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Moving towards 2050 the main challenges we are facing globally is to accommodate the need for food, sustainable energy and fresh water for a world population of almost 10 billion people. As our planet's surface is for 71% covered with water, unlocking its potential through a strategy of Blue Growth is called for. In addition adaptation to climate change and mitigation of its negative consequences rates equally high among societies' grand challenges. At the same time technological progress is advancing at tremendous rates; making use of novel technology is a must to turn these challenges into opportunities.

In the H2020 work programmes 2014-2017, the research and development of Blue Growth has concentrated on new maritime technologies for exploration and exploitation of sea-based resources (food, energy, materials). For the period 2018-2020, the main need is to integrate Blue Growth into the Circular Bio-Based Society.

EFARO does see the potentials, possibilities and choices to be made in furthering the Blue Growth agenda. The research community has an important role to play when it comes to providing knowledge required for sustainable management, as well as the monitoring and evaluation of the ecological, economic and societal impact of these developments. Based on this knowledge and its use, advice can be rendered for policy development. In order to ensure that this knowledge is developed capacity building, training and education are key factors to facilitate this process.

Crucial to arrive at marine sustainable innovation is planning the optimum use of our marine space and resources. Therefore there is a need for optimising and harmonising Marine Spatial Planning processes, also at the regional level. Noting the scarcity of valuable ocean space, especially competition over the near shore area, the concept of multiple use in a single location needs to be further explored. Examples can be multi-purposing wind farms for seaweed production, aquaculture and tidal energy. Following on this multiple use theme, also the concept of building with nature, operating in harmony between nature, engineering and society needs to be a prevalent theme.

In particular EFARO would like to draw attention to the following topics as being of major importance:

1. Exploring resources

- Upscaling of seaweed production, development of efficient farming technologies to a higher TRL; optimal use of the marine environmental conditions (sites) for production and processing, including bio-refineries for complete utilization of the biomass (human edible proteins, fine chemicals, energy, bio-based materials, ethanol, methane, low ruminant feed stocks). *Envisaged impacts: unlocking the production of marine algae, increased food security, increased employment in sector, reduction of fresh water use.*
- Exploration and development of sustainability concepts such as the exploitation of large mesoplankton and mesopelagic stocks, exploration and development of systems of retention of nutrients related to aquaculture, optimising usage of marine rest products or “by-catch” from fisheries. *Envisaged impacts: unlocking the production of the mesopelagic, increased food security, improved utilization of resources and generation of new business opportunities for existing and new players, produce high value substances and ingredients, increased employment in sector, enhanced management of the resource.*
- The use of “omics” in Fisheries and Aquaculture science: the application of OMICS in fisheries and aquaculture research is lagging behind development in other sectors. It is proposed to initiate projects that translate OMICS methods into applications relevant to fisheries and aquaculture. *Envisaged impacts: enhanced stock identification and separation, more accurate description of population dynamics in relation to environmental drivers, improved management and enhanced production.*

2. Innovation

- Novel technology for efficient monitoring, data collection, -processing, and -analyses: High Tech Field Observations in Fisheries and Environmental Management (development and application of new sensors and measuring systems incorporating advances from other fields), big data retrieval, handling of data in management support systems, using the potentials of the ‘internet of things’. *Envisaged impacts: more effective and efficient monitoring of more aspects of the marine environment and resource use, enhanced advisory capacity, Early Warning Systems anticipating threats.*
- Multi-use of ocean space, such as the use of windmill parks and offshore production sites, integrating biomass and energy production with focus on multiple-risks, including system design, technology development, site management and legal aspects. For this Novel Building with Nature concepts can be explored, combining food/feed/energy production with coastal protection and water works and ecological engineering to restore/enhance depleted marine habitats and recover fish stocks as well as to support sustainable exploitation of alternative seafood resources. *Envisaged impacts: increased energy, food, feed and ingredient production, efficient and effective use of marine resources, optimal use of geographic/hydrographic features.*
- Further development of efficient and reliable aquaculture farming production systems with low environmental impact, including pond, Integrated Multi-trophic Aquaculture, RAS, floating closed containment systems and offshore for increased production of biomass for human consumption, including Aqua-breeding: improvement of the growth potential, resilience and robustness of the main aquatic production species using smart genomics based breeding programmes, including ethical aspects.. *Envisaged impacts: increased availability of safe and healthy food for consumers, reduction of EU fish imports, job creation in supplier industries.*

3. Management

- Development of management strategies and management strategy evaluation tools sensitive to marine ecosystem resilience and regime shifts based on *Reversing the perspective*: from resource-based to product-based management. Closer integration of fisheries and aquaculture into a more holistic seafood production system with attention for seafood safety and perceived benefits of seafood for consumers.
 - including the role of climate and habitat change
 - while focusing on implementation of MSY and fisheries management plans for mixed fisheries and interacting species in an ecosystem based context,
 - with enhanced adaptive management systems including evaluation of social-ecological-system impacts.

Envisaged impacts: increased availability of safe and healthy food for consumers, reduction of EU fish imports, increased global food security, from a viable capture fisheries being climate change robust, vital coastal communities.

- Marine Governance related to societal acceptance of Blue Growth perspectives, including animal and environmental friendly (e.g. ecosystem based and organic) production systems based on local and recirculated resources. *Envisaged impacts: growth in Blue Economy in terms of jobs and income, viable coastal communities, acceptance of sustainable exploitation of the Marine Environment.*
- Integrated (cross sector) large marine ecosystem based management at regional level:
 - development of high quality, cost effective, integrated environmental, fisheries and aquaculture monitoring systems for spatially explicit regional implementation of the CFP, MSFD and MSPD;
 - develop institutions and best practices at the regional sea level;
 - develop specific Regional Programmes, like Mediterranean focus in earlier calls, with a special emphasize on deep sea, oligotrophic and larger inland water systems.

Envisaged impacts: more effective resource management, societal acceptance of policies.

- Citizen science: Engaging society to collect scientific information. Modern media and social networks can help to foster a more systematic engagement of society with marine science issues and promote collecting data for which a systematic scientific monitoring would be too scattered and too costly. *Envisaged impacts: more effective and efficient monitoring of more aspects of the marine environment and resource use, enhanced advisory capacity, increased compliance and support for policy.*
- Coupled social-ecological system modelling: Novel natural resource usage modelling approaches to better address the coupling of social, economic and ecological systems and the often non-linear interactions between system components across multiple spatial and temporal scales. *Envisaged impacts: more effective resource management, societal acceptance of policies.*