

Institutional and Financial Aspects



World Soil Information

Green Water Credits Report M3b



H. Benabderrazik



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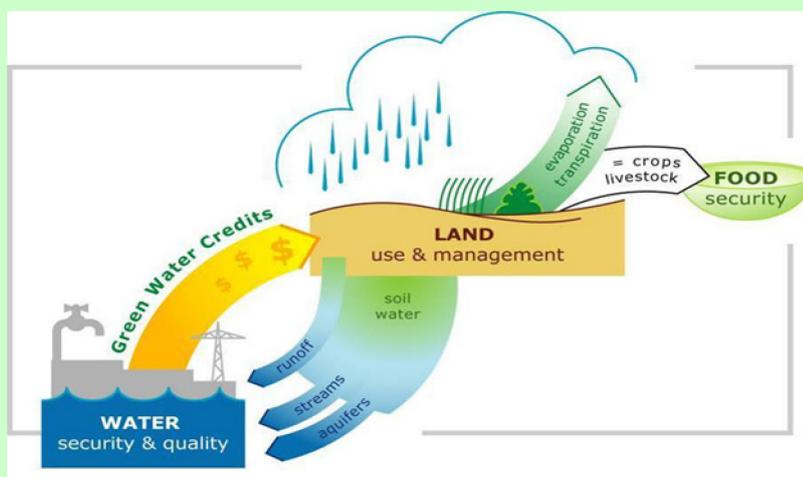
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Green Water Credits: the concepts

Green water, Blue water, and the GWC mechanism

Green water is moisture held in the soil. Green water flow refers to its return as vapour to the atmosphere through transpiration by plants or from the soil surface through evaporation. *Green water* normally represents the largest component of precipitation, and can only be used *in situ*. It is managed by farmers, foresters, and pasture or rangeland users.

Blue water includes surface runoff, groundwater, stream flow and ponded water that is used elsewhere - for domestic and stock supplies, irrigation, industrial and urban consumption. It also supports aquatic and wetland ecosystems. *Blue water* flow and resources, in quantity and quality, are closely determined by the management practices of upstream land users.



Green water management comprises effective soil and water conservation practices put in place by land users. These practices address sustainable water resource utilisation in a catchment, or a river basin. *Green water* management increases productive transpiration, reduces soil surface evaporation, controls runoff, encourages groundwater recharge and decreases flooding. It links water that falls on rainfed land, and is used there, to the water resources of rivers, lakes and groundwater: *green water* management aims to optimise the partitioning between *green* and *blue water* to generate benefits both for upstream land users and downstream consumers.

Green Water Credits (GWC) is a financial mechanism that supports upstream farmers to invest in improved green water management practices. To achieve this, a GWC fund needs to be created by downstream private and public water-use beneficiaries. Initially, public funds may be required to bridge the gap between investments upstream and the realisation of the benefits downstream.

The concept of green water and blue water was originally proposed by Malin Falkenmark as a tool to help in the understanding of different water flows and resources - and the partitioning between the two (see Falkenmark M 1995 Land-water linkages. FAO Land and Water Bulletin 15-16, FAO, Rome).

1 Introduction

The awareness of the problems associated with soil erosion in Morocco is old. Since the late thirties of the twentieth century and the spread to North Africa of anti-erosion practices initiated by the U.S. Tennessee Valley Authority, soil scientists and foresters advocate conservation management of sensitive soils. The proliferation of benches and facilities for protection and restoration of soils in most Moroccan hills and mountains shows this.

This old awareness, and the many development projects that result from it, present a common characteristic, that of relying exclusively on public investment, financed by the general budget of the state and sometimes by donors on loans, concessional credits and grants. As such, given the magnitude of the investment needs, they were very inadequate.

This exclusively public funding is explained by several sets of arguments.

- The first group was the public ownership of rivers and their immediate surroundings. As the hydrographic system is the engine of water erosion, it is natural that the State, eminent owner of the network, intervene to reduce its negative impacts on third parties. The same argument prevails for the investments to protect the dams and reservoirs. These are public goods, and support for welfare spending is justified by the public benefits under the old tax principle according to which the beneficiary of a policy must pay for it.
- The second group of arguments is the number of actors in the process of watershed management and the number of beneficiaries of such a process. It follows that this number does not allow a conventional solution where recipients of facilities reward upstream providers. As a result, only the state is able to do this coordination by charging through taxes to fund 'providers'. Coordination capacity of the state acts as proof of his commitment.
- The third group of arguments is the difficulty of measuring benefits and disadvantages. The erosion phenomena in the upstream catchment are diffuse, difficult to quantify in place of their occurrence. The benefits of reduced erosion for the downstream watershed are also difficult to assess given the interference of other climate factors. How can we distinguish the improvement of water quality due to the increased rainfall from that caused by the anti - erosion measures in the upstream watershed? Only the State is able to manage this local uncertainty justifying its intervention by the measurable benefits overall (at the mouth of the sub - watersheds, for example).

Of course, this exclusive reliance on public funding had the usual problems associated with insufficient resources dedicated to the protection of natural resources. Given the profile of the losses, very long and gradual, the budgetary decisions overcome the most pressing at the expense of watershed management. Usually, due to the fact that the impact of no intervention is delayed, the ministry will not allocate funds to it, in case of budget stress.

This draft 'Green Water Credits' explores an alternative to public funding by building a financial relationship between the beneficiaries of anti-erosion downstream and farmers in mountain areas upstream, leading anti-erosion projects in their fields whose benefits are felt downstream. Building such a relationship makes it possible to abstract part of public intervention and lead a more sustainable watershed management policy, at least less dependent on budgetary constraints of the state.

This new approach of payment for environmental services, tries to build a direct contractual relationship between the beneficiaries of protection actions and those who lead them. Historically, an early example.

This new approach was first made by the company operating the source Perrier. She had realized that the farm fields located around the source reduces the quality of bottled water. It therefore proposed to farmers to convert their fields to grassland in a conventional relationship where they received an annual payment from the company. This approach of payments for environmental services has also been implemented for the protection of biodiversity, where organizations such as WWF have signed contracts with some states to create national parks and protect wildlife.

The success of these initiatives has led to considerable discussion in order to extend this model of payment for environmental services. This draft 'Credit Eaux Vertes' fits naturally into this process. In spite of the obvious advantage of this approach, which is to pay the beneficiaries of the projects for the benefits of development, one must not forget the many difficulties that such an approach must overcome to be operational.

The first challenge is to organize the links between a multitude of actors, atomised. It is difficult to establish first a contractual relationship, it is even more difficult to enforce it.

The second difficulty is the measurement of profits. It is difficult to link the actions x benefits, due to their microscopic nature and role of exogenous random variables in determining benefits. Specifically, in fact, how to ensure that the development of a linear meter of bench terrace had an effective role on the quality of water used by a farmer in the irrigated area dominated by the watershed ?

The third difficulty is the role of the state, as it directly benefits from environmental services. Indeed, the state is not a beneficiary like any other. Through acts and regulations, it has tools for coordination of collective action, ranging from the mandatory imposition to coercion through the courts. It is difficult to link it conventionally with individuals on a anti - erosion project. But, as in the case of Morocco, the dams are considered public property, eminent property of the state, and the first benefit of the upstream watershed management will be extending the life of reservoirs located behind the dams.

This note seeks to develop an institutional framework for the implementation of the 'green water credits', which overcomes the difficulties identified above. It consists of three parts. The first presents the project. The second part outlines the proposed institutional and organizational choices to lead this project. The final section presents the arguments for public intervention for this project.

2 Project Definition

The proposed 'Green water Credits 'aims first and foremost to create a sustainable relationship between the beneficiaries of watershed development and those who carry out the management, to encourage a financial relationship with the latter. It therefore comprises two components: the first is the definition of the proposed watershed management and the second includes all the instruments supporting the institutional and contractual framework needed to build this relationship.

In the first part, a simplified presentation of the proposed watershed management will be conducted. Its main objective is to explain the problems associated with reduced runoff to introduce the proposed contractual action.

The second part presents the problem of environmental services fees, a theoretical point of view, it serves to introduce the presentation of the institutional project.

2.1 The proposed development

The watershed management is to reduce runoff and promote infiltration of precipitation to reduce water erosion. The water running off loosens soil particles, reducing soil fertility and increasing turbidity of the water. These transported solids settle in the reservoirs of dams and reduce their ability to regulate water intake. When the ratio of infiltrated water and rainfall improves, the residence time of water in the watershed grows, floods are reduced, the erosive power of rain is reduced, plant production increases at the place of precipitation, which increases the resistance to soil erosion on the one hand and fertility on the other. In other words, increase the proportion of infiltrated water precipitated improves the quality of water released from the watershed and reduces siltation of reservoirs and dams.

The connection between the concept of green water and watershed management is direct. Green water is infiltrated water used for biomass production where it falls. Develop the use of green water reduces runoff and erosion effects local and remote.

In the preceding paragraphs, the watershed management is presented as anything that helps reduce runoff and increase infiltration. In fact, watershed management projects are developed in two stages. In the first phase, the watershed is analysed to identify areas most vulnerable, the most sensitive to water erosion. Second, an intervention plan is developed for each of the critical areas identified in the previous phase. This plan articulates interventions on different plots, depending on erosion risk and vocation.

Thus, on sloping farmland, interventions focus on the adoption of good agricultural practices like the promotion of contour plowing and not along the line of greatest slope. It also covers the construction of benches, stone walls, grass strips to break the runoff and reduce its erosive power.

On forest land or forest vocation, interventions focus on the installation of benches or half-moons to promote infiltration of water in support of tree planting.

For the river system, and the gullies in particular, the interventions focus on bank stabilization, installation of small dams in gabions to protect against regressive erosion on agricultural land.

A good combination of all these actions will reduce the energy of the depth of runoff and promote infiltration. This will result in improved quality of water flowing through the basin and a corresponding reduction of sediment transport. It also results in an improvement in soil cover, improving infiltration and trigger a cumulative process of restoring fertility.

In the previous example, most benefits are the improvement of water quality and greater retention of rain in the catchment. This is the main justification for watershed management projects. And beneficiaries of these projects are those that directly benefit from improved water quality and reduced sediment transport collected from the watershed. In Morocco in general, recipients are:

- managers of the reservoirs of dams by extending the life of reservoirs;
- managers of irrigation, by reducing the cost of cleaning the canals;
- transmission system of drinking water by reducing the cost of water treatment.

Of course, there are other benefits to the watershed management:

- the life of the hydroelectric turbines is elongated due to the reduced aggressiveness of the water in the turbines;
- increased infiltration reduces evaporation and promotes a greater availability of water in aquifers in particular;
- reduced flood risk ;
- improved soil fertility on slopes can reduce poverty in the area by increasing agricultural productivity;
- planning helps reduce conflicts upstream / downstream;

The consideration in contractual structuring the project 'green water Credits' of these benefits depend on the identification of beneficiaries and the extent of benefits. It will be the subject of discussions in the next section.

2.2 Environmental services payments

The presentation of the principles that govern the environmental services fee was discussed in the introduction to this note. Their implementation is largely inspired by the work to correct the effects of externalities in economics. Two approaches are possible for this reason: taxes and subsidies (Pigovian), the state discourages negative externalities by imposing taxes and encourages positive externalities with subsidies, while the second approach was proposed by Coase, it is based on the idea that a contract between the generator of externalities and the indirectly affected person can substitute for government intervention and internalize externalities. In other words, the beekeeper who benefits from the presence of an orchard may contract with the orchard owner to install his hives for the benefit of both parties (the beekeeper produces more honey and the farmer will benefit from the effects of pollinating bees). Conversely, the organizer of a festival that will result in noise for the neighbours can compensate them in a contractual framework. In both cases, the positive and negative externalities have been settled by a contract and not by government intervention.

In our case, the same approach is proposed. Positive externalities of actions for soil conservation and water carried by farmers in the upstream watershed are put in contract to develop incentives to drive them. This contract replaces an action of a public organization, led by the state to manage these externalities through water conservation practices.

Obviously, this raises the question of contractual role of the state, when it should be part of such a contract. Given the special prerogatives of the State under the law, several options should be considered before integrating in the contracting process just as the beneficiary.

3 Institutional and organizational choices

This section will develop organizational and institutional solutions for the implementation of the proposed water green credits. As with anything regarding the water sector in Morocco, the number of stakeholders is very significant. The responsibilities of various public actors must be considered in developing the institutional framework. The actors and their responsibilities will therefore be the first part of this section.

The organizational principles proposed for the implementation of the project constitute the second part of this section. This is to justify and argue the principles of organization, before detailing in the last section the proposed organizational and institutional for this project.

3.1 Presentation of actors and their responsibilities

3.1.1 Secretary of State for Water and Environment (S3E)

The institution responsible for overseeing the water sector is the State Secretariat of Water and Environment. It has a presence in the vertical and responsibility to define the water policy and plays a supervisory role in the management of resources and in the supply of bulk water and in detail and sanitation.

3.1.2 High Commissioner for Water and Forests and the Fight against Desertification (HCEFLD)

The Office for Water and Forests and the Fight against Desertification (HCEFLD) is responsible for forest protection and restoration. It also plays an important role in the preservation of wetlands and in the fight against soil erosion. The Office oversees the National Plan for watershed management. The HCEFLD operates at the regional level through the DREF (Regional Water and Forestry).

The areas of interventions are mandated: (i) the safety of the forest estate, (ii) the reversal of current trends of degradation of forest cover through reforestation, regeneration and improved forest grazing (iii) control of water erosion, (iv) the contribution of forests to improve the living conditions of local residents, (v) the preservation and enhancement of important biodiversity, (v) improving the contribution forest products to cover the local needs of industry and handicrafts.

Watershed protection is a high priority because it can control water erosion, the latter being the source of the current reduction in the life of dams. The priority watersheds are those of Ouergha, Moulouya Sebou upstream Allal El Fassi, Hassan I, Mellah Aoulouz. Targeted actions are to conserve water resources, preserve farmland, stabilize the rural population and conserve biodiversity.

3.1.3 The Ministry of Agriculture and Maritime Fishing

The Ministry of Agriculture and Marine Fisheries oversees the agricultural sector, which is the largest consumer of water, and has a decisive role in the mobilization of water resources, resource allocation, efficiency and conservation. It operates through the Department of Irrigation and Agricultural Development of

Space at the central level and through the Regional Directorates of Agriculture and Regional Offices for Agricultural Development (ORMVA), which manages large modern irrigation schemes which represent nearly 50 percent (700,000 ha) of irrigated land of Morocco. The DPA (Provincial Directorates of Agriculture) are involved at the provincial level and help users associations to manage water irrigation medium to small size, and promote efficiency in rainfed areas.

3.1.4 The Ministry of the Interior

Through its management of water and sanitation, the Department of the Interior shall assist local governments, and plays an active role in planning, implementation and operations support infrastructure based on sanitation and water.

It plays a supervisory role in rural communities that could be used to increase the adoption and ownership.

Its specific objectives are: (i) the economic development of communities, (ii) participation in the provision of basic infrastructure, (iii) Human Development (NIHD), (iv) the involvement of elected bodies in the development, (v) local development plan approved by City Council.

3.1.5 Hydraulic Basin Agency Sebou, Fez

Hydraulic Basin Agency Sebou created in April 2002 aims to promote the integrated management of water resources in the following objectives:

- Ensure sustainable use of water resources to preserve them for future generations;
- Promote efficient use of water;
- Ensure economic use of water;
- Ensure social equity between users upstream and downstream.

3.1.6 National Office of Drinking Water

The National Drinking Water plays a key role in the supply of towns and villages with drinking water in the Kingdom. As such, it develops and manages the supply network, the processing units and often, sanitation units. It buys raw water main surface water, and as such has a special interest in improving water quality and extension of life spans of the reservoirs.

3.1.7 The autonomous water distribution authorities

Where ONEP transports raw water and treats it, independent administrations are responsible for distribution to consumers. They also provide sewerage treatment and sometimes the distribution of electrical energy. They depend on local communities. They are not the only actors in the distribution of water in the Moroccan concession regime; ONEP and several private companies ensure this. All these actors have a vested interest in improving the water quality and a corresponding reduction of the cost of treatment and supply.

3.2 The principles of project

In the previous section, the main actors of the project were described in their roles and responsibilities. In this section, the principles of steering the project will be outlined. The first principle relates to the conduct of its operations and favors 'globalization'. The second will focus on developing an endogenous process of information gathering.

3.2.1 First principle: the globalization of operations

The first principle is to reduce the number of players in the 'Green Water Credits' project. Instead of a multitude of beneficiaries, farmers, water users, industry, this is to substitute the main operators that serve them. This allows for contracting without effective coordination problems posed by the inclusion of all the final beneficiaries. Similarly, globalization also relates to the conduct of projects. It is proposed to replace all potential providers, by two operators leading the project.

For the globalization of beneficiaries, the project would build on ONEP, on ORMVA and on the Authorities for distribution of water resources with beneficiaries of projects upstream. With regard to the conduct of projects, two players coordinate the program : the Office for Water and Forests and the Fight against Desertification (HCEFLCD) and the Ministry of Agriculture and Fisheries (MAPM).The first would occur on the forestry sector, the water system and the badlands. The second would occur on agricultural lands and rangelands in accordance with their respective powers.

Several arguments are in favor of the principle of globalization. The first is the reduction of transaction costs. It is clear that instead of a contract with several thousands contractants, it reduces both the cost of contracting and the cost of effective implementation of the contractual provisions. Instead of managing tens of thousands of contracts for beneficiaries and providers of environmental services, it is sufficient to manage the contracts for successful applicants to globalize the benefits and rely on the program of watershed management led by the Ministry of Agriculture and the High Commission.

The second argument is the state ownership of water. All legislation and regulations implemented since 1914 reinforces the principle of public ownership of water resources. A direct contracting with providers of environmental services, resulting in improved quality and quantity of water available, because of their actions, implicitly recognizes the right of water from the upstream and downstream. It does not appear that this approach has the preference of public authorities. Project management in a conventional reduced to key stakeholders avoids a debate on the rights of the upstream and downstreamrights, with their political and emotional burdens.

The third argument is the simplicity of a public support for anti - erosion measures in the case of the globalization of the action. Indeed, the watershed management project would be conducted as public and as such would benefit from a public budget allocation for his conduct, in perfect continuity of the current procedure of funding. The use of contracts with providers of environmental services does not allow a government grant for its actions, without a change in the legal provisions governing the awarding of grants. Clearly, at least during the demonstration of proof of concept, the simplicity of a public financing of management intervention has many advantages.

3.2.2 Second principle: to make endogenous information

The system of collecting information necessary for the implementation of the project 'Green Water Credits' has to overcome many difficulties to meet the needs of contracting projected.

The first difficulty lies in the strategic nature of this information to beneficiaries and providers. Ultimately, this information must determine the amount of profits attributable to the provision of environmental services, and thus determine the financial flows of earnings. As such, the beneficiaries would have a theoretical advantage to conceal or minimize the indicators that would require them to pay a higher flow later. Similarly, providers (government agencies or their representative) have an obvious interest in presenting the indicators to overestimate the participation of actions undertaken to create environmental benefits. The strategic nature of the information on the effectiveness of management measures and the extent of benefits must be taken into account in structuring the information collection system. Consideration must be given to incentives of the actors in the construction of the latter.

The second difficulty is the evaluation of the benefits. Assuming that we have solved the problems of concealment raised in the previous paragraph, the question of the objective assessment of benefits remains. The first issue is the separation of the benefits attributable to anti-erosive measures vs. those attributable to changes in exogenous variables. These variables can conceal true profits when they are negatively correlated to the indicator of profit retained or overestimate the reverse. This of course assuming that the definition of indicators measuring the benefits can be conducted easily. Indeed, the notion of profit is intrinsic to the actors, it depends crucially on their business. It is not the same for ONEP for the Office of Irrigation or Administration for distribution of drinking water. An example illustrates this problem. Consider the indicator of sediment transport. Given the separation of profits attributable to the project and those exogenous, we are required to make assumptions or model the behavior of the watershed to separate the effects of rainfall from those attributable to the project. Assuming this separation made, we have a second difficulty in measuring the benefits because they are different depending on the players. A 10% reduction in sediment transport does not have the same economic benefits for a unit of water treatment or for a distribution administration, or for an irrigation system. Measuring benefits will therefore depend on a second model that will link the effects of reduced sediment transport to reduce the cost of dredging channels or to reduce the cost of treating one cubic meter of water.

The third difficulty is the hierarchy of benefits that can turn a tangible benefit in a joint benefit. Take the example of extending the lifetime of reservoirs. This is the most important benefit of watershed management, the most tangible and easiest to measure. We see that the investment to protect these reservoirs siltation will be justified by the economic benefit of extending the life of these reservoirs. Improving water quality by reducing sediment transport appears as an accessory consequence to the protection of the reservoirs. In this case, valuing this benefit presents many challenges. Beneficiaries may refuse to pay for this benefit, arguing that expenditure has been made for extending the duration of reservoirs and not to generate profit for their benefit. They will now simply wait for the owner of the dam to protect the capacity of its dam to benefit indirectly from this investment.

To meet these challenges, our principle is to rely on stakeholder information systems to determine the benefits of the project and not to develop theoretical models to evaluate them. Specifically, this means relying on the analytical accounts of ONEP to measure the reduction in processing costs. To rely on the accounts of the irrigation office to measure the reduction of costs of cleaning the canals. To rely on the accounts of the board to measure the impact on their operating costs.

With regard to interventions conducted by the state, performance measures are derived from the modelling effort conducted in the framework of 'green water credits'. Indeed, the actions taken upstream of dams can

not be measured individually and their contribution to the hydraulic operation of the watershed can not be understood only through a general model of the functioning of the basin. Regarding the impact on the dams, it will be based on bathymetric measurements conducted regularly by the managers of the dam. The economic value per cubic meter reservoir will be maintained by considering the cost of replacing lost volumes under siltation.

This approach which makes measures of performance and of profits endogenous and can avoid building a control mechanism for independent information.

4 Proposed organizational and institutional

This section describes the proposed 'Green Water Credits' project's organizational and institutional setting.

4.1 Organisation of operations

4.1.1 The proposed development

As was presented as part of the general principles, the watershed management project will be conducted jointly by the High Commission and the Ministry of Agriculture. The development of the repository, the measurement system, the operating model of the basin (SWAT) and the selection of priority sub-basins in the development and appropriate technologies to install fall under their responsibilities. The action on agricultural lands and rangelands will be led by the services of the Ministry of Agriculture. Furthermore, in accordance with their powers, the High Commission will be the primary stakeholder and will be responsible for these operations.

4.1.2 Funding for operations

In financial terms, two distinct periods will be considered. In the first funding is public. This will facilitate to accumulate the data necessary to demonstrate the benefits of the project. The reasons for public intervention in the first phase will be detailed in the next section, let us remember at this point that this intervention is justified mainly by the absence of evidence on the benefits of action upstream, except those relating to extending the life of reservoirs.

In a second step, the payment for environmental services by the beneficiaries will take over from government intervention (or complement it). This compensation will flow naturally by the basin agency. It is subject to the provisions of the General Convention of payment for environmental services which will link the beneficiaries and operators globalized projects watershed management.

This agreement will define precisely the conditions that will trigger a payment by the recipient organization under the project loan vertes 'Green Water Credits'. These conditions will be defined by changes in relevant accounting variables of recipient organizations. Payment for the counterpart of these benefits will pass through a dedicated account of the basin agency. Gradually, as the state delegates the implementation of anti erosion measures to the service provider, the account will serve to pay these in the context of specific contracts. Indeed, it is expected to gradually switch to a process in which the High Commission and the Ministry of Agriculture intervene in the framework of integrated projects to encourage farmers by subsidies to practice anti-erosion, promoting infiltration. The resources collected from beneficiaries will finance part or all of these grants. Indeed, given the public impacts, such as the preservation of reservoir dams, the state will not get away from all funding for these interventions.

4.1.3 The agreement of the parties

To internalize the collection of data relevant to the extent of the benefits of the projects, the information system will rely on the data of the accounts of beneficiaries. This should allow a gradual demonstration of the interest and benefits of the proposed management, and avoid strategic behavior to avoid contributing to the costs by the beneficiaries AT the expense of the project.

To this end, a binding agreement, established under the aegis of the basin agency, will define precisely the conditions under which access to the data for recipient organizations will be organized. This agreement will also define the terms audit of the accounts of beneficiary organizations. Finally, it will clarify the share of profits that will be donated to the basin agency with the payment of environmental services.

Beyond the payment mechanism, this agreement will define the parties' commitment to cooperate in the project and their willingness to provide access to their data for this purpose. It also defines the roles, contributions and how to resolve potential conflicts resulting from its implementation.

Given the complexity of causal relationships between the project and the benefits this agreement will focus on simple measures of performance to trigger payment. For example, it may be preferred to rely on the average costs for a period of several years as a basis for performance measures of the project. Since the average costs are lower than the benchmark average, they will result in a payment of a fixed proportion of profits (defined as the difference between the observed cost and average cost of reference).

5 Justification of the contribution of the State

The rationale for public intervention for the project 'Green Water Credits' can be divided into two. The first classic justification covers funding for watershed management. For development projects, they are required to pass the test of internal rate of return, by a detailed identification of costs and benefits with and without project. Reducing costs to the state associated with the preservation of reservoirs, improved water quality, greater production of electricity from hydropower, and the benefits to downstream dams must justify the management measures.

All studies show the benefit of the interventions and the economic return to the community from this investment. Also, later in this section, we consider that these arrangements are cost effective and that the question posed concerns the government intervention in a draft 'Green Water Credits'.

5.1.1 What is expected from the State for this project? What are the benefits to the community?

It is expected that the state invests to achieve the watershed management and the implementation of the Convention managing the payment process for environmental services described above. In fact, given the very minimal costs associated with the development of the Convention and its monitoring, it is possible to consider that the investment of the state are those required for watershed management. The benefits to the community will be equal to those of the interventions and those specific to the project 'Green Water Credits'.

5.1.2 The specific benefits of the project 'Green Water Credits'

The first benefit is the development of an institutional innovation for a better funding mechanism for watershed management. Indeed, funding for the pilot project to develop an institutional framework to link the payment for environmental services to the benefits made possible to avoid resorting to tax, without discrimination, to finance these projects. This research and development of a new institutional solution will enable significant savings later because it will be possible to duplicate the entire watershed and it replaces the public payment in the pilot project.

Such innovation will therefore generate a high public benefit because it will remove the constraints of public funding for a socially useful activity, the watershed management in upstream reservoirs. In addition, it will generate a greater social cohesion between populations upstream and downstream basins.

5.1.3 Why is it that the proposed 'Green Water Credits' can not start immediately in its contract?

The intervention of the state can initiate the project. Indeed, the measurement of benefits will necessarily be very out of step with investment planning. Indeed, it is necessary to reach a critical mass of interventions to achieve measurable impacts on water quality. And implementation of this critical mass will take time. No

potential beneficiary can invest in achieving these interventions without certainty about the benefits and scope. Only the State is able to do so. Only the State is able to overcome the gap between the projects and the appearance of profits. Only the state benefits from the implementation of payments for environmental services in the sense that it can gradually withdraw from the financing of watershed management.

Conversely, the benefits of joint watershed management, in addition to extending the life of the dams, argues from the perspective of the beneficiaries downstream having an expectant attitude, before benefiting from work done by the state and funded by the community. It will be much easier for beneficiaries to join an agreement that will only impose the payment of environmental services after benefits have been measured.

In short, government intervention is necessary to begin the process and break the dialectic of expectation of profits to fund services. Conducted as part of an agreement, this procedure may result in a cumulative process of knowledge and benefits to reduce the funding of watershed management of the state.

GWC Reports Kenya

GWC K1	<i>Basin identification</i>	Droogers P and others 2006
GWC K2	<i>Lessons learned from payments for environmental services</i>	Grieg Gran M and others 2006
GWC K3	<i>Green and blue water resources and assessment of improved soil and water management scenarios using an integrated modelling framework.</i>	Kauffman JH and others 2007
GWC K4	<i>Quantifying water usage and demand in the Tana River basin: an analysis using the Water and Evaluation and Planning Tool (WEAP)</i>	Hoff H and Noel S 2007
GWC K5	<i>Farmers' adoption of soil and water conservation: the potential role of payments for watershed services</i>	Porras IT and others 2007
GWC K6	<i>Political, institutional and financial framework for Green Water Credits in Kenya</i>	Meijerink GW and others 2007
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