ROADMAP AND PLAN OF ACTION

Consultancy performed by Beatus on behalf of and for Conservation International (CI) under Service Agreement Number 6005604 in conjunction with the International Union for Conservation of Nature (IUCN), Rwanda office, for the Ministry of Environment, Rwanda.

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The PES partners:
The sellers of ecosystem services are, notably, the villagers who sell soil stabilisation services through, among others conservation and regenerative agriculture. This can be enabled through a network of agencies assisting in the implementation thereof, made possible by the resources unlocked and administered by FONERWA. There are primarily three sources of funds (Public, private and international), each with their own unique characteristics and opportunities.
Cost of soil degradation
If the soil erosion in Rwanda is 100 million tonne/year, then the cost of soil degradation is at least RwF3 trillion/year.

Cost of soil stabilisation
If land managers are paid RwF25/m²/yr, or 12.5% of the agricultural GDP/m² to provide soil stabilisation services, the cost will be Rwf108 bil/yr, or 4% of the cost of soil degradation.
1. INTRODUCTION

The International Union for the Conservation of Nature (IUCN) and Conservation International (CI) are supporting the Government of Rwanda in advancing their environmental and climate change policy ambition by providing a roadmap and national action plan for implementing the mechanism of Payments for Ecosystem Services (PES).

This is a direct outflow of the Memorandum of Understanding (MoU) signed between the Governments of Rwanda and Costa Rica in 2018.

This activity further responds to the Environment and Climate Change Policy (Policy Objective 2, Policy statement 1, activity 5) that states the need to develop PES into a fully-fledged and operational mechanism in Rwanda. The IUCN and CI, in support to and in conjunction with the Ministry of Environment (MoE) embarked therefore on a process to prepare a plan of action and roadmap to guide the implementation of PES under this Policy.

To this end Beatus has been appointed to assist, see Annexure 1 for the Terms of Reference. Annexure 2 provides a list of the meetings held during a fact-finding mission 2 – 6 September 2019.

This report provides:

- a brief introduction to PES;
- a brief reflection on the status of the PES policy in Rwanda;
- a brief reflection on Rwanda and Costa Rica’s PES experience;
- a brief reflection on the need for an intervention;
- a discussion on the proposed PES system for Rwanda; and
- a discussion on the proposed roadmap and plan of action for PES implementation.

2. PES IN BRIEF

Traditionally the value of ecosystem services is not included in the calculation of the Gross Domestic Product (GDP) since such services are not captured within conventional markets. This leads to market failure and the under provision of these services because they are considered public goods with no commercial value.

Ecosystems, however, render services that benefit people and these services can therefore, in some contexts, be viewed as positive externalities. For example, carbon sequestration is a positive, co- incidental side-effect of the process of photosynthesis and biomass accumulation; see Figure 1 for a non-exclusive list of services.
Figure 1: List of ecosystem services

The ecosystem services listed in Figure 1, and others, are offered by ecosystems following a range of ecosystem functions and processes. They are of very high value to humans, but when degraded or being threatened or at risk, then the loss thereof has a determinantal impact on the entire society, affecting its economy, the health of people, and the entire socio-ecological system is at risk.

Given the fact that the benefits ecosystems offer humans are broad-based and widespread as well as inter-generational, the prudent management therefore is the responsibility of the entire society. The entire society must share in the cost of managing ecosystems and not only the landowner, user and/or manager.

To achieve such cost-sharing there are mainly two options, firstly fiscal instruments, i.e. taxes and charges, that mainly deals with what is referred to as the polluter-pays principle, which is already embedded in legislation to deal with negative externalities. Secondly there are market-based instruments of which PES forms an integral part and, to a large extent, addresses the counter-side of the polluter-pays principle which is the provider-gets principle, also referred to as the beneficiary-pays principle.

These principles are applicable in the case of positive or collectively beneficial externalities, such as in the case of providing ecosystem services. The provider-gets (beneficiary-pays) principle is based on providing support or the necessary incentive structure to promote the delivery of these beneficial public goods and services.

This provides a unique opportunity to link the providers of ecosystem services with the beneficiaries thereof using market-based principles. In so doing the entire society will be enriched with an increased understanding of the benefits humans derive from ecosystems while stimulating a dialogue with respect to restoration fostering a restoration culture.

Rural landowners could gain from the provider-gets principle since their economic activity and asset-holding, the land, is directly linked with ecosystems and the services provided by these systems.

Until now, farmers and/or communal landowners have not received any compensation for the provision of ecosystem services such as carbon sequestration, water treatment, soil stabilisation, etc., as these are often considered public goods. In extreme cases, this may lead to what has popularly been known as the tragedy of the commons, leading to resource depletion or degradation. This will particularly be true where there is a trade-off between the provision of public goods and services and the production of marketable, private produce.

In absence of the provider-gets principle, or incentives to produce beneficial public goods or restrict the production of detrimental goods, it is likely that normal behaviour will lead to further degradation. It is easy to understand private gains at the expense of public losses since the private welfare gains are clearly demarcated and promoted, while the public welfare losses are obscured because of market failure.

Typically, therefore, agri-environmental provider-get schemes aim at reducing negative externalities, preventing the generation of further negative externalities, preventing the loss of features which have a public good character, and generating positive externalities while compensating the provider of those services. In short this implies the need to reduce, even eliminate, activities that leads to degradation that has a negative impact on society in general, even if such activities imply income generation at the local level in the short term.

A policy intervention is therefore required for the economic value for these public goods and services that are not traded in the marketplace to be introduced in the economic (traded) system.
Funding the provider-gets principle does not necessarily imply an increase in tax burdens, since public goods can be funded in a variety of ways. One option may be that of taxing a negative externality, such as air or water pollution, to fund a positive externality, such as promoting afforestation. By doing so, a double dividend may be realised (reducing a negative externality while encouraging a desirable outcome) through a single policy action.

Such taxation may become revenue neutral by reducing other taxes. For example, revenues raised from the introduction of a carbon tax could be used to fund environmental reconstruction, similar to the Costa Rica system (which will be discussed briefly later). Another option would be to allow infrastructure and commercial development in one area if the impact of this development is mitigated through ecosystem rehabilitation elsewhere, which is not unlike the European Habitats Directive.

Such a policy would, however, require a well-managed land-use and offset policy. When considering these options, the tax inception point and the tax burden must be carefully analysed as it can easily be shifted in the value chain and be carried by the poorest of the poor. This is especially true since most environmental taxes are regressive affecting the poor disproportionately more than the rich, more especially because taxes are non-requited payments.

This implies they are not linked to specific actions and activities and have a very low impact on behavioural change. This is especially important in the context where behavioural change is of the highest importance. This makes a market-based approach, such as PES, a much more appropriate way with respect to the provisioning of positive externalities, enriching the dialogue in society and the general understanding of ecosystems and their services and achieving system-wide behavioural change.

Within this context one of the most recognised definition for PES is:
a voluntary transaction where a well-defined ecosystem service (or a land-use likely to secure that service) is being 'bought' by a (minimum one) ecosystem service buyer from a (minimum one) ecosystem service provider if and only if the ecosystem service provider secures ecosystem service provision (conditionality).

Another definition often used, supporting the first, is:

Current ecosystem services payments include both monetary and non-monetary transactions (such as deals related to shifting property rights) between an individual (or a group of people) who provides services ("sellers") and an individual (or a group) who pays for maintenance of these services. The key characteristic of these buyer/seller transactions is that the focus is on maintaining a flow of a specified ecological "service," such as retaining clean water, biodiversity, and carbon sequestration capabilities.

In order to ensure that the ecological service is indeed maintained—as buyers expect for their money — the transactions require regular, independent verification of sellers’ actions and effects on the resources. In sum, the key attributes of ecosystem service payments and markets are that sellers (a) maintain specific ecological structures and functions, and (b) remain accountable to independent verifiers that the “service” being paid for is indeed being delivered.

What these PES definitions are highlighting is that there are opportunities for local land owners and land users or managers to benefit privately from what is generally considered public service and, in the process, reduce or avoid ecosystem degradation and depletion and even restore those rendering more services for generations to come. Such PES, or PES-like, transactions, however, have some conditions that one must consider, namely:

- Efficiency will the PES project contribute to the least cost solution or option? In other words, if there was a range of possible interventions at a site, will the PES project facilitate the implementation of the least cost?

- Equity will the PES project address various issues related to equity:
  - Procedural equity: the degree of involvement and inclusiveness in rulemaking and decisions around land management or conservation action at a site
  - Distributional equity: Distribution of costs and benefits, burdens and rights derived from the land management or conservation actions or programs among the transaction agents
3. PES POLICY IN RWANDA

3.1 The PES policy context in Rwanda

Figure 2 replicates Rwanda’s strategic framework on climate change and low carbon development. This is based under overarching objective for Rwanda to be a developed climate-resilient, low-carbon economy by 2050.

This is to be brought about by a range of programmes of action, many of which are within the domain of the natural resources sector. One of these programmes is that of PES. The importance of PES within the development of Rwanda cannot, therefore, be overstated.

Figure 2: Strategic Framework for Rwanda’s National Strategy on Climate Change and Low Carbon Development

These programmes of action are strongly supported by the strategic objectives – notably sustainable land use and water resource management to accomplish food security and the preservation of biodiversity and ecosystem services.

Vision 2050, correctly, indicates (as can be seen in Figure 3) that the starting point of initiating the programmes of action is through the establishment of the appropriate institutional arrangements.

Vision 2050 therefore provides the operating framework for all national departments to develop policies, and all districts to implement those policies.

The importance of developing an appropriate institutional framework was also clearly demonstrated within the context of Costa Rica (see Section 4.2). The success of its PES was unlocked because of its institutional arrangements which centred around FONAFIFO, a role FONERWA must play in Rwanda.
Vision 2050: For Rwanda to be a developed, climate-resilient, low-carbon economy by 2050.

Guiding Principles
- Economic Growth and Poverty Reduction
- Sustainability of the Environment and Natural resources
- Welfare and Wellness of all citizens in a growing population
- Good Regional and Global Citizenship
- Gender Equality and Equity

Strategic Objectives
- To achieve Energy Security and a Low Carbon Energy Supply that supports the development of Green Industry and Services.
- To achieve Sustainable Land Use and Water Resource Management that results in Food Security, appropriate Urban Development and conservation of biodiversity and Ecosystem Services.
- To achieve Social Protection, Improved Health and Disaster Risk Reduction that reduces vulnerability to climate change.

Programmes of Action
- Sustainable intensification of small-scale farming
- Agricultural diversity of markets
- Sustainable land use management
- Integrated Water Resource Management
- Low carbon energy grid
- Small scale energy access in rural areas
- Disaster management and Disease prevention
- Green industry and private sector development
- Climate compatible mining
- Resilient transport systems
- Low carbon urban systems
- Ecotourism, reforestation and PCS
- Sustainable forestry, agroforestry and biomass
- Climate data and projections

Enabling Pillars
- Institutional Arrangements
- Finance
- Capacity Building and Knowledge Management
- Technology, Innovation and Infrastructure
- Integrated Planning and Data Management

Roadmap for Implementation
- Big Wins, Quick Wins and Further Work
Figure 3: Roadmap to implementation

The role PES can play within Rwanda is highlighted in Figure 4 in both a detailed and simplified manner. This illustrates the importance of PES to reduce the national security risk the prevailing threat which current land use practises are placing on food, water, energy and life itself. This risk can be mitigated significantly through prudent resource management, which could involve, among others, a PES strategy as per the stated objective in Vision 2050.
Figure 4: Causal-loop diagram indicating the linkages between environmental degradation and national security and the role PES can play to circumvent the problem. The top diagram illustrates the relationship between the drivers of degradation, the impact thereof on soil degradation and the cost to the economy leading to national security risk in much detail.

The bottom diagram provides a simplified version of the same illustrating the undesirable loop of degradation to increased cost in the economy to national security risk, but that PES, among others, can lead to restoration and a resilient society.

The system-wide linkages indicated in Figure 4 are highlighted through four very discernible interactions, marked with different colours, they are:

1. The blue arrows reflect the impacts of the drivers of degradation, subdivided in three categories, on soil degradation: the higher and more intense the driver, the more the soil degradation, and vice versa – a positive causality indicated by the “+” sign.

2. The red arrows reflect the impacts of degradation on soil erosion, and the cost, at a local level, that it is causing various sectors: the higher and more intense the soil erosion, the lower the agricultural production and the water quality (indicated by the “-” sign, and the more the landslides, the cost of living and the higher poverty (all indicated by a “+” sign).

3. The black arrows reflect the impacts of soil degradation, and its local consequences, on national security: the higher and more intense the erosion, the deeper the impacts on the local economy, and the higher the water, food, and energy risks are, indicated by the “+” sign. The impact on international reputation and tourism can be added.

4. The green arrows reflect the introduction of a payments for ecosystems system from either and/or both local and international funding sources thereby reducing national security risk (indicated by the “-” sign), and reducing the intensity of the drivers of degradation (indicated by the “-” sign) and thus, reduce, for example, poverty.

Given both the Vision2050 framework and the need for intervention and the role PES can play to assist in unlocking resources, we turn to the stated PES policy in Rwanda.

3.2 PES policy in Rwanda

According to Article 27 of the Law (duplicated on the right-hand side) the Government of Rwanda must, among others, put in place concrete measures for rehabilitating degraded soils and establish measures for controlling soil erosion. To assist in this, and other objectives, the Government of Rwanda through its National Environment and Climate Change Policy has adopted PES as a mechanism towards resource mobilisation and the implementation of measures to restore degraded landscapes and ensure soil stabilisation. According to this policy the official definition of PES in Rwanda is:

A market-based approach to conservation based on the twin principles that those who benefit from environmental services (such as users of clean water) should pay for them and those who generate these services should be compensated for providing them.
PES is furthermore embedded within the policy under Policy Objective 2, Policy statement 1, Activity 5. The entire Policy statement 1 is replicated below for illustrative purposes and to show the context within which PES is operating in.

<table>
<thead>
<tr>
<th>Policy statement 1: Conserve, preserve, and restore ecosystems and enhance their ecological functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystems provide a wide range of goods and services. These include provisioning, regulating and maintaining ecological systems and functions. Despite the services they provide, ecosystems are under pressure from human activities. The most critical ecosystems include forests, water, wetland ecosystems, among others. Some of these have been converted into agricultural use and settlements. Therefore, the policy actions are:</td>
</tr>
<tr>
<td>1. Develop a national wildlife adaptation strategy that includes well-assessed climate change adaptation strategies.</td>
</tr>
<tr>
<td>2. Promote park management practices that enable wildlife to adapt to the changing climate.</td>
</tr>
<tr>
<td>3. Promote weather-resilient tourism infrastructure and develop tourism products which have a low-carbon footprint.</td>
</tr>
<tr>
<td>4. Strengthen implementation of integrated water resource management strategies including operationalisation of water fees payment scheme to support water catchments’ protection and conservation.</td>
</tr>
<tr>
<td>5. Institutionalise, pilot and upscale Payment for Ecosystem Services (PES).</td>
</tr>
<tr>
<td>6. Provide incentives for investment in sustainable tourism and wildlife conservation initiatives.</td>
</tr>
<tr>
<td>7. Promote biodiversity conservation including revitalisation of national parks (NP).</td>
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<tr>
<td>8. Promote programmes for the conservation of natural heritage.</td>
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<tr>
<td>9. Take all appropriate measures to protect and preserve rare or fragile ecosystems.</td>
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<tr>
<td>10. Integrate Natural Capital Accounting and valuation of ecosystem services into national development planning frameworks.</td>
</tr>
<tr>
<td>11. Strengthen the involvement and empowerment of local communities in the prevention, eradication and control of invasive species that have major environmental and economic impacts.</td>
</tr>
<tr>
<td>12. Regularly conduct an inventory of degraded ecosystem and prepare restoration development plans.</td>
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</tbody>
</table>
Given the abovementioned Law as well as enabling policy, Rwanda not only has the legal instruments required to embark on institutionalising PES, it is mandated to do so. Before suggesting how this could be done, a brief reflection is provided on experiences Rwanda and other countries, notably Costa Rica, has had with respect to PES.

4 PES EXPERIENCES: RWANDA & COSTA RICA

(This section is taken in part from an earlier study with permission.)

4.1 Rwanda

PES and PES-like schemes have been considered for a considerable period and for a range of countries in Africa, Rwanda is no exception, three studies are of interest, namely:

- Ngungwe;
- Yanze / Rulindo ; and
- Rugezi.

Only in Ngungwe a PES scheme has been implemented. This temporary scheme, known as the ReDirect project, was reliant on EU funds, which activities support conservation efforts in and around Nyungwe National Park. 25 USD was given to participating household as well as an annual payment of 2000 USD (1.2 million RWF) to each cell to support cell activities. This money provided small 'salaries' for cell monitors selected by the community, that assisted in ReDirect's work — e.g. disbursement of information, assistance in monitoring activities, liaison between community and ReDirect.

While some studies were geared towards an institutional analysis of theoretical PES schemes for Rwanda, others describe practical experiences in Rwanda. A common denominator of these studies is that they indicated that while there is a clear willingness among governmental stakeholders, and groundwork for innovative environmental policy is in place, specific national PES policies still needed to be developed to facilitate its implementation, this shortcoming has, however, now been addressed as discussed above.

One study provides positive indications that the Rwandan population (75% of the study population) has knowledge of functions of forest ecosystem services and the most valuable forest ecosystem service in Rwanda is erosion control and sediment retention.

Practical limitations of some of the PES schemes are often relate to the longevity thereof as they were dependent on donor funding (for example in the case of Ngungwe) and modalities for revolving funds are restricted. In addition, transaction costs need to be managed well and be kept at an acceptable level. The private sector in Rwanda is still in a nascent state and the farmers themselves often face issues around insecure tenure. Where high quality data sources are scarce, simplicity of PES schemes is hard to attain, as this complicates valuation and monetarisation, as well was monitoring and evaluation. Finally, many of the benefits identified, including carbon sequestration and storage and biodiversity conservation, are global and, therefore, are not realised in terms of financial benefits to the local population and Rwanda, who bear the cost of conservation.

4.2 Costa Rica

One country that did get the institutional design right and became a world leader with respect to PES as a result thereof, is Costa Rica. Herewith a brief overview of the institutional model followed by Costa Rica at its inception.

In 1950, more than half of Costa Rica was covered by forest, but by 1986 only 29% of the country still enjoyed forest cover. Decades of deforestation driven by the rapid expansion of the road system, cheap credit for cattle, and land titling laws rewarded deforestation. The underlying policies that supported the harvest of the forests are embedded in the conventional wisdom that growth in man-made capital equates development and is an indicator of progress. This implies that the ecosystem services rendered by forests were taxed on behalf of man-made capital. Viewed differently, investment in man-made capital was subsidised by the forestry services, by not valuing them appropriately. At that stage Costa Rican authorities realised that drastic measures were necessary to reduce the rate of deforestation. This decision was based on a new understanding that it was necessary to preserve forests because of the many ecosystem services that they provided. These include: biodiversity or the diversity of species, hydrological services, carbon sequestration, ecotourism and scenic views. Biodiversity is important to conserve for its bioprospecting value (various products that use material from natural flora and fauna,
including perfumes, cosmetics, pesticides and pharmaceutical products), its ecotourism value and its ecosystem services, such as the provision of healthy habitats for animals. Well-functioning watersheds also provide important hydrological services, as the loss of forests in important watershed areas can result in soil erosion and subsequent sedimentation in rivers and streams. This sedimentation can reduce the quality of drinking water and cause losses in hydroelectric production potential. It also increases the risk of flooding, which in turn can result in further losses in potential electricity generation. The loss of forest cover had therefore major negative economic implications, over and above the services that forests provide, while the carbon sequestration value of primary forests was estimated to be between $60 and $120 per ha in 1989.

After realising the importance of their forests, and in an effort to conserve and promote the ecological services rendered by these, Costa Rica developed legal instruments and institutional arrangements that enabled the internalisation of these benefits (see Figure 5). In this way, landowners have an incentive to conserve their forests and safeguard the integrity of their land. By 1998, the payment for Forestry Environmental Services Program (FESP) compensated three types of activities, namely i) reforestation, ii) natural forest management and iii) forest protection. Provision was also made for a fourth activity, namely forest regeneration. In return for the payments, the landholders had to cede their carbon and other ES rights to the government through the National Forestry Financing Fund (FONAFIFO) for years, while they promised to manage or protect the forest for a period of 20 years (or 15 in the case of reforestation). This obligation was registered in the public land register and would apply to any future purchasers of the land. Monitoring is the responsibility of each participant’s supervising forester (who was also responsible for drawing up the forestry management plan for the property).

The main source of funding for the programme is a tax of 15 per cent on fuel sales, dedicated to the reduction of greenhouse gases and the protection of biodiversity. One third of this (5%) is dedicated to forestry through FONAFIFO. Additionally, the government (MINEA) established a Carbon Fund in 1997 to distribute “rights” or “credits” in exchange for monetary deposits from domestic and international sources.

The secondary source of funding is the sale of Certifiable Tradable Offsets (CTO) (the Costa Rican version of a certifiable emission reduction (CER)), a financial instrument designed by Costa Rica to transfer (sell) greenhouse gas (GHG) offsets in the international market.

5. THE NEED FOR INTERVENTION

(This section is taken in part from an earlier study with permission.)

5.1 Background

Further to the illustration provided in Figure 4, land use in Rwanda has changed substantially over the past three decades. This can be seen from Figure 6, which clearly shows the dramatic conversion of forested land into croplands. The area under forests has more than halved from 1,1 million ha to 430,000 ha while the area under croplands has more than doubled from 620,000 ha to 1,4 million ha between 1990 and 2015.

This change in land cover is the result of a rapid change in land use and the conversion of land as a result of the increasing agrarian nature of the country and the demand for land for food production. The importance of croplands as a generator of wealth is also self-evident as can be seen in Figure 7 with croplands contributing US$5,007 (or 23% of the total of US$21,619/capita) to the per capita wealth of the nation – more than any other asset category with the exception of human capital generating remuneration.
Figure 7: Rwanda: Total wealth per asset class: 2014 US$/capita with natural capital deconstructed into its individual parts

The consequences of this land conversion, with respect to high sediment levels have been well documented. WRMD and Water for Growth Rwanda has concluded that:

- high sediment loads and turbidity are due to mining and traditional farming methods;
- high loads of e. coli and coliform bacteria (and others not measured) are from untreated sewerage; and
- there are very high organic loads and high biological oxygen demands (BOD) and chemical oxygen demands and resulting low concentrations of oxygen (mg/L).

What is therefore happening?

- land has and is being converted from natural forested areas into mostly croplands since croplands are the basic and most important and dominant source of income protection and livelihood support;
- land cover and -use change, however, has coincided with an increase in soil erosion and thus the increase in sediment loads in rivers, leading to high turbidity levels and declining water quality and increasing soil movement and soil loss, and hence also a decline in soil health through the export of soil-based nutrients.

The changes in sediment loads, and the export of soil-based nutrients, strongly coincide with rainfall patterns – see Figure 8 that depicts the relationship between rainfall and turbidity in the Yanze River. Rainfall, which is required to replenish and maintain replenishable natural capital is now the medium for its destruction and loss because of the change in land cover and -use patterns and the lack of soil cover due to inappropriate management.

![Figure 8: Relationship between rainfall and turbidity in the Yanze River](image)

Due to the current land use practices, the country topography, the population pressure and the climate, the country is very susceptible to high rates of soil loss.

5.2 Sense making: Upper Nyabarongo catchment

To assist in a sense-making process, Kurtz and Snowden, based on Snowden’s earlier work proposed the Cynefin sense-making model, see Figure 9. As opposed to normal, scenario-based models, this framework does not seek to categorise data into quadrants, rather, it allows the data to define a state in a process to assist with making sense of a circumstance.

It should be noted that there are multiple spaces on this diagram. First, the quadrants themselves, but then there are the boundaries among them. These are not cast in stone. A system can easily move between and among domains, or even be caught-up in a boundary between two domains.

Each domain, however, requires different management interventions. Not only do the boundary zones add additional spaces, but so does the centre, a space in which one operates when you simply do not know in which domain a system is operating in.

It is not uncommon for human systems to operate within the complex zone, fluctuating in and out to other domains over time. This is since human systems have many variables and actors. This requires the manager, typically the policy- and decision-maker, to use pattern management, based on historic trends by probing the system, sense the direction it is going in, and then responding appropriately.
Life in the Upper-Nyabarongo catchment at the time of writing, however, is probably better described by the known domain. Due to well-established traditions and cultural patterns, the daily activity of people, and how they are likely to behave over time, are highly predictable. Normally such a domain is where most societies would strive towards, and an ideal situation where one can apply best practices using standard operating procedures.

According to Kurtz and Snowden, however, the most dangerous place to be on this sense-making plane, however, is on or near the boundary between the known and chaotic domains. This position is often characterised with complacency due to the daily routine. Unfortunately, however, and since all human systems are permanently in flux, drifting “over the edge” from the known into chaos is not only possible, it is relatively easy, especially when dealing with external, unforeseen and disastrous, events.

More so, when the resilience of a system has deteriorated over time due to resource extraction. The monotony of the system, and the high degree of predictability and certainty that brings about complacency is thus also the social system’s biggest enemy as it leads to unpreparedness.

Once a system has collapsed into chaos it will require stability-focussed crisis management. This is often led by outside parties and that in a dictatorial fashion by means of enactment to establish order again.

Some salient characteristics of the local realities in the Upper-Nyabarongo District are:
1. a high population of 1,5 million people with an average population density of 4,1 people/ha;
2. high resource use based on extractive activities for both economic/commercial and domestic/livelihoods use;
3. the monotonous daily routine based on well-established societal rules, largely linked to extracting resources for immediate use;
4. the short-term nature of decision-making (reflecting a very high social discount rate; probably because of the high poverty prevalence) illustrated and articulated by various interviewees who indicated that, for example, when the need arises bananas will be harvested young, or trees be cut early for timber and poles;
5. in all probability, significant losses of carbon from the system – an indicator of the ongoing deterioration of the capability of the system to function properly; and
6. the system’s seemingly inability to replenish itself sufficiently, as is evident by the increased competition for organic matter and the die-off of the bee population.

The combination of the above, leaves the people of the Upper-Nyaborongo catchment extremely exposed and vulnerable. Any negative and large-scale environmental disaster will push the system into chaos requiring assistance from outside for:
1) survival,
2) the establishment of order, and
3) the implementation of a new development pathway.

This societal change is likely to be dramatic and potentially painful.

The restoration of the catchment, and the ongoing management thereof within sustainable parameters are, therefore, of the utmost importance from a national security perspective. PES can, and as per the Vision 2050 should, play a role in accomplishing this.
5.3 Soil erosion: at what cost

Currently there is not yet consensus as to the exact extent of soil erosion in Rwanda. One estimate suggests approximately 50 million tonnes of topsoil is lost per year, another estimate the loss to be closer to 150 million tonnes. Assuming:
• 100 million tonnes is lost annually due to soil erosion, which is 8 tonnes per person per year; and
• a conservative market value of topsoil of RwF30,000/tonne, topsoil often trades for as much as RwF100,000/tonne but this includes transport and labour; then
• the forgone productive value of the topsoil is RwF3 trillion, or US$3.2 billion, which is about a third of the annual GDP. Given that 80% of the erosion is generated on about 1.6 million ha, this implies that the value forgone is RwF1.5 million/ha/year, or US$1.630/ha/year.

These estimates exclude the damage caused by soil erosion to property, and the loss in life as a result of landslides, etc. Drastic action is required to curb this loss.

6. PES: THE PROPOSED SYSTEM

6.1 Introduction

As will be discussed in Section 6.3, a PES system entails, at its core, a system of institutional and inter-personal relationships that are harmonised in its quest to support or accomplish a common theme or objective. According to the Golden Rule of the Noble laureate in economics, Jan Tinbergen, policymakers who are trying to achieve multiple economic targets need to have control over at least one policy tool for each policy target, stated otherwise, the number of instruments must always either equal or exceed the number of targets (or objective).

This is because the achievement of certain economic targets precludes the achievement of others. According to this rule, a single instrument, PES in this case, should therefore have one objective and not more. Achieving this single objective might have multiple impacts or outcomes, but those outcomes are consequences of achieving the objective.

Within the policy context of Rwanda as described above as well as the local realities, it is proposed that the objective for PES in Rwanda is:
to contribute towards a climate resilient Rwanda through soil conservation and landscape restoration.

By focussing on soil conservation and landscape restoration, PES will contribute much towards:
• mitigating the prevailing food and water security risks as a result of inappropriate land management practices;
• climate change adaptation through improved and climate smart land management practices;
• climate change mitigation through enhanced carbon sequestration;
• system resilience that includes an improved understanding of ecosystem functioning and the benefits from the resulting ecosystem services;
• economic development by i) reducing the losses linked to degradation and high-intensity climatic events and ii) developing a new economic sector with respect to natural resource management; and
• reducing the cost of all affected parties and sectors, such as hydro-power, water abstraction and treatment, tea and coffee production and processing, mining, etc.

This begs the question how a national PES system for Rwanda could be developed and/or conceived, we turn to this next.

6.2 Building blocks

Blockchain has revolutionised society’s thinking about nested relationships in a variety of ways and is highly applicable here, also because it is an autopoietic system, or a system capable of reproducing and maintaining itself.

As illustrated in Figure 10, a successful PES system is one in which a variety of disciplinary as well as institutional relationships work in harmony, and in a self-sustaining manner, together towards accomplishing its objective – in this case that is defined above. There are three main interlocking parts, each with its own layers and subsequent nests. These will be explained below.
The PES building blocks, from a blockchain perspective, are:

- **Foundational**: This first block focusses on the bio-physical realities and it comprises various districts, represented as layers, and the bio-physical characteristics of each layer, or district, comprises aspects such as climate, soil, land-use, infrastructure, etc., represented by the small boxes. Each box in and by itself is derived from a variety of different parameters.

- **The cement, or the system-wide glue**: The second block focusses on the institutional realities and it comprises the public and private sector as well as the international domain and the peculiarities in and among households, represented as the layers. Within each layer there are different entities with different mandates, objectives and functions, represented by the small boxes. As above, each box in and by itself is derived from a variety of different parameters.

- **Bricks, or that which will make PES to work**: The third block focusses on the human reality and people that are organised in terms of different networks or social systems, each with its own culture, norms and values, histories and ontological knowledge represented as the layers.

Within each layer each person has different capabilities, capacity and behavioural patterns, to mention but a few, represented by the small boxes. Likewise, each small box is dependent on a range of variables.

PES must be treated in terms of this system of interlocking and nested cells since it is addressing what is called a wicked research problem, that is a research problem that originates within systems that are both complex and complicated, such as societal systems and ecosystems. Restoration deals with the consequences of the collapse, failure and/or malfunction that occurs simultaneously in both these wicked systems juxtaposed on-top of one another.

Seeking to redress such dual system failure cannot be addressed within the domain of scientific knowledge. The only pathway towards healing is through active and structured dialogue. Through dialogue a culture of restoration can be fostered, and an entire system commences on the process of self-healing – hence also being an autopoietic system.

The PES building blocks are therefore much more than just a technocratic intervention, but much rather a system of relationships to facilitate dialogue that is based on science.
but that seeks to go beyond science towards nurturing a restorative culture. In seeking to achieve such a restorative culture the system, being ecological, social, and/or institutional, will also enjoy healing. We will thus continue by discussing these relationships in more detail.

6.3 PES system of relationships

Introduction

As mentioned above, PES, as a system, is effectively a conglomeration of relationships working together towards achieving a common objective. Within the Rwandan case the objective is to contribute to a climate resilient Rwanda through soil conservation and landscape restoration. There is a myriad of interventions through which this can be achieved, but they can be categorised into two types, namely:

- **Type A**: once-off large-scale infrastructure-like interventions:
  - afforestation;
  - terracing;
  - agroforestry;
  - marshland stabilisation;
  - riverbank stabilisation;
  - gully restoration;
  - etc.

- **Type B**: ongoing on-site management:
  - regenerative or conservation agriculture ensuring a robust cover and cash crop;
  - establishment and management of perennial pastures;
  - etc.

The most appropriate intervention, or, more likely combination of interventions, that will be best suited for a specific site will be highly case depended. Irrespective of the combination of interventions chosen, they must, as a minimum, contribute to:

- soil stabilisation; and
- soil fertility.

By contributing to soil stabilisation and soil fertility most soil-based ecosystem services will be enhanced, including carbon sequestration, food production, water treatment (i.e. sediment reduction) and, within the climate context, contribute to a food and water secure Rwanda. Activities that lead to these two aspects, soil stabilisation and soil fertility, as per the Law (Article 27), must be included in the land use master plan, downscaled to a local level.

System of relationships

The system of relationships is provided in Figure 11, with two simplified versions provided in Figure 12.

![Figure 12](image-url)

and essentially comprises the three building blocks discussed above, with one (the institutional reality) that can be subdivided into two making it four blocks in total. These building blocks with the dynamic relationships will subsequently be discussed.

- **Building block 1**: Bio-physical reality – depicted in Figure 11 by the notations 1a, b, c and d
  - Through dialogue with all stakeholders, most notably the village residents, develop a village land-use action plan that is aligned with both the national land-use master plan and the micro-catchment management plan.
  - This plan should also be aligned to the process of land consolidation and combat the process of ongoing land fragmentation.

  - The action plan should contribute towards soil stabilisation and the enhancement of soil fertility by selecting the most appropriate set of interventions for each specific case.
Interventions seeking soil stabilisation and the enhancement of soil fertility should take cognisance of the local realities with respect to income generation and a sustainable future. It is in this context that the deployment of conservation, or regenerative, agriculture should strongly be encouraged.

Building block 2: Institutional reality (internal) – depicted in Figure 11 by the notations 2a - f

An extremely robust set of institutional relationships should be cemented internally among the Villages, the Districts and the Ministry of Environment and its agencies, including FONERWA.

In all cases these internal relationships exist already. None of the relationships, listed as 2a-f, must be developed afresh as they all are operational. There are standing operating protocols and communication structures in place among all the relevant institutions. This is one of the reasons PES can most certainly succeed in Rwanda. What must be done is to utilise the existing framework within the context of PES.

This implies the establishment of a dedicated Landscape Restoration account in the District that will operate as the transaction account dedicated to the PES-related activities.

Utilising the existing institutional framework for PES implies that the MoUs that have to be developed, based on the existing templates, must encapsulate the intent of the PES, namely soil stabilisation and the enhancement of soil fertility through the designated interventions with an emphasis on regenerative or conservation agriculture.

Figure 11: PES system of relationships
Note: the annotated numbers refer to various actions; the detail discussion thereof is in Section 7.2.
but that seeks to go beyond science towards nurturing a restorative culture. In seeking to achieve such a restorative culture the system, being ecological, social, and/or institutional, will also enjoy healing. We will thus continue by discussing these relationships in more detail.

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  - This plan should also be aligned to the process of land consolidation and combat the process of ongoing land fragmentation.

  - The action plan should contribute towards soil stabilisation and the enhancement of soil fertility by selecting the most appropriate set of interventions for each specific case.
Figure 12: Simplified PES framework

Note: The PES system connects the Village, the level of implementation according to the land use plan, with two national entities (FONERWA and the Ministry of Environment) through the District. There is continuous interaction among these entities, and feedback in the form of monitoring, reporting and verification plus valuation of the benefits and the communication thereof to all parties.

- Building block 3: Institutional reality (external) – depicted in Figure 11 by the notations 3a, b and c
  - Mentioned earlier the now famous Costa Rica success with respect to the implementation of PES was made possible through the existence of FONAFIFO, the financial institution established to assist in resource mobilisation and management, including the deployment thereof. That function, in Rwanda, is to be played by FONERWA. The existence of FONERWA and the scope of its mandate are contributing factors to the plausible success of PES in Rwanda.
  - FONERWA is statutorily mandated to embark on resource mobilisation to the advancement of a green and climate resilient economy across a very broad range of fields, including resources from development partners and other international agencies, the private sector and the public sector. To this end FONERWA has developed a Resource Mobilisation and Partnership Strategy (currently in draft format).

- Building block 4: Human reality – depicted in Figure 11 by the notations 4a, b and c
  - The PES system of relationships is merely the means through which behavioural change among all participating people in the larger network is accomplished, notably a change towards a more resilient, sustainable and secure Rwanda. All parties, be it the people who are performing the tasks as outlined in building block 1, or the people administrating the system as outlined in building block 2, or the people responsible mobilising as well as those committing resources as outlined in building block 3, have to embrace the need for and see the impact of soil stabilisation and soil fertility. The connectedness of people’s actions, the resources and the outcomes must be made as strong as possible.
  - PES, as a market-based instrument, is not just about raising funds, it is also about gaining a much deeper understanding of the economy-ecology relationship and to entice behavioural change. This is since price signals are such important and highly informative educational tools.
  - Linked to building block 3, the capacity and capability of FONERWA to execute its mandate should constantly be enhanced. This also includes its ability to provide adequate and appropriate feedback to its partners on the effectiveness and impact of their investments.
The factor that will connect all the pieces and close the loop, so to speak, is that of ongoing monitoring, reporting and verification inclusive of the valuation of the economic and financial benefits of investing in PES. This information must to be communicated to all parties concerned in various formats as deemed appropriately.

### 6.4 Institutional map and options for resource mobilisation

Based on the above, Figure 13 provides a simplified view of the institutional landscape.

**Figure 13: PES institutional map**

Within the PES landscape there are four main categories of players, namely:

1. **The sellers of ecosystem services:**
   - This is most notably the villagers who, in conjunction with the Districts, are committed to a land-use change inclusive of conservation or regenerative agriculture and activities that will reduce deforestation and combat soil erosion while enhancing food production.
   - It is important that each villager and each village develops a story, a narrative, of restoration. Such restoration experiences can be shared using, among others, the ReStory communication platform that is due to be launched in October 2019.

2. **The project implementers:**
   - The project implementers include the villagers, the sellers of ecosystem services, who are responsible for the actual activities, but also the government administrators of the system with support from external technical partners such as RICA, SEAD, ICRAF and the IUCN/CI. The project implementers are thus a broader group of people and/or agencies with capacity to assist the villagers where needed. The degree of assistance will have to be determined on a case-by-case basis pending i) the expertise available at local level, and ii) the technical requirement of the restorative activity at the site. In some cases, villagers might opt to form a Project Implementation Committee (PIC) to represent them, in others they might not.

3. **Resource mobilisation and administration, MRV and valuation:**
   - FONERWA and external partners such as the IUCN/CI and others. FONERWA is already mandated for the task of resource mobilisation and is actively engaged in that process. FONERWA also has a history of working together with Districts on the implementation and management of various projects. From an administrative perspective, PES-related projects are no different.

   What is, however, required is the need for ongoing monitoring, reporting and verification of the progress as well as the valuation of the benefits of the PES-specific actions. FONERWA could engage in this, or external parties could assist in it, pending expertise and resources and on-site peculiarities. It is more than likely that while one MRV and valuation template has to be developed by FONERWA, that the implementation modality could vary from site to site.

4. **The potential buyers of ecosystem services:**
   - Development assistance and other international sources:
     - In addition to the existing ongoing resource mobilisation efforts of FONERWA, serious attention should be given to tap into international REDD+ sources of finance. It is thus suggested that FONERWA, as part of their resource mobilisation strategy, investigate the current formal status of REDD+ in Rwanda and, with the help of external partners such as the IUCN/CI, seek ways to access international REDD+ funding.

   It is suggested that these sources of finance be used for both Type A and Type B interventions as mentioned above.

   - Private sector finance:
     - In order to achieve the desired behavioural change, not only among land managers, but also the private sector about their understanding of the function and working of an ecosystem, it is important to draw the private sector in as close as possible to the action. The shorter and the more obvious, even visible, the link,
between the payment and the benefit is, the better. That will enhance the general knowledge and understanding of both the economy and the ecosystem and assist in developing mutually beneficial long-term partnerships. The options for unlocking resources on an ongoing basis will be greatly enhanced in this way.

Two such options could be considered in the short to medium term:

1. Rwanda has embarked on a National Agriculture Insurance Scheme (NAIS). NAIS is still being tested and piloted. There is the possibility to either amend NAIS or to expand NAIS with a special component linked to regenerative or conservation agriculture whereby:
   - The private sector co-finance the crop insurance premium of participating villages in exchange for a land-use change;
   - Participating villages will have the advantage of crop insurance, based on the proposed index-based system while society and the private sector will gain the benefits of the enhanced soil stabilisation and fertility.

   This has the potential to, in a very short space of time, have a big impact connecting the private sector to the land managers in a very cost-effective manner while stimulating a change in land-use.

The private sector-led Circular Economy Forum could be used as platform to explore further options in this regard.

2. The development of markets for products using regenerative and conservation agriculture, at a premium, for the hospitality industry should actively be investigated and promoted. By twinning hotels, or other entities in the hospitality industry, with villages that produces high-quality food produced sustainably at a premium could unlock a significant amount of resources while, simultaneously, develop partnerships across a range of sectors. This could be linked to a publicity process connecting both the source as well as end-user of the food.

   It is suggested that these sources of finance be used for the ongoing management of the land, or Type B interventions as mentioned above.

In the medium to longer term other opportunities to unlock resources can be explored, like the development of an easement model stimulating the investment in regenerative or conservation agriculture as a practical yet productive, sustainable and profitable means towards soil stabilisation and conservation. FONERWA is ideally placed to develop this instrument parallel and in addition to its ongoing resource mobilisation efforts.
Before this can happen, however, a few examples of the successful implementation of conservation and regenerative agriculture is required. FONERWA could, through the Ministry of Environment, seek the assistance of both RICA and RAB in this regard and develop a database of local success. It is anticipated that as PES gathers momentum that more and more examples with evidence will emerge and be added to the database. This database is likely to become an important tool for securing resources in the future.

Also, as more information become available and the general knowledge about and robustness of PES improves, opportunities to engage private sector beneficiaries of prudent land-use, such as REC, WASC, coffee and tea producers, the insurance industry, etc., should be targeted as potential contributors. This would be a joint responsibility of the Ministry of Environment and FONERWA through its PES focal point (see below). As will be discussed below as well, the private sector led Circular Economy Forum could be a point of entry to a large body of enterprises already committed to an environmentally benign Rwanda.

Public sector finance:
There is a list of 34 statutory, or mandatory, environmentally linked fees, penalties and charges that FONERWA is, by law, suppose to receive, but none of those are currently collected. It is suggested that FONERWA and the Ministry engage in an active process to identify the bottleneck in the recuperation process and that the resources from these sources be earmarked for landscape restoration and sustainable land management.

The currently ongoing FONERWA/World Bank Deep Dive project aims to assist with this unblocking process. In addition, to the technical support with respect to unlocking these charges, penalties and fees, Deep Dive is also considering options to promote clean cooking and the use of renewable energy. These measures are important as they will contribute to the removal of some of the drivers of degradation.

It is suggested that these sources of finance be used for both Type A and Type B interventions as mentioned above.

7. PES: PROPOSED PLAN OF ACTION

7.1 Introduction

Following the system of relationships within the broader PES network as discussed above, what is the proposed plan of action? Table 1 presents a typology of the high-level actions. These are expanded below in the next section in an item-by-item way.

7.2 Detailed plan of action

Land use plans

The starting point is the development of village land-use action plans (see Table 2, the annotated numbers refer to Figure 11). The development of these action plans across Rwanda is an ongoing process and the Ministry of Environment, most notably also the Rwanda Water Resources Board and the Rwanda Forestry Authority, is actively engaged in the development of landscape and catchment restoration plans that is in harmony with and embedded in the national land-use plan.

These plans are taking cognisance of the need to consolidate land-use in general and to combat land fragmentation.

These land-use action plans focus mainly on i) high-cost and once-off restoration interventions such as terracing where required, and ii) ongoing land-use management processes. It is especially the latter that will have to be influenced strongly within the context of PES to also include conservation and regenerative agricultural practises. This is still lacking.

This will be a joint and ongoing function between RWRB, RWFA, RAB and REMA. Priority districts should be identified using either multi-criteria analysis or the CROM-DSS, or a combination thereof, or any other method.
### Table 1: Typology of the PES system of relationships

<table>
<thead>
<tr>
<th>Building block</th>
<th>Mechanism to construct the building block</th>
<th>Actions required at a high-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-physical reality (foundation)</td>
<td>Landscape restoration and sustainable land use management (SLM) and specifically conservation or regenerative agriculture in accordance with an agreed plan of action.</td>
<td>Design the required actions using dialogue, empowerment &amp; understanding while taking cognisance of the bio-physical realities; making the bottom-up approach practical.</td>
</tr>
<tr>
<td>Institutional reality: internal (cement)</td>
<td>Empower a resource mobilisation and facilitation unit that connects all parties.</td>
<td>Define, design and formalise internal (system-wide &amp; gov.) institutional relationships including compensation mechanisms.</td>
</tr>
<tr>
<td>Institutional reality: external (cement)</td>
<td>Flow of funds between sources of funds (beneficiaries) and service providers (land managers) in exchange for landscape restoration and SLM.</td>
<td>Resource mobilisation from various sources to allow for blended finance inclusive of anticipated benefits.</td>
</tr>
<tr>
<td>Human reality (bricks)</td>
<td>Compensate service providers in terms of an agreement with specific, verified, deliverables and performance.</td>
<td>Develop and test the monitoring, reporting and verification (MRV) system and the protocols regarding the valuation of the PES benefits, feedback and payment while cultivating a restorative culture.</td>
</tr>
</tbody>
</table>

### Table 2: Development of village land-use action plans

<table>
<thead>
<tr>
<th>Nr</th>
<th>Activity</th>
<th>Responsibility</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>1a, 1b, 1c, 1d</td>
<td>Development of land-use plans at all levels: it is an existing process that should continue but differentiate between initial interventions (Type A) and ongoing sustainable land management (SLM) inclusive of conservation and regenerative agriculture (Type B)</td>
<td>RWRB, RwFA, RAB, REMA</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1a, 1b, 1c, 1d</td>
<td>Prioritisation of micro-catchments within districts for intervention based on a systematic process using, for example, multi-criteria analysis and/or the CROM-DSS.</td>
<td>RWRB, RwFA, RAB, REMA</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
With respect to the development of land-use action plans, the important principles are:

- dialogue at local level drives success of PES;
- through dialogue, combined with incentives, seek to achieve behavioural change to advance soil stabilisation and soil fertility through understanding — this includes the knowledge of the impact of ongoing grass-cutting at, among others, road verges that leads to destabilised soils;
- embed process in local ownership and active empowerment, this includes regular awareness raising by the Districts in conjunction with the RWRB;
- there is an existing process to develop the land-use plans, this process must be used to the full;
- prioritisation of micro-catchments in districts must take place using, for example, multi-criteria analysis and the CROM-DSS GIS decision-making tool the RWRB has — the RWRB should therefore be actively engaged in this process of micro-catchment prioritisation utilising the existing processes and knowledge; and
- ongoing capacity building in, among others conservation and/or regenerative agriculture.

**Internal institutional relationships and the payment formula**

As indicated earlier, the glue, or cement, that will hold the entire system together is the internal institutional relationships. This must be extremely robust and well-functioning to ensure transparency, accountability and creditworthiness. Table 3 highlights the required set of relationships and what needs to be done to formalise them. None of these relationships are, however, new. The proposed PES system is embedded within an existing framework of operation. This framework must be applied to serve the PES objective though. For that the existing MoU templates can be adopted and adapted to serve the specific requirement.

With respect to the development of land-use action plans, the important principles are:

- all the MoUs must be in place before money can start to flow; and
- focus on removing the drivers of degradation through other initiatives. A policy review investigating i) policies that provide perverse incentives for prudent environmental management, and ii) which highlights the driving forces of environmental degradation (see Figure 4), should be considered. This can be done jointly between the Ministry of Environment and MINECOFIN.

As mentioned in Table 3 a formula must be developed according to which participating villages and villagers therein, can be compensated. Herewith a proposal.

Proposed payment formula for consideration:

Given the fact that Rwanda is a country with such a high population density, about 4,3 people per ha — among the highest in Africa — the farm sizes and property holdings are very small, on average 0,3ha. Furthermore, the farmers are among the poorest people not only in Rwanda, but in the world. Furthermore, the GDP for the agricultural sector was RwF 2,378billion and that the Agricultural sector is host to about 1,5million farmers; this implies that each farmer’s average income is about RwF1,585million/year or RwF30,500/week. Any contribution PES can make to augment this income stream would be hugely advantageous to the general development of the country. The GDP mentioned is derived from 1,2million ha, this implies a GDP/ha of about RwF1,98million, or about RwF198/m2/year. To incentivise a land-use change towards regenerative and conservation agriculture, and thereby to reduce soil erosion due to the stabilisation capability thereof while enhancing soil fertility, a payment based on a sliding scale by multiplying a topography score with a land cover score, as per Table 4, for each village and participating farmer to generate a location score. The location score is used in the formula below to generate the PES payment

\[
\text{location score} = \frac{\text{Topography score} + \text{land cover score}}{2}
\]

\[
\text{PES payment} = \text{location score} \times \text{PES area (m2)} \times \text{unit value (RwF/m2)}
\]
<table>
<thead>
<tr>
<th>Nr</th>
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<td></td>
<td></td>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>2a</td>
<td>Develop and sign MoUs with the Sebeya District with executive powers on the dedicated restoration account at District level, and then roll-out as funds become available as per the list of priority catchments</td>
<td>MoE &amp; Districts</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2b</td>
<td>Develop the implementation plan for the Sebeya catchment that could be used as template for all other catchments later; if deemed necessary, to be evaluated on a</td>
<td>MoE, District &amp; Village</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2d</td>
<td>appoint a village-level project implementation committee (PIC) for ease of communication with the participating members; upscale as funds becomes available as per the list of priority catchments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2e</td>
<td>Develop and sign generic overarching MoU that covers all PES-related actions and transactions, incl. working arrangement.</td>
<td>MoE &amp; FONERWA</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2f</td>
<td>Learn from the ongoing Sebeya pilot and develop a generic MoU that can be applied in all cases; roll-out as funds allow</td>
<td>FONERWA &amp; District</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Develop a standardised payment formula that could be informed by the existing community-based approach; include the use of a PIC where applicable; apply this payment</td>
<td>District &amp; participants</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
• \((\text{Topography score} + \text{land cover score})/2 = \text{location score}\)
• \(\text{location score} \times \text{PES area (m}^2\) \times \text{unit value (RwF/m}^2) = \text{PES payment}\)

A unit value of RwF25/m²/year is proposed. That is 12.5% of the unit GDP for agriculture and would serve as an exciting incentive to achieve the desired change by applying Type B forms of land-use management principles as described above.

In Section 5.3 the cost of soil erosion has been estimated to be at least RwF3trillion, or US$3,2billion per year. Assuming an average location score of 0.6 and that PES is rolled-out to 60% of the agricultural land, i.e. 720,000ha, then this payment would entail RwF108billion, or US$-117million/year, or 4% of the cost of soil erosion.

Both the typology class and the C-factor are in the RWRB GIS model. While the topography score is unlikely to change, what is sought is an improvement in the C-factor. The PES can be used by RWRB to continually fact-check and update this score. This will also enhance the robustness of the RULSE model.

**Table 4: Topography and land cover scores**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Topography score</th>
<th>Land cover in RULSE equation</th>
<th>Score 1</th>
<th>Score 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1: Slope 0-6%</td>
<td>1</td>
<td>0.0-0.2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Class 2: Slope 6-16%</td>
<td>0.8</td>
<td>0.2-0.4</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Class 3: Slope 16-40%</td>
<td>0.6</td>
<td>0.4-0.6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Class 4: Slope 40-60%</td>
<td>0.4</td>
<td>0.6-0.8</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Class 5: Slope &gt;60%</td>
<td>0.2</td>
<td>0.8-1.0</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

**External institutional relationships**

It is acknowledged that while the gross amount required for land use management (Type B forms of land-use management) of approximately US$100million is but a fraction of the damage caused by soil erosion, it still is a substantial amount of money. More so when the cost of Type A forms of restoration is added. It is therefore unlikely to be resourced through a single means. An active process should thus be embarked on to source the finances required as mentioned above. Three processes are highlight in Table 5 referring to i) external sources of finance, ii) private sector of finance, and iii) public sources of finance, see also Section 6.4. Each should be developed since they have different roles to play in the PES scheme.

In the light of the cash requirement, the payment of RwF25/m² for the area dedicated to Type B forms of management can be offsetted, or reduced, by, among others, the introduction of an insurance scheme and/or the development of markets for the produce. On a case-by-case basis where there are insurance payments, or markets developed, or other forms of stimuli, that could replace, either in full or in part, the need for a cash payment as well. As mentioned in Section 6.4, in the medium to long term other sources of funds will have to be developed as well.

With respect to the development of these external relationships, the important principles are:
- there is an important and potentially exciting opportunity to link with the circular economy initiative of the MoE, especially Private Sector Forum, to communicate the need of restoration as a least cost intervention and as a protective hedge around businesses through risk mitigation;
- there should be ongoing awareness raising regarding nature-based solutions as cost-effective and efficient options to mitigate risk;
- co-finance using innovative means such as the above-mentioned easement possibility should be considered to broaden the capital base; and
- resource mobilisation is not just about raising finances, also about spreading the ecosystem management burden, equity, and knowledge.
Fostering a culture of restoration

The final building block is, perhaps, the most important and yet often overlooked part. Without effective monitoring, reporting, verification combined with i) the valuation of the benefits of restoration, and ii) the effective and appropriate communication thereof, much of the weight of the restoration message dissipates. Suggestions towards such actions are proposed in Table 6.

With respect to the development of an effective MRV and valuation system, the following important principles should be considered:

- the entire PES network will only be as good as its MRV system – the MRV system determines its integrity;
- the culture of restoration will be developed through ongoing processes of communication and feedback;
- the costs must be linked to the benefits of the restoration through proper valuation of the benefits.

### 7.3 Immediate next steps

In order to be able to take the above process forward, the following immediate steps are suggested:

1. The appointment of a national PES co-ordinator with a technical team of at least 4 people comprising:
   - 1 = legal specialist;
   - 1 = an environmental economist;
   - 2 = ecologist/agronomist

   jointly within the MoE and FONERWA to develop and oversee the implementation of the PES system. Some of the details of their functions are listed below.

2. Develop and expand the existing Sebeya pilot study using the framework described above and learn by doing. This include the development of the internal MoUs that will flesh out the institutional framework with all parties and remove all the known uncertainties as far as possible. It also includes the development of the compensation and MRV framework.

3. Involve all parties in the pilot case study, including FONERWA, MoE, etc. with the intent to upscale once the resources have been mobilised. This implies the active and concurrent development of the three resource streams in partnership with FONERWA, the IUCN/CI, World Bank and other parties and agencies mentioned above as well as others.

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### Table 5: Development of external institutional relationships

<table>
<thead>
<tr>
<th>Nr</th>
<th>Activity</th>
<th>Responsibility</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>Develop external sources based on resource mobilisation &amp; partnership strategy; Develop REDD+ based sources of external support based on existing networks</td>
<td>FONERWA IUCN/CI</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3b</td>
<td>Investigate the option of attracting private sector co-funding NAIS &amp; hospitality sector</td>
<td>World Bank &amp; MINECOFI N</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3c</td>
<td>Investigate the options to unlock the bottlenecks re the statutory payments</td>
<td>World Bank &amp; FONERWA</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
### Table 6: Making the benefits explicit developing a culture of restoration

<table>
<thead>
<tr>
<th>Nr</th>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>Develop robust MRV and system of valuing the benefits of PES link to soil cover</td>
<td>MoE &amp; internal counterparts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4b</td>
<td>Develop effective communication strategy to share the benefits and the costs of restoration to all parties</td>
<td>FONERWA &amp; external counterparts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4c</td>
<td>Develop effective communication strategy to share the benefits and the costs of restoration to participants &amp; other villages</td>
<td>District &amp; Village</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Pilot**
- Operationalise the Sebeya catchment using existing resources
- Use the designated framework to learn by doing

**PES unit**
- Establish a well-resourced PES-co-ordination unit in MoE
- PES co-ordination to act as the focal point and hub for PES

**Process**
- Develop internal MoUs: ensuring a robust and smooth PES
- Develop payment protocols in harmony with land-use plans

**Science**
- Develop the required MRV protocols
- Develop valuation protocol for estimating the PES benefits

**Business**
- Local and international resource mobilisation
- Effective communication and feedback strategy

**Practice**
- Implement PES nation-wide in prioritised Districts
- Foster a culture of restoration through dialogue & evidence
As mentioned above one of the proposed first steps is the establishment of a PES focal point or unit comprising 5 people jointly between the ministry and FONERWA. Without such a driving force the current momentum behind PES could drift away in time. The 5 people include:

• Co-ordinator
The co-ordinator has to be a senior person well-versed in how the Government of Rwanda functions with ease of access to other senior members of government. Moreover, the co-ordinator must be able to easily engage with private sector, assisting FONERWA in their resource mobilisation process, as well as the Districts and Villages down to site-level. He co-ordinator must preferably be able to have good communication skills, including the use of social media, and software such as GIS for both mapping and illustration purposes.

• Legal specialist
The legal specialist must assist the ministry, the RWRB and FONERWA with the drafting of all the MoUs based on existing examples, or templates. This thus involves the customisation of MoUs among the various agencies, but this time with the specific focus on PES. It is in this context that the opportunity that the Sebeya pilot study, under management of the RWRB, offers should be used to maximum affect. In conjunction with the RWRB the legal specialist could develop the MoUs required in such a manner that they could easily be transferrable to other areas within the context of a national roll-out plan.

• Environmental economist
The environmental economist, or a person with an agricultural economics background or economics main with a strong knowledge in agro-ecosystems, should be responsible for the development of the MRV system as well as the valuation methodology for the PES benefits. Again, the opportunity the ongoing Sebeya case study offers should be used. In conjunction with RWRB as well as the Ministry and FONERWA, taking their requirements into account, the MRV system that is both technically robust and operationally simple should be developed. This person should have good excel skills. Skills with respect to mind-mapping and system dynamic software such as Vensim will be an optional advance.

• Ecologist/agronomist
Two people with strong skills in conservation and regenerative agriculture, working in close collaboration with RAB, RICA, SEAD, ICRAF, etc. must develop the most sensible way to integrate conservation and regenerative agriculture methods onto farm level in each case. This must be in conjunction with the Districts and the villages. These plans must complement the land-use plans and enable the sustainability of the land-use plans.

8. CONCLUSION
As discussed herein, it is proposed that the objective for PES in Rwanda is:

- to contribute towards a climate resilient Rwanda through soil conservation and landscape restoration.

By focussing on soil conservation and landscape restoration, PES will contribute much towards:

• mitigating the prevailing food and water security risks as a result of inappropriate land management practices;
• climate change adaptation through improved and climate smart land management practices;
• climate change mitigation through enhanced carbon sequestration;
• system resilience that includes an improved understanding of ecosystem functioning and the benefits from the resulting ecosystem services;
• economic development by i) reducing the losses linked to degradation and high-intensity climatic events and ii) developing a new economic sector with respect to natural resource management; and
• reducing the cost of all affected parties and sectors, such as hydro-power, water abstraction and treatment, tea and coffee production and processing, mining, etc.

In order to accomplish this objective, there is a myriad of possible interventions, but they can be categorised into two types, namely:
• **Type A: once-off large-scale infrastructure-like interventions:**
  o afforestation;
  o terracing;
  o agroforestry;
  o marshland stabilisation;
  o riverbank stabilisation;
  o gully restoration;
  o etc.

• **Type B: ongoing on-site management:**
  o regenerative or conservation agriculture ensuring a robust cover and cash crop;
  o establishment and management of perennial pastures;
  o etc.

While the cost of the Type A interventions will be determined by on-site realities, it is proposed that for Type B activities an incentive towards a land-use change, notably towards regenerative and conservation agriculture, be made to enhance soil cover. A payment is proposed based on a sliding scale by multiplying a topography score with a land cover score, as per Table 4, for each village and participating farmer to generate a location score. The location score is used in the formula below to generate the PES payment:

\[
\text{PES payment} = \frac{(\text{Topography score} + \text{land cover score})}{2} \times \text{PES area (m}^2\text{)} \times \text{unit value (RwF/m}^2\text{)}
\]

A unit value of RwF25/m²/year is proposed. That is 12.5% of the unit GDP for agriculture and would serve as an exciting incentive to achieve the desired change by applying Type B forms of land-use management principles as described above. Assuming an average location score of 0.6 and that PES is rolled-out to 60% of the agricultural land, i.e. 720,000ha, then this payment would entail RwF-108billion, or US$117million/year, or 4% of the cost of soil erosion. This value is neither target nor a minimum of what must be achieved, but merely indicative of the potential scope of PES.

FONERWA is mandated to engage in resource mobilisation, and indeed does. There are three streams of finance, each with its own unique character, complexity and opportunity, namely:

• **International development assistance:**
  o FONERWA is engaged with rising funds from international sources, but, together with expertise in the IUCN/CI should consider developing REDD+ resources as well

• **Public sector:**
  o FONERWA and the World Bank has commenced on a process seeking to identify and unblock the bottlenecks to the 34 statutory fees, penalties and charges FONERWA is not collecting but mandated to do.

• **Private sector:**
  o In the short run there are exciting opportunities possible that FONERWA could explore pertaining to the National Agricultural Insurance Scheme (NAIS), as well as engaging the hospitality industry in buying produce from villages that have been produced in a regenerative manner seeking to advance soil conservation.
  o In the longer term as the PES system becomes more robust, options exist to consider an easement fund as well as approaching members of the Circular Economy Forum for payments.

In order to operationalise PES, a very systematic process is proposed, a process in which many of the items can happen concurrently and overlap and inform one another in an iterative process. This proposed process is:

1. **PES Pilot**

That RWRB use the resource they have received from EKN to develop and embark on the Sebeya case study as a learning-by-doing platform. This process could be used to assist in the development of the various MoUs, the MRV system, the payment protocols, etc., in a manner that is conducive for rolling the system out nationally.
2. **PES focal point or unit**
To assist the RWRB and to enhance the development of an institutional memory as well as broaden the PES capacity at a national level, a PES focal point of 5 people that sits jointly in the MoE and FONERWA is proposed. This focal point could work in close conjunction with RWRB in the development of the MoUs, the MRV system development, the payment protocols, etc. so that the developed framework can work both at a local level, Sebeya, and at a national level for roll-out.

3. **Developing the PES process**
This is part of the task of the PES focal point or unit and refers to the development of all the institutional relationships and MoUs among the agencies and ministry.

4. **Developing the science behind PES**
This is part of the task of the PES focal point or unit and refers to the development of the MRV system, the methodology for the valuation of the PES benefits, and the calculation of the PES incentive.

5. **Develop the resource base**
This is the responsibility of FONERWA with which they have already commenced.

6. **Implement and scale-up**

Once the Sebeya case study has been implemented and there is confidence in the system, then it can be roll-out to another area. As the PES system becomes more robust, the roll-out becomes more and more possible. System robustness, however, is the key. There has to be confidence in the developed system. That is why it has, among others, to be developed by the ministry and other stakeholders themselves through ongoing dialogue.

- Rwanda has an institutional system in operation among all its governmental institutions and agencies that allows for easy contracting and disbursement of funds, together with a well-functioning Auditor General that audits all accounts;
- the goodwill of the people, as illustrated through Umuganda and the operation of what is called the “community-based” approach towards mobilising resources for local action – the country is thus able to organise itself into small and well-functioning operating entities;
- there are at least three main sources of funds that can be developed to assist in the financing of wide-scale restoration and the management of the land;
- the country has an ongoing programme towards landscape restoration, that includes soil stabilisation and the enhancement of soil fertility – a program that PES can upscale.

Conditions are indeed ready for PES to contribute towards a climate resilient Rwanda through soil conservation and landscape restoration. It is a matter of utilising the opportunity.

- There is very good reason to believe that PES can work in Rwanda. This is because of: the Law in Rwanda mandates the prudent and restorative management of soil, so does the Policy prescribe PES as a contributing mechanism to achieve such;
- like Costa Rica, Rwanda has an agency dedicated to resource mobilisation and management, FONERWA;