

# PESFOR-W: Improving the design and environmental effectiveness of woodlands for water Payments for Ecosystem Services

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## Abstract

The EU Water Framework Directive aims to ensure restoration of Europe's water bodies to "good ecological status" by 2027. Many Member States will struggle to meet this target, with around half of EU river catchments currently reporting below standard water quality. Diffuse pollution from agriculture represents a major pressure, affecting over 90% of river basins. Accumulating evidence shows that recent improvements to agricultural practices are benefiting water quality but in many cases will be insufficient to achieve WFD objectives. There is growing support for land use change to help bridge the gap, with a particular focus on targeted tree planting to intercept and reduce the delivery of diffuse pollutants to water. This form of integrated catchment management offers multiple benefits to society but a significant cost to landowners and managers.

New economic instruments, in combination with spatial targeting, need to be developed to ensure cost effective solutions – including tree planting for water benefits - are realised. Payments for Ecosystem Services (PES) are flexible, incentive-based mechanisms that could play an important role in promoting land use change to deliver water quality targets. The [PESFOR-W COST Action](#) will consolidate learning from existing woodlands for water PES schemes in Europe and help standardize approaches to evaluating the environmental effectiveness and cost-effectiveness of woodland measures. It will also create a European network through which PES schemes can be facilitated, extended and improved, for example by incorporating other ecosystem services linking with aims of the wider forests-carbon policy nexus.

## Keywords

Payments for Ecosystem Services, Woodlands, Water quality

## S&T Excellence

### Challenge

#### Description of the Challenge (Main Aim)

The [EU Water Framework Directive \(WFD\)](#) aims to restore Europe's water bodies to "good ecological status (GES)" by 2027 but many Member States (MS) are struggling to achieve this target. Around half of EU river catchments currently report below standard water quality (EEA 2012) and diffuse pollution poses long-term chronic risks for 42% of European freshwater bodies (Malaj et al. 2014). Meeting WFD targets in a cost-effective way will require mainstreaming new economic instruments such as Payment for Ecosystem Services (PES) schemes to deliver effective, spatially-targeted restoration actions.

The proposed 'PESFOR-W' Action aims to improve Europe's capacity to use PES to address WFD and wider issues. PES is a flexible, incentive-based mechanism with significant potential to utilise available finance more efficiently for environmental improvement (EC 2012a). It has gained increasing policy acceptance at national and international levels and offers much scope for tackling more intractable issues such as diffuse water pollution. Diffuse agricultural pollution is a significant pressure in more than 40% of Europe's river and coastal water bodies, and accumulating evidence shows that in many cases good water status will only be achieved by targeted land use change (EEA 2012). PES schemes based on smaller-scale forest planting, termed here "Woodlands-for-water (W-for-W)", have been highlighted as a potential solution to the problem (MCPFE 2007, EC 2012b), as well as a mechanism to harness multiple benefits for other policy agendas (e.g. climate change adaptation and mitigation, including carbon sequestration).

Information on the environmental impacts and cost-effectiveness of existing W-for-W PES schemes in COST countries is currently sparse, with comparative data generally lacking. The PESFOR-W Action will synthesise current knowledge on these schemes and help develop standard approaches and tools to improve quantification of the ability and cost effectiveness of woodland planting to reduce a range of diffuse pollutants, as well as potential trade-offs for water quantity. This will facilitate comparisons with alternative measures and enhance targeting of W-for-W measures as a novel, cost-effective solution to diffuse pollution management.

PESFOR-W will therefore consolidate and develop knowledge on: the potential breadth and scope of W-for-W PES schemes; PES environmental effectiveness (including 'additionality'); PES cost-effectiveness; and agreed standards and guidance to aid PES design and implementation across Europe and beyond. The inter-disciplinary platform will link research findings to frontline users in water, forestry, agriculture and environmental

finance sectors, adding value to existing training provision. It will provide practitioners with Case Study examples showing how barriers to practical implementation can be overcome and their effectiveness secured. Considering W-for-W PES as part of the wider forests-water-carbon policy nexus presents a huge opportunity for innovation.

### **Relevance and Timelines**

A large number of water bodies in many MS are unlikely to achieve GES by 2027. MS therefore face the prospect of heavy fines, as well as high environmental and significant human health costs. 90% of MS River Basin Management Plans (RBMPs) identify agricultural runoff as the main source of diffuse pollution (EC 2012c). On-farm measures to tackle the problem (e.g. use of cover crops and grass buffers) are increasingly being found to be insufficient to meet water quality targets (Fiquepron et al. 2013). This is driving interest in targeted woodland planting (e.g. on or around pollutant sources or along pollutant pathways) as a more effective and secure intervention to attenuate (or eliminate) pollutant delivery to surface waters and groundwaters, while minimising land take and impacts on food security. However, while woodland creation offers multiple benefits to society, progress is highly constrained by the significant costs to landowners and managers (e.g. in terms of reduction in land value and agricultural income). There is therefore an urgent need to better incentivise land use change for longer-term water protection (including the potential for targeted woodland creation on steep slopes, cross-field belts and riparian zones). Timing for this 4-year project is ideal to inform 2020 water policy renewal and the third River Basin Management planning cycle, and to contribute to the Strategic Implementation Plan of the European Innovation Platform for Water (EIP Water), per 'Innovation in tackling the Challenge' subsection.

W-for-W is also highly relevant to wider policy agendas such as climate change mitigation and adaptation, and flood risk management. With global change, drought periods and flooding are expected to become more frequent, threatening ecosystems' capacity to deliver environmental goods. Higher water demand, notably in the Mediterranean, will result from population growth. As a tool that can account for multiple benefits and threats, PES has a key role to play in fostering policy coherence in this regard. The urgent need for such pluralistic value frameworks has been voiced by: the Millennium Ecosystem Assessment, the Economics of Ecosystems and Biodiversity (TEEB) and the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES).

PES' ability to facilitate integration of funding streams is also vital. Reduced public funding creates a strong need to lever in private sector funding streams to achieve environmental protection goals. The Warsaw Resolution (MCPFE 2007), Roadmap to a Resource Efficient Europe (EC 2011), and EU Forestry Strategy (EC 2013), all encourage a greater use of market-based (private sector) tools; the LIFE Programme is also piloting the Natural Capital Financing Facility for PES. Advances in technologies to analyse large-scale datasets – at lower cost – now make it feasible for national, regional and local policy teams to consider spatial targeting of PES schemes.

Europe is behind the international curve in PES implementation: most mature PES schemes lie elsewhere (Costa Rica, USA, Kenya, Australia) (Martin-Ortega et al. 2013). Despite discussing PES for many years, their potential has not been fully realised in COST countries, in part because Europe currently lacks the trained experts to commission and deliver effective, well-designed schemes. The proposed PESFOR-W network is thus highly relevant and timely: it will help equip Europe with a cohort of technical experts capable of commissioning and delivering well-designed W-for-W PES schemes, benefiting water policy teams and utility companies, who urgently need lower-cost methods to protect watercourses, reduce water treatment costs and to avoid non-compliance fines (DEFRA 2013).

## Objectives

### Research Coordination Objectives

PESFOR-W's overall research aim is to combine practical, expert knowledge from the forestry, agriculture, water and financial sectors, to improve the design and environmental effectiveness of W-for-W PES, as a means of tackling the major problem of diffuse water pollution impacting on Europe and beyond. This knowhow will assist EU MS to pursue commitments to "*increase awareness of the relationship between forests and water*" and "*develop appropriate policies and strategies for managing forests and water resources sustainably to adapt to climate change and contribute to its mitigation*" (MCPFE 2007). PESFOR-W's four principal research objectives are to:

1. **Characterize and critically evaluate the governance models and design structure of W-for-W PES schemes** in the EU, with particular regard to i) service provision (supply); ii) policy drivers; iii) payments/markets (demand); and iv) types of governance. This will assess weaknesses with existing PES schemes and identify organizational arrangements and metrics that could increase their effectiveness and improve governance.
2. **Evaluate the environmental effectiveness of targeted woodland planting** in reducing a range of agricultural diffuse pollutants, particularly sediment, nitrate, phosphate, pesticides and Faecal Indicator Organisms (FIOs). This will address the general lack of awareness within water sectors of the potential for woodland creation to help tackle a major agricultural pressure and inform model use and data availability for quantifying impacts.
3. **Develop a European PES repository of Case Studies** that investigate lessons from existing W-for-W PES schemes, to share with practitioners, policy makers and stakeholders to promote best practice. Current knowledge of such schemes is very fragmented and the Case Study Repository will draw together European and international examples into an open access, trans-disciplinary learning platform that highlights the scope to apply the W-for-W PES approach more widely, and pinpoint its strengths and weaknesses.

4. **Develop User Guidance** on the suitability of pollutant, ecosystem service and catchment scale models to quantify the effectiveness of tree planting to reduce diffuse pollution; and provide advice on how PES schemes linking these can be applied. This advice will be consolidated into the publication '*A User Manual: Smarter Guidance on Woodlands-for-Water PES*' ('the User Manual').

Overall, progress towards the scientific challenges will be ensured by the inter-disciplinarity and expertise of the assembled team, which will include the participation of leading international experts, and by the close working of the four WGs, to deliver joint outputs. Strong links with related projects (Section 1.4.2) and with national, EU and international initiatives (e.g. emerging voluntary market standards for water benefit projects) will ensure effective knowledge sharing and help identify synergies between the research agendas of different groups.

### Capacity-building Objectives

PESFOR-W will increase Europe's capacity to use W-for-W PES as a major policy tool for delivering water benefits and meeting WFD targets. The Action will develop a critical mass of skilled 'experts' (both researchers and users) able to commission and deliver well-designed and cost-effective W-for-W PES schemes, securing their wider implementation and improvements to the quality of Europe's water resources. Four principal capacity-building objectives support this:

- **To provide training in technical and economic skills**, particularly for Early Career Investigators (ECIs), the 'PES-engineers' of the future. Over 100 individuals (>50% ECIs) will be trained through 4 Training Schools and related workshops. This will increase Europe's capacity to tackle the intractable diffuse pollution issue by designing targeted and cost-effective W-for-W PES schemes, providing a new approach that could be attractive to potential investors and help develop an innovative market in water credits.
- **To facilitate interaction between specialists with different skill sets** (forestry, agriculture, ecology, hydrology/ hydrogeology, biophysical, economics, law, etc.) needed for PES schemes. The Action's web-hub will incorporate links to a LinkedIn/ Facebook 'European PES Skills Directory', allowing Training School delegates and linked professionals to register their skills and contact details, and stimulating the creation of new professional and academic networks.
- **To build stakeholder understanding**. PESFOR-W will increase the understanding of regulators, governments, land owners and managers, water companies, environmental consultants and other investors of the potential for W-for-W PES schemes to meet WFD targets, as well as to deliver other water and wider objectives. It will use: workshops; the web Survey; participation in Case Study reviews; and the development of robust metrics to communicate PES scheme environmental and cost-effectiveness, to engender stakeholder support and interest. High quality, peer-reviewed papers, reports and Case Studies will be published to improve Europe's evidence base on PES-for-water, creating discussion and understanding (regulation in favour or against markets). Information and data



will be derived from literature reviews, plus work by ECIs and others in STSMs and Working Group meetings. In reaching these objectives, PESFOR-W will strive to also:

- **Improve geographic balance.** PESFOR-W will increase Inclusiveness Target Countries' (ITCs') access to international expertise and funding, identifying and promoting excellence in science and finance across Europe. It will encourage ITC researchers and institutions to lead WG activities and play strong roles in project delivery by hosting events and providing STSM candidates. Spatial Case Studies map and Glossaries on the web portal will assist researchers and stakeholders to develop a common language and overcome terminology barriers. The 'European PES Skills Directory' will assist PES researchers and practitioners in all geographic regions and areas of expertise to develop links at the local level and with important hubs of excellence.
- **Improve gender balance:** The forestry, agriculture, water and environmental finance sectors share an acute gender imbalance. PESFOR-W aims to exceed 40% female representation in MC composition and 50% in Training Schools, and will positively select of women for leadership roles, to an extent consistent with scientific quality and geographic balance. Its Gender Action Plan will form an integral part of the project's Dissemination and Exploitation Plan (described in WG4 Work Plan) to ensure communications fully support these goals and promote positive role-models. For example, activities will be advertised to reach and engage women, highlighting opportunities for re-qualification via the project for women returning to science after career breaks, and ensure project communications connect with existing networks (e.g. female foresters' network).

## Progress beyond the State-of-the-art and Innovation Potential

### Description of the State-of-the-art

PES schemes are innovative mechanisms which aim to ensure the value of Ecosystem Services (ES) is taken into account in decisions. PES involve *"a transfer of resources between social actors, creating incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources"* (Muradian et al. 2010).

PES mechanisms are highly adaptable and have already been applied to a wide range of contexts and ES, including carbon sequestration, habitat protection, landscape conservation and various hydrological services (see: Morrison and Aubrey 2010, Table 3, p.8). As shown in Fig. 1, PES schemes differ in: the extent of voluntary transactions; how well the ES are defined; and whether payments just depend upon altered land use (e.g. increasing tree cover) and projected changes in ES provision, or monitoring their increased delivery ex-post ('conditionality'). A number of economists (e.g. Morrison and Aubrey 2010) consider the last point to be a defining characteristic of PES. Schemes also differ in relation to principles underpinning associated property rights. Some - including mandatory 'cap-and-trade' and 'offset' schemes, are based on the WFD 'polluter pays' principle (EU 2000,

para 38, p.7). Others draw on the ‘beneficiary pays’ principle, which underpins woodland creation grants, and voluntary markets for ES driven by corporate social responsibility.

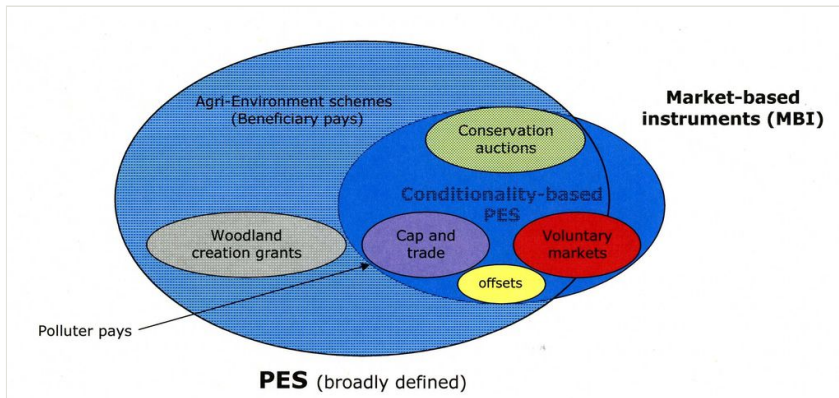


Figure 1.  
Types of PES Schemes

PESFOR-W focuses primarily on PES schemes that incentivise woodland planting and management for water benefits. Targeted planting on or around pollutant source areas and along or across delivery pathways can be very effective at intercepting a range of diffuse pollutants derived from agriculture. A tree cover requires little fertiliser or pesticides, efficiently cycles nutrients, enhances soil infiltration, reduces rapid runoff and protects the soil from disturbance and erosion (Calder et al. 2007, EC 2013). The ability to reduce runoff can also help to alleviate flooding, although the high water use of some trees can pose problems for water resources (CRPF PACA 2012).

Interest in W-for-W PES schemes has grown in recent years but application in Europe remains fragmented and piecemeal, despite recent notable successes such as Spain’s use of CAP funding and UK’s tailoring of Rural Payments to encourage tree planting for water (Burton and Schwarz 2013). In preparing this proposal, a detailed search identified eight examples of W-for-W PES found in COST countries plus a further eight related schemes, but this compares poorly with other parts of the world. Water-related PES are a focus of global reporting initiatives (Bennett et al. 2014), but a comprehensive pan-European picture (including of the size of the market size) is lacking. 75% of literature derives from developing countries; only 10 papers could be found on EU case studies (mostly Agri-Environment Schemes(AES)) (Schomers and Matzdorf 2013). Most key models are currently proprietary, with Open Source models generally less well known.

**Progress beyond the State-of-the-art**

PESFOR-W will address critical knowledge gaps relating to W-for-W PES in: i) the design and governance of PES schemes; ii) the underpinning science and modelling; and iii) cost-effectiveness plus supply- and demand-side issues.

**The design and governance of PES schemes:** The network will improve understanding of the institutional factors facilitating the development of PES – including: roles for government in underpinning new markets; existing barriers to development of schemes; and how water regulation could be streamlined to provide enabling conditions. Exploring these contextual factors will help determine how best agri-environment funding could be combined with PES schemes.

**Underpinning science and modelling:** A major barrier to application of W-for-W PES is uncertainty about the effectiveness of tree planting in delivering water benefits, plus concern about possible dis-benefits, such as reducing water yield. Quantification of the ability of trees to remove the main diffuse pollutants and impact on water resources will be advanced by a methodological evaluation and comparison of available pollutant and water use models, including those underpinning ecosystem service and catchment scale water models. This will generate value ranges and look-up tables to aid scheme design and help develop a shared understanding across Europe of opportunities for targeted tree planting to tackle diffuse water pollution from agriculture.

**PES Cost-effectiveness plus supply- and demand-side issues:** Approaches to estimating cost-effectiveness will vary according to whether a private sector or societal perspective is adopted, differences such as the time horizon and the approach to discounting, and whether ancillary benefits are considered. To facilitate comparisons, a common approach(es) need(s) to be agreed. Knowledge of the cost-effectiveness of tree planting measures will be improved by synthesizing data on the economic performance of existing PES schemes and comparing with data on the use of alternative measures. Consideration will also be given to socioeconomic factors such as buyer motivations plus the impact of climate change. A major step will be linking water values to tree carbon and potentially other benefits. This will strengthen the durability of W-for-W PES schemes by integrating funding from different sources, including private payments and public subsidies, as well as contributing to multiple policy agendas.

The Repository of European W-for-W PES Case Studies will be of particular benefit to policy makers, practitioners and stakeholders. This will provide a one-stop shop for those interested in developing new schemes, explaining terminology, describing lessons learned, and offering information on tree planting, appropriate models, look-up tables, different financial approaches, and guidance on best practice. It will also identify limits and challenges to the approach, such as in drier regions where tree water use and drought tolerance may be an issue. Gathering and disseminating knowledge on enabling conditions and successful schemes will make a major contribution to promoting interest in and marketing of W-for-W PES schemes. It will also raise awareness of potential trade-offs and perverse incentives (such as the potential for financial payments to undermine intrinsic motivations), ensuring any dis-benefits are minimised. In order to scale-up private sector investment in woodlands for water projects, it will be useful to explore approaches that have been used to successfully expand other ecosystem markets.

Overall, the Action will significantly advance Europe's ability to use W-for-W PES as a policy tool to help solve the intractable issue of diffuse water pollution, thereby improving its water environment.

### **Innovation in tackling the Challenge**

EIP Water has selected the provision of water-related ES as one of its five priorities, because *“the ecosystem services approach offers market opportunities in the water utilities sector and other sectors [...and] the establishment of markets dealing with quantified ecosystem services offer opportunities to further develop the PES concept.”* PESFOR-W's STSMs and meetings will provide a multi-disciplinary, multi-sector approach to water governance, creating a 'safe' space for policy entrepreneurship, allowing stakeholders to explore ESS innovation and associated financial tools.

This Action is innovative by extending water-PES schemes to support more targeted tree planting within intensive agricultural areas. These represent the dominant sources of several agricultural diffuse pollutants responsible for degrading the water environment and causing many water body failures. Monitoring studies increasingly show that restoring GES will require an element of land use change but landowners remain resistant due to the impact on land values and incomes. PESFOR-W will fill this gap by sharing knowledge and providing tools and guidance on designing cost effective W-for-W PES schemes that reflect the social value of environmental benefits and offer an appropriate level of funding support. Account will also be taken of possible trade-offs for water yield, facilitating 'precision engineering' of catchments.

Another novel aspect will be efforts to develop a 'Woodlands for Water Code' that links to existing carbon codes. This would include standardised 'look-up' tables giving ranges for the effectiveness of planting for reducing different diffuse pollutants that take account of planting design and potentially management (e.g. spacing, thinning, etc.), physiography and climatic factors. Incorporating water benefits, along with other values, will strengthen the economic case for land use change and stimulate both public and private sector interest in W-for-W PES schemes.

The EU Science for Environmental Policy *'Future Brief: Innovation in the European water sector'* emphasizes that *'water innovation applies not only to new sustainable technologies but also to new partnerships extending across public administrations, research and industry: new business models and new forms of water governance that are not only innovative themselves but can also stimulate and support technological innovations'*. PESFOR-W will enable the creation of these much-needed partnerships, to design and deliver W-for-W PES as part of a more sustainable and integrated approach to catchment management. The opportunity to contribute to a number of policy agendas and help solve a currently intractable major water issue will ensure a wide range of ECIs, SMEs and other stakeholders participate in Training Schools, Case Studies and knowledge exchange.

Presenting Case Studies spatially through a web-hub (Milestone 4.4) will help overcome the fragmented nature of existing initiatives and provide relevant resources for all COST

countries, including ITCs and NNCs, overcoming language barriers between countries and facilitating the closer joint working of the forestry, agriculture and water sectors.

## Added Value of Networking

### In relation to the Challenge

Networking is essential to share knowledge and experience on W-for-W PES schemes so that lessons are learned and barriers addressed. As described in the State-of-the-art subsection, existing knowledge is fragmented and piecemeal, with much to be learned from local Case Studies and international developments. PESFOR-W will build a strong, European-led, trans-disciplinary community of specialists to consolidate knowledge and agree standardised evaluation approaches, particularly on the technical and economic aspects of effective W-for-W PES. Achieving this, with the close involvement of both public and private sector stakeholders, will generate confidence and support in implementing schemes and help lever in greater private sector investment. Creation of the network will significantly improve Europe's international visibility and standing in PES implementation, as well as link Europe with key global initiatives, as detailed in the subsection on the added value of networking in relation to existing efforts at European and/or international level. The strong representation of ITCs will increase ITC researchers' visibility and connection to leading European science and policy hubs. Provision of accessible Case Studies and high quality training will help overcome language barriers and assist career development of scientists and professionals from the water, forestry, agriculture and financial sectors. The strong involvement of ECI researchers and leading global experts will assure a particularly high level of innovation.

### In relation to existing efforts at European and/or international level

PESFOR-W will extend existing European research in PES-for-water by drawing on results and interacting with experts from many research, demonstration and innovation projects, including:

**H2020:** [Water Innovation projects](#): Water-1B-2015 '*Demonstration/Pilot Activities*' & Water-2B-2015 '*Integrated approaches to water and climate change*' (both 2016-2020) examining ES' roles in the provision of water-related services. [PROVIDE](#) '*Providing smart delivery of public goods by EU agriculture and forestry*'; & [PEGASUS](#) '*Public Ecosystem Goods and Services from land management*' (both 2015-18.). [ERASMUS+ Knowledge Alliance](#) project ECOSTAR '*Research and enterprise alliance in the Marketing and Economics of Ecosystems and Biodiversity*' (2016-19) on PhD entrepreneurship in Natural Capital business activities. [DIABOLO](#): '*Harmonising forest data*'.

**FP7:** [DESSIN](#) '*Demonstrate ecosystem services enabling innovation in the water sector*' (2014-17); [OpenNESS](#) '*Operationalisation of Natural Capital and EcoSystem Services to Real World application*' (2012-17); [OPERAS](#) '*Operational Potential of Ecosystem Research Applications*' (2012-17); [OPPLA portal](#) for Ecosystem Services and Natural Capital; [Newfor ex](#) '*New Ways to Value and Market Forest Externalities*' (2010-13); FP7 PEOPLE

FORESTA 'FORest conservation and EcoSysTem Accounting: towards the integration of private & public values in landuse decision modelling at farm scale' (2014-16); [POLICYMIX](#) (2010-14); [WFD-in-Croatia](#) Twinning project (2007-9); and [SUMFOREST](#) ERA-NET 'Implementing Sustainable, Multifunctional Forestry by enhanced Research Co-ordination for Policy Decisions' (2014-17).

**COST Actions:** ORCHESTRA FP1207 '*Orchestrating Forest-Related policy analysis in Europe*' (2012-15) and its successor [Wiki](#); FORMAN FP 0601 '*Forest Management and the Water Cycle*' (2006-11) and its successor Nordic-Baltic research network [CAR-ES](#) (2011-2015), which examined the impacts of forest management on water quality and carbon; and Targeted Network [CAPABAL TN1401](#) '*Capacity Building in Forest Policy and Governance in Western Balkan Region*', a strong network of young forestry sector researchers and practitioners.

**Several LIFE+ projects** have piloted and evaluated water-related PES: [GESTIRE](#) '*Lombardy NATURA 2000 Network*'; [INBIOWOOD](#) '*Afforestation for biodiversity*'; and EU Centre for River Restoration [ECRR network](#) portal for river restoration schemes in Europe (923 projects, 1995-present) plus [River Wiki](#), legacies from LIFE+ RESTORE (2010-13).

**Interreg & Nationally-Funded projects** e.g. [InterregIVB VALUE](#) '*Valuing Green Infrastructure and water benefits*'; Opportunity Mapping for woodland creation for water benefits; Wales' nutrient offsets; use of auctions for AES schemes; and Italy's 'Guidance on PES for water sector'.

PESFOR-W will use the above projects as 'leverage multipliers' to spread project messages to target stakeholders. Careful scheduling of project activities (e.g. Training Schools and Final Conference) to combine with other events (e.g. biennial conference of European Society for Ecological Economics being held in Budapest in 2017) will further contribute to knowledge sharing.

PESFOR-W will also link with innovators through EIP Water's '[Matchmaking for Water Innovation](#)' [online market place](#) and ensure project results feed into existing global innovation initiatives. For example, Task 4.2 will contribute to the biennial European and global survey of watershed payment schemes undertaken by Ecosystem Marketplace. Closing the gap between Europe and the current global leaders in PES development (USA and China) is directly addressed by the direct participation of China, USA, New Zealand and International organisations. The proposers' substantial role in international networks will assist linkage with global initiatives (e.g. Ecosystem Marketplace) and enable leading international experts to participate at their cost as trainers in the Training Schools.

Contact with [IUFRO](#) Unit 9.04.02 'Valuation of Ecosystem Services and Carbon Markets' and relevant IUFRO and IFSA Task Forces ('*Forest Foresight*'; 'Contribution of Biodiversity to ES'; and '*Higher Education*') will enable PESFOR-W results to feed into the 2019 IUFRO XXV World Congress in Brazil. Contact with **citizen science initiatives**, such as the World Water Monitoring Challenge, will provide a means to engage with citizens interested in their local water quality.

## Impact

### Expected Impact

#### Short-term and long-term scientific, technological, and/or socioeconomic impacts

The project will generate the following **scientific and technological impacts**:

- **Synthesising evidence**, including developing a common understanding of links between woodland creation and water quality and quantity, will help underpin targeting, design and evaluation of W-for-W PES Schemes. Provision of look-up tables with value ranges on the effectiveness of woodland planting to reduce a range of diffuse pollutants will improve the performance of existing models and facilitate mainstreaming PES development across Europe in the short-medium term.
- **Integrating models** covering water and other benefits will add value, facilitating links to existing PES schemes that address services such as carbon sequestration. Policy makers will benefit from understanding how PES schemes can interact with climate change scenarios, to deal with expected medium/long term challenges and improve confidence in their application/longevity.
- The '**User Manual: Smarter Guidance for Woodlands-for-Water PES**' will assist EU and national regulators in designing appropriate and cost-effective schemes, driving PES setup and implementation across MS. By consolidating knowledge and experience, the linked spatial Repository of Case Studies and supporting peer-reviewed articles will facilitate learning and dissemination, as well as help overcome language barriers.
- **Fostering interactions** between specialists from different sectors and research disciplines, PESFOR-W will advance understanding of a complex water issue and promote the need for an integrated approach to catchment management. This will facilitate future trans-disciplinary research and further improvements to modelling and mapping tools, allowing W-for-W PES schemes to continue to evolve and remain fit for purpose.

Overall, PESFOR-W is expected to result in three main socio-economic impacts:

- **Improve Europe's water quality** by reducing the major pressure of diffuse pollution from agriculture, the single most important source of water pollution in Europe (EEA 2012). Increased implementation of well-designed, targeted W-for-W PES schemes will help address this intractable issue, reducing economic and human health costs. The scale of potential savings is huge:
  - Annual costs of UK agricultural diffuse pollution alone are estimated at £238m (**Jacobs, 2008**)
  - Compared to water treatment, preventing water pollution at source can have an estimated cost-benefit ratio as high as 1:65 (POST 2014)
  - 13% of 12,938 groundwater monitoring stations across Europe exceeded the 50 mg NO<sub>3</sub>/l limit for drinking water (**EuroStat, 2014**).

- Over 3 million people (5.8% of the French population) are exposed to water quality below World Health Organization standards (**EuroStat, 2012**)
- **Grow the European market and employment for PES scheme design and implementation**, increasing opportunities for European environmental consultancies and entrepreneurs, and their ability to compete globally. In 2013, nature-based solutions to water management were estimated to be worth \$12.3 billion per annum globally, rehabilitating and/or protecting over 365 million ha of water-critical ecosystems worldwide (an area larger than India). This market is said to be growing at 12% per year, (Bennett et al. 2014). 59% of global PES-for-water funding flows to projects that compensate landowners for sustainably managing their farms, forests and other lands.
- **Extend integrated catchment management**, promoting local ownership of water issues and delivering solutions, as well as improving the rural economy. Targeted integration of woodland into the farmed landscape will minimise land take, maximise water benefits, improve agricultural productivity (e.g. by shelter provision) and diversify farm incomes. It will also support the forestry and wood processing industries. The forestry sector has an annual turnover of >€300 billion, delivers 8% of EU added value in manufacturing and provides around 3.5 million jobs, mainly in rural areas.

## Measures to Maximise Impact

### Plan for involving the most relevant stakeholders

Implementing well-designed W-for-W PES requires the close interaction of knowledgeable and engaged 'users' in the forestry, agriculture, water and environmental finance sectors. The assembled partnership are well connected with end users and have a good track record of effective engagement and delivering practical outcomes. PESFOR-W's impact will be maximised by involving two main types of stakeholder:

**Water, forestry and agriculture end users** who can stimulate the mainstream adoption of W-for-W PES, including: water utility companies (and representative organisations such as the European Association of water utilities); water regulators; municipalities/ local councils; river basin and catchment management planners; landowners, farmers, foresters and their lobby groups and advisors (e.g. farmers' unions, angling associations, CEPF and EUSTAFOR); government bodies/Agri-Environment-Scheme policy-makers (including European Federation for Information Technology for Agriculture); businesses reliant on clean water resources (including social enterprises and food and beverage producers); finance and insurance companies; and organisations interested in Corporate Social Responsibility and water foot-printing.

**Environmental economists** responsible for designing PES schemes, training practitioners and developing PES as an economic tool, including: environmental consultancies; knowledge providers and modellers, such as university business schools/graduate



programs in environmental economics; and organisations interested in developing market standards for W-for-W schemes.

The **Work Plan** is structured to enable these diverse stakeholder groups to interact and 'gel' through meetings, workshops, training schools and related events. The extensive use of **Case Studies** provides a powerful means of involving stakeholders in a more focused way, sharing learning and stress testing ideas. This will also ensure that scientific progress is 'ground-truthed' by participants with real-life experience and that project results feed directly to stakeholders at the frontline of PES implementation, enabling current bottlenecks to be overcome. Where possible, **STSMs** will be embedded with key stakeholders, helping to create an expanded cohort of skilled experts capable of commissioning and delivering well-designed W-for-W PES. Creation of a '**European skills directory**' in water PES will garner stakeholder interest and participation. The Action's Final **Conference** will consolidate learning and inform further research and development activity amongst stakeholders. A major output, the '**User Manual: Smarter Guidance for Woodlands-for-Water PES**', will involve extensive consultation to engender shared ownership and support.

### **Dissemination and/or Exploitation Plan**

The importance of knowledge sharing and communication is recognised and will be assured by agreement of a detailed Dissemination and Exploitation Plan at the project start (WG4). A key route for dissemination will be the project website and linked open access Case Study Repository. There will be full use of social media to promote engagement and raise awareness of results. A wide range of publications will be produced, the most important being the User Manual and case study fact sheets. These will be underpinned by high impact, open access, peer reviewed journal papers and supported by a mixture of reports and trade press articles. Findings will also be disseminated through meetings, workshops and Training Schools, as well as cascade through partnership organisations and strong industry links. This will maximise outreach and ensure end users become more confident and knowledgeable participants in PES schemes, and evolve access / open source models. Opportunities will be actively pursued to exploit models, decision and mapping tools, and advisory services in support of W-for-W PES Scheme development and implementation.

### **Potential for Innovation versus Risk Level**

#### **Potential for scientific, technological and/or socioeconomic innovation**

The opportunity for woodlands to be used 'proactively' to help tackle the intractable issue of diffuse water pollution from agriculture, represents an important new role for the forestry sector which, hitherto, has focused mainly on protecting water quality within existing forests. Bringing the forestry, agriculture, water and environmental finance sectors together - and ensuring the strong participation of businesses and users in the MC, WGs, Case Studies and STSMs - will pave the way for mainstreaming W-for-W PES. This will be underpinned by the involvement of a high quotient of ECIs and PhDs, which together with

global PES experts from Europe, USA and China, will maximise knowledge sharing and the generation of new ideas.

Building on existing, benchmark models will reduce risk, while the provision of look-up tables, a Woodland-for-Water code, user manual, training, and stress testing via Case Studies will strengthen PES design and scheme cost-effectiveness, increasing confidence in delivering water improvements. Tailoring woodland placement, design and management to minimise potential dis-benefits such as a potential reduction in water resources, will further reduce risks. Significant financial returns can be expected from water quality improvements, enhanced by linking water and carbon benefits. Facilitating integration of public (AES) money and private investments will reduce government risks of failing to meet WFD targets, avoiding infraction proceedings and fines. Thus the Action presents a very low risk/return trade-off and can be expected to achieve the full potential for scientific, technological and socio-economic innovation described in 'Innovation in tackling the Challenge'.

## **Implementation**

### **Description of the Work Plan**

PESFOR-W will have two MC meetings per year, organised to co-incide with bi-annual WG meetings and WG activities (workshops will focus on specific topics linked to STSMs and Training Schools). MC plenaries will include invited speakers on key issues related to W-for-W PES in the host country, involve site visits to consider local schemes, and discuss reports on WG progress. The first MC plenary will finalise the WGs' remits, Work Plans and the Project Dissemination and Exploitation Plan (which will include the project's Gender Action Plan).

WGs will arrange Workshops, dissemination, Training Schools and other events on topics of particular interest to stakeholders. Between formal meetings, Working Group Leaders (WGLs) will arrange extra, ad hoc meetings, using geographical hubs to ensure extensive information sharing.

Four Training Schools will be organised for PhD students, ECIs and end users on key research challenges, including using models and case study sites, to provide 'real life' examples. Training Schools will usually last 3-5 days and will be timed to link with other relevant events to maximise uptake (e.g. European Society of Ecological Economics 2017 conference in Budapest). STSMs will last from 5-60 days depending on subject and nature of exchange visits. Workshops will be 1-3 day events. The final Conference will include a site visit to a W-for-W PES scheme and link to a final Training School on the User Manual, maximising learning opportunities.

### **Description of Working Groups**

Four Working Groups with cross-collaboration will ensure continuity and broad exchange of ideas:

## Working Group 1 (WG1): PES Design and Governanc

WG1's primary objective is to characterize and critically evaluate the governance models and design structure of W-for-W PES. It will examine: i) service provision (supply); ii) policy drivers; iii) payments/markets (demand); and iv) types of governance. It aims to identify organizational and policy arrangements that could increase the effectiveness of PES schemes and improve their governance. An institutional and governance analysis approach will be adopted, led by a leading researcher with expert, up-to-date understanding of European research on PES in the water sector. Findings will inform the work of WG2 and WG3 and feed directly into the User Manual.

WG1 will evaluate European W-for-W PES through expert meetings and three STSMs, which will compare and contrast institutional settings, governance structures, payment mechanisms, contracts and procedures, different actors' roles and expectations; and institutional and actor interactions. Evaluations will also consider drivers, roles of national legislation and 'green' taxes in creating demand, property rights issues, and quality assurance underpinning associated markets (Table 1).

| Table 1.<br>WG1 tasks, milestones and deliverables |       |  |
|--|-------|--|
| Task   | Month |  |
| T1.1   | 1-27  | Characterise <b>design and governance aspects of European W-for-W PES</b> .  |
| T1.2   | 22-36 | Identify <b>Best Practice in PES design and governance</b> , using Case Studies.   |
| T1.3   | 31-48 | <b>Training and guidance</b> for 'Design and Governance' chapter of ' <i>User Manual</i> '.  |
| Milestones   |       |  |
| M1.1   | 15    | <b>STSM (A)</b> , exploring potential investors' perceptions of what would be needed to attract them to purchase credits, and interest in providing finance. |
| M1.2   | 24    | <b>STSM (B)</b> , exploring motivations and barriers of other potential PES participants (e.g. farmers, water utilities, landowners and the general public). |
| M1.3   | 33    | <b>STSM (C)</b> , engaging with policy-makers on best governance of new schemes + explore potential for citizen science to monitor completed PES schemes.    |
| M1.4   | 39    | <b>Training School 'PES design and governance'</b> , including participatory approaches to stakeholder interaction at river basin level.                     |
| Deliverables                                       |       |  |
| D1.1   | 18    | Report on investors' perceptions   |
| D1.2   | 28    | Report on motivations of potential PES participants and barriers.  |
| D1.3   | 36    | Report on governance and engaging with policy-makers.  |
| D1.4   | 39    | 'Design and Governance' chapter for ' <i>User Manual</i> '   |

## Working Group 2 (WG2): PES Environmental Effectiveness

WG2's primary objective is to consider the environmental effectiveness of woodland creation measures to reduce agricultural diffuse pollution. It will develop and compare

model performance, and provide a methodology and guidance on strengths and weaknesses of data and models to inform valuation approaches and assessments of cost effectiveness by WG3. The focus will be to provide value ranges for a standard set of measures to reduce key diffuse pollutants, and to use these to populate look-up tables for use by pollutant and ecosystem services models. The Action will enjoy free-of-charge access to models; data ownership remains with the source. Potential impacts on water resources will also be assessed, particularly the ability of woodland creation to increase water use and how this might be influenced by climate change. Work will take place through 3 STSMs, 2 workshops and one Training School (Table 2).

| Table 2.<br>WG2 tasks, milestones and deliverables |       |   |
|--|-------|---|
| Task   | Month |   |
| T2.1   | 1-9   | <b>Review evidence</b> on the effectiveness of woodland creation measures for reducing a range of agricultural diffuse pollutants.  |
| T2.2   | 7-12  | Agree a value range for the effectiveness of woodland creation measures to reduce different diffuse pollutants for use in pollutant and ES models.  |
| T2.3   | 7-24  | <b>Populate look-up tables:</b> evaluate how well existing pollutant and ES models quantify woodland creation impacts on diffuse water pollution. Assess models' ability to account for other W-for-W benefits (e.g. flood risk, water temperature), possible disbenefits (e.g. water yield) & linked services (e.g. carbon sequestration). Evaluate mapping tools; write methodologies; and provide guidance on data, models and mapping tools, as a Chapter for ' <i>User Manual</i> '. |
| T2.4   | 19-48 | <b>Training and guidance</b> on designing and managing woodland measures to enhance their effectiveness at pollutant removal; chapter for ' <i>User Manual</i> '.   |
| Milestones   |       |   |
| M2.1   | 9     | <b>STSM (D)</b> , to review the effectiveness of woodland creation measures in reducing a range of agricultural diffuse pollutants and design a standard set of measures.   |
| M2.2   | 12    | <b>1st Workshop</b> , to discuss and agree value ranges for the ability of woodland measures to reduce individual diffuse pollutants; and populate look-up tables.  |
| M2.3   | 15    | <b>STSM (E)</b> , completing review of pollutant and ES models' suitability to quantify impacts of woodland measures on diffuse pollution at a range of scales.   |
| M2.4   | 21    | <b>2<sup>nd</sup> Training School</b> , on applying and comparing usefulness of preferred models to assess impacts of woodland measures on losses of agricultural diffuse pollutants to water in selected Case Study sites.   |
| M2.5   | 24    | <b>STSM (F)</b> completes methodology for assessing the effectiveness of woodland creation measures to reduce agricultural diffuse pollution, and provides guidance on the strengths and weaknesses of data, models and mapping tools.  |
| M2.6   | 36    | <b>2nd Workshop</b> , to write guidance on the design and management of woodland measures to maintain/enhance pollutant removal effectiveness at minimum risk.  |
| Deliverables                                       |       |   |
| 2.1  | 15    | <b>Publish look-up tables</b> on the effectiveness of woodland measures in reducing agricultural diffuse pollution.   |

|     |       |  |
|-----|-------|--|
| 2.2 | 24    | <b>Report:</b> <i>'The suitability of pollutant and ecosystem service models to quantify woodland creation impacts on diffuse pollutant losses to water, to account for other woodland water benefits and potential disbenefits, and services such as carbon sequestration, across a range of scales.'</i> (Chapter of <i>'User Manual'</i> ). |
| 2.3 | 30    | <b>Methodology, with Case Study worked examples,</b> to assess the effectiveness of woodland creation measures for reducing agricultural diffuse pollution.  |
| 2.4 | 36    | <b>Journal paper:</b> <i>'The effectiveness of woodland creation measures for reducing agricultural diffuse pollutants'</i> .  |
| 2.5 | 39    | <b>Practical guidance</b> on designing/managing woodland measures to optimise their effectiveness at pollutant removal, for Chapter for <i>'User Manual'</i> .   |
| 2.6 | 18-48 | <b>Newsletters &amp; trade articles</b> on using targeted woodland creation to tackle agricultural diffuse pollution as part of integrated catchment management.   |

### Working Group 3 (WG3): PES Cost-Effectiveness

WG3's primary objective is to consider the cost-effectiveness of woodland creation measures to improve water quality and providing other benefits. Work will focus on:

- Synthesizing evidence on the economic performance of existing PES schemes in COST countries, including wider impacts (e.g. employment creation and carbon sequestration);
- Standardising economic and financial metrics;
- Quantifying costs (including agricultural opportunity costs) of woodland creation;
- Quantifying woodland creation benefits, including ancillary benefits (carbon sequestration etc);
- Quantifying returns on investment, including the societal distribution of returns, and accounting for any AES/rural development program payments; and
- Preparing marginal abatement cost curves.

4 STSMs will develop best practice in estimating the cost and social effectiveness of W-for-W PES, and identify topics for further study. One Training School will be held (Table 3).

Table 3.

WG3 tasks, milestones and deliverables

| Task              | Month |   |
|-------------------|-------|---|
| T3.1              | 1-12  | Agree <b>common protocols</b> ; to estimate the cost-effectiveness of W-for-W PES (by month 6) and for socioeconomic evaluation (by month 12).                |
| T3.2              | 13-27 | <b>Evaluate demand-side (buyer) motivations.</b>  |
| T3.3              | 16-30 | Evaluate impact of applying climate change scenarios on PES cost-effectiveness.   |
| T3.4              | 31-48 | <b>Training and guidance</b> on Best Practice for socioeconomic evaluation and cost-effectiveness analysis of W-for-W PES; chapter for <i>'User Manual'</i> . |
| <b>Milestones</b> |       |   |
| M3.1              | 24    | <b>STSMs (G&amp;H) on demand-side (buyer) motivations</b> of W-for-W PES.   |

|                     |          |  |
|---------------------|----------|--|
| M3.2                | 27       | <b>STSMs (I&amp;J) on demand-side and climate change investigations into PES cost-effectiveness</b> completed.   |
| M3.3                | 33       | <b>3<sup>rd</sup> Training School</b> on Best Practice (socioeconomic evaluation and cost-effectiveness analysis of W-for-W PES).                        |
| <b>Deliverables</b> |          |  |
| D3.1                | 12       | <b>'Thought leadership' article</b> on 'Cost-effectiveness of W-for-W PES'.  |
| D3.2                | 24;27;33 | <b>Reports</b> on demand-side and climate change STSM results.   |
| D3.3                | 27-48    | <b>Journal paper, newsletters &amp; trade articles</b> on socioeconomic evaluation and cost-effectiveness analysis of W-for-W PES.                       |
| D3.4                | 39       | <b>Guidance</b> on Best Practice for socioeconomic evaluation and cost-effectiveness analysis of W-for-W PES for a chapter of the <i>'User Manual'</i> . |

**Working Group 4 (WG4): Communication, Dissemination and Marketin**

WG4’s main aim is to communicate, disseminate and market project activities and results: by developing a European PES Case Study repository which is shared with practitioners, policy makers and stakeholders, to promote best practice (making information more accessible to potential PES buyers, suppliers and intermediaries, including use of mapping tools); by publishing the *'User Manual: Smarter Guidance on woodlands-for-water PES schemes'*; and by an STSM exploring how to market PES schemes. WG4 will synthesise results from WG1-3 and will provide a stakeholder forum for dialogue about enabling factors and potential barriers in mainstreaming PES, such as discussing undesirable consequences (e.g. ‘commodification of nature’, implicit redistributions of property rights/ social equity, or ‘crowding out’ of intrinsic pro-social motivations).

WG4 will work closely with WG1-3 to agree and implement the project Dissemination and Exploitation Plan (Task 4.1), and ensure this is consistent with the project Gender Action Plan. Project results will be disseminated through a web hub, provided through Task 4.2, which will function as a trans-disciplinary learning platform and incorporate: the project work plan, progress reports & training resources,; event information; skill database of European PES Expertise (M4.1); the spatial repository of Case Studies on W-for-W PES (M4.5); and links to EU and global initiatives listed under the plan for involving the most relevant stakeholders (e.g. Ecosystem Marketplace reports and WFD-related maps).

A survey of PES Case Studies (T4.4) will be organised in collaboration with a biennial global market outlook and the results used to inform the work of WG 1-3. WG4 will compile the resulting best practice in the *'User Manual'*, with dissemination via the website, social media, final conference, final suite of training courses and through partner and industry links (Table 4).

|  |       |  |
|--|-------|--|
| Table 4.<br>WG4 tasks, milestones and deliverables |       |  |
| Task   | Month |  |
| T4.1   | 1-3   | Agree <b>Dissemination and Exploitation Plan</b> (M2). |

|                     |       |   |
|---------------------|-------|---|
| T4.2                | 1-48  | Design, create, promote, extend and maintain the <b>PESFOR-W web hub</b> .  |
| T4.3                | 1-15  | Expand the network of countries involved in assisting collection of information on existing PES pilots, projects and best practice.                 |
| T4.4                | 1-9   | Conduct EU <b>online web survey</b> to gather information/opinions on W-for-W PES.  |
| T4.5                | 10-45 | <b>Collect key details, including financial and socioeconomic information for W-for-W PES fact sheets for existing and new Case Studies.</b>        |
| T4.6                | 24-48 | Synthesise and edit Best Practice in the ' <i>User Manual: Smarter Guidance on Woodlands-for-Water PES</i> '; translated into 6 European languages. |
| T4.7                | 24-48 | Organise/deliver <b>Final Conference</b> (Month 45) by Conference Committee.  |
| <b>Milestones</b>   |       |   |
| M4.1                | 6     | <b>Spatial hub</b> operational.   |
| M4.2                | 10    | Launch <b>online web survey</b> .   |
| M4.3                | 21    | <b>STSM (k)</b> collecting key data, including financial and socioeconomic information, on W-for-W PES schemes for Case Study fact sheets.          |
| M4.4                | 27    | <b>Existing Case Studies are all on Spatial Repository</b> on PESFOR-W website.   |
| M4.5                | 28    | Establish skills database on 'European <b>PES Expertise</b> '.  |
| M4.6                | 29    | <b>STSM(I)</b> on best marketing and communication practices for PES.   |
| M4.7                | 45    | <b>Final Conference</b> takes place.  |
| M4.8                | 45    | <b>4<sup>th</sup> Training School</b> , on applying the User Manual.  |
| <b>Deliverables</b> |       |   |
| D4.1                | 6     | PESFOR-W <b>website</b> .   |
| D4.2                | 27    | Publication of <b>factsheets on existing Case Studies</b> on W-for-W PES.   |
| D4.3                | 33    | Report on ' <i>Communicating the PES "Wow factor"</i> ' (- ' <i>User Manual</i> ' Chapter).   |
| D4.4                | 39    | <b>Publication of Final Case Study synthesis</b> chapter for ' <i>User Manual</i> '.  |
| D4.5                | 42    | Publish ' <i>User Manual: Smarter guidance on W-for-W PES schemes</i> '   |
| D4.6                | 1-48  | Other <b>knowledge exchange</b> activities (e.g. via social media and press).   |
| D4.7                | 48    | <b>Final Conference</b> published proceedings and Final Project Report.   |

A Gantt Chart is shown in Fig. 2 and a Pert diagram in Fig. 3.

### Risk and Contingency Plans

The main risks and countermeasures are:

Risk (1): **Poor management and administration** – Mitigated by the lead proposer's extensive and proven experience as a COST Action administrator; and by Secondary Proposers' solid reputation.

Risk (2) **Paucity of EU W-for-W PES Schemes for Case Studies** – Mitigated by proposers having already completed an extensive preparatory mapping exercise (including those published by **Bennett et al., 2014**), which has identified >20 PES schemes.

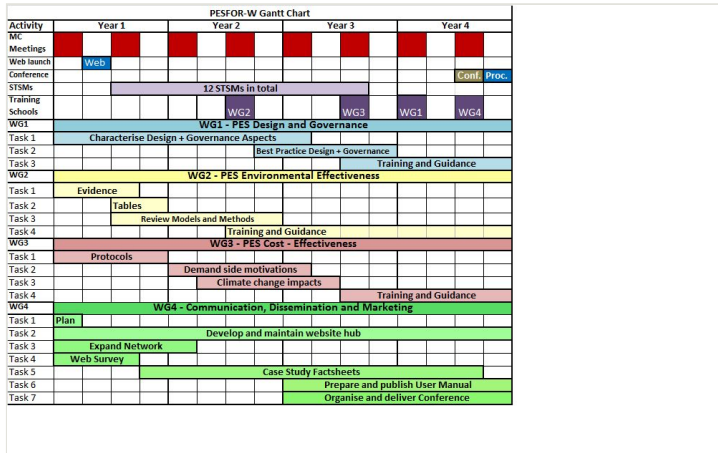


Figure 2.  
GANTT Diagram

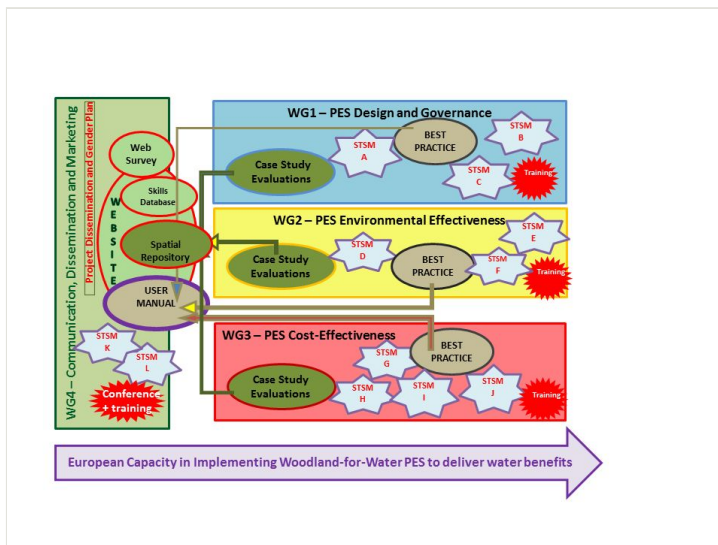


Figure 3.  
PERT Diagram

Risk (3) **Network fails to achieve required scale and impact** – Mitigated by strong Secondary Proposers and their associated networks: Proposers engage in many relevant EU and international projects and networks (per the subsection on the added value of networking in relation to existing efforts at European and/or international level), which will act as “leverage multipliers”. Proposers have in-house communications professionals with good knowledge of social media (blogs/Twitter/Facebook) and other networks (including COST Office and EU science communication channel EUresearch.eu).



Risk (4) **Inclusiveness goals not achieved** – Many ITCs, ECIs and women already expressed strong interest in participating; and the high quality of proposers providing Training Schools will guarantee high quality trainees. Proposers' extensive links with ITC research networks will enable rapid growth and inclusiveness. Activities will be advertised to engage under-represented groups (e.g. highlighting opportunities for re-qualification for women after career breaks).

Risk (5) **Industry users and policy stakeholders reticent to participate** – Mitigated by the high importance of the diffuse pollution issue and urgent need for action. Proposers already obtained strong support from forestry, water, agriculture and environmental finance sectors. SMEs and users have also agreed to participate; and good links with policy teams are in place.

## Management Structures and Procedures

PESFOR-W will be co-ordinated through the Management Committee (MC), in accordance with the 'Rules for Participating in and Implementation of COST Actions' COST132/14. Management posts (Chair, Vice-Chair and Working Group Leaders (WGLs)) will be formally nominated and elected at the kick-off meeting. Gender balance, ECI involvement and geographic balance will be standard items at all MC meetings, ensuring sustained emphasis on their encouragement.

A Steering Group, comprising MC Chair, Vice-Chair, WGLs and Grant Holder, will be responsible for oversight of the Action's planning and delivery, including: STSM prioritisation, liaison with local organisers in each country hosting meetings of the Action, and ensuring that STSM participants (visiting researchers and hosts) are adequately supported. STSMs will provide the means to implement agreed Tasks leading to the major Deliverables. Research gaps will be identified and addressed via STSMs and existing research programmes. Scientists participating in STSMs will present their studies at the next WG meeting and will provide a report for the website.

The MC will select a Conference Committee to organise the Conference and organise and edit Conference Proceedings, which will be managed through WG4 activities. Regular communication within the Action and with external parties will be mainly through the website, supported by email, telephone, Skype and video conferencing (VC). To reduce carbon impacts, PESFOR-W will actively encourage Skype, VC, land travel and use of public transport.

Each WG will elect a leader to ensure effective delivery of the WG Targets and Milestones (per 'Description of the Work Plan') and to ensure good liaison within and between WGs. WGLs will preferentially be drawn from ITC countries unless the scientific expertise required is unavailable, in which case the WGL will appoint an ITC "Shadow" to build capacity. Annual WG meetings will provide opportunities for sharing expertise and information, and WGs will be encouraged to organise joint activities through STSMs and Training Schools. Training Schools will be embedded in WG meeting programmes to provide opportunities for all participants to acquire new skills. Information from Training

Schools will be available through the PESFOR-W website, providing resources to enable further e-learning.

### **Network as a Whole**

PESFOR-W will form an extensive, interdisciplinary network, involving hydrologists, environmental economists, foresters, agriculturalists, water regulators and policy makers, to increase Europe's capacity to design and implement effective W-for-W PES, overcoming current bottlenecks. The Action will create the necessary 'step-change' in PES scheme implementation to tackle the currently intractable issue of agricultural diffuse pollution, playing a pivotal role in translating efforts being made in EU initiatives and research, into frontline environmental management tools, commercial opportunities, and most notably, in delivering better water quality and GES. The proposers demonstrate good geographic balance, a diverse organisational composition and strong ITC and female representation. The lead proposer is highly experienced in managing Actions and has already received offers to host STSMs and Training Schools. The network is well poised to exceed 40% female representation in MC composition and to achieve 50% female participation in Training Schools. The Action is well placed for further growth: particularly strong interest has already been expressed by other Balkan countries and other core MS, evidencing the network's relevance across Europe; and further interest has also been expressed by notable NNC and International Countries and organisations with relevant experience.

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