MACROFUELS

WP6: Sustainability Assessment

Progress Meeting 11th January 2017

AU, AVT, ECN, Eurida, SAMS, SIOEN, ERM

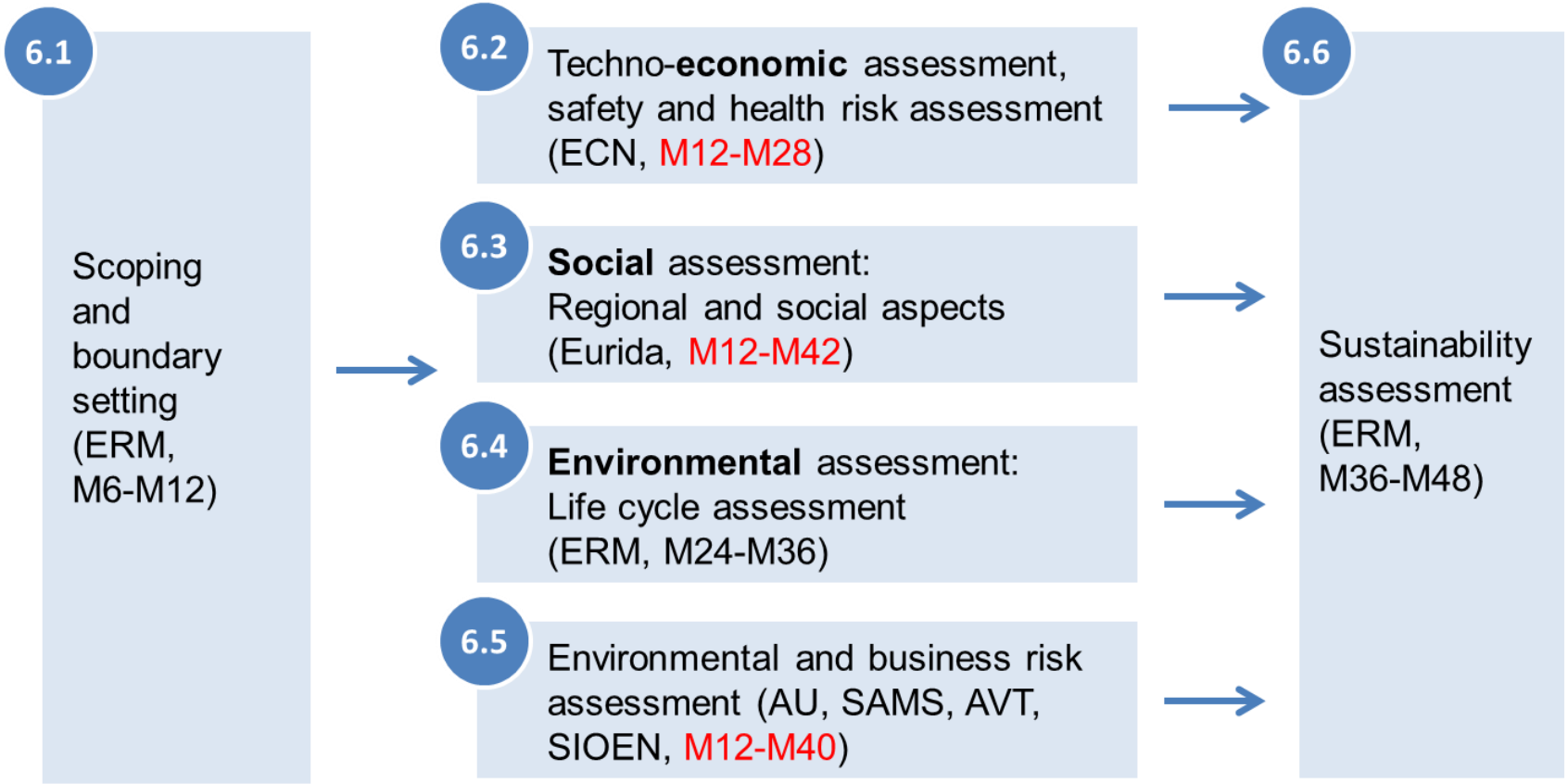
Scope of WP6

The sustainability assessment is a multi-criteria appraisal with the aim of **evaluating the impacts of seaweed-derived transport fuels with respect to the environment and society, their technical and economic viability and health, safety and risk aspects** of seaweed biofuel production systems.

The overall objective is three-fold:

- Assess the overall sustainability of biofuels from seaweed, identifying where in the supply chain the main impacts occur;
- Benchmark the sustainability of different value chains for biofuel production within the MacroFuels concept; and
- Benchmark the sustainability of MacroFuels against equivalent conventional, fossil-based, fuels and currently available biofuels.

Scope and timeline of WP6



Deliverable D6.1 Summary

Scenario	Description
Main scenarios	
Ethanol & co-products	Production of ethanol and the co-products of proteins and nutrients.
ABE & co-products	Production of butanol and the co-products of protein, nutrients, and hydrogen.
Furanics & co-products	Production of furanics and the co-products of mannitol and proteins.

- **Geographical coverage**: Northern Europe
- **Technical reference**: industrial large-scale and with mature technology
- **Time period**: considering the development status of technology, 2025 is set as the reference date

Deliverable D6.1 Summary

Scenario	Scenario ethanol / co-products	Scenario ABE / co-products	Scenario furanics / co-products
Cultivation & harvesting			
Site	Coastal, nautical miles from shore tbd		
Cultivation system	Rotating crop system		
Growth substrate	AlgaeNet with a 50 cm mesh		
Maintenance	tbd		
Harvesting	Twice annually (approx. October and May)		
Harvesting method	Mechanical and automated, achieving 1,000 m2 per hour		
Seaweed yield	25 kg per m2 per year		
At sea storage			
Method	Temporary, up to 6 weeks		
Equipment	Flexible storage containers, 25 m3 capacity, material and lifespan tbd		
Biomass loss	5% loss		

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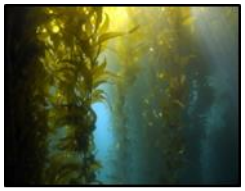
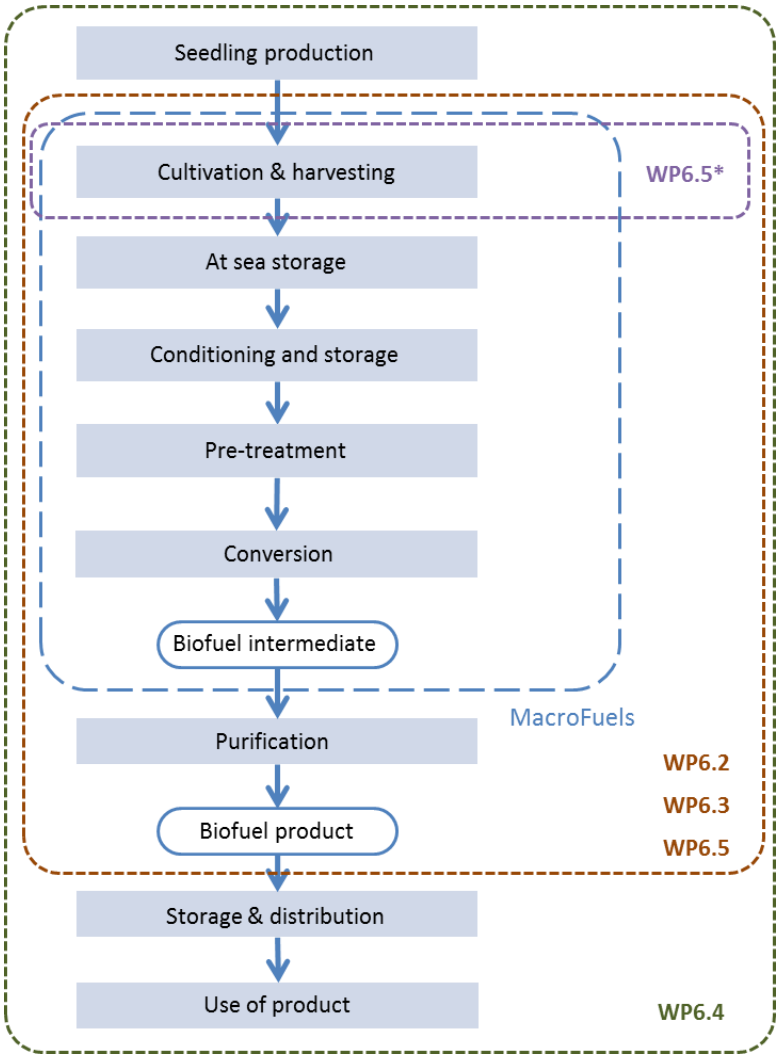
Deliverable D6.1 Summary

Scenario	Description
Potential additional scenarios on cultivation variations	
Seaweed yield	Alteration of the seaweed yield per hectare, should a higher or lower yield be achieved.
Material needs	Variations to material needs in cultivation activities.
Energy needs	Alteration of the energy requirements per tonne of feedstock brought onshore.
Potential additional scenarios on fractioning and fermentation process variants	
Fermentation efficiency	Alteration of ethanol/ABE yields should different pre-treatment and fermentation performances be achieved.
Thermochemical fractioning efficiency	Alteration of furanics yields should different pre-treatment and thermochemical fractioning performances be achieved.
Anaerobic digester efficiency	Alteration of digester performance and methane yield achieved from residual biomass from the conversion processes.
Potential additional scenarios on energy provisions	
Energy provision	Energy input fulfilled in full by anaerobic digestion of harvested seaweed.
Potential additional scenarios on the management of co-products	
Co-product	Different utilisation of the co-products produced and the assumptions applied around system expansion.

Deliverable6.1 Summary





Work Package task 6.2

- **Title**: Techno-economic assessment, safety & health risk identification
- **Purpose/objective**: Assessment of the options for cultivation and processing in terms of technical and economic feasibility and safety, health and risk aspects
  - Design of a seaweed processing plant for the 3 scenario's: mass & heat balances
  - Economic assessment of the value chain (cultivation & processing)
  - Identification and assessment of safety and health risk aspects
- **Duration**: M12-28

Work Package task 6.3

- **Title**: Social Assessment: Regional and Social Aspects
- **Purpose**: Evaluate potential positive and negative social impacts, using the approach of social life cycle assessment.
  - A variety of tools will be used, including analytical, procedural, management, monitoring, reporting and communication
  - engage stakeholders through focus groups, citizen panels and surveys/interviews
- **Duration**: M12-42

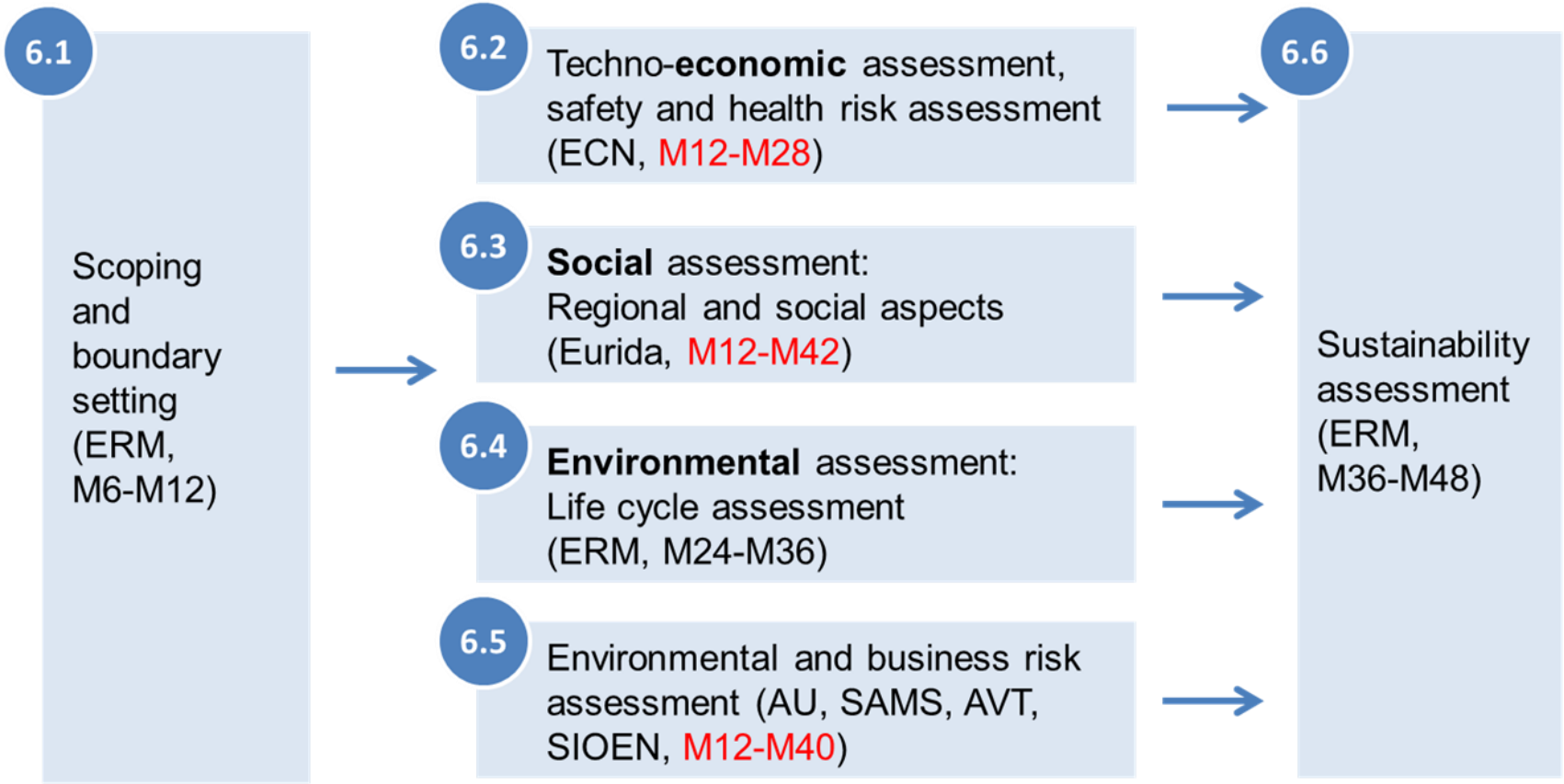
Work Package task 6.4

- **Title:** Environmental assessment: LCA
- **Objective:** Assess the environmental impact of seaweed-derived fuels, using life cycle assessment (LCA), to
  - highlight ‘hotspots’ and best practice/optimisation potentials, and
  - evaluate performance against other transport fuel sources.
- **Duration:** M24-M36

Work Package task 6.5

- **Title**: Environmental and Business Risk Assessment
- **Purpose/objective**:
- Developing of a monitoring program aiming to describe the baseline system (AU, SAMS)
- Analysis and evaluation of the environmental impact of the Macrofuels seaweed cultivation concept (AU, SAMS) (D6.5)
- Identification of major business risks associated with implementing large scale seaweed cultivation, storage and conversion (AVT and SIOEN)
- Development of risk minimisation strategies (AVT and SIOEN)
- **Duration**: M12-40

Looking forward (M12-18)



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