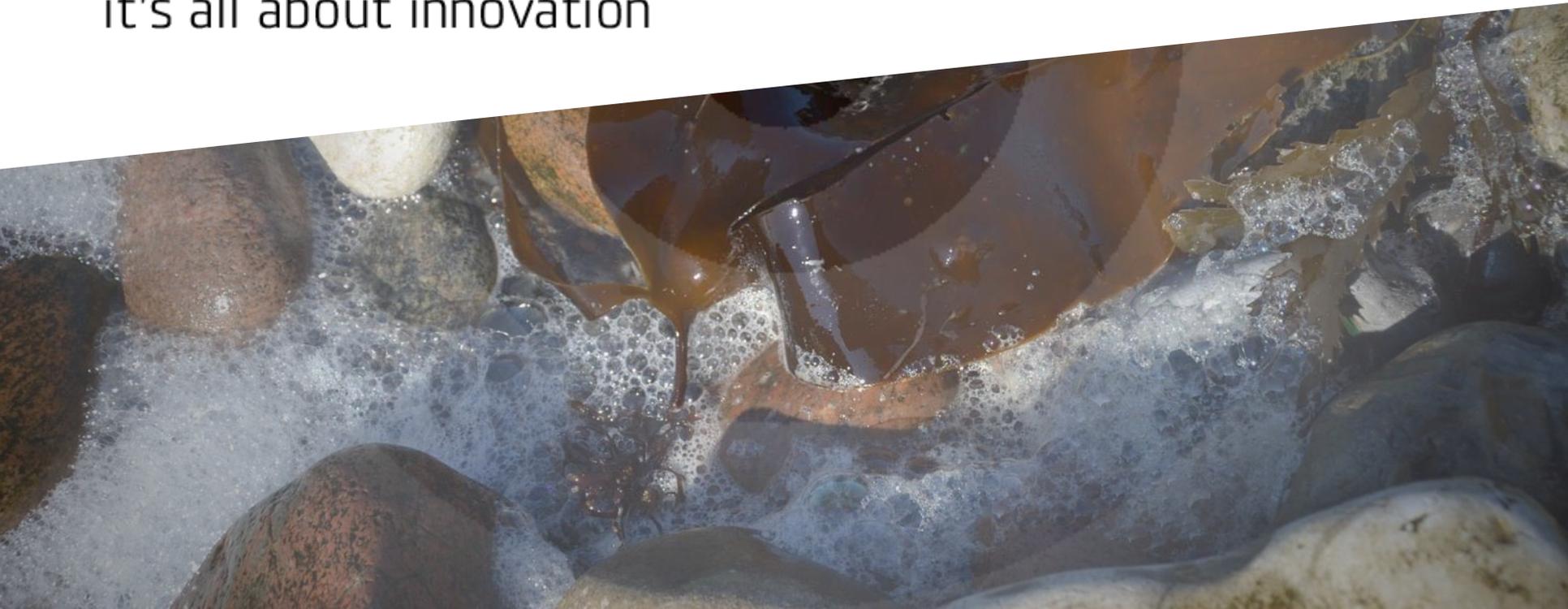




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it's all about innovation





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"Aquaculture in the Bioeconomy framework - Nordic developments"

Gilli Trónd, Project Manager, Danish Technological Institute

Bioeconomy

- COM(2012) 60: Innovating for Sustainable Growth: A Bioeconomy for Europe
- A comprehensive approach to address the ecological, environmental, energy, food supply and natural resource challenges that Europe and indeed the world are facing already today.
- Not a new piece of legislation, but serves to focus Europe's common efforts in the “**right**” direction
- The sustainable production and exploitation of biological resources will allow the production of more from less, including from waste.
- The Bioeconomy will also contribute to limiting the negative impacts on the environment, reduce the heavy dependency on fossil resources, mitigate climate change and move Europe towards a post-petroleum society.

FAO (Food and Agriculture Organization of the United Nations)



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- The Global Blue Growth Initiative
 1. Focus on Small Island development
 2. Links **Blue Growth** to 'bioeconomy'



- Key Points
 1. Promoting responsible and sustainable fisheries and aquaculture
 2. FAO is advancing the Blue Growth Initiative as a **coherent framework** for the **sustainable** and **socio-economic management** of our **aquatic resources**.
 3. Anchored in the principles set out in the benchmark Code of Conduct for Responsible Fisheries in 1995, Blue Growth focuses on **capture fisheries, aquaculture, ecosystem services, trade and social protection**.

The European Union

Directorate-General for Research and Innovation
(Horizon 2020)

- BLUE GROWTH: Unlocking the potential of the seas and oceans
 - Links Blue Growth to societal challenge
 - Food security, sustainable agriculture, marine and maritime research and the **bio-economy**
 - A large budget:
 - Annual budget (2014-2020) €260 million within H2020 alone.
 - Other related efforts (Blue Growth and blue bioeconomy in Interreg, EMFF, etc.) valued at over €1 billion annually.

- Key Points
 - Job growth and job retention
 - Five cross-cutting priority domains
 1. Valorizing the diversity of marine life;
 2. Sustainable harvesting the deep-sea resources;
 3. New offshore challenge;
 4. Ocean observation technologies;
 5. The socioeconomic dimension.

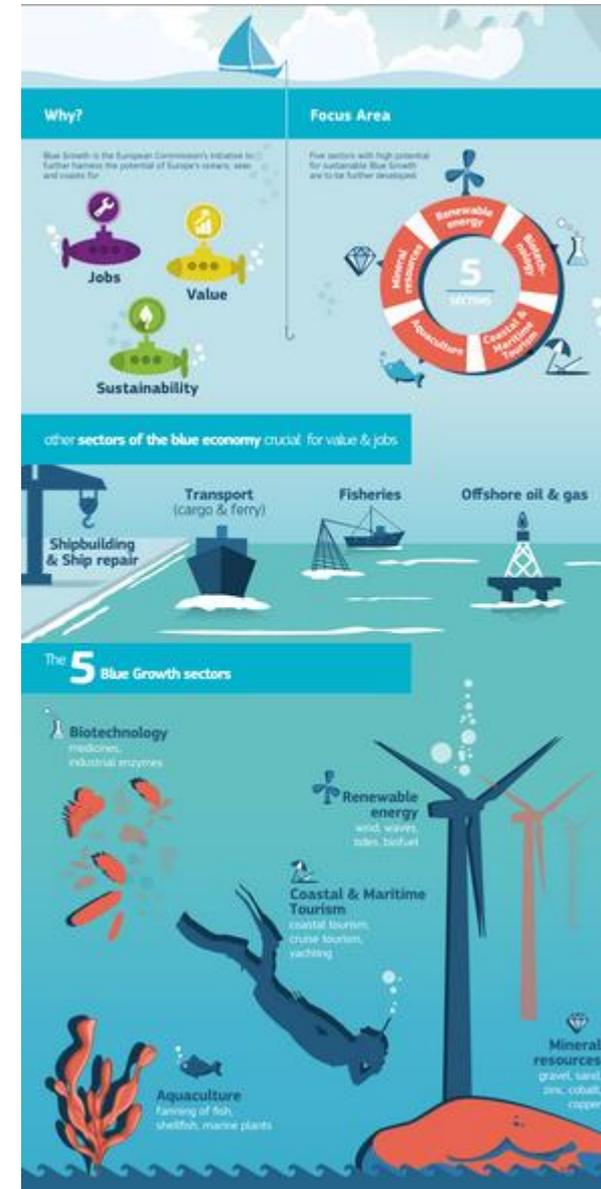
The European Union

Directorate-General for Maritime Affairs and Fisheries

- Blue Growth Agenda, a three component strategy
 1. Develop sectors that have a high potential for sustainable jobs and growth, such as:
 - a. Aquaculture
 - b. coastal tourism
 - c. marine biotechnology
 - d. ocean energy
 - e. seabed mining
 2. Essential components to provide knowledge, legal certainty and security in the blue economy
 - a. marine knowledge to improve access to information about the sea
 - b. maritime spatial planning to ensure an efficient and sustainable management of activities at sea
 - c. integrated maritime surveillance to give authorities a better picture of what is happening at sea.
 3. Sea basin strategies to ensure tailor-made measures and to foster cooperation between countries



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The European Union

Directorate-General for Maritime Affairs and Fisheries

- Blue Growth Initiative
- Com (2012) 494 final

- Key Points - Five focus areas
 1. Blue energy
 2. Aquaculture
 3. Maritime, coastal and cruise tourism
 4. Marine mineral resources
 5. Blue biotechnology

- Sustainable marine and maritime growth.



Blue Growth

Opportunities for marine and maritime sustainable growth

The European Union

Directorate-General for Maritime Affairs and Fisheries



- Blue Growth is hence defined as "**smart, sustainable and inclusive (bio) economic and employment growth from the oceans, seas and coasts**".

- **Key Points – 11 focus areas**
 1. Shortsea shipping
 2. Offshore oil and gas
 3. Coastal tourism
 4. Coastal protection
 5. Marine aquatic products
 6. Offshore wind
 7. Cruise shipping
 8. Maritime monitoring and surveillance
 9. Blue biotechnology
 10. Ocean renewable energy (blue energy),
 11. Marine minerals mining



Blue Growth Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts

Final Report

Call for tenders No. MARE/2010/01

Client: European Commission, DG MARE

Rotterdam/Brussels, 13th August 2012



The European Union



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Directorate-General for the Environment

- **Blue Growth** → **Green Growth**
- Blue growth – an initiative to harness the untapped potential of Europe's oceans, seas and coasts for **jobs and growth**.
- Com(2014) 254
- **Key Points** – contributions to the EU's:
 - International competitiveness
 - Resource efficiency
 - Job creation
 - New sources of growth
 - Safeguarding biodiversity
 - Protecting the marine environment
 - Preserving the services that healthy and resilient marine and coastal ecosystems provide.



‘Could Blue Growth turn into Green?’
The Marine Strategy Framework Directive:
A healthy basis for Blue Growth

JEROEN CASAER
European Commission DG Environment
Unit Marine Environment and Water Industry

Nordic Council of Ministers



- Blue Growth, Green Growth
 1. Links Bioeconomy, Blue Growth, Green Growth.
 2. Follows FAO definition of the bioeconomy and blue Growth, not the EU definition (s).

Nordic Bioeconomy

Theme

- ↳ Nordic Bioeconomy
- ↳ Events
- The Nordic Marine Innovation conference 2014: "Blue growth in the marine industry"
- Previous events

The Nordic Marine Innovation conference 2014: "Blue growth in the marine industry"

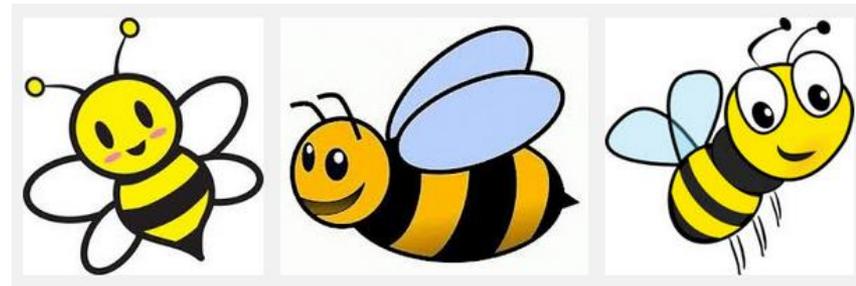
Oct 08, 2014

The Nordic Marine Innovation conference 2014: "Blue growth in the marine industry" will summarize the Nordic Marine Innovation Programme, but also look forward to see what lays ahead for Nordic marine sector.

- **Green** growth is a concept that captures one of the greatest challenges facing the future development of society: How do we promote economic **growth** and **competitiveness** while being **socially** and **environmentally sustainable** over the **long term**?

So what is bioeconomy?

- It depends upon who you ask
- It is important when facing a question regarding blue bioeconomy (and blue growth) that you are aware of who is asking the question.
- Different calls, tenders, and work descriptions use different definitions.
- It's a buzzword



So what is blue bioeconomy?

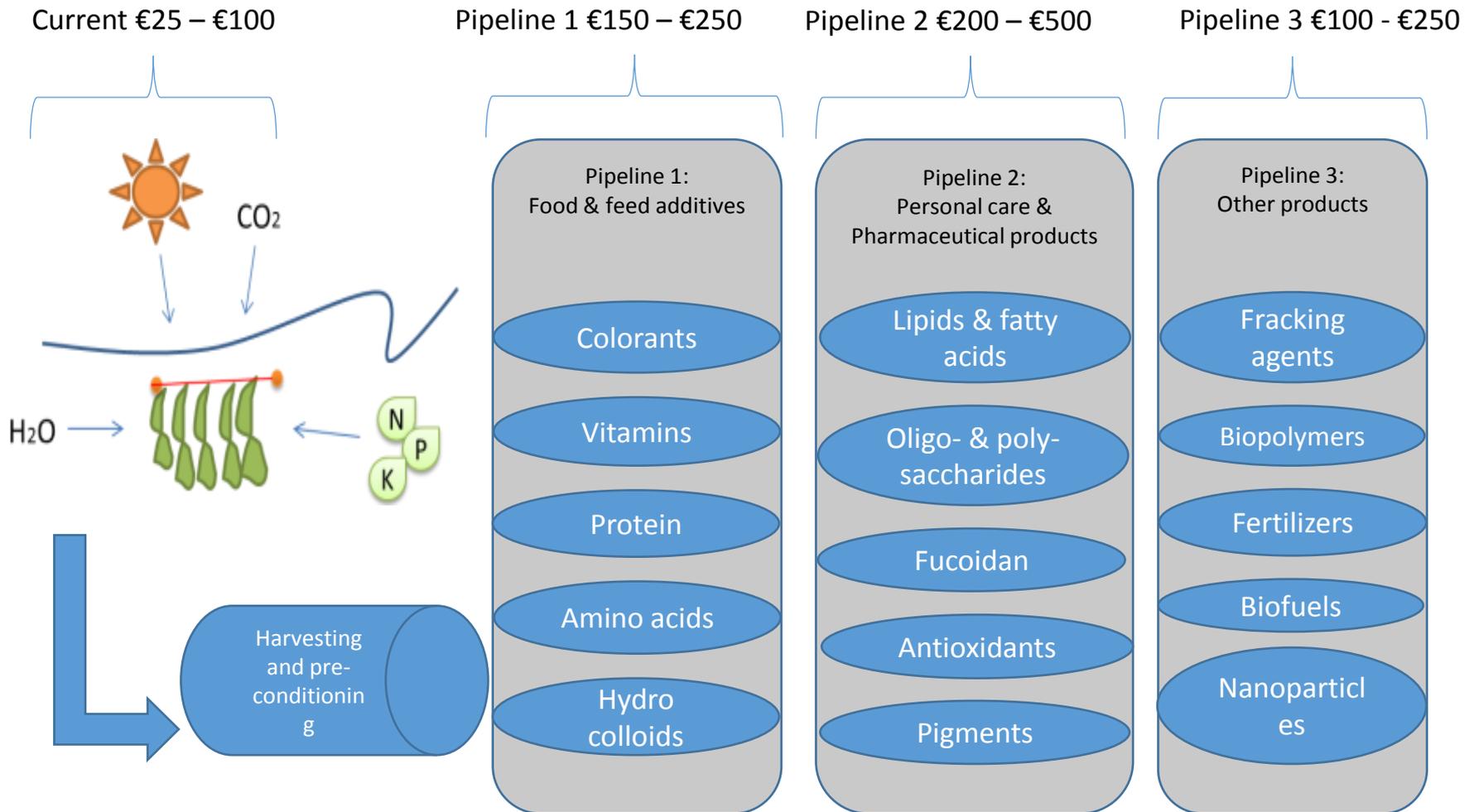
- Key Points
 1. Sustainable long term growth of the “Blue sectors”.
 - The sectors included vary from organization to organization.
 2. Providing continued socio-economic benefit (jobs) for coastal areas.
 3. Ensuring that aquatic resources are available for future generations.
 4. Attempting to use marine resources as feedstocks for industrial processes, often replacing fossil resources.

- EU policy instruments
 1. Innovating for Sustainable Growth: A Bioeconomy for Europe (COM 2012 60)
 2. Innovation in the Blue economy (Com 2014 254)
 3. Blue Growth agenda (COM 2012 494)
 4. Integrated Maritime policy (IMP)
 5. Marine Strategy Framework Directive (MSFD)

Nordic developments

- Nordic Council of Ministers has a bioeconomy agenda for the Baltic Sea, and the Arctic, with other regions to come.
- There are many research under way to increase the sustainable usage of waste, bi-products and co-products.
- These projects focus on supplementing
 - energy (e.g. fossil fuels),
 - industrial components (e.g. plastics, succinic acid)
 - feed (pig, poultry, and fish feed)
- Utilize biorefinery concepts

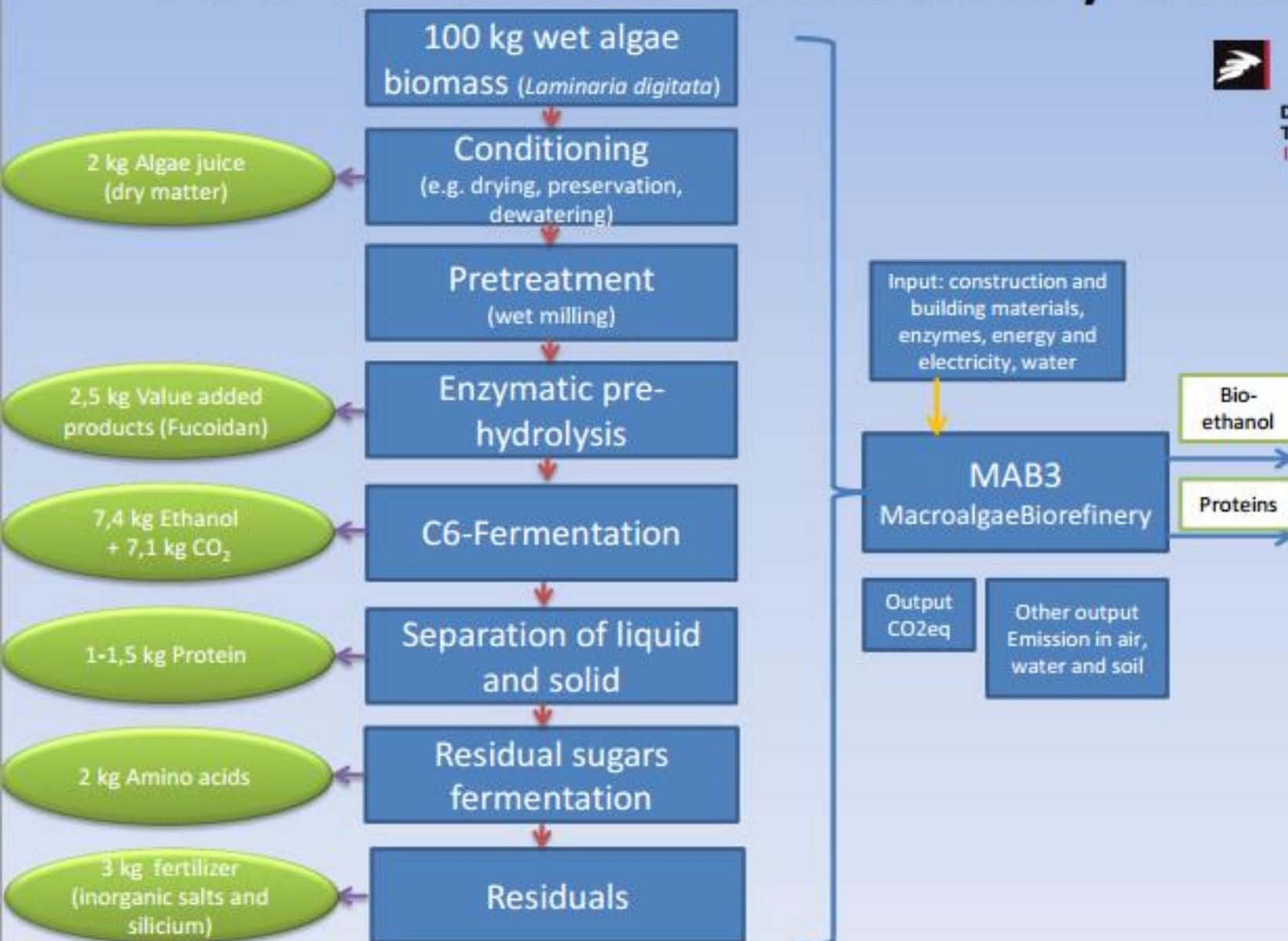
Value of Seaweed – € per ton of fresh weight



MAB3 Ethanol Biorefinery concept



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Nordic Commercial developments

- Commercial developments are currently more basic.
- Seaweed and mussels farmed as compensation for increased fish farming.
- Integrated Multi-Trophic Aquaculture (IMTA)
- 100 ha of seaweed (Saccharina) production = 3500 ton of fish.
- The value of seaweed is not dependent upon it's own value, but rather the value of the pollution it removes.
 - Mainly phosphorus and nitrogen.
 - Each ton of seaweed (wet weight) removes 5 kg of nitrogen and 0.3 kg of phosphorus.
 - Mussels are also applicable, each ton (wet weight, without shells) removes 10 kg of nitrogen and 0.6 kg of phosphorus.
 - Mussels are suspected of detritus pollution – debate ongoing.
- Seaweed can be used to clean up pollution.

High value compounds from seaweed

- Many discussions focus on the high value compounds from seaweed.
- Chiefly the interest has been focused on:
 1. Fucoidan (health supplement)
 2. Laminarin (natural pesticide)
 3. Phlorotannins for natural coloring, (UV block).
 4. “extracts” for cosmetics industry.
 5. Ultra-pure, ultra-sterile biomolecules for pharmaceutical applications
 6. Organic horticulture supplements.
- Small scale production >€20m turnover per year in North East Atlantic area.

Established industries



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- Turnover: several billion € per year. Vertically integrated companies. Focus on processing seaweed into additives for food and consumer care products.
- Large capital costs associated with processing plants.
- Focus on wild harvest in cold waters, and cultivation in warm (tropical waters).
- FMC in Norway
- Algea in Norway
- Thorverk in Iceland
- CP Kelco in Denmark
- DuPont in Denmark
- Cargill in the UK



Established industries 2

- Clients include:
 - Nestle
 - Kraft
 - Unilever
 - Colgate
- Products are mostly E 400 to E 410, emulsifiers used as additives in food and consumer care products.
- Key point:
 - If the production cost becomes low enough, there is a huge established market for seaweed in Europe (> €500 million per year)
 - Currently that market is served with seaweed imported from Chile, Tanzania, Indonesia, the Philippines ... and Norway.

Bioeconomy and aquaculture

- Seaweed farming is difficult to make economically sustainable in western Europe without additional benefits from European policy instruments.
 - Cost of seeding, harvesting and in particular pre-processing are high in Europe.
- The role of seaweed as an accumulator of nitrogen and phosphorus is particularly interesting – more so for countries with large salmon or pork industries.
 - Minor policy changes could make seaweed farming reasonably profitable.
- Aquaculture connects bioeconomy and the blue growth agenda.
 - Within aquaculture seaweed farming is currently a niche product in Europe, while it is the most common source of seaweed in Asia.
 - Wild harvest of seaweed for commercial products still utilized in the Nordic countries: 250.000 tonnes/year in Norway, and 25.000 tonnes/year in Iceland.



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Thank you

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