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Interactive Soil Quality Assessment

Protecting Europe's soils, protecting Europe's water bodies?

EU water law and its ability to support soil protection

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Key messages

- Soils and surface waters are intimately related – much surface and groundwater enters water bodies through soils.
- Substances in soils may, therefore, end up as pollutants in water bodies through diffuse pollution. Some of these are deliberately applied to soils, some not.
- Erosion of soils may also cause water pollution.
- Many pollutants pose a risk to both soils and waters.
- EU law is relatively comprehensive for water protection, but views control of pollutants from soils from the perspective of water protection rather than wider environmental protection including that of soils themselves.
- The limited links between EU water law and soil protection actions have been recognised in the recent Fitness Check of EU water policy.
- Many Member States have different institutional arrangements for soil and water protection, making integrated decision making a challenge.
- Member States could integrate water and soil planning better, with combined assessments of pressures and risks (including within River Basin Management Plans) and adopting an integrated approach to measures that deliver protection to both of these environmental media.

The Issue

Soils and water (surface and ground waters) are intimately connected. The water in surface and groundwater bodies has most likely arrived there by travelling first through the soil. In doing so, substances in the soil (and indeed soil particles themselves) may transfer to the water body. This is a natural process and is important in determining the chemical nature of water bodies and the ecosystems they can support.

When humans interact with soils, this can then have consequences for water bodies – for example, as a consequence of chemicals introduced to soils or run-off of sediments. A range of agriculture, construction and other development activities in rural and urban areas may contribute to this.

As a result, if one wants to protect water bodies, one needs to consider the activities that are affecting soils. In some cases, chemicals introduced to soils (e.g. fertilisers or pesticides) may also have negative impacts on soils themselves (e.g. their biological communities) as well as on receiving waters[1].

Therefore, there is not only a chemical and biological connection between soils and waters but also a practical policy connection. Measures to protect waters will also affect the protection of soils (and vice versa). This raises the question of whether those policies are sufficiently joined-up and whether there are gaps in the suite of policies that are in place.

Soil as a pollutant

Soil itself can be a serious water pollution problem. If it enters a water body, the soil particles may remain (at least for a short time) suspended in the water column and so restrict light penetration to algae and other plants. More commonly, soil entering water bodies deposits within the water body, onto plants and substrates. Plants may become smothered and may lose their attractiveness as sites for epiphytes to grow and animals to congregate in. Soil particles covering substrates may cause serious damage to fish spawning grounds, such as loss of clean, highly aerated gravel.

Soil entering water bodies may also introduce chemical pollution to the water column. Soil particles may have nutrients such as phosphorus bound to them, as well as harmful chemicals such as pesticides. Thus, the introduction of soils to waters may have a double pollution action[2].

In some cases, the introduction of soils into water bodies is a natural event and the introduction of sediments and nutrients is an important part of natural ecosystem functioning. However, in other cases, it is driven by human activity (ploughing of arable fields, trampling of riverbanks by cattle, forestry activities, construction works, transport on unpaved roads, etc.). In many of these cases the loss of soil through erosion is itself undesirable (e.g. for a farmer), so again there is a double impact.

Thus, understanding soil erosion is critical for water managers. Effective controls on

[1] European Commission (2012). A Blueprint to Safeguard Europe's Water Resources. COM(2012)673. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0673

[2] Farmer, A.M. (2018). Phosphorus as a global pollutant problem. In: Phosphorus: Polluter and Resource of the Future - Removal and Recovery from Wastewater, edited by Christian Schaum. International Water Association Publishing.

erosion, which is not natural, is important both for water protection, for effective maintenance of soils and for economic activities that depend upon them.

Soil as a pathway for water pollution

The challenge for water managers is to address the pressures on water bodies. Many of these pressures occur directly within the water body (fishing, dredging, discharge from a sewage outfall, abstraction, etc.). However, other pressures occur on water moving through soils and rocks before it enters a water body. During this process, the water may attract dissolved nutrients and toxic chemicals, leading to pollution of surface and groundwater bodies.

Many pollutants of concern for water protection are first emitted to soils and it is from those soils that they enter the water bodies. For agricultural soils, most of these pollutants are deliberately applied – either fertilisers that become nutrient pollutants in water bodies or pesticides which may continue their biocidal actions in water bodies (and remain a risk to human health in water abstracted for drinking water). For urban soils, some pollutants are deliberately applied (e.g. pesticides), but many others arise from industrial activity, waste sites, run-off from roads, etc.

The list of pollutants that may be transmitted to water bodies via soils is large – nutrients, toxic organic and inorganic chemicals, endocrine disrupters, microplastics, acidifying substances, etc. These pollutants may affect many different aspects of biological functions in water bodies as well as pose risks to people exposed to these substances. Some of these impacts will also occur in soils, such as toxic effects on soil invertebrates which also impact invertebrates in water bodies. Some substances will affect soil structure and, as a result, function. Thus, some pollutants have similar impacts in soils and waters, while others have impacts relatively unique to soils or waters.

Soil sealing affects the way that water is transported across surfaces. Where sealed surfaces are fully sealed, further diffuse contamination of the sealed soils is prevented. However, the changed water movements may affect contamination patterns of surface waters. This is particularly the case for water movement during heavy rain events, causing significant pulses of pollutants to water bodies, which sewer systems often cannot cope with (hence the use of combined sewer overflows). As a result, methods that allow ingress of floodwaters to soils to reduce flooding and pollution inputs to water bodies are important elements of water management. However, they would not address the immediate problems of contamination of the soils themselves.

EU water law

There is a sizeable body of EU water law. What exactly constitutes "water" law is not always clear and has certainly varied over the last forty years. Today, the main law is the 2000 Water Framework Directive[3]. This covers most water bodies, sets comprehensive objectives for biological, chemical, hydromorphological and

[3] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

quantitative characteristics of waters and establishes a management framework to deliver these. Alongside this are directives that establish particular standards (for priority substances and groundwater), directives on particular pollutant sources (nitrogen in agriculture and sewage sources) and others such as on flood management or the proposed new regulation on water reuse. There is also legislation controlling pesticides and the quality of sewage sludge applied to soils. More widely, one could include directives such as the Industrial Emissions Directive[4] (which partly developed from old water law and specifically protects waters and soils), but this is usually not viewed as part of EU water law.

Overall, it is clear that there is now a comprehensive body of EU water law[5]. *Figure 1* presents examples of how these different items of legislation may impact on soils. In many cases, the legislation controls pollutant inputs. Sometimes the aim is to meet a particular water quality objective, in others to reduce inputs from a source (without reference to a specific standard). The Floods Directive[6] is different in that the decisions made to prevent or reduce flood risks may impact on soils and waters. Allowing floodwaters to stay on farmland may waterlog soils. Decisions on urban flood management may affect levels of soil sealing. The Water Framework Directive is more comprehensive and measures adopted to address pressures that prevent the achievement of its objectives may also impact on soils (not only pollutant inputs but reducing soil losses through erosion, etc.).

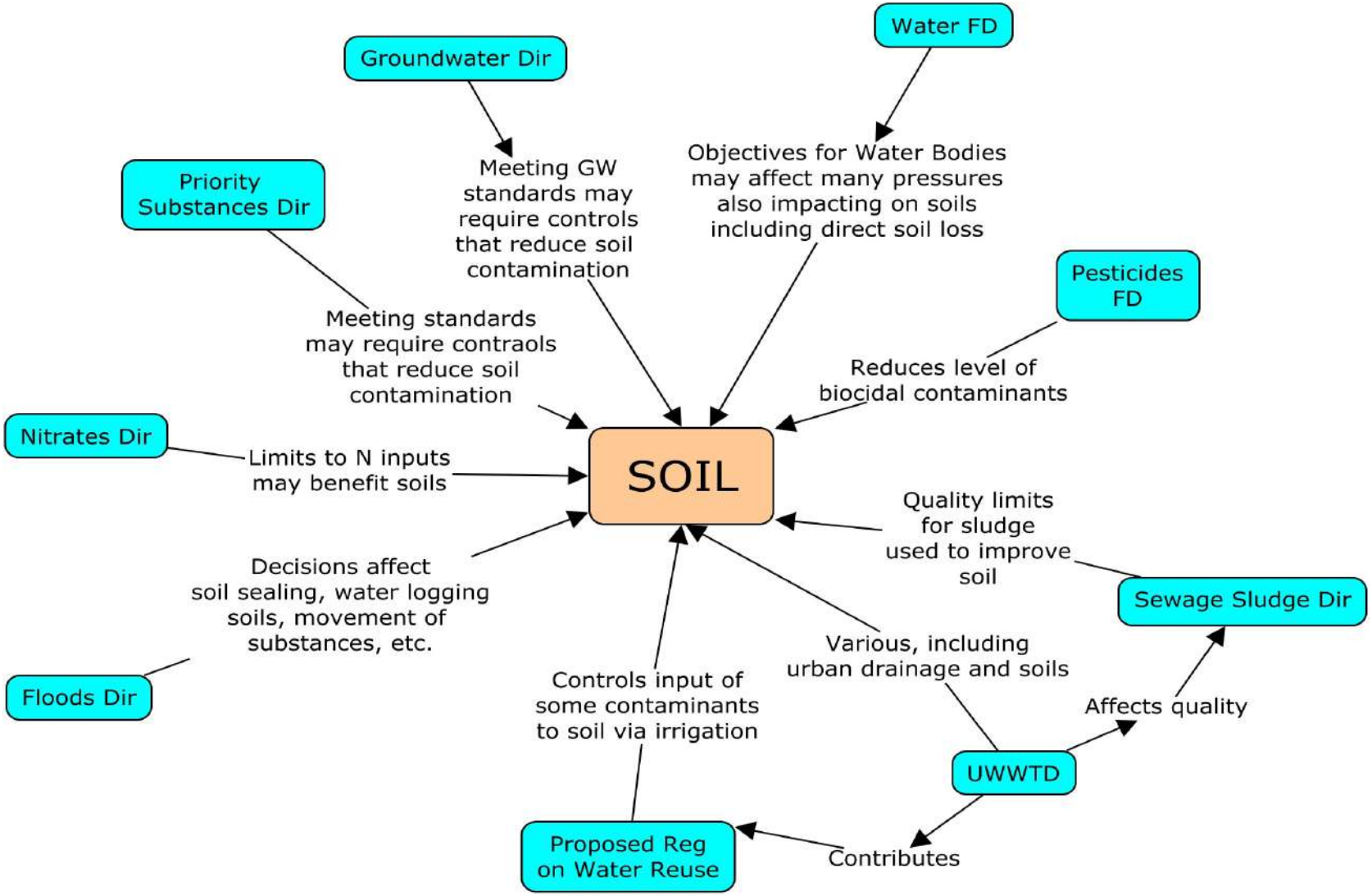
EU water law does not require actions to be taken to protect soils in themselves. However, where soils or pollutants in soils are a risk to meeting EU water objectives, EU law does require these to be addressed. In most cases, the choice of actions to take is up to the Member State (indeed the local water manager). The legal minimum is to act to protect water, but the choice of measures could bring in wider objectives, including those for soil protection

[4] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075

[5] Farmer, A.M. (2012) Editor. *The Manual of EU Environmental Policy*, Earthscan.

[6] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

Figure 1*:* Examples of the types of impacts EU water policy can have on soils



Integrating soils management within water management

The EU WFD requires an integrated approach to water management and is an expression of the global concept of "integrated water resources management". The WFD management focus is on River Basins (and sub-divisions of these). It requires objectives to be set for the surface and groundwater bodies in the River Basins (based on objectives set out in the WFD and other EU law).

Where these objectives are not being met, the WFD requires the pressures causing these failures to be assessed and measures adopted to address them. Accompanying these actions is a requirement to monitor water status and pressures to assess progress and effectiveness of measures.

It is clear that this approach to water management integrates water bodies and the land areas which form the catchments feeding into those water bodies. Some pressures occur in the water bodies themselves, but most start on the land – whether urban or rural.

Further, in many cases, those pressures from the land are transmitted to water bodies through the soils in the respective catchments. Thus, adopting measures to tackle a pressure in a water body under EU law may well require to tackle a pressure affecting the soil.

There are important caveats to be clear upon:

- Not every pressure affecting soils necessarily results in a pressure on water bodies (or a pressure sufficient to threaten the achievement of a legal obligation for those water bodies).
- The extent to which a pressure causes damage to soils may be different to the extent to which it causes damage to water bodies. Therefore, a measure might be sufficient to reduce the pressure in a water body to the necessary targets, but it might only partially address the pressure in the soil.

The WFD does not require any soil protection objectives to be integrated into its management framework. However, its management framework is flexible and not restrictive.

Indeed, EU law, for example, does not require the integration of River Basin Management Plans (RBMPs) under the WFD and Flood Risk Management Plans under the Floods Directive, but Member States are encouraged to do this. Similarly, where needed Member States should develop Drought Management Plans – again there is no obligation to integrate these into RBMPs, but Member States are encouraged to do this.

On water management, many Member States have integrated different aspects of water management within their river basin management processes for the WFD as needed at Member State level. This makes practical sense and enables Member States to build on the traditions and structures for water management that have developed over many years before the adoption of EU law.

The extent to which Member States have integrated soil issues within RBMP development and implementation is not well understood. There are examples of specific agricultural or contaminated land diffuse pollution being taken into account, but these

examples tend to be about addressing pressures on water bodies rather than an integrated approach to soil protection alongside water protection.

Institutional challenges

Integrating soil and water management is often an institutional challenge. At a basic level, responsibilities for agricultural soil protection are almost always within agricultural ministries (and respective agencies) in the EU Member States. If there are responsibilities specifically for the protection of soils in urban areas, these may be in different ministries – sometimes environment, but also local government, interior, planning, etc. Responsibilities for water management may be elsewhere[7].

At a ministerial level, in some Member States (e.g. Austria, Cyprus, Denmark, UK) the same ministry may be responsible for agriculture (including agricultural soils) and water management. In most, they are under separate ministries. However, even where there is a common ministerial responsibility, the agencies under that ministry may separate agricultural and water management delivery (e.g. in the UK). For urban soils, it is difficult to determine what division there may be. Even in countries such as Slovenia where environment and spatial planning are combined, this does not mean that decisions on urban soil sealing are integrated.

Further, simply looking at ministerial responsibility at the national level is insufficient. In some cases (e.g. France), there is a strong devolution of water management responsibility to the river basin authorities. In others (e.g. Germany), there is strong devolution of responsibilities for agriculture and water to regional structures (where integration may, or may not, take place).

For urban areas, decisions are usually devolved to the municipal level. If there is national direction on soils, then municipal decisions may need to reflect this, but it is unclear how strong a driver this is. In such cases, local water managers and municipal authorities would need to co-operate.

Integrating soil and water management is not a single decision or an individual institutional arrangement. It covers a range of different processes:

- Shared understanding and analysis: a prerequisite to most institutional collaborations is that there is some common understanding of the problems being examined. For soils and water, this may be a simple as ensuring common datasets are used, the same models are utilised, etc. This is different from agreeing on objectives (see below). It is first important that there is the same understanding of issues such as nitrogen surplus, etc.

- Framing the questions: building on this shared analytical basis, it is important to develop a common framework of the questions/issues to be considered. Of course, some are unique to water or soil, but many overlap the two areas.

- Setting objectives: from this, objectives for soils and water protection can be developed. In many cases, the objectives

[7] See: European Commission (2019). The fifth Water Framework Directive Implementation Report – assessment of the second River Basin Management Plans and the first Floods Directive Implementation Report – assessment of the first Flood Risk Management Plans (2019), including individual Member State reports. https://ec.europa.eu/environment/water/water-framework/impl_reports.htm

for soils and waters may be different. But they will concern the same issue, such as how much nitrogen or phosphorus input is ideal or what level of erosion is sustainable. For some areas (particularly water) the legal basis for objectives (e.g. EU law) may be stronger than others, this needs to be understood by all. But it is still important to bring all objectives together as this leads to a common choice of action, to be most effective and efficient.

- Prioritisation: within the setting of objectives there may be a need for prioritisation. This can be an area where friction arises as views of what is most important will vary, especially where the legal basis for objectives is different. This is why ensuring common understanding at an early stage can help in building the foundation and trust for the right prioritisation for optimum protection of soils and waters.

- Stakeholder engagement processes: stakeholders responsible for, or having an interest in, soils will likely have interests in water protection (or water authorities may have an interest in them). Where stakeholder consultation occurs, it is important to integrate this as far as possible. Not only does this deliver clearer communication to the stakeholders, but it can also enhance buy-in to the objectives. For example, discussions with farmers about what needs to be done to protect water bodies may seem to be about the farmers having costs to meet something which is not of their direct interest. However, if those actions are seen to be part of soil protection as well, then the farmers may see a direct benefit to themselves.

- Selecting measures: with confirmed analysis, objectives and discussion with stakeholders, it is important to integrate the measures to be adopted to meet the agreed objectives. Many measures will deliver benefits to both soils and water and it is important that the extent and timing of those measures maximise the benefits to both. There may be some legal constraints affecting this decision, but as far as is possible integration should be sought.

- Monitoring and evaluation: it is always important to monitor the environment and pressures on it to determine if measures are working or what else might need to be done. The WFD, for example, has a detailed monitoring framework to be established (which in its monitoring of pressures means that such monitoring is not necessarily limited to water bodies). Monitoring tends to be a costly burden on authorities. Therefore, integrating soil and water monitoring not only will ensure shared data and knowledge to support the shared understanding and analysis, but it will also lead to efficiencies and the potential for cost savings.

The Fitness Check of EU Water Policy

The 2019 Fitness Check[8] noted that "water protection policies are playing an important role in protecting Europe's soils". However, it also made clear that "there is no specific requirement in water quality legislation (e.g. in the WFD) to remediate or protect soils in

[8] European Commission (2019). Fitness Check of the Water Framework Directive and the Floods Directive. SWD(2019) 439. https://ec.europa.eu/environment/water/fitness_check_of_the_eu_water_legislation/documents/Water%20Fitness%20Check%20-%20SWD(2019)439%20-%20web.pdf

situ". As a result, the protection of soils through the application of EU water law may occur because actions to protect water bodies result also in the protection of soils. The Fitness Check highlighted that WFD Art. 5 requires soil protection aspects and the possible impact of soil degradation as a pressure on water quality "to be taken into account" in the characterisation of river basin districts. However, characterisation is not the same as choosing measures.

The Fitness Check does stress the importance of addressing soil loss from agricultural and forestry practices where sedimentation affects water quality and hydromorphology and wider soil actions are needed to reduce contamination leading to water pollution.

However, this is concerned with the protection of water bodies rather than directed at soil protection itself. Indeed, concerning soil protection policies, the Fitness Check refers to the 2006 Soil Thematic Strategy[9] of the 6th EAP[10] and the 2004 Environmental Liability Directive[11]. These policies do not provide a comprehensive approach to soil protection.

Interestingly, the Fitness Check does not discuss opportunities for wider integrated environmental management in catchments, linking River Basin Management Plans with wider soil protection plans, etc.

Such approaches are, of course, not an obligation in EU water law (or other EU law), but encouraging such good practice and integrated analysis and decision-making would benefit several different objectives of EU policy as well as lead potentially to gains at local governance levels.

[9] European Commission (2006). Thematic Strategy for Soil Protection. COM(2006)231. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0231

[10] Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32002D1600

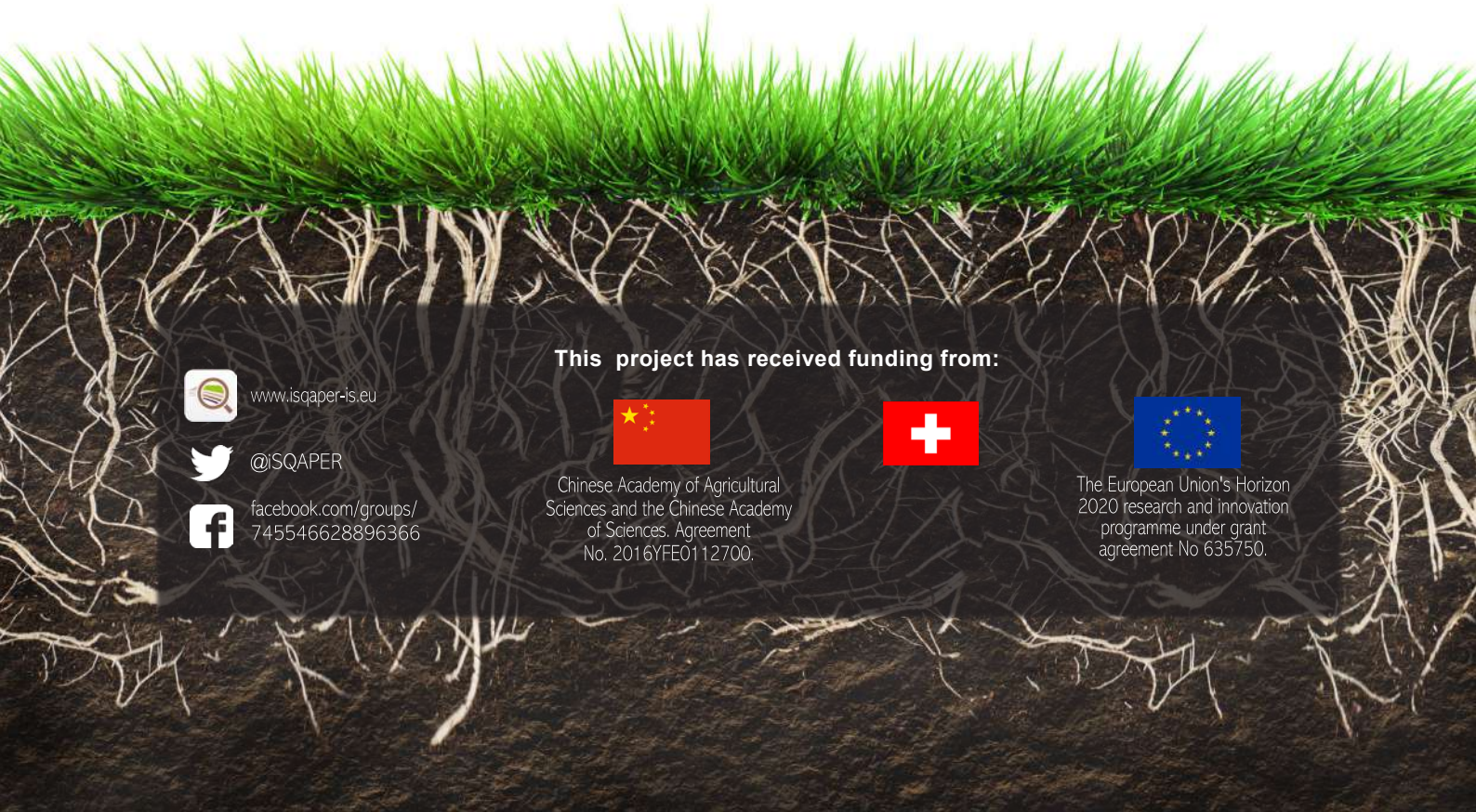
[11] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32004L0035

Conclusions

Soils and waters are intimately connected and for most water bodies it is not possible to adopt a comprehensive plan for water protection without a detailed understanding of pressures on soils, soil behaviour and movement of water through soil, together with the adoption of measures focused on soil pressures.

management procedures for soil and water protection.

This is a Member State level activity (and in many cases a catchment-level activity) and the institutional opportunities and challenges to deliver this vary. However, addressing these challenges would bring significant



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