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## ANALYSIS

# Organizing a public ecosystem service economy for sustaining biodiversity

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## ABSTRACT

The core question this paper attempts to address is how social organization needs to respond to biodiversity features and functions in order to achieve its sustainable use. Scholars have suggested that the governance of complex systems should be dispersed across multiple centers of authority and that any regulative system needs as much variety in the actions that it can take as exists in the system it is regulating. Further, it has been argued that complex ecosystems and biodiversity can successfully be maintained by complex, polycentric, multi-layered governance systems which have a variety of response mechanisms. But how should polycentric governance of biodiversity be organized? Borrowing from the organization of public economies in metropolitan areas we distinguish between production and provision of public ecosystem services and suggest the direction of institutional change for the organization of a public ecosystem service economy. If the market alone cannot solve the allocation of public ecosystem services, economic efficiency criteria based on hypothetical markets are not sufficient. Therefore, we suggest design principles which go beyond economic efficiency and provide examples of the emergence of polycentric governance from an Ethiopian coffee forest conservation project.

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## 1. Introduction

The core question this paper attempts to address is how social organization needs to respond to biodiversity features and functions in order to achieve its conservation and sustainable use. We start our analysis by looking at these features and functions. Biodiversity is conceptualized by the many goods and services it provides. These have private, common-pool and public good features. The basic organizational problem arises because “the private delivery of public services is a different ball game from the private delivery of private goods and services” (Ostrom and Ostrom, 1999, p. 76). The related economic problem is not new. Economists refer to it as externality—a situation

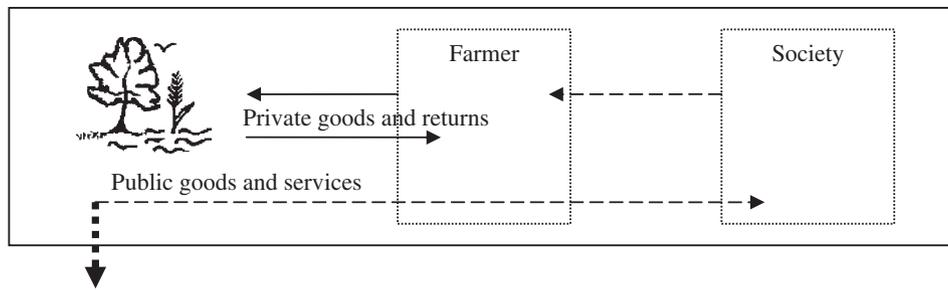
which exists whenever private and social costs differ, or put differently, when one individual’s actions affect the well-being of another individual. A negative externality exists when (part of) the cost of producing/maintaining a good or service is born by an actor other than the beneficiary.

This is, e.g., the case when a farmer manages his land or forest in a manner which goes beyond good agricultural practice and thereby helps to maintain the provision of ecological services which are enjoyed by larger society (Fig. 1). The farmer bears the costs of maintaining the provision of ecological services by nature to society. Economists may consider such behavior as irrational and inefficient because the farmer is not rewarded for investing in the maintenance of ecological service

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**Fig. 1 – Public biodiversity goods and services are lost if their maintenance is not rewarded by society.**

provisions and there is no way to recover these costs. Why does someone invest in ecological practices without being rewarded? Imagine the farmer belongs to a local community which is strongly rooted into tradition. Cultural norms and values may require him to behave “ecologically” by either punishing him for behaving otherwise or rewarding him by, e.g., social status or respect. Within the narrow boundaries of traditional societies with functioning norms, social equity is achieved by the reward and incentive mechanisms of a moral economy.<sup>1</sup>

These mechanisms no longer work in a globalizing world. Development efforts have identified even the last forest dweller as a potential consumer of market goods and joining the market by replacing ecosystem goods with artificial goods is a new indicator of social status among communities who do not want to be considered as underdeveloped. In Ethiopia, like in other developing countries the dichotomy between modern (formal) and indigenous (informal) governance structures is distinctive. As the moral economy transforms into a market economy, the narrow boundaries of traditional society dissolve and traditional values and norms are lost or altered. The reward and incentive mechanisms of the market economy are different from those of a moral economy. In the process of that transformation there is not always an immediate replacement for the former. Ecological management of the land and the services provided to society by doing so is reduced to those practices which promise actual (usually monetary) returns. If not immediately required for the production or harvest of private goods, the maintenance of ecological regulation functions is reduced to a minimum, eventually resulting in resource degradation. Poverty (usually defined by the rules of the market economy itself) enforces this process because escaping from poverty requires individual farmers to adopt short-term survival strategies and disables long-term investment strategies.

The decision to consume forest resources rapidly or to conserve them so as to yield a perpetual stream of future returns is an investment decision. Deacon (1994) argues that investments will only be made when those who make a sacrifice not to harvest immediately are assured they will receive the future benefits of their actions. This certainty is absent in the process of transformation described above. And, to make matters worse, scientists remain within their own narrow boundaries and fail to perceive these emerging

problems from a broader perspective. The consequence is that we are not only confronted with market failure, but also with institutional and policy failure, not to mention the failure to perceive the problem of biodiversity loss beyond the narrow boundaries of scientific disciplines.

In this paper we argue that in order to adequately address these failures, a holistic approach to biodiversity conservation is required which includes different levels of decision making and different types of governance. We argue that—similar to complex metropolitan organization—polycentric governance is necessary for the conservation and sustainable use of biodiversity goods and services. We explain why, suggest organizing principles beyond that of economic efficiency, and recommend initial steps for Ethiopia.

## 2. Features and functions of biodiversity goods and services

Biodiversity (genetic, species and ecosystems) can be defined by the concept of various ecosystem goods and services (functions) developed by De Groot et al. (2000, 2002). The concept of ecosystem functions is particularly useful for relating the analysis of ecosystems to that of social systems—a necessary task for biodiversity conservation. This is because it implies that ecosystem functions are not only necessary for maintaining ecosystem integrity and resilience, but also because they deliver goods and services necessary for a decent quality of life. De Groot et al. (2000, 2002) note that the underlying logic in the ranking of the functions is that regulation and habitat functions maintain “natural processes and components, and are therefore conditional to the availability of the other two function groups: production and information functions”.

For the purpose of organizing and governing biodiversity conservation, key features of biodiversity goods and services need to be considered (Gatzweiler, in press). These are:

- Non-universality: Biological resources can have private good (e.g., timber, fruit, medicines), as well as common pool and public good characteristics (beauty, water purification, CO<sub>2</sub> sequestration, climate regulation).
- Imperfect exclusivity/subtractability: Benefits and costs accrue to the owner and others. Efforts to exclude others from the benefits of biodiversity are usually too costly to make exclusion feasible. Actors who are not entitled to use the goods or services (or have limited entitlements) are

<sup>1</sup> In the case of traditional Dayak communities managing Rubber Forest Gardens (Gatzweiler, 2003) it is prohibited to fell trees for the sake of maximizing individual profits because social equity (and thereby social peace) would be disturbed.

free riding or behave opportunistically which can result in the depletion of biodiversity resources or undesirable environmental damages. Those resources which are non-subtractable (e.g., scenic view) cannot be depleted by additional use intensity.

- Imperfect transferability: Property can be transferred from one owner to another in case of private property. Other goods and services cannot be transferred or only at high cost.
- Imperfect enforceability: Property is usually only protected from involuntary seizure if it is private property. The enforcement of property rights and entitlements for common pool resources and public goods is much more difficult.
- Rivalry: In case of common pool resources more than one user appropriates the resource and reduces the potential benefits for another user. In case of public goods and services (e.g., carbon sequestration, climate regulation or beauty) rivalry is less of a problem.<sup>2</sup>
- Heterogeneity, variability and complexity are typical attributes of biodiversity. Groups of resource users “are linked to each other and to multiple resources that occur across multiple scales through multi-level governance arrangements” (Janssen et al., 2003).
- Certainty and risk: Farmers often do not know whether certain environmental occurrences will affect them or not. Diversity is an essential strategy for survival, e.g., by the distribution of risk. A drop in agricultural diversity increases the risk of crop failure by pathogens. This rule is usually known to farmers. Therefore, if farmers choose management alternatives with low biodiversity or those which decrease diversity, it can be assumed that their goals have changed. Instead of long-term risk minimization they have now switched to short-term survival strategies. The portfolio of institutional arrangements in an uncertain and biodiverse world needs to be larger than that in a more certain world. The presence of possible surprises requires institutions and policies which are changing as social and ecological systems evolve and knowledge advances.

### 3. Organizing the delivery of biodiversity goods and services

Which interests do various stakeholders have to invest in the provision of private and public biodiversity goods and services and which types of governance respond to these interests by adequate incentive mechanisms? There is widespread agreement among scholars that the governance of complex systems should be dispersed across multiple centers of authority. Advocates of polycentric governance argue that polycentric systems, “because of their nested and overlapping structures, can be sized to respond to the preferences of publics that may vary enormously in scope” (Bikers and Williams, 2001, p. 94). Ostrom et al. (1961) criticized the presumption that a multiplicity of governmental units in a metropolitan area was a pathological phenomenon. Similarly to the governance of

complex metropolitan systems, ecological systems require adequate governance responses in order to maintain the provision and production of multiple biodiversity goods and services.

Another argument for polycentric governance of complex systems is brought forth by Ostrom (1998), who cites Ashby (1960), a biologist, who developed the “Law of Requisite Variety”, which states that any regulative system needs as much variety in the actions that it can take as exists in the system it is regulating. She argues that complex resource systems and biodiversity can successfully be maintained by complex, polycentric, multi-layered governance systems which have a variety of response mechanisms. But how should multi-level governance be organized? A first important step, with regards to the features and functions of biodiversity, is to abandon the “illusion of chaos or the appearance of disorder” (Ostrom, 1972) and to search for the “nature of the order that exists in the complex of” socio-ecological relationships (Ostrom and Ostrom, 1999, p. 107).

Inspired by Vincent Ostrom’s early approach of organizing public economies in metropolitan areas we suggest a framework for the organization of a public ecosystem service economy. As the production and allocation of private goods is well organized by the governance of the market, we focus on the boundaries of the market and the problem of maintaining the provision of ecosystem services (providing environmental maintenance or stewardship services) to the public. One way of conceptualizing the organization of a public ecosystem service economy is by distinguishing between (1) the sustainable production of private ecosystem goods (e.g., honey, firewood) and (2) the maintenance/stewardship of ecosystem service provisions (e.g., water retention and purification services, biological control services, soil formation, waste treatment).

The starting point for organizing a public ecosystem service economy is the recognition that markets do well in allocating private goods but less well in rewarding for the maintenance of ecological regulation services by management which goes beyond “better practice” and ensures the delivery of these public ecosystem services to society (Table 1). James et al. (2000) support this argument by stating that “private institutions alone will not do enough to protect biodiversity.” Markets are better equipped for the allocation of private goods (goods with high excludability and rivalry) than for public goods and services. They provide few incentives to provide public goods because the players in a market need to recoup their investments through exchanges—which is difficult because of the joint use and free riding problem (see previous chapter). But markets can also be created for ecosystem services such as water purification and carbon sequestration, or aspects of biodiversity that create a demand for ecotourism. But many ecosystem services remain uncovered. There are many situations where conditions do not exist for markets to function effectively, mainly because of the public-good nature of ecosystem services. In these cases markets fail and this failure is the primary justification for public policy intervention (Bikers and Williams, 2001).

The well-established field of environmental economics has produced much knowledge about economic incentive

<sup>2</sup> Pure public goods are neither rivalrous nor exclusive, whereas common pool resources are rivalrous and non-excludable (Bikers and Williams, 2001).

**Table 1 – Biodiversity goods and services occur across multiple scales through multi-level governance arrangements**

Biodiversity functions (goods and services)	Nature of the goods and services	Governance modes	Example from CoCE-Ethiopia
Production functions—provision of natural resources	Private (e.g. honey, wood, spices, medicinal plants)	Market  Community self-governance	Private companies buy “wild” coffee. Coffee cooperatives receive higher prices for this specialty coffee. The company hopes that the higher price contributes to conserving the forest.
Habitat functions—providing habitat (suitable living space) for wild plant and animal species	Common pool (e.g. habitat, land, forest, water)	Private–public partnership	An NGO is asked to carry out a participatory forest management project. Contracts between forest user groups and the government are made.
Regulation functions—maintenance of essential ecological processes and life support systems	Public (e.g. fresh air, landscape, pest control, water purification, pollination)	Government	Three forest areas are fenced. Local users have highly restricted access and use rights.
Information functions—providing opportunities for cognitive development			

mechanisms. Agri-environmental subsidies in Europe and the USA, taxes, tradable permits, eco-labelling and bioprospecting scheme are reward mechanisms which link the environmental service and the reward. This is usually done by contracts between governmental units or the government with the local resource managers. Social incentives include measures like training, education and employment in biodiversity related fields. However these reward mechanism require a well-established institutional setting and the capabilities to draft contracts, legally enforce them and claim respective rights and duties. Also funds must be available for certification or public subsidies. In addition, the policy cycle which ranges from formulation, implementation evaluation and reformulation of policies should work. Most of these requirements are usually missing in developing countries.

Further, the literature on economic incentives for biodiversity conservation (McNeely, 1988) distinguish institutional mechanisms from economic incentives. Former is understood as the establishment of agencies or organizations, whereas latter refers to the above-mentioned measures which aim at correcting market failure. That again is built on the illusion that markets, wouldn't they fail, are able to solve the allocation problem. Another confusion is on the use of the term “institution”. Instead of being understood as the complex system of rules and regulation of a society, it is understood as an organization or a physical institution. However, economic incentives are just one type of social incentives which emerge from the underlying institutional arrangements of a society. The critique refers to the narrow understanding of economic incentives and the misconception of institutions. Incentives are not merely financial rewards, they are “the positive and negative changes in outcomes that individuals perceive as likely to result from particular actions taken within a set of rules in a particular physical and social context.” Prestige, desirable physical conditions, pride in workmanship, religious and other feelings, are other outcomes of particular institutional settings (Ostrom et al., 1993).

Literature provides further sources of confusion by two lines of argumentation. The first argues that because of market failure we need public policy intervention. The government has definitely a role to play here. However, Hooghe and Marks (2003) argue that centralized governments

are not well suited to accommodate ecological diversity. Ecological conditions vary from area to area. Preferences of citizens also vary sharply across regions within a state, and if one takes such heterogeneity into account, the optimal level of authority may be lower than economies of scale dictate. That provides the ground for the second argument.

The second argues that because so many individuals and businesses are involved in the production of environmental public goods, the government cannot manage their output and therefore the market has to be involved (Heal, 2000, p. 154). As a “third way” Lindahl markets are proposed which respond to the different willingness-to-pay of different customers (e.g., airplane tickets, which have different prices depending on the time of purchase, the return date or the age and status of the purchaser). However, Lindahl markets are highly artificial since they are based on the problematic assumption that the agents truthfully reveal their willingness-to-pay. Yet agents have an incentive to underreport their willingness-to-pay and therefore Lindahl markets do not emerge in real market economies. Rather, in the example of airline tickets, the provider of the service seeks to sell its service by responding to the specific needs, interests and budget restrictions of different consumers. In addition, although the service of transportation is the same, the broader conditions of enjoying the service do vary (e.g., restrictions in choosing the date of purchase and the period of stay), so that one could argue that different services are actually provided for different prices.

Both lines of arguments are partial truths. The better truth is probably that neither markets nor states, nor other governance types alone are panacea for the governance of a public ecosystem service economy. Rather, as stated previously, multi-level polycentric governance and institutional diversity allows to adjust the scale of governance to reflect heterogeneity.<sup>3</sup> This brings us back to the starting point of this investigation: how should multi-level governance be organized? In order to tackle this problem, Musgrave as early as 1959 (cited in Oakerson, 1999, p. 7) suggested to separate

<sup>3</sup> Other hypothesized benefits of multi-level governance are that it provides more complete information of constituents' preferences, is more adaptive in response to changing preferences, is more open to experimentation and innovation, and that it facilitates credible commitments (Hooghe and Marks, 2003).

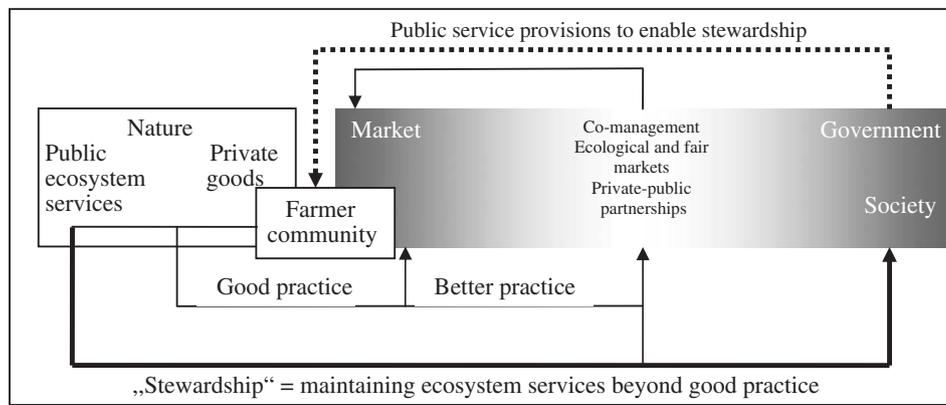


Fig. 2 – Conceptual organization of a private–public ecosystem goods and service economy.

between provision and production side of local public economies. This concept was taken up and elaborated by Ostrom et al. (1961) and later by Oakerson (1999) but it has been a design principle for polycentric governance at the Indiana University, Workshop in Political Theory and Policy Analysis in Bloomington, ever since.

The idea of separating provision and production of public goods and services is useful because in organizing a public ecosystem service economy we are confronted with goods and services of which some have private and others public good features. Both require different approaches for organization. The distinction connects to the previously made point that in a globalizing world farmers cannot be expected to be the sole carrier of the costs for providing public ecosystem services and that the government cannot be the sole authority in the allocation of private and public goods. And, as discussed above, it is not as easy as simply leaving the allocation problem of private goods to the market and that of public goods to the government.

The provision side of organizing local public economies refers to collective choices made by the public with regards to goods and services, the benefits of which can be enjoyed by many (the public). The basic choice on the provision side is whether to make any kind of provision at all. The decisions made effect the type, quantities and qualities of goods and services provided (to the public), the type and degree of regulation to private activities, the amount and type of revenue raised (e.g., taxes). Organizing the provision of public goods in societies is different from that in ecosystems. Here the basic choice to provide a service or not does not need to be made because the service has already been provided by nature. Further, the provision side is not a public governmental body. The collective decision-making bodies are resource user groups or farming communities who make decisions on how the resource should be managed and thereby, on the quality and quantity of ecosystem goods and services provided. That means, in contrast to usual local public economies, (only) the decisions on the quality of the public (ecosystem) service remain private decisions. To the degree that ecosystem management proportionately effects the (ecological) provision of public ecosystem goods and services, one can say (to simplify) that these public ecosystem goods and services are provided privately by the resource

managers (farmers).<sup>4</sup> In Fig. 2 this is symbolized by the bold lower arrow.

The production side of local public economies refers to the technical process of making and delivering a product or service (transforming inputs into outputs). Whereas in usual local public economies the collective decision-making body (e.g., government) can decide to produce the public service itself or have it produced by others (and to decide whether other governmental units or private bodies should provide the service), the situation is different with public ecosystem services. Here, they are produced privately by individuals or groups of resource users. Consequently, provision and production of public ecosystem services are privately organized. A fact, that gives reason for concern. Just like the public economy need not be an exclusive government monopoly, the public ecosystem service economy cannot be exclusively private, especially when the production of the respective ecosystem services remains unrewarded.

Therefore, in the organization of a public ecosystem service economy we need to seek ways towards a mixed or polycentric economy with substantial public participation in the delivery of public ecosystem services. For organizing a public ecosystem service economy we need to move from an exclusively private organization to a “private+public” organization and we need mechanisms by which the private players can call for the commitment of the public. For the organization of a traditional public economy the direction of required institutional change is from exclusively public to “public+private” organization. Unfortunately, in contrast to the former, there are many ways by which the public can call for the commitment of the private.

Is there any empirical evidence available which supports our arguments? The German-Ethiopian Coffee Forest Conservation project<sup>5</sup> reports of multiple players and organizations in the field of coffee forest conservation. Their existence may

<sup>4</sup> One could also argue that because nature is not an actor in the social process of organizing a public service economy, farmers are nature’s agents and represent them in society.

<sup>5</sup> CoCE–Conservation and sustainable use of wild *Coffea arabica* populations in the montane rainforests of Ethiopia. A research project funded by the Ministry of Education and Research (BMBF) of the Federal Republic of Germany.

be evidence of the fact that different people and governance structures at respective scales are better equipped to solve specific organizational tasks. The main players in the Ethiopian coffee forest conservation field consist of (Gatzweiler, *in press*):

- (1) The (post-socialist) government of Ethiopia, which has designated protected forest areas in three forests in SW Ethiopia: Geba-Dogi, near Metu, Boginda-Yeba near Bonga, and Kontir-Berhan near Mizan Teferi. With support from the EU funded Coffee Improvement Program, the area is being fenced and guards are employed to control access and use. Access is restricted to locals and use rights given only for collecting few products, such as firewood. The guards do not receive regular salaries and the effectiveness of their work is questionable.
- (2) The local communities have traditionally defined forest use rights and forest plots which belong to them. Traditionally they perceive themselves as owners, although the constitution defines all land as public. Sale of land is prohibited. Only recently the government has introduced land certificates which enable some exchange of land. How this affects the forest areas is still unclear.
- (3) The coffee industry, especially small private coffee businesses, buy forest coffee from local cooperatives and sell it as specialty coffee on the German market. Although no special label has been developed yet, the idea is that farmers receive higher prices for their forest coffee which serves as an incentive not to convert the forest into agricultural land.
- (4) An NGO driven participatory forest management project facilitates the formation of forest user groups who sign contracts with the local government on the use of designated forest areas.
- (5) A Private–Public Partnership (PPP) aims at improving the quality of the coffee production and marketing process in cooperation with local coffee cooperatives and—in the long run—establish a type of Coffee Forest National Park. The idea of the PPP is that through improved quality of the coffee, farmers receive higher incomes and thereby an incentive to protect the coffee forests from conversion to intensive agriculture. Whereas the large private companies are interested in quality improvement and marketing of mainstream coffee, smaller companies aim at developing coffee specialty markets and the civil society organizations aim at improving environmental and social conditions.

The Ethiopian Coffee Forest Forum was established as a platform for exchange and collectively developing coffee forest conservation strategies. It was established by stakeholders who have their individual but also common interests to sustain the coffee forests. Although local communities, private enterprises and co-management is required, the government needs to get involved by taking an initiating and facilitating role in conserving the Ethiopian coffee forests. With the establishment of the Ethiopian Coffee Forest Forum, first steps towards collective action have been taken. These activities of the various stakeholders and the foreseen role of the government show how a specific pattern of institutional diversity can emerge but it does not necessarily say something about the direction of change.

Decentralization suggests a direction of change from consolidation to fragmentation. In Ethiopia, when the responsibilities of biodiversity conservation were passed down from the (state) Institute of Biodiversity Conservation (IBC) to the regions there was no National Biodiversity Strategy nor Action Plan available. According to the last available national report to the Convention on Biological Diversity both are in “early stages of development”. In the meantime, however, the Ethiopian Wildlife Conservation Organization (EWCO), which was responsible for all protected areas, has been dissolved and transformed to a department at the Ministry of Agriculture and Rural Development. The previous duties and responsibilities of IBC and EWCO are passed on to the regions without giving them a plan for guidance or the financial as well as human resources to meet the requirements. This process of decentralization, accompanied with a simultaneous shift of responsibilities has met with lacking local capacities and created confusion instead of being beneficial for biodiversity conservation and the people involved.

In Ethiopia, the question is not so much whether the government should play a role in organizing biodiversity conservation or not. Rather, the question is how the government should play its role. Apart from the theoretically suggested shift from a private to a “private+public” organization of an ecosystem service economy, in Ethiopia, the government needs to play a key role in conserving coffee forest areas because (1) it requires time for an authoritarian and post-socialist regime to evolve into a functioning federal democracy and (2) it requires resources to develop the local capacities needed to carry additional responsibilities. Further, trust needs to be re-established, assuring farmers their basic rights of self-governance. State officials need to place themselves as partners and facilitators of a rural development process instead of “commanders and controllers”. The norms and values of the legacy of socialism and the time in which kingdoms and slavery ruled the country is still deeply rooted into traditional rural society and also requires time to change. Private businesses involvement and private–public co-operations have the potential to catalyze and accelerate the process of institutional change towards a functioning ecosystem service economy. Binning (2000, pp. 22) explains that regions (in Australia) which tend to be rural and remote and which are unlikely to perceive responsibility for biodiversity issues “are quite antagonistic to the notion of being asked to make a contribution to the conservation of biodiversity.” In these regions, he says, approaches from the central government are needed to build local capacity and manage structural adjustment: “Regional strategies, developed through structures that are directly supported and managed by central government, are likely to be most successful.”

In sum, we know how to arrange for the private delivery of private goods and services by the means of the market and we also know how to organize the public delivery of public goods and services by bureaucracy. What we need to learn is how to better involve the private in the delivery of public services (e.g., co-production) and how to better involve the public in the delivery of public ecosystem goods and services which are now exclusively organized privately. We have evidence from Ethiopia, which shows that private and public arrangements exist next to each other. Their existence may be the result of

non-random institutional change processes. The need to combine “top-down” with “bottom-up” approaches is not new and has been suggested for developed countries as well (Binning, 2000). However, understanding the broader context and directions of institutional change for biodiversity conservation is new and can provide orientation for the organization of public economies in different political and development contexts. For Ethiopia that means central government involvement in the building of awareness and capacity.

As the “private delivery of public services is a different ball game from the public delivery of public services” we also need different criteria and principles for organizing a private–public ecosystem goods and service economy. Efficiency works well when we are dealing with goods and services with excludability attributes and when all these goods and services have an economic value which is created in an environment where all players in an economy are fully informed about the features and functions of the goods and services and state their true willingness to pay for them, which—at some point—is actually paid. As we know that this ideal world is non-existent we need other criteria than that of economic efficiency to organize a public ecosystem service economy. The next section explains why.

#### 4. Beyond economic efficiency for organizing a public ecosystem service economy

Elinor Ostrom and Roger Parks (in McGinnis, 1999: 284) studied mixed systems of metropolitan organization and come to the conclusion that “the more social scientists preach the need for simple solutions to complex problems, the more harm we can potentially cause in the world (or the more irrelevant we will become to the analysis of difficult problems).” Despite this warning, one widely held argument, especially among economists is that whatever way we choose to conserve biodiversity, it should be done efficiently. Similarly, in the context of public service reform, individuals had argued on the ground of efficiency that many local jurisdictions be merged into a single unit of government for any particular metropolitan area. Ostrom et al. (1961) challenged that presumption by stating that the consolidation argument need not hold “if agencies offer similar but differentiated services that impinge upon diverse communities of interest.”

Economic efficiency of a resource allocation implies the Pareto criterion which says that efficiency is achieved once there is no other feasible allocation of the resources that can increase the utility of any other person without decreasing someone else’s utility. Pearce and Nash (1981: 2) note that it is quite impossible for a policy to benefit all and harm nobody. Therefore, modern welfare economics is based on the Kaldor-Hicks principle of potential compensation which implies that when benefits exceed costs, compensation (of the losers by the gainers of a resource allocation measure) is potentially possible. As ecosystem managers are confronted with intertemporal allocation questions, economic efficiency is achieved when the present value of benefits (at some adequate discount rate) exceeds the present value of costs.

The message of a Benefit Cost Analysis to decision makers is rather straightforward: If the net present value is positive

the project is economically viable or if the benefit-cost ratio is larger than 1 the project is efficient and worthwhile. A country will decide for biodiversity conservation, if the national gains are greater than the costs (Pearce and Moran, 1994). Total economic values of biodiversity are usually assessed by methods which assume hypothetical or surrogate markets for ecological goods and services which are not allocated by the market mechanisms of supply and demand. However, these methods treat them as if they were part of a market by asking people about their willingness to pay for these goods and services. Numerous sources of error are connected to this economic valuation approach. In the biodiversity context, the embeddedness bias is of special concern. This bias refers to a contextual problem. People conceive the goods and services to be valued differently. In addition they attach their own experiences and feelings to them. The value of a good being sought may be embedded in the value of a more encompassing set of goods.

The standard economic approach to biodiversity valuation neglects the question whether the nature of the valued goods and services may require different coordinating mechanisms—other than that of the market. That means, that if the market is not the exclusive organizing principle for these types of biodiversity assets, the worth of market based valuation techniques applied to many biodiversity assets becomes questionable.

Some economists have suggested that the methodology of economics and the nature of ecological systems, including their value, are largely incompatible. Norgaard (1989) mentions that methodological monism and the atomistic-mechanistic approach weaken neoclassical economics as a useful approach. Similarly the author argues that approaching biodiversity conservation merely by optimization overlooks institutional change processes of evolution (Gatzweiler and Hagedorn, 2002). Optimization can merely address partial components of a complex issue, such as organizing a public ecosystem service economy for the purpose of biodiversity conservation. Sometimes, biodiversity conservation even requires transaction cost inefficient measures, like investments into capacity building and trust or reliability and accountability among people and authorities. The return on investments of such measures may only appear after very long time periods—if at all. In addition, the choice of the discount rate strongly reflects a certain ethical standpoint, which is not necessarily the one held by people concerned about or affected by biodiversity conservation measures.

Does efficiency matter at all for biodiversity conservation? Some scholars argue that political decisions with regards to biodiversity conservation are made regardless calculations of their economic values. Based on experience and discussions with politicians and leading decision makers in many countries Byron and Bennet (1999) argue that such decisions are made irrespective of the values calculated in valuation studies. The authors claim that the majority of resource allocation decisions in most countries have not been made on the basis of resource valuation. This is true even in industrial economies, which commonly apply the methodology and have numerous practitioners.

For the organization of a public ecosystem service economy efficiency definitely matters because services are linked to

goods and goods are not only public but also private. For the allocation of private ecosystem goods, which are part of a public ecosystem service economy the market can be considered as the most successful mechanism. However, economic efficiency only matters to the extent that economic values can be attached to the goods and services of biodiversity. The question therefore is, which other mechanisms are available to organize a public ecosystem service economy and how to design them? Based on research and supporting theory about how public economies work (Dietz et al., 2003; Binning, 2000; Oakerson, 1999) we can formulate some general and specific principles to guide such design:

- Distinguish goods and services of the ecosystem and their private as well as public good features as well as their functions. As it is unlikely that one governance form is good for the allocation of all goods and services, we can thereby attribute specific goods and services to specific governance forms.
- Identify the different players in a public ecosystem service economy, their attributes and interests. Incentive mechanisms need to meet their interests and motivate them to invest in biodiversity sustaining activities in farming, trade, or conservation/stewardship activities.
- Distinguish provision from production. Local farmers are providers and producers of ecosystem services. Those services which are not rewarded by the market require government or NGO and business involvement. If the government is not itself the producer and provider (that would be the agrarian socialist model) it needs to facilitate and arrange for contractual relations and partnerships with farmers. Farmers can co-manage or engage in fair and ecological trade. Farmers should be recognized as stewards of biodiversity that occurs on their holdings. Partnerships with the NGO sector have the potential of delivering the service more effectively. The private sector which derives benefits from biodiversity has a responsibility in
- Freedom of choice of organizational structures and strategies. Communities and regions need to be given the right to organize the delivery of ecosystem services themselves. These need to fit the spatial distribution of citizen and consumer interests and preferences. Communities could, e.g., decide to cooperate with the government in co-management arrangements or with the private sector in private–public partnerships. They may also decide to self-govern their biodiversity resources or involve in ecotourism business. Also, the building of independent conservation trusts and organizations should be supported by equivalent tax treatment to other charitable organizations.
- Legal security and infrastructure. The central government should take the lead in developing legislative frameworks and ensuring adequate resources are available at a regional scale. The legislative framework should provide tenure security, encourage private investments and allow for participation in decision making. Low-cost conflict resolution mechanisms should be provided.
- Roles and responsibilities at different levels. Actions at central, regional and local level should ideally be complementary and reinforce one another. The principle of subsidiarity (devolution to the lowest level able to take

effective action) should be considered. If the capacities at each level still need to be built, the central government should support this capacity building process. Whereas legal security is required from the national level, the regions should take the lead in developing regional strategies and brokering partnerships for on-ground delivery with local government and the private sector. Local government, NGOs and private individuals are encouraged to operationalize on-ground management programs.

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## 5. Conclusions

In literature the argument is made, that biodiversity should be governed by a variety of institutional arrangements which are able to better respond and adapt to the special features and functions of biodiversity. The organizational response to increasing complexity should not be increasing simplicity. That means that one governance type alone (market, state, or others) is not well equipped to “efficiently” allocate biodiversity goods and services with private and public good characteristics. Polycentric governance is suggested as alternative. For the organization of local public economies in metropolitan areas it has been suggested to move from the pure governmental provision and production of public services to the separation of provision and production. A local public economy can be optimized by allowing private units to produce the public service while the public units maintain its provision. Institutional change goes from “public to private”.

The organization of a public ecosystem service economy for the sustainable use of biodiversity is different. Here the production and provision of these services has traditionally been organized locally and privately by farmers. The production and provision of ecosystem services largely depends on the quality of their management practices. As the narrow boundaries of traditional resource use become increasingly permeable and as extremely poor farmers cannot be expected to carry the costs for public ecosystem service delivery, it has been suggested that the direction of institutional change goes from “private” to “public”. Especially in Ethiopia, this calls for the commitment of the public to co-manage biodiversity resources and to provide the public infrastructure for new institutional arrangements. Markets have their limits in organizing for the allocation of public environmental services but there are also undiscovered opportunities for niche markets and private–public partnerships. We suggest that because of the diverse features and functions of goods and services delivered by a public ecosystem service economy the institutions and governance mechanisms engaged in allocating them should be as diverse. Such a mixed ecosystem service economy would be composed of conventional markets, markets for fairly and ecologically traded goods, private–public partnerships (private businesses and public agencies), and government agencies.

If the market alone cannot solve the allocation of public ecosystem services, economic efficiency criteria based on hypothetical markets are not sufficient. To the degree that we have universal knowledge of all the goods and services provided by ecosystems, that we are able to attach a price to them and can replace trust in exchanging these goods and

services by perfect contracts, and perfect rationality, economic efficiency is a useful principle. Unfortunately that is not the case. Therefore, we have suggested design principles which go beyond those of economic efficiency and help to organize a public ecosystem service economy for the sustainable use of biodiversity. Organizing a public ecosystem service economy goes hand-in-hand with organizing a democratic civil society. A country like Ethiopia, which claims being a Federal Democratic Republic, will progress in sustaining its biodiversity resources as it progresses in transforming into a democratic civil society. The conservation and sustainable use of biodiversity in Ethiopia critically depends on the support from the central government to build local capacity and manage structural adjustment.

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