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I am a marine biologist studying light production (bioluminescence) in invertebrates, which brought me in many different parts of the world. During my experience overseas I met people from different cultures, and scientists from different expertise. Despite our differences, our interaction always drifted to a common topic of interest: the environment. As responsible citizens of the World, how can we take better care of it, how can the public be educated about sensitive environmental issues, how can we manage our resources to allow sustainable development, how can we limit anthropogenic impacts? These numerous questions basically address the point of the necessity to increase harmony between growing civilizations and the environment.

About 6 years ago I decided to use my expertise in biology and bioluminescence to address these questions, and started the ecotoxicology side of my research. It is obvious that the environment is a complex entity, and as a biologist that studies organisms in interaction with their surroundings, addressing environmental issues would require a complex interaction among multiple expertise. I have been puzzled however by the lack of multidisciplinary studies being developed in the field on environmental risk assessment. There are multiple reasons behind it: multidisciplinary and integrative research is a "new" science, with greater cost but mostly with much greater challenges because involving interaction of human beings that usually do not interact at the professional level. Indeed, developing integrative research is associated with heavier logistics as involving people (scientists, engineers, city planners, and decision makers) that have different priorities, speak different languages, different limitations and work at different time and geographical scales. Finding a common ground of interaction and centralizing the research focus are therefore key for success of such a mutidisciplinary program.

The SIOSED project is this kind of program. The project, led by Scripps Institution of Oceanography takes place in the Venice lagoon, Italy. It involves 9 scientific expertise, from microbiology, geochemistry, ecotoxicology to physical oceanography. The goal of the project is to provide the most integrative scientific assessment related to the environmental impact of re-using dredged sediment in the lagoon. The project is designed to encourage interaction among all the scientific expertise, but also to allow an open dialog between scientists, engineers, the public and, most importantly in Italy perhaps, the politics. The SIOSED project could serve as a template for multidisciplinary research programs addressing environmental issues in a framework that is multifaceted by apparently diverging interests from different groups of people.

Comments to the Netherlands essays

The focus in low coastal areas is the protection against flooding usually through the development of structures that reduce the inflow of water from offshore. These structures, if presenting a mechanical solution to an ephemeral event, also impact, through their construction and presence in the field, the local environment. As a result, such structures could be considered protective against flooding, while possibly deleterious for the local ecosystem on a more permanent basis. The coastal ecosystem under such protective structures could then be changed in a way that might have greater impact –in the long run- on the sustainability of costal resources and local economy.

Coastal areas have a critical position being at the interface between land and sea. They are constantly exposed to changes and therefore are ruled by very dynamic processes. This dynamism impacts the conventional approach of environmental quality assessment. Indeed, in costal areas more than in oceanic areas, importance needs to be given to processes rather than to strict empirical measurements. Thus, the key in coastal areas is the understanding of how processes interact with each other and govern the balance between different compartments of the ecosystem, different niches of the biosphere, different levels of the food web, and different physico-chemical parameters of the environment.

Comprehensive environmental quality assessment usually involves multiple disciplines that address the various levels of bio-physico-chemical complexity. This is particularly true for coastal areas where multiple bio-physico-chemical factors are in constant interaction. As a result, the mechanistic understanding of the analytical approach is more complex than if only one discipline is involved, yet the ecological significance of the assessment is more realistic. The analytical time is also much increased when using multi-disciplinary approach, which could become a limiting factor towards integrating multiple disciplines in a study (Fig 1).

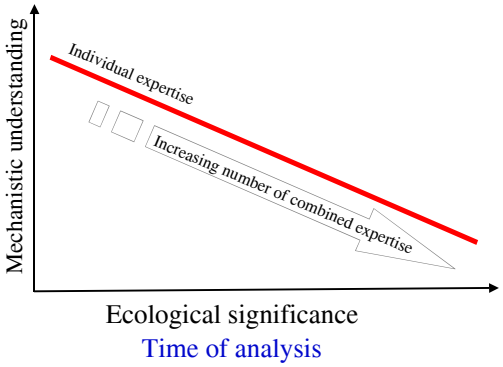

Figure 1: Theoretical relationship between understanding of analysis and ecological significance, time of analysis, and number of disciplines involved in the analysis. For ecosystems assessment, a low understanding is usually associated with a high ecological significance, a long time of analysis and a high integration of disciplines.

The challenge now is to make people face the reality: giving more time and funding to a multidisciplinary team assessing environmental problems will probably not lead to better and faster solutions to the problems, but to a more realistic –even though relatively poor- understanding of the challenges to address.