

Ecologically Sustainable Soil: The Role of Environmental Policy and Legislation

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ABSTRACT

Sustainability refers to the longevity of the health of an agricultural land use system and the ability of this system to maintain a productive capability. A key criterion for a healthy ecosystem is that it is sustainable, especially healthy soil and sustainable soil is a desired land management outcome. For many years' soil conservation policy and law was the main area of law to manage and control soil and land degradation. Since the early 1980's there has been substantial development of global conventions, treaties and strategies for sustainable development (e.g. *The World Commission on Environment and Development 1987; United Nations Conference on Environment and Development 1992; Convention on the Conservation of Biological Diversity 1992; Commission on Global Governance 1995*). These have been used variously around the world to reform natural resource laws and policies and produce new integrated resource management law and policy. Many environmental laws and policies now embody the ecosystem health and land use sustainability concepts. Recent achievements in environmental law and policy that incorporate an ecosystem management and sustainable land use objective in Australia, Thailand and Iceland are outlined.

INTRODUCTION

Various global studies indicate that soils are being used beyond their physical and ecological capability to sustain long-term agricultural land use. Land degradation is defined as the reduction in the capability of the land to produce benefits from a particular land use under a specific form of land management. Soil degradation is a process, which lowers the current and/or the potential capability of the soil to produce goods or services. Seven processes contribute to soil degradation: water erosion, wind erosion, waterlogging, and excess salts, chemical degradation, physical degradation, and biological degradation. In some African nations the soil can no longer produce sufficient food to sustain the population. In other nations, agricultural land experiences low to moderate levels of degradation and there are severely degraded areas, with an increasing concern over global food security (Eswaran, 1999). Soil degradation has affected about one-third of the world's agricultural soils, particularly soils less suitable for cultivation that are used for agriculture, grazing, and other purposes (GLASOD, 1990). The GLASOD study demonstrates that land use systems in all ecoregions and in most countries are affected, although the impacts differ depending on the type, the severity and the areal coverage.

Economic, engineering and scientific approaches to environmental management have generally been unable to prevent the deterioration of many of the world's ecosystems. Degradation of soil and land is a key contributor to ecosystem dysfunction. The lack of integration has inevitably led to simplistic solutions that are generally based on the belief that all-powerful technologies can deal with the problems after they have occurred. The development of environmental law and policy to manage soil, which is based on the fundamental principles of ecology, includes provisions that consider the key threats to the soil, is an important part of the land use decision making process.

Ecosystem health

The main driving forces that lead to unsustainable soil has been summarized by IBSRAM (1997) as being: population growth and distribution; poverty and income disparity; inappropriate legal systems and institutions; environmental degradation, and climatic change. The consequences for land use occur from higher demands for more food production, the need to expand and intensify the use of arable land, to prevent and reverse land degradation, and to balance agricultural and non-agricultural land use. A number of solutions have been proposed, including using more productive and efficient land use systems, restorative and conserving land use systems, using more socially and culturally acceptable land use systems, and applying adequate supportive policy and land use regulations.

The concept of ecosystem health is not hard to grasp. Individuals know, from personal experience, what it means to be dysfunctional and are educated about the process of general screening, diagnosis, monitoring of signs, and other phases of health care. There is a very similar process that is applicable to evaluating ecosystem condition and the implications are similar. Ecosystem health can be defined in an operational manner and assessments of health status can be based on objective criteria. Also, the systematic diagnosis of ecosystem condition is possible and the careful study of the etiology of ecosystems under stress can yield early warning indicators of ecosystem degradation. Ecosystem health practice requires not only diagnostic and curative capabilities but also preventive measures (Rapport, 1998). The deterioration of ecosystems, both quantitatively and qualitatively, has defined a goal of ecosystem health. Economic activity, social organization, and human health maintenance are all tied closely to the viability and health of ecosystems (Rapport et al., 1998). Their continued degradation threatens the future of the entire human community. There are direct linkages between threats to human health, a relationship that underscores the critical

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importance to society of fostering ecosystem health (UNEP, 1996).

Sustainable land management

Sustainable development has been interpreted in many ways (WCED, 1987; IUCN 1991). The past two decades have witnessed a remarkable growth in the number of bilateral and multilateral conventions concerning the environment (UNEP, 1996), and special reference has been made to the role of "ecologically sustainable development" in the prevention and control of soil degradation. Following the publication of the *World Conservation Strategy* (WCS) (IUCN, 1980), as a plan of action for governments and public bodies around the world, many nations prepared national conservation strategies to address environmental degradation and resource depletion. The WCS identified a range of priorities and actions designed to achieve three key objectives, including: the maintenance of essential ecological processes and life-support systems, the preservation of genetic diversity, and the sustainable use of species and ecosystems. Other major environmental strategies to follow were, the World Charter for Nature (UNEP, 1982a), the World Commission on Environment and Development (WCED, 1987), Caring for the Earth (IUCN, 1991), Rio Declaration on Environment and Development (United Nations, 1992a), and Agenda 21 (United Nations, 1992b). It has been acknowledged that a wide range of land management programs, policies, educational initiatives and national and local laws are necessary to successfully achieve a goal of sustainable land management (Hannam, 1998a; Blume et al., 1998).

The definition of sustainable land management is: "land management systems that combine technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns to satisfy the five pillars of sustainable land management". Five main pillars of sustainable land management have been described, and these are, to maintain or enhance production, to reduce the level of production risk, to protect the potential of natural resources and prevent degradation of soil and water quality, to be economically viable, and to maintain social acceptability (IBSRAM, 1997). A framework for sustainable land management is a long-term endeavour requiring the input and cooperation of many disciplines and the experiences of many experts.

ENVIRONMENTAL LAW AND POLICY

Many agrarian land laws and nature conservation laws contribute to sustainable land management (Grossman and Brussaard, 1992) and these laws are associated with native vegetation management, forest management, threatened species habitat, water management, land tenancy, pastoral land management, agricultural land use protection, and watershed management. The laws contain a variety of ecological, land use planning and statutory planning provisions, which decide the type, and intensity of land use or they can act to manage or prevent land degradation (UNEP, 1996).

Land degradation law

The main type of legislation and policy material aimed at

the control of soil and land degradation is 'soil conservation law' (Grossman and Brussaard, 1992). The early legislation focussed on land utilisation rather than land conservation (Hudson, 1995) and its effectiveness legislation was overshadowed by agricultural production price support schemes for domestic and export needs, land settlement and land development schemes, rather than for ecological objectives. However, to successfully achieve sustainable land management, it is argued that a wide range of programs, policies, educational initiatives and national and local laws are necessary. The main principal of global environmental treaties, conventions and strategies is to achieve ecologically sustainable development, combat desertification, manage forests, control the effects of climate change, and to manage biodiversity. These instruments are now used to re-assess and reinvigorate domestic and international environmental laws and policies aimed at the management of land degradation and to provide for the future sustainable use of the land. These reforms have often included a critical review of existing laws and policies and the review of national social, cultural and economic plans and policies. Alternative environmental legislative models are often developed, and discussion papers and multi-disciplinary forums have been assembled to guide the development of the legislative context and format (Hannam, 1998a,c).

Ecological philosophy

Reasonable global and national information exists for nations to commence a legislation and policy reform program. The approach taken will depend ultimately on factors such as the form and success of existing soil and water conservation law, existing policy material, attitude to environmental law and policy reform in general, the experience available, and the existence and strength of a soil conservation institution. The success of reform ultimately depends on the level of community support and the political willingness for change (Hannam, 1992; UNEP 1996; Hannam 1998a,b). Adoption of an 'ecosystem conservation' attitude will help determine the direction of a reform process (Hannam, 1998a). A change in attitude will ultimately depend on the willingness of society to accept ecological values in a legal and policy system to manage land degradation. Essential changes will include the recognition of natural rights for soil, adoption of a public trust doctrine, adopting the principles of ecologically sustainable development and sustainable land management, and recognising the precautionary principle and the conservation of biological diversity (Commission on Environmental, Law 1995). Areas for improvement and consideration in the legislative reform include: 1) an interdisciplinary and ecological approach to research that encompasses a broad range of system components, including socio-economic aspects of human involvement in these ecosystems, 2) a capability to undertake research, development and extension of sustainable land management - bridging the gap between research, extension and farmers, 3) monitoring changes in sustainability of agro-ecosystems which review the impact of current and improved policies on land resources, and 4) adapting existing technologies and improved practices which

meet sustainable land management criteria.

Australia

Each Australian state and territory has soil conservation legislation and policy (Bradsen, 1988) and two of the states have approached their legislative reform by developing a hierarchy of integrated legislation, generally covering vegetation, soil, and catchment management law, linked by over-arching environmental planning and assessment legislation. This regime of legislation is supported by environmental policies regarding management of threatened species, coastal land, wetland and soil. In South Australia, the *Pastoral and Land Management and Conservation Act, 1989*, the *Soil Conservation and Land Care Act 1989*, and the *Native Vegetation Act 1991*, combine to manage soil and land degradation. New South Wales has the most comprehensive legislative system, made up of the *Soil Conservation Act, 1938*, *Catchment Management Act, 1989*, *Native Vegetation Conservation Act, 1997*, *Environmental Planning and Assessment Act, 1979*, *Threatened Species Conservation Act, 1995*, and the *Protection of the Environment Administration Act, 1992* (Hannam, 1998a). The self-regulatory and voluntary provisions encourage a "whole of property" conservation approach, and include property management plans, agricultural land use codes of practice, and regional environmental management plans. The integrated legislative regime is supported by numerous community support projects. Some are provided for under the legislation (e.g. catchment management committees), but many projects are organized under national programs (e.g. Landcare and the Natural Heritage Trust), that allocate funds to control and manage inland and coastal land degradation problems, and for catchment planning, native vegetation conservation, coastal dune stabilisation, riverine restoration, and property management.

Iceland

Iceland introduced a soil conservation law; *Log um landgrædslu*, in 1965 to combat serious soil erosion in the pastoral lands. Land degradation has now reached an extreme level and is considered the most severe environmental problem in Iceland. The national land degradation survey undertaken between 1991-1996 reveals that 52% of the country is severely degraded (Arnalds, 1998; Arnalds, 1999). The soil conservation law contains provisions to prevent soil erosion and vegetation degradation, to manage stock and restore land, but excludes the support provisions and enforcement capabilities necessary to achieve full ecosystem rehabilitation. In 1996, Iceland commenced the move towards holistic ecosystem management, guided by sustainable development principles (Hannam, 1996). This started with a review of the legislation and existing policy, followed by consultation with land use associations and farmer groups, a review of international environmental law, policy and strategies, international consultation, and preparation of material for institutional and government review (United Nations, 1994). The objective is to improve the capability of the environmental law and policy to deal with ecosystem decline, and to integrate traditional soil conservation practices with sustainable land

management regimes (Hannam, 1996). The national land degradation survey is used to frame new land use policies and the legal parameters of sustainable land use, based on ecological concepts and principles. Changing views of the public to land management has resulted in the environmental impact assessment of degraded areas and stockowners are offered incentives to remove animals from degraded land. Forestry has been accepted as a land use alternative to agriculture in some areas but the total exclusion of livestock, or strict control over livestock numbers is the most successful ecological tool to restore the degraded land (Arnalds, 1998; Arnalds, 1999).

Thailand

The high population density of Thailand and the requirement to maintain the economic viability of the agricultural industry has produced laws that focus on access to land, forest and water resources (Chomchan, 1988). The potential of Thailand's soil and water conservation law, the *Land Development Act, 1983*, is overshadowed by a range of laws that focus on land allocation - the *Land Code of 1954*, *Forest Act 1941*, *National Forest Reserves Act, 1964*, *Land Settlement Act 1968*, *Land Consolidation Act 1974*, and the *Agricultural Land Reform Act, 1975* (Hannam, 1998b). Land degradation problems occur in Thailand for many reasons, such as the lack of coordination in the implementation of land use policy, the lack of effective administration and management, the lack of enforcement of land use plans, the uncontrolled expansion of settlement, and the encroachment of urban uses onto high quality agricultural land (Office of Environmental Policy and Planning, 1997).

The *Land Development Act* is responsible for land use planning, implementing soil and water conservation, and investigating soil improvement techniques, and generally, for 'utilization of agricultural land'. The review of the *Land Development Act* in early 1998 resulted in a number of guiding factors for the environmental law reform. The principal factors were found to be the existing and potential land utilisation problems, the type, distribution and status of soil and land degradation, existing institutional structure, technical expertise and capabilities. Other complicating factors included land tenure, land administration and land rights. There was also the many socio-economic aspects of agriculture, how the community perceived agriculture as an environmental issue, the general inadequacies of the *Land Development Act*, and the relationship between Land Development policy and Thailand's policy for the enhancement and conservation of national environmental quality (Office of Environment Policy and Planning, 1997; Hannam 1998b).

The key features of the draft 'sustainable land management' legislative and policy model are to create a duty of care to land conservation, to enable land resource evaluation and soil degradation mapping, to implement resource plans, and to prepare resource policy. Other important sustainable land management considerations include property agreements with landowners; community involvement in soil conservation planning and decision-making and provisions to develop and implement formal education programs on sustainable land management and

conservation techniques. The merits of developing a law that deals with management of natural water catchments as an integrated whole has also been canvassed (Wongbandit, 1996; Ministry of Science, Technology and Environment, 1996).

SELECTED SOIL AND WATER CONSERVATION LAW REGIMES

A number of environmental law regimes in aspects of the environment other than land degradation can also be considered as good alternative models for legislation and policy to manage land degradation. Many of these have an ecosystem-based approach.

Soil and water conservation law

The Chinese Legislative of Yuan introduced the *Soil and Water Conservation Law* in 1994 to carry out soil and water conservation, preserve soil and water resources, rehabilitate land, and to promote the rational and proper use of land. Soil and water conservation has a broad meaning under this act, covering the application of engineering and agronomic technology to conserve soil and water resources, preserve the ecological landscape, and prevent soil erosion, landslides, and debris flows from extreme climatic events. Soil and water conservation zones can be designated over reservoir and watershed areas, major river basins and coastal areas to preserve natural ecology.

A compendium of environmental law and policy

The Government of Mongolia undertook a major environmental law reform in 1990 including the law of the land, protected areas, water, forest, wildlife, and native flora resources. The *Law on Land* regulates the possession, use, and other related issues of land by the people, economic entities and organisations. The *Environmental Protection Law* regulates the inter-relations between the state, citizens, economic entities and organizations, with a guarantee for the human right to live in a healthy and safe environment. It aims for an ecologically balanced social and economic development, the protection of the environment for present and future generations, the proper use of natural resources, including land restoration and protecting land and soil from adverse ecological effects (Ministry for Nature and the Environment, 1966). There are provisions that enable the development of state and local rights on environmental protection; environmental protection rights and obligations of citizens; environmental carrying capacity; to specify the maximum level of natural resources use; to provide for ecological training and education; to specify state environmental guidelines and principles; and to provide for environmental assessment, databases and research and financing. National policy to protect ecologically significant aspects of the environment and to restore natural resources is prepared under the *Environmental Protection Law*.

Integrated environmental law and policy

New Zealand undertook a major environmental reform program in the 1980's, leading to the *Resource Management Act, 1991* (RMA). The RMA integrates environmental protection and conservation provisions with the

environmental planning and resource management regime, an effective way of defining land uses which have the potential to cause soil or land degradation problems (Williams, 1997). The RMA controls resource use and the procedures to conserve natural and cultural heritage. It provides a framework for national and regional policy making, and the national integration of natural resource management. Operational responsibilities for land management and standardization of procedures to prepare planning instruments and resource consent reside with 14 regional government councils. A priority of the RMA process was the development of the *Sustainable Land Management Strategy for New Zealand* (Ministry for the Environment, 1996). It focuses on control of high country degradation, soil erosion, sedimentation of river systems, soil compaction and urban run-off. Its essential elements provide for the establishment of a national land care trust, and preparation of best management practice guidelines, advisory services, research and information, and regulation.

Stratified soil and water conservation law and policy

Most state and local resources conservation laws in the United States of America evolved from the *Soil Conservation Act 1935*, and the *Standard Soil Conservation District Law 1937*, becoming the model for state and local resources conservation laws. Many laws in the United States now have a role with land degradation prevention and control, water quality management, groundwater protection, rangeland management, wetlands protection, prime farmland protection, wildlife habitat protection, and regulating farm input products. State resource conservation laws are responsible for conservation policies, soil conservation programs, allocation of funds, and provision of technical and educational assistance. They also serve as a legal bases for the resource policy of the local governments who are authorized by the state governments to enact laws, regulations and rules and ordinances for natural resources conservation. The county or local laws are consistent with a state's statutory requirements and limitations, though some may allow for more flexibility in implementation. State soil and water conservation district Laws create the soil conservation districts that assist the Federal government and states implement conservation in the local districts (USDA, 1996; Tran et al., 1997).

Sustainable Soil Instrument

Since UNCED in 1992 there has been growing interest to prepare a global soil instrument, for the benefit of all nations, to bring together into one principal policy source the essential guidelines and rules for the sustainable management of soil (United Nations, 1992b; The Tutzing Project, 1998). The general role of a global instrument is to set out the objectives, fundamental principles, and common concerns for humanity, rights to development, consumption patterns, and general obligations expected by all states in the conservation of soil. Such an instrument would provide the legal framework to support the objective to control soil and land degradation, create an agreed set of fundamental principles (like a 'code of conduct') to guide states,

institutions and individuals, and consolidate into a single framework the vast body of widely accepted but disparate principles of 'soft law' associated with soil conservation. The instrument will facilitate institutional linkages between existing treaties and their implementation, fill in gaps in international law by creating a global context for soil, make best use of scarce resources by consolidating in one instrument fundamental principles and avoiding repetition. Finally, it will set out a common basis upon which future law making efforts might be developed (Commission on Environmental Law, 1995; UNEP, 1996).

CONCLUSION

Results of recent environmental law and policy reform indicate that nations are seeking the overall goal of ecologically sustainable development through the improvement of environmental law and policy aimed at land degradation management. Some of the recent reforms indicate the change in community attitude to the ecological impact of land degradation on social and economic conditions, and to biodiversity conservation. It also recognizes that land use has ecologically sustainable limits and that legislation and policy has an important role in achieving sustainable land management. Provisions that enable a greater emphasis on regional natural resource management plans, soil and land survey requirements, community advice and scientific research, are increasing the ability of government and non-government agencies to manage land degradation within the bounds of holistic natural resource management. The introduction of the global soil conservation instrument will substantially benefit this objective.

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