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Appraisal of Payment for Environmental Services related to water management in the Central Rift Valley, Ethiopia

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Since the publication of the Brundtland report on sustainability in 1987, there has been increasing awareness and consensus that natural resources should be used judiciously. However, the existence of many forms of market failures has contributed to natural resource base depletion and degradation beyond what is socially optimal. Market failures are associated with, for example, environmental externalities (e.g. water pollution, soil erosion), the public good nature of natural resources, imperfect property rights as well as insufficient knowledge and information.

Recently, Payments for Environmental Services (PES) have received increasing attention as a means to 'correct' these market failures by translating non-market values of the environment into financial incentives for local actors to provide environmental services. PES are widely supported as one of the promising mechanisms for resource transfer, including in the joint policy documents of the Netherlands ministries for development cooperation (DGIS) and for agriculture, nature management and fisheries (LNV). Although PES instruments primarily are developed to improve the efficiency of natural resource management and to realize environmental objectives, the effect on income redistribution is often an important side objective, especially in developing countries since those who provide environmental services often constitute the poor groups in society.

The objective of this policy brief is to introduce the underlying concepts of PES and to support the policy dialogue on the potentials and constraints of PES using the Central Rift Valley (CRV) of Ethiopia as a case study, a region where environmental degradation and poverty are firmly intertwined. We limit our illustration of the concepts of PES to hydrological services as these seem most threatened in the CRV. To assess the full scope of market-based PES instruments, we compare them with other environmental instruments. We identify bottlenecks to introducing hydrological PES programs in the CRV and we suggest ways forward to capitalize on the potentials that PES programs offer.

Definition and scope of PES

Often, the term PES is used as broad umbrella for any kind of (market-based) transaction for environmental conservation including eco-certification and charging entrance fees of nature parks to tourists. Here, we focus on PES mechanisms that comprise payments to providers of hydrological services based on contracts specifying restrictions on the use of water resources, or environmental results. PES can be best defined as *a voluntary transaction where a well-defined environmental service (often a land use providing this service) is 'bought' by one or more service buyer(s) from one of more service provider(s) if the provider(s) continuously secure the provision of that service*.

Buyers of ES can be the actual users of these services, or institutions (e.g. the Government, an NGO, or an international donor) acting on behalf of the service users. PES programs in which the actual users are buyers of services are often considered more efficient because the actors with the most information on the value of the service are directly involved and have a clear incentive to ensure that the program is functioning well. A typical example of such 'user-financed' PES program is the hydropower producer paying upstream land users to conserve the watershed.

Sellers/providers of ES are those actors who are in a position to secure the delivery of the ES. In general, sellers are land managers who are paid for specific land use practices that generate the desired ES.

Examples of *hydrological services* for which PES schemes have been developed include water provision and water quality through watershed protection programs, which are often combined with objectives related to biodiversity, carbon sequestration and storage, and landscape conservation.

Central Rift Valley of Ethiopia

The Ethiopian Central Rift Valley (38°00'-39°30' E and 7°00'-8°30' N) covers about 1 million ha and is part of the Great African Rift Valley. The CRV river basin encompassing Lake Ziway, Lake Abyata and Lake Langano forms a complex and vulnerable hydrological system with unique ecological characteristics. Lake Ziway and Lake Langano drain to Lake Abyata through the Bulbula River and Horakelo River, respectively. Lake Abyata, a terminal lake, is part of a National Park (NP) that is primarily created for its aquatic bird life.

Recently, the area with irrigated agriculture comprising both open-field horticulture smallholders and large scale greenhouse growers (at Sher-Ethiopia) has expanded rapidly. Irrigated agriculture mainly occurs along the tributaries of Lake Ziway, i.e. the Meki and Ketar river, along the shores of Lake Ziway and along the Bulbula river connecting Lake Ziway with Lake Abyata. The development of irrigated agriculture has been associated with the rapid decrease in lake levels. For example, the size of Lake Abyata has reduced by approximately 50% during the last decade. Extreme poverty forces the population to not only over-exploit water resources but also other local natural resources. The gradual erosion of wood stocks, over-grazing of common pastures and lack of proper soil management has resulted in the sharp increase of the area with degraded land.

Although Ethiopia has developed a sound environmental policy framework, implementation and enforcement of environmental policy instruments is seriously lacking. The government of Ethiopia seems not able to cope with the increasing claims for natural resources and associated environmental problems. Market-based PES schemes seem therefore promising instruments for environmental conservation as they establish a direct link between sellers and buyers of ES, and may contribute to income redistribution.

Hydrological services in the CRV

The inventory of potential hydrological services relate to water quality and quantity issues in the CRV (Table 1). The services can be geographically divided into (i) upstream of Lake Ziway (sellers) and along Lake Ziway (buyers), and (ii) upstream of Bulbula village (sellers) and Bulbula village/entrance NP (buyers).

In all identified cases, irrigation farmers ('irrigators') are potential sellers, but in cases related to water quality also rain fed farmers are identified as potential sellers. In the case of water provision, irrigators along Lake Ziway can be potential buyers of this service provided by upstream irrigators. In general, the group of potential buyers is more diverse and comprises the local population of Bulbula, fishery, municipal water supply, (inter)national nature organizations and different types of irrigators.

One important condition for a successful PES scheme is that the targeted service is threatened. At least for two potential hydrological services the extent of the threat is unknown, i.e. the level of sedimentation and the water pollution with nutrients and biocides.

Only for the first potential ES, i.e. water provision to Bulbula village and the NP, the causal relationship between service provision and users seems well established. However, it is uncertain which upstream users (sellers) contribute (most) to the lower water provision downstream, i.e. water users along the Bulbula river, along Lake Ziway or those along the tributaries of Lake Ziway.

PES is based on the beneficiary-pays principle and is most promising in settings where ES providers are poor and ES users are relatively well-off. In the inventory of potential hydrological services in the poverty-stricken CRV, this situation is an exception rather than the rule. Only growers of Sher-Ethiopia may be considered as wealthy service users in the CRV, but they may convert to cheaper or more easily alternatives rather than to participate in complex PES schemes of which the ultimate benefits are uncertain. Major obstacle for developing PES schemes in the CRV may be related therefore to limitations on the demand-side (buyers).

One of the possible side effects of PES in the CRV is that some services may result in opportunistic behaviour of people moving towards the target area due to the 'pulling' effect of service payments. Tenure security and property rights may prevent such undesired side-effects of PES but require a change in policy attitude at federal level towards land tenure, which is not expected in the short term.

Alternative environmental policy instruments

- PES *vs* environmental taxes

Environmental subsidies like PES programs tend to suffer from several potential inefficiencies as compared to environmental taxes. First, it is often unclear what the additional effect of subsidies is on land use activities compared to the business-as-usual scenario. Maybe the service-providing land use activities would have been applied anyway. Second, subsidies may lead to a shift in environmental-damaging activities to other areas. Third, PES programs may induce expansion of environmentally degrading activities to obtain higher subsidies later on. Fourth, similar to tax systems, PES schemes may lead to substitution of other land use activities that are preferred from an environmental point of view. However, securing cooperation of land users is often easier when offering carrots (subsidies) than when treating them with a stick (taxes). In addition, taxes impose the cost of environmental protection on land users rather than on service users. This is often considered unfair from an equity point of view.

- PES *vs* command-and control regulation

In theory, market-based instruments such as PES programs are considered more efficient than command and control regulation instruments, such as restrictions on the use of water for irrigation. Subsidies (PES) tend to be more flexible, while command and control instruments are usually prescriptive to all ES providers. In addition, the inflexibility of command and control mechanisms may lead to adverse distributional consequences as many poor communities depend on the use of natural resources for their livelihoods. A more practical disadvantage of command and control approaches in developing countries is that their implementation is often hampered by weak governance, high transaction costs and information problems associated with the regulations, monitoring and enforcement.

Conclusions

PES is one of the instruments available in the environmental policy tool box. PES does not provide a 'silver bullet' solution for all environmental problems but it may be part of a policy mix, for example used as the carrot to make command and control instruments more acceptable and thus making overall natural resource management more effective. Until now there is little evidence of PES as an effective mechanism for redistribution of wealth. However, there seems agreement on the fact that transaction costs will be much higher when involving poor and small service providers in PES schemes.

This policy brief addresses several issues why development of hydrological PES schemes in the CRV is problematic. In the inventory of potential ES in the CRV, most ES sellers are better off than the buyers and in many cases the buyers will be too poor to act as buyer. This calls for PES schemes with the federal or regional government or international donors acting as buyers on behalf of the local service users. Usually, such 'government-financed' PES programs work less efficiently because buyers have no clear incentive to ensure that the program is functioning well.

In addition to the 'poor buyer' issue, for all potential hydrological services identified the causal relationship between service provision and service use is unknown or, at least uncertain. This is not unique to the CRV. Processes underlying the causal relationship between land use (intervention) and service provision can be clear (e.g. carbon sequestration) but are sometimes difficult to measure, or even understanding of the causal pathways is lacking. Especially, hydrological services are frequently not based on scientific evidence, for example, the assumption that forest covers increases or stabilizes the downstream water flow. Therefore, many existing hydrological PES schemes include more readily measurable biodiversity, carbon sequestration and storage, or landscape conservation targets. More research contributes to better understanding of relationships between hydrological service provision and needed land use interventions, and of the potential effects of current land use on ecosystem services.

References

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Table 1. Inventory of potential hydrological environmental services, buyers and sellers in the CRV.

Environmental service	Through:	Buyers	Sellers	Issues:
1. Water provision in Bulbula village and NP	Water-saving land use practices upstream	Population of Bulbula and surroundings; (Inter)national nature organization	Irrigators upstream	- Is causal relationship sufficiently developed, i.e. which upstream irrigators contribute most to lower water supply downstream ?
2. Water quality in Bulbula village and NP	Adapted land use practices (IPM, nutrient management, other crops, etc.)	Population of Bulbula and surroundings; (Inter)national nature organization	Irrigators and rain fed farmers upstream.	- Water quality affected downstream? - Is causal relationship sufficiently developed, i.e. who are polluters?
3. Water provision to Lake Ziway	Water-saving land use practices upstream along Meki and Ketar river	Population along Lake Ziway and further downstream; Water supply Ziway city; Fisheries; Sher-Ethiopia; smallholder irrigators	Irrigators along Meki and Ketar river	- Is causal relationship sufficiently developed? - What is the effect of water demanding activities along Lake Ziway on the lake level?
4. Water quality Lake Ziway (increased salinity due to low water inflow)	Water-saving land use practices upstream along Meki and Ketar river	Population along Lake Ziway and further downstream; Water supply Ziway city; Fisheries; Sher-Ethiopia; smallholder irrigators	Irrigators along Meki and Ketar river	- Is causal relationship sufficiently developed? - Is salinity really a problem for Sher-Ethiopia? - Alternative (groundwater) cheaper and more practical for Sher-Ethiopia than participation in PES program?
5. Sediment load in Lake Ziway	Land conservation upstream and along Lake Ziway.	Sher-Ethiopia; Water supply Ziway City; fisheries	Rain fed and irrigating farmers	- Is causal relationship sufficiently developed? - Has sediment load increased over the years? - Sediments really a problem for greenhouse farmers and water supply plant? - Alternative (groundwater) cheaper and more practical for Sher-Ethiopia than participation in PES program? - 'Pulling' effect of people to CRV claiming the conservation of natural vegetated land?