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INDUSTRY BRIEF:

Exploring the applicability of Payments for Ecosystem Services (PES) in Mpumalanga

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List of acronyms:

DFFE	Department of Forestry, Fisheries and the Environment
DWS	Department of Water and Sanitation
EPI	Economic Policy Instruments
IUCMA	Inkomati-Usuthu Catchment Management Agency
K2C	Kruger 2 Canyon
PES	Payment for Ecosystem Services
RQO	Resource Quality Objectives
SAFCOL	South African Forestry Company SOC Limited
SAN Parks	South African National Parks
US EPA	United States Environmental Protection Agency
WDCS	Waste Discharge Charge System
WMA	Water Management Area
WWF	World Wide Fund for Nature

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Key insights:

- For sustainable economic development to be pursued, and to successfully transition away from a coal-based economy, access to adequate supply of clean water is critical.
- Aquatic ecosystems across the Mpumalanga Province are beset by several environmental issues, including water pollution, destruction of wetlands, and unsuitable land management practices (leading to water scarcity) that affect the water users in the province.
- Payments for ecosystem services (PES) schemes are economic policy instruments (EPI) that provide an economic incentive to conserve and improve ecosystems. These instruments could potentially be used to improve the aquatic ecosystems in the province.
- In particular, wetland banking is an EPI scheme that may be a potential, implementable solution to help address the wetland loss and associated water quality issues seen in the Olifants and Vaal catchments.

Intended audience:

This industry brief is written for policy makers (government), investors, land owners and solutions providers that are interested in establishing and participating in the hydrological ecological infrastructure and services market in Mpumalanga.

1. Context:

The Mpumalanga province of South Africa faces socio-economic and environmental challenges arising from its resource intensive economic activities that contribute to climate change. Carbon intensive industries like mining, power generation and petro-chemicals are the core economic drivers in the province. The region is also currently navigating high levels of unemployment, inequality and poverty, even as pressure mounts to transition away from its current coal based economy.

Under the leadership of the Mpumalanga Department of Economic Development and Tourism work has begun to design a strategic intervention for the green economy in the province to attract investment and create jobs. This strategy identified the concept and theory of cluster development as an effective way to transition to an economy that has the ability to provide labour absorbing capacity through competitive green jobs. The Mpumalanga Department of Economic Development and Tourism, working with GreenCape and with support from the international development finance community, has set up the Mpumalanga Green Cluster Agency. This cluster focusses on unlocking and unblocking economic opportunities in the green economy, with the aim of making a contribution to regional economic diversification and job creation efforts.

For sustainable economic development to be pursued, and to successfully transition away from a coal-based economy, access to an adequate supply of clean water is crucial. Therefore, innovative approaches for improving water security, water quality and ecological functioning of the catchment areas in Mpumalanga need to be explored. Although the benefits that are provided by the ecological services have been well documented, there is lack of understanding and development of a market to certify and facilitate the payments and penalties schemes in South Africa. Towards this purpose, Prime Africa was contracted to investigate the applicability of a payments for ecosystem services (PES) in the context of Mpumalanga province, South Africa.

This brief provides an overview of the key findings of the investigation by highlighting:

- What are Payments for Ecosystem services?
- The key environmental problems in the catchments of Mpumalanga.
- Potential Economic Policy Instruments (EPI) interventions.
- Relevant stakeholders (payer, seller and beneficiaries).

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2. What are Payments for Ecosystems Services?

Economic Policy Instruments (EPI) attempt to influence behaviour and decision-making through introducing economic incentives or disincentives into the economic decision-making processes. These are used as a way of influencing the actions of individuals and corporations through monetary and fiscal instruments. Examples of economic instruments include subsidies, taxes and fees, tradable permits, administered tariffs, or production incentives. Payments for Ecosystem Services (PES) is one type of economic instrument designed to incentivise developers, land users or landowners in exchange for managing land to provide an ecological service. A PES scheme in other words functions to provide an economic incentive to ecosystem maintenance and preservation of ecosystem services which in turn promotes conservation of natural resources in the marketplace.

The Food and Agriculture Organization (2007) has defined PES follows: "PES transactions refer to voluntary transactions where a service provider is paid by, or on behalf of, service beneficiaries for agricultural land, forest, coastal or marine management practices that are expected to result in continued or improved service provision beyond what would have been provided without the payment."

These ecosystem markets and payments are used to comply with regulations. In other cases, investing in "green infrastructure" may be a voluntary strategy to save money, reward good stewardship, or demonstrate good corporate citizenship.

EPI schemes that could potentially be implemented in South Africa include water pricing, conservation banking, Carbon trading and alien clearing (alien clearing water charge and fire risk premium). These concepts will now be further explained.

Water pricing:

Is an important economic instrument for enhancing social equity, improving water use efficiency and ecological sustainability, and securing financial sustainability of water utilities and operators. The Water Pricing Strategy from DWS deals with different charges for environmental externalities through various charges including Waste Discharge System (WDCS) and industrial wastewater charge. This system is intended to establish an economic instrument for charging waste discharges, or water pollution.

Conservation banking / trading scheme:

This EPI proposes that a landowner or manager invests into ecological restoration or maintenance in return for some form of biodiversity credit. These credits may be traded with other parties as part of their environmental authorisation conditions. Such a mechanism would require the environmental authority to develop a strategic framework that regulates and enables the institutional requirements of such a credit trading scheme.

Conservation banking pricing would represent the value of one hectare of land which considers the value of the expected ecosystem services which will be derived for the duration of the ownership of the land. One approach to calculate this value considers the following:

- Land price.
- Rehabilitation and maintenance cost (costs).
- The value of ecosystem services which are offered by a fully rehabilitated ecosystem (Benefits).

A prominent example of this EPI is **wetland banking**, the purpose of this solution would be to implement a system which incentivises wetland rehabilitation through land value, i.e. institutionalising a mechanism for trading debits and credits and thus creating value for wetland servitudes that can otherwise not be used for commercial purposes (Bayon, 2004).

Carbon trading is a market-based system that aims to provide economic incentives to encourage organizations to reduce their environmental footprint. It aims to put a price on CO_2 following the principle of caps and trade where the government sets a limit, or cap, on emissions permitted per industry. Emission certificates in the amount of this total quantity are placed on the market by auctioning them or allocating them to polluters. At the end of a predefined period, participating polluters must submit allowances equal to their emissions. They can buy or sell allowances on the market.

WDCS is based on the polluter pays principle (envisaged in National Environmental Management Act (NEMA)) that consist of waste discharge levy charge and waste mitigation charge, with the aim of internalising environmental costs of waste dischargers by recovering the costs of mitigating water resource quality impacts of pollution.

Alien clearing EPI's:

· **The alien clearing water charge** would constitute a payment by the water service authority (or other entity) to the landowner for initial clearing and maintenance. If a landowner does alien clearing the water yield of the catchment will increase. The increased water yield is the water provisioning benefit resulting from alien clearing. The direct beneficiary of the additional yield would be the government water scheme, a water board, or WSA downstream of the cleared area. This requires suitable hydrological monitoring and modelling to implement. The magnitude of the water charge would vary depending on the marginal cost of water supply. Investigations are also currently under way to develop a biomass economy to incentivise private sector players to engage more actively in the clearing of alien vegetation.

· **Fire risk premium:** With respect to disaster risk management, the devastating wildfires in the Southern Cape in 2016 serves as stark evidence of the increased fire damage risk that alien tree species introduce to infrastructure. In plantation forestry context, fire risk is mitigated by managing fire breaks and having clear fire safety risk management plans. Similarly, alien invasive clearing mitigates the risk of fire damage. Thus, it is expected that alien invasive clearing would reduce re-insurance risk premiums. The causal effect of alien clearing on insurance risk premiums is not simple. The insurance premium benefit would impact a large multiple of property owners (the insured) and insurers alike.

Transaction clearing mechanisms and institutional arrangements:

For an EPI to be effectively implemented, it requires a range of transaction clearing mechanisms, i.e. the mechanisms that make markets work. These mechanisms can be thought of as institutional arrangements that enable transactions to be cleared. In other words, they comprise the range of institutional arrangements that enable the completion of all activities required, from the time a commitment in a transaction is made, to the point where the transaction is settled.

· **Tradable permit systems** are so-called cap and trade schemes, which involves rights to sell and buy actual or potential endowments (e.g., emission allowances) in artificially created markets.

· **Assigning property rights:** An interesting phenomenon arising from the concept of ecological infrastructure is the emergence of ecological commodity properties of water resources. In essence developers are granted development rights through water use license applications that sometimes allow them to alter or "destroy" existing ecological infrastructure in exchange for the rehabilitation of alternative sites, or the creation of artificial ecological infrastructure. An example of this is the fly ash storage site at Kusile Power Station, where the site was placed on an existing wetland, which was offset by the rehabilitation of a nearby degraded wetland.

· **Water tariff:** A well-functioning tariff system is a key transaction clearing mechanism underlying the successful implementation of EPIs. Well-functioning in this case means firstly that water tariffs or charges are set accurately through a regular and appropriate review process. Secondly, it also means the tariffs are policy relevant and therefore effective. This would include policy effectiveness related to the equity, efficiency, and sustainability imperatives. Thirdly, the tariffs need to be implemented through an effective invoicing and payment system. Finally, the revenue collected needs to be spent effectively.

3. Findings from the investigation into PES for Mpumalanga

There are several conditions that need to be satisfied for the implementation of an EPI scheme including:

· The ecosystem services (i.e., watershed protection, water quality improvement, etc.) or the ecological asset at risk needs to be identified.
· The owners or the sellers of the ecosystem service (or asset that produces it i.e., wetlands, rivers, grasslands etc.) need to be identified.
· The purchaser of the ecosystem service or asset needs to be identified.
· There should be an existing policy framework in place to support the implementation of the EPI.

Once these conditions have been identified, an appropriate EPI can be developed. In order to identify appropriate EPIs to address key water-related environmental problems in Mpumalanga Province, South Africa, an investigation was undertaken.

The following sections outline the findings of this investigation.

3.1. Overview of Mpumalanga and the ecosystem services provided by the catchments in the Province.

The Mpumalanga Province is situated in the North-East of South Africa bordering Swaziland and Mozambique to the east. It also borders Limpopo, Gauteng, Free State and KwaZulu-Natal within South Africa. It covers an area of 76 495km^2 and has a population of 4 335 964, making it the sixth most populated in the country. Mpumalanga envelopes portions of four key Water Management Areas (WMA) depicted in Figure 1 and Table 1 including:

· Olifants Water Management Area (Approximately 40% of the upper catchment)
· Inkomati-Usuthu Water Management Area (100% represented)
· Vaal Water Management Area (Approximately 7% of the upper catchment)
· Pongola-Mtamvuna Water Management Area (less than 1% of the upper catchment and not included in this analysis)

Figure 1: Locality of Water Management Areas (WMA), key water resources and protected areas within Mpumalanga province (Simpson at al., 2019)

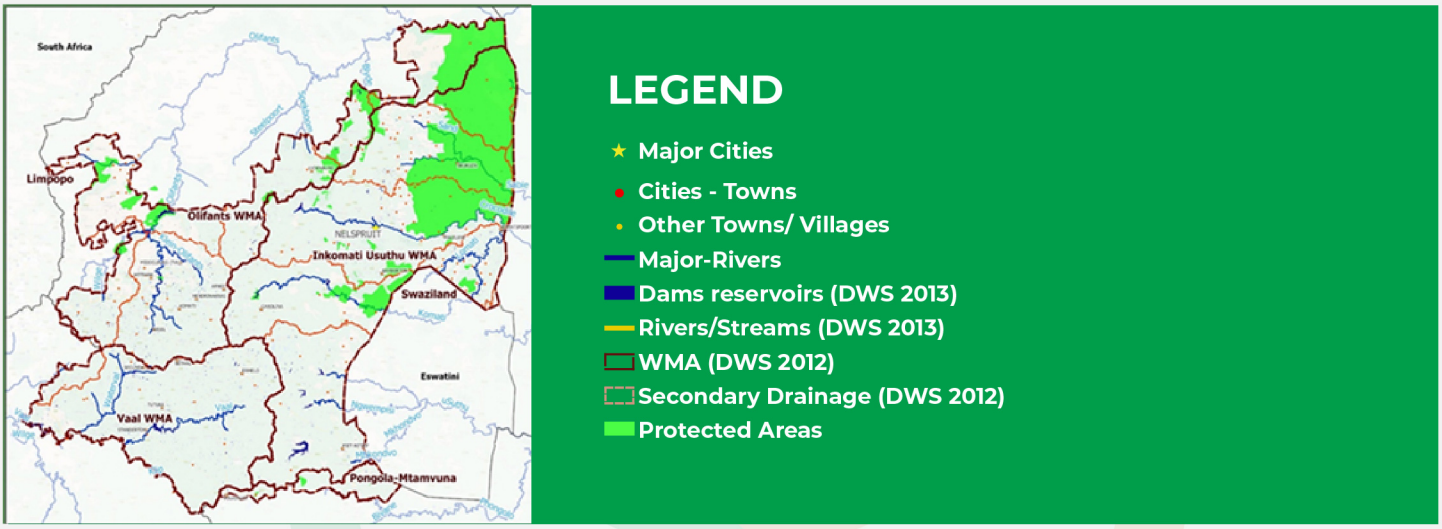

Table 1. Key Water Management Areas in Mpumalanga

Catchments	Status quo	Socio-Economic drivers	State of water resources	Stakeholders in the catchment
Upper Olifants WMA	Land use intensity within the upper Olifants WMA represents some of the highest in South Africa. The landscape is highly degraded owing to extensive industrial, mining and agriculture activities.	Coal mining, electricity production and commercial agriculture.	The Olifants River, tributaries and wetlands are impacted by water quality as well as habitat degradation from mining activities.	The Loskop Irrigation Board, Eskom, eMalahleni Local Municipality, Mining operators.
Upper Vaal WMA	Most of the water utilised within the catchment is sourced from the Grootdraai Dam (situated in the centre of the catchment) which provides water to SASOL I, II and III coal to liquid plants at Secunda and Eskom's Tutuka and Matla Power Stations as well as municipalities in the catchment.	Coal mining, electricity production, commercial agriculture and industrial activities.	Water quality in the Grootdraai Dam is impacted by different land users upstream. The source of pollution is difficult to ascertain, but it is likely to be a combination of poorly functioning wastewater treatment works, runoff from agricultural activities and mining and industrial activities.	SASOL, Eskom, municipalities and Rand Water and commercial agriculture.
Inkomati-Usuthu WMA	The Inkomati-Usuthu WMA is water-stressed with a growing water deficit in the basin resulting from frequent water restrictions, growing demands from emerging farmers, international treaty obligations, and widespread concern regarding water quality and the ecological reserve (DWA, 2012).	Forestry, commercial agriculture, tourism, and protected areas..	The major water issue facing users in the Sabie catchment is the availability of water rather than poor water quality.	Mbombela and Bushbuckridge LM, Local irrigators (both formal and informal); Forestry sector; The IUCMA; The Kruger National Park.

3.2. Water-related environmental issues and potential EPIs

The selection and implementation of an EPI will face different challenges and will be better suited to different environmental issues and geographic locations. The analysis of the three catchments across Mpumalanga showed that there are three broad categories of environmental problems that affect users: 1) **water pollution**, 2) **destruction of wetlands, and** 3) **unsuitable land management practices** (leading to water scarcity impacts). These impacts are distributed differently across the catchment, but can be broadly grouped as follows:

- Upper Olifants: Water pollution and destruction of wetlands.
- Upper Vaal (Grootdraai system): Water pollution and destruction of wetlands.
- Sabie catchment: Unsuitable land use practices (leading to water scarcity impacts).

Each of these environmental issues requires the implementation of a unique EPI or a combination thereof. The EPIs that were deemed most appropriate for each of the environmental issues identified were as follows: 1) a **Waste Discharge Charge System** (WDCS), to address water pollution, 2) conservation banking, specifically **wetland banking**, to address wetland destruction and 3) **watershed management** to address unsuitable land management practices. The environmental problem and possible EPI solution were assessed, and the results are given in Table 2 below.

Wetland degradation throughout the Upper Olifants and Vaal catchments has led to both water quality and regulation issues. Rehabilitation of wetlands has proven to be successful and is an intervention that is cost effective and has shown to improve water quality and water regulation of flow (De Klerk et. al., 2016). It is likely that wetland degradation will continue, and current mitigation options will be unable to reverse or stem the tide of degradation. **Based on the experience of the US EPA, wetland banking may be a potential, implementable solution for the current trajectory of wetland loss and associated water quality issues seen in the Olifants and Vaal catchments.**

The WDCS has shown to have potential and is favoured by the Department of Water and Sanitation (DWS) in reducing water pollution through the polluter pays principle. However, complexities around identifying and quantifying point source water pollution as well as implementing resource quality objectives (RQOs) at specific points along the water course has proven to be complicated.

Watershed management is a potential solution for improving water quantity and availability in the Sabie Catchment. Implementation of a watershed management strategy requires considerable stakeholder consultation as well as stakeholder relationship management. Within the Sabie catchment, K2C, WWF and SANParks have already invested considerable time and resources in developing a solution in the catchment. There are opportunities to explore this in the other catchments.

Table 2: Analysis of water-related environmental issues and potential EPIs

Environmental problem identified	Water pollution	Wetland destruction	Unsuitable land management practices
Drivers	Wastewater treatment works, mining, heavy industry.	Mining, Eskom, other	Forestry / private land
Consequence	Water quality/ ecosystem destruction	Ecosystem destruction/ water quality	Water scarcity
Consequence (stakeholder impacted)	Water users (Sasol; Rand Water; Eskom)	Water users (numerous beneficiaries at scale)	Water users downstream of intervention
Solution – active	Water treatment	None	Management
Solution – passive	None	Rehabilitation	Rehabilitation
Environmental asset	Rivers / dams	Wetlands/rivers	Strategic water source area (terrestrial and aquatic)
Potential EPI	Waste discharge charge system	Conservation banking, specifically wetland banking	Watershed management
Transactional clearing mechanism	Water tariffs; tradeable permit; deposit refund	Assigning property rights; tradeable permit	Assigning property rights; tradeable permit; water tariffs; reduced insurance premium
Catchment	Upper Vaal, Upper Olifants	Upper Vaal, Upper Olifants, Sabie Catchment	Sabie catchment
Who pays?	Polluter/ could be investor	Investors	Impactors/land owners

Environmental problem identified	Water pollution	Wetland destruction	Unsuitable land management practices
Potential investors	None identified yet	Eskom; Loskop IF; Sasol	WWF and K2C expressed interest- Sappi/SAFCOL
Potential market	Municipal- Bilateral	Developers/Land-owners- (Market)	Market or Bilateral
Policy conditions	Based on polluter pays principle. The National Water Act 36 of 1998 currently provides for regulatory mechanism (economic) in the form of the WDCS	A national offset policy has been developed by the DFFE and is currently under review. Existing framework for wetland offsets (Mcfarlane et. al., 2014)	No new policy or legislation required.
Evidence of success	Originally meant to be implemented in 2007. The complexities around identifying and quantifying point source water pollution as well as implementing resource quality objectives (RQOs) at specific points along the water course has proved complicated.	Implemented has proved successful in the US.	Implemented in US, The Cape Town Water Fund, the Holsloot Irrigation Scheme.

4. Conclusion and way forward.

Aquatic ecosystems across the Mpumalanga Province are beset by several environmental issues including decreasing water quality, destruction of wetlands, and unsuitable land management practices. These environmental issues affect several water users, and economic policy instruments have been proposed as potential solutions. In particular, wetland banking may be a potential, implementable solution to help address the wetland loss and associated water quality issues seen in the Olifants and Vaal catchments.

Currently, there is no formal market for payment for ecosystem services in South Africa and the concepts of the market are not yet understood. To set up a functional market, there is a need for a third party certification organisation to value and certify the intervention put in place and facilitate the payments between the parties involved.

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For more resources produced by the Mpumalanga Green Cluster Agency, including the latest Water Market Opportunity Brief, please visit:

https://mpumalangagreencluster.co.za/resources/

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