Scientists and stakeholders: can two separate worlds be joined for sustainable water management?

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ABSTRACT

According to the International Council for Science, science should be developed for the benefit of all. In face of complex environmental problems and of a need for the sustainable management of water, answers are increasingly requested from science. A science that can face such challenge must be constructed in cooperation with policy makers and society (hence enlarging the traditional scientific sphere), and its product must be effectively linked to policy. However, these new forms of science production always raise a number of obstacles: differences in interests, incentives and languages among these actors. These obstacles are further increased when the scientific issues are of low social relevance, which is the case with climate change.

This paper focuses a set of scientific projects financed by Circle–Med programme which dealt with management of hydrological resources in the Mediterranean region in a context of climate change. In this call, a strong appeal was made for research to be pursued in collaboration with local stakeholders and for the interdisciplinary of teams, as to include social science researchers. After the analysis of research projects' documents and interviews to coordinators, we conclude that the liaison to stakeholders has a very secondary role (and is often not even considered) in the scientific outputs. The current organization of science and public administration, as well as its under financing and focus on short term goals, was unanimously considered to be strong deterrents of the collaboration of science and society.

KEY WORDS: *scientists, stakeholders, collaboration, interdisciplinary, water*.

INTRODUCTION

According to the International Council for Science, science should be developed for the benefit of all. For that to happen scientific knowledge must be effectively linked to the political process and have practical consequences for society (Saner, 2007). In the case of the sustainable management of environmental resources, given the complexity (e.g. the multiples values and objectives involved) and uncertainties involved, just an integrated scientific approach, one that focuses on the dynamic interrelations of system components (Blackstock e Carter, 2007) and incorporates the knowledge of a multiplicity of actors is needed: scientists, administrators, decision makers and citizens.

Several studies have shown that environmental problems require new types of knowledge production (Cortner & Moote, 1998; Ravetz, 2006). A major difference with regard to traditional science is that solutions for sustainability problems have to be sought, often at a time where it has not yet been possible to study these problems in a sufficiently comprehensive way. Thus science should be problem oriented, inter and transdisciplinary with a focus on complex system dynamics including social, political, economic, biological and physical dimensions. This new science production incorporates disciplinary and interdisciplinary scientific knowledge with actor knowledge, in order to cope with real world problems. Such science must involve collaboration among science and society and emphasize: 1) joint problem definition, 2) mutual learning, and 3) knowledge integration producing socially robust knowledge (Clark & Dickson 2003)

Despite such realization, stakeholder engagement during the process of knowledge production is not yet common practice (Phillipson *et al*., 2012). Integrating scientific findings into decision making, as well as doing science in close collaboration with stakeholders is one of the greatest challenges to environmental management and raises many doubts on how to go about it to researchers and stakeholders (Pahl-Wostl, 2002; Roux *et al*. 2006; Liu *et al*, 2007). The consequence of those difficulties is that there have been greater expectations toward science's role in society and a disappointment towards the role science. In fact, there is a growing perception that science is not responding adequately to the global challenges of the 21st century (Cortner, 2000). Accumulation of knowledge, human resources, financial investment, technological sophistication are greater than ever but we seem unable to solve serious environmental problems without compromising social justice (Milani, 2005).

The gap of collaboration between science and practice in part due to the view, strongly rooted in the natural sciences method, that only a science in which the scientific rationality (objective, value free) is the preferred logic and that uses technical solutions as first order solutions (Cortner, 2000) may be able to contribute to the advancement of knowledge. From this perspective stakeholder engagement in knowledge production is "typically viewed, at its best a distraction, and at worst, as undermining scientific integrity" (Phillipson *et al*., 2012, p.57). In practice, scientists establish a logically distinction for knowledge transfer and knowledge production. This vision which still prevails is quite visible in the use of terminology such as "(end) users", which serve to segregate those which apply the scientific results from those who have produced them (Shove & Rip, 2000).

In the environmental fields, there are system uncertainties and decision stakes for which the rational approach of science, certain and value free cannot respond. When issues are not totally tackled by the scientific facts, inferences will be conditioned by the values of the agent (Ravetz, 1999). Science does not and cannot deliver truth that is non arguable. Subjective value interpretations are made by scientists all the time in activities such as defining problems, framing hypotheses, choosing methodological design, making methodological assumptions, selecting criteria for analysis, building and running computer models, and interpreting results (Cortner, 2000).

The effort to enhance the relevance of research to society and the call for a more integrated scientific process are by no means new. In the 90's, it came about with the designation of mode 2 science (Gibbons *et al*., 1994), but other forms of scientific research offer support for different knowledge claims such as collaborative or participatory research (e.g. Pretty *et al*., 1995; Chambers, 2008), transdisciplinary research (Hirsch-Hadorn, 2008), or sustainability science (e.g. Kates *et al*., 2001), post-normal science (Ravetz, 2006) or the "research in the wild" concept (Callon *et al*., 2009). However it was just over the past decade, that greater pressure was imposed on research by funding agencies to justify public investment, as if it is no longer acceptable a science that does not explicitly contribute to economic and social betterment. Aware of this new constraints, research funders themselves are testing equipments (infrastructures as networks, management as financial support or new interfaces for boosting dialogue) to address matter of science's relevance and impact on society.

Even, for the greatest majority of scientists the idea on an integrated science is agreed upon implicitly. Yet, there is a large ignorance of the determinants research outputs into policy and decision support tools. Empirical and conceptual analysis of the challenges faced by collaborative production of knowledge with stakeholder also remains open issues (Podestá *et al*. 2013). Certainly the challenges associated with implementing ecosystem management are not trivial. These challenges entail revising laws and regulations, strengthening the administrative and institutional capacity of governmental entities at all levels, rethinking property rights and responsibilities, better linking the political and economic market place, and building social capital for more effective collaborative stewardships and citizenship (Cortner & Moote, 1999). These challenges also involve changes in the institutional and culture of science. For Cortner (2000), integrated scientific production involves overcoming resistance about disciplinary logics and incumbencies that are anchored in the scientific practice. Cummings and Riesler (2005) suggest that collaborative research across disciplines requires changes also in the funding programmes. Besides, Podesta *et al*. (2013) refer that to understand each others' position, skills like empathy, positive relationships and humility are preconditions for the effective translation of multiple knowledges into a coherent whole.

Stakeholder engagement in research has been widely pursued, but it has yet to be subject to systematic evaluation. Therefore, there is the need for more systematic research on the self reflective process to identify and intervene on factors that foster or impede cooperative production of knowledge involving scientists, practitioners and stakeholders. Most of these accounts of sciences' relationship with practice have been relatively ad hoc and unplanned, or conceived as a marginal add on or an afterthought (e.g. Carney *et al*., 2009, Podestá *et al*. 2013). The few accounts that exist are quite positive and evidence is emerging that these can enhance knowledge exchange and increase the likelihood that sustainable management effort will be successful (Phillipson *et al* 2012; Podestá *et al*. 2013). Multiple benefits have been identified by researchers from the participation of stakeholders in integrative science (McNeely *et al* 2012; Philipson *et al*., 2012). Early and sustained stakeholders involvement in the research process demonstrates many tangible benefits – from project definition to validation of outcomes; the integration for stakeholders in research also allows to draw upon the insights and expertise of different actors (from farmers to agricultural policy makers) and had access to data (e.g financial performance of farmers) often unavailable to researcher (Phillipson *et al* 2012).

Study object

The object of this study was to get a stock of the scientific experiences of the projects financed by Circle-Med Network, specially focusing the relationship between scientists and stakeholders external to the scientific teams. Circle Med is a network dedicated to common interests in the Mediterranean Basin around climate change topic. This sub-network functions as an initiative of the larger European program Circle-Era-Net, dedicated to the coordination of scientific policies of European countries for climate change issues. The Circle Med Network launched the first call in 2007 stressing the need for integrated coastal zones and water management given the expected reduction in water availability. The call also referred that "multi-disciplinary approaches should play an important role" and that "a good balance between biotechnical sciences and social sciences" should be expected in the proposals. Moreover it is stated that **"**adaptation strategies call for early collaboration with decision makers in order to effectively disseminate recommendations from the call to policy practitioners. Research projects should aim at identifying and providing information to solve practical adaptation problems".

The current study focus 7 of the 8 projects selected by the CIRCLE MED call which had 31 research teams and which varied from 3 to 5 scientific partners. The main disciplinary areas are biology, marine ecology, chemistry, and hydrogeology. Our study was set out to determine the stumbling blocks and enabling conditions for the relationship between scientists and stakeholders as to achieve the call's objectives.

METHODS

The methodology pursued was that of study case. Data collection techniques were documental analysis and in depth interviews to project coordinators and stakeholders (see Table 1). The main documents analyzed were the research proposals submitted to the call, a number of presentations in Circle Med seminars and final meetings of the call. Guidelines of the interviews included questions on the existence of formal links with the stakeholders; of previous relations with these stakeholders; details on how the collaboration was pursued; how much was gained from this relationship; how the views of stakeholders were integrated into the research, etc. The data collected was then systematized into a grid (constructed inductively) and analyzed qualitatively.

Here, for simplicity we will differentiate stakeholders into 1) administration (local or regional) and 2) local actors which can include economic actors (fishermen, farmers, and businesses), local associations, and users of the resource for leisure for instance. Projects differed in the type of

Table 1

Total interviews to researchers	***Interviews recorded and transcribed***	***Phone interviews***	***E-mail interviews***
21	13	4	4

stakeholders they approached – some approached both types, others just one type, while others none of them.

We have also built categories for: a) the type of method used to make the linkage with them, such as participation in workshops, questionnaires or informal conversations and meetings; and b) the level of involvement with them – from disseminating or asking for information to c o-production of knowledge. Other typologies have, been used in other studies (Jonsson, 2005; Cohn, 2008; Phillipson *et al*. 2012), but these do not differ in substantively relevant manner.

RESULTS

The first aspect to be mentioned is that all researchers interviewed recognized the importance of making a linkage with stakeholders, in order to collect data (administration stakeholders), or to learn about the local reality (local stakeholders). They also considered important to pass stakeholders information about their research, and recognized that for the management of the resource both efforts should be joined. However, the data led us to conclude that the recommendation that research teams should create external links with stakeholders was not taken into serious consideration by researchers, e.g. no project had a formal partnership with stakeholders (excepting two projects in which such relations were internalized: one in which two teams' scientific partners were ONG's and another in which a scientific partner was a consultant firm). Most proposals did not consider the socio-economic component to be a priority of their project. In fact, social reality ended up having just a minor role in most projects; little time, little human resources and little financing were allocated to it. Just one project was designed towards strong relationships, in the sense of co-production of knowledge, with stakeholders and implemented it successfully through participatory workshops: this team allocated the time, the money and the skilled human resources to such task. Other projects had planned and made efforts to build that linkage but were not able to do it successfully, as they did not plan it timely and adequately, did not invest enough time and financing in it and missed skilled human resources. Still other projects had not planned to emphasize socio-economic component, but due to the presence of team members, or outside collaborations with researcher form the social sciences, ended up investing more time and resources than previewed initially. One of the projects due to internal team difficulties ended up not following through this plan effectively and another did pursue it but such experience was not embedded in this scientific results. Finally two projects did not explicitly engage with stakeholders as to build knowledge towards the project final results, but did interact with stakeholders informally profiting from gathering occasions that could arise from others projects or commitments.

In the tables below, it is summarized the level of involvement of stakeholders in the research work and the different methods used to engage them in the research projects. The level of involvement ranges from: researchers

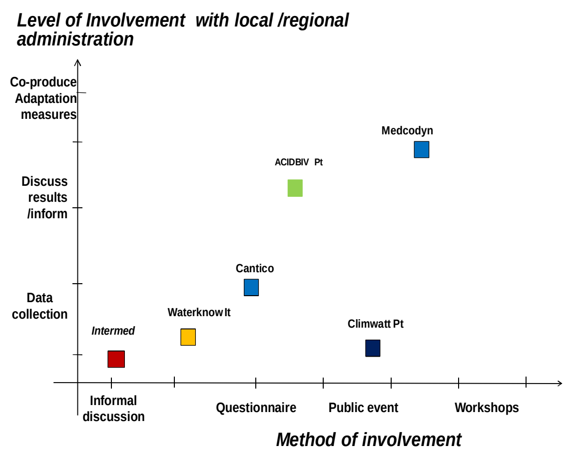

Figure 1- Existence of effort to make linkage with the local actors (associations/ONG's, individual userr, economic actors) in the framework of the research project

asking and gathering data from stakeholders, to stakeholders collaborating with researcher in the co-production of adaptation measures. It becomes clear that no research project has engaged into the highest level of collaboration- co-production of knowledge- which implies the participation of stakeholders in a reflection about the design of the project, choice of methods, goal of the projects, analysis of data and dissemination of the projects. Also just one of the projects was able to co-produce adaptation measures based on an enlarged discussion and search of solutions between administrators and users.

As it concerns the methods used they differ in the intensity of engagement required. They range from those which required little organizational effort and little demand

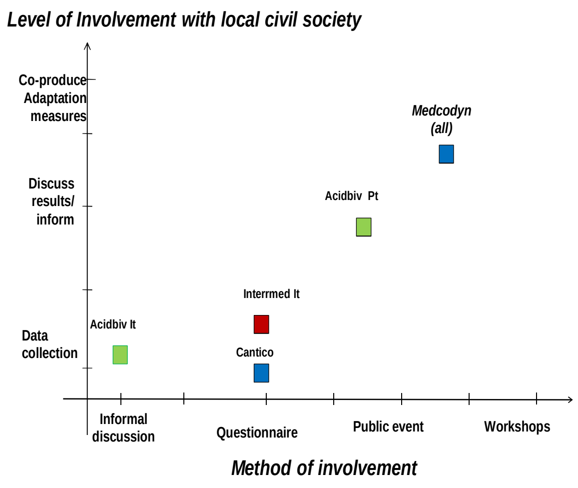

Figure 2- Existence of effort to make linkage with the local actors (associations/ONG's, individual users, economic actors) in the framework of the research project

from the stakeholder to great organization effort and great demand from stakeholders : 1) informal discussions, 2) application of a questionnaire, 3) organization of public events, 4) organization of participatory workshops. Again those making fewer demands were the most used.

DISCUSSION

Here we will discuss both the obstacles mentioned by the researchers and the facilitating drivers of the relationship among the scientists and other stakeholders. The researchers interviewed, unanimously cited that the main reason underlying their difficulties, and even their frustration, in the linkage with stakeholders, were the short duration of the project (24 months) and the low amount of financing. All coordinators recognized that, given these constraints, it was quite difficult to achieve both scientific goals and the linkage with stakeholder's goals. The time constraints (but also the financing) made that only projects with previous working relationships with stakeholders, and skills within the team to make such linkage, were able to be carry it out successfully. Also, teams which had no previous working relations were more prone to internal management problems, which also endangered the relational capacity with stakeholders.

Still another difficulty, and one which was cited by all researchers that tried or had past experience of engaging in field work, was the relevance of the topic of research itself, climate change (Faysse *et al*., 2012). Climate change is so distant form the concerns and needs of local actors that did not seem a topic in which knowledge could fruitfully be exchanged and built. Even some research teams, which had previous relationships with stakeholders, avoided to engage with stakeholders - mainly local civil society but in some cases, in general southern countries of regions, also regional administrations - under the umbrella of such topic. The testimony of a researcher when he tried to approach stakeholders can translate the attitude to the topic: *“Climate change? Hmmm….please just let me get back to my work!”*

A look at the interview results in greater depth reveals greater collaboration with stakeholders from administration than with local civil society. This relationship with the staff from the administration is almost mandatory as researchers need their data, information and expertise to carry out research. But it is also “easier”, as administration staff is usually qualified and the language used has a common ground to rely on. It is also “easier” because researchers and administrators usually belong to the same social network, and hence often find themselves in common places, such as committees, meetings conferences, and social occasions linked to water or coastal resources. This perception of relational “easiness” is embedded in the fact that mutual demands in these relations are not high, relational goals and expectations are in general not raised above the exchange of data and information. This relationship does not aim what Ravetz (2006) calls an extended peer community committed to answering why things are going wrong. Instead, this relationship is managed in a way such that there is no strong mutual impact; researchers do not aim impacting on policies (although as they say it would be desirable to do so and see the practical value of their research) and do not intend to construct knowledge with the administrations, as equal partners in research project. Given the low expectations towards this relationship by framing it within the set of rules of the “scientific” “value-free” process, researchers are protected from entering “muddier” territories such as those of real world problems.

Differently, the relationships with the civil society facegreater barriers from the outset. The cultural and cognitive gap is greater. Often there is lower level of education, a totally different language and sources of knowledge. To mobilize local actors is more difficult because they are more numerous; more geographically disperse and often not well organized. The types of incentives for participation are diverse and they are not easily controlled or manipulated by scientists. However, in the end, the construction of knowledge with local stakeholders may not be more difficult than with local administration. It is just that barriers are perceived earlier in the relationship i.e. as soon as the less demanding methods of involvement were are activated (hence the disillusionment and frustration from the part of researchers).

In this context, organization of knowledge exchange and production in a plural discussion is a key driver for making collaboration a reality. Unfortunately, according to results, there is a prominence of use of methods of involvement of stakeholders that are less demanding of time, human energy, know-how, and financing support) on researchers and stakeholders. As the choice of methods of involvement is linked to the level of involvement, we see a prominence of researchers-stakeholders relationships based on simple exchange of information which is not enough to produce knowledge aiming at the sustainable management of the resource, as this demands an integrated scientific effort.

CONCLUSION

These results show that in order to reach a genuinely integrated science there is still a long way to go. A science that integrates multiple partners, researchers from the natural and social sciences and non-scientists, such as administration and local stakeholders, needs to diversify the means and the spaces of knowledge exchange. This is of course hindered by the current organization of science and administration. But the lack of cooperation and collaboration in between scientists and non-scientists has also to be framed in a context in which natural and social sciences are disentangled. Interdisciplinary is certainly part of this challenge of developing a science that is concerned with both natural and social dimensions in water and coastal resources and the sustainability of those elements.

We argue that to go beyond wishful thinking, collaborative reflection on these topics is a first step. But is must be followed by changes of current policies defining scientific performance and the incentives underlying it. Right now current policies of low budgets, and demands for short term results, for science and administration, are great deterrents. Greater flexibility (budgetary for instance) and responsiveness, together with a better distribution of power among all partners in the scientific process, are needed if the goal is adaptive management of environmental resources. Given openness, humility and political will (from the part of science), there is certainly enough know-how accumulated to proceed towards a transformation of both domains and to join two worlds incomprehensibly apart.

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