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Mitigation of diffuse water pollution from agriculture in England and China, and the scope for policy transfer

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ABSTRACT

This paper evaluates the existing policy frameworks for mitigation of diffuse water pollution from agriculture (DWPA) in England and China. With reference to a conceptual model of the process of policy transfer or international lesson drawing, and possible constraints to this, it assesses whether and how China can draw lessons to improve current policy from the supra-national and national provisions of the EU and a member state that by 2016 had comprehensively implemented EU agricultural and environmental policy. DWPA is first analysed as a public policy challenge to inform specification of a generic framework for its mitigation. The current policy frameworks for mitigation of DWPA in England and China are evaluated, and their potential for improvement is assessed. A number of barriers to lesson drawing for regulation, incentive payments schemes and advice provision are diagnosed. These barriers are potentially least in relation to advice provision and its use to promote voluntary action by farmers. Given its structure and capabilities the public agricultural extension system in China is also recognised as a key resource. A focus on three policy approaches to mitigate DWPA in China is recommended: i) targeted regulation to a 'reference level' of large intensive livestock, and ultimately other large commercial farms; ii) strategic use of incentive payment schemes to protect water resources from DWPA; and iii) re-orientation of the ethos and modalities of operation of the extension system, informed by international lesson drawing, with the aim of rebalancing farm productivity and environmental protection.

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1. Introduction

Water pollution from agriculture and its consequences are a source of increasing concern (Vorosmarty et al., 2010). In England the leading pollutants from agriculture and wastewater are sediment, chemicals, nitrate and phosphorus (Gov.UK, 2016a). Projected improvement in compliance with European Union (EU) Water Framework Directive (WFD; CEC, 2000) standards for 'good status' seem modest in rising from only 17% of all waterbodies in 2015 to 25% in 2021, but physical modifications of waterbodies are a common reason for 'failure'. In contrast, 82–88% of the chemical and biological parameters monitored should be at 'good status' or better in all areas by 2021 (Gov.UK, 2016a). In China water pollution remains severe with more than 61% of groundwater and 28% of surface waters in the main river basins classified as unfit for human use or contact (China Water Risk, 2015). Agriculture is a major cause, estimated to be the source for 57% of the nitrogen and 69% of the phosphorus entering Chinese watercourses (MEP, 2010).

Point source[1] water pollution can be mitigated by pre-discharge treatment of wastewater subject to the right regulation,

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[1] A discrete and discernible source of wastewater such as pipes, ditches and channels.

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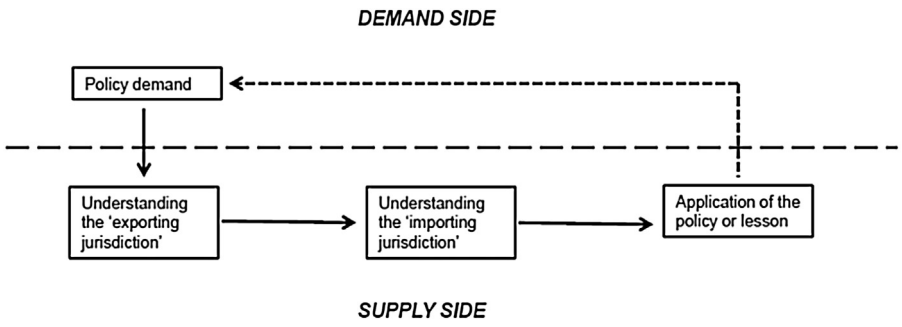

Fig. 1. Stages of lesson drawing.

Source: Benson, 2009.

technology, and political will (Smith et al., 2015a). When control has been at least partially achieved policy emphasis shifts to diffuse pollution for which agriculture is a significant source. However, diffuse water pollution is more difficult to mitigate as it consists of the releases of diverse pollutants from dispersed sources across the landscape including run off and leaching from fields and farmyards.

The challenges and conditions for agriculture and water resource management in China are unique and there is no 'model country' to provide a reference point for policy solutions; however, large federal countries such as the United States and Australia, and supra-national bodies such as the European Union can provide applicable lessons (World Bank, 2006), subject to analysis of how these might transfer with appropriate modification. Such detailed analysis is lacking in relation to DWPA. In 2016, England (as part of the UK) is representative of an EU member state that has comprehensively implemented EU agricultural and environmental policy.[2] This paper evaluates the policy framework for mitigation of DWPA in such an EU member state in comparison to that in China; providing an original assessment of the potential for international lesson drawing.[3]

The assessment proceeds by first adopting a conceptual model for the process of lesson drawing and identification of constraints to this. It then analyses the policy challenge of DWPA to derive a generic framework for its mitigation. The characterisation and validity of this framework is further established by evaluation of policy in England (supported by other OECD country examples) and equivalent policy in China. The conceptual model for policy transfer is then applied to review the potential for an improved policy framework in China and conclusions are drawn.

2. Methods and materials

Preparation of this paper employed review and analysis of literature and secondary data. This was supplemented by semi-structured interviews with key informants in England and China, field visits to four farming systems in China, and workshops with stakeholders in each of those locations, and with national stakeholders in Beijing. The local workshops were attended by community leaders, farmers, large farm managers, local researchers and government officers, including representatives of the public agricultural extension service (PAES) at administrative levels from village to county and city. The workshops were part of a wider project investigating nutrient management in Chinese agriculture and associated risks of DWPA. The farming systems visited in China were: rice-wheat farms near Lake Tai in Jiangsu Province; maize-wheat farms in Huantai County, Shandong Province; solar greenhouses for horticultural crops near Yangling, Shaanxi Province; and kiwi fruit and maize growers in Zhouzhi, Shaanxi Province.

3. A conceptual model for lesson drawing

The concept of lesson drawing or policy transfer is a domain of public policy analysis (e.g. Dolowitz and Marsh, 1996, 2000; Evans 2009; Benson and Jordan, 2011). It can be understood as the process through which knowledge of policies, administrative arrangements and institutions in one jurisdiction can be used in the development of similar features in another (Dolowitz and Marsh, 2000). As in Fig. 1 and Table 1, the process of lesson drawing can be analysed in stages (Benson, 2009; Rose, 2005). Fig. 1 infers possible constraints to the transferability of lessons, which are identified and posed as questions and indicators in Table 1. Many of the constraints are associated with 'hard' policy transfer, i.e. adoption by the public sector based on formalised peer-to-peer information exchange (Benson, 2009). This contrasts to 'soft' transfers occurring flexibly via exchange of norms, knowledge and techniques by a diverse range of actors and processes. The latter may be less constrained but typically more concerned with how best to implement a given policy or programme than its functional objective (Benson, 2009).

4. The policy challenge of diffuse water pollution from agriculture

As a 'market-failure' displaying public good and externality properties DWPA is challenging for public policy (Weersink and Livernois, 1996; Smith and Porter, 2010; OECD, 2012). Bio-physical uncertainties and the temporal and spatial characteristics of DWPA render a solely regulatory approach costly if not impractical (OECD, 2012; Smith et al., 2015a). Complexity is exacerbated by the multi-functionality of land use, its delivery of both complementary and competing ecosystem services, and the relevant property rights of society and land owners. This applies to the activity that generates DWPA but also to some of its mitigation measures. For example, riparian buffer zones can limit pollutant runoff but also provide amenity, habitat and carbon sequestration. Furthermore, today's pollution is in large part a legacy of past farming practice, and change in practice today may not fully deliver its benefits for decades to come (Powers et al., 2016). Consequently how all costs and benefits from agriculture and DWPA mitigation are distributed is a matter for socio-political determination. Deliberation on this is

[2] Noting that the UK referendum result of 23rd June 2016 prompts UK withdrawal from the EU. This paper focuses on England rather than the UK because of differences in policy in Scotland, Wales and N. Ireland.

[3] The bilateral research and knowledge exchange for this paper can be seen as a part of the 'soft' policy transfer (see definition below) conducted by the Sustainable Agricultural Innovation Network (SAIN, 2016) and inspired by common challenges, needs and aspirations for sustainable agriculture in the UK and China.

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