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Deliverable 2.16

Human-ecosystem interactions.

Modelling DPSIR for All sites



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1. Introduction

The detailed description of the DPSIR model and all its “moments” has been already described on deliverable D2.15. Here we have identified, base on the result of Project meetings and exchanges between ECOManage partners, all moments for each of the three sites: Bahía do Santos, Bahía Blanca and Fiordo Aysen. For each site we graphically describe: a) Drivers of environmental change; b) Pressures on the environment, c) State of the environment; d) Impacts on environment and society; and e) Societal responses.

The development of conceptual and numerical models, policies, programs and initiatives relating ecological and social problems started at the end of the XIX century. Now they have become a worldwide concern. This concern is generated on the current deterioration of World ecosystems and its effect on the sustainability of societies (Millennium Ecosystem Assessment; 2005). One of the main focus areas is coastal zones. The ECOManage program was indeed conceived as an initiative to generate models oriented to improve the integrated management of those zones (<http://ecomanage.info>).

Coastal zones worldwide represent correspond to ecosystems with very high level of ecological risk. Indeed, those areas and the hydrographic basins that drain into them sustain more than 50% of the world human population. Integrated Coastal Zone Management (ICZM) is an option for the sustainability of those ecosystems, and it has been defined as: “a dynamic process where coordinated strategies are developed and implemented to localize the multiple uses (environmental, socio-cultural and economic) of the coastal zone” (CAMPNET, 1989). The inclusion of ICZM as one of the main recommendations of Agenda 21, during Rio 1992 (United Nations Conference on Environment and Development, Rio de Janeiro, 1992) Janeiro, 1992), increased the international awareness and political prominence of this concept.

Many conceptual models have been designed with the goal of integrated management. One of them, widely used by the European Unions is the DPSIR model (Turner, et al., 2000). The ECOManage project has contributed to this line of research generating new approaches for these type of problems: considering PHES-systems as the key study elements and not only “natural” ecosystems. From this point of view, the two sub-systems (ecological and socio-economic) are in constant interaction; mutually modifying each other. In this context, it is possible to apply the DPSIR model to all ECOManage study sites: Aysén Fjord in Chile, Bahía Blanca estuary in Argentina and Santos estuary in Brazil (Fig. 1).



Figure 1. Geographic distribution of ECOManage study sites.



2. DPSIR methodology

THE DPSIR model used as the basis for the analysis of ecosystem-society interactions, allowed us to identify the main drivers of change for each site. At a local scale, the main socio-economic driver for the Argentinean site seems to be population growth and agriculture activities. For the Brazilian case, one of the most impacting drivers is population growth, which generates high pollution levels on the environment. The Chilean site is contrasting; population growth is not a driver but salmon farming is and cattle pasturing and growth to a lesser extent. However, the DPSIR model relates mostly to those local drivers and yet, coastal zones are also affected by drivers generated at different scales (local, national, global). In this regard, we have slightly modified the model, using PHES-system considerations, to reflect the multiscale condition of some of its moments (Fig. 2). Drivers are multiscale; pressures and impacts although can indeed be national, most of the time they will be local. State is always local. Finally, responses are once again multi-scale and indeed for many Latin-American coastal zones they are global given the sources of funds that generate the drivers (e.g. multi-national industries).

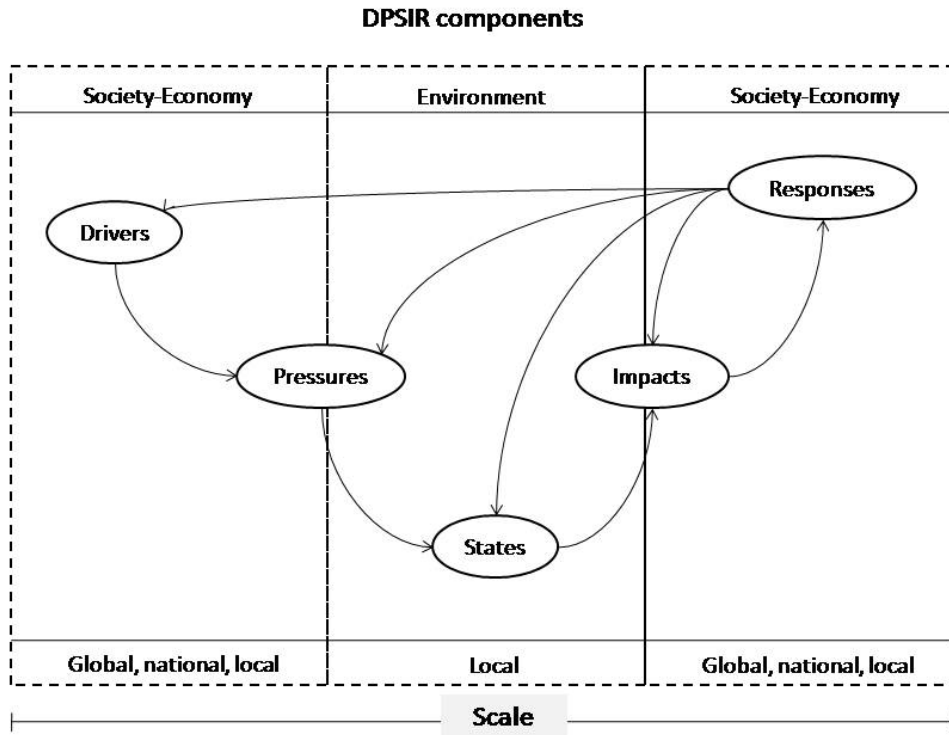


Figure 2: Adaptation of the DPSIR model to the multiscale condition of PHES-systems.



3. Results -DPSIR- ALL SITES

3.1 DPSIR model for Bahía Blanca PHES-system, Argentina.

The main identified socio-economic drivers for the Bahia Blanca PHES-system are: agricultural activity and population growth. The actual configuration of Bahia Blanca seems to be the result of the action of municipal governments that planned its development in different periods, considering it as the center of a vast territory southwest of Buenos Aires¹. Nowadays, the city comprises nearly 300000 people, with a large potential for growth. This population growth generates a pressure over land use, impacting the water quality of the estuary, and also affecting the coastal zone which is also influenced by a large port activity.

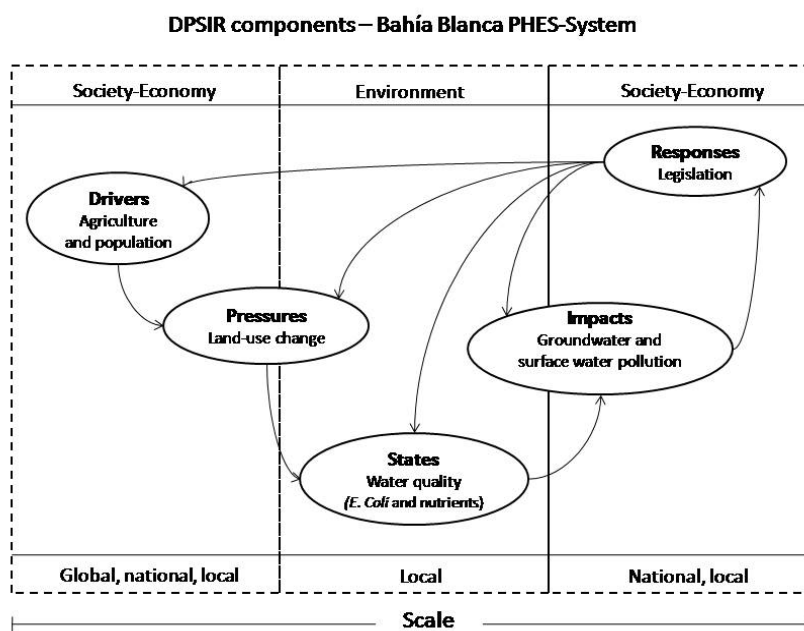


Figure 3. DPSIR model for the Bahía Blanca PHES-system, Argentina.

¹ <http://www.monografias.com/trabajos/pebb/pebb.shtml>



3.2 DPSIR model for the Santos estuary PHES-system, Brazil.

The main socio-economic drivers for the Santos estuary is the population located in this area (fabelas). At the beginning of the XX century, the port of Santos was the largest in Latin-America. Currently, there are nearly 1,000,000 people living in this area; generating high levels of pollutants through sewage water. As a response to this problem, the local government created the Santos Beaches Recovery Program in 1991². Its main goal was building sewage treatment plants. As a result, the tourism was re-activated in 1993. However, water quality is still an eco-social problem in this coastal zone.

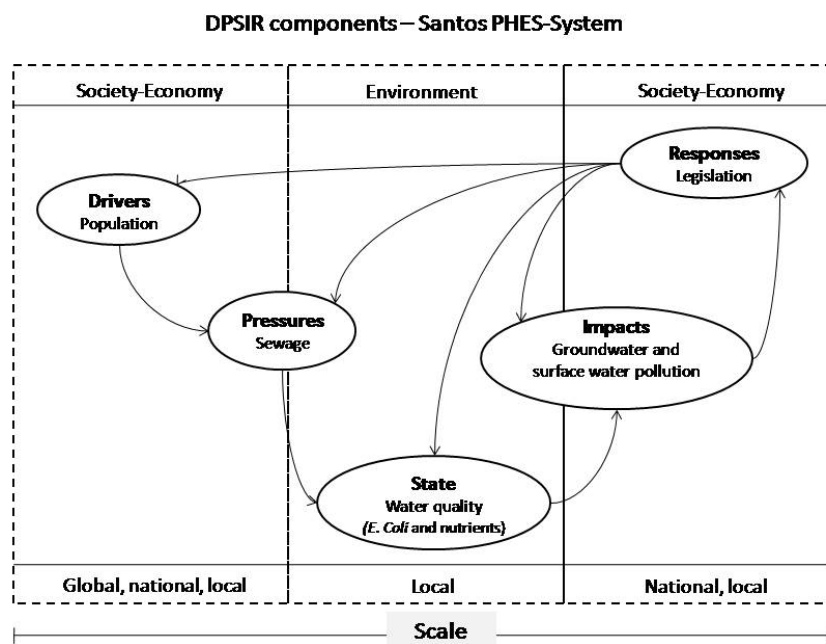


Figure 4. DPSIR model for the Santos, estuary PHES-system, Brazil.

² <http://idrinfo.idrc.ca/archive/ReportsINTRA/pdfs/1996e/112111.htm>



3.3 DPSIR model for the Aysén fjord PHES-system, Chile.

The main socio-economic driver at Aysén corresponds to the salmon farming industry. The indirect, higher level, driver is clearly the global market for salmons which explains the origins (e.g. Japan, Spain) of the capitals invested in Aysén. As an example, during the year 2004, five salmon companies from Aysén were within the top ten industries nationwide and two of them worldwide. Indeed, the salmon industry has been called the main “economic engine” of Aysén³. However, increments in salmon production have generated social as well as ecological impacts (water quality, marine sediments). As a response, Chilean environmental authorities, with contributions from the ECOManage project, have elaborated water quality norms for the Chacabuco bay and have legally sanctioned many industries. From the other side, salmon farmers have signed clean production agreements, as a response of the national and international request of improving the environmental quality of the production process.

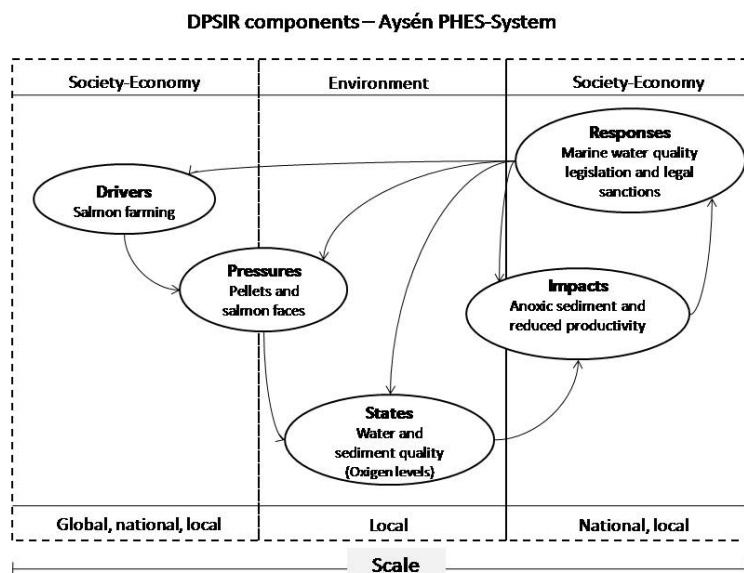


Figura 4: DPSIR model for the Aysén fjord PHES-system, Chile.

³ (Vial, El Mercurio Newspaper 10/11/2006).



4. Conclusions

The integrated management of coastal zones is an option when considering their sustainability. However, since it is a dynamic process it can be better served by having a conceptual model that may be used guidance. The DPSIR model, as modified through the incorporation of PHES-system attributes, may indeed be a powerful conceptual tool for the sustainable management of coastal zones. Using this model we could identify the socio-economic pressures affecting all three ECOManage sites and their effects on natural ecosystems.

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