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Bridging the Gap between Science and Policy: A Prerequisite for Effective Water Governance †

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Abstract: Water governance in the EU is enshrined in the Water Framework Directive (WFD), with the engagement of stakeholders being one of the governance cornerstones. The inclusion of the interests of scientific and non-scientific groups in decision-making is crucial. Our objective is to examine the contribution of the participatory approach to the effectiveness of local water resource management. Within the Eye4water project, a participatory assessment was applied for the Lissos river basin, through joint identification and evaluation of the main water-related issues. Firstly, we identified the social system engaged to the basin through stakeholders' mapping. Secondly, based on criteria selection, three stakeholders' groups were invited to a workshop. Our preliminary results show that mutual learning should be encouraged at multiple levels. Well-recognized threats such as water pollution, flood risk, and groundwater lowering are present, while biodiversity issues are quite underrepresented.

Keywords: stakeholder analysis; participatory management; local knowledge; Lissos; interactive workshop; basin management

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1. Introduction

Water governance describes the legislation, policies, regulation, and institutional frameworks related to the management of water resources, which affect human activities and nature's sustainability. Water governance is a complex process that requires the participation of not only technical experts and the scientific community, but also of the different stakeholder groups in water decision-making [1]. More specifically, the development and implementation of water policies are characterized by challenges which concern the integration of legal requirements, technical issues, scientific knowledge, socio-economic aspects, and the competitive uses of the resource [2] in all stages of the process. For the minimization of conflicts and the measures' success assurance, all voices should be heard, making intensive multi-stakeholder consultations be required for effective, equitable, and sustainable water governance [3]. Lately, the participation of stakeholders in water governance is considered a key element for improving water resources management and is strongly supported (suggested or mandatory) in the majority of water-related EU directives [1,4]. In particular, the Water Framework Directive (WFD) (2000/60/EC) establishes a legal framework to protect and improve the status of aquatic ecosystems, including—among other factors—public participation. It is now documented that stakeholder consultations based on communication and group interaction depend on trust-building science-policy collaborations [5,6]. Common understanding and interpretation of local water issues and solutions, and collaborative production of scientific, local, and bureaucratic knowledge are essential for legitimate decision-making processes and the effective co-creation and implementation of measures [5–7]. The contribution of stakeholders to the design of a good

governance scenario together with the gaps in data are considered the most important dependencies in the management of Greek river basins [8]. Having the above in mind when considering the peculiarities of the Lissos basin as concerns stakeholders' identity, this paper aims to outline the participatory bottom-up approach for this basin's management, having the bridging between science and policy as its supreme goal.

2. Materials and Methods

A participatory workshop was conducted under the framework Eye4water, which aims to strengthen the local water management practices in the Lissos river basin by developing supporting technological tools as a result of systematic monitoring of the quality of natural water bodies. To our knowledge, this is the first participatory assessment of a local river basin being applied to the Lissos river basin. Our methodology was conducted in four stages: (1) Process design; (2) Workshop process; (3) Results analysis; and (4) Follow-up.

2.1. Study Area

The Lissos river basin (Rhodope, Thrace, Greece) covers an area of 1486 km^2 and is partly protected by Ramsar. It is a Heavily Modified Water Body (HMWB), which suffers from several anthropogenic pressures such as landfill, Wastewater Treatment Plant, intensive agricultural and industrial activities, livestock, sand extractions, and flow-intercepting construction [9]. It is considered a lesser-researched river of primary importance for the local community [9], of a higher trophic state, receiving important pollution loads in a segmented hydrological network.

2.2. Process Design

2.2.1. Stakeholder Mapping

Firstly, we identified the social system engaged to the Lissos river basin through stakeholders' mapping. We organized a list of stakeholders and we complemented it through Internet searches (Google maps and business lists), on-site contacts, and the use of our own network (NGOs, academic community, farmers, entrepreneurs, administrative authorities). The identified stakeholders were categorized into three groups: (1) farmers, (2) practitioners, and (3) experts. Before the invitations, equal representation and gender equality among the participants were taken into account. The invitations were sent via email, phone calls, posted on the website, and on the social media accountes (Twitter, Facebook, Linkedin, Instagram) of the Eye4water project. The workshop was also announced through a press release (to about 140 media members). A reminder was also sent.

2.2.2. Questionnaires Development

Based on a SWOT-PEST analysis combined with monitoring results, a number of questions were developed. The main aim of the questions was to gather local knowledge and to further understand how the stakeholders value the resource, prioritize pressures, and jointly identify solutions. For each group, a different set of 12 questions was developed, considering each one's relation to the water sector. The context of the questionnaires covered the water uses, the river pressures, the water management and governance, and the possible solutions. The set of questions included open-close, multiple selection, and importance-grading questions where the participants had the liberty to answer as many questions as they wanted from all groups' questionnaires.

2.2.3. Workshop Process

The process was divided into two sessions. In the first session, a formal briefing of the monitoring findings were communicated to the participants, and then the stakeholders were encouraged to participate in two exercises in a free and open manner with the aid of nine facilitators, where a different color of Post-it was attributed to each group. Exercise 1: In this exercise, the stakeholders were invited to answer the questions anonymously by placing a Post-it somewhere on one of three big panels, allowing for the ability to

further comment on each question, thereby promoting meaningful discussions. Exercise 2: A follow-up round after the first exercise took place. In this exercise, the stakeholders were asked willingly to answer the questions of the other two groups. The objective was to identify any conflicts and to evaluate their impact on water management.

2.2.4. Workshop Material Analysis

All produced material from the workshop was photo-documented, and processed as follows: The Post-its from the panels were transferred to a database with the qualitative details from the related discussion notes. A categorization followed, aiming to identify thematic convergences and divergences.

3. Results Discussion

We consider the resulting representation marginally sufficient, since, from more than 100 invitations, at least six representatives from each group attended the workshop. The representatives of each group were urged to reply to the questions posed to other groups. Figure 1 is indicative of the participation and interaction among stakeholders. Using this method, each question gathered about five replies. The exercises were complemented by a continuous discussion and a short evaluation feedback of the entire process. The sub-aim of developing simple and understandable queries for linking science to the tools used by both stakeholders and practitioners and further encouraging action and innovation among all stakeholders [10] was achieved, since none of the moderators noticed any misinterpretations or conceptual errors.

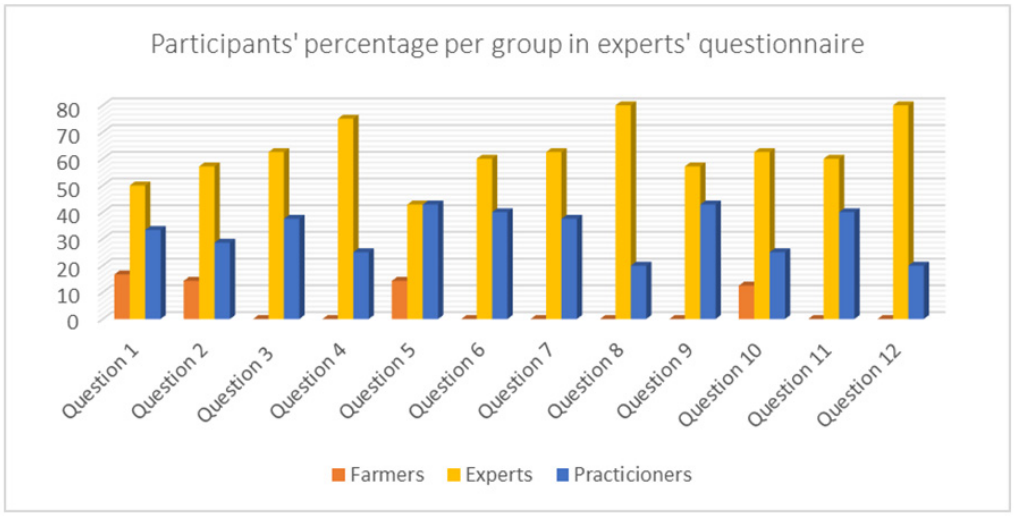

Figure 1. Given answers per group for the experts' questionnaire, indicative of participation and interaction among stakeholder groups.

The results deriving from common queries dealing with the main water uses, pressures, and main issues are presented in Figure 2. It can be clearly seen that irrigation is the major need according to farmers, acknowledging at the same time that agriculture and livestock are among the main activities posing pressure on the watershed. On the contrary, experts and practitioners are more "afraid" of agriculture, livestock, and waste disposal effects, and less of industrial effluents. Different opinions are expressed by the three groups regarding water resource uses or, more simply, their beliefs regarding the needs for water resources allocation, downgrading the importance of biodiversity, industry, and recreation. Despite the large number of low-water crossings and the frequent announcements of flooded areas, floodings were not one of the locals' primary issues.

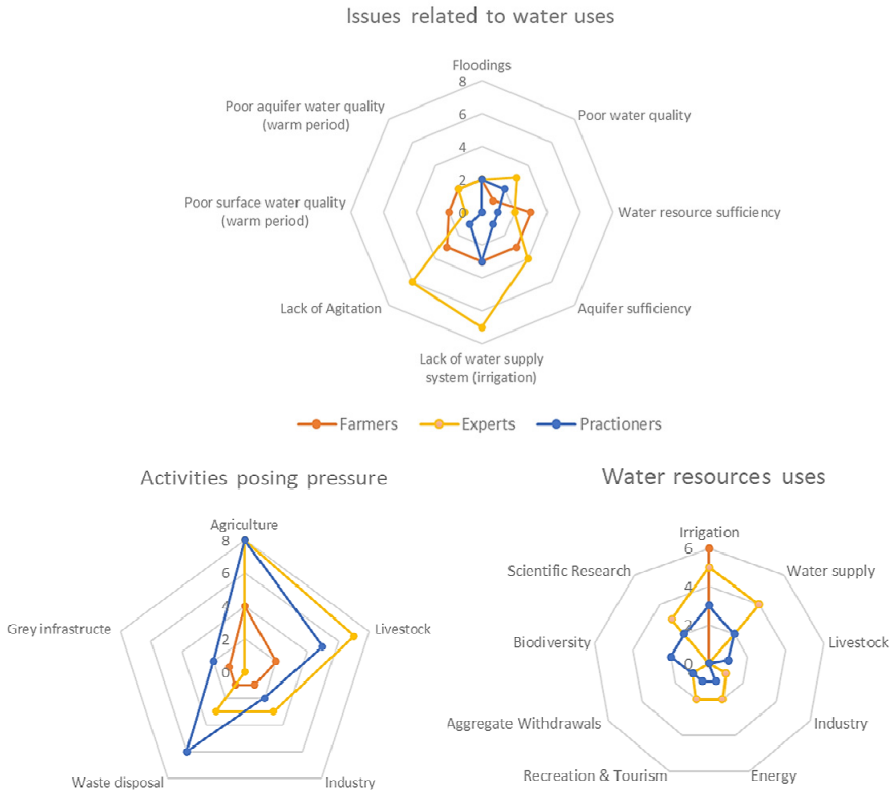

Figure 2. Comparative results regarding common queries from the three stakeholder groups dealing with pressures and uses.

An interesting finding is that experts propose agitation as a measure for land use/land cover alteration in favor of the river system, along with the need for a better irrigation system. Farmers are more anxious of the resource sufficiency, either surface or groundwater. No group deems that there is a seasonal/warm period problem related with water quality. It should be noted that we intentionally omitted queries using a rating scale as a type of answer from the results. The last ones will be used to generate weights for more in-depth analyses through advanced mathematics to suggest some optimal solutions for management of the Lissos basin. It can be stated, though, as a general direction, that better awareness on water issues from the part of higher administrative authorities' and targeted small infrastructure interventions are major components of the solution.

This workshop aimed to bridge the gap between science and policy, and successfully managed to take a "snapshot" of stakeholders' perspective on the management of the Lissos basin. The findings seem to be applicable to decision-making for strategic design and measures implementation, incorporating information of great value that is also based on local knowledge, which could not be gained otherwise. Similar to other research findings [11], Lissos stakeholders seem to be able to implement some management measures (i.e., pollution prevention, channel creation, methodological approach) without official governmental support.

The participation was affected by stakeholders' financial constraints (transport, agricultural duties) while the COVID-19 pandemic situation prevailed in some remote villages. Conflicts between stakeholder groups (farmers vs. practitioners) affected the participatory process. The expressed perception of the different stakeholders' groups did not coincide, except for the activities posing pressure on the watershed. Some points supported by our research and the literature (i.e., seasonal quality and quantity variation, touristic growth potential, and biodiversity) were not supported by public opinion. A major finding can be concluded that "primary production" should not be altered, but rather, should be eased as a measure of water stewardship.

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Data Availability Statement: Supporting data can be given upon demand in eye4water.com.

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