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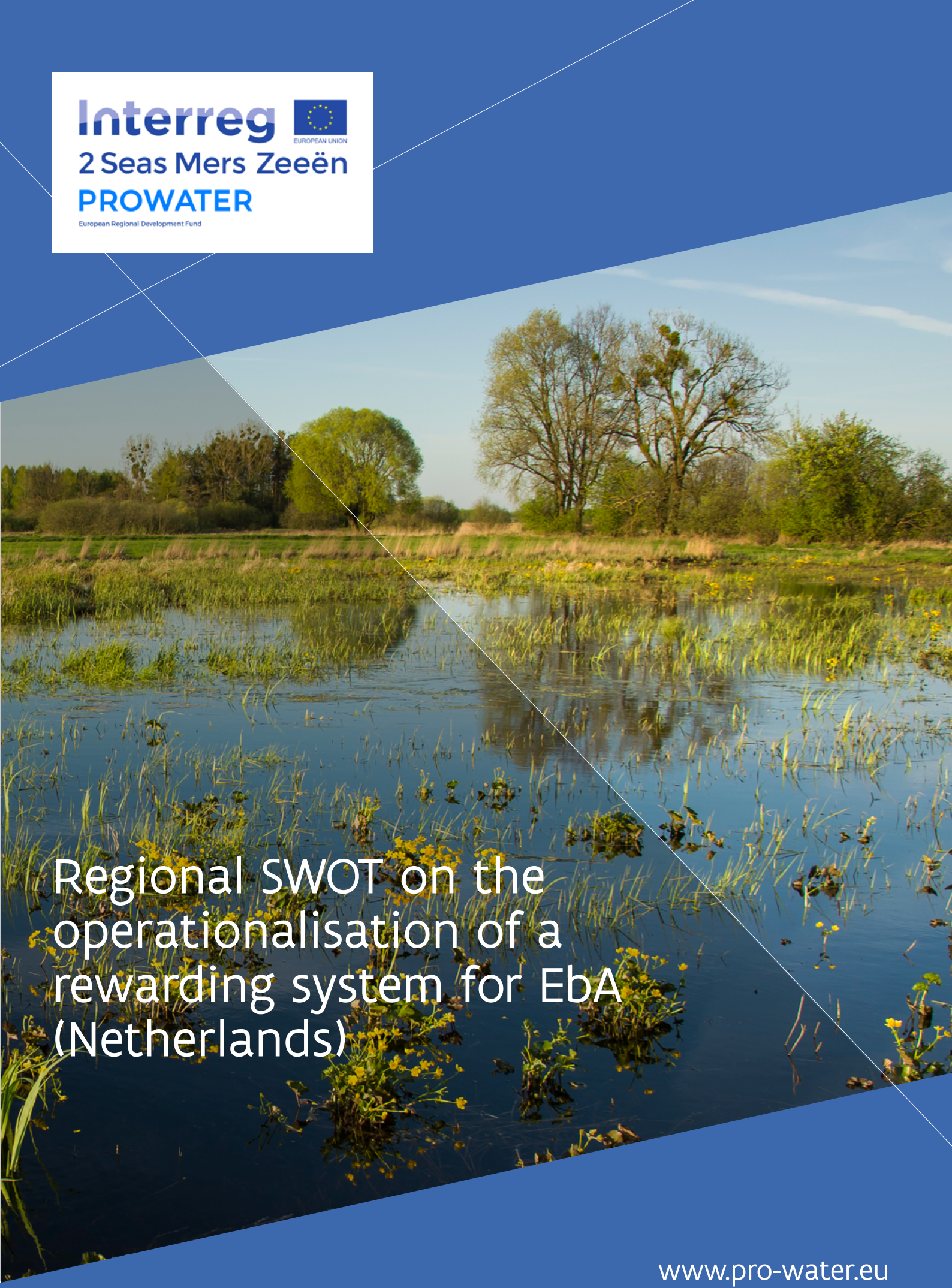

Regional SWOT on the operationalisation of a rewarding system for EbA (Netherlands)

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AUTHORS

L. Santbergen
Waterschap Brabantse Delta
Bouvignelaan 5, 4836 AA Breda | Postbus 5520, 4801 DZ Breda, The Netherlands

PARTNERS

Flanders State of the Art
Universiteit Antwerpen
Provincie Antwerpen
pidpa water in beweging
Westcountry Rivers Trust
Kent County Council kent.gov.uk
south east water
Waterschap Brabantse Delta
natuurpunt
south east rivers trust

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1. Introduction

1.1. PROWATER project

PROWATER (Protecting and Restoring Raw Water Sources through Actions at the Landscape Scale) is an Interreg 2 Seas project running from 2018-2022 with partners from Belgium, Netherlands, United Kingdom and France (observers).

The overall objective of the project is to build resilience against droughts (and extreme precipitation events) through Ecosystem Based Adaptation measures (interventions that work with natural processes).

Climate and Land Use Change are increasing pressures on water resources. Changing rainfall patterns, alongside intensification of agriculture (often resulting in increased input of fertilizers and pesticides and machinery) and urbanisation (with increased surface sealing and urban pollution) impact water quality as well as water quantity not only in the environment but also for human consumption. Increasing resilience of catchments to the combined effects of these pressures necessitates different actors to work together to address these challenges and implement ecosystem-based adaptation. One approach is through the use of rewarding mechanisms in the form of Payments for Ecosystem Services (PES) schemes, which can bring together those benefitting from adaptation measures and those delivering them through (financial) incentives that create benefit for both stakeholders.

A key objective of the project is therefore to develop and implement a PES model that facilitates the implementation of Ecosystem Based Adaptation (EbA) measures. The project will develop tools to target the implementation of EbA measures and aims to identify, quantify and demonstrate additional benefits of the EbA measures in order to recognise the full spectrum of benefits and provide additional leverage and funding for implementation.

1.2. Regional context

Generally, in the public opinion around the world, people consider the Netherlands as a water-rich country. In practice, without the major inflow of water of four European rivers (Rhine, Meuse Eems and Scheldt) the Dutch would suffer from water scarcity. The Dutch depend for about 2/3 of their drinking water on (deep) ground water resources and for 1/3 on surface water resources. Additionally, also agriculture and industry abstract water from these resources. The prolonged dry period in the Summer of 2018 caused severe fresh water availability issues. If climate change will not be mitigated sufficiently, the consequence will be severe water scarcity in the 2 Seas region of the Netherlands in the next decades. Therefore, there is an urgent need to invest in Ecosystem based Adaptation measures and to develop a sustainable financing system for their timely and effective implementation.

There is an urgent need to enlarge public awareness of the need of a long term strategy to mitigate climate change and to adapt land and water use practices to cope with the drought and water scarcity consequences of climate change. Within the Interreg 2 Seas PROWATER project, the Brabantse Delta Water Management Authority (*Waterschap Brabantse Delta*) focuses on the Mark River Valley, between Breda City and the Dutch-Belgian border, as a demonstration site for Ecosystem based

Adaptation measures. Additionally, together with the six Dutch observer parties (*Vereniging Markdal duurzaam en vitaal, Provincie Noord-Brabant, Evides Water Company, Stichting Het Zeeuwse Landschap, Brabant Water* and *Vereniging van Bos- en Natuurterrein-eigenaren*), the applicability of the Payment for Ecosystem Services (PES) concept within the Dutch institutional context will be explored.

The Dutch PROWATER demonstration site concerns the Mark River Valley which is part of the trans-boundary Mark river basin, as shared by the Flemish Region of Belgium and the Netherlands (see Figure 1). The Dutch part is designated as a 'heavily modified surface water body' for the Water Framework Directive: 28 km of this small lowland river in a sandy hill area is situated in Belgium (the upstream part which includes the river source), for 3 km the river is the territorial border and 11 km flows on Dutch territory towards Breda City (the downstream part; Beers et al., 2017).

Figure 1: the Mark River Valley (photo: Piet Verdonschot)

In the 1960's the river has been channelized and normalised to a large extent in order to prevent floods in urbanised parts and for fresh water distribution for agriculture (Figure 2). Due to these river reconstruction 'efficiency' works, both in Belgium and the Netherlands, the ecological quality of the river and its valley has deteriorated dramatically. Also the natural retention and infiltration capacity of the river valley and the related ground water resources have diminished significantly. Consequently, vulnerability to (prolonged) dry periods has increased (Beers et al., 2017).

A volunteer group of citizens and entrepreneurs (the *Vereniging Markdal duurzaam en vitaal*) has taken initiative to develop a river restoration vision for the Dutch part of the Mark River Valley. The aim is to restore aquatic and terrestric ecological values and the natural infiltration and retention capacity of the landscape by means of ecosystem based adaptation measures. Stage 1 of these restoration works will be implemented as part of the PROWATER demonstration site. The approach of the volunteer group is participative and innovative. The involved local citizens and entrepreneurs want to redevelop the river valley as their shared common good. From inside the community they decide how to develop a sustainable regional economy, which should be based on ecosystem services. The volunteer group takes the lead in mobilising financial resources and the cooperation with the Brabantse Delta Water Management Authority, local and regional governments, farmers and nature management organisations. The payment for ecosystem services concept will be explored as a thought experiment.

Figure 2: The channelized and normalised Mark River and the (artificial) Oudhof Meander at the vicinity of Ulvenhout Village (photo: Waterschap Brabantse Delta)

1.3. Payments for Ecosystem based Adaptation measures (PEbA)

For a detailed elaboration of the principles of the Payment for Ecosystem Services concept, we refer to paragraph 1.2 in the Regional SWOT on the operationalisation of a rewarding system for EbA (Flemish Region) (Staes and Boerema, 2019).

1.4. The PES concept

For this paragraph we refer to Section 1.3 in the Regional SWOT on the operationalisation of a rewarding system for EbA (Flemish Region) (Staes and Boerema, 2019).

2. Methodology

2.1. Context of the SWOT analysis in PROWATER

For this paragraph we refer to Section 2.1 in the Regional SWOT on the operationalisation of a rewarding system for EbA (Flemish Region) (Staes and Boerema, 2019).

2.2. Workshops

In the Netherlands we will explore the questions of the agreed PROWATER common approach and action plan related to a potential implementation of the rewarding scheme for Ecosystem based Adaptation measures (PEbA, see Figure 3).

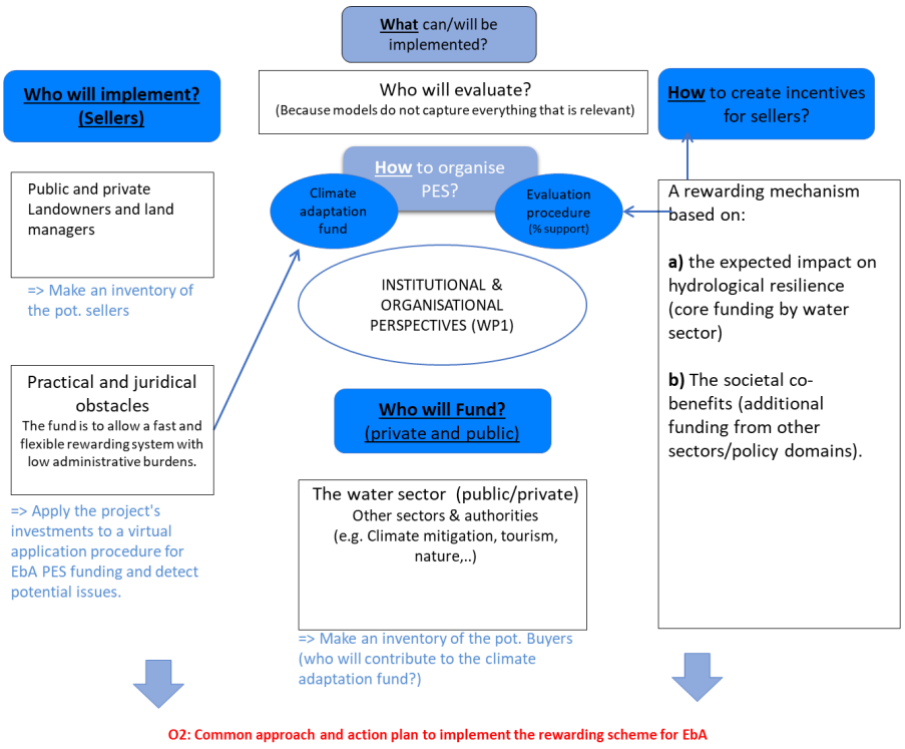

Figure 3: the PROWATER common PES approach (Staes and Boerema, 2019)

By means of a series of workshops, the Dutch exploration exercise aims at raising awareness of stakeholder groups on the need for and the practical and juridical obstacles to a sustainable financial system for Ecosystem based Adaptation measures. The challenge is to trigger willingness to pay for substantial measures that are needed for adaptation of water and land use to cope with climate change. Measures that are beneficial to all, but without obvious buyers and sellers at a first glance. The challenge for such a new financial system is to overcome classical dilemma's in the management of common pool resources like the free rider problem. As Rome has not been built in one day and given numerous possible routes to Italy's capital, we will start pragmatically from an evolutionary approach. Looking for small steps of amending existing financial schemes and adding new schemes whenever considered effective. Small steps that may trigger a transition towards a future PES scheme. That

means putting PES at the top of the pyramid (see Figure 4), instead of an ideal world picture, in which PES would be the pyramid's fundament.

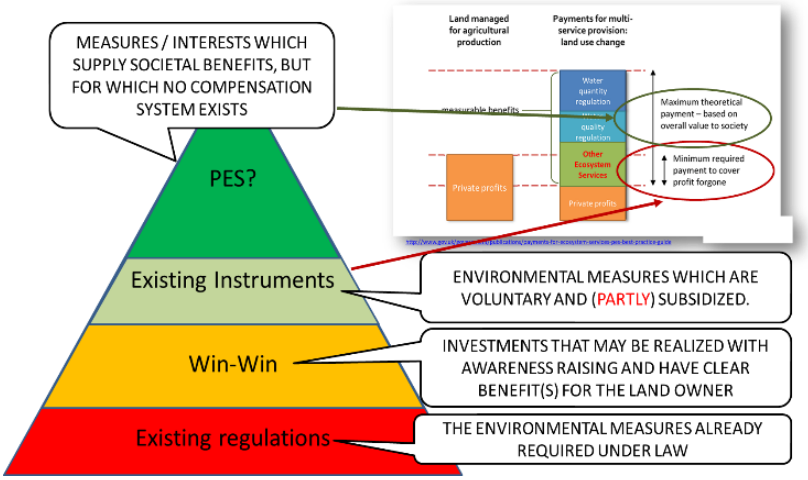

Figure 4: The PROWATER-PES Pyramid (Staes and Boerema, 2019)

The pyramid's fundament consists of environmental measures that are already required under law, e.g. to comply with conditions for fresh water abstractions from ground and surface water bodies and to meet water quality standards. The second layer of the pyramid consists of common sense practices that are beneficial for planet, people and profit. Raising awareness, e.g. by demonstration events, may succeed in implementation of practices that obviously are beneficial for both an entrepreneur and the environment. The third layer are voluntary investments, e.g. as triggered by subsidies for more environmental friendly investments. What remains at the top of the pyramid are measures with broader societal and environmental benefits, but without a present financial arrangement. The question is who is willing to buy and sell such measures that may hurt some and will benefit many. For example measures for restoring the infiltration and retention capacity of a river valley. For these type of measure, PES might be an attractive way out.

The Dutch exploration journey of the PROWATER-PES concept consists of the four subsequent steps (Table 1). Note that the questions in Table 1 may be specified more in detail during dialogues with stakeholders.

Table 1: Steps in the Dutch exploration of the PROWATER-PES concept

Step	Description	Timing
1	Introduction of the PES concept to Dutch stakeholders (policy-makers, water managers and experts from drinking-water companies and nature reserve managers) conducting a general SWOT.	September 2018 – March 2019
2	Selection of case studies with the Dutch observer parties to explore the questions of the PROWATER common PES approach.	April –July 2019
3	Answering the subsequent questions per case study (by means of local workshops).	July 2019 – December 2020
3a	*Snowball Inventory: who/which expertise do we need to explore the PES scheme?*	
3b	*The WHAT question: Which ecosystem services are at stake in the case study?*	

Step	Description	Timing
3c	*The WHAT question: Which Ecosystem based Adaptation measures (EbA measures) are required to restore/develop/manage the ecosystem services in a sustainable manner?*	
3d	*The PES pyramid:* ○ *Which Ecosystem based Measures are covered or may be covered by present legislation and financial arrangements and/or by common sense and/or voluntary arrangements?* ○ *Which Ecosystem based Measures are or may not be covered yet and may be eligible for funding in a new or additional financial (PES) scheme?*	
3e	*The WHO questions about ROLES in a PES scheme:* ○ *Who will fund the Ecosystem based Adaptation measures? By other means, who are the buyers?* ○ *Who are the sellers that implement the EbA measures and that cab apply for funding??* ○ *Who will be setting up and hosting such a PES fund to reward for example EbA measures that promote infiltration and retention? By other words, who are are the brokers, i.e. the people that connect potential buyers and sellers?* ○ *Who are the knowledge providers?* ○ *Who will evaluate the applications for funding?*	
3f	*The HOW questions:* ○ *HOW to evaluate a PES scheme? Which criteria to apply for buyers and sellers?* ○ *HOW to create incentives for sellers and buyers to participate in a sustainable manner? Can we differentiate the funding, based om location or effectiveness?* ○ *HOW to overcome practical, ethical and juridical obstacles? Are there conflicts with existing initiatives, programs and legislation?*	
4	*Formulating policy recommendations from the case studies.*	Jan –July 2021

So far, two local Dutch stakeholder workshops have been organised to elaborate step 1 of Table 1.
At workshop 1 (November 20, 2018), 28 participants were present. At this workshop, Flemish PROWATER colleagues introduced the PES concept and inspired the Dutch stakeholders (policy-makers, water managers and experts from drinking water companies and nature reserve organisations) with Flemish PES examples. A general SWOT for the PES concept has been conducted. At a second workshop (February 22, 2019) 40 Flemish and Dutch experts focused at the Mark river restoration plan which consist of Ecosystem based Adaptation measures, e.g. for infiltration and retention (see Figure 5).

Figure 5: Participants of the expert workshop looking at the Mark River restoration (photo: Marc Treffers)

3. Results

The results of the general SWOT analysis are the outcome of the two local Dutch workshops. Following the Flemish classification (Staes and Boerema, 2019), the paragraphs 3.1 till 3.4 present the strengths, weaknesses, opportunities and threats for subsequently the legal context, PES mechanism, participants and transaction payment.

3.1. Legal context

Strengths:	○ There is an urgent need for legal incentives to protect, restore and manage water infiltration and retention in natural landscapes. These are activities for sustainable management of ecosystem services that are beneficial to all, but that suffer the dilemmas of common pool resources management. ○ In the case of shared, international river basins, there is a lack of strong legal arrangements for transboundary, integrated river basin management. Climate change and the concept of Ecosystem Services (and PES) may trigger such arrangements, since they elucidate the physical interrelations that do not know human made borders.
Weakness:	○ The willingness to pay for Ecosystem Services could be limited because some people consider that good land stewardship should be the norm. Payment leads to ethical discussions on whether one should reward to restore or reward to maintain the good stewardship. In other words - rewarding someone for restoring something that was destroyed in the first place. Moreover, the question arises as to why one landowner is rewarded for a certain intervention and the other not.
Opportunities:	○ When additional PES arrangements and payments will only be allowed when sellers meet all previous, existing legal requirements for good land stewardship and good environmental practices, they might trigger higher compliance rates. ○ PES is a strong instrument which offers opportunities for brokers to mediate without interference of judges and specific stakeholder lobbyists.
Threats:	○ Entrepreneurs might try to re-frame activities for good land stewardship and good environmental practices as additional PES activities. Clear legal arrangements are required to prevent such perverse incentives. ○ Existing rules and laws might hinder a successful PES implementation (e.g. supported by influential stakeholder groups). How to legally support a sustainable PES arrangement? ○ How to organise a sustainable deliverance of ecosystem services and related quality and performance control?

3.2. PES mechanism

Strengths:	○ The PES concept makes the interrelations among different ecosystem based adaptation measures visible. By doing so, the search for synergy and win-win investments is stimulated. ○ The PES concept is more oriented at societal values and a more sustainable economic system that may benefit a large group of people above the self-interest of individuals. By organizing a PES arrangement you may trigger entire communities to re-develop an area from inside out.

Weakness:	○ The PES concept might trigger an attitude of consumers of ecosystem services that present organizations as city councils and water management boards should provide for those services, since those consumers already pay taxes to them. This might hinder awareness raising and willingness to pay for different interrelated ecosystem based adaptation measures.
Opportunities:	○ The PES concept offers opportunities for new sustainable payment arrangements for nature restoration projects that concern common pool resources. ○ The PES concept offers opportunities to connect stakeholders with different (potential) roles in the PES-scheme. With options to get to know new, 'unusual' partners by relating different ecosystem services. ○ PES offers opportunities for ecological farming to frame the co-benefits (in terms of ecosystem services) of organic (food) products. PES might support a transition to a more ecosystem specific food production (e.g. rice farming in natural wetlands). ○ PES offers opportunities to establish a climate change proof network of natural reserves and areas for biodiversity. ○ PES offers opportunities for climate change mitigation by forest and wetlands restoration and for the development and management of (local) food forests.
Threats:	○ In an ideal world, PES should be the fundament in a pyramid for common pool resources management. By placing PES pragmatically at the top of the pyramid, it might be considered as the left, most difficult part to arrange after all the more present day, business-as-usual arrangements have been applied. ○ NIMBY behaviour: 'nice idea for my neighbour(s) to start with, it is not for me'.

3.3. Participants

Strengths:	○ By connecting different stakeholders who combine investments for (restoration of) ecosystem services, the PES concept may stimulate shared ownership for common pool resources management.
Weakness:	○ Since the Dutch already pay specific taxes for water systems restoration and management and given the strong governmental organisation of such common goods activities, the willingness to participate or self-organise ecosystem services generally is rather low.
Opportunities:	○ Raising public awareness and concerns about (the impact of) climate change triggers willingness to change behaviour and citizen initiatives. ○ The moment for a broad societal PES dialogue is now! With the water scarcity perception and the felt urgency for a climate transition agenda. ○ If local communities are willing to invest in shared interests and pay the sellers (for example farmers) for a PES-guides transition, the motivation of trendsetters will trigger other farmers to participate (societal multiplier effect).
Threats:	○ Although the visibility of several interrelations may enlarge the potential investment combinations, stakeholders might be overwhelmed by the increasing complexity. The challenge is to start with small-scale PES

	arrangements to make its added value a trigger for transitions at a larger scale. ○ Free rider behaviour and the perception or conscious framing that polluters might be paid to correct their previous unsustainable practices, will diminish the motivation to participate in PES-like arrangements. ○ Win-neutral arrangements will trigger a few trendsetters only. Win-win combinations offer more perspectives for long term arrangements. Will there be enough trendsetters to make the new arrangement last? Who feels ownership for ecosystem services?

3.4. Transaction payment

Strength:	○ If based on fair prices, the PES concept offers substantial, alternative financial benefits for farmers who are willing to change to a diversity of more ecosystem based adaptation practices (from food production only to a combination with water quality and water quantity improvement and/or leisure activities).
Weakness:	○ Controversial figures and studies around the exact value of ecosystem services might hinder motivation and willingness of stakeholders to invest in such an alternative/additional financial arrangement.
Opportunity:	○ Mark River Valley Restoration Initiative: this participative initiative of citizens and entrepreneurs in and around Breda City aims at ecosystem based adaption measures for the benefit of both sustainable farming and restoration of biodiversity and a more natural water system. The PES concept offers the opportunity to arrange new financial arrangements to make this approach viable.
Threats:	○ People in the Netherlands already pay taxes for drinking water, waste water treatment and water system restoration and management. Consequently, the willingness to pay for additional PES payments could be rather low and limited to well-off, high-income people and/or high income families. ○ Generally, farmers have made long-term investments for a specific (traditional) business model. A transition asks time and also other skills which may not fit well to their natural talents and/or dreams for the future. ○ Negotiation behaviour on the value of specific ecosystem services with perverse market pricing as worst case scenario.

4. Conclusions and Key Findings

4.1. SWOT for PES

PES is a potential powerful concept for sustainable development and management of common pool resources. The momentum is there, given the public and political attention for the negative impact of climate change like the increased risks of floods and droughts. Eisenstein (2018) argues that 'increased levels of drought and flooding are not *caused* by climate change; they *are* climate change'. He warns for an over-focus towards carbon emissions which might trigger business as usual scenarios. The real problem is the degradation and loss of several ecosystems around the world. Einstein stresses that water, not temperature, is the factor that *most directly* impacts life. He calls for a paradigm shift (ibid, page 85):

> "*The paradigm shift when it comes to climate is not really from carbon to water; it is a shift from a geomechanical view to a Gaian view, a living systems view. Whether we are looking through the lens of carbon or water, from the living systems perspective we see that climate health depends on the health of local systems everywhere. The health of local ecosystems, in turn, depends on the health of the water cycle, and the health of the water cycle depends on the soil and the forests.*"

PROWATER aims to restore the health of the water cycle by enlarging the infiltration and retention capacity of the landscapes in the 2 Seas Region. *Payment for Ecosystem Services (PES)* is a promising concept for elaborating additional legal and transactional incentives to overcome the challenges of common pool resources management, e.g. the free riders problem and unwillingness to participate in and pay for activities that are beneficial to all, but that are not covered entirely by present day institutions.

What does the promise look like (strengths)? By making the interrelations among different ecosystem based adaptation measures visible, synergy and win-win options may appear. Given growing awareness of citizens and politicians on the negative impact of climate change and the necessity for everybody to act, mitigate and adapt, the PES concept uncovers the promise of a more sustainable economic system with a predominant focus at societal and ecological values. As in the example of the Mark River Valley Restoration Initiative, by organizing a PES arrangement a group of (well-informed and well-skilled) volunteers may trigger (almost) an entire community to re-develop an area from inside out. The diversity of ecosystem services offers ample opportunities to connect several stakeholders, leading to both familiar and new alliances. By connecting different stakeholders who combine investments for (restoration of) ecosystem services, the PES concept may stimulate shared ownership for common pool resources management.

What are major weaknesses that may turn literature about the PES concept into a vast series of interesting but dead pages? So far, PES is still a complicated and mainly theoretical concept, combining almost all aspects of life in a large number of ecosystem services. Having its roots in a holistic concept, the majority of the people might be confused and feel lost in a maze. According to Harari (2014), the tragedy of the commons and human nature essentially lies in the disability to develop and manage natural resources from an integrative and coherent manner.

In an ideal world, PES should be the fundament in a pyramid for common pool resources management. By placing PES pragmatically at the top of the pyramid, it might be considered as the left, most difficult part to arrange after all the more present day, business-as-usual arrangements have been applied. Those present arrangements (legislation, common sense practises and compensation schemes) only partly cover for the environmental externalities of human activities. For example, as expressed by Figure 4 (Staes and Boerema, 2019), to trigger farmers to deliver ecosystem services, they need a fair price, which comes closer to the maximum theoretical payment (based on overall value to society) than to the minimum required payment to cover profit foregone. Furthermore, controversial figures and studies around the exact value of ecosystem services hinder motivation and willingness of stakeholders to invest in such additional or alternative financial arrangements.

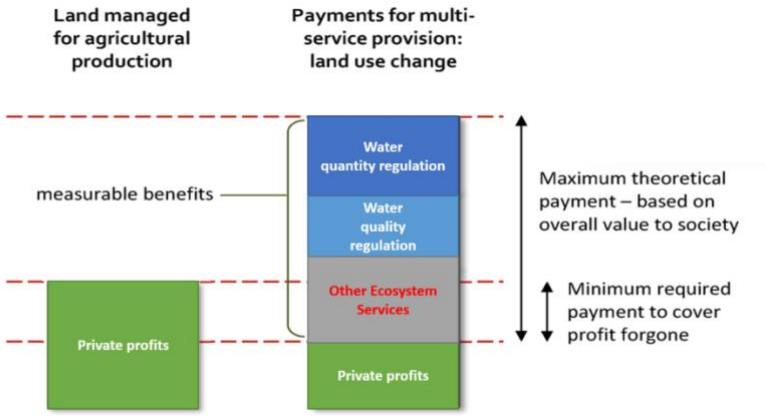

Figure 6: A PES scheme may lead to net higher income for farmers (Staes and Boerema, 2019)

In the Dutch context, the PES concept may trigger a hesitant, waiting or reluctant consumers' attitude to get actively involved in ecosystem services, since they already pay present organizations as city councils and water management boards for providing those kind of services. Consequently, willingness to pay *additionally* for different interrelated ecosystem based adaptation measures will be rather low. Payment for Ecosystem Services also lead to ethical discussions on whether one should reward to restore or reward to maintain the good stewardship. In other words - rewarding someone for restoring something that was destroyed in the first place. Moreover, the question arises as to why one landowner is rewarded for a certain intervention and the other not (Staes and Boerema, 2019).

Which opportunities do Dutch workshop participants see for successful PES application? The workshop participants feel that with the urgency to act on climate change, the moment for at least a broader societal PES-dialogue is now. The PES concept may offer answers to the dilemmas of common pool resources management, although it needs much clarification and simplification. Also its added value towards existing payment schemes needs to be demonstrated by field examples. If a more elaborated PES concept (from theory to practice, without major controversies) seduces local communities to invest in shared interests and fairly pay the sellers (for example innovative farmers) for transitional, ecosystem based adaptation activities, the motivation of these trend-setters will trigger other farmers to participate (societal multiplier effect). As a fundamental basic requirement, PES-sellers should comply with existing laws and rules for good environmental practices and good land stewardship. The other way around, when additional PES arrangements and payments will only be

allowed when sellers meet all existing legal requirements, these additional payments may trigger higher compliance rates by more sellers. Specific opportunities mentioned by the Dutch participant are:

- new sustainable payment arrangements for nature restoration projects that concern common pool resources;
- the PES concept offers opportunities to connect stakeholders with different (potential) roles in the PES-scheme. With options to get to know new, 'unusual' partners by relating different ecosystem services;
- PES offers opportunities for ecological farming to frame the co-benefits (in terms of ecosystem services) of organic (food) products. PES might support a transition to a more ecosystem specific food production (e.g. rice farming in natural wetlands);
- PES offers opportunities to establish a climate change proof network of natural reserves and areas for biodiversity.
- PES offers opportunities for climate change mitigation by means of forest and wetlands restoration and for the development and management of (local) food forests.
- if based on fair prices, the PES concept offers substantial, alternative financial benefits for farmers who are willing to change to a diversity of more ecosystem based adaptation practices (from food production only to a combination with water quality and water quantity improvement and/or leisure activities).

The major threats to successful PES schemes are the complexity of an integrated approach and the persistent perverse incentives that are well-known from common pool resources management literature (e.g. Ostrom, 1990). Although the visibility and a non-controversial quantification of several (interrelations among) ecosystem services may enlarge the potential for investment combinations, stakeholders might be overwhelmed by the complexity. Free rider behaviour and the perception or conscious framing that polluters might be paid to correct their previous unsustainable practices, will diminish the motivation to participate in PES-like arrangements. Win-neutral arrangements will trigger a few trendsetters only. Win-win combinations offer more perspectives for long term arrangements. Will there be enough trendsetters and followers to make the new arrangement last? Who feels ownership for ecosystem services? According to the Dutch participants, the challenge is to start with small-scale PES arrangements to explore the added value and, whenever successful, to trigger transitions at a larger scale.

To conclude, given the impact of climate change, there is an urgent need for legal incentives to protect, restore and manage water infiltration and retention in natural landscapes. These activities for sustainable management of ecosystem services are beneficial to all, but suffer the dilemmas of common pool resources management. In the case of shared, international river basins, there is a lack of strong legal arrangements for transboundary, integrated, common pool resources manage-ment. Climate change and the concept of (Payment for) Ecosystem Services elucidate the physical interrelations that do not know human made institutional borders. The Dutch PROWATER demonstration site, the Mark River Valley, offers the opportunity to explore the viability of the PES concept in a transboundary context.

4.2. The Mark River Valley demonstration site

Human activities and water-related ecosystem services

Table 2 shows the conclusions of the expert workshop on the relations between human activities and water-related ecosystem services in the Mark River Valley demonstration site. According to the participating experts, a transboundary Belgian-Dutch river valley restoration approach would pay off optimally in terms of ecosystem services management (in the context of climate change). However, at present, the Belgian and Dutch stakeholders predominantly focus at restoration approaches within their own territory.

Table 2: Human activities and water-related ecosystem services in the Mark River Valley

Code	Ecosystem service	Negative impact of human activities
	Production services	
P1	Water production (industry, agriculture, drinking water)	○ Upstream groundwater tables are declining, mainly by agricultural activities. ○ Drinking water production from groundwater in the adjacent *Chaamse Beken* water body. Negative impact on water-related terrestrial ecosystems.
P2	Food production	Water abstraction for irrigation (both groundwater and surface water) contributes to a low river flow especially in (dry) summer periods.
P3	Wood production	-
P4	Energy crops production	-
	Regulation services	
R1	Coastal defence	-
R2	Conservation of sediment fertility	Agriculture has caused a surplus of nutrients in the sediment (especially for phosphorus)
R3	Water quality regulation	○ See also P2. A more natural river flow is essential for water quality improvement and related plants and animals (Water Framework Directive objectives). ○ Weirs hinder fish migration. ○ Sometimes problematic low oxygen concentrations at the border. ○ Hypertrophic ecosystem (too high nitrogen and phosphorus concentrations). ○ Problematic high concentrations of zinc, mercury and some insecticides with (potential) eco-toxicological effects. ○ Too high water temperature due to a lack of river forests (lack of shadow).
R4	Erosion risk regulation	○ Disconnection of the river channel with the river valley to a large extent. ○ Disturbed natural erosion and sedimentation patterns.
R5	Flood risk regulation	○ Normalisation and channelization works in the 1960s have caused a substantial reduction of the water retention capacity in the valley landscape. ○ Over dimension of the river stream (too broad and too deep), almost no natural length profile and cross section.

Code	Ecosystem service	Negative impact of human activities
		○ Too intensive mowing management with a negative impact on plants (which are home to many macro-invertebrates and fish).
R6	Pollination	Not explored yet
R7	Pest control	Not explored yet
R8	Air Quality regulation	-
R9	Global climate regulation	Not explored yet
R10	Noise disturbance regulation	Not explored yet
Cultural services		
C1	Green space for outdoor activities	○ Walkers and cyclers increasingly recreate in the Mark River Valley. ○ There is an transboundary cycle path for a large part of the river basin. ○ The river valley inspires artists and mindfulness practitioners.

According to the experts, improving the water infiltration and retention capacity by natural landscape restoration should include the following aspects:

- Do not extend the river length dramatically by a multi-channel system, since this will hinder natural flow rehabilitation. These particular low inland river systems are mono channel character by nature and did not include large meanders. The experts' advice is to restore a less deep and less broad river channel, e.g. by sand supplementation.
- Restore brook swamps with a small stream as natural infiltration and retention areas for an enlarged sponge effect.
- Increase stream flow variation by means of natural structures (wood and plants in water).
- Let small river forests develop themselves along the stream, delivering enough shadow for about 50% of the river length.
- Improve water quality conditions (oxygen, nutrients, insecticides, temperature) in cooperation with the Belgian partners.

Applicability of the Payment for Ecosystems concept

The PES concept keeps the promise of sustainable management of the (transboundary) Mark River Valley as a common pool resource. An informal PES dialogue with Belgian and Dutch stakeholders could act as a trigger for cooperation. In the design of a PES scheme, one should be aware of the ethical considerations. Participants of the first local workshop emphasized that PES should not include payments for correcting unsustainable behaviour. The 'user pays principle' and the 'polluter pays principle' should remain key elements in climate change and environmental policies. In other words the PES dialogue should not trigger rewarding someone for restoring something that he should not have destroyed in the first place. Hence, getting paid (or paying for) ecosystem services is not free of controversy. Question is whether a PES scheme may find a solution for a major dilemma of common pool resources management, i.e. free rider behaviour and a NIMBY attitude (which might temper willingness to pay for ecosystem services by motivated people).

Another challenge in designing a sustainable PES scheme is to prevent a generic consumer's attitude that 'usual suspect' organizations as city councils and water management boards should (always) provide for ecosystem services, since those consumers already pay taxes to those institutions. This might hinder awareness raising and willingness to pay by specific groups of people that (in)directly benefit from interrelated ecosystem based adaptation measures at a local level.

Viewed from a positive position, by organizing a PES arrangement governments and water managers may trigger and facilitate entire communities to re-develop an area from inside out and to overcome free-rider behaviour. As in river valley restoration processes often farmers are key entrepreneurs, it would not be fair to load all the burden of ecosystem based adaptation measures on their shoulders. A viable PES scheme should offer sustainable alternative financial benefits for farmers who are willing to change to a diversity of ecosystem services beyond their traditional food production practises. To act as a strong incentive, a PES scheme should lead to a net higher revenue model (see Figure 6 in Section 4.1).

5. Next steps

Two local workshops have taken place on 20 November 2018 and 22 February 2019. The first workshop was attended by a broad range of Dutch stakeholders for a general introduction to PROWATER and the PES concept. Also a general SWOT analysis has been conducted (see Chapter 3). The second workshop concerned an expert dialogue on the planned Ecosystem based Adaptation measures for the Mark River Valley demonstration site. Independent ecological and hydrological experts were invited to provide for a critical review. Subsequently, Belgian and Dutch stakeholders discussed the expert reviews and formulated recommendations to improve the planned restoration works.

At the second workshop experts plead for a transboundary approach for river valley restoration. Departing from a river basin approach, the hydrological, morphological, chemical and ecological processes should be analysed from the source till the mouth. In this way best options may appear for connecting sustainable human water-related activities to restoration of and working together with (or building with) natural processes. In the case of the Mark River Valley, the majority of the people and officials experience the frontier between Belgium and the Netherlands predominantly as a strong political, cultural and emotional barrier. In this sense, European cooperation projects are very important since they trigger exchange of ideas and experiences and personal networking as a fundament for 'dismantling' the border. Therefore, the idea is to conduct a more elaborated SWOT for the application of PES in the *transboundary* Mark River Valley.

The next step will be a meeting with the Dutch PROWATER observer parties to discuss the methodology and planning (steps of Table 1 in Section 2.2) and to make an inventory of (potential) PES examples.

6. References

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