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Options for Improving the Design and Enforcement of Water Institutions in Lake Naivasha Basin, Kenya

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1. Introduction

Institutions play a key role in enhancing the resilience of Socio Ecological Systems (SES) (Janssen & Ostrom 2006). It has become important to seek institutional innovations that enhance the adaptive capacity of any SES. However, most Socio-Ecological Systems are highly complex and are characterized by many social and physical dynamics (Brekes, Colding, et al. 2003) associated with stochastic and unpredictable natural events and human activities. This poses a challenge to the effectiveness of institutions and consequently the robustness of the SES. As the world continues to grapple with the challenges of climate change and population growth, it is important to assess how the social and economic systems interact with ecological systems and the implications to sustainability. Particularly, it is vital to assess how the ecological conditions of a SES influence institutional development especially in fragile ecosystems like the Lake Naivasha basin. The basin is a show case of a situation where rapid changes in human activities and ecological conditions have challenged the functioning of existing institutions and survival of the entire lake's ecosystem. Located in Kenya's Rift Valley, Lake Naivasha is a shallow fresh water lake that is rich in biodiversity (*flora and fauna*). Due to its natural landscape and the volatile rainfall patterns of semi-arid eastern Africa, the lake's fill level fluctuates substantially. Given these conditions, the Lake has over time continued to experience accelerated pressure to provide key ecological goods and services besides supporting a rapidly growing horticultural industry. In the last two decades, a vibrant horticulture and floriculture industry has emerged in the basin, favoured by good climatic conditions and existing links to local and international markets for vegetables and cut flowers. Labour demand by the horticultural industry has triggered a rapid population growth, exerting more pressure on the land and water resources of the lake basin (WWF 2011), a typical feature of similar semi-arid areas in developing countries. The major environmental problems in the basin are (1) receding surface and ground water resources due to over abstraction and prolonged dry weather conditions in the catchment affecting water inflows, (2) deposition of nitrogen, phosphorous and agro-chemicals into the lake leading to eutrophication, (3) constant siltation resulting from poor soil conservation in the basin, and (4) oxygen depletion incidences, leading to fish kills.

In response to these problems, stakeholders in the basin have designed various institutional reforms of water management. For instance, the government, through the water Act 2002,

established two key water institutions (non tradable water permits and volumetric water charges) to be implemented and enforced by a public administration body, the Water Resources Management Authority (WRMA). The same Act also gave provisions for the formation of Water Resources Users Associations (WRUAs). The water users around the lake have also designed some codes of conduct and a water allocation plan for the basin. However, these institutions and institutional arrangements have yielded limited success on sustainable water use in the basin. Currently, illegal water abstraction is ubiquitous (WRMA 2009) and sustainable water abstraction levels are yet to be achieved. Currently only 8% of water abstractions are legalized by permits, and monitoring and enforcement of the existing water institutions has been characterized by seemingly prohibitive transaction costs due to heterogeneity of water users and water use activities and ecological conditions. Motivated by the low effectiveness of water institutions, the current paper seeks to assess the opportunities and constraints that institutional development faces given the existing social and ecological conditions in the Lake Naivasha basin. Our hypothesis is that options for institutional reforms to enhance the resilience of a socio-ecological system depend on the specific nature of the environmental problems within the SES.

2. Theoretical situation analysis

To enhance the understanding of the institutional challenge in Lake Naivasha, it is important to assess the nature of and relationships between actors in the basin and the implications of these relationships for institutional development. Location of some water users upstream not only makes them privileged to access water before their downstream counterparts, but their activities also affect the quality and quantity of water available to the downstream users. This asymmetric water access makes downstream water users dependent on those upstream and externalities from water use and other farm activities unidirectional (Van Oel et al. 2009). However, although upstream water users have the privilege in access, they face the ‘*use it or lose it*’ predicament since they have no water storage reservoirs and are more vulnerable to the intertemporal volatility of water resources as compared to the users around the Lake who are mutually interdependent and face a real *common pool situation*. Further, as periods of water surplus coincide with high rainfall, the scarcity of irrigation water is low during these periods of abundance, which makes it difficult to maintain costly water management institutions. The challenge is therefore to establish institutions that put these unique relationships into consideration, create win-win solutions that offer multi-directional benefits and allay the existing environmental problems.

Empirical evidence shows that situations similar to those in the Lake Naivasha basin can be tackled using both Market and Non-Market Based Instruments (MBIs and NMBIs). NMBI, that is command and control instruments must be enforced by the government and are only as effective as their implementation. Besides, they are generally not efficient as they do not consider differences in costs and benefits among users.

Market based instruments such as taxes, charges and tradable permits in theory offer *first best solutions* to institutional development to tackle environmental problems. Water markets, for instance, usually utilize tradable water permits/rights which are incentive-based economic instruments to allocate water among users and uses. Rights are allocated to resource users, who can then trade these rights among each other, and this theoretically provides a high level of economic water use efficiency. However, these markets can only function if it can be assured that no one will use water without the corresponding water rights. Besides the market, the other viable instrument that could be administered by the state to improve the allocation of scarce resources is efficient pricing / taxation. Resource taxes such as volumetric water charges ensure that resources are used

efficiently because with an ideal tax, resources are used at their shadow prices. Taxes in this case serve both fiscal and allocative functions.

However, as has already been briefly mentioned, the necessary conditions for these MBIs include well defined and enforced property rights, accurate information on water quantities, a strong legal system, and, therefore a strong government administration. These are clearly lacking in the lake Naivasha case. We find a *weak government, numerous heterogeneous water users, lack of secure property rights, lack of accurate information on water balance and stochastic inter-annual water supply due to frequent droughts*. The state as represented by WRMA lacks sufficient resources to fulfil its obligations, and the heterogeneous nature of water users makes monitoring and enforcement of rules challenging due to the huge transaction costs involved. Further, the water management instruments currently in use are unlikely to have any allocative effect on water use because of their current design and lack of secure property rights. Therefore MBIs present a weak option for the lake Naivasha basin, not being more easily enforceable than command and control strategies.

What would be the options for users in the absence of effective governmental institutions? In a situation of numerous, heterogeneous resource users, individual trading contracts are difficult to negotiate and costly to enforce. Drafting such contracts with every single upstream user would generally lead to prohibitive transaction costs and a prisoner's dilemma. When upstream-downstream contracts are negotiated, an upstream user will only benefit the downstream user if there are no other users in between who will abstract the amount of water which the first user renounced from using in accordance with the contract. This is further complicated by the intertemporal volatilities in water quantities which would require contracts that take this variable water supply into account. Under these circumstances, water markets will not naturally emerge among individuals as they may for tradable goods. Trading among groups of water users (water user associations), however, would be an alternative.

If the government and markets cannot yield substantial solutions to environmental problems, individuals could design mechanisms to solve these through collective action (CA) initiatives that involve win-win bargaining arrangements. The mutual benefit associated with CA allows sustainable management of common resources such as ground and surface water and distribution of benefits. The challenge is to create substantial incentives for individuals to join and participate in the water user groups, that is, overcoming first and second order free rider problems¹.

Institutions, when understood as 'rules of the game' should aim at achieving efficiency, equity and sustainability in resource use. Clearly, there is need for institutional improvements in Lake Naivasha to address two key sets of environmental problems: (1) The *permanent* water quality related problems of siltation and eutrophication and (2) The *non-permanent* problem of water allocation considering the volatility in water availability caused by natural shocks. The volatility in water supply means that in years with above-average rainfall, water is not felt to be scarce and therefore institutions dealing with water abstraction may function sufficiently well. On the other hand, in years of extreme scarcity, institutional arrangements functioning in normal years may break down, as the increased opportunity cost of the resource makes the violation of rules much more attractive (Bardhan 1993). The volatility in water scarcity results in prohibitive costs of maintaining any water institutions whether stemming from the state or from collective action.

¹ First order free rider problem involves the tendency of individuals to refrain from joining others in collective efforts for producing a public good, while the second order free rider problem occurs when the public good is already produced; individuals refrain to participate in maintaining its sanction system (Heckathorn 1989).

In spite of these constraints and the nature of environmental problems in the Lake Naivasha SES, we think it is worth considering the possibility of using the collective action option. We recognize the opportunity offered by the existence of WRUAs in both the upper and lower catchment of the basin which can be useful in reducing transaction costs of implementing and enforcing laws and establishing upstream-downstream agreements. When the state is weak, WRUAs can be used to enhance compliance at the local level and create a platform for bargaining and seeking adequate solutions to environmental problems. To address permanent problems of siltation and eutrophication, collective action initiatives that involve bargaining between lower and upper catchment water users are possible and have actually started to be implemented. Win-win bargaining solutions are based on mutual benefits between lower and upper catchment water users, which result from the positive effect of reduced erosion for farmers in the upper catchments as well as for the lake. Since the (transaction) cost of collective action arrangements are borne by the water users, there is need for a constant flow of benefits as an incentive to bear such costs. This may pose a problem for addressing water scarcity through collective action. However, if the benefits from the functioning of the WRUAs when dealing with silt and eutrophication are substantial enough for farmers to be interested in collective action, WRUAs can use persuasive powers to support permit enforcement by water authorities and show ways to use water efficiently. They could also represent a basis that can be used in cases of acute water scarcity for upstream-downstream agreements.

3. Conclusions and policy implications

When seeking institutional solutions to environmental problems and enhancing resilience at basin level, the nature of such problems becomes vital. In the Lake Naivasha case considered in this paper, we have identified the key environmental problems and assessed different options for institutional development to address them. Because of the constraints existing in the basin, we find limitations for MBIs and NMBIS. For collective action, the nature of environmental problems in the basin is very decisive. The permanent environmental problems (siltation and eutrophication) offer an opportunity for establishing long term upstream-downstream environmental cooperation institutions (e.g. contracts). If the efforts by upstream users generate substantial benefits that could attract continuous payments from the downstream users, this might also create incentives for users to adopt other WRUA rules including reduction of water abstraction during the extreme scarcity periods and adhering to permit requirements. In this case part of government control could partly be substituted by WRUAs reducing transaction costs in monitoring and enforcement, and facilitating upstream-downstream interactions.

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