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Public Policy to Support Environmental Sustainability and Circular Economy: efforts towards integrated approaches.

Angelos Alamanos[1*]

[1] *The Water Forum | Centre for Freshwater and Environmental Studies. Dundalk Institute of Technology, Dundalk Co. Louth, Ireland.*
**Corresponding author: angelos.alamanos@dkit.ie*

The Water Forum (An Fóram Uisce, AFU)[1] was established in June 2018 in Ireland. AFU is the only statutory body representative of all stakeholders with an interest in the optimal management of Ireland's water bodies/catchments (26 members-representatives from all organisations levels and disciplines, and staff providing scientific support). AFU is required to advise the Minister on policy having regard to, among other things, water quality and conservation, domestic, marine, and rural water services, optimum implementation of the National, and compliance with the EU legislations.

Currently in Ireland, the Department of Agriculture, Food and the Marine released the 2030 Agri-Food Strategy (Draft Plan) and put out for public consultation the accompanying Environmental Report (Strategic Environmental Assessment-SEA) and the Natura Impact Statement. Also, the River Basin Management Plan (RBMP) is under preparation (3rd Cycle), and it is expected to improve the quantitative and qualitative status of the Irish water bodies and enhance sustainable catchment management (for which agriculture was found to be the dominant pressure in the 2nd cycle). The scope of these Plans is very broad, as they set the objective of Sustainable Food Systems (SFS) and Environmental management, involving national economy and international trade, agri-food sector and high-quality products, society, new technologies and talent, climate, biodiversity, water bodies and environment. Embedding the agri-food sector in the circular bioeconomy is crucial, and currently is seen as an opportunity "for additional income and employment, as long as the rural sector gets more diversified". However, "the core of the agri-food output will continue to be grass-based livestock production wherein lies Ireland's natural competitive advantage". The environmental sustainability is outlined mainly as the improvement of water quality, proposing an ambitious reduction of agricultural nutrient losses to water by 50% by 2030.

In both aspects, further support is needed in terms of education, awareness and understanding from the public, that will allow *stakeholder engagement, and an overarching framework to monitor and model these objectives jointly to reach to optimum solutions*. The research question is how to provide and mainstream this framework that will balance conflicting objectives, and the strong interlinkages among them. The goal is "Ireland's economic boost and its position as an international leader", however certain environmental pressures (e.g. water bodies, soil, land use, air, landscape, climate, etc.) – acknowledged by both Plans, put into doubt the future environmental capacity for reaching this objective. This is very similar to the classic *economic problem,* where increasing and competitive economic-productive objectives need to be met with limited and deteriorating resources or emissions.

AFU proposed an overarching framework that will facilitate an integrated and systemic approach-analysis in order to bring positive outcomes to all sectors. The FILLM (Framework for Integrated Land and Landscape Management)[2,3] was developed as a 'whole-of-environment' catchment-based approach to

[1] https://thewaterforum.ie/
[2] https://thewaterforum.ie/infographic-for-the-framework-for-integrated-land-and-landscape-management-fillm/

combine environmental monitoring-modelling and multi-stakeholder engagement. The integrated management with agencies working together to maximise actions, receiving continuous input from local key-stakeholders and scientific support is a fundamental principle, and also a necessity. In this work, the stages-steps to apply this framework, address the aforementioned challenges, and expand the approach towards environmental sustainability and circular economy are outlined. Emphasis is given on the recommendations for a successful practical application, which heavily relies on three pillars – parallel processes: a) education, b) stakeholder analysis, c) technical support (monitoring-modelling).

Continuous and targeted education will ensure the understanding and awareness of the environmental and economic interlinks, risks, pressures, and benefits from their rational co-management, as well as the individual and community benefits of the engagement in the decision-making process. In a stakeholder platform such as AFU (and other Bodies), staff and members can contribute with various ways to disseminate information, knowledge, and influence their 'communities', and organise catchment training as a two-way process of "informing and being informed". Here a 'scientificated' stakeholder analysis is suggested, where commitment and scientific excellence are driving factors that boost trust-building and strengthen long-term cooperation.

The technical support requires integrated databases that will lead to a holistic monitoring-modelling of the system as a whole, ensuring that no discipline will act in the expense of another. Creating databases of hydrological, hydrogeological, soil, land use, atmospheric and climate, demographic and social (including decisions, preferences), economic (environmental economics, behavioural economics, sales, subsidies, production costs, trades), emissions, ecological, biological, etc. parameters will enable studying and quantifying their interlinkages, and more realistic and comprehensive simulations. Of course, this is a difficult process, not only regarding the data availability, but also because integrated databases concentrate the weaknesses of each dataset (different time-steps, scales, and nature or form of the available data). The mathematical representation of such systems is a difficult and computationally demanding process, often needs simplifications and aggregations that may downgrade the models' accuracy, reliability, and include uncertainties. However, the international literature has proved that even the outcome of such a data-gathering procedure is highly beneficial both for the better understanding of the system and the exploration of extreme or/and management scenarios. Similarly, engineers use hydro-economic models, or economists use behavioural-econometric. input-output or equilibrium models, despite the limitations. Several examples from the international experience are presented and their relation to the examined policy case is explained, to justify the suggested approach. The proposed framework and its expansion possibilities that promote transparency, allow a gradual model-building, asset and knowledge capacity are novel elements for Ireland, and useful for the international public policy towards sustainability and circularity.

Key words: circular economy; agriculture; food; Ireland; resources sustainability.

Topics: Public Policy to Support Circular Economy; Sustainable Economic Growth; Sustainable Production and Consumption.

[3] Alamanos, A., Rolston, A., & Papaioannou, G. (2021). Development of a Decision Support System for Sustainable Environmental Management and Stakeholder Engagement. Hydrology 2021, 8(1), 40. https://doi.org/10.3390/hydrology8010040