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## Envisioning innovative groundwater management policies through scenario workshops in France and Portugal

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### Introduction

In the Mediterranean basin, climate change is expected to result in reduced available water resources and increased water demand. This will lead to growing competition for the access to scarce water resources. And it will increase environmental pressures exerted on aquatic ecosystems and problems of water resources overexploitation. Groundwater resources could be significantly affected (drop in water tables, sea water intrusion) in particular because their exploitation is often weakly regulated. In this context, policy makers are increasingly enjoined to explore how current groundwater management rules can be adapted. Given the magnitude of predicted hydro-climatic changes, deep institutional, economic and legal changes will be required to take up the challenge of climate change. Policy makers and stakeholders will have to invent a new water management paradigm, calling into question some of the established assumptions, social values and even ideologies. In particular, the role of the State, market forces and collective action in water management will need to be re-examined. In this paper, we argue that the exploration of possible futures should not be conducted by policy makers and experts alone but that it should also involve grass root water users, farmers in particular. We present a participatory foresight methodology which was implemented in two case studies in southern France (Roussillon) and Portugal (Algarve). After describing the methodology, the paper focuses on three contrasted water management scenarios which were discussed with five groups of farmers. It then describes the results obtained, both in terms of ideas related to future water management scenarios and in terms of participatory process.

### Methodology

The methodology implemented is inspired from the abundant literature on scenario planning and participatory foresight (see for instance van der Helm 2003 and Hatzilacou, Kallis et al. 2007). It consisted in inviting groups of farmers to participate to three series of scenario workshops. To facilitate the envisioning process, farmers were first invited to debate on the future of agriculture (2030 time horizon), mainly considering socio-economic drivers which are sources of immediate concern (scenario workshop 1). A second workshop was then organised to debate on the consequences of climate change on agriculture, focusing on water related issues at farm level. A third workshop was then organised to debate on possible future water management scenarios. This paper only focuses on this third workshop. To facilitate the debates, three contrasted future water management scenarios were used as material to initiate the debate. Each scenario consists of a narrative describing groundwater management rules in 2040. Scenarios were constructed by researchers, incorporating bits of visions which had been expressed by farmers and

stakeholders during the first two series of workshops and previous interviews. The policy scenario space is defined along three axes depicting the relative intensity of government intervention in groundwater management, market forces and collective action. The three scenarios are clearly presented as a support for discussion which participants should deconstruct and adapt according to their perception. The visions used in Portugal and France were consistent although adapted to specific regional contexts. The visions were criticised and modified by participants during the seminars. They were also analyzed in terms of perceived probability that they become true and in terms of level of desirability. Workshops were tape recorded to allow detailed analysis of visions expressed by participants.

### **Future groundwater management scenarios**

The key features of the three scenarios are the following. Scenario A assumes groundwater abstraction can only be regulated by an increased intervention of the State. Each farmer is officially entitled with a groundwater quota in volume. All boreholes are registered and equipped with smart automatic reading meters, allowing real time monitoring of groundwater abstraction. To detect possible illegal abstraction, a State Agency also monitors irrigated areas using satellite images. It estimates corresponding crop water requirements and theoretical groundwater abstraction and cross check these estimates against metering data at farm level. Whereas some incentives are offered to farmers who abide by the rules, severe sanctions are applied to others.

In scenario B, a global volume that can be abstracted from the aquifer is estimated by the State and shared among farmers (individual quotas). To increase water use flexibility, the State allows that groundwater individual quotas be traded among farmers. Quotas can be exchanged for short or long periods of time. However, although market forces play a much greater role in water allocation, the State remains the owner of water rights which are leased to farmers without transfer of property.

Scenario C assumes that groundwater abstraction can be regulated by farmers' organisation, State involvement being kept at a minimum level. The State devolves the responsibility of allocating water on a Regional Agricultural Groundwater User Association (RAGUA). Farmers must be member of this Association to be allowed using groundwater. Monitoring of groundwater pumping is carried out by RAGUA. Conflicts are arbitrated by judges elected among farmers. Temporary water reallocation between farmers is allowed under the supervision of RAGUA, without financial compensation.

### **Farmers' perception**

The main conclusions emerging from the workshops in the French case study are the following. When asked to describe how water management is likely to evolve in the future, farmers quote most of the elements contained in scenario C. They do not believe that the State will interfere in water management as described in scenario A and most of them consider as very unlikely the development of water markets (scenario B). Overall, scenario C is considered as highly desirable by most farmers. However 30 to 40% of farmers also consider that some of the assumptions included in scenarios A and B should be considered. Overall, farmers agree to play a greater role in groundwater regulation through the devolution on farmers of responsibilities related to groundwater allocation, borehole control and abstraction monitoring. They claim that conflict resolution should remain the responsibility of the State. And they do not oppose to trading of quota provided exchanges

are closely supervised by farmers' associations – in particular to prevent the risk of transfers outside the agricultural sector (i.e. to cities).

On the contrary for Portuguese farmers the state has a crucial role in the management of groundwater. However this intervention must be more transparent and closer to the needs and interests of farmers. These ideas came out as a criticism of the way groundwater is currently managed. The lack of universal criteria for use and control leads to strong inequities. On the other side, participants did not support a scenario of collective management, as they disbelieve the capacity of farmers themselves to cooperate and mistrust this type of organizational arrangements due to bad past experiences of associative efforts. Nonetheless, an outcome of the discussion was the call for a different scenario integrating elements of scenario A and B. The will to participate in the definition of quotas, was very clearly stated, as well as the need of a management system closer to the needs of farmers. In what concerns the scenario B, farmers believe that this is a highly improbable scenario and they dismiss as unethical. All the main elements present in this scenario are rejected, i.e. privatization of water, the water market and the water regulation (quotas definition, monitorization) by the farmers association. This system of water management breaks all ancient values related to the use of water, such as the strong link between the water and the local territory, the practice of exchange of water for seeds, etc. Moreover the risks of such system are perceived as very high: speculation, water traffic/black market, abandonment of the agriculture and water conflicts. This state of opinion is so pronounced that participants would even refuse to go on discussion it in detail.

### **Discussion**

The research presented above has demonstrated farmers' ability to contribute to an exploratory assessment of possible future water management scenarios, in two contexts where water is not an immediate source of concern for agriculture. In the French case study, we observed drastic changes in attitudes during the participatory process: some of the farmers who were initially not willing to consider basic changes such as the installation of meters and the allocation of individual quotas have been able to discuss, evaluate and provide very meaningful comments and suggestions on very innovative water management scenarios. In Portugal, farmers have been very receptive to the 3 scenarios presented. They recognise how pertinent is the subject and the opportunity that this discussion space gave them to debate management aquifers. Farmers have a very rational and equitable vision about the need of installing meters and about the allocation of water. Very conscious of their own fragilities, farmers are not receptive of a collective instrument for regulating conflicts but they are open to collaborate with state agencies responsible for managing the aquifer, even though they do not know them and have so far not even tried to dialogue with them.

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