IWRM Action Hub

IWRM TOOL - C1.05

Ecosystem Assessment

Summary

Ecosystem assessments are used to appraise the state of ecosystems, the services they provide, threats they are facing, and their trends. Thus, ecosystem assessments provide a strong starting point for identifying levers of change and designing appropriate management responses towards strengthening the vitality of water-related ecosystems. This tool provides principles, guiding frameworks, and methods that can be used for ecosystem assessments so as to maintain and regain ecosystems health for sustainable development.

The Importance of Water-Related Ecosystems

Water-related ecosystems possess enormous biological, social, educational and economic value (Tool C5.04). They provide a range of benefits and services such as drinking water and recreation, water for agriculture and energy, habitats for aquatic life forms, and natural solutions for water purification and climate resilience, among many other uses. Achieving lasting social and economic development thus requires the sustained provision of these services, which are derived from functional and healthy ecosystems. Recognising the importance of freshwater ecosystems for Agenda 2030, SDG target 6.6 aims specifically “to protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes”. Unfortunately, water-related ecosystems are increasingly degraded by human activities, including from pollution, water over abstraction, land encroachment – not to mention that these pressures are further exacerbated by climate change.

Ecosystem assessment is an important tool to understand the status of ecosystems and the

services they provide, the threats they are facing, and levers for positive action. It gives decision makers and stakeholders the information they need to make informed choices on the use and management of ecosystems to maximize benefits and minimise negatives impacts. Key questions to consider in such an assessment include:

1. What is the state of the ecosystem right now?
2. Which kinds of services are provided?
3. What are the stressors and threats to the ecosystem? What trends do we identify?
4. Who lives in the ecosystem and which services provided by the ecosystem do they use?
5. Which may be levers of change?

Assessing the Status of Freshwater Ecosystems

There are different ways to assess the status of water-related ecosystems, including extent, quantity of water, quality, habitat and biology, and different countries and actors may apply different methodologies. A useful reference approach is the one provided under SDG framework, under which progress on target 6.6 is tracked via indicator 6.6.1, change in the extent of water-related ecosystems over time. The indicator aims to monitor four main categories of ecosystems: vegetated wetlands, open water bodies, rivers and estuaries, and groundwater. Four sub-indicators (spatial extent, water quantity, water quality, and ecosystem health) describe different aspects of these ecosystems. Practitioners can access the data on indicator 6.6.1, derived from remote sensing, on the freshwater ecosystem explorer platform.

Assessing Ecosystems Services

Ecosystem services are “the benefits that people can derive for ecosystems” (Alcamo, 2003). Defining and understanding the different types of services provided by freshwater ecosystems helps understand their contribution to sustainable development and mobilise stakeholders for their protection and restoration. Ecosystem services are often grouped into the following categories:

1. **Supporting services**: including biomass production, soil formation, water cycling, etc., which are essential for producing all other ecosystem services;
2. **Provisioning**: including for example the production of food, raw material and water;
3. **Regulating**: refering to the regulation of hydrological flows, of natural hazards, of pollution and of climate;
4. **Cultural**: encompassing spiritual and recreational benefits.

As a first approach, key ecosystems services provided might be identified through existing literature, consultations with experts, and engagement with stakeholders. To go further, an array of ecosystem services assessment tools have been developed in recent years. IUCN 2018 guidance on Tools for measuring, modelling, and valuing ecosystem services provides information on nine ecosystem services assessment tools that are commonly applied, and provides a decision tree to help the practitioner choose an appropriate tool, including based on the purpose of the assessment, outputs required (qualitative or quantitative, monetary or not..) and practical considerations such as time, budget and data availability. Some of

the tools provide step-by-step guidance for qualitative assessment of ecosystems services, whilst others are computer-based modelling tools.

Building on the identification of services provided by freshwater ecosystems, their valuation can further greatly contribute to their protection and restoration. Tool C5.04 provides perspectives on Valuing Water, and Tool C4.06 explains how payments for ecosystem services can build on the valuation of ecosystems.

Assessing Interactions between Freshwater Ecosystems and Human Societies

The interaction between freshwater ecosystems and human societies drives changes in freshwater ecosystems. A reference framework for understanding these interactions and designing appropriate responses is the Driver-Pressure-State-Impact-Response Framework (DPSIR) (Fig. 1). It is a causal framework for describing the interactions between society and the environment and is used to assess and manage environmental problems.

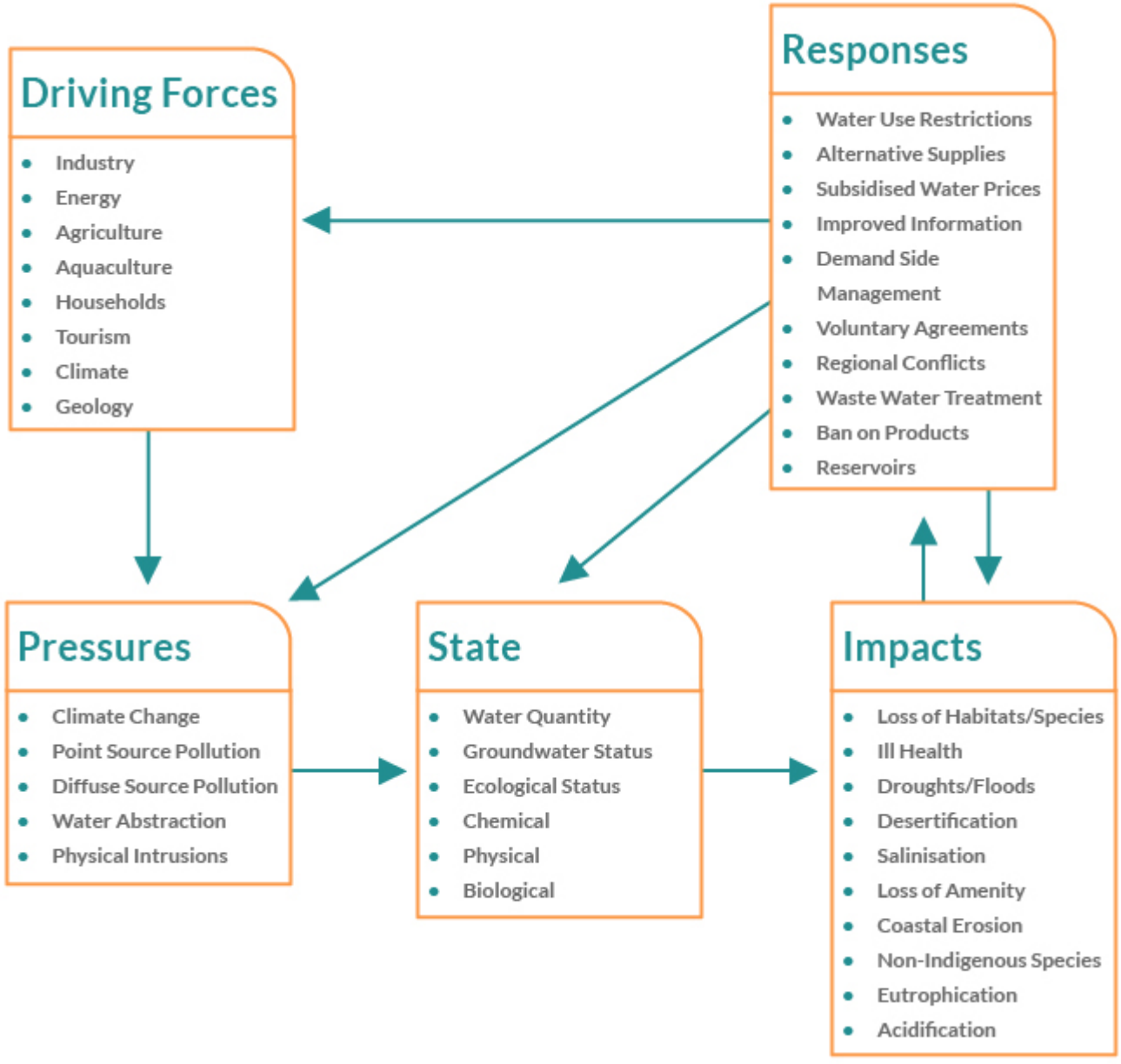

Figure 1. Driver-Pressure-State-Impact-Response Framework (Adapted from Kristensen,

2004)

Kristensen seminal 2004 paper goes over the DPSIR framework and looks at each key component in detail and how they relate to one another, putting a particular emphasis on the use of DPSIR framework in relation to water issues. To go further, abundant literature has since been published on the topic, including examples of applications, value-added, and limitations. More refined conceptual frameworks have also emerged that may be considered by actors in their interventions, such as for example the conceptual framework underpinning the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. The DPSIR framework remains however a very useful and accessible framework for structuring the thinking and the approach and helps identify drivers and levers of change as well as possible action pathways.

Thematic Tagging
Ecosystems/Nature-based solutions
