The DPSIR framework

The DPSIR (Driving force – Pressure – State – Impact - Response) framework, developed by the European Environmental Agency in 1999, is aimed at analysing the cause-effect relationships between interacting components of complex social, economic and environmental systems, and in managing the information flow between its parts.

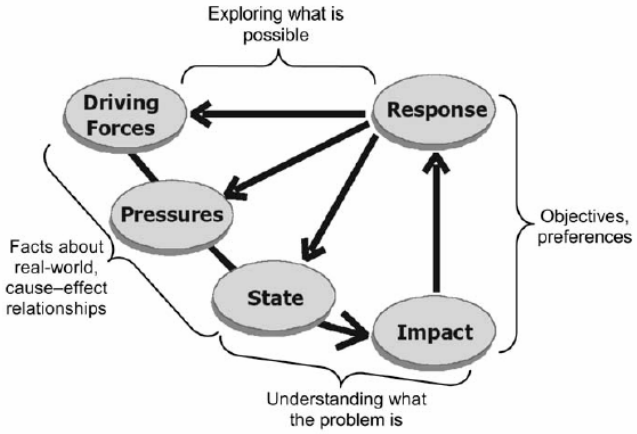

Figure 1. Components of the DPSIR framework.

As shown in Figure 1, the DPSIR framework is composed of five nodes, and combines environmental processes and states with human actions in a general framework. *Driving forces* (D) represent major social, demographic and economic developments in societies, and the corresponding changes in lifestyles, overall levels of consumption and production patterns. Demographic development may be regarded as a primary driving force whose effects are translated through related land use changes, urban expansion, industry and agriculture developments. The *Pressures* (P) are the effects of driving forces. They represent processes affecting the resources (land, water) by producing for instance substances (emissions), physical and biological agents which consequently cause changes to the *State* of water resources (S). Examples of pressure indicators are the emission of nutrients and pesticides by agriculture, effluent disposal in water by sewage treatment, and flow regulation due to hydroelectric dams. The state may be described by adequate structural (river morphology), physical (e.g. temperature), chemical (e.g. P and N concentration), and biological (e.g. abundance of phytoplankton or fish) indicators. Depending on the changes of state, positive or negative consequences for society may occur. These consequences are identified and evaluated to describe *Impacts* (I) by means of evaluation indices.

In a generic decisional context (Figure 2), the perception of the existence of relevant impacts in the catchment area induces decision makers to develop *Responses* (R) which prevent, compensate, or mitigate the negative outcomes of state changes. Responses may be targeted to address the driving forces, the pressures or the state itself: either the driving forces may be re-organised (prevention, changing behaviour, etc.), pressure mechanisms may be altered (e.g. the introduction of new production systems), or the state of the environment may be restored or adapted to reduce its sensitivity to pressures.

It turns out that the DPSIR framework may be effectively used to represent the conceptual procedures for understanding, modelling and managing the decisional issues associated with water resource management.

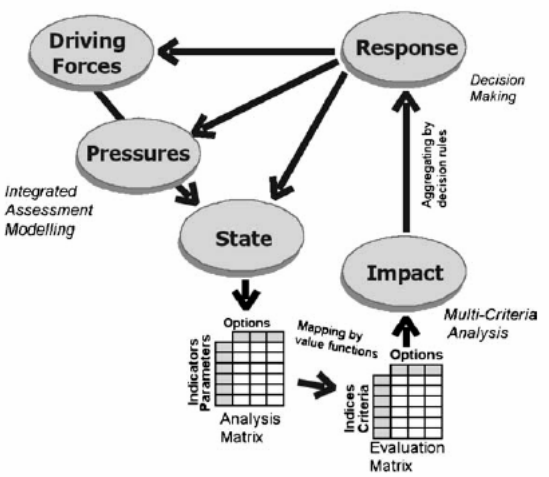

Figure 2. Implementation of the DPSIR framework in a decisional framework.