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STATE OF EUROPEAN MARKETS 2017

Watershed Investments

Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

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TABLE OF CONTENTS

FIGURES, MAPS, TABLES, BOXES

Figures

Maps

Tables

Boxes

ACRONYMS

CAP	Common Agricultural Policy
EAFRD	European Agricultural Fund for Rural Development
ESIF	European Structural Investment Funds
EU	European Union
MS	Member States
NWRM	Natural Water Retention Measure
SWW	South West Water
USD	United States Dollars
WFD	Water Framework Directive

GLOSSARY

Bilateral agreements for watershed protection: This transaction mechanism involves a single user or beneficiary of ecosystem services compensating one or more parties for activities that maintain or enhance ecosystem services delivery to the payer.

Buyers: The actors who pay for watershed services in a transaction. Buyers may act on their own behalf or in the public interest.

Co-benefits: Additional environmental, social, or other benefits arising from a watershed investment project and quantified based on metrics or indicators defined by the project developer, a co-benefits certification programme, or third-party project standard accounting for both watershed services and co-benefits.

Collective action: Collective action for watershed management refers to voluntary cooperation among various stakeholders in a watershed, where multiple actors from the public, private, and/or civil society sectors self-organise to address water resources management through information-sharing, joint decision-making, and other coordinated activities. Typically, these partners are united by common challenges or goals and recognise that collective action will deliver better outcomes than unilateral action by any one actor.

Collective action fund/Water fund: Collective action funds are collective action partnerships that include a cooperative funding element in order to maintain, restore, or create green infrastructure in the watershed. Partners contribute financial and/or in-kind support to watershed protection activities, which are typically designed and implemented in consultation with the group. Collective action funds may establish an endowment or trust fund to manage contributions, as in the case of a number of “water funds” in Latin America and the Caribbean; or they may use other systems for administering funds or operate on the principle of matching funds (where partners coordinate investments but resources are never actually pooled).

Compliance markets: Ecosystem services markets whose buyers participate in them in order to meet regulatory obligations.

Credit: A defined unit of environmental goods or services that can be applied toward compliance with a permit, held, traded, sold or retired. Credits may be measured in terms of mass, area, functional units, or other assessment

methods. In water quality trading markets a credit represents the quantity of a pollutant reduced over a specified time period that is in excess of the required reduction for a certain source.

Ecosystem market: Any programme or platform that facilitates transactions between buyers and sellers who exchange financial compensation for ecosystem assets or practices that restore, enhance, or protect ecosystem services. Markets are organised around specific asset types; ecosystem assets or credits are typically not fungible across markets.

Ecosystem services: The benefits nature provides to human society, such as reliable flows of clean water, timber products, pollination of crops, or cultural values associated with a specific place.

Green infrastructure: Green infrastructure restores, maintains, or mimics natural hydrological processes through natural and semi-natural features and practices. Green infrastructure may be implemented at the site scale or as part of a landscape-scale network. Within urban areas, the term often is used to refer to specific low-impact or green urban design elements/practices, such as the use of bioswales or tree plantings to manage stormwater. However, in this report we use the term more broadly as defined above.

High Nature Value farming: Farming practices based on traditional low-intensity agricultural systems that include semi-natural areas and features such as pastures, meadows, orchards, and hedges. High Nature Value farming aims to provide ecological connectivity and a mosaic of habitat types on the landscape, as well as ecosystem services such as hydrological filtration and carbon storage.

Interventions: The specific land management, restoration, enhancement, or conservation activities undertaken in expectation of ecosystem services benefits or maintenance.

Offset: This term refers to a quantified environmental benefit that is designed to compensate for impacts to habitat, environmental functions, or ecosystem services. Offsets may be regulatory or voluntary. In water quality trading markets, offsets refer to pollutant load reductions that are purchased by a new or expanding facility with pollutant load discharges, to mitigate its increased discharge to an impaired waterbody.

Natura 2000: A network of nature protection areas in the European Union. Natura 2000 sites include Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive. SPAs are established by Member States themselves. SACs are selected by the European Commission from a list of sites submitted by Member States.

Programme: The overarching system that facilitates transactions between buyers and sellers, linked by a common administrator and/or market infrastructure (such as an exchange mechanism, crediting protocol, or regulatory framework). A programme can encompass many distinct projects.

Project: A site, or suite of sites, where restoration, enhancement, or other resource conservation actions are implemented for the purposes of marketing the resulting ecosystem service assets or outcomes to buyers.

Public subsidies for watershed protection: Public subsidies for watershed protection reward land managers for enhancing or protecting ecosystem services. They are funded by governments (sometimes with multilateral or donor support), acting on behalf of the public good, and typically operate at a large scale.

Replenishment: Broadly, a guiding principle for activities that aim to generate an annual volumetric benefit equal to a company's consumptive use by watershed restoration, water access and sanitation projects, irrigation efficiency improvements, and/or other interventions. Companies may commit to replenishment activities or targets in order to "balance" their water impacts.

Sellers: The actors who receive compensation or payments from buyers for interventions resulting in maintained, enhanced, or restored watershed services or specific watershed services outcomes.

Transaction: We consider “transactions” to occur at the point that offsets or other agreed deliverables are contracted, regardless of the date of delivery.

User-driven watershed investments: Investments that channel payments from water users, such as companies or water utilities acting on behalf of customers, to landholders or other parties (“sellers”) in exchange for conserving, restoring, or creating green infrastructure. Buyers may contract directly with sellers in a process known as “bilateral agreements for watershed protection,” or pay into a “collective action fund/water fund” that pools contributions for greater impact. User-driven programmes can be voluntary or a mechanism to meet regulatory compliance. Also see definitions of “Bilateral agreements for watershed protection” and “Collective action fund/Water fund.”

Voluntary markets: Markets through which firms, individuals, and organizations voluntarily buy offsets or pay for ecosystem services.

Water quality trading and offsets: Water quality trading and offsets allow water users to manage their impacts on watersheds by compensating others for offsite activities that improve water quality or supply. Compensatory activities are packaged as a credit or some other unit traded in an established “market,” defined by watershed boundaries. Trading and offsets are often compliance-driven.

Watershed investments: Any transaction between a buyer and a seller where financial value is exchanged for activities or outcomes associated with the maintenance, restoration, or enhancement of watershed services or natural areas considered important for watershed services.

Watershed services: Ecosystem services associated with hydrological functions or systems.

1. INTRODUCTION

The European Union (EU)'s Water Framework Directive (WFD) was first announced more than a decade and a half ago, in 2000. Yet its core principle–that good water resources management requires a basin-scale approach–still represents innovative, if not yet fully realized, policy.

The WFD sets ambitious targets for improving water management and water quality in EU water bodies, and for conserving ecosystems within and around those water bodies. Despite progress, Europe faces challenges in meeting those targets. Fewer than half of water bodies met the standard of "good status" by 2015 (European Environment Agency 2015). However, governments responded to this setback by strengthening policy and financing commitments. In the latest round of funding under the Common Agricultural Policy (CAP), the budget for payments to landholders who voluntarily carry out sustainable landscape management activities jumped by €2 billion (B) per year. Meanwhile, the European Commission is supporting numerous high-level projects that encourage demonstration and integration of **green infrastructure**[1] in planning and policy, demonstrating a vote of confidence in the potential of healthy landscapes to deliver clean, reliable water to European citizens.

At the same time, many of the sources of water risk are tightly linked to specific places on the landscape and local land-use patterns, and so solutions must also be found at that scale, and not just in Brussels. European communities, companies, and local government are showing growing interest in incentive mechanisms, local partnerships, and innovative approaches involving both the private and the public sector to address water risk. While funding for watershed protection continues to be led by the public sector, this report finds evidence of water users themselves–particularly utilities and the private sector–steadily increasing support for green infrastructure as well in recent years.

This report seeks to capture the scale and performance of incentives and market-based mechanisms for green infrastructure for water. It includes not only public finance for watershed health, but also local-scale initiatives driven by water users themselves to address shared water challenges. We focus specifically on **transactions** for watershed protection, where financial value is exchanged between a **buyer** and **seller** for activities or outcomes associated with the maintenance, restoration, or enhancement of **watershed services** or natural areas considered important for watershed services.[2] We use the term "**watershed investment**" in the sense of a long-term investment in an asset, just as a city would "invest" in upgrades to its wastewater treatment plant. Watershed investments may provide financial returns to the parties funding them, but more often the benefits come in the form of cleaner or more reliable water supplies, cost-savings (for example, for water service providers), or even **co-benefits** like increased incomes for farmers participating in a watershed investment **programme**.

In this report, broad trends in the size, scope, and direction of watershed investment mechanisms are presented at the European level. National-level data is also provided for a number of countries where watershed investments are prominent, along with information on policy and key trends. Several case studies are offered to highlight innovative programmes active in Europe. Readers interested in learning more about watershed investment or specific initiatives are encouraged to consult our global *State of Watershed Investment 2016* report (Bennett and Ruef 2016) and explore Ecosystem Marketplace's online programme inventory at http://www.watershedconnect.org/programs. We hope that this report provides an interesting and inspiring look at watershed investment in Europe, and lessons for how communities, government, and companies are already successfully working to address water risk through nature-based solutions.

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[1] All terms highlighted in **bold blue** text are defined in the Glossary.

[2] Direct investments in green infrastructure where no transaction between a buyer and a provider of green infrastructure takes place are excluded from this study. For example, a city planting trees along public sidewalks, while certainly a green infrastructure intervention, will not be included in this report since no incentive or payment is deployed. If that city paid private property owners to install green roofs or rain gardens, on the other hand, those activities would fall within our tracking.

2. WATERSHED INVESTMENT: THE BASICS

This report benchmarks global transactions in 2015 that delivered funding for green infrastructure for water (referred to in this report simply as "green infrastructure") from buyers who believe that restoring, enhancing, or protecting natural systems is an effective, sustainable, and (often) cost-effective way to ensure clean, reliable water supplies (Box 1).

Box 1: Benefits of Green Infrastructure for Water Supplies

Healthy landscapes support a complex network of **ecosystem services** and offer numerous benefits—like plant pollination or flood protection—each with their own unique value to ecology and economies.

Some of these services (like pollination) cannot be replaced with existing technology. In other cases, integrating nature-based and built solutions for water treatment, storage, or delivery can reduce operating costs or prolong the lifespan of built infrastructure. For example, reforesting hillsides can limit sedimentation in a hydropower station's reservoir—protecting the turbines from damage and prolonging the life of the reservoir—and also provide immediate, direct benefits for rural communities nearby in terms of soil retention, reduced flood risk, or enhanced groundwater recharge. These benefits are known as watershed services.

Other examples of watershed services provided by healthy landscapes:

Water for consumptive and non-consumptive human use	Healthy natural systems help ensure clean, reliable water for drinking, agriculture, hydropower generation, navigation, and other uses.
Aquatic productivity	Healthy aquatic habitats and the species that live in them are an important source of food and medicine. Water quality in coastal fisheries, for example, can be strongly affected by the condition of adjacent upstream watersheds. In other words, what happens on the mountain ridges—for better or worse—impacts the reefs.
Flow regulation and storm/flood buffering	Healthy forests, wetlands, grasslands, and mangroves in some cases act as natural "sponges" that absorb water—recharging groundwater supplies, reducing flood risk, and/or maintaining stream flows during dry periods.
Filtration of nutrients and contaminants	Ecosystems, including forests and wetlands, filter pollutants, improving water quality by trapping sediments and pollutants before they enter surface waters.
Erosion control and soil fertility	Healthy forests and grasslands help stabilise soils, preventing erosion and landslides. Natural areas also host critical nutrient cycling, maintaining soil health and productivity.

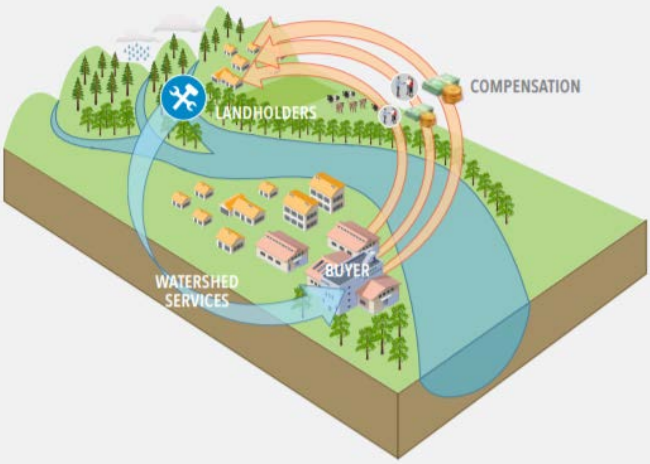
Market Mechanisms for Green Infrastructure

All mechanisms covered in this report originate with a water service provider, government, business, or other party that attaches value to a watershed service, or set of services, and agrees to compensate providers of the service(s) accordingly. For example, a beverage company might be willing to pay local farmers €100,000 per year to reduce pesticide use, if on-site treatment of polluted water would otherwise cost €150,000 per year. In this scenario, an individual farmer might be willing to curtail his or her pesticide use for €5,000 per year, assuming that this amount would cover the costs of switching to organic methods or otherwise compensate him or her for foregone income.

This is only one example. In practice, the nature of payments varies according to a buyer's specific goals and the political, social, economic, geographic, and environmental context (Figure 1). Many governments elect to pay subsidies to farmers or other landholders for watershed protection. One business may decide to partner directly with landholders located near its water source, while another may prefer to contribute to a watershed restoration fund that handles the land management decisions. Some programme types require fairly sophisticated regulatory frameworks and institutional capacity (such as trading and **offsets**).

Figure 1: Mechanisms Tracked in This Report

Public subsidies for watershed protection reward land managers for enhancing or protecting ecosystem services. They are funded by governments (sometimes with multilateral or donor support), acting on behalf of the public good, and typically operate at a large scale.



User-driven watershed investments channel payments from water users, such as companies or water utilities acting on behalf of customers, to landholders or other parties ("sellers") in exchange for conserving, restoring, or creating green infrastructure. Buyers may contract directly with sellers in a process known as **bilateral agreements for watershed protection** or pay into a **collective action fund/water fund** that pools contributions for greater impact. User-driven programmes can be **voluntary** or a mechanism to meet regulatory **compliance**.

Water quality trading and offsets allow water users to manage their impacts on watersheds by compensating others for offsite activities that improve water quality or supply. Compensatory activities are packaged as a **credit** or some other unit traded in an established "market," defined by watershed boundaries. Trading and offsets are often compliance-driven.

In contrast to other **ecosystem market** mechanisms tracked by Ecosystem Marketplace, there is no real "market" for green infrastructure; there is no single established platform where a buyer can go to directly finance

interventions that deliver services like aquifer recharge or floodwater storage. There is rarely a market-determined price for watershed services. Even the unit of delivery varies: buyers might pay for hectares of land sustainably managed or kilograms of pollution kept out of water bodies.

Hydrological benefits from green infrastructure are highly localized. Thus, transactions often are local, too. This contrasts with markets for greenhouse gas emissions reductions where transactions and climate benefits span the globe and are based on the exchange of a clearly defined and universally accepted unit (one tonne of carbon dioxide equivalent). In contrast, contracts for green infrastructure services and the basis of payment can vary tremendously.

Green Infrastructure and Water Systems

However, common to most watershed programmes tracked in this report is the recognition that natural systems can complement or substitute for “grey” (i.e., built or “hard”) infrastructure. Forests or wetlands, for example, can filter out water pollution, regulate stream flows, recharge aquifers, and absorb flooding, thus limiting the need for hard infrastructure to perform these functions. For example, a green-grey hybrid infrastructure approach for a coastal city facing flood risks might include the following defences: wetland restoration on the periphery of urban areas, bioswales or permeable pavements within the city itself to naturally absorb floodwaters, upgrades to constructed seawalls to buffer surges, and wastewater infrastructure in order to minimise sewer overflows in the event of a flood event.

These green-grey infrastructure hybrids incorporate modern technology with practices from watershed management, low-impact development, and even ancient technologies for treating, storing, and moving water across the landscape (Figure 2). Hybrid and green infrastructure solutions can often be implemented at lower cost and in incremental fashion, delaying large upfront capital costs. Green infrastructure can also improve the functioning of built infrastructure, helping society to fully capture or exceed the expected returns on infrastructure investments. Cities and communities often face complex, interlinked water resource challenges with respect to land use in their surrounding areas. For example, new energy development or growing demand for water-intensive crops such as almonds can conflict with drinking water needs. Watershed-scale approaches can help manage such challenges and trade-offs holistically.

Figure 2: The Green-Grey Infrastructure Spectrum

3. SCOPE AND METHODOLOGY

This report summarises data on watershed investments in Europe drawing from two primary sources: data from Forest Trends' Ecosystem Marketplace's 2016 survey of programme administrators on watershed investments in 2014 and 2015, and agri-environmental subsidy data on European Structural Investment Funds (ESIF) obtained from the System for Fund Management for the EU.

Ecosystem Marketplace gathers data through a global survey of administrators of watershed investment programmes; ongoing tracking through programme reports, donor reports and databases, statistical yearbooks, credit ledgers; credit registries; and interviews with programme administrators and market intermediaries. The survey, which gathered data on activity in 2014 and 2015, was available online and disseminated via personal contacts and Ecosystem Marketplace newsletters and announcements from March 28 until June 1, 2016. Our scope included both EU and non-EU European countries.

A total of 40 European programmes were identified: 34 were in an active or pilot/demonstration stage, four were inactive, and two were in development and not yet transacting. Eighteen programmes responded directly to the survey. In other cases, Ecosystem Marketplace staff compiled programme profiles based on previous years' survey responses or desk research and provided programme contacts with an opportunity to review and correct data. Where programme activity could not confirmed, programmes were not included in the dataset informing this report. All transaction data was collected in US dollars (USD) and converted to Euros at a rate of EUR0.89775:USD1.00. Transaction data is non-adjusted for inflation.

ESIF data on came from two primary databases: ESIF Finance Details, which summarises ESIF financing (EU and National amounts) by country, operational programme, priority axis, thematic objective, category of region, and measure (where available); and ESIF Achievement Details, which summarises ESIF achievements by country, operational programme, priority axis, thematic objective, and investment priority (where available). These datasets are updated regularly; readers should note that a more recent version of the data became available in July 2016, and thus numbers on EU public finance for watershed protection are slightly different than those reported in our global *State of Watershed Investment 2016* report (which relied on a dataset published in November 2015). This is because financial allocations may change over time due to transfers between themes or between funds. We apologise for any confusion on this matter but in the interests of accuracy have opted to use the new ESIF dataset. The new ESIF Achievements Details dataset also contains data on activities implemented through the end of 2015, which are included in this report.

4. MARKET OVERVIEW

Table 1: Mechanisms Tracked in This Report: Value, Area under Management, and Number of Operational Programmes in 2015				
	Total Value, All Programmes	**Total Area, All Programmes**	**Median Programme Value**	**Median Programme Area**
Public subsidies for watershed protection	€5,668M	12.8M ha	€77.6M	417,020 ha
User-driven watershed investments	€39.4M	0.6M ha	€0.8M	3,500 ha
Water quality trading/offsets	*n/a*	*n/a*	*n/a*	*n/a*
TOTAL	€5,708M	13.4M ha	-	-

Notes: Data are not reported for water quality trading and offsets programmes in this table. Ecosystem Marketplace requires a minimum of three data points to report figures publicly in order to protect respondents' confidentiality. Data was only collected for two programmes in the water quality trading and offsets mechanism category in 2015.

In 2015, an estimated €5.7B in payments for watershed protection flowed to landowners and public land managers on 13.4 million (M) hectares (ha) of land in Europe (Table 1).

Nearly all value (€5.668B or >99% of total transactions) associated with watershed investment in Europe in 2015 was public finance. Public subsidies for watershed protection, mainly agri-environmental contracts for sustainable landscape and water management funded under the CAP's Pillar II, averages €5.5B a year for the 2014-2020 period.

But in some cases, water users themselves also directly funded watershed protection incentives, driven by growing water risks and stricter regulation. This study documented €39.4M in user-driven watershed investments in 2015. These initiatives were generally much smaller in scale than public subsidy programmes (Table 1) and were motivated by specific local water concerns. Typically user-driven investment took the form of direct contracts between landholders and water users, or contributions from water users to a collective action fund (see the "Watershed Investment: The Basics" chapter on page 2 for more information on these mechanisms).

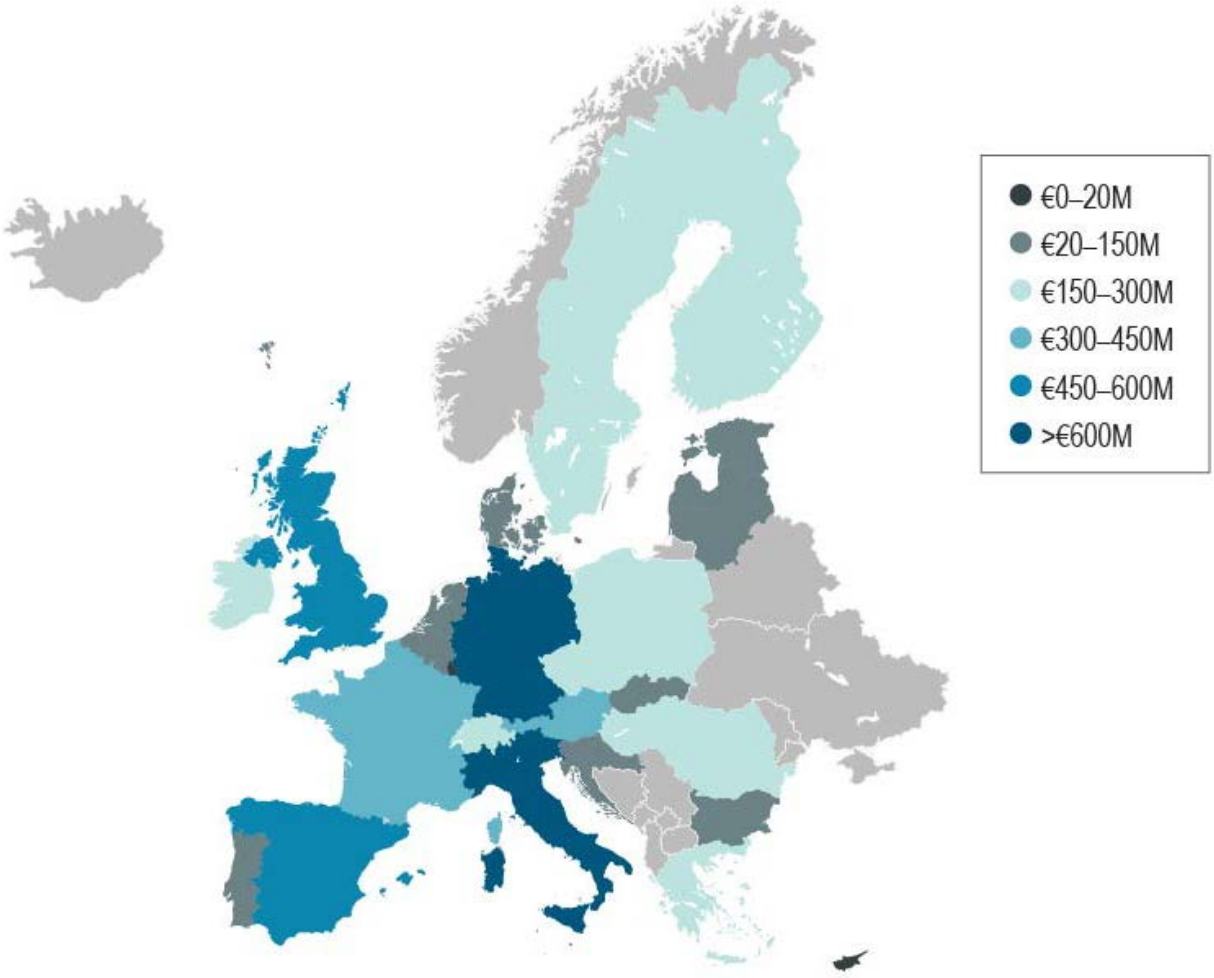
Finally, two cases in the United Kingdom and Germany involved local public water service providers who used a water quality offsetting mechanism to meet water quality standards and manage risk in the watershed. Water quality offsets are a relatively new mechanism in Europe.

Virtually all of the watershed protection finance that we tracked targeted private landowners: 12.9M ha reported under watershed management in 2015 were privately owned, compared to slightly more than 42,000 hectares of public lands.[3]

[3] Based on 12,950,344 ha for which ownership type was reported.

5. MECHANISMS: PUBLIC SUBSIDIES

Map 1: Public Subsidies for Watershed Protection in 2015: Countries by Value and Area under Management



The primary source of public incentives for land management that supports watershed health is the European Agricultural Fund for Rural Development (Box 2). The EAFRD is the funding mechanism for national and subnational rural development programmes implemented under Pillar II of the CAP.[4]

For the 2014-2020 period, an average of €5.5B per year is committed to restoration, conservation, and sustainable management activities that benefit watershed health under Priorities 4 and 5 of the EU rural development policy. Priority 4 sets an objective of "restoring, preserving, and enhancing ecosystems related to agriculture and forestry," while Priority 5 concerns "promoting resource efficiency and supporting the shift towards a low-carbon and climate-

[4] Farmers who receive direct payments under Pillar 1 of the CAP must comply with certain standards related to animal welfare, food safety, environmental protection, and landscape maintenance. Since these "cross-compliance" measures are mandatory, they are not included in the scope of this report.

resilient economy in agriculture, food, and forestry sectors," which includes improving water use efficiency in agriculture.[5] (See Box 3 for a detailed explanation of priorities, focus areas, and measures tracked in this report.)

Roughly €3.5B of annual rural development funds comes in the form of EU co-financing, which is matched by €2B from MS. The share of EU co-financing of national rural development budgets for 2014-2020 ranges from 26% of total national budget (Luxembourg) to 95% (Romania). The average annual national share of EU co-financing for measures tracked in this report was 65%. Landholders themselves also provide match funding for public subsidies under Pillar II of the CAP. Subsidies cover 80% of the total costs of implementation of activities, with landholders contributing the remaining 20%.

Rural development funding is implemented at the MS level. Countries establish their own targets in line with the EU rural development policy and administer their own national or subnational rural development programmes, which must be approved by the European Commission. In total there are 118 rural development programmes active for the 2014-2020 period.

Italy spends the most of any EU country on the watershed protection measures tracked in this report, with an estimated €721M committed annually, followed by Germany (€644M) and the United Kingdom (€581M). Meanwhile, the United Kingdom allocates the greatest *share* of its total rural development budget to restoring, preserving and enhancing ecosystems related to agriculture and forestry (73.1%). Overall, Priority 4 activities have been embraced across the continent. Priority 4 is accorded at least one-quarter of total national rural development budgets in all MS and accounts for 43.1% of overall EAFRD funding for 2014-2020 (European Commission 2015).

These funds aim to enrol more than 47M ha by 2020 in contracts supporting ecosystem services on agricultural lands, organic farming, land rehabilitation, and conservation of natural areas. As of the end of 2015, MS have implemented these activities on more than 12.8M ha, with the greatest progress to date reported by Austria, France, and Portugal (Figure 3).

Box 2: Watershed Approaches: The European Policy Context

EU Water Framework Directive

The EU WFD sets out a set of steps for EU Member States (MS) to reverse trends of deteriorating water quality in EU rivers, lakes, and groundwater, and to achieve "good status" in ecological and chemical terms for all EU waters. Its scope includes inland, surface, transitional, coastal and groundwater resources, as well as the ecosystems in and around water bodies. The WFD requires countries to implement management at the scale of the river basin, rather than according to political jurisdictional boundaries. Thus a number of transboundary basin districts now exist where management and planning are coordinated across national borders. The WFD also mandates that MS ensure cost-recovery in setting water prices and carry out research, monitoring, and public reporting and consultation on basins' statuses.

EU Common Agricultural Policy

Reform of the EU CAP for the 2014–2020 period included a commitment to target 30% of Pillar I direct payments to farmers for "greening" measures (including for crop diversification, grassland conservation, and designation of "ecological focus areas"). However, some environmental groups have noted that mechanisms designed to provide MS with more flexibility have resulted in loopholes and weakening of environmental measures.

This report tracks only Pillar II of the CAP, namely rural development funds associated with Priority 4 of the EU rural development policy, which support activities conducive to watershed and landscape health, and Priority 5a which is associated with agricultural water use efficiency.

[5] Regulation (EU) No 1305/2013 of the European Parliament and of the Council, Title 1, Chapter 2, Article 5 (17 December 2013).

Box 2 (continued)

EU Rural Development Policy Priorities 4 & 5

Title 1, Chapter 2, Article 5 of the European Agricultural Fund for Rural Development (EAFRD) regulation defines priorities as:

> Priority 4: Restoring, preserving, and enhancing ecosystems related to agriculture and forestry, with a focus on the following areas: (a) restoring, preserving, and enhancing biodiversity, including in **Natura 2000** areas, and in areas facing natural or other specific constraints, and **High Nature Value farming**, as well as the state of European landscapes; (b) improving water management, including fertiliser and pesticide management; and (c) preventing soil erosion and improving soil management.
>
> Priority 5: Promoting resource efficiency and supporting the shift towards a low-carbon and climate-resilient economy in agriculture, food, and forestry sectors, by: increasing efficiency in water use by agriculture.

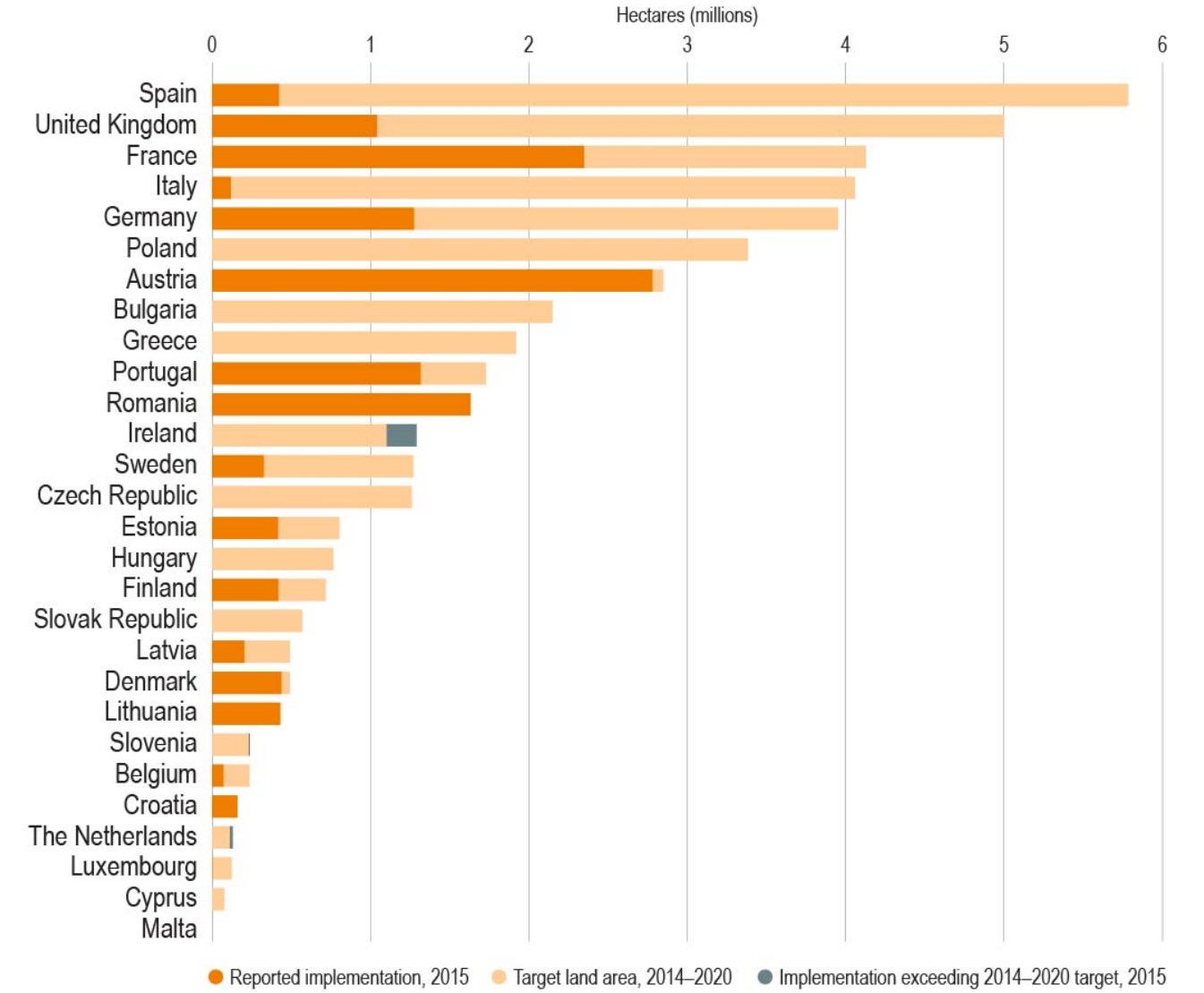
Box 3: Rural Development Programme Priorities, Focus Areas, and Measures Tracked in this Report

Focus Area	Associated Measures
Priority 4: Restoring, preserving, and enhancing ecosystems related to agriculture and forestry	
4a: Restoring, preserving, and enhancing biodiversity, including in Natura 2000 areas, and in areas facing natural or other specific constraints, and High Nature Value farming, as well as the state of European landscapes 4b: Improving water management, including fertiliser and pesticide management 4c: Preventing soil erosion and improving soil management	Measure 8: Investments in forest areas Measure 10: Agri-environment-climate payments Measure 11: Organic farming Measure 12: Natura 2000 & WFD payments Measure 15: Forest-environmental and climate services and forest conservation practices
Priority 5: Promoting resource efficiency and supporting the shift towards a low-carbon and climate-resilient economy in agriculture, food, and forestry sectors	
5a: Increasing efficiency in water use by agriculture	Measure 16: Cooperation [approaches among different actors in the Union agriculture sector, forestry sector, and food chain, and other actors that contribute to achieving the objectives and priorities of rural development policy]

Source: Regulation (EU) No 1305/2013 of the European Parliament and of the Council (17 December 2013).

Notes: Focus Area 5a is also linked to Measure 4, "Investment in physical assets," in EU rural development policy legislation. However, it is not tracked here as it is not possible to determine to what extent investment is in "green infrastructure" assets rather than built assets.

Figure 3: Rural Development Programmes for CAP II Priority 4: Land Area Targeted and Implemented to Date by Country, 2015



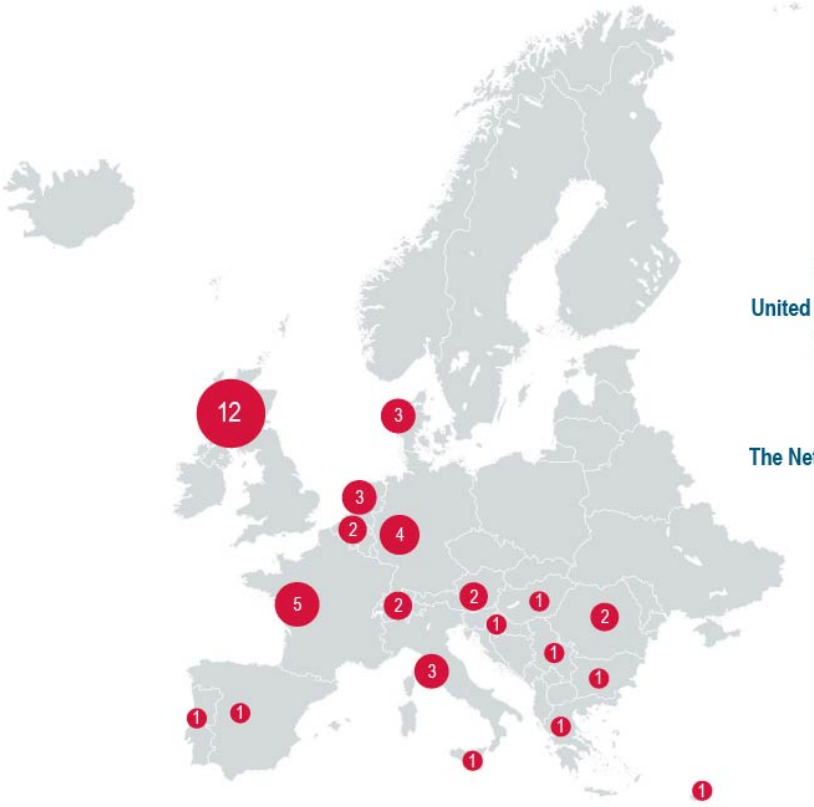
Source: ESIF Achievement Details 2016.

Notes: This figure displays progress reported by MS to the European Commission through 2015. Implementation data for 2015 was not available for Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Hungary, Lithuania, Malta, Poland, Romania, and the Slovak Republic at the time of writing this report. Meanwhile, Ireland, the Netherlands, and Slovenia have reported greater implementation figures than the original targets established in their rural development programmes.

This figure summarises hectares targeted and implemented reported by MS for the following indicators: agricultural land under management contracts supporting biodiversity and/or landscapes, organic farming, land rehabilitation (total surface area of rehabilitated land), and nature and biodiversity (surface area of habitats supported to attain a better conservation status). Progress associated with implementation of Priority 5 measures tracked in this report is not included, since it is not reported in hectares.

6. MECHANISMS: USER-DRIVEN INVESTMENTS

Map 2: User-Driven Watershed Investment Programmes by Country

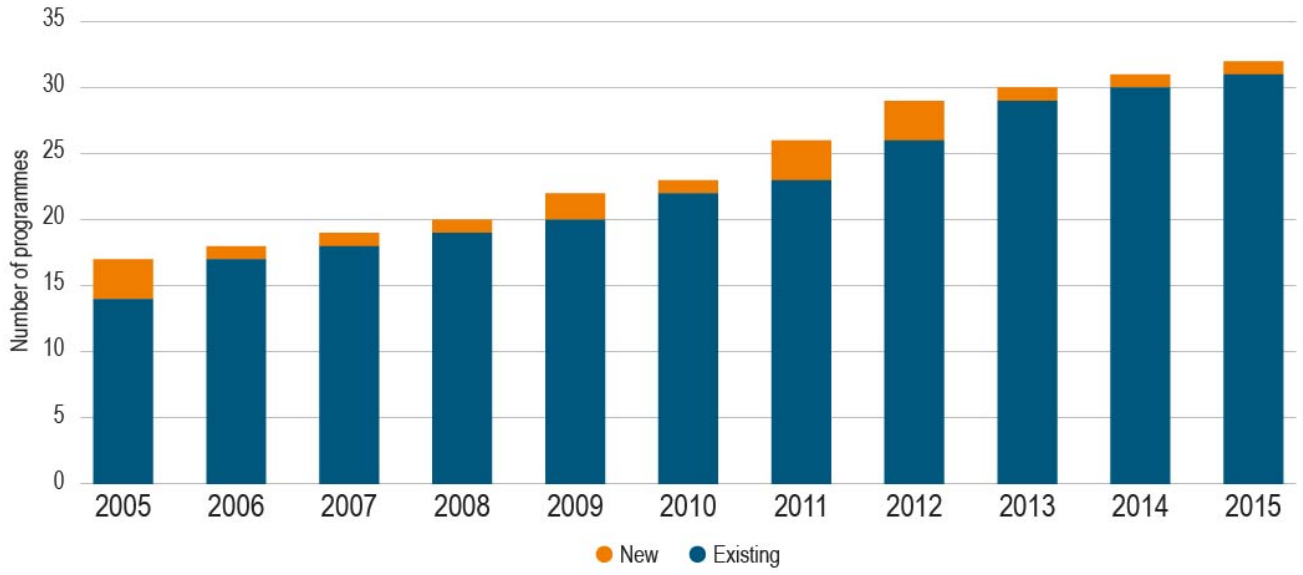


Number of programs

	Value	Total hectares
Germany	€28.4M	305,500
United Kingdom	€5.6M	98,893
Denmark	€1.8M	6,665
France	€1.5M	11,403
Italy	€0.9M	115,000
The Netherlands	n/a	7,300

Despite their smaller profile, user-driven watershed investment programmes continue to grow steadily in number reaching 34 operational programmes in 2015 (Figure 4). These programmes transacted a reported €39.4M in watershed payments in 2015. They supported watershed management on 604,400 ha, frequently focused on sustainable agriculture, grassland conservation, and forest restoration (Table 2).

Figure 4: User-Driven Watershed Investments: Cumulative Growth in Programmes by Year



Notes: Based on 32 programmes reporting mechanism and year in which programme was launched. Start year was unavailable for two programmes.

Most user-driven programmes (20 out of 34 operational in 2015, transacting a total of €36.9M) took the form of direct contracts between a single buyer of watershed services and one or more landowners. Four programmes reported using a collective action fund mechanism, pooling a total of €2.5M in funds in 2015 from multiple buyers in their watersheds.[6]

[6] For three programmes, mechanism could not be determined because the source of funds was not reported.

Table 2: Most Popular Interventions, User-Driven Watershed Investment Programmes	
Intervention	**% of Programmes (Number)**
Agricultural or pastoral sustainable management	62% (21)
Grassland conservation	50% (17)
Forest restoration or enhancement	50% (17)
Forest conservation	29% (10)
Wetland restoration or enhancement	24% (8)

Notes: Interventions are reported for total share of programmes implementing that intervention. Most programmes use a mix of interventions – thus percentages sum to greater than 100%.

Most user-driven programmes (20 out of 34 operational in 2015, transacting a total of €36.9M) took the form of direct contracts between a single buyer of watershed services and one or more landowners. Four programmes reported using a collective action fund mechanism, pooling a total of €2.5 M in funds in 2015 from multiple buyers in their watersheds. [7]

Germany led Europe in value, with a reported €28.5M in user-driven watershed payments in 2015. The United Kingdom (€5.7M), Denmark (€1.8M), and Italy (€0.9M) all hosted a number of long-running programmes as well.

Several programmes were active in multiple countries in 2015, including a multi-country effort to restore wetlands along the Danube River in Hungary, Croatia, Serbia, Romania and Bulgaria, and Austria. Initiatives funded by Coca-Cola and Nestlé Waters to protect source water areas and "**replenish**" water use impacts also spanned borders. Nestlé Waters continued to pay for watershed protection in France, Italy, and Switzerland, while Coca-Cola and its local partners supported **projects** in 2015 in Belgium, Cyprus, France, Germany, Greece, Italy, Malta, Romania, Spain, and the United Kingdom.

Programmes were typically fully financed by water users, with little reliance on grants or donations reported for 2015. Two-thirds of programmes (15) reported that they were 100% financed by revenues from buyers, which amounted to €30.4M in 2015. Another five (19%) programmes relied on a mix of buyer revenues and public loans or grants, with an average ratio of 61% buyer revenues to 39% loan/grant finance. Three programmes (11%) said they were fully dependent on public loans or grants as they worked to court potential buyers. The total reported public support for these programmes was slightly under €1M in 2015.[8]

Among programmes funded by drinking water utilities, 55% (or 6 out of 11 utilities providing detailed data on their funding sources) have an established charge or fee paid by customers that directly funds watershed protection activities. Others use a portion of the utility operating budget, or combine funds from multiple sources to finance watershed protection.

[7] For three programmes, a mechanism could not be determined as it was unclear where funding was coming from.

[8] Based on 23 operational programmes provided financing data for 2015 representing €30.1M in funding.

7. USER-DRIVEN WATERSHED INVESTMENTS: BUYERS

Private sector entities were the largest group of buyers participating in user-driven watershed investment in 2015, but in terms of value, utilities spent more than any other buyer type, accounting for more than nine out of every ten dollars transacted (Table 3).[9] The average utility contribution to user-driven programmes in 2015 was nearly €6.7M, compared to private buyers' average of €366,245 and the public sector's €121,531.

Programmes also indicated significant reliance on a single sector in 2015. If a programme engaged a private sector buyer in 2015, that buyer was on average responsible for 90% of total transaction value (Table 3). Similarly, programmes with utility funding were virtually entirely supported by utilities. Meanwhile, when public sector buyers engaged in user-driven watershed investment, they were far more likely to do so along with other buyers: the average public sector buyer in 2015 contributed 38% of total funds to its respective programme.

Table 3: User-Driven Watershed Investment Programme Buyers by Profit Status, Number of Buyers, Average Share of Value, and 2015 Value

	Number of Buyers	Average Share of Revenues per Programme	Total Value Reported in Transactions	Average Transaction per Buyer
For-profit/Private sector	26	90%	€1.8M	€366,245
Public sector/Government	20	38%	€1.3M	€121,531
Water utility (public or private)	19	98%	€33.3M	€6,662,302
ALL BUYERS	65	-	€36.4M	€1,737,122

Notes: Based on 65 buyers reported by 31 programmes representing €36.4M in user-driven watershed investment transactions (or 92% of total transactions reported).

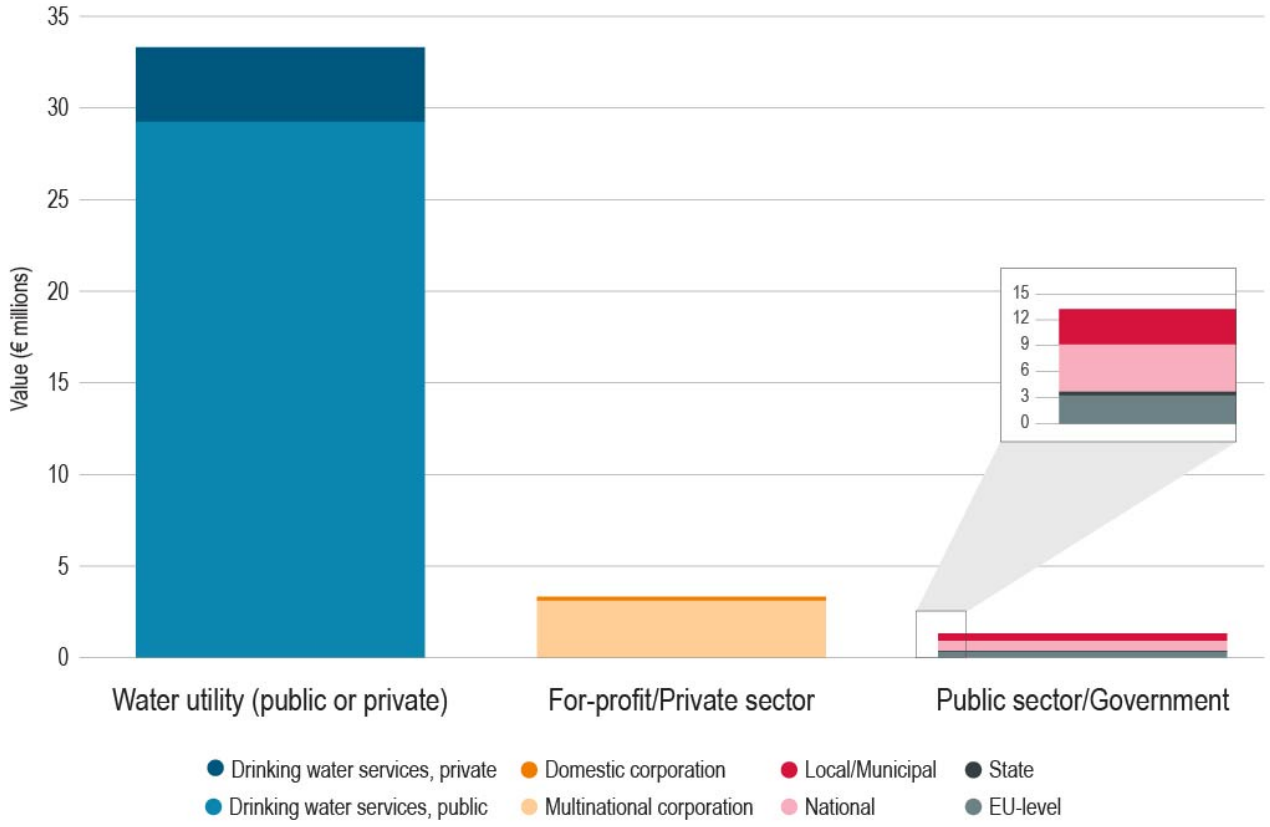
Public utilities were responsible for the largest share of utility transaction values in 2015 (Figure 5) thanks in large part to legal frameworks in Germany channelling water abstraction charges toward payment programmes for farmers voluntarily implementing groundwater protection practices.

Private sector transactions were dominated by multinational corporations in the food & beverage and consumer goods sectors (totalling €1.6M out of €1.8M in cumulative spending by companies in 2015). These sectors funded 11 different programmes across the European continent in pursuit of water stewardship and water use replenishment commitments, which sought to "balance" impacts from companies' water use in their operations and/or supply chains.

Meanwhile, public sector funding tended to come from the top: national and EU-level (non-CAP) funds accounted for most of the public contributions to user-driven watershed investments in 2015.

[9] In this report, utilities are generally treated as a distinct category from either government or private business. Utilities encompass both publicly and investor-owned water service providers, since both are typically subject to similar regulations and face similar water resource challenges.

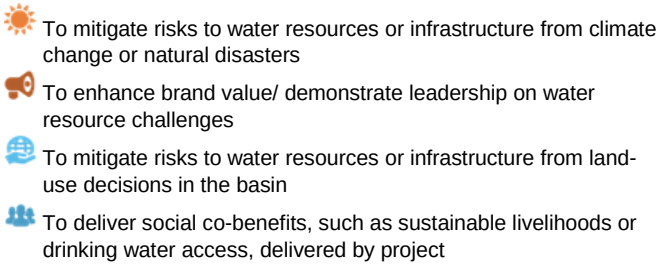
Figure 5: User-Driven Watershed Investments: Buyers by Type and Value Transacted in 2015



Buyer motives varied across sectors (Table 4). Public sector buyers were motivated by broader societal challenges like climate change and supporting rural livelihoods. On the other hand, programmes reported that private sector buyers were driven by reputational concerns, as well as the desire to manage water-related risks to their supply chains and operations. Water utilities shared these concerns about water risk, particularly when it came to land-use patterns in their basins, but also were more likely to be motivated by compliance or cost-savings opportunities.

Table 4: User-Driven Watershed Investment Programmes: Buyer Motives by Sector

Rank of motive	Public sector/ Government	For-profit/ Private Sector	Water Utility (Public or Private)
1.			
2.			
3.			

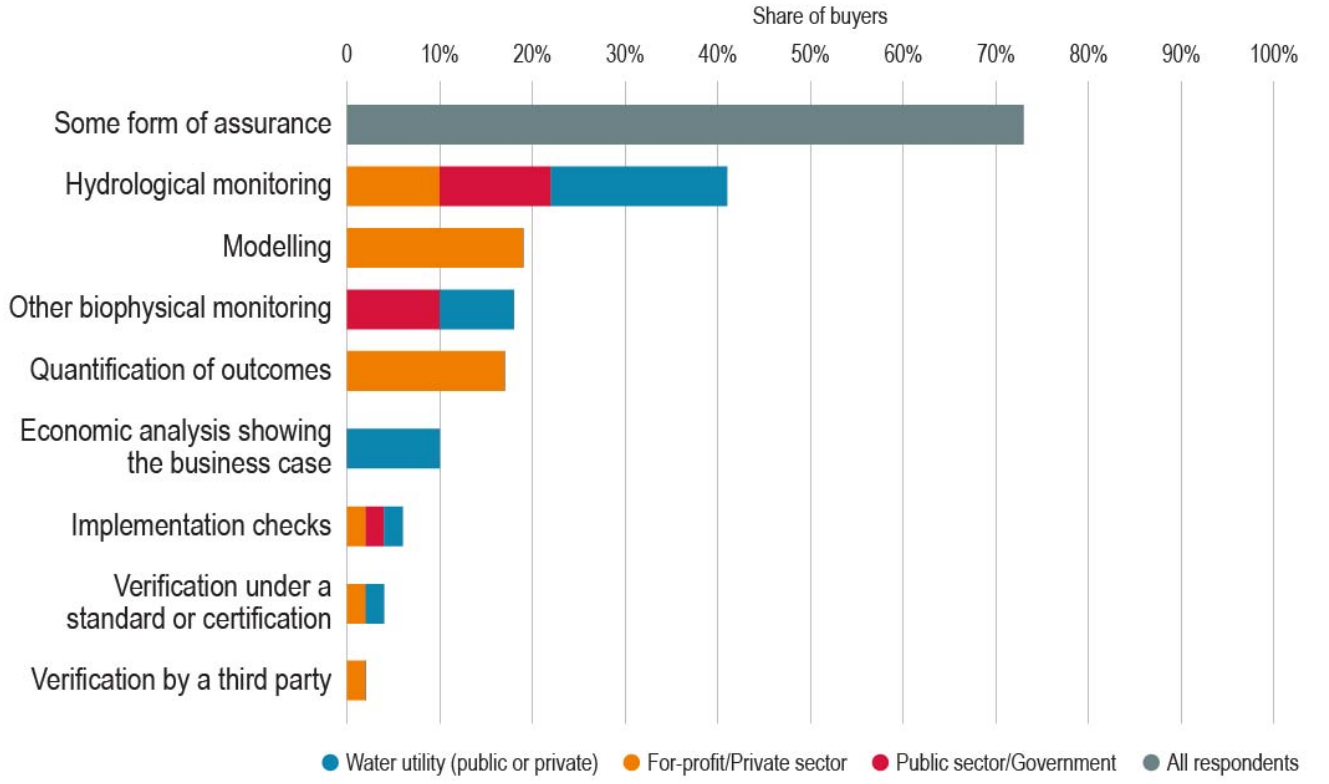


Notes: Programme administrators were asked to report on up to three key motives that each buyer had for supporting watershed investments. This figure summarises the three most commonly reported motives for each buyer group.

8. USER-DRIVEN WATERSHED INVESTMENTS: DEMONSTRATING PERFORMANCE AND ASSURANCES REQUIRED BY BUYERS

Nearly three in four buyers funding user-driven watershed investments required some form of assurance that green infrastructure interventions had been implemented or were performing as expected (Figure 6). Most often this included hydrological or other biophysical monitoring, or modelling or simple quantification of outcomes. In contrast to forest carbon markets, where more than 99% of carbon offsets transacted in 2015 used a third-party standard for project design and verification (Goldstein and Ruef 2016), we find very little use of third-party standards or certifications in the watershed investments world. Only five programmes reporting using a standard or certification, all of which were sustainable commodity certifications (e.g., organic farming, Forest Stewardship Council, and Program for the Endorsement of Forest Certification) that buyers associated with positive hydrological outcomes but did not directly measure those outcomes.

Figure 6: User-Driven Watershed Investments: Assurances Required by Buyer Sector

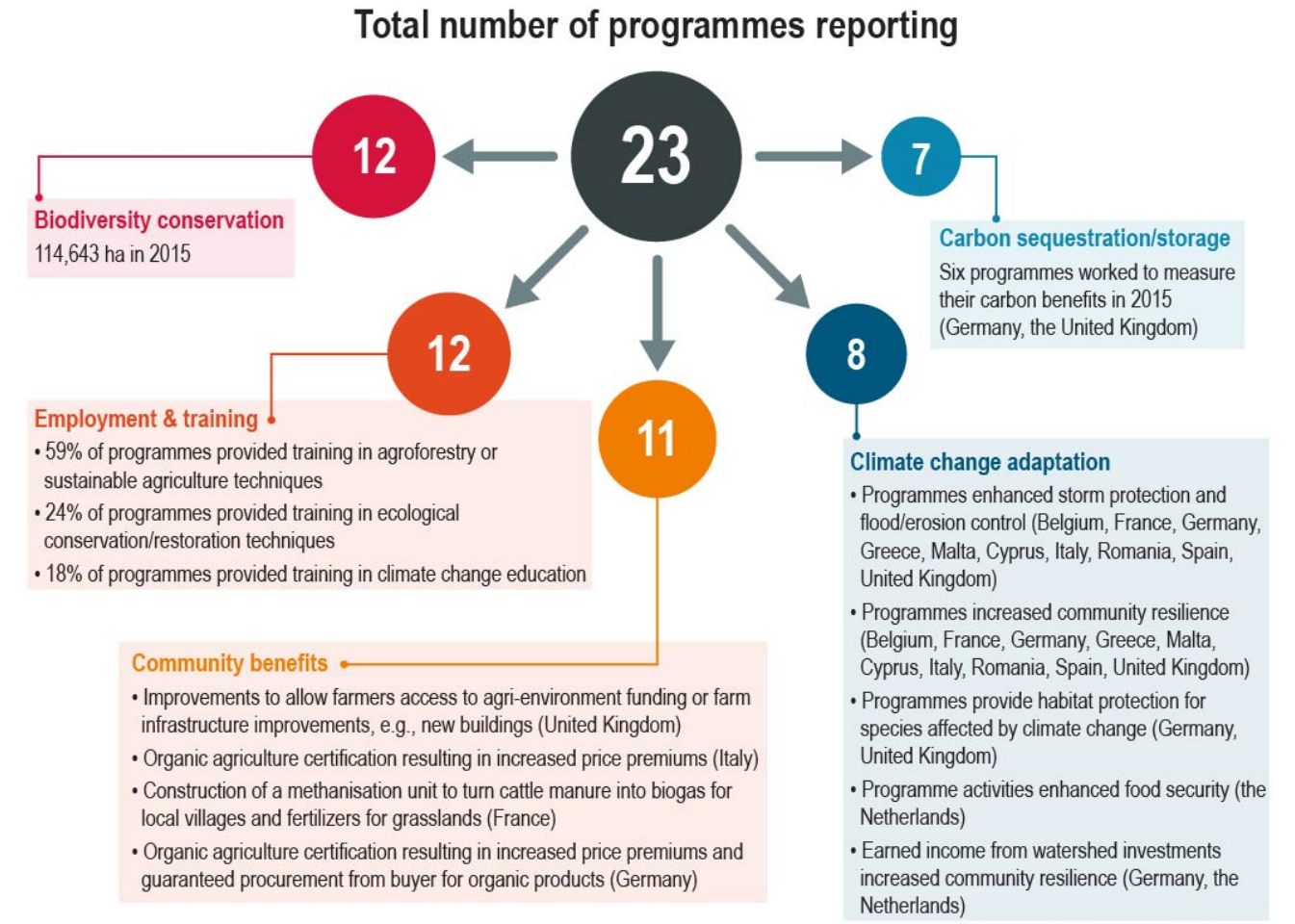


9. CO-BENEFITS: "BEYOND WATER" OUTCOMES FOR COMMUNITIES & NATURE

User-Driven Watershed Investments

Two out of three user-driven watershed investment programmes reported monitoring and/or evaluating the "beyond water" impacts of their work (Figure 7). Biodiversity benefits and employment/training opportunities for participating landholders were most frequently tracked by programmes, followed closely by benefits for communities in the watersheds where programmes were active. A smaller share also reported on outcomes of watershed investmentsin terms of climate resilience and carbon sequestration.

Figure 7: User-Driven Watershed Investment Programmes: Co-Benefits Reported in 2015



Public Subsidies for Watershed Protection

Public subsidies under Priority 4 of CAP Pillar II are by design focused on multiple ecosystem services benefits: as noted earlier, Priority 4 explicitly targets biodiversity and soil health in addition to hydrological outcomes including water management and water quality impacts from fertilizer and pesticides (see Box 3 on page 9).

Data on progress against these goals for the 2014-2020 period is for the most part still unavailable. However, some indicators provided by the European Commission are suggestive of potential impacts (European Commission 2016a). For instance, MS have set a total target under Priority 4 of 31.1M ha of agricultural lands under management contracts supporting biodiversity and/or landscapes (equalling an average of 18.7% of MS's total agricultural land area), and 35.1M ha of forest area under management contracts supporting biodiversity (or an average of 5.5% of MS's total forest areas). As of 2015, MS had reported implementation totalling 10.9M ha of agricultural lands under contracts supporting biodiversity/landscapes, and slightly less than 11.1M ha of forest area under biodiversity-friendly management contracts.

In terms of community benefits, performance data was similarly sparse at the time of this report. But MS have set a target of 572,966 farm holdings receiving advice under Priority 4 for the 2014-2020 period. With only Estonia, Finland, Italy, and the United Kingdom reporting progress for 2015 at the time of this report's publication, 6,345 farm holdings have already received advice on managing their lands in support of Priority 4 objectives.

10. COUNTRY PROFILES

This chapter complements EU- level summary data by introducing the status of watershed investment programmes in five different European countries: Germany, France, Spain, Italy, and the United Kingdom. These profiles are meant to illustrate how watershed investment mechanisms have developed in different countries and been shaped by their specific historical or legislative contexts. This chapter has been developed in coordination with contributing authors and its findings are not based on Ecosystem Marketplace's survey data; thus some information presented may differ slightly from findings presented in previous chapters of this report.[10]

10.1 Germany

Compiled by: Theresa Bodner (Department of Land, Environment, Agriculture and Forestry [TESAF], University of Padova, Italy)

In Germany, the EU Water Framework Directive has been ratified into the Federal Water Act (*Wasserhaushaltsgesetz*) with the aim of achieving good status for all water bodies, by 2027 in terms of water quality and biodiversity (BMUB 2016). Specific management plans have been introduced for the 10 national river basin districts, and a variety of instruments are being used to achieve these goals including legislative measures, water extraction and emission thresholds, and environmental agreements such as payments for watershed services (NMUEK 2015).

As agriculture has intensified since the 1980s, German water quality has steadily degraded in many water bodies, mainly due to excessive loads of fertiliser and other chemicals. Therefore, most German watershed investment schemes specifically target the protection of clean water by improving agricultural management practices. Six out of the eight active watershed investment programmes identified in Germany are led by either utilities (owned by the state, e.g., the Munich and Hannover city utilities) or local governments themselves (e.g., the Lower Saxony Cooperation mechanism) that use economic incentives to reduce diffuse pollution in agriculture while improving drinking water quality at source. Voluntary contracts and/or compensation payments for switching to less intensive agricultural practices are the most common models. One programme in Augsburg scheme is results-based rather than practice-based: it links payments to quantify of nitrate reduction achieved. Although German utilities are usually not driven by regulatory compliance to investment in their watersheds, two-thirds of those who do indicate that this form of source water protection proves to be less expensive than engineered methods of treatment.

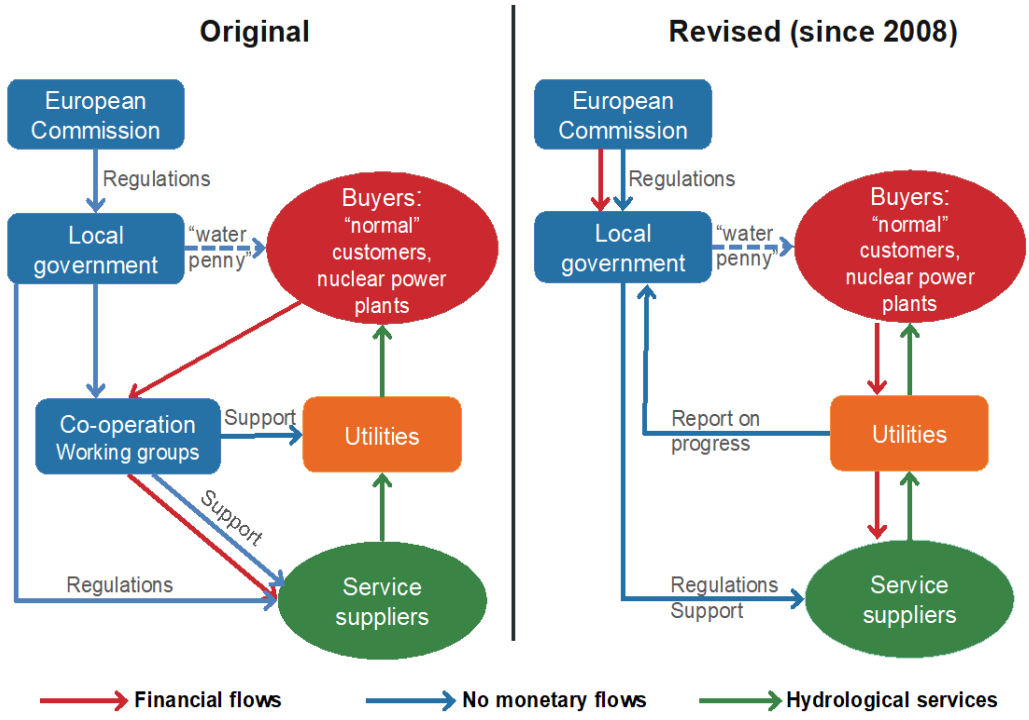
It is estimated that 700,000 ha of land are currently involved in watershed investment schemes in Germany with overall annual transactions of more than €40M, not including EU subsidies. With the exception of one user-driven programme where the private beverage company Bionade balances its annual water use by restoring pure conifer plantations into mixed forests (dubbed "drinking water forests;" Bionade n.d.a; Bionade n.d.b), local government typically plan an important role as a buyer, intermediary and/or regulator in all programmes. This involvement does not seem to change in the near future, except for one program, the Lower Saxony Cooperation model, which is explained in more detail in Box 4 and fig. 7.

[10] The country sections of this report have been drafted thanks to the link with a COST Action project (CA15206) Payments for Ecosystem Services (Forests for Water), which allowed to reach out a EU network of experts on the topic of interest. More information at: https://forestry.gov.uk/fr/pesforw

Box 4: The Lower Saxony Co-operation model

The Lower Saxony Co-operation model was originally created by the local government in 1992 to replace the command-and-control system of groundwater protection with a cooperative scheme. Governmental working groups were established in the state to foster voluntary agreements for watershed protection (Figure 8). The working groups acted as mediators and intermediaries between farmers and water utilities, as well as financial administrators of the "water penny," a water abstraction charge equal to five cents per cubic meter of water use. In 2008, however, the original structure was revised and simplified, handing over the main responsibilities of overseeing voluntary agreements to the utilities. The main reason for this change was an anticipated decline in budget; many nuclear power plants who originally made up almost 50% of the "water-penny" funding (given their need for large quantities of cooling water) would soon go offline (Bluemling and Horstkoetter 2006). As of 2013 about 300,000 ha of land were involved in the scheme, with an annual financial investments of €17M (NMUEK 2013).

Figure 8: Governance Structure of the Lower Saxony Co-operation Model



Source: Department of Land, Environment, Agriculture and Forestry (TESAF), University of Padova.

10.2 France

Compiled by: Serge Garcia, Jens Abildtrup, Marc Benoît, Julien Fiquepron, and Claire Montagné-Huck, French National Institute for Agricultural Research (INRA)

In France, the role of forests in the provision of a number of goods and services was formally recognized in the national *Forest Orientation Law* in 2001. But though this law reinforces the important role of forest policies and contractual models in promoting and developing conservation of non-market goods and services, it remains difficult to provide a comprehensive overview of incentive payments and investments for watershed services in France. This is due to a decentralization in public policies addressing watershed services preservation, a multidisciplinary integration of rural development policies (making it difficult to isolate watershed-specific programmes), the

multiplicity of local initiatives, and the fact that public policies for water protection are still mainly based on regulations.

However, there are some tools that aim to promote watershed services in the agricultural and forest sectors:

- The agri-environmental and climatic measures within the European Common Agricultural aim at supporting water quality, biodiversity, and good soil condition by financially compensating farmers for their change of practices. Such practice changes have included for example phytosanitary treatment reduction through agricultural advisory in the Bassin versant de la Gimone (totalling 5,000 ha with payment rates of €146-187/ha/year; Feader 2012), or strengthening local water management as in the contract of Nappe de Dijon Sud in Bourgogne (which encompasses 37 km^2 and 15 communes and will transact total payments of €7M for 2016-2021; Eaufrance 2017).

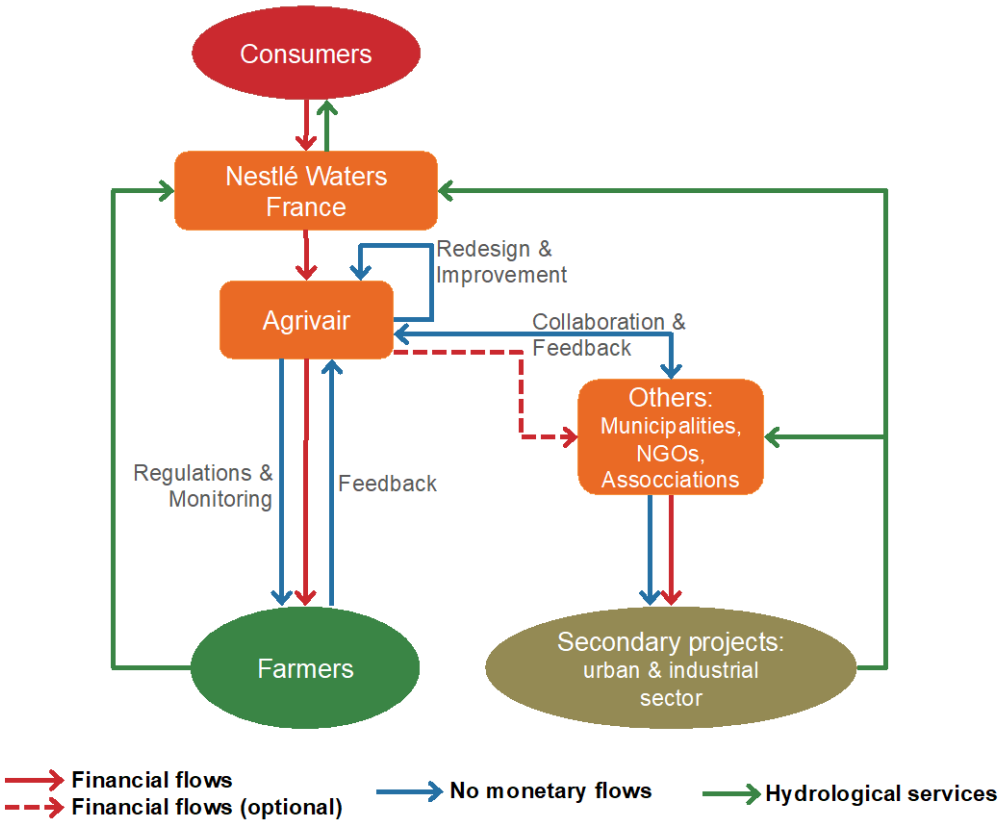
- A number of bilateral or multilateral private contractual relationships support voluntary agreements on a local scale between actors involved in water management, such as bottled water producers, farmers, forest owners and managers. The company Danone is very active in this regard, protecting the watersheds for their Evian and Volvic mineral water (3,500 ha and 3,800 ha, respectively; Volvic, n.d.; L'APIEME n.d.) and funding a "green bubble" initiative focused on protecting the watershed environment while supporting economic development (30 ha; Badoit, n.d.). Other brands with similar projects are Coca-Cola (Coca-Cola 2015) and Nestlé Waters France (Box 5, Figure 9)(INRA 2014).

- Other bilateral or multilateral public contractual relationships involve public-private partnerships on a quasi-voluntary basis, often in areas with major water problems. Participating actors are local communes, water agencies, water utilities, farmers, forest owners and prefects. Projects like these include fire prevention efforts in the watershed of la Verne (2,000 ha at a payment rate of €9/ha/year; Sylvamed 2012), efforts to decrease nitrate levels in Lons-Le-Saunier (1,500 ha at a payment rate of €510-760/ha/year; ProdINRA 2010), or the protection of water quality of catchments in mountain forests by the water utlity of Masevaux (200 at a payment rate of €40-80/ha/year; CNPF 2012, CSP 2016).

Box 5: Nestlé Waters (formerly Vittel)

In response to the increasing use by farmers of chemical fertilizers, pesticides, and herbicides, in 1992 Nestlé Waters France set up the Agrivair consulting firm to protect the water quality and purity of the Vittel natural mineral waters, later extending efforts to adjacent catchments for the Contrex and Hépar brands (Deffontaines et al. 1994). All three brands rely on water from a 10,000 ha area in the Vosges plain, where Nestlé and Agrivair invested more than €24.5 M over a seven year period to design a system to either compensate farmers for their change in practice, or acquire the land and lease it for free under conditions targeting groundwater protection (Perrot-Maître 2014). Payment rates for practice changes average €200/ha/year; farmers are also eligible to receive up to €150,000 per farm for capital improvements. Practice changes supported include giving up maize production and agrochemicals, reducing stocking rates, and improving the efficiency of fertilizer application (Brossier et al. 1992). In the years since its introduction, however, Agrivair has expanded their watershed protection programme from one focused on farming systems to a broader programme tackling urban and industrial impacts on groundwater quality (Perrot-Maître 2014, p.9). Through close collaboration with the 11 municipalities in the area, as well as local and national organisations, recent efforts have resulted in a ban of agrochemicals on railtracks, school and airport grounds, and parking lots; the collection and recycling of all dangerous urban and industrial waters; and the use of gas heating instead of oil in residential areas. The governance structure of the project (expanded version as detailed in Perrot-Maître 2014) is presented in Figure 9.

Figure 9: Governance Structure of the Vittel Project by Nestlé Waters France



Source: Department of Land, Environment, Agriculture and Forestry (TESAF), University of Padova.

10.3 Spain

Compiled by: Ignacio Pérez-Silos and Jose Barquín, University of Cantabria Institute of Environmental Hydraulics ("IHCantabria")

During the 20th century a number of programmes in Spain began targeting hydrological services, such as the national afforestation programme that operated from the 1940s until the 1980s. The programme afforested over 3M ha of land with the aim of improving the ecological conditions of catchments and increasing forest productivity (Goméz and Mata 2002).

Despite this history, payments for watershed services programmes in Spain were still considered in their early stages of conceptualization at the beginning of this decade (Russi 2010). Yet at present there are clear opportunities or conditions in place which would favour and suggest the application of watershed investment schemes, including uneven spatial and temporal distribution of water resources within the country, climate projections suggesting that hydrological services will be at risk in the future, and European forest policy that clearly supports forest and water-related incentive mechanisms (e.g., ForestEurope 2007 and 2011 resolutions, the 2014-2020 Rural Development Programme, European Water Framework Directive). Specific Spanish laws like the *Law 42/2007 of Natural Patrimony of the Biodiversity* and the *Law 43/2003 on Mountains* also have the potential to support a national payments for ecosystem services mechanism (Martínez de Anguita and Flores Velásquez 2014). The former establishes a fund to support measures taken to achieve sustainable forest management and protection of forest and natural areas. The latter introduces the idea of subsidies to forest owners or contracts with them to ensure positive externalities (e.g. soil conservation, flood prevention) derived from forests.

Still, at present there are only a few case studies that can be clearly categorized as watershed investments in the sense that they specifically mention hydrological services as their main aim. For example, in Cataluña in the North-East of Spain, the water bottling company Aguas font Vella y Lanjarón S.A. offers an “economic service payment” to landowners in exchange for reducing the environmental impact of their practices on the land and aquifers (Russi 2010). The"el Bajo Ebro" project is another exmapl, described in more detail in Box 6.

It should also be noted here that Spain was one of the few countries which has tried to set up a water abstraction credit system, specifically in the Alto Guadiana river basin. These efforts, however, ultimately failed due to corruptive behaviour of local institutions.

Box 6: "El Bajo Ebro" project in the North-East of Spain

The "El Bajo Ebro" project is located in North-East Spain, where a voluntary agreement for river regime restoration was established as a public-private partnership in 2002 (Gómez et al. 2011). The initiative aims to gradually restore parts of the river Ebro in the lower part of its basin which has been highly modified by engineering projects. Public and private incentives support a series of flood pulses, with the aim of restoring fluvial process that will allow a wide range of river ecosystem functions to improve. Three hydropower dams synchronize operations to create the artificial flood. Although this initially reduces their financial revenues, monitoring results have shown an improvement of the river's ecological status, and the expected welfare gains by society will be high enough to facilitate compensation of the hydropower operators (Gómez et al. 2011; Loomis et al. 2000).

10.4 Italy

Compiled by: Alessandro Leonardi (University of Padova & ETIFOR) & Giulia Amato (ETIFOR)

The Italian legislative framework on watershed services is very fragmented at present. But in recent years positive signals include the fact that the EU Water Framework Directive in 2015 was recognized in a Decree (DM 39/2015) which introduced the “polluter pay principle” and an estimation method of the environmental and resource costs associated with different water uses. This allows for the inclusion within water tariffs of costs related to sustainable catchment management interventions. The Decree represents a major cultural and legal change; until 2015 only grey infrastructure investments were permitted in water utilities’ investment planning. Romagna Acque Spa, a water utility in Emilia Romagna, has been a frontrunner in this sector. In 1988 the utility began to allocate 2% of its revenues (later increased to 3% in 2008 and then 4% in 2012) to the mountain towns where its treatment plants are located in order to indirectly support watershed protection. Romagna Acque Spa is currently working with nearby universities to demonstrate a science-based approach to calculating environmental and resource costs for setting water tariffs.

In late 2015 the so-called “Collegato ambientale” Act (L. 221/2015 art. 70) was also issued. The Act contains, for the first time in Italy, a clear and specific reference to payments for ecosystem services. In particular, it requires the Government to develop new legislation for the introduction of a system of payments for ecosystem services including rules and design guidance for development of such mechanisms in Italy.

However, although the term “payments for ecosystem services” has only recently appeared in Italian law, Italian legislators have been supporting compensation payments since the early twentieth century; Decree 1775/1933 introduced hydropower production fees to compensate local municipalities for their environmental and economic losses. Under another law (Law 36/1994, or “Galli’s Act”), compensation is provided in two the Piedmont and Veneto Regions to mountain areas that provide drinking water, funded by citizens who pay an extra charge on their water bill. In both Regions, part of the compensation fees are also invested in interventions that reduce hydrogeological risk. In the case of Piedmont, the investments total €5M, as directed by Regional Law 13/1997, art. 8.

At local levels, there are a number of Water Boards or Regional Parks that make agreements with landowners to subcontract landscape management works for improving the provision of ecosystem services, such as flood controls (Dlgs 228/01). For example, in a mountain basin in Tuscany, the “Land Stewards” project directs annual payments

to farmers and forest owners from the Union of Municipalities to provide flood control and eventually be involved in forest hydrology operations.

Prospects are also encouraging as far as leveraging European funding for watershed investments: within GESTIRE 2020, an integrated LIFE project with a budget of €20M for the management of Natura 2000 areas in the Region of Lombardy, payments for ecosystem services will be the reference innovative governance model for future development of the network. At the same time, within the LIFE+ Project "MGN Making Good Natura", following an evaluation of ecosystem services in a number of pilot areas, payments for ecosystem services are in development to address hydrogeological risk, threats to drinking water and groundwater recharge, and the conservation of local fish's habitats. A similar process is also being carried out within the Ecopay-Connect-Oglio Sud Project.

This positive policy trend is also evident in the private finance sector: an important environmental foundation of a private bank, Fondazione CARIPLO, has released the first Italian Grant Program on Natural Capital, with €3.5M for projects that engage with private stakeholders using a payments for ecosystem services or ecosystem-based approach.

The correct identification of the beneficiaries of a specific ecosystem service, and the fragmentation of property ownership represent serious difficulties for the application of real payments for ecosystem services schemes. But thanks to legislative supports (both old and new) and an increasing use of EU and regional funding, existing and new best practices of payments for watershed services are consolidating into a promising working framework to provide better hydrological services.

10.5 United Kingdom

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In the United Kingdom, watershed management is an area that is growing quickly due to a shift in policy focus as funds are made available to incentivise better land management practices and safeguard ecosystem services. Of the European countries, this shift is most evident in the United Kingdom due to Government policy change to encourage localism and smaller-scale regional and local community involvement, with support from (amongst others) the privately owned but publicly regulated water companies (for example, South West Water and United Utilities).

One outcome of the public water regulator (known as "OFWAT")'s Price Review in 2009 (PR09) for the period between 2010 and 2015 was the approval of catchment management plans by more than 100 companies. Water utilities have since invested €77 million in more than 100 catchment management schemes and investigations around the country (DEFRA 2014; OFWAT 2011). In the OFWAT Price Review 2014 (PR14) for the period between 2015 and 2020, "water company plans include an estimated 300 catchment schemes and investigations" (Indepen 2014). There is also an increased "disclosed" catchment spending of about €30 million (bringing the disclosed total for the PR14 period to more than €100 million). This is likely an underestimate as only eight water companies disclosed their catchment spending for this period (Indepen 2014). Thus, it is evident that the private water utilities are willing to invest many millions of pounds in order to save operational and capital investments and deliver multiple benefits at the catchment level.

Private water utilities are not the only source of funding for catchment management schemes, indeed, "almost all payments for watershed services [programmes] are using the Catchment Sensitive Farming Capital Grant Scheme funds to help farm investing in capital works improvements and complement the payments of water utilities for improving water quality" (Leonardi 2015). Indeed, in recent benchmark studies documenting watershed investments in 2011 and 2013 respectively, the island nation was responsible for a third of European programmes and nearly two-thirds ($24.3M) of all European transactions (Forest Trends 2014). In parallel to the estimated 300 catchment schemes and investigations approved in OFWAT's PR14, DEFRA in 2013 allocated €2M to improve the establishment of catchment partnerships. While not all of these schemes and investigations will consolidate into long-term watershed investment programmes, interest is indisputably increasing.

A recent analysis of the total number of payment for watershed management schemes in the United Kingdom (consolidated and non-consolidated) for a study in publication for UNECE/FAO and based on internet searches of the UK Environmental Institutions (OFWAT, EA, DEFRA - Ecosystems Knowledge Network, Natural Capital case studies), various other search items and a review of literature (Leonardi 2015; UNECE/UNEP/FAO 2014), estimated the number of initiatives to be at over 100 - including catchment-specific projects - (21 consolidated and 19 non-consolidated). An example of such a project can be found in Box 7. Although some ambiguity may exist among the different sources in terms of definitions of "watershed investment," there is a clear overall increase in the number of catchment management schemes.

Box 7: Upstream Thinking

South West Water (SWW) is a regulated private company that manages a water and wastewater network serving nearly 600,000 customers in South West England. Following the success of the Exmoor Mires Project in 2008, SWW understood the potential for a catchment-wide approach and started an "umbrella initiative" grouping many different payments for watershed services initiatives under a single brand called Upstream Thinking. Upstream Thinking aims to improve water quality in river catchments in order to reduce water treatment costs and provide multiple benefits such as climate change mitigation and biodiversity conservation. In 2010 OFWAT approved SWW's Upstream Thinking project with a budget of nearly €12M for 2010-2015. For the period between 2015 and 2020, Upstream Thinking have budgeted another €12M for a programme that focuses on 11 catchments across Devon and Cornwall. This represents an expansion of the 2010-2015 programme (Upstream Thinking Web Pages, 2017). As of 2016, 1,948 ha of moorland have been restored. The target for the next period is 3,000 ha; an ambitious target that suggests SWW's commitment to the watershed investment model.

11. OUTLOOK

WFD Driving Basin Approaches

The EU Water Framework Directive, which seeks to establish a framework for community action in the field of water policy, requires that member states develop management plans for river basins. This appears to be driving the creation of new stakeholder networks and bodies of knowledge for coordinated watershed management (both prerequisites for watershed investments), as well as new tools that can catalyze investments, including from the private sector.

Moreover, in some Member States, the application of the "polluter pays principle" and "user pays principle", might be a strong driver for the application of environmental water tariffs within the water bills systems of many public utilities. While in country like Germany, this has been applied since the past, in Italy some utilities are exploring the ways to invest in catchment areas by applying a brand new law that define technical rules for the calculation of the Environmental and Resource Cost (ERC) and its recovery through the tariff system.

Natural Capital Financing Facility Aims to Blaze a Path for Conservation Finance in Europe

In 2014, the European Commission kicked off a three-year pilot of its Natural Capital Financing Facility (NCFF) funded by the European Investment Bank. In its first phase, NCFF has a budget of up to $141M (€125M) for loans and investments that will support projects taking ecosystem-based approaches to natural resources and climate adaptation challenges. It aims to focus on "bankable" initiatives that can either generate revenue or deliver cost savings, an approach that may prick up the ears of private capital seeking investment-grade conservation projects.

In 2017, the NCFF inked its first loan agreement with Rewilding Europe Capital, an enterprise financing facility based in the Netherlands. Rewilding Europe Capital says it will use NCFF funds to invest in initiatives making a "business case" for conservation and ecological restoration at 20-30 Natura 2000 sites (mainly wetland ecosystems) across Europe (European Commission 2017)

NCFF has also initiated NCFF-Cities, a project specifically focused on financing natural infrastructure projects such as nature-based flood protection, sustainable urban drainage systems, retention basins, lakes, ponds, watershed management, and re-naturalization of rivers. Support is based on a European Investment Bank loan and grant-based technical assistance of up to €1M.

High-Level Signals on Green Infrastructure

At the EU level, a 2014 European Commission policy document on "Natural Water Retention Measures" (NWRMs) recognized green infrastructure's broad potential to cost-effectively achieve goals set out in the Water Framework Directive, Floods Directive, and Birds and Habitats Directives. But it identified a need to better integrate green infrastructure concepts into River Basin Management Plans, improve coordinated planning and financing across various policy arenas, and raise awareness among decision makers of NWRMs' multiple benefits (Cools et al. 2014).

The European Commission will contribute more than €300M in 2017 to Horizon 2020-funded projects demonstrating innovative nature-based solutions in cities (SCC-02-2016-2017; European Commission Research & Innovation Participant Portal, Funding Opportunities 2017a) and large-scale pilots of using nature-based solutions for hydro-meteorological risk reduction as alternatives to traditional built infrastructure (SC5-08-2017; European Commission Research & Innovation Participant Portal, Funding Opportunities 2017b). A recent Nature and Biodiversity LIFE call for proposals has also specifically asked for projects that develop innovative approaches for managing water-related ecosystem services that could help drive funding toward meeting the goals of the WFD and EU Biodiversity Strategy targets.

Whither the Brexit?

English and Welsh water companies' business plans for the 2014-2020 period included significant commitments to watershed investments by 2020. But national government support for green infrastructure approaches, which has been slowly warming for nearly a decade, may now be thrown into question by the Brexit. Whether the goals set via the EU Water Framework Directive will be retained, and whether the United Kingdom will maintain its position as a leader in Europe on watershed-based strategies, remains unclear.

Corporate Water Stewardship – Already Strong in Europe – Gains Momentum

The needle hasn't moved much in terms of voluntary private sector spending on green infrastructure in the last few years. But that may change. The concept of water stewardship has been widely embraced and is (slowly) driving companies towards looking at their surrounding landscapes.

The European Water Stewardship Standard has been piloted for basin planning efforts in Belgium, France, and Germany. Its creator, the the European Water Partnership, recently launched a platform for collective action for water stewardship in the agricultural sector. Water bottling companies are looking with particular interest to this new standard. Nestlé for instance has already committed to apply the standard to ten sites by 2020.

National and Regional Green Infrastructure Policy and Guidance Matures in 2017-2020

New national-level strategy and guidance will bear fruit in the coming years in a number of European countries. In Germany, a national Green Infrastructure concept will be published in 2017 that will guide integration of green infrastructure across federal policies. Beginning in 2017, Denmark's Green Map will help guide planning and implementation of the country's national nature strategy (Naturplan Danmark) which prioritizes created connected networks of natural areas. Work is ongoing in Sweden in 2017 to develop regional green infrastructure action plans and to craft a national green infrastructure strategy to guide conservation and planning decisions. Finally, updates to Spain's Natural Heritage and Biodiversity Law in 2015 (Law 33/2015) set a target of completing aligned national- and regional-level green infrastructure strategies by 2018.

12. BIBLIOGRAPHY

Abildtrup, Jens, Frank Jensen, and Alex Dubgaard. 2010. "The Coase Theorem and Real Markets: An Empirical Analysis of Negotiations between Waterworks and Farmers in Denmark." In *Miljøøkonomiske Råds Konference*, pp. 21.

Aylward, Bruce, Jayanta Bandyopadhyay, Juan-Carlos Belausteguigotia, Peter Borkey, A. Z. Cassar, Laura Meadors, and Lilian Saade. 2005. "Freshwater ecosystem services." In *Ecosystems and Human Well-being: Policy Responses Volume* 3, edited by Kanchan Chopra, Rik Leemans, Pushpam Kumar, and Henk Simons. Island Press.

Badoit. Protéger l'impluvium de Badoit et préserver les écosystémes. n.d. Accessed June 6 2017. http://www.badoit.fr/#/protegee_par_lhomme/vous_accueillir_a_saint_galmier/.

Bennett, Genevieve and Nathaniel Carroll. *Gaining Depth: State of Watershed Investments 2014*. Washington, DC: Forest Trends, 2014.

Bennett, Genevieve and Franziska Ruef. *Alliances for Green Infrastructure: State of Watershed Investments 2016.* Washington, DC: Forest Trends, 2016.

Bionade. *From the original idea to the present day: the Bionade story.* n.d.a. Accessed March 6 2017. http://www.bionade.de/en/story/.

Bionade. *Because drinking will never go out of fashion: Bionade for Trinkwasserwald e.V.* n.d.b. Accessed March 6 2017. http://www.bionade.de/en/drinking-water-forest/.

Bluemling, B. & Horstkoetter, M. *Agricultural Groundwater Protection through Groundwater Co-operations in Lower Saxony, Germany, - a multi stakeholder task*. 2006. Actes du séminaire Wademed, Cahors, France, 6-7th November 2006. 23pp.

BMUB - Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. *Water protection policy in Germany.* 2016. Accessed March 15 2017. http://www.bmub.bund.de/en/topics/water-waste-soil/water-management/policy-goals-and-instruments/water-protection-policy-in-germany/.

Bristol Avon Rivers Trust, Environmental Gain Ltd, Bath Spa University, and RM Wetlands & Environment. *Payments for Ecosystem Services (PES) – Pilot PES Research Project.* The Tortworth Brook Project: Final Report, 2014. http://randd.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=18550.

Centre for Local Economic Strategies and Wildlife Trust for Lancashire, Manchester and North Merseyside. “Payment for ecosystem services - Irwell Catchment.” Centre for Local Economic Strategies and Wildlife Trust for Lancashire, Manchester and North Merseyside, 2015. http://randd.defra.gov.uk/Document.aspx?Document=13742_FinalReportforpublicationApril2016.pdf.

CNPF - Centre National de la Propriété forestiére. *2012 - Woodlands for drinking water*. 2013. Accessed June 6 2017. http://www.cnpf.fr/n/woodlands-for-drinking-water/n:263.

Coca-Cola HBC. *Building a Stronger Coca-Cola Hellenic. 2012 Integrated Report*. Coca-Cola Hellenic, 2012. http://coca-colahellenic.com/media/1203/2012_iar.pdf.

Coca Cola. *Protéger les ressources en eau*. 2015. Accessed June 6 2017. http://www.coca-cola-france.fr/stories/proteger-les-ressources-en-eau.

Consolidated Act No. 130 on Water Supply etc. as amended by section 10 of Act No. 355 of 2 June 1999 and Act No. 374 of 2 June 1999. Ministry of Environment and Energy, Danish Environmental Protection Agency (February 26, 1999).

CSP - Cambridge Scholar Publishing. *Forest and the Water Cycle*. 2016. Accessed June 6 2017. http://www.cambridgescholars.com/forest-and-the-water-cycle.

Danish Ministry of the Environment. “Afforestation: Increasing the forest area helps protect the drinking water resource.” *Danish Environment and Energy Newsletter* 8 (June 2001). http://www.mex.dk/uk/vis_nyhed_uk.asp?id=1957&nyhedsbrev_id=215.

DEFRA. *Defra Payments for Ecosystem Services (PES) Pilot Projects : Review of key findings, (October), 2011–2013*. 2014. Accessed June 6 2017. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/578005/pes-pilot-review-key-findings-2016.pdf.

DeVial, L., L. Smith, M. Payne, J. Atkinson, A. Darvey, P. Hickey, and A. Murkherjee. “A record of the question and answer sessions.” Panel debate at Protecting Water Catchments from Diffuse Pollution - the Emerging Evidence, Birmingham, United Kingdom, February 21, 2012. Accessed October 17, 2016. http://www.rsc.org/images/Panel_Debate_tcm18-216649.pdf.

Eaufrance. Gest'eau - *La communauté des acteurs de gestion intéegrée de l'eau*. 2017. Accessed June 2017. www.gesteau.eaufrance.fr/.

European Commission, 11 April 2017*. Bank on Nature: First loan agreement backed by Natural Capital Financing Facility signed in Brussels*. http://europa.eu/rapid/press-release_IP-17-914_en.htm.

European Commission Research & Innovation Participant Portal, Funding Opportunities, 2017a. TOPIC: Demonstrating innovative nature-based solutions in cities (Accessed 1 June 2017). http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/scc-02-2016-2017.html.

European Commission Research & Innovation Participant Portal, Funding Opportunities, 2017b. TOPIC: Large-scale demonstrators on nature-based solutions for hydro-meteorological risk reduction (Accessed 1 June 2017). http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc5-08-2017.html.

European Commission. *Synthesis of Ex Ante Evaluations of Rural Development Programmes 2014-2020.* Luxembourg: Publications Office of the European Union, 2015.

European Commission, European Structural and Investment Funds. ESIF 2014-2020 Achievement Details [Data set]. European Commission, 2016a. https://cohesiondata.ec.europa.eu/dataset/ESIF-2014-2020-Achievement-Details/aesb-873i.

European Commission, European Structural and Investment Funds. ESIF 2014-2020 Finance Details [Data set]. European Commission, 2016b. https://cohesiondata.ec.europa.eu/dataset/ESIF-2014-2020-FINANCE-DETAILS/e4v6-qrrq.

European Commission. *Rural Development in the EU Statistical and Economic Information Report 2012*. European Commission, 2012. http://ec.europa.eu/agriculture/statistics/rural-development/2012/index_en.htm.

European Community. *Fourth National Report of the European Community to the Convention on Biological Diversity*. European Community, 2009.

European Environment Agency. *The European environment — state and outlook 2015*. Copenhagen: European Environment Agency, 2015.

Feader. *Les mesures agroenvironmentales*. 2012. Accessed June 2017. http://www.eaurmc.fr/fileadmin/aides-et-redevances/documents/AidesRhoneMed/Guide-MAE-PDRH_2007_2014.pdf.

Forest Trends. *Gaining Depth*. 2014. Accessed June6 2017. http://www.forest-trends.org/documents/files/SOWI2014.pdf.

Goldsmith, Louise. “Building Community Flood Resilience in West Sussex.” Presentation at National Flood Forum Conference, London, March 2014.

Goldstein, Allie, and Franziska Ruef. *View from the Understory: State of Forest Carbon Finance 2016*. Washington DC: Forest Trends, 2016.

Gómez, C.M., Delacámara, G., Pérez, C.D., Rodríguez, M. *Lower Ebro (Spain): Voluntary agreement for river regime restoration services*. 2011.

Gómez, J. and Mata, R. *Repoblación forestal y territorio (1940-1971). Marco doctrinal y estudio de la Sierra de los Filabres (Almería)*. 2002. Ería 58, 129–155.

Government of the Netherlands. *Draft National Water Plan 2016-2021*. Government of the Netherlands, 2014. Accessed October 18, 2016. https://www.government.nl/binaries/government/documents/policy-notes/2014/12/23/draft-national-water-plan-2016-2021/draft-national-water-plan-2016-2021.pdf

Greiber, Thomas, Chantal van Ham, Gerben Jansse & Marta Gaworska. *Final report study on the Economic value of groundwater and biodiversity in European forests*. The IUCN Regional Office for Europe. Brussels: IUCN, 2009.

Indepen. *Discussion paper on the potential for catchment services in England, (July).* 2014. Accessed June6 2017. http://www.indepen.uk.com/docs/catchment-services-report_july2014.pdf.

INRA - Départment de recherches Sciences pour l'Action et le Dévelopment. *Agriculutre-Evironment Vittel*. 2014. Accessed June 6 2017. http://www7.inra.fr/vittel/index.htm.

Leonardi, A. *Characterizing governance and benefits of payments for watershed services in Europe*. 2015.

Loomis, J., Kent, P., Strange, L., Fausch, K. and Covich, A. *Measuring the total economic value of restoring ecosystem services in an impaired river basin: results from a contingent valuation survey*. 2000. Ecol. Econ. 33, 103–107.

L'APIEME. *L'Association APIEME*. n.d. Accessed June 6 2017. https://collectifveillemontagnes2.files.wordpress.com/2012/07/apiem.pdf.

Martínez de Anguita, P., Flores Velásquez, P. *Diseño de sistemas y políticas públicas de pagos por servicios de los ecosistemas 239*. 2014.

NMUEK - Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz. *Niedersächsischer Beitrag zu den Maßnahmenprogrammen 2015 bis 2021 der Flussgebiete Elbe, Weser, Ems und Rhein*. 2015. Accessed March 15 2017. http://www.fgg-rhein.de/servlet/is/4367/.

NMUEK - Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz. *Trinkwasserschutz-Kooperationen in Niedersachsen*. 2013. Accessed March 8 2017. http://www.umwelt.niedersachsen.de/themen/wasser/trinkwasser/trinkwasserschutz-kooperationen-in-niedersachsen-8944.html.

OFWAT. *From catchment to customer. Can upstream catchment management deliver a better deal for water customers and the environment?* 2011. Accessed June6 2017. http://www.ofwat.gov.uk/wp-content/uploads/2015/11/prs_inf_catchment.pdf.

OFWAT. *Setting price controls for 2015-20 – framework and approach. 2014.* Accessed June6 2017. http://www.ofwat.gov.uk/wp-content/uploads/2015/10/det_pr20141212final.pdf. 152pp.

OECD. *Agricultural Policy Monitoring and Evaluation 2016*. OECD, 2016. DOI: 10.1787/agr_pol-2016-en

OECD. *Water Governance in the Netherlands: Fit for the Future?* OECD Studies on Water, OECD Publishing, 2014. http://dx.doi.org/10.1787/9789264102637-en.

Perrot-Maître, D. *The Vittel Case: A public-private partnership in the mineral water industry. 2014*. Case studies on Remuneration of Positive Externalities (RPE)/Payments for Environmental Services (PES), prepared for the Multi-stakeholder dialogue 12-13 September 2013, FAO, Rome. 8pp.

Poole Harbour Catchment Initiative. *Catchment Plan Update May 2014*. Bath, United Kingdom: Wessex Water, 2014.

ProdINRA - Archive ouverte des productions de l'INRA. *Agriculture et qualité de l'eau : le dispositif de Lons-le-Saunier. Évolution des jeux d'acteurs.* 2010. Accessed June 6 2017. http://prodinra.inra.fr/?locale=fr#!ConsultNotice:45031.

Rogers, S., Rose, S., Spence, J. and Hester, N. *Holnicote Payments for Ecosystem Services (PES) Pilot Research Project 2014-15: Final Report to Defra on Project NR0156*. London: Department for Environment, Food, and Rural Affairs, 2015.

Rozza, Joe Paul, Brian D. Richter, Wendy M. Larson, Todd Redder, Kari Vigerstol, and Paul Bowen. "Corporate Water Stewardship: Achieving a Sustainable Balance." *Journal of Management and Sustainability* 3, no. 4 (2013): 41.

Russi, D., 2010. *El pagament per serveis ambientals: una eina per a la conservació dels recursos naturals a Catalunya.* 2010.

RSPB. *The Feasibility of a Nitrogen PES Scheme in the Poole Harbour Catchment*. RSPB, 2013. Retrieved from https://www.cbd.int/financial/pes/unitedkingdom-poole.pdf.

Schwagerl, Christian. “With Too Much of a Good Thing, Europe Tackles Excess Nitrogen.” *Yale Environment 360*. April 14, 2015. Accessed October 18, 2016. http://e360.yale.edu/feature/with_too_much_of_a_good_thing_europe_tackles_excess_nitrogen/2865/.

Sherrington, Chris, Dominic Hogg, and Ayesha Bapasola. *Winford Brook PES Pilot Research Project*. Bristol, UK: Eunomia, 2016. http://www.eunomia.co.uk/reports-tools/payments-for-ecosystem-services/.

Sherrington, Chris. "Payments for Ecosystem Services Round 3: Winford Brook PES Pilot Research Project." Presentation to Chew Valley Area Forum, Bath, UK, April 2016. Accessed October 18, 2016. http://www.bathnes.gov.uk/sites/default/files/winford_brooks_project.pdf

Short, C., J. Phelps, D. Henehan, C. Staddon, S. Wells, and J. Turvill. *Cotswold Catchment Payments for Ecosystems Services Pilot: Catchment Based Approach Collaborative Project Demonstrating the Integrated Local Delivery Framework, Defra Project Report NE0144, Defra funded Round 2 PES pilot*. CCRI: Gloucester, 2014.

Smith, Laurence, Keith Porter, Kevin Hiscock, Mary Jane Porter, and David Benson, eds. *Catchment and river basin management: integrating science and governance*. Routledge, 2015.

Sylvamed - Mediterranean Forests for All. *Financial contribution of a water union to the management of a defence zone against forest fire along a strategically fire defence road (DFCI)*. 2012. Accessed June 6 2017. http://www.sylvamed.eu/docs/PES_foret_eau_protection_maures_eng.pdf?phpMyAdmin=aB65QHjTP8Xf4LRMjkiDbdpJzmf.

UNECE/UNEP/FAO. *The Value of Forests*. *Nature* (Vol. 141). 2014. Accessed June 6 2017. http://doi.org/10.1038/141680a0.

UNFCCC. “Paris Pact on Water and Climate Change Adaptation Announced.” UNFCC, December 2, 2015. http://newsroom.unfccc.int/lpaa/resilience/press-release-lpaa-resilience-1-paris-pact-on-water-and-climate-change-adaptation-announced/.

United Nations. *Paris Agreement*. Bonn: United Nations Framework Convention on Climate Change, 2015. http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.

van den Brink, C., A. Dries, C. Steinweg, and W.J. Zaadnoordijk. “Drenthe takes action to reduce risks of pesticides; Number of harmful substances and crops still requiring attention.” Presentation to AquaConsoil Barcelona 2013, 12th International UFZ-Deltares Conference on Groundwater-Soil-Systems and Water Resource Management, Barcelona, Spain, April 2013.

Volvic. *Protegér l'écosystème de Impluvium de Volvic.* n.d. Accessed June 2017. http://www.volvic.fr/protegee_par_lhomme/proteger_l_impluvium_de_volvic.html.

Walton, Brett. “Water Gained Stature at Paris Climate Talks.” *Circle of Blue*. December 15, 2015. Accessed October 18, 2016. http://www.circleofblue.org/2015/world/water-gained-stature-at-paris-climate-talks/.


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