Environmental Science and Policy 84 (2018) 41–51

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

A participatory approach for comparing stakeholders' evaluation of P loss mitigation options in a high ecological status river catchment

Evgenia Micha[a,*], William Roberts[b], Mary Ryan[c], Cathal O'Donoghue[c], Karen Daly[b]

[a] Agricultural Catchments Programme, Teagasc, Johnstown Castle, Wexford, Ireland
[b] Environment, Soils and Land Use Department, Teagasc, Johnstown Castle, Wexford, Ireland
[c] Rural Economy and Development Programme, Teagasc, Athenry, Galway, Ireland

ARTICLE INFO

Keywords:
Agriculture
High status river bodies
Phosphorus
Participatory methods
Policy design

ABSTRACT

Phosphorus (P) transfer from land to water is a source of diffuse pollution that contributes to the decline in ecological status of river bodies in the European Union. The Water Framework Directive (2000/60/EC) provides for the protection of water bodies that represent pristine or near-pristine condition, classified as high ecological status through the adoption of an agri-environmental decision making process that promotes stakeholder participation. However, successful implementation of agri-environmental policies can prove challenging when faced with uncertainties and diverging opinions due to the variety of actors involved. This study adopted a participatory approach including stakeholders with conflicting interests in the selection of P transfer mitigation policies. Fifteen P transfer mitigation options were shortlisted based on agronomic and environmental data from a case-study agricultural catchment and presented to a group of experts and farmers. Results showed significant disparities between perceived effectiveness by farmers and experts groups, with experts prioritizing problems related to connectivity issues, while farmers to soil compaction and erosion. In addition, measured agronomic and environmental variables were used to model effectiveness from a decision support tool (FARMSCOPER) and compared with stakeholder groups' perceived effectiveness. This approach combined the scientific research with the empirical knowledge of farmers and the modelling of quantified field and farm data. This study showed that stakeholders are diverse, and perceive effectiveness based on group-specific operational and social factors. Experts identified effectiveness at catchment scale, whilst farmers identified field scale effectiveness. For decision support tools and simulation models to be beneficial for policy makers, they need to be calibrated to local conditions and farm typologies to select the right measure at farm scale. The study recommends improved knowledge transfer between interested actors and the need for integration of conflicting opinions in policy design. A bottom-up approach to decision making is suggested, to assist in the decentralization of the procedures towards more effectively implemented P transfer mitigation policies.

1. Introduction

Clean unpolluted waters are vital for our ecosystems. The EU Water Framework Directive (WFD) (2000/60/IEC) assigns ecological status to all water bodies based on physico-chemical, hydro-morphology and biological quality conditions. This legislation seeks to maintain those water bodies that reflect undisturbed conditions or high ecological status, and improve all waters to good[1] status. However, more than half of the surface waters in the European Union are reported to be in less than good ecological status.

Generally speaking, 30–50% of surface water bodies are affected by pollution pressures, with diffuse sources contributing the most severe pollutants (see Fig. 1). Around 40% of river and coastal water bodies are affected by diffuse sources while approximately 25% are also subject to point source pollution, with nutrient enrichment causing eutrophication the most significant pressure (EEA, 2012). The highest proportion of river bodies in worst ecological status is reported in North-Western Europe, where pressures on freshwaters are higher (Fig. 1).

Agriculture is a key source of diffuse pollution (European

* Corresponding author at: Teagasc, Johnstown Castle Research Centre, Co. Wexford, Ireland.
E-mail address: evgenia.micha@teagasc.ie (E. Micha).

[1] According to the EU Water Framework Directive a water body river is assigned its ecological status based on its physico-chemical, hydro-morphology and biological quality elements conditions. When these reflect undisturbed or nearly undisturbed conditions the waterbody is assigned "high" or "good "ecological status respectively. The High Status River Catchments in the republic of Ireland are monitored by the Environmental Protection Agency and the Teagasc Agricultural Catchments Programme. In total 508 and sites are monitored. Most of these sites are located in upland areas or along the western seaboard and, have a high proportion of peat soils.

https://doi.org/10.1016/j.envsci.2018.02.014
Received 10 April 2017; Received in revised form 26 February 2018; Accepted 26 February 2018
Available online 08 March 2018
1462-9011/

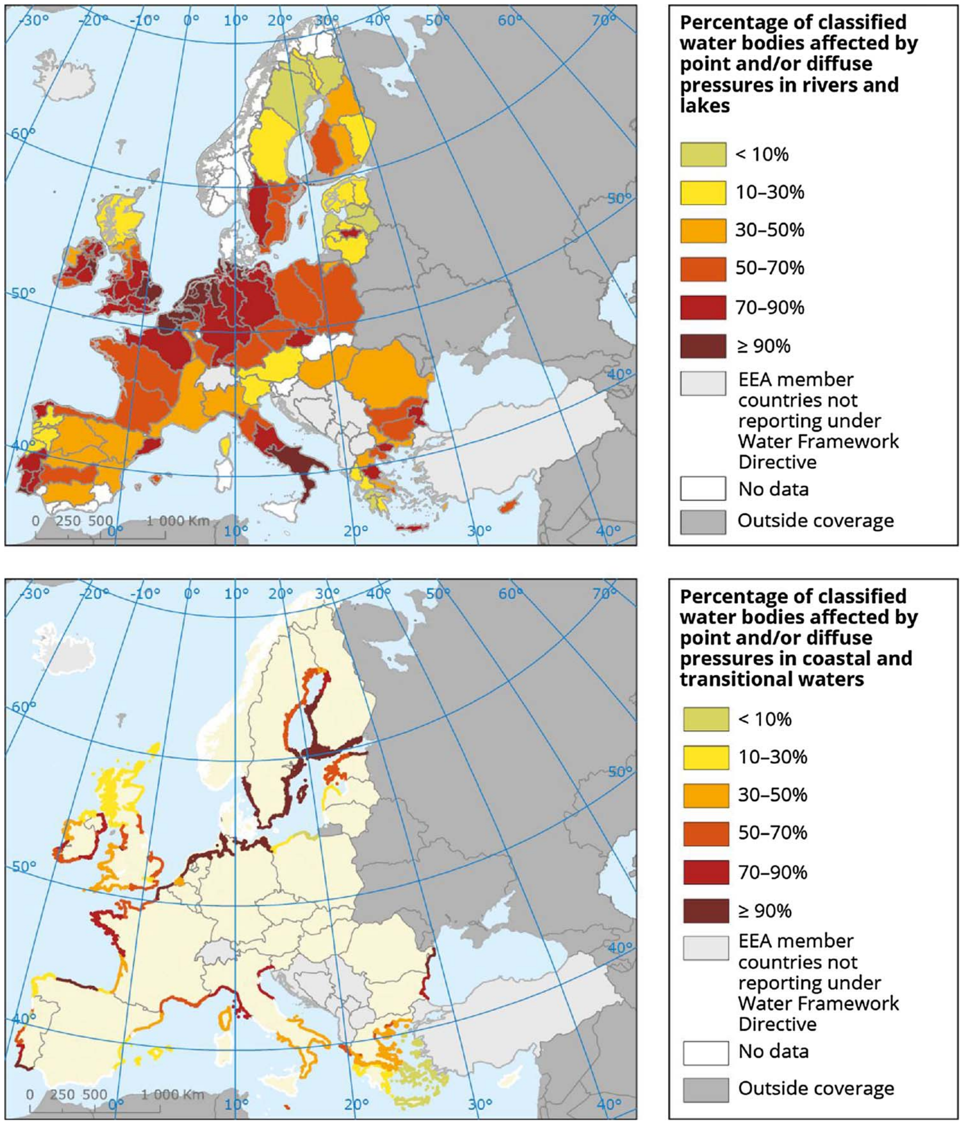

Fig. 1. Maps of spatial extent of affected freshwater and transitional waterbodies across Europe.
Source: European Environmental Agency (EEA).

Environmetal Agency, 2005). Measures exist to tackle agricultural pollution need to be implemented according to the WFD. The WFD has identified agricultural sources of phosphorus (P) as a pressure on water quality and requires member states to implement measures to mitigate P losses to surface waters including the restriction on P use on farms. However, these measures are implemented at farm scale and do not account for landscape and soil conditions (Doody et al., 2014). Additionally, in low intensity farming systems P surpluses often exist due to poor nutrient and farm management practices on marginal soils (Roberts et al., 2017) rather than high inputs, therefore restrictions on P use may not guarantee their reduction (White et al., 2014).

WFD policy suggests that measures should be implemented at river basin scale by identifying sources and pathways of P. However, such measures will have to be examined from the point of view of applicability at farm level (McDowell et al., 2015). Multiple stakeholder participation is also a requirement of the WFD, particularly during the process of measures selection design.

This study focuses on Ireland where recent reports by the Environmental Protection Agency (EPA) recorded a decline in the percentage of high status waters (HSW) from 30%, in 2000, to 17% in the period 2007–2009 (Ni Chathain et al., 2013). In Ireland, WFD policy is implemented on a whole territory basis (including those pertaining to agricultural P), through national River Basin Management Plans (RBMP). Intensive agriculture is often perceived as imposing a higher source pressure on water quality compared to extensively farmed areas, however, HSW are typically located in less developed and less intensively farmed areas (White et al., 2014) often characterized by high levels of annual rainfall on marginal and poorly drained soils with little capacity for nutrient assimilation (Gibbons et al., 2006; Roberts et al., 2016).

To date, the design of pollution mitigation measures is based on scientific research which is transformed into standardized tools that assist agricultural policy design (Obermeister, 2016). This approach facilitates the production of objective pollution mitigation options, based on “professional and technical expertise” and is less likely to be biased by the opinion of public actor’ groups (Fung, 2006). However, Cash et al. (2003) concluded that knowledge systems for environmental sustainability that put science into action are more likely to be effective when communication, translation and mediation is included. The authors cite case studies where agricultural production, aquifer management and reducing air pollution include scientific advice for policy at the interface between experts, communities and decision makers, and conclude that effectiveness suffered when communication was one-way, when participants were misunderstood and when mediation was