



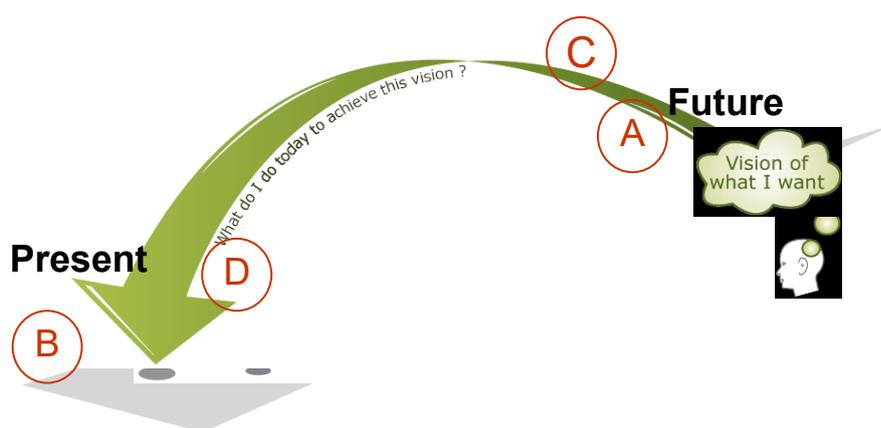
**Introduction and Background**

**Seaweeds Uses for Strategic Sustainable Development of Coastal Ghana.**

**The SeaBioGha Project aimed at**

- Selecting and characterizing seaweed species in Ghana with max. yield of functional hydrocolloids carrageenan, alginate and fucoidan;
- Developing seaweed cultivation technology at sea and biorefining for optimal utilization of seaweed;
- Identify energy efficient and cost effective bioenergy production from seaweed / seaweed residues;
- Provide technology transfer of bio-processing technologies for seaweed to establish local enterprises and pro-poor employment generation in Ghana;
- Empowering and expanding livelihood opportunities in the coast via seaweed cultivation and processing.

**Results** As outlined, a significant number of important and encouraging technical, engineering, and scientific results were obtained, and the original hypothesis that seaweeds and seaweeds processing (according to the points above), can be an important asset in Ghana, turned out to be valid. In the collaboration a four-step ABCD backcasting concept process ([www.thenaturalstep.org](http://www.thenaturalstep.org)) was employed as a tool to help sustainable development conceptualization and local engagement (Illustration below).



*Left: Different steps of the ABCD process on a backcasting timeline.*

## **A-step: Future Goals and Principles for Sustainable Development from SeaBioGha**

Summary of recommendations:

- Enhance living conditions along the coast through a clean and healthy coast and a strong economy for coastal communities.
- Use resources responsibly, and regulate coastal activities to avoid overexploited areas or areas with depleting resources.
- Engage and educate the coastal communities to ensure awareness on the use of new resources and participation in decision-making processes.
- Respect local cultures and traditions.
- Ensure gender and intergenerational equity in the use of coastal resources and profit distribution.
- Strive for a low carbon economy for coastal Ghana.

## **B-step: Current Points to Emphasize for using Seaweeds for Sustainable Development in coastal Ghana**

### **1. It was recognized that the production of seaweed...**

- can provide alternative livelihood for coastal communities
- can contribute to carbon sequestration (and thus in efforts toward climate change mitigation)
- may lead to conflicts due to competing use of the coastal areas (water and land)

### **2. Regarding the natural resource, it was recognized that...**

- seaweed growth is naturally occurring in Ghana with high diversity (incl. both green, brown and red seaweed species)
- production must control pollution problems (turbidity of the water, presence of heavy metals, plastic waste, pollution by dejections) and consider environmental factors (depth of the continental shelf, rock surface, extreme wave action)
- there is so far no case of cultivation in Ghana, but suitable cultivation sites are being identified
- moreover, there is active and promising research on commercial cultivation of seaweed in Ghana (lab-scale cultivation set-up at CSIR-WRI)
- Occasional strong invasions of seaweed or the sargassum species are catastrophic for the fishing activities, and may have contributed to a negative perception of seaweed by fishing communities

### **3. Regarding the coastal livelihood, it was recognized that...**

- there is a high unemployment and poverty rate in coastal areas
- there is a strong gender segregation (e.g. gender-specific activities in the fishing value chain – men are fishing; women are smoking fish)
- there is a clear tendency of fish stock decrease
- seaweed waste is accumulating in coastal environments
- access to capital is difficult for coastal communities

### **4. Regarding the processing of seaweed, it was recognized that...**

- there is no seaweed processing activities/infrastructure in Ghana, but active on-going research activities regarding processing and technology (processing at KNUST Chemical Engineering)

- the human capacity for seaweed processing can be found in Ghana, in particular due to high poverty rates and high unemployment rates, and is likely to be influenced by gender segregation
- water pollution may have consequences on processing costs
- different varieties of seaweed could be processed in order to produce: hydrocolloids, enzymes, livestock and fish feed, fertilizer (composting may require desalination), biofuels (alcohols, fuel additives, biogas), as well as pharmaceuticals

#### **5. Regarding the market setting, it was recognized that...**

- competition with similar products may arise, but there is currently no competition from seaweed products in Ghana and neighbouring countries
- there is no existing market for the raw seaweed in the region
- carbon sequestration by using the seaweed to substitute fossil fuel, could be commodified

#### **C-step: The role that seaweed could play in the sustainable development of the coastal Ghana.**

Strategic goals summary.

##### **1. Seaweed Production**

On a short term, the following goals can be envisioned:

- suitable sites are identified along the coast, and seaweed species are characterized
- awareness and engagement are fostered through e.g. town hall meetings, radio talks, posters, trainings for cultivation
- pilot farms are set up in all coastal regions
- coastal communities are employed in priority
- appropriate business models are developed such as contract farming (out grower schemes)

On a medium term, the following goals can be envisioned:

- nursery farms are set up in all coastal regions and quality standards are developed
- producers are licensed and certified
- cooperatives of seaweed producers are formed to increase resilience, collaboration and efficiency
- cooperatives of seaweed producers, processors and merchants are formed to access credit
- a best practice award scheme is set up for different actors in the value chain
- funding for research and development in seaweed production is expanded
- private-public partnerships foster the seaweed production and development
- acceptance by coastal communities is broadened
- regulation bodies are set in order to control activities of seaweed production
- policies that facilitate seaweed production are implemented

On a long term, the following goals can be envisioned:

- a seaweed advisory board is set
- state-of-the-art methods and technologies are used for cultivation
- carbon footprint of coastal Ghana is reduced
- carbon credits are sold and contribute to the value of seaweed
- benefits from the seaweed value chain are used for establishing schools, hospitals and waste disposal facilities
- children of school age are not permitted to be engaged in cultivation activities

## **2. Seaweed Processing**

On a short term, the following goals can be were envisioned:

- pilot projects are set for the processing seaweed products
- research is pursued into industrial products from seaweeds
- seaweed should not be exported raw, but value should be added locally
- qualified technicians are trained from the local communities for roles in the processing industry
- adequate funding is put for research and development in the area of seaweed processing
- stakeholder workshops are organised

On a medium term, the following goals can be envisioned:

- specialized processing plants are set up for the different types of seaweed, and are located close to the sources of raw material
- local production of enzymes from seaweed is developed, so as to reduce the reliance on foreign sources
- employment is focused on coastal communities
- cooperatives of seaweed producers, processors and merchants are formed to access credit
- a best practice award scheme is set up for different actors in the value chain
- private-public partnerships foster the seaweed production and development

On a long term, the following goals can be envisioned:

- state-of-the-art methods and technologies are used for processing
- Ghana is the knowledge hub for seaweed processing

## **3. Seaweed Products**

On a short term, the following goals can be envisioned:

- based on estimates of demand and production costs, selected seaweed products are promoted locally

- laboratory- and pilot-scale samples are produced for demonstration and marketing
- a coherent value chain is developed, based on opportunities and constraints at the different stages
- target species that would be useful for final products (at local or global scale) are identified

On a medium term, the following goal can be envisioned:

- Ghanaian seaweed products are promoted at the national level

On a long term, the following goals can be envisioned:

- carbon footprint of coastal Ghana is reduced
- carbon credits are sold and contribute to the value of seaweed
- Ghanaian seaweed products are promoted at the international level
- benefits from the seaweed value chain are used for establishing schools, hospitals and waste disposal facilities for participating communities

## Conclusions

### D-step: Suggestions for implementation Action Plan Summary (an extended version was made in Project)

1. Establish pilot farms
2. Establish pilot processing plants with a focus on zero-waste processes
3. Develop an adequate regulatory framework
4. Establish a coastal land use management policy
5. Spread knowledge to ensure community engagement and make Ghana a knowledge hub
6. Make Ghana one of the leading producers of seaweed product, with emphasis on carbon-neutral development

**Implications:** What are the implications of your results and capacity building? Which policy changes do the results point to?

The production and processing of seaweeds must start with the high value products that already have an established market, i.e. the hydrocolloids. At this point in time the political climate in Ghana is very focused on employment, value generation and gender engagement. Continued positive awareness, training, and investments are needed with respect to infrastructure and industrial reward programmes to apply the seaweed technologies in practice to an impact. The potential is there.

**Recommendations:** Call to action, which precise steps should be taken? It is very important to keep up the momentum concerning development of seaweeds cultivation and partial processing in Africa. In Ghana it is important to now support the integration of the project partners (mainly at universities) with stakeholders in the coastal communities and companies that can implement the results and technologies in practice. Green growth is a crucial focus area that may enable improved livelihood development in developing countries e.g. in Africa. Continued political focus, local technology development, and investments in the area are recommended.