SOCIO-ECONOMIC METHODOLOGY, APPROACHES AND RESULTS IN ACCORDANCE WITH THE SUSTAINABLE DEVELOPMENT GOALS AND BLUE ECONOMY

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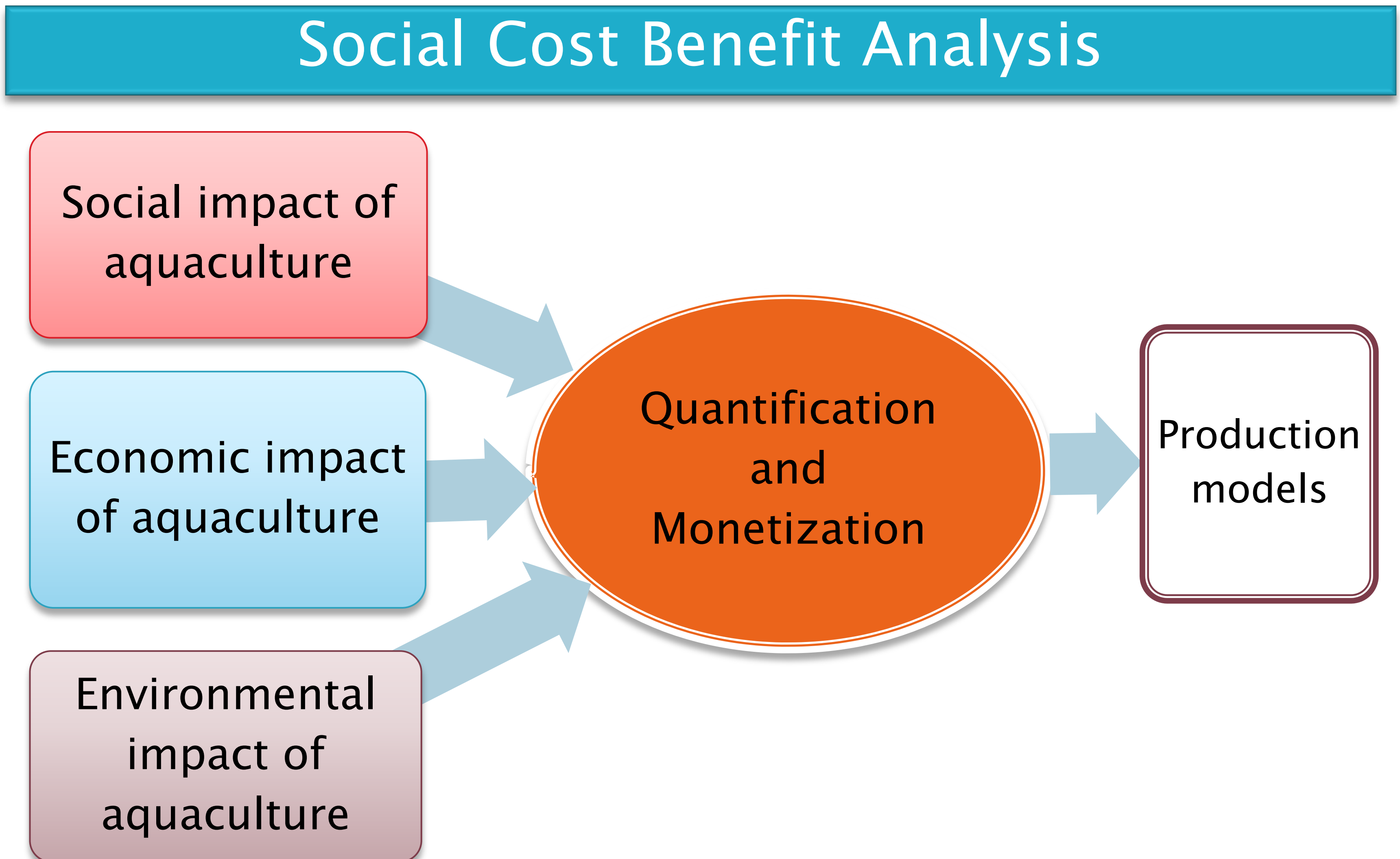
Aim

- Conceptualize and monetize the social and environmental impact of aquaculture in accordance with SDGs and Blue Growth
- Combine social and environmental impact with specific techno-economic and production models of Blue Economy
- Consider data and computational resources at reach
- Distinguish between private and social costs and benefits and incorporate social costs and benefits in private functions

Approach


Social Cost Benefit Analysis
Social impact of aquaculture
Economic impact of aquaculture
Environmental impact of aquaculture
Quantification and Monetization
Production models

Economic, Social and Environmental Effects

- Income
- Employment generation
- Capital investments
- Investment in infrastructure

- Protection of traditional skills & Community stability
- Livelihoods, sense of place and way of life
- Food preferences and associated utility

- Waste generation
- Impact on biodiversity
- CO_2 emissions and climate change

Introduction of socio-environmental impact in cost-driven production models

- Core idea: Introduce socio-environmental costs and benefits in the Net Present Value (NPV) function employed by cost-driven production models
- Specification of the augmented NPV function:

$$NPV = \sum_{i}^{n} \frac{(BF_{it} + ESBF_{it}) - (CS_{it} + ESCS_{it})}{(1+r)^t}$$

  - *where NPV: Net present value, BF: Annual gross revenues, ESBF: Extended annual benefits, CS: Annual gross costs, ESCS: Extended annual costs, r: discount rate, i: Benefit/cost category, t: time*
- Extended annual benefits and costs reflect the monetized value of socio-environmental impacts

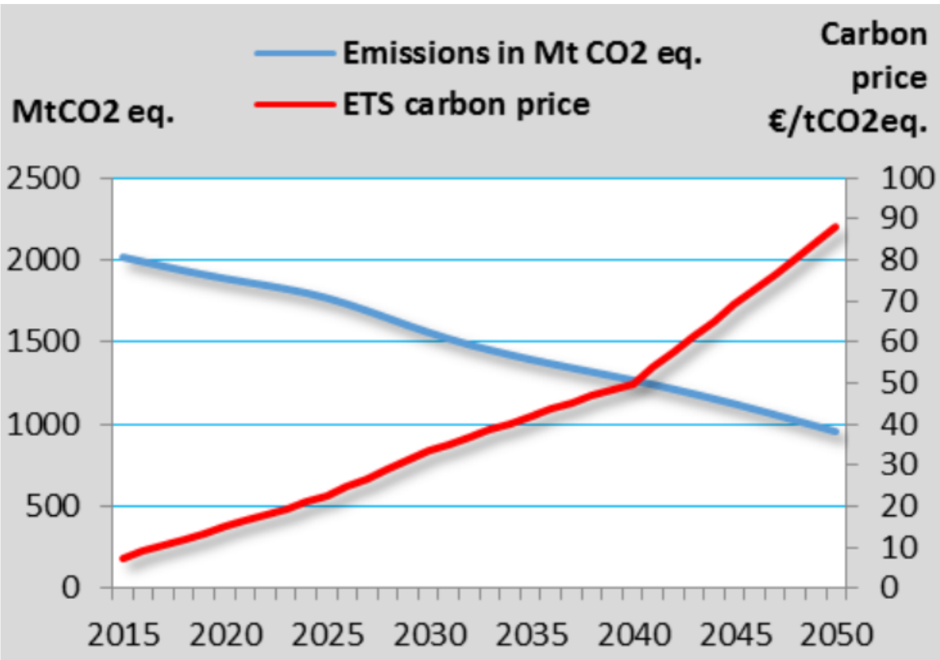
Climate change and emission costs

- Aquaculture-related emission costs can be quantified and internalized with the use of information on the site-specific emissions (in CO2 equivalent) and on carbon prices

Aquaculture type	Emissions (Kg CO2 eq/kg)
Salmon (Norway)	1.8
Salmon (Chile)	2.3
Salmon (UK)	3.3
Pangasius (Pond based Vietnam)	4.7
Trout RAS France	1.6
Mussel culture raft system	2.6
Captured mussels	0.04
Asian sea bass (RAS)	1.7

Climate change and emission costs (cont.)

ETS emissions and carbon prices in the EU energy, transport and GHGs emissions- Trends to 2050



Social cost of CO2, in 2007 dollars per metric ton CO2

	Discount rate		
	5%	3%	2.5%
2020	12	42	62
2025	14	46	68
2030	16	50	73
2035	18	55	78
2040	21	60	84
2045	23	64	89
2050	23	69	95

- EU Reference Scenario 2016
- Social costs of CO2 provided by the USA Environmental Protection Agency

Water pollution and waste management costs

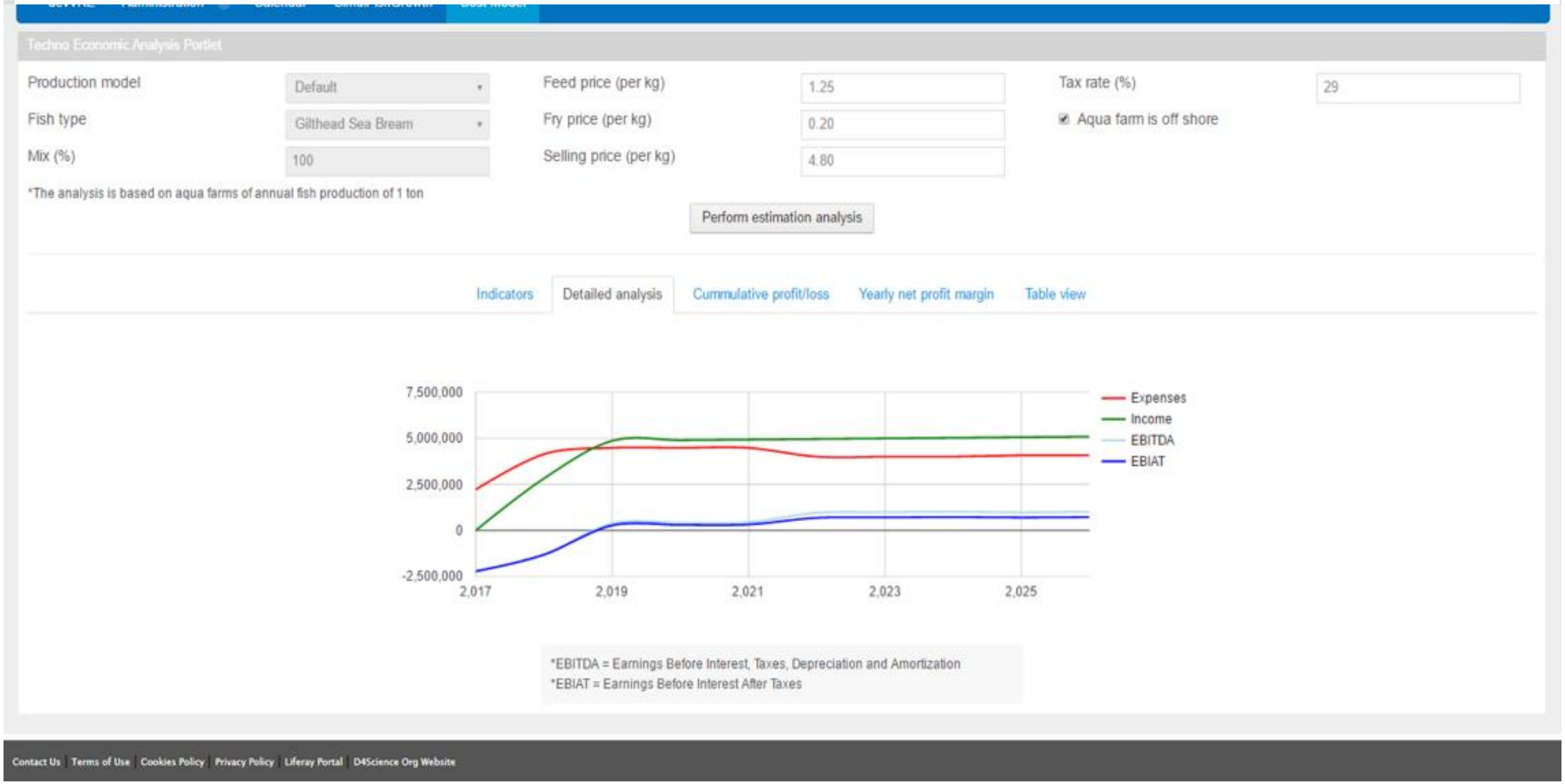
- Aquaculture waste: metabolic, chemical and pathogenic
- Private costs are captured to some extent from the costs of chemicals, of the production methods and of the technologies used in the aquaculture site, incorporated in investment and production costs
- social costs are not internalized

Internalized cost of water pollution/prevention, in % of private production cost	Case study	Source
6	Trout, West Virginia	Smearman et al. (1997)
15-16	Salmon, Sweden	Folke et al. (1994)

Biodiversity, environmental attitude and community effects

Action surveyed, year and country of reference	Methodology	Willingness to pay (in 2013 US dollars)	Payment frequency	Unit	References
Protection program, 2003, Greece	Contingent Valuation	21.74-29.95	One-time	Individual	Stithou and Scarpa (2012)
Protection program, Norwegian lobster, 2006, Spain	Contingent Valuation	22.96	One-time	Household	Ojea and Loureiro (2010)
Protection program, Loggerhead sea turtle, 2003, Greece	Contingent Valuation	22.46-32.12	One-time	Individual	Stithou and Scarpa (2012)

Application snapshot



Thank you

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