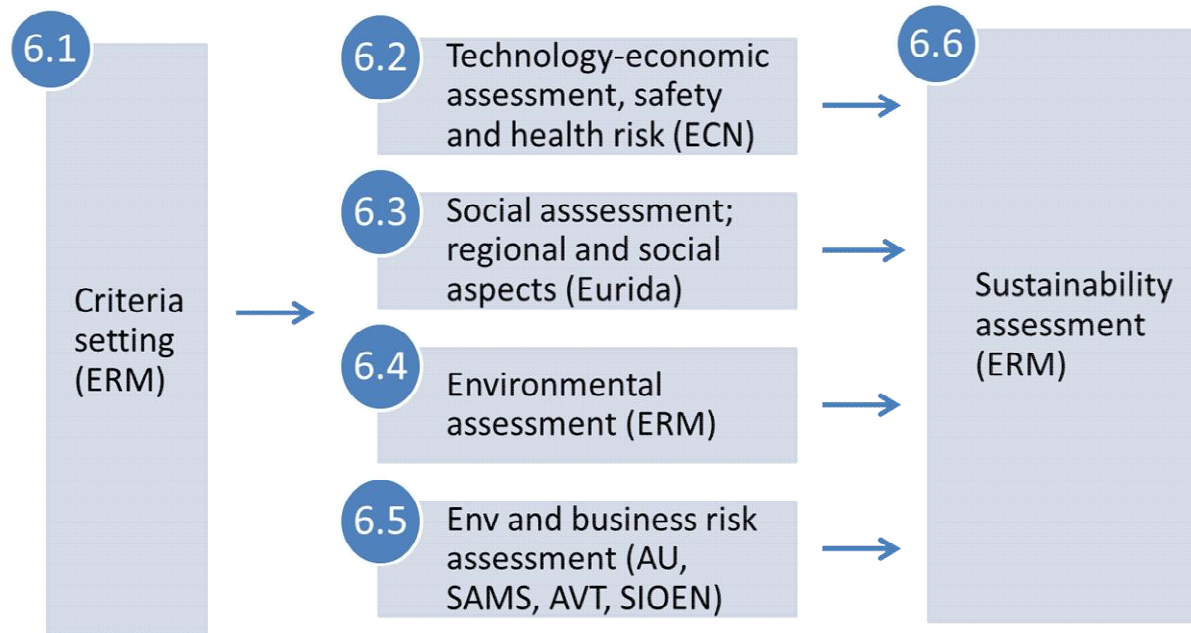


Biofuel use



# Scope of WP6

- Multi-criteria approach
- With numerous players
- Challenge is to ensure consistency across tasks



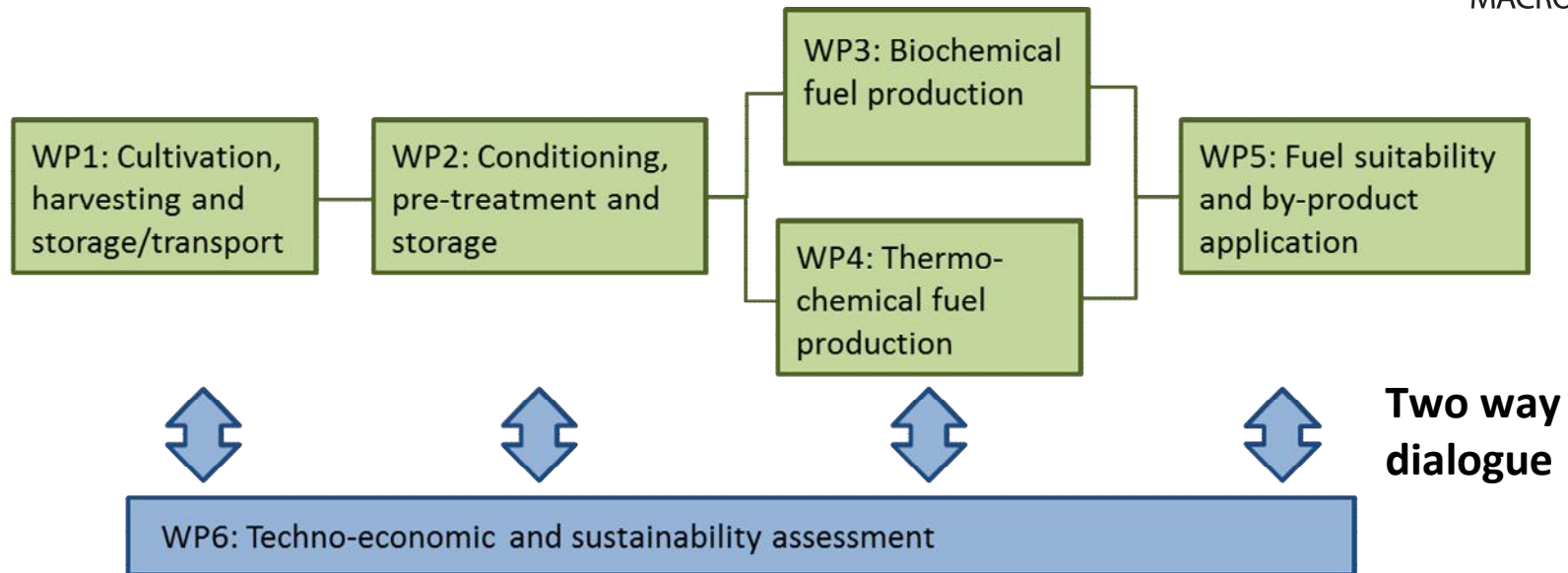
# Scope of WP6



- **WP6.1 Criteria setting** (ERM; M6-12) – defines the wider scope of the sustainability assessment, including scenarios to be assessed and indicators.
- **WP6.2 Techno-economic assessment, safety and health risk identification** (ECN; M12-28) – identifies the economic viability of the different production routes (feedstocks, production methods, etc), including technological bottlenecks, and major health and safety issues.
- **WP6.3 Social assessment: Regional and social aspects** (EURIDA; M12-42) – assesses the social life cycle impacts, both potential positive and negative impacts. Will include stakeholder engagement.
- **WP6.4 Environmental assessment: Life cycle assessment** (ERM; M24-36) – evaluates the environmental performance of the scenarios, identifying best practice/optimisation potentials, and performance against other transport fuel sources.
- **WP6.5 Environmental and business risk** (AU, SAMS, AVT, SIOEN; M12-40) – assesses the direct environmental impacts and risks that large-scale seaweed cultivation may pose at the levels of the physical/chemical environment (eutrophication, oxygen conditions), as well as at biological levels (biodiversity: e.g. effects on natural seaweed populations, effects on higher trophic levels).
- **WP6.6 – Sustainability assessment** (ERM; M36-48) – summary: a structured discussion of the pros and cons and limitations of the indicators results and the scenarios evaluated. Indicators and results from WP6.2 to WP6.5 will be collated in overview tables and interpreted/summarised.



# Scope of WP6



- Scenario based
  - to be developed based on scope of WP1-5
- Data input
  - based on measurements from and findings of WP1-5



# Timescales of WP6



- Workload back end heavy
  - except scenario development and data identification
- Data input dependent on progress of other WPs
  - tight co-ordination required
  - possibly base assessments on preliminary results

		Year 1												Year 2												Year 3												Year 4												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
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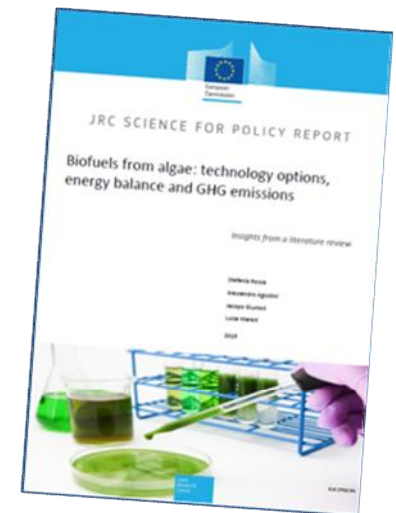


# Current knowledge



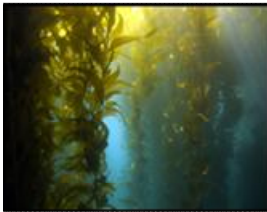
## Life cycle assessments:

- **Current knowledge extrapolated** from lab results and/or pilot scale experiments
- **Large variation** in energy and GHG emissions balances
- The **production of macroalgae** is identified as the most energy intensive step of the seaweed biofuel chain
- To enhance viability, need to **integrate macroalgae growth** with existing platforms (offshore wind power, aquaculture)
- **Further research** needed to understand variability in biofuel production
- For most pathways, without considering **co-products credits**, the energy balance is unfavourable





# Chain characteristics



Cultivation



Harvesting &  
transport



Storage



Biofuel  
production



Biofuel use

- Some steps in the chain can be done with different technologies
    - Seaweed, conversion technology, products
  - Many alternatives/options within each technology
    - E.g. cultivation strategy, harvesting strategy, plant design
  - Significant interactions between steps
    - E.g. Seaweed type → harvesting → plant design → product yield
  - Quite some 'unequal' trade offs
- Pre-define scenario's in 1<sup>st</sup> 6 months



# Input for WP6



## **Scenarios and criteria**

- Dialog to define cases and full chain scenarios

## **Techno-economics and SHE**

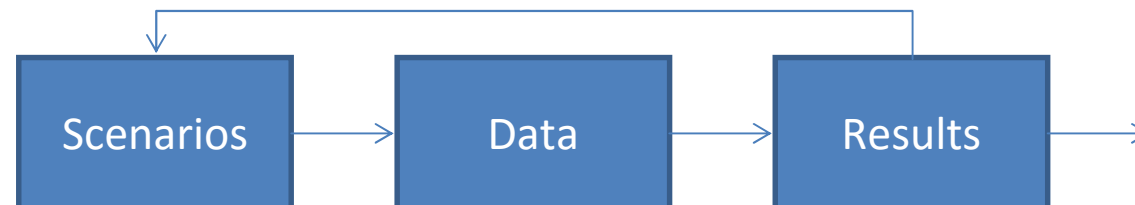
- Cultivation system design
- Harvesting and transport strategy
- Seaweed comp/yield in relation to harvesting
- Dialogue on storage strategy and data
- Dialogue on processing system design
- Yields and sizing data for processing plant



# How to organize?



- Two-way dialog to arrive at scenarios
  - Partners can benefit from this!
- Input: some iterations will be needed
  - You could benefit from intermediate results
- Challenge is to align the three elements involved



# Acknowledgement



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