Digital management of irrigation water and agriculture: Transparency and accountability towards resilience and sustainable development

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Introduction

This research reflects the outcomes from an ongoing project based on continuous collaboration (stakeholder engagement) and scientific support towards sustainable and resilient water management. A multi-disciplinary platform is used to bring together all relevant stakeholders of Thessaly, a Greek rural region facing multiple water management problems, historically. The problems, causes and potential solutions are analysed in a series of virtual meetings (March 2021 – June 2022) in order to develop business plan(s) for the improvement of the situation in multiple levels. A basic result from the project so far, a commonly acceptable measure, refers to the digital agriculture – irrigation water management, which has multiple benefits and enhances resilience to different future challenges.

Such measures are supported by the international practice, research, and policy agendas: Geographical Information Systems (GIS) and interactive maps have been used successfully for agricultural monitoring and management in the context of informed decision-making (Jhariya 2019) and guidance for targeted measures (Mockler et al. 2016), while they support the use (and adaptation) of new technologies by multiple users (Mustafi et al. 2021). The main objective of this work is to analyse the multiple benefits of such digital management tools from a new perspective: as a means for transparency and accountability to speed up progress and support informed decisions, as resulted from a multi-disciplinary stakeholder group. The methodology developed and followed for this project, the way of reaching to common visions, and the proposed actions for the specific study area are the novel elements of this work.

Materials and methods

The study area is Thessaly (Central Greece), the country's driest region and more intense agricultural supplier. The area faces several water quantity and quality issues, ambitious production-economic objectives, continuous (historically) drought and flood events, conflicts, administrative, institutional, regulation and economic issues, under serious climate change impacts (Alamanos et al. 2022). For the first time to our knowledge, a multi-disciplinary platform is used to bring together all relevant stakeholders (27 representatives from the government, local authorities, experts and experienced professionals, start-ups and technological solutions, agricultural co-operations, and local agencies). The methodology followed is the Systems Innovation Approach (SIA) consists of two processes:

- A continuous scientific support: to enhance the understanding of interactions within the various sub-systems and challenges, and provide examples from international practice and research, as well as the techno-economic support to the proposed measures. For this component, a whole-of systems multi-disciplinary approach is followed, combining all socio-economic (social, economic, influential relations, behavioural) and environmental components (water, soil, atmosphere, climate, biodiversity), as analysed in Alamanos et al. (2021; 2022).
- A proper stakeholder analysis and engagement, integrating local knowledge: to collaborate, co-design future visions and ensure a healthy two-way feedback with the scientific support.

The goal is to reach to a feasible commonly acceptable measure, to be applied (and supported), providing multiple benefits. This will be innovative, scientifically supported (perception and development of business plan), making use of new technologies and allowing for overall support by the various stakeholders.

Results and concluding remarks

During the meetings and through SIA, the group has reached to a common understanding of the main problems and future challenges of the area (economic, environmental, social, political, technological). Each measure of the River Basin Management Plans, the ones scheduled under the Resilience and Recovery Plans, and other efforts from all different actors (state, academics, private sector, local initiatives, etc.) have been evaluated, and a sincere analysis of priorities for action (including current obstacles) has been achieved. A commonly acceptable measure, with the most benefits so far, is the development of a GIS-based platform (digital record) providing basic and necessary information to facilitate management and cover existing data limitations. The idea is to collate various data (e.g. agricultural, agronomic, natural-soil-topographic, water use, water supply sources, pollutants emissions, cropping data, irrigation methods and other agricultural practices) and combine them in an accessible multi-layer map. This initiative is considered realistic and doable, and the participants have relevant experience to support its development.

Multiple benefits will arise from the effort and the implementation of the proposed measure:

- Transparency as a form of effective governance: Creates a sense of responsibility, informal control (and inspection), accountability, commitment, and a culture of improvement (motivation to find data and/or make them reliable).
- It can facilitate the work of all individual actors (project's participants and other stakeholders) at many levels (speed, effectiveness, data accessibility, guidance for targeted measures, accountability, informed decision-making).
- Contributes in a practical and simple way to most of the activities proposed individually by the participants-stakeholders during the living labs so far. These include project completion, demand management measures (including precision agriculture, crop replacements, pollution control, more efficient irrigation methods), modernisation of existing management practices and tools, adoption of new technologies, enhanced communication and information, etc.
- The use of new technologies (digital management) as a path towards modernisation will majorly assist the capacity building of the area's stakeholders and will promote a human-technological efficient cooperative intelligence. This will bring the local management up to speed with the international practice and will set a good example to be followed by other Greek regions.
- Space for support-cooperation (Greek Ministry of Environment – through the General Directorate of e-Government and Geospatial Information & Water Secretariat, academic institutions, practitioners, private sectors, etc.), including various scientific fields and expertise's.

The current and future stages of the project focus on the development of a business plan to implement the solution. The design must be careful, take into account many different factors, to ensure the proper development, operation and management of this tool, so any form of cooperation and support to this project and effort is welcomed.

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