

WP 2 : Identifying and quantifying the most relevant indicators of the interactions of aquaculture on ecosystems

indicators of the **impacts** of aquaculture **on** ecosystems, including on other activities (fisheries grounds, sea-ranching)

WP 2 Objectives

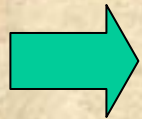
- To retain a **workable definition** of indicators, to be used in this study.
- To identify the most relevant indicators of the **impacts of aquaculture on ecosystems**, including on other activities (fisheries grounds, sea-ranching) and interactions relating to issues of relevance to the Birds and Habitat Directives.
- To identify indicators of **socio-economics** impact of aquaculture on **coastal areas**.
- To classify the different indicators of **positive or negative impact** of aquaculture on ecosystems, with regards to the **different types** of aquaculture, their location and their environment.
- To assess the interactions between aquaculture and other major **uses of the coastal zone** (fisheries, tourism & recreation, shipping etc)

WP 2 description of work (tasks)

- 1- To prepare a **grid of factors** (physical, chemical, biological and economical) and **of aquaculture systems** (from intensive to extensive), allowing to **classify** the different indicators
- 2- To identify and **review the available** indicators, from the literature and common practice.
- 3- If necessary, to identify the **need of specific indicators** and propose new solutions
- 4- To prepare an **annotated list of indicators**, including specific formulae, field of application, and references, for use by WP4

WP 2 interactions

- WP 3 is focused on the **impact of** anthropogenic factors **on** aquaculture, with regards to the water quality.



To avoid overlapping, while following a comprehensive approach in the two WP. There is a need for coordinating within the two WP

- WP 4 and 5 will rely on results from WP 2 and 3. They could participate to the last tasks of WP 2 (annotated list of indicators

A few questions about indicators

- Selecting indicators, for what?

For use in EIA. For operational studies

- Selecting indicators, to whom?

Policymakers, Farmers, or applied science

- Selecting indicators of what?

Please refer to the contract!

Do we need an indicators framework?*

- Indicator frameworks provide the means to structure sets of indicators in a manner that facilitates their interpretation.
- Indicators are usually needed for many aspects of a problem or issue, and the framework selected ensures that all of those aspects have been taken into account.
- Frameworks can also aid the understanding of how different issues are interrelated.

3 different types of frameworks

*Lisa Segnestam, 2002. Indicators of Environment and Sustainable Development. Theories and Practical Experience. Environmental Economics Series, The World Bank Environment department, 61 p.

1- A project-based framework (also referred to in the literature as the Input-Output-Outcome-Impact framework), which is used in the monitoring of the effectiveness of projects whose objective it is to improve the state of the environment.

2- A framework developed by the Organisation for Economic Co-operation and Development (OECD) for national, regional and international level analyses.

- The first version of this framework is called the **Pressure-State-Response (PSR)** framework,
- the first variation replaces the pressure indicator category with a category of **driving force indicators** (creating a **DSR** framework),
- the second variation adds a category of **impact indicators**, transforming it into a **Pressure-State-Impact-Response (PSIR)** framework,
- the last version includes all five indicator categories creating a **DPSIR** framework.

3- A framework based on **environmental**
(or **sustainable development**) themes, e.g.

- Pelagic/benthic
- communities and species
- flows of carbon/nitrogen
- loss in diversity
- economic damage
- intensive vs extensive aquaculture
- open or closed environments
- hydrodynamics

Some selection criteria

- **Direct relevance to objectives.**

The indicator selection must be closely linked to the environmental problems being addressed.

- **Direct relevance to the target group.**

Different target groups could have different needs and uses for the information provided by the indicators. To carefully consider who the target group consists of, is therefore central.

- **Clarity in design.**

It is important that the selected indicators are defined clearly in order to avoid confusion in their development or interpretation.

- **Realistic collection or development costs.**

Indicators must be practical and realistic, and their cost of collection and development therefore need to be considered. This may lead to trade-offs between the information content of various indicators and the cost of collecting them.

- **High quality and reliability.**

Indicators, and the information they provide, are only as good as the data from which they are derived.

- **Appropriate spatial and temporal scale.**

Careful thought should be given to the appropriate spatial and temporal scale of indicators.

Another approach is to develop one set of **alarm indicators**, and one set of **diagnostic indicators**.

In this approach, the issues are relevant and present throughout the area and process, and the first priority of the monitoring activity is to give early enough warning about adverse environmental effects in order for decisionmakers to react.

There is therefore a difference in the purpose of the alarm and diagnostic indicators. This should be considered when preparing an EIA.

Indicators as communication tools

- Their significance can easily be understood by stakeholders.
 - levels of dissolved oxygen, rather of sulfide concentration
- Their range should be transformed into a linear quotation, whenever possible : 0-10 or 0-100, or % saturation O₂.
- Graphical presentation should be preferred : bar charts, different diagrams, maps through the use of GIS...

An annotated sheet for each indicator

- Name
- List of data required for computation
- Computation. Formulae, or model output
- Scientific meaning, references
- Range
- Type of aquaculture concerned
- Type of environment
- Quotation for the selection criteria
- Data and models availables for use by WP 4
- Suggestion for use by WP 5