

# What Is the Role of Markets in Altering the Sensitivity of Arid Land Systems to Perturbation?

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## ABSTRACT

Markets never function perfectly because of policy, market, and institutional failures and this is particularly so in arid and semi-arid ecosystems. A framework is presented to take these failures systematically into account. The policy failures are described at both the macro and sector levels. At the micro level, the social costs and benefits of investments made in drylands should be estimated using valuation methods that duly consider environmental externalities. The difference in the economic analysis of investments made at the household, community, national, or international scale lies mostly in the transfer payments, the discount rate, and the scope of the externalities. Finally, institutional economics will be shown to be particularly relevant in desertification-prone areas, to set proper transaction rules that minimize transaction costs and to correct prices for institutional failures. Having analyzed these failures using proper economic tools or approaches, another framework is presented to analyze land-use instruments. These instruments help to correct for the failures and to allocate resources better to mitigate for and adapt to desertification caused by natural and anthropogenic factors. The instruments can be categorized as regulatory (e.g., land tenure), economic (e.g., cost-sharing), informational (e.g., extension), and other (e.g., debt relief) instruments. In practice, a mix of these instruments is most often required.

## INTRODUCTION

Desertification results from both climatic variations and human activities. The word *desertification* could have a misleading diagnostic connotation, but here it is used to describe the “aridification” of ecosystems. Properly functioning markets can help make better decisions

and manage risks in relation to potential desertification. An economic framework to explain decision making in arid, semi-arid, or dryland areas should encompass both macro and sector considerations. In dryland ecosystems, institutional economics is fundamental to understanding the complexity inherent in decisions made by individuals, communities, and different levels of governments. Macro, micro, and institutional economic considerations often boil down to decisions regarding land use in ecosystems prone to irreversible change. Proper economic and land-use instruments, which correct for market, policy, and institutional failures, can help individuals, communities, and governments mitigate and adapt to the desertification of ecosystems.

Because of policy, market, and institutional failures, markets never function perfectly. These failures are often notable in arid and semi-arid ecosystems. Policy failures, such as fixed exchange rates or subsidies, are first described at the macro and sector levels. At the micro level, economic costs and benefits of investments in drylands should correct for market failures by incorporating externalities using proper valuation methods. Finally, institutional economics are shown to be particularly relevant in desertification-prone areas to set clear rules that minimize transaction costs and sometimes also to correct prices by adding user costs. Once these three failures have been analyzed, land-use instruments are presented as one set of tools to correct for these failures. These tools, especially the economic instruments, should facilitate mitigation and adaptation to desertification caused by natural and anthropogenic factors. The political economy of desertification sometimes includes stakeholders from outside arid and semi-arid areas. Good levels of social capital can help facilitate consensus and better economic decisions and, in so doing, preserve the natural capital of drylands on which the well-being of many poor people depends.

## **A FRAMEWORK**

Environment needs to be mainstreamed in the general economic development strategy of a country. This is particularly important for countries containing extensive drylands. The fragility of arid and semi-arid ecosystems exacerbates any possible negative environmental impacts of otherwise appropriate changes in economic policies. It is useful to consider a framework (Figure 15.1) to systematically describe the possible interactions between economic policies and the environment. Efforts to tackle desertification must be linked to measures that foster broader economic and social change, while being at the same time designed to overcome the conditions that resulted in the degradation, i.e., focused on the process of development itself (World Bank 1998).

The context of economic policy in this chapter is mostly at the national level. However, the global context (see Box 1 in Figure 15.1) of today can be ignored only at the expense of misguided national policies. Macroeconomic policies (Box 2, Figure 15.1) are often reformed by adjusting monetary and fiscal policy variables such as exchange and discount rates, taxes and subsidies, and by liberalizing trade. These reforms will generally have a direct impact on the different sectors of the economy and indirectly on the environment and desertification. A devaluation policy could exacerbate the pressure on natural resources by boosting exports of natural resources, for instance. Sector policies (Box 3, Figure 15.1), particularly agriculture, forestry, livestock, water, and energy, can have important impacts on desertification by

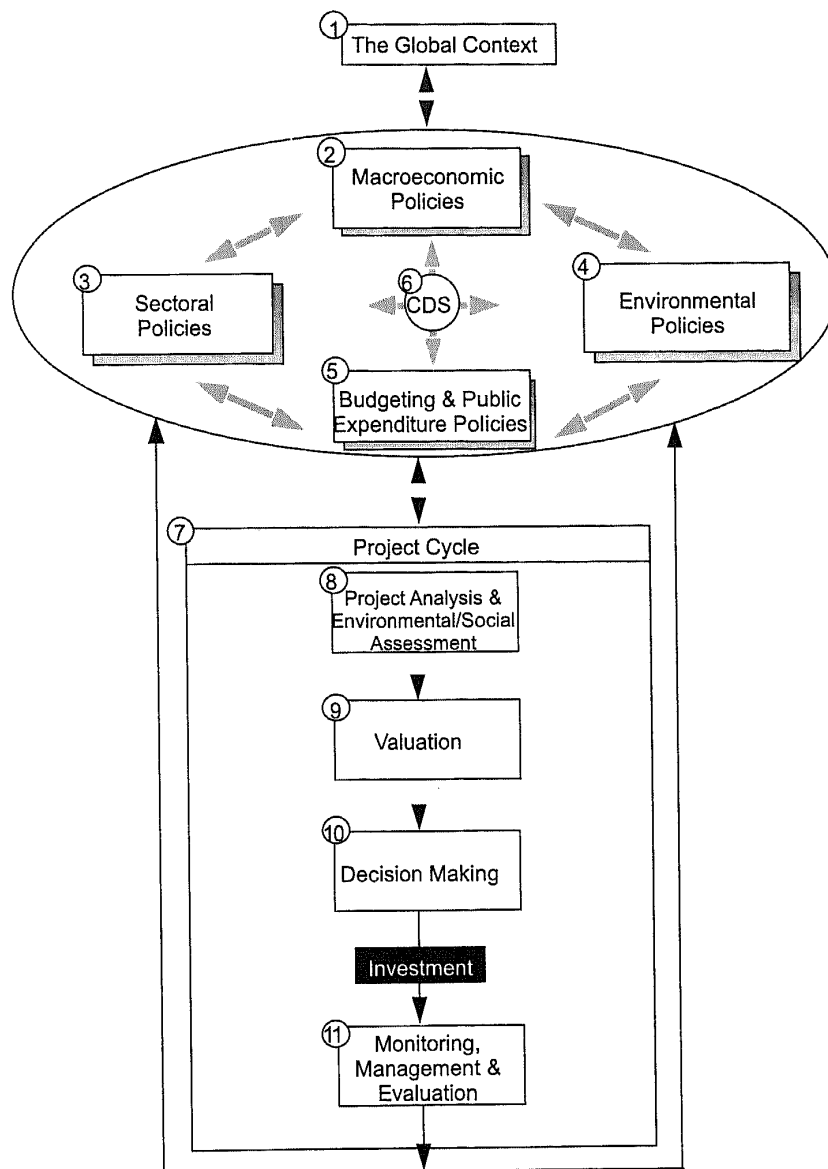


Figure 15.1 Economy-environment framework.

modifying pricing policies and land ownership laws, which may impact directly on natural resources management. Environmental policies (Box 4, Figure 15.1) attempt to prioritize the main desertification-related interventions. The priority interventions need then to compete in the annual budgetary process (Box 5, Figure 15.1). To defend such a budget will require strong political will, since these investments are often up against other more profitable investments probably favored by the ministry of finance. The global, macroeconomic, sector, environmental, and budgetary considerations must ultimately coalesce to pursue a strategic development vision and set of plans (Box 6, Figure 15.1). The plans are implemented through a series of projects and programs for which the benefit-cost has to be estimated (Boxes 7–11, Figure 15.1). An overarching plan to conserve and enhance natural capital in drylands can

only be implemented through the participation of all stakeholders and strong institutions. It requires political will and cohesive societies with high social capital to slow down the deterioration of arid and semi-arid ecosystems.

### MITIGATING POTENTIAL DESERTIFICATION FROM MACROECONOMIC REFORMS

Given this general framework for considering the systemic link between economic policies and desertification, I illustrate three macro-policy variables of potential importance for dryland countries. Devaluation of national currencies, often recommended in structural adjustment, results in greater competitiveness for natural resource products on the world market, but not necessarily in better resource management. It may, in fact, result in resource mining, such as indiscriminate deforestation, thus increasing the likelihood of desertification. As with other policies affecting relative prices, exchange rate policies have complex effects throughout the economy.<sup>1</sup> Monetary and fiscal policies bringing price inflation do not favor long-term investment in natural resources management or conservation because they increase discount rates.

Change in the discount rate is another important macroeconomic policy variable that can have potential impacts on the environment. Because market prices do not take resource degradation into account, governments need to set corresponding safeguard policies to avoid desertification. In dryland countries, it is particularly important that economy-wide policies, both macro and sectoral, be the object of an Environmental Impact Assessment (EIA), just as projects are. The Action Impact Matrix (AIM) can be a useful tool to accomplish this (World Bank 1994). AIM is a matrix relating the principal macro and sector variables with the important environmental issues of a country or region. The EIA at the project level and AIM at the policy level systematically assess the environmental impacts with and without the new proposed project or policy.

Fiscal policies affect the budget and hence the funds available to manage and conserve natural resources. They also affect the exchange rate indirectly, with the consequences described above. A domestically financed budget deficit creates inflation, crowds out private economic activity, increases unemployment, and may also increase pressure on the open-access natural resources often encountered in dryland countries. External financing of the budget deficit increases the need for foreign exchange, the pressure for exports, and the corresponding drawdown of natural capital. The long-term effect of debt will depend on the economic returns to the public investment made with the funds. Managing the external debt can be crucial for dryland countries because they frequently have a balance of payments deficit that impacts on the natural resources base, since the industrial or services sectors are not always developed. Governments often respond to high debt levels by reducing the social, natural, and human-made capital expenditures which are so important in dryland economies, in favor of politically more important, but not sustainable, current expenditures for jobs.

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<sup>1</sup> An overvalued currency could also create an implicit tax on exports and subsidy on imports, possibly resulting in a bias against agriculture and other sectors, and thus causing rural poverty, destruction of low priced resources, and under-investment in conservation.

Investments in health, education, resource management and protection, and infrastructure become underfunded. The problems are often compounded by a poorly managed tax system that does not collect taxes on natural resources in proportion to their value. The initiative for the Heavily Indebted Poor Countries (HIPC) aims at reducing the external debt of poor countries by reforming their economies to a "sustainable" level in a reasonably short period of time (Andrews et al. 1999). Debt relief links directly to a reduction in the budget deficit and indirectly to poverty reduction; this in turn could help dryland countries to get out of the poverty-desertification nexus.

Structural adjustment loans (SALs) of multilateral banks include conditions related to the above macroeconomic policy variables. However, the social and environmental implications of these macroeconomic reforms were not always considered ex-ante. This might have resulted in faster desertification in some dryland countries. Sustained poverty reduction requires rapid economic growth with macroeconomic stability and structural reforms. However, experiences in these countries show that proper safeguards must be set in place in conjunction with these reforms to avoid environmental degradation.

Green National Accounting attempts to include the depletion and degradation of the natural environment in the standard measures of income and product. For instance, it will deduct from GNP the depletion of natural capital, such as the irreversible loss of a forest area, or defensive expenditures, such as the cleaning of pollution damages (OECD/EDI/ODI 1995). Genuine savings (GS) measures total investment (including education) less foreign borrowing, depreciation, depletion, and environmental degradation allowances. Positive GS measure the extent to which new wealth is created for the future. On this basis many dryland countries exhibit negative GS (World Bank 1997). This should give pause to politicians and invite them to put the environment in the mainstream of their economic development policies.

### **MITIGATING POTENTIAL DESERTIFICATION FROM SECTOR ECONOMIC REFORMS**

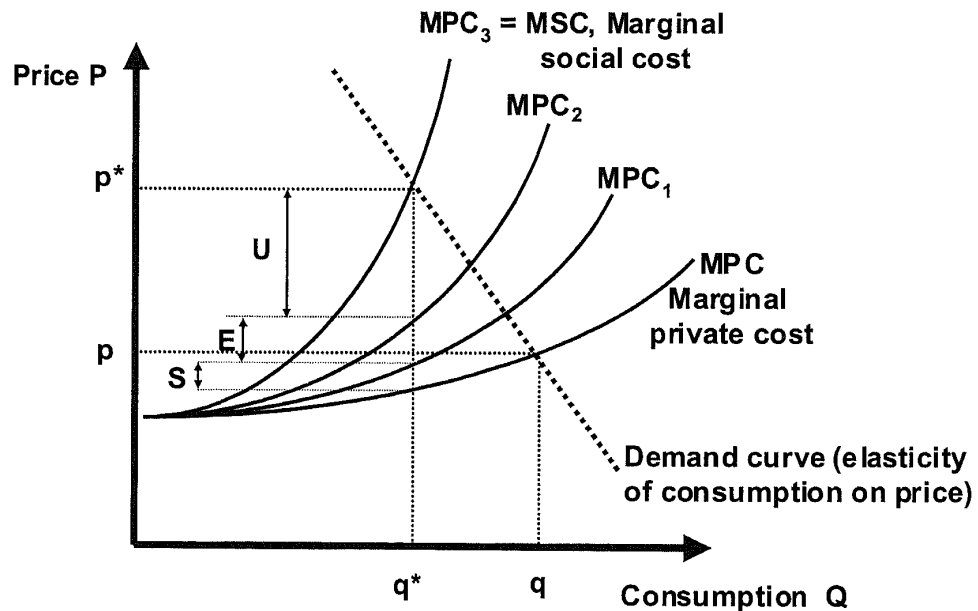
Sector economic reforms (Box 3 in Figure 15.1) focus on enhancing the contributions of a sector to the country's sustainable economic development, establishing priorities for the sector, contributing to macroeconomic policies and strategies, and evaluating the institutional aspects impinging on the sector. Two important sector policy variables discussed here are trade and pricing policies. Liberalizing a sector of the economy will impact not only on that sector but also on the entire economy, if the sector represents a high percentage of GNP. Pricing policies are key to sustainable management of natural resources and, particularly in arid lands, should be considered in conjunction with their potential social and environmental impacts if these policies are to be effective.

Protectionist policies can be correlated with wasteful and polluting production processes. These policies, which are implemented through tariffs, quotas, and subsidies, often do not help the sustainable management of resources by depressing their prices. The removal of trade barriers may increase the price of resources that were banned from export, for instance, and so may foster a more careful management of these resources. However, it can also accelerate resource depletion if property rights are not clearly established. Liberalizing trade

in some sectors of the economy can bring investments in efficient, less resource-intensive and more environmentally friendly modes of production and technologies. In dryland countries, for example, lowering tariffs on kerosene and fertilizers can slow down fuelwood cutting and intensify agriculture, thereby avoiding deforestation and the opening up of more marginal and fragile land. Lowering these two tariffs could thus slow desertification. The impact of changing trade policies on arid/semi-arid ecosystems will depend on the specifics of each situation.

Free trade policies do not necessarily bring about the “right price,” since other policy, market, and institutional failures may still exist. Often, agricultural and natural resources policies have provided subsidies to make basic needs such as food and fuelwood more affordable, thus aiming to fulfill a legitimate social objective. However, these price policies can bring overuse of chemicals as well as overexploitation of forests. Correcting for these sector policy failures by removing the subsidies increases the price of the resources, as depicted in the supply and demand curves of Figure 15.2 where the Marginal Private Cost (MPC) curve moves by the amount of the subsidy ( $S$ ) to  $MPC_1$ . This can be good for the environment to the extent that the management of resources becomes more efficient because they are more expensive. On the other hand, an increased price of fertilizers, as already noted, can exacerbate land degradation, especially by the poor who cannot afford to purchase the fertilizers. Likewise, indiscriminate fuelwood cutting, caused by a higher stumpage price in the absence of clear property rights, may exacerbate deforestation and desertification. Institutions need to be in place to mitigate such negative impacts.

Market failures are frequently encountered in sensitive arid and semi-arid ecosystems. These systems provide multiple products as well as services and ecological functions, which



**Figure 15.2** Effects of subsidy costs ( $S$ ), externality costs ( $E$ ), and user costs ( $U$ ), on the basic marginal private cost (MPC) curve. The MPC intersects with the demand curve at price  $p$  and consumption  $q$ . Adding the real but conventionally uncoded  $S$ ,  $E$ , and  $U$  causes the curve to move up the demand curve, such that a true analysis of marginal social cost (MSC) results in a higher price,  $p^*$  and consequently lower consumption  $q^*$ . See text for further discussion.

economists call positive externalities. However, market prices reflect only the value of the resources. The cutting of fuelwood in an unmanaged arid or semi-arid forest, for instance, can preclude communities and local markets from benefiting from fruits, building material, and forage that a sustainably managed forest could produce ad infinitum. The hydrological functions, shade for animals and people, a pasture of last resort in time of drought, any positive effects on the climate, and the CO<sub>2</sub> sink functions may be lost. The valuation of these externalities, indirect products, services, and functions is presented later. If the price is corrected for these market failures, the supply curve shifts further to the left to MPC2 and the price of the resource increases by the amount of the externalities (*E*) over and above the price corrected already for policy failures (MPC1).

Finally, and especially important for arid/semi-arid ecosystems prone to irreversibility, the institutional failures explained in more detail later should be taken into account through a cost, called user cost (*U*), to replace nonrenewable resources or renewable resources such as a forest that are mismanaged and so disappear. This again shifts the supply curve further to the left to MPC3, now depicting the true Marginal Social Cost (MSC) of the resource. The final economic or social price  $p^*$  resulting from the three successive shifts in the supply curve MPC can be several times the market price  $p$  used in conventional financial analysis. This will bring about a lower consumption of resources,  $q^*$ , than with the market price,  $q$ , and could often contribute to easing the pressure on the resource. If the market price of fuelwood in the Sahel were corrected for subsidies, externalities, and user costs, and if effective institutions were in place, especially land tenure, the social or shadow price  $p^*$  would be several times the market price  $p$ . In such a hypothetical situation, incentives would exist to invest in forest management and tree planting, contributing to slowing or even halting desertification.

## **BUDGETING FOR THE DEVELOPMENT STRATEGY**

Revisiting components 4–6 in Figure 15.1 now completes the explanation of the framework. The environmental review (Box 4) is not a sector review. The environment permeates all sectors of the economy. An environmental strategy, such as the MSC, attempts to prioritize environmental actions identified in the macroeconomic and all sector reviews through a participatory and dynamic process involving local up to central government officials and all stakeholders. The National Action Program (NAP) recommended in article 10 of the United Nations Convention to Combat Desertification (UNCCD 1994) has a similar purpose. Desertification should become part of the mainstream in all macro and sector policies and NAPs could help prioritize desertification interventions and coordinate international funding at the national or regional level (i.e., in Sub-Regional Action Programs, SRAP). A proper valuation of the proposed interventions is crucial in setting these priorities.

The next element in the framework, national budgeting and public expenditures (Box 5), inserts the list of investments emerging from the NAP in with other national priorities to arrive at a final national budget for the country. Without a credible economic analysis, these priorities may not be considered in the national budget. The priority investments chosen to combat desertification can be funded partly by the general budget but also by the National Desertification Funds (NDF) in conformity with articles 20 and 21 of the UNCCD (1994 and UNSO 1995), which is similar to the environmental (e.g., Global Environment Facility) and

social funds, and by specific debt-relief instruments, such as debt-for-desertification swaps (Andrews et al. 1999).

Finally, the central element of the first part of the framework (Box 6, Figure 15.1) represents the Country Development Strategy (CDS) of a country in which the environment (and thus desertification) should be duly mainstreamed. The CDS coalesces all the other elements of the framework to present a sustainable economic development strategy in line with the vision that the country's society has of its future in the new global context of the twenty-first century.

### **SHADOW PRICING FOR PROJECTS AND PROGRAMS IN DRYLANDS**

Once in possession of a proper economic development strategy, which places desertification concerns in the mainstream, the development policies have to be translated into projects and programs according to a set of priorities. These priorities should be established with good governance through a participatory process involving all stakeholders at every level from individuals and households to national central government, and in some cases to international regional and global bodies and institutions. The techniques of environmental valuation are used to account properly for the benefits and costs of the proposed activities, and subsequently to prioritize them to combat desertification. As mentioned earlier, these valuations must correct for policy, market, and institutional failures. Policy failures need to be corrected at the macro or sector level as seen in the first part of the framework. If this is not the case, prices used in the economic analysis of the investment will have to be corrected for monopolies, subsidies, taxes, and other inappropriate economic interventions. This economic analysis of investments is well understood (Harou 1987). It consists of developing corrected prices or "shadow" prices, ignoring transfer, and using a social discount rate which has the opportunity cost of capital and future generations in mind. The transfer payments among members of society will be different at the household, community, national, and international scales of the economic analysis. The discount rate may also vary between the opportunity cost of capital to an individual, a community, a country, or the world. The point of view or the scale at which the economic analysis is carried out is thus important.

The economic analysis of investment is complicated further when externalities exist. These environmental externalities need to be elucidated in an EIA, which describes the biophysical impacts, including the social impacts, with and without the project (Box 8 of Figure 15.1). The impacts of the externality can be felt at the scale of the community, the nation, or the world, and shadow pricing should adjust to the scale of the economic analysis. Some of the inputs and outputs described in the EIA may not have market prices, or their price may not reflect externalities, and so will need to be valued. The environmental shadow price is derived from estimates of "willingness to pay" (WTP) to receive a benefit or "willingness to accept" (WTA) to bear the costs (Box 9). The WTP can be derived indirectly from market prices and proxy to market prices, or from contingent valuation methods. Many valuation methods exist, but their description is beyond the present scope (Markandya et al. 2002).

Once the important environmental and social impacts of an investment have been identified in an EIA and shadow prices established for the new inputs and outputs using



proper valuation methods, the economic profitability of the project or program is estimated. A public decision is made considering not only the net benefit of the intervention proposed, but also nonefficiency objectives, including the social objective presented in the next section (Box 10). Since many uncertainties and risks surround the analysis of investments made in arid/semi-arid ecosystems, it is of paramount importance to monitor and evaluate these projects and programs closely, to react quickly to unexpected changes (Box 11).

This concludes the explanation of the framework, its elements, and the interrelations between them and possibly with the desertification process. Dynamic feedbacks exist between these elements depending on the institutional context under which economic decisions are made. Many examples of these interactions are discussed elsewhere in this volume, such as the impact of culture, institutions, communities, national, and international economic policies on the state and management of the natural resources for given ecological and meteorological situations. This framework attempts to organize at the global, national, local, and individual levels and explain these interactions systematically using economic reasoning, duly considering other factors but as constraints to the decision-making process.

## **INSTITUTIONAL ECONOMICS FOR DRYLANDS**

Having taken into account the policy and market failures in the economic–environment framework, one is left with a critical aspect of dryland societies, the social context in which economic and environmental factors interact. Institutional economics research in drylands focuses on the responsibility of land management through clear ownership and responsibility rules that minimize transaction costs, as defined by North (1990). Transactions often take place in a context of conflict in dryland areas, for example, between pastoralists and farmers. This means potentially high transaction costs and the nonapplicability of the Coase theorem. Coase (1960) demonstrated that if private parties can bargain without cost over the allocation of resources, then they could solve the problem of externalities on their own. In the absence of high transaction costs, the market is supposed to solve the problem of externalities and allocate resources more efficiently. The higher the social capital of a community, the clearer its property rights and the lower the transactions costs will be. In such cases the Coase theorem applies and actions causing desertification occur less frequently. The market mechanism will then operate under the constraint of social norms that in traditional societies were often established on sound natural resources management principles and through long experience with issues such as the establishment of fallows and the regeneration of seedbanks.

Institutions are defined broadly here as the formal and informal rules and practices that govern behavior and actions of individuals, and that are recognized and frequently followed by members of the community. These rules and practices impose constraints on the actions of individual members of society (Clague 1997). Institutions can be sets of rules allowing an organization to function and governing the operation of markets or property and contract rights. They can also be cultural norms of behavior. Institutions are important because they structure incentives for innovation, production, and exchange for individuals, communities, and nations, as well as firms, and so impede or enhance sustainable economic growth (Olson and Kahkonen 1998). Institutions create the incentives to attain a desirable outcome. Given all the

		RIVAL	
		Yes	No
E X C L U D A B L E	Yes	Private Goods Markets Congested Toll Roads	Natural Monopolies or Toll Goods Command and Control Uncongested Toll Roads
	No	Common Resources Collective Actions Congested Non-toll Roads	Public Goods Command and Control Uncongested Non-toll Roads

**Figure 15.3** Types of economic goods for institutional analysis.

factors affecting outcomes, institutional analysis should inquire into the nature of the good or service to be provided, the actors involved, the rules affecting decision making and incentives, and the desirability of the outcomes.

Three basic mechanisms exist to coordinate the provision of goods and services: market, command and control, and collective actions (Ostrom et al. 1997). The appropriate organizational design for the provision of a good or service depends on the characteristics of the good. Economists recognize four types of goods depending on their excludability and rivalness as summarized in Figure 15.3. A good is excludable if you can ensure its property right, such as land tenure. A good is rival if the consumption of the good by one individual prevents another's use of it. Excludable and rival goods are *private goods* and better organized by markets, for example, private grazing land. At the opposite of the spectrum, nonexcludable and nonrival goods, called *public goods*, a wilderness park for instance, are better dealt with through command and control by the government. Global public goods such as clean air and oceans should be managed by regulations and treaties supervised by regional or international bodies. In between these two extreme situations are the *common goods*, frequent in dryland resource management; these are rival but not excludable goods such as grazing land or groundwater. *Toll goods* can be made excludable, such as water pipes or irrigation channels. Roads can be classified in any of these four types of goods depending on their degree of congestion and the options for commanding access to them.

Resources in drylands are most often public, such as, gazetted forests, or common goods, such as, communal grazing land. They are rarely best organized through markets, and a command and control approach is often expensive and inefficient. Instead, collective action is recommended in which economic activities are coordinated by common interest. In some circumstances, the privatization of the commons can solve the problem of deteriorating resources by having them follow the rules of the markets. Many commons in Europe started to be privatized at the end of the Middle Ages.

Decentralized common property resources have been the norm in most dryland societies. Common property management does not need to be a tragedy (Hardin 1968). Common pool goods, as they are also named, are highly rival. Their supply is finite so that their use by one

person limits their availability to others, but at the same time it is very difficult to exclude nonpayers from their consumption. This explains why if social capital as reflected in institutions — understood here as rules of norms and behavior — disappears, the land will eventually be overgrazed and soils may deteriorate irreversibly. The “working rules of collective action,” as defined by Commons (1990), enhance the ability of community to implement the traditional or modernized norms relating to the management of soils and natural resources on the common land. Without those norms, common lands become open access lands (Bromley 1989). The central government usually does not have the means and institutions to fill the void when the social fabric of communities disappears. Therein lies the tragedy of the commons.

In a modern setting, some formal economic mechanisms can be put in place to avoid a tragedy. If the problem is overgrazing, a community having evolved into a formal municipality could regulate the number of animals in each family’s flock, internalizing externalities by taxing the animal, the equivalent of a Pigovian tax for pollution control; alternatively it could auction off a limited number of grazing permits. The other more extreme solution mentioned earlier is simply to privatize the commons. Because of the particular characteristics of arid ecosystems and the existing traditional rules of the commons involving many different stakeholders, strengthening existing rules and norms is often more appropriate because it reduces the transaction costs involved. As communities evolve into municipalities, new instruments could be adopted and tailored to each specific circumstance so that incentives to manage the natural resources sustainably are progressively put in place to guide the evolution of more individualistic behaviors.

Another important factor that determines desirable outcomes is the institutional dynamic between those involved in the participatory process of setting and monitoring the rules of collective actions. Different levels of participation exist, from information dissemination, through consultation and collaboration, to empowerment. Different stakeholders require different levels of participation. Rietbergen and Narayan (1997) divide stakeholders into four categories according to their influence and importance. *Influence* is defined here as power over the reform process in terms of controlling the decision-making process and facilitating or hindering the reform. This power may originate from a stakeholder status or from informal

		IMPORTANCE	
		High	Low
I N F L U E N C E	High	Primary participants	Potential problem-makers; monitor closely
	Low	Facilitate participation	Keep informed

**Figure 15.4** Classification of stakeholders.

connections with leaders. *Importance* refers to the group whom the reform is intended to benefit. Figure 15.4 provides a classification of stakeholders according to these two criteria.

The participation process needs to include the participants of high importance and influence to ensure a successful management of the resources and reforms as the system evolves over time. Stakeholders of high influence but of low importance are the potential “losers” in the reform process and so need to be informed and their view acknowledged in order to avoid disruption and conflicts. Stakeholders of low influence but high importance, the potential “winners” or beneficiaries of the reform, have to be involved even if it is difficult in some communities. Stakeholders of low influence and importance need to be informed but not brought into the reform process. Careful analysis of the stakeholders should allow lower transaction costs and more sustainable outcomes. The study of the distribution of benefits and costs of an investment is also important to avoid conflict and to guarantee the sustainability of a project or program. Projects prepared through a proper level of participation have usually shown a higher net economic return than without participation (World Bank 1994b).

In relation to the global commons, note that new groups of stakeholders are appearing on the international scene (Bromley and Cochrane 1994). The stakeholders of global public goods can be broadly categorized as governments, civil society, and international firms, and they start deliberating about different global issues through the informal creation of international networks (Reinicke 2001) which could degenerate into *Club Goods* if these stakeholders are not representative (Leeuw 2001).

Once the type of goods and services and the different stakeholders are properly understood, appropriate mechanisms need to provide the incentives to do the right thing, here to bring the right outcome in the management of natural dryland resources. For the economist, the right price is supposed to bring the right decisions. Thus far, it has been shown how the price of goods or services can be corrected for policy and market failures. The price correction for institutional failures is less obvious and sometimes calculated with a user-cost adjustment. The user cost is relevant for nonrenewable resources such as mining. With the deterioration of potentially renewable natural resources, the scenario relevant to desertification, ecosystems may be damaged irreversibly. The resources under this scenario are becoming nonrenewable and the user-cost approach would apply. Of course, if the rule of collective actions is well enforced and the resources on the commons are sustainably managed, the user cost is zero.

The Hotelling (1931) rent establishes the efficient price of nonrenewable resources. The problem in our irreversible use of otherwise renewable natural resources is how to capture the rent from the use of these resources. For minerals those rents can be more easily captured. Once these rents are captured, one is left with the disposition of the revenue. Hartwig (1977) argues that in a fixed technology world with finite resources, as long as investment in produced assets just equals the value of marginal resource rents (Hotelling rule), consumption will be constant over an infinite time horizon, the characteristics of a sustainable economy. The idea is that nonrenewable resources are liquidated and the proceeds or user costs are invested in other assets that can continue to yield the same income (Harou et al. 1994). Here, that income flow should correspond at least to what the resources would have generated in perpetuity had these resources been managed sustainably. Some oil-rich Middle East countries follow this economic policy and invest the oil proceeds outside their country where the return on foreign investments is higher than the Hotelling rent from

the oil fields and alternative investments at home. Sustainability and even economic growth from these reinvestments will only materialize if they generate sustainable returns that are higher than the price increase if oil is left in the ground. If this is the case, the conventional economist, who generally assumes a quasi-perfect substitution between human-made and natural capital, feels the economy is sustainable. However, this is a weak sustainability criterion. The ecologist-economist prefers to follow a strong sustainability criterion. A strong sustainability criterion assumes that these two forms of capital, human-made and renewable natural capital, are complementary instead (Daly 1992).

This completes the three possible adjustments made to market prices by economists who study the economic net benefit of possible policy interventions and prioritize public projects and programs. These adjusted prices can also be used to calibrate economic instruments to combat desertification as explained in the next section. If institutions are in place and working properly, the price of goods and services will not need to be adjusted for institutional failures. Markets function best when a legal foundation exists to hold down the costs of transactions across time and space. Understanding institutional failures that bring market failures is important to explain and reverse human-induced land degradation in dryland countries. For many common resources as defined in Figure 15.3, the working rules of collective action rather than of the state are crucial to manage desertification. These rules provide the right and monitorable incentives in many situations encountered in drylands, and minimize the transaction costs involved. However, it is the integration of the rules established at all scales—global, national, local, and individual, and the feedbacks between them—that allows societies to confront external meteorological and ecological shocks in arid/semi-arid production systems effectively. This is in line with what E. Ostrom calls “polycentric governance systems.” These are hierarchical organizations of small-, medium-, and large-scale democratic units that each may exercise considerable independence to make and enforce rules within a circumscribed scope of authority for a specified geographical unit (Ostrom 2001). The redundancies inherent in these overlapping authorities ensure the resilience of the systems in time of stress.

## **POLICY INSTRUMENTS**

If all the possible links between the economy and desertification presented in the framework have been systematically considered at all levels, and mitigations put in place when appropriate, most of the innumerable decisions made daily in an economy should avoid many of the activities contributing to desertification. The framework could even help adaptation to sporadic and long-term drought. To that extent, markets would not contribute to desertification. The proper macroeconomic policies would take into consideration and mitigate possible negative impacts of structural adjustment reforms on arid and semi-arid ecosystems. Sectoral economic policies, which consist mostly of getting the price “right” for the goods and services produced by arid ecosystems, would account for any policy, market, and institutional failures. The enabling environment of effective institutions would help in making the right decisions throughout the economy by respecting the rules of collective actions at the local level and setting proper monitoring at the national levels.

Pursuing the right policies and decision making at the international, national, community, and individual/household level is unfortunately not always possible. Policy processes are imperfect and the political economy of desertification is such that the environment and desertification is not foremost in the mind of policymakers and the important ministries of economy and finance. Consequently, there is a need to set specific policy instruments to get the right outcomes that the more general policies and institutions are not able to deliver. A mix of instruments exists that can be broadly categorized as: regulations or command and control approaches, economic instruments, and information.

A dual financial and economic analysis, such as that described earlier and in more detail elsewhere (Harou et al. 1994), is required to decide upon and calibrate an instrument. The financial analysis establishes the profitability of an investment at the private level while the economic analysis does it at the societal level. If the proper activity, one that does not contribute to soil degradation and desertification, is not financially feasible, another nonsustainable course of action, but financially profitable in the short run, could be chosen by the private investor. If the economic analysis shows the sustainable activity to be feasible from society's point of view, there is ground for public intervention and the proper instrument has to be chosen to induce the outcome that is desirable to society. The dual analysis can be used also to calibrate the eventual instruments. It can be used, for example, to calculate the minimum subsidy required by individuals to induce the proper societal decision. Adesina et al. (1999) used a dual analysis of this type organized in a policy analysis matrix, which is essentially a comparison of financial and economic analysis under different policy scenarios (Monk and Pearson 1990), to study a possible shift to agroforestry schemes by farmers in three African countries.

The results of the economic analysis of a natural resource management instrument program in drylands would have to be compared with other possible public investments in the economy. It may be that investments in the less arid part of the country will be much more attractive. Here, mostly land-use-related instruments are proposed to slow down or halt desertification. To explain the instruments, an integrated land-use framework is presented in Figure 15.5 (Harou and Essman 1990a). It makes sense to look at desertification as a decision- and policy-making process related to the use of the land. A recent publication (UNDP 2000) suggests an ecosystem approach to guide economic development in dryland countries, in which the needs and requirements of people is linked to the biological capacity of ecosystems to continue to provide for the future. The framework proposed here to identify land-use instruments (LUI) subscribes to this approach (Harou 1990).

The LUI framework links macro and sector policies to the use of the land and proposes LUI to redress policy, market, and institutional failures. The framework is as follows. Land use in a country is somewhat linked to the natural comparative advantage of the country in a global economy. A particular land use reflects both the biophysical characteristics of the land and the socioeconomic as well as cultural context of the country. The suitability of the land for grazing or forestry or other uses depends in part on the force of supply and demand for the resources in these sectors, and hence on their prices and the macro and sector policies affecting these prices. The financial net benefit for the different land uses together with landowners' objectives result in a specific pattern of land use. If that use causes desertification, economy-wide policies may have to be reformed and/or an appropriate policy instrument chosen to redirect the use of the land toward more sustainable production outcomes. The system is

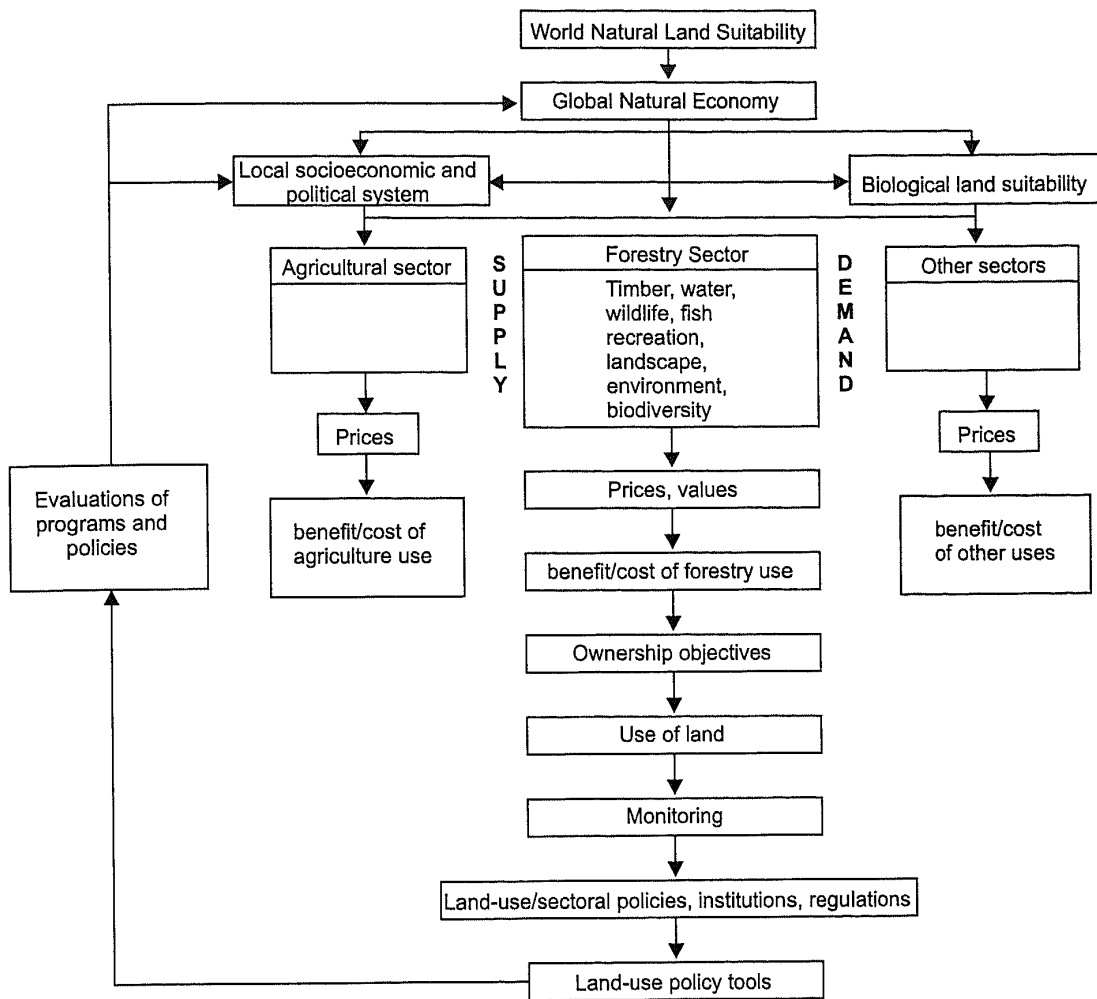


Figure 15.5 A framework for identifying land-use instruments (LUI).

highly dynamic, so that policies and the instruments to implement them need to be reviewed regularly and corrections proposed to ensure a sustainable use of the land.

The broad categories of LUI are regulatory, economic, informational, and other instruments. In dryland countries, the *regulatory* instruments focus first and foremost on property rights and the institutions guaranteeing those rights. While the working rules of collective actions are of paramount importance and very diversified in drylands, some more formal regulatory instruments exist when private property rights are already well established. These instruments (Harou 1990) are: zoning, subdivision regulation, transfer of development rights (even for an entire community), and other types of land-use controls outside the scope of this paper (e.g., land acquisition, voluntary sales, expropriation, easements, land exchange). An argument for privatizing the land when feasible is that it allows the use of more formal instruments. In addition, it provides a local property tax base as the community evolves into a modern municipality and needs to finance its budget.

The *economic* instruments include economic incentives such as preferential taxation schemes, transfer and development taxes, subsidies, and cost-sharing programs among others. As for the command and control instruments of land use, the formal economic instruments also require a modern organization. Before using specific instruments, one must ensure that the policy failures have been taken care of. The removal of agricultural subsidies and of marketing boards maintaining artificially low or high prices for agriculture outputs are sector policies that can redirect the use of the land. In some cases, the subsidy removal or the market clearing price can help correct the environmental problem. The working rules of collective actions can do a better job, i.e., with lower transaction costs, than a modern system of formal economic instruments if the social capital of the community is intact. The most difficult period for implementing economic instruments is certainly when the economies and corresponding institutions are in transition from one system to another and the property rights are not yet well established.

*Indirect* instruments are the provision of infrastructure, of alternative economic activities, information, and education, among others. Extension activities systematically providing the proper information on the ecologically most appropriate crops, time of planting, and rain and drought forecasting may be a flexible and cost-effective way to mitigate and adapt to the risks of drylands. The sharing of good practices, and reporting on activities that fail to respect local rules and norms can put social pressure on the entities harming the environment to halt that behavior. The best instrument or mix of instruments for a given situation depends on which combination minimizes public investment and transaction costs for a given outcome. For the semi-arid zone of Southern Sri Lanka, for instance, a recent study (Birner and Gunaweera 2001) found that collective action and bargaining between organized interest groups was the most efficient way to help resolve the issue of crop damage by livestock.

The land-use framework is appropriate at the global, national, or community level. At the community level the working rules of collective action may want, for instance, to enforce the "Gestion des Terroirs" developed in the Sahelian countries using a mix of instruments adapted to that particular sociocultural context (Harou 2001a, b). The same instruments could be used at the national level but using a different institutional setting. At the international level, different instruments also exist: the Clean Development Mechanism (CDM) could be adapted to drylands (IPCC 2000) which covers the largest biome area (4.55/15.2 10<sup>9</sup> ha) and holds 199 out of 2477 Gt. of carbon mostly in soils. The Global Environmental Fund, especially as it relates to greenhouse gases and biodiversity, could finance the incremental costs related to these two aspects (Hansen 1997). Regional Desertification Funds and the debt for sustainable management of arid lands swap (HIPC initiative mentioned earlier) are two possible sources of global financing for internalizing global externalities.

The appropriate instrument to use at each level of government must be determined for each specific situation. To help this search for the best instruments, one could use the two frameworks proposed here to review both the possible links between macro, sector, and investment/program policies and desertification, and the use of instruments to correct the potential remaining negative impacts. These frameworks can be used as a checklist to consider different policy options, and used together with all the stakeholders to reach a transparent decision for the common good. In some situations, the best options lie well outside the world of the local stakeholders, such as providing employment opportunities elsewhere. Many overlaps may exist between the institutions that provide these instruments



at different hierarchical levels in the system, but this is not necessarily a problem. As noted earlier, some degree of redundancy provides greater resilience to external meteorological and ecological shocks as well as political and economic risks.

## **POLITICAL ECONOMY OF DESERTIFICATION**

Having attempted to establish the link between the market and desertification, and having proposed instruments to counter desertification, one can wonder what concrete actions have sought to combat desertification using the market, through economic reforms and targeted lending. One way to consider this question is to review some of the experiences gained by development banks such as the World Bank and others, and see what lessons learned could be blueprints for further actions. Here, I provide some preliminary reviews of some analytical macro and sector works, Country Assistance Strategies (CAS), as well as project portfolios related to UNCCD (1994) together with various other documents (World Bank 1996, 1998; Nelson and Lawaetz 2000; Deng 2000; Deininger 2001; Harou 2001a, b) to illustrate the effort currently occurring to move the environment of dryland countries into the mainstream of different levels of decision and policy setting.

Dryland ecosystems support some of the poorest communities of the world and some of the communities most dependent on natural habitats and biological resources. These considerations have been included in practically all the CASs<sup>2</sup> reviewed for 30 countries with 75% or more of their total land area consisting of drylands (including arid, semi-arid, and dry subhumid lands; Deng 2000). The review was carried out using four broad criteria: diagnosis of desertification problems, strategies and actions proposed to address the problems, discussion of the desertification-poverty nexus, and recommendations of bank instruments (Economic and Sector Work SAL project loans, etc.) as part of the actions proposed. On these criteria, the review concluded that the desertification and natural resources management issues are sufficiently addressed in the context of overall strategies for the agriculture, rural development, environment, and water sectors even though there are no established bank directives to integrate dryland issues into CASs.

The CASs are not supposed to provide as detailed analyses as the Economic and Sector Work (ESW). This is best illustrated for instance by Pratt et al. (1997)'s recommendations for the livestock sector in arid lands. Nelson and Lawaetz's preliminary review of the World Bank portfolio noted that ESW has made a limited attempt to explore long-term sustainability and incentives such as land reform and issues related to indigenous people (pastoralists). While policy reform affecting drylands was discussed in the appraisal documents and was considered substantially relevant for 11 of the 18 projects examined, only three of these projects made substantial progress in changing relevant policies. The portfolio review

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<sup>2</sup> CAS is the central vehicle for broad review of the bank group's assistance strategy for International Development Assistance (IDA) and World Bank borrowers that (a) describes the bank group's assistance strategy based on an assessment of priorities in the country and (b) indicates the level and composition of assistance to be provided based on the strategy and the country's portfolio performance. A CAS policy matrix identifies policy goals and the instruments to achieve them as well as the timing of any expected policy action.

recommends undertaking more ESW to help resolve public/private goods issues and address possible public good subsidy questions in dryland countries.

Both reviews of CAS and ESW propose to consider desertification in country and sector strategies through the mainstreaming of land and natural resources management issues in the new type of analytical work undertaken at the World Bank, the Poverty Reduction Strategy Paper (PRSP). This seems appropriate given the link between poverty and the degradation of the environment in dryland countries. However the portfolio review points out that the future of drylands will increasingly lie outside the rural areas and that dryland strategies need to anticipate these changes. Structural adjustment reforms have raised input prices and dismantled marketing boards guaranteeing pan-territorial pricing for remote areas. However, crop diversification to exploit the trade liberalization opportunities created by these reforms is more difficult in dry than wetter areas. These reforms have also increased nonfarm employment opportunities and migration and have supported income diversification, but again less in the remote dryland areas than in the more accessible and productive areas. The resulting migration to areas of economic growth should be managed to avoid conflicts appearing today as in some countries of Western Africa. To face these far-reaching changes, it is recommended that dryland strategies include the possibility of creating networks of community groups including urban-based but rural-linked community support groups, artisanal training, literacy, infrastructure and transport, marketing, employment information, public works schemes (food for work), public-private partnerships aimed at employment, and rural growth centers (Nelson and Lawaetz 2000).

Turning now to the lending instruments of the World Bank, a preliminary portfolio review suggests that estimates of lending for drylands over the fiscal years 1990–1998 fluctuate, depending on how drylands projects are defined, from a minimum of \$ 1.7 billion for “predominantly drylands projects”<sup>3</sup> up to a maximum of \$8.9 billion for 159 projects when a wide range of projects with either modest area coverage in dryland zones or limited immediate dryland thematic content are included. Lending has declined steadily especially in pastoral development projects, where many poor and indigenous people live. On those grounds, the authors conclude that desertification and the UNCCD (1994) have not become sufficiently mainstreamed yet in Bank lending (Nelson and Lawaetz 2000). This decline seems to occur across all donor agencies. The trend for these rural projects has also shifted from natural resource management projects focusing on long-term natural resources sustainability to community development projects focusing on short-term village infrastructure (World Bank 1999). Within the lending portfolio review, around one third of 18 projects have contributed to improving land tenure or rights for beneficiaries. The projects supported changes in land tenure through loan conditions, studies, or other schemes such as the “Gestion des Terroirs.” An ongoing review of the Rural Development portfolio of the World Bank found that since 1985, of 39 projects relating to pastoral land tenure in drylands, 27 projects discussed land tenure issues but only 16 undertook actions related to land tenure. The results of these actions

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<sup>3</sup> Excluding national environmental institutional development projects, research projects, large-scale irrigation projects, and projects falling predominantly outside dryland zones, all of which are included in the larger estimate, the World Bank invested about \$1.73 billion over the fiscal years 1990–1998 or approximately 6% of total agriculture lending during that period. Lending in pastoral areas declined from \$200 million per year in the late 1970s to \$20 million in 1999.

have been mixed due to conflict between traditional and new legislated land rules. As mentioned with institutional failures, the working rules of collective action are probably more important in drylands than when focusing strictly on land tenure matters. *Ex-post* evaluation of two Community Land Management type projects in the Sahel found that activities undertaken during a project often end with the project funding partially because of weak community or association cohesion and administration (Harou 2001a, b).

A draft review of the portfolio of land policy and administration lending of the World Bank (Deininger 2001) has a section on natural resources management and policies because, it is said, they pose special issues for land policy and administration. These issues were discussed earlier under institutional failures: “common pool” resources shifting to “open access” free-for-all. Common pool arrangements are recommended if feasible because they are more flexible in accommodating multiple users. Individualization of the property rights excludes many traditional users, usually pastoralists and the poor, from access to the resources. As a consequence the land portfolio review shows a growing interest in working with community resources management under common property regimes in which the different stakeholders have to engage in a transparent decision process. Conflicts are found to be an intrinsic feature of complex property regimes rather than an anomaly. It is recommended that conflicts be managed in regular institutional mechanisms and not as a crisis.

The lending record by the international community does not seem to be commensurate with the importance of drylands, that cover about 40% of the Earth’s land surface and are home to about one billion people, many of whom are poor, often indigenous people who are politically and economically marginalized. Few investments help dryland inhabitants to contend with a high-risk environment characterized by low and highly variable rainfall and frequent drought. The political economy of doing more for these populations to adapt and also to migrate toward better opportunities is complex. The UNCCD (1994) objective is to help the dryland constituency to gain more weight in national and international economic development policies.

It should be recognized that poverty in some dryland countries might be inescapable in the short run. Even if the proper institutions are in place to enforce community rules and if the prices are corrected properly to account for other failures, the state of poverty and underdevelopment may be such that people will still assign low priority to conservation in arid and semi-arid ecosystems given the imperatives of day-to-day survival (Deng 1999). Under those circumstances, investments in safety nets are required while long-term plans are initiated or people are invited to resettle in more hospitable environments. However, higher levels of economic development are needed in those countries to allow resettlement where new economic opportunities exist. Public investment in education and improved health can increase opportunities for migration, reducing the population pressure on resources and providing capital inflows to drylands through remittances for investment in more sustainable agriculture practices (Hazell and Lutz 1998). In this regard, pervasive poverty and land degradation must be seen as two faces of the same coin in many dryland countries. Available evidence suggests that the poor are much more dependent on common property resources for their livelihood than the rich (Bojö et al. 2000). As the resources dwindle, poor people may want more children to do the day-to-day work of fetching water and fuelwood, worsening the aridity–poverty–population nexus (Dasgupta 1992). Globalization could increase inequality and so the situation of the poor could worsen (Wade 2001). If it does, so would desertification.

The political economy of desertification needs to shift from a focus on property boundaries to the empowerment of stakeholders. In the short and medium term, institutional solutions can be directed toward process-oriented approaches that create platforms for the negotiation of access to, and control over, key resources. In the long run, however, it is important to facilitate migration toward areas of more sustainable and less risky economic growth (Cour 2001). It is probably only under such a two-phase strategy that markets corrected for different failures may best allocate resources in a dryland economy. The extreme and risky environmental conditions of arid and semi-arid lands need to be duly incorporated into the policy- and decision-making process at all levels of decisions. The political economy of resource management in these ecosystems is complex but must be well understood if the welfare of one billion people is to be improved throughout the world.

The stakeholders for this work include not only the various people directly involved in dryland resource management but also the urban people and the inhabitants of wetter regions who influence the strategy of migration toward areas of better economic opportunities. The stakeholders may also be outside the national boundaries. The economic development issues of Sahelian countries, for instance, need to be resolved appropriately in a Pan African forum in which the problem of environmental refugees is studied and resolved openly at the level of the region and the continent. Indeed, migration may very well accelerate if global warming trends are not reversed. To allow migration away from desertification-prone areas without creating conflicts, governments may be well advised to invest in the education and health of the youth living in these areas. These investments could greatly decrease the costs of future resettlements by facilitating the creation of new economic opportunities for the displaced populations. This may be the best instrument of all to combat desertification: to empower the people from these zones to master their own future and to widen their options for a better life. In order to make all these difficult decisions, the two frameworks proposed should be useful to mainstream the environment and desertification into the different levels of decision making from the community to the global commons.

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