

The Problem

To accomplish the transition towards a sustainable blue growth, it is imperative to adopt modern value chain approaches within circular bioeconomy concepts. However, treatment of industrial wastewaters is not always trivial, as many times the extreme conditions (e.g. pH, salinity, inhibitors) do not allow implementation of conventional water treatment technologies based on bacteria. On the contrary, valorisation of wastewater using microalgae can overcome the abovementioned limitations and simultaneously upcycle and recycle carbon and other nutrients. In such way, microalgae represent a largely untapped resource of valuable bioactive compounds that can be used in various applications including cosmeceuticals, aquafeed and food industries.

BlueBioChain Overall Objective

A) The development of an integrated, multidisciplinary, and holistic value chain aiming at simultaneous wastewater valorisation by microalgae and subsequent transformation of harvested microalgal biomass into high market value products.

B) The exploitation of the potential of green microalgae species to produce a variety of natural functional extracts for the formulation of creams with antiaging, antioxidant and skin protection properties.

C) The production of astaxanthin to be used as a food additive in convenient meat and dairy analogues addressing current dietary consumer requirements.

D) The development of easy-to-use algal cultivation facilities that can be used directly by aquaculture companies to clean their wastewater and create value from microalgae on site.

The Project

BlueBioChain aims at implementing a holistic biorefinery platform along with emerging technologies to exploit the potential of microalgae for wastewater valorisation and production of high market value bio-based products. Therefore, it will present a zero-waste aquaculture farm, produce cosmeceuticals, food supplements and feed from waste material, deliver a sustainable and energy-efficient biorefinery process, develop a plug-and-play circular bioeconomy concept which closes loops of carbon, nutrients and water as well as take advantage of the inherent seasonality and diversity of bioresources.

The Approach

To achieve its objectives, BlueBioChain will develop a framework and apply novel process technologies for simultaneous wastewater valorisation, cultivation of microalgae using industrial wastewater and subsequent transformation of the harvested microalgal biomass into high market value products.

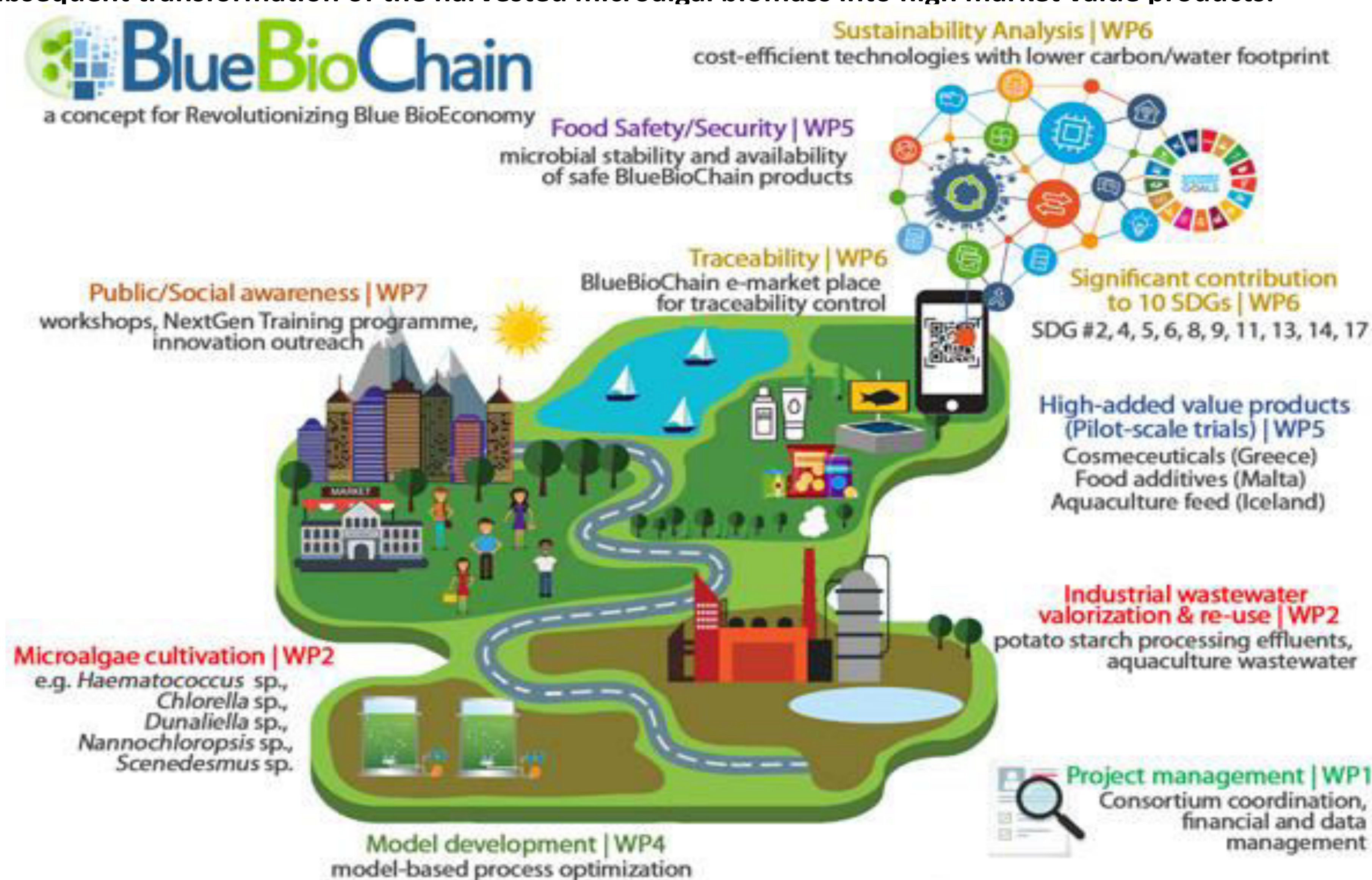


Figure 1. Overview of the BlueBioChain concept.

In this context, an initial screening of specific microalgal strains will be performed, to obtain high biomass productivity along with high nutrient removal upon the specific wastewaters. The project will cultivate algae to obtain high quality algal extracts that will be used for the pilot formulation of skin creams (Greece), food products (Malta) or aquaculture feed (Iceland), and define wastewater optimal use cases.

All aspects of supply chain design and planning that support green image will be tackled, including food/feed safety and security, energy and water consumption efficiency, traceability, “blue” marketing, and social responsibility. Also, an e-marketplace web-tool will be developed connecting stakeholders and helping to re-invent the blue economy supply chain network.

Expected Impacts

- Efficient wastewater valorization through intelligent system for nutrient recycling and upcycling via microalgae cultivation.
- Delivery of high-end market value end-products through the pilot scale production of (i) cosmeceuticals, (ii) food additives and (iii) aquaculture feed.
- Model-based optimization by applying advanced models to optimize the process in respect to a) nutrient upcycling and recycling, b) productivity rates and c) efficiency.
- Improved biosecurity by producing functional compounds allowing better availability of nutritious products to end-users.
- BlueBioChain e-marketplace through an online tool providing information regarding water use, carbon footprint, and traceability control of end-products.
- Improving professional skills through the development, testing, and piloting a bespoke training programme, “BlueBioChain NextGen”, aimed at the youth – i.e., the future generation.

The Project Partners



Contact:

Dr. Georgios Banias

Researcher

g.banias@certh.gr | +30 2311 257650



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS

