The DAPSI(W)R(M) Framework within the Simple SES approach

An overview resource in support of the Simple SES guidance.

Quantitative Indicators

Indicators should be quantitative because we will perform a loop analysis to understand reinforcing and balancing loops, so we need to base the analysis on data-driven indicators.

Activities

Definition: Anthropogenic activities to satisfy human needs, potentially positive or negative, by society in an area – what we do in the natural and built environment to provide the Drivers. We account for actions throughout all stages including creating, operating, using, removing infrastructure; creating an energy supply; obtaining food and water; being cognitive; using material by our presence (air), etc.

Examples

- Commercial fishing in a specific marine area
- Construction of new beachfront hotels and resorts to accommodate rising tourist numbers.
- Expansion of deep-sea fishing operations to meet seafood demand.

Indicators

- Number of new hotel constructions in marine tourism areas.
- Number of deep-sea fishing licenses issued annually.
- Capacity in a (given period) in a (given geographical area) of (given activity) using (given technique)

Pressures

Definition: Pressures are mechanisms of change and can result in changes to the natural and societal systems by modifying the structure and functioning of the systems (endogenic and generated and managed in an area, or exogenic emanating from outside).

Examples

- Input of litter
- Disturbance of species due to human presence.

Indicators

- Median total number of littered items per 100m^2
- Spatial distribution of disturbance events (e.g., distance from critical habitats)

Drivers

Definition: These are basic human needs which require activities that include the qualities and their quantities that humans need from the natural and built environment for health and well-being, e.g. space, food, water, clean air, shelter, energy, comfort, employment, enjoyment and relaxation, education, good mental and physical health.

Examples

- Demand for fish as a primary protein source due to population growth and dietary preferences.
- The need for safe places and protection from erosion and flooding.

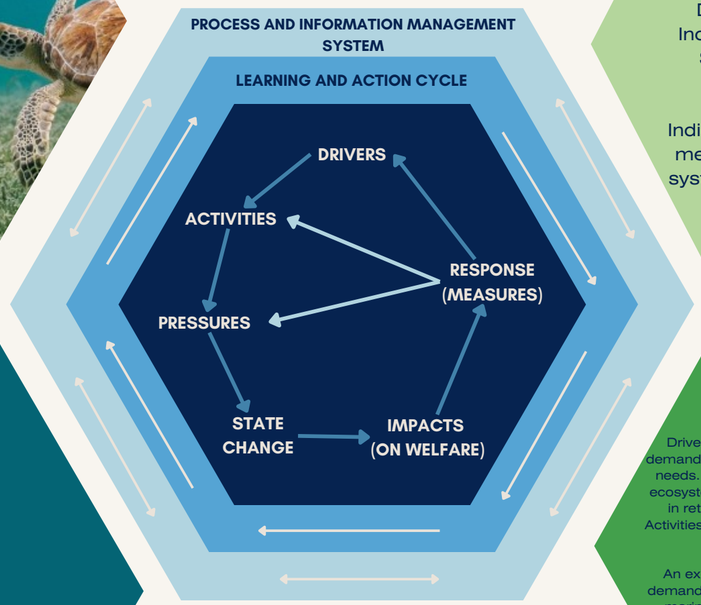
Indicators

- Proportion and/or number of households located below 2m above sea level, which reflect the vulnerability to rising sea levels due to climate change, which is itself driven by human activities.
- Number of international flight bookings to marine tourism destinations.
- Seafood consumption rates per capita.

Specific indicators

It's essential to differentiate indicators for the various components of the DAPSI(W)R(M) framework. SMART Indicators refer to indicators which are Specific, Measurable, Achievable, Relevant, and Timebound.

Indicators within this approach are proxy measurements of our social-ecological system, so they must be site specifically relevant.



Response (Measures)

Responses (using management Measures) – including all aspects (ecology/environment, technological, economic, societal behaviour, governance (politics/policies, administration, legislation), culture, ethics/morals and communication, using stakeholders) (i.e. the 10-tenets) as ways of influencing the Drivers and controlling the Activities and Pressures as the causes of change in order to prevent State changes and Impacts on Welfare; to respond to both the exogenic and endogenic causes and consequences)

State Change

Definition: State changes include the underlying Marine Processes and Functions (MPF) and their Ecosystem Services (ES). State changes relate to the natural system (as the ecology and its supporting physio-chemical aspects). These are the resulting spatial and temporal changes in the structure (situation at one time) and functioning (rate processes), the changes in the natural aspects of the supporting and regulating ecosystem services.

MPF

- Changes over time in community composition (e.g. abundance)

Indicator

- Hydrological processes
- Current speed and direction

ES

- Coastal and marine biota
- Places and seascapes

Indicator

- Quality of the fish, shellfish (age profile; length profile)
- Number/area of specific seascape features (% of total natural seascape)

The DAPSI(W)R(M) Framework

The DAPSI(W)R(M) framework provides a structured approach for ecosystem-based management by categorising key elements of Drivers, Activities, Pressures, State changes, Impacts (on Welfare), and Response (using management Measures).

This framework uses key indicators at each stage to inform management decisions, evaluate responses, and facilitate stakeholder communication, enabling conceptual and quantitative analyses.

The difference between drivers and goods and benefits

Drivers are the causes; they represent the human-induced demands put on the environment due to societal behaviours and needs. In contrast Goods and Benefits are the products of the ecosystem services; they depict what the environment provides in return, either resulting from those Drivers which warrant Activities or as inherent products of Ecosystem Services after the input of human capital.

An example is that an increasing coastal population (Driver) demands more seafood. In return, through human Activities, the marine ecosystems provide fish as a resource; the food for human consumption (Goods and Benefits). However, overfishing (Activities) might deplete fish stocks, reducing the ecosystem's capacity to provide this benefit in the long term.

Impacts (on human Welfare)

Definition: The changes affecting the goods and benefits, which affect the quality of life required to satisfy our needs. These are changes in the results of the provisioning and regulating ecosystem services; positive and negative influences on the human complementary assets/capital to extract societal goods and benefits from ecosystem services.

Examples:

- Tourism opportunities and storm surge protection.
- Food for human consumption
- Employment

Indicators:

- The number of tourists visiting a marine protected area
- Fish landed for human consumption (landings data at particular times and places in tonnes)
- Imports of goods and services (% of GDP)

For further information, see: Elliott, M., Burdon, D., Atkins, J. P., Borja, A., Cormier, R., de Jonge, V. N. & Turner, R. K. (2017) "And DPSIR begat DAPSI(W)R(M)!" - A unifying framework for marine environmental management. Mar Pollut Bull, 118(1-2), 27-, https://doi.org/10.1016/j.marpolbul.2017.03.049

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