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Preparation of Action Plan for Protection of Land in Albania

James G. Bockheim



Land Tenure Center

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MADISON

PREPARATION OF ACTION PLAN FOR PROTECTION OF LAND IN ALBANIA

by

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1. PROBLEM OF LAND DEGRADATION

The degradation of the country's land resources is a serious impediment to the welfare of the people of Albania as well as that of future generations. Soil erosion is a key problem that relates not only to environmental quality but also to Albania's food security. In addition, the potential for catastrophic flooding is great in Albania because of widespread deforestation, loss of soil through erosion, and sedimentation in reservoirs that reduces storage capacity. The lower coastal plain is most susceptible to flooding because many of the earthen dikes have been weakened through neglect. The pollution of soil and water and air pollution from agriculture and industry directly affect the health and welfare of the people of Albania. The uncontrolled conversion of high-quality agricultural land to nonagricultural uses undermines the capacity of the country to feed itself and generate an exportable agricultural surplus.

Resolving these aspects of land degradation requires the concerted action of governmental and nongovernmental agencies. The purpose of this document is to describe how a Land Protection Action Plan could be developed.

2. OBJECTIVE OF LAND PROTECTION ACTION PLAN

The objective of this Land Protection Action Plan (LPAP) is to reduce the rate of land degradation in Albania—and even to reverse the process.

3. TYPES OF LAND DEGRADATION

There are three general types of land degradation which this Land Protection Action Plan will attempt to solve:

1. **Excessive soil erosion.** This type of land degradation is caused by: (a) the cultivation of highly erodible agricultural land; (b) the conversion of forest and pasture land to agricultural use which is inappropriate; (c) the deforestation of fragile forested lands; and (d) the overgrazing of forest and pasture lands by cattle, sheep, and goats. The problem arises when the rate of soil loss far exceeds the tolerable level to maintain the productive capacity of land. This problem if unchecked gives

rise to others, such as the sedimentation of impoundments for hydroelectric dams and canals for irrigation systems.

2. Contamination of surface and ground water. There are three major types of contamination:

- a) **Inappropriate municipal solid-waste disposal.**
The location of municipal solid-waste facilities in rural areas will reduce the amount of agricultural land available for crop production and, if not properly located taking soil types into consideration, will pollute surface and ground water.
 - b) **Contamination of surface and ground water.**
Sediment from soil erosion, along with fertilizers and pesticides carried with soil particles, contaminates surface and ground water and reduces its quality for irrigation, industrial, livestock, human, fishing, recreational, and livestock purposes.
 - c) **Contamination of land from industrial and agricultural sources.**
Factory and mining wastes often flow onto the surrounding land and produce contamination of the soil. The pumping of wells along the Adriatic coast can produce the filtration of salt water into the aquifers which then is pumped onto the soil, producing problems of salinity.
- 3. Unguided urbanization on high-quality agricultural land.** Unguided urbanization on high-quality agricultural land is also a threat to valued land resources. The construction of homes outside the “yellow line” of cities, where over one-third of prime agricultural land is located, and village boundaries without permission is increasing, thus reducing the availability of highly productive land and affecting the ability to provide sufficient food for the country. In order to formulate a general strategy for dealing with land degradation, this factor will be included in the action plan.

4. FORMATION OF WORKING GROUP TO DEVELOP COMPONENTS OF LAND PROTECTION ACTION PLAN

A working group should be formed under the coordination of the Land Policy Department of the Project Management Unit/Immovable Property Registration System (PMU/IPRS) to develop a Land Protection Action Plan (LPAP). Other members of the working group should include specialists from the following agencies:

- (1) Instituti i Studimi të Tokave (IST, Land Research Institute);
- (2) Instituti i Studimeve dhe Projektmeve të Veprave Ujore (ISPVU, Institute for Studies and Designs of Water Works);
- (3) Instituti i Kërkimeve të Pyjeve dhe Kullotave (IKPK, Forest and Pasture Research Institute);
- (4) Instituti i Studimeve e Prejktmeve Urbanistike (ISPU, Institute for Urban Studies and Projects; and
- (5) Komiteti i Mbrojtjes së Mjedisit (Committee for Environmental Protection in the Ministry of Health).

Each institutional member of the working group should be assigned responsibilities relating to the particular type of land degradation in which it has expertise. For example, the Land Research Institute would be responsible for soil analyses, documentation of high-risk areas, and contamination

of the soil, while the Institute for Studies and Designs of Water Works would be responsible for documentation of sediment in channels, streams, rivers, and lakes and water quality analyses. The Forest Research Institute would be responsible for elucidating problems relating to deforestation and overgrazing. The Institute for Urban Studies and Projects would be responsible for documenting the problems of uncontrolled urbanization of agricultural land and the solutions to this problem. The Committee on Environmental Protection would be responsible for describing and proposing solutions for the land pollution problems.

Personnel of the various Ministry of Agriculture and Food (MOAF) directorates and enterprises in each district and from the Ministry of Construction and Tourism and the Academy of Science can provide much of the staff to perform the work and the MOAF district laboratories can provide the analyses.

Representatives and advisory personnel will be invited to participate in the activities of the working group as needed from the following agencies:

- (1) Soil and Water Directorate of the MOAF;
- (2) Fisheries Division, Directorate of Natural Resources, MOAF;
- (3) Directorate of Forestry and Pastures, MOAF;
- (4) Directorate of Livestock, MOAF;
- (5) Legal Office, MOAF;
- (6) Ministry of Construction and Tourism, various departments;
- (7) Ministry of Health;
- (8) Ministry of Interior (Local Government);
- (9) Agricultural University of Tirana;
- (10) University of Tirana;
- (11) Agricultural University of Korça;
- (12) environmental nongovernmental organizations;
- (13) municipal, district, and commune local governmental organizations;
- (14) farmer organizations; and
- (15) international organizations and projects (IFDC, FAO, Extension, SARA, and the like).

Advisory committees of the working group should be formed to become involved with specific types of degradation and organizational, legal, and institutional issues. Such committees can be composed of a few members of the working group in addition to representatives of the agencies collaborating with the working group, such as municipalities, prefectures, districts, communes, villages, and farmers. In addition, the advisory committees to the working group, without members of the working group on it, would consist primarily of persons with professional expertise. These committees may also consist of local government and farmer representatives. Committees must seek the active participation and input of local government representatives and farmers.

5. STEPS TO BE TAKEN TO PREPARE ACTION PLAN

5.1 DETAILED DOCUMENTATION OF PROBLEMS

The first step in the development of the LPAP is to determine the various types of land degradation and then to document the nature, extent, and geographical location of the problem. For example, it

would be of priority to determine the rate of sedimentation in irrigation and drainage canals and reservoirs; amount of soil erosion; rate of erosion; salinization hazards; effects of sediment, plant nutrients, and pesticides on surface and ground water quality; rate of deforestation; erosion rates from deforested land; potential loss of agricultural land from locating solid waste disposal facilities in rural areas; and rate of housing construction in rural areas and the potential loss of prime agricultural land.

5.2 IDENTIFICATION OF HIGH-RISK AREAS

A second step in the development of the LPAP is to identify the geographic areas of highest risk for the various types of land degradation. For example, it would be important to identify the high-risk erosion areas and areas where the quality of surface water is dramatically reduced from sedimentation, plant nutrients, and pesticides. Areas of high risk from flooding due to sedimentation of the drainage canals should be identified. The rate of erosion and sedimentation in these identified high-risk areas should be documented.

The former Ministry of Health and Environmental Protection (1993) depicted generalized “hot spots” of degradation on a sketch map that was accompanied by tables showing the severity of each form of environmental degradation by district. The most important localities that need to be addressed as a priority are Elbasan, Vlorë, Fier, Ballsh, Kukës, Rubik, Laç, and Tiranë. The World Bank-supported study has identified areas of severe erosion on a 1:200,000 scale map. However, detailed maps of soil erosion and other forms of land degradation are needed on 1:50,000 scale maps for each district and smaller-scale maps are essential for depicting high-risk areas. For each district the International Fertilizer Development Center has digitized soil maps that could be used as base maps. In each prefecture the CEP has located environmental inspectors who could provide data and expertise to refine the delineation of high-risk areas.

Concerning uncontrolled urbanization, it is clear that the Tirana-Durrës-Elbasan triangle is the most affected, though the degree of the problem in other urban centers should be assessed.

5.3 IDENTIFY AND CARRY OUT NEEDED RESEARCH ON LAND DEGRADATION

There is a need for research to protect Albania’s natural resources. Air, soil, and water quality should be monitored on a routine basis. Air pollution is generally restricted to several industrialized urban areas, notably Kukës, Rubik, Laç, Elbasan, Tiranë, and Vlorë. Air monitoring should detect gases such as sulfur dioxide, sulfuric acid mist, carbon monoxide, ammonia, nitrogen oxide, and hydrocarbons as well as particulates (dust, soot, and ash), all of which affect human health. A limited amount of this type of research is being done by the Institute of Hygiene and the Faculty of Natural Sciences at the University of Tiranë.

There is no comprehensive monitoring program for water quality, including surface water (reservoirs, lakes, rivers, and irrigation channels) and ground water. The Hydrometeorology Institute is monitoring water quality at the points of discharge of six of Albania’s major rivers into the Adriatic Sea, including biological oxygen demand, heavy metals, and suspended solids. Surface water and ground water pollution is due to industrial discharges, particularly by the mining industry, the use of agrochemicals, especially during the previous collective government, and the lack of on-site small-scale waste water disposal. Surface water quality is impacted by mining of river basins and disposal of municipal solid waste directly into rivers and the Adriatic Sea. Monitoring of surface water quality

should be done at Durrës (agrochemical), Rreshen, and Tiranë (industrial and domestic discharges), and Fier and Vlorë (industrial and mining discharges). Virtually no studies have been done of ground water quality. Ground water monitoring studies should be initiated at Fier, Tiranë, and Vlorë. These studies should be done cooperatively by the Hydrometeorology Institute and the Land Research Institute.

Soils have been contaminated by indiscriminate application of agrochemicals (pesticides) and poor irrigation practices which have led to a build-up in salts (salinization) during the previous regime. Moreover, heavy metals have accumulated in soils from industrial pollution. Soil monitoring should be done in the following districts: Vlorë (salts), Durrës (pesticides), and Fier, Tiranë, and Vlorë (heavy metals).

An effective way to integrate these and other studies would be to examine the fluxes of water, particulates, and dissolved chemicals in a watershed that features multiple-use activities. For example, the Drini watershed features pristine conditions in its mountainous headwater zone (a control area). However, deforestation and overgrazing in the hilly zone of this watershed have led to excessive soil erosion; industrial pollution due to mining has occurred near Kukës; and agrochemical pollution due to intensive agriculture has occurred in the coastal plain near Lezhë. A study of this watershed would demonstrate to the Albanian public the dangers of land degradation and would also demonstrate to Albanian scientists the importance of the multidisciplinary approach to the solution of regional and national environmental problems.

Applied research that is needed to improve the productivity of agro-ecosystems include: (1) alternatives to the gravity system of irrigation, (2) ways to maintain drainage channels in reclaimed areas of the coastal plain, and (3) farming system approaches to avoid soil erosion.

Applied research is also needed to clearly identify and map the high-quality agricultural land surrounding urban areas as well as the location of the yellow lines.

5.4 DESIGN EDUCATIONAL PROGRAMS

The fourth component of the LPAP should be an educational program to teach farmers and the general public of the types of land degradation, their causes, the extent of the problems, their effects on the welfare, health, and safety of all people, and the methods for prevention and protection of the environment. The general public should be educated on the prevention of land degradation because public support is necessary for an effective land protection program.

An important component is the need to educate Albania's 500,000 new farmers in land protection, especially in minimizing deforestation and soil erosion, maintaining drainage and irrigation channels, and avoiding contamination of surface and ground water with agrochemicals and soluble salts. The same applies to urban dwellers regarding issues such as the loss of prime farmland and proper waste disposal. The second component of an educational program is a public environmental awareness program that addresses all issues of land protection for persons of all ages.

Perhaps Albania's greatest need for land protection is a comprehensive agricultural extension program. During the collective era, technical information was transferred from research institutes to the managers of the state or cooperative farms. With privatization and land fragmentation, there is an even greater need for an extension program. There currently are two proposals for an Albanian agricultural extension program. The USAID-sponsored Study for the Agricultural Reorganization of

Albania (SARA) recommended a complete restructuring of the Ministry of Agriculture and Food (MOAF). Under this plan, there would be a separate institute for agricultural extension which would maintain close linkage with the Agricultural University of Tiranë.

An extension program within the MOAF has been developed by the European Community (EC/PHARE). This program began in September 1994, with pilot extension programs in six districts containing an abundance of arable land; the program was later expanded to twelve districts. The goal of the program is to train farmers in cropping patterns and economics. Although participants are not working specifically on the issue of land protection, a priority of the program is protecting against soil erosion. EC/PHARE is cooperating with Mr. Vangjo Kovaçi at the Land Research Institute on a soil erosion demonstration study. Similar demonstration programs could be organized to demonstrate the effects of desalinization on crop production and composted municipal solid waste on maturation of fast-growing, hybrid tree species that would eventually be used for firewood.

The potential for agroforestry should be explored in Albania. EC/PHARE has begun preparing leaflets describing good farming techniques. The staff is willing to distribute leaflets developed by LPAP on land protection. EC/PHARE is also preparing instructional manuals for use in two-year vocational-agriculture schools and would welcome the addition of an instructional manual on land protection to the curriculum.

At the present time there is no comprehensive public awareness program in Albania. The Ministry of Health's CEP has three directorates, one of which has responsibility for developing a national information system that includes environmental education *and* an environmental impact assessment program. With only one staff member, the directorate clearly is understaffed. To be effective, an environmental awareness program must reach children of all ages as well as adults. There is no environmental education curriculum in Albania's public schools. The U.S. National Science Foundation "Bottle Biology" program is an example of an approach that recycles plastic 1.5-liter bottles for demonstrating principles of biology and environmental protection. Costa Rica has developed a model program for educating children in protecting the environment. An environmental awareness program should take advantage of the value Albanians' place on printed material (newspapers and magazines), radio, and television. With the assistance of the Ministry of Education or a private photographer, the LPAP Working Group could produce a video depicting the problems of land degradation and the need for environmental protection in Albania. Workshops and seminars could be coordinated by the Agricultural University of Tiranë and Korça University.

5.5 REVIEW AND PREPARE LEGISLATION

5.5.1 Examine existing legislation for adequacy in land protection program.

Existing laws in Albania relating to land and the environment should be examined to determine their adequacy to protect the land and other elements of the environment from degradation. The development of an adequate legal framework is particularly important prior to the establishment of an active land market, so that people who become landowners are aware of the responsibilities toward the land as well as their rights of ownership.

The law "On Environmental Protection," approved by Parliament in January 1993, was derived from an analysis of legislation in European countries with consultation from the World Bank and the United Nations Environmental Programme (UNEP). The new law's goals are prevention and

reduction of pollution, conservation of biodiversity, rational management of natural resources, avoidance of overexploitation, ecological restoration of damaged areas, and maintenance and improvement of the environment. The law requires an environmental impact assessment (EIA) for all projects and activities that could have significant impacts on the environment and human health. The degree of effective implementation of this law and its problems should be assessed.

Another piece of legislation, the Law on the Construction, Administration, Maintenance, and Operation of Irrigation and Drainage Works (Law No. 7846) apparently has adequate provisions for the protection and maintenance of both irrigation and drainage systems. Under this law drainage channels are to be cleaned and maintained to prevent land flooding; however, the law does not provide adequate protection of those channels from sedimentation.

The Law for Forestry and Forest Police Service (Law No. 7623) apparently provides adequate protection of forestlands from further deforestation, soil erosion, and livestock overgrazing. However, the means for involving local communities in the protection of forestlands are not clearly identified.

Provisions are also included in the Law on the Land (Law No. 7501) on the protection of land from soil erosion and housing developments in rural areas; however, these provisions are insufficient for adequate protection.

5.5.2 Prepare needed legislation.

A subsequent step to be taken by the working group in the development of the LPAP is to develop legislation protecting land from degradation. For example, it is likely that the working group will identify the need for developing a Soil and Water Conservation Law that includes provisions for controlling soil erosion and preventing surface and ground water pollution from sedimentation, nutrients and pesticides resulting from soil erosion. Such a law should involve both the national government and local governments in soil erosion and water pollution control programs, with responsibilities assigned to both levels. In the law the national government should (1) establish tolerable soil loss goals and a time schedule for attaining those goals, (2) provide nationwide administration of the soil erosion and water pollution control program, (3) create a soil erosion control and water resource management plan, and (4) assign responsibilities to local governments and permit them to adopt regulations. Local governments should be required to create a soil erosion control and water resource management program for their territories, in which they indicate how they are to meet the national goals, and be permitted to adopt local soil erosion control regulations. The adoption of local regulations may be made mandatory or voluntary with voter approval depending upon the desires of the People's Assembly when adopting the law. Such a law and local regulations would also protect against sedimentation in surface water.

Another likely piece of legislation is a regionally oriented Land Use Planning and Zoning Control Law to prevent land degradation from housing developments in rural areas and assist in locating solid waste disposal facilities.

5.6 DEVELOP INVESTMENT PROGRAM FOR LAND PROTECTION

Public resources as an investment in the future will be needed to resolve the different types of land degradation by sharing the costs with the owners of land or enterprises. It will also be necessary for

the owners of the land or enterprises where degradation is most severe to share in the costs of correcting the deficiencies. The Land Protection Action Plan should develop a procedure for identifying the needed investments for land protection and for mobilizing the necessary public and private resources. Some examples of incentives which might protect and restore the quality of the land resource and which might be included in the LPAP are:

Deforestation. Tree seedlings could be offered at minimal cost to farmers for reforestation about 100,000 hectares of highly erodible land cleared during the previous administration.

Soil erosion. Communities could be encouraged to form “Soil and Water Conservation Komunas.” The government would share the cost of fertilizers and mechanical equipment with *komunas* adopting soil and water conservation practices such as contour plowing, strip cropping, grassed waterways, and minimum tillage. In addition, tax breaks could be given to farmers for seeding and not cultivating or overgrazing highly erodible land.

Inadequate drainage of former reclaimed land. There is some question as to whether land that was reclaimed in the lower coastal plain during the previous administration should be rehabilitated because of the high cost of maintenance of drainage channels and replacement of pumps and the interest by environmental groups in restoring these wetlands for migratory wildfowl. If the government chooses to invest in rehabilitation of these lands, a *komuna*-coordinated program could be initiated for regularly cleaning the channels using government-supplied equipment. It may be appropriate for the government to bear the cost of pump replacement.

Salinization. Approximately 13,000 hectares of soils have become salinized because of a rising water table enriched with seawater and repeated irrigation with salty water during the past regime. Free soil testing for soluble salts (a simple test using an inexpensive conductivity bridge) could be offered; gypsum, used in the remediation of these soils, could be made available at a nominal cost.

Municipal solid waste disposal. An expert on modern options for municipal solid waste disposal should be contracted as soon as possible so that a comprehensive energy conservation and recycling program can be devised. Recycling plants established by private enterprise with some governmental support would recycle aluminum, ferrous metals (especially abandoned automobiles), paper products (newspapers, corrugated cardboard, and office paper), glass, plastics, and discarded tires. For example, the paper products could be composted and sold to farmers at a small cost as organic fertilizer. The discarded tires could be shredded and used with asphalt for constructing roads.

Contamination of soil and water by agrochemicals. Proper use of agrochemicals will come only from extension programming. Awards can be given to farmers using “best management practices” (BMPs) that avoid soil and water contamination by pesticides and chemical fertilizers.

5.7 LIS FOR MONITORING EVOLUTION OF DIFFERENT TYPES OF LAND DEGRADATION

Detailed information has been collected on Albania’s natural resources. In addition, high-quality maps exist for forest, topographic, climatologic, and hydrologic resources. Aerial photography covering the major urban centers of the country was performed in 1994. However, few of the data have been digitized, and few reproducible maps have been prepared that depict the potential and actual extent of land degradation, particularly the high-risk areas. Much of the data are presently stored in notebooks that remarkably survived the 1990–1991 government reform. Accordingly, it is essential that these

data be scanned and archived on computer. This will necessitate that the number of computers be expanded for LPAP-cooperating institutes, that networking capabilities be established for upgrading information files electronically, and that a Land Information System (LIS) be established in the MOAF, possibly in the Soil and Water Directorate. A geographic information system (GIS) will be needed to prepare a base map. The GIS would be used to construct maps from the electronically stored data that show the geographic distribution of various forms of land degradation, especially areas of high risk.

6. IMPLEMENTATION OF ACTION PLAN

The Land Protection Action Plan should lay out a timetable of activities and financial requirements. The following ideas might be further developed for the soil erosion control and water protection component of the action plan.

SOME PROPOSED ACTIVITIES

Action time frame	Equipment and facilities	Research	Extension	Legislation
Immediate	Computers, laboratory equipment & supplies; internet; CD-ROM abstracting service	1:200,000 national maps of land degradation & high-risk areas	Leaflets on deforestation, overgrazing, & soil erosion	Land use & land protection
Short-term	Geographic information system (GIS)	Scan & archive natural resource data	Video program on land degradation	Land market
Intermediate	Laboratory rehabilitation (LRI)	1:50,000 district maps of land degradation & high-risk areas; monitor air, water, & soil quality	Workshops & seminars; manual on land protection	Environmental pollution control standards
Longer-term	Office & further laboratory rehabilitation	Watershed study	Primary/secondary environmental awareness program	Rehabilitation of damaged land; toxic waste cleanup

ANNEX 1 URBANIZATION ON HIGH-QUALITY AGRICULTURAL LAND

The most often heard cause of agricultural land degradation during discussions while in Albania was the construction of homes on prime farmland or the conversion of agricultural land around cities to housing developments. Nearly 34 percent of the class I and class II (prime) land in the country is located in districts containing the six largest cities. The construction of homes and other buildings on prime agricultural land outside the yellow line of cities and village boundaries without permission is increasing, thus reducing the availability of highly productive land and affecting the future ability of farmers to provide sufficient food for the country.

One of the research areas that the Land Research Institute has developed in cooperation with the PMU/IPRS is to identify land uses around cities to determine what has happened to the agricultural land that formerly was in the possession of cooperative and state farms. There appears to be three different situations under which housing construction is taking place on agricultural land. One situation is where the former owners of ex-state farm land, which has been distributed to former workers for use, are illegally building homes or the former owners are illegally selling that land to persons other than those given the land for use and the new owners are building homes. Some of the land given to former owners for use is not being worked by them for various reasons. In another situation, some of the agricultural land near cities, particularly around Tirana, that was not previously owned by individuals has not been distributed to farmers; it remains state-owned property. Families from different parts of the country are migrating into the areas and illegally building houses on this state land. Under the third situation, farmers who have received agricultural land that is distant from their present homes are building new homes on that land for protection purposes.

Housing development and business construction activities will continue to increase in Albania as land is being privatized. Urban and rural land-use planning and regulations, such as zoning, must be initiated to minimize loss of valuable agricultural land close to urban areas and to avoid haphazard urban growth and land speculation. Changes in present land use rules and regulations may be necessary to meet the need for more housing, new businesses, and accompanying infrastructure such as roads, streets, and water and sewage facilities; to avoid degradation and contamination of land, water, and air; and to minimize loss of valuable agricultural land. An assessment must be made to determine existing land use planning activities, authority, and rules and regulations to implement plans with regard to urban, agricultural, housing, construction, business, industrial, and public uses. There is an Urban Land Use Planning Law, but not one relating to such land.

Planning is necessary for the orderly development and use of land. While land use planning has economic and social effects and economic and social matters are taken into consideration when planning, land use planning *per se* is concerned primarily with the physical environment. It deals with the location of land uses, activities, and structures, such as agriculture, industry, manufacturing, commerce, business, residential, and public facilities and buildings, in reference to other uses, activities, and structures. Policies relating to planning and regulations seek to balance urban, industrial, agricultural, and public use of land and other land resources; to respect local community needs and interests; and to improve quality of life in urban and rural areas. Zoning is the principal regulatory tool employed in planning.

Local planning in some instances can create conflicts between local governments or political subdivisions that have overlapping jurisdictions as well as between neighboring municipalities that are part of a suburban or metropolitan area. To solve these conflicts laws should be designed to promote regional land-use planning which is more conducive to situations encompassing large land areas comprising portions of two or more local governments or political subdivisions. Regional land use planning may be necessary when planning within a metropolitan area is not possible without accounting for the circumstances of all the separate communities making up the metropolitan area. Many cities of any size have suburban or satellite communities. To plan only for the central city, without considering the situation of suburban or satellite communities, makes no sense. Consideration should be given to regional land-use planning for the Tirana area because of its size and for the Durrës area because the city is Albania's major seaport.

The end result of the land use planning process is the preparation of a "master plan," "comprehensive plan," or "general land use plan" [hereinafter referred to as a master plan], which is a long range guide for the development or use of the whole area in question by the planning commission or other administrative body. A master plan is developed after studying population trends, existing land use patterns, traffic conditions and problems, location of major business districts and commercial areas, drainage or sewage problems, location of public buildings, single family areas, and so forth. Traditional master plans take into account the location and type of activities taking place on the land and the design and type of physical structures and facilities serving those activities. Long-range projections of population and employment trends are also included in master plans. Such information serves as a prediction of physical facility needs, allocation of land to desired activities, and preservation of open space for aesthetic and recreational needs. This planning process is designed to enable a governmental entity to plan for the construction of schools, streets, and water and sewage facilities and provide fire and police protection and other public services. Zoning, subdivision, and local regulations controlling private use of land are enacted in compliance with the master plan. They are an exercise of the police power residing in a government to regulate the advancement and protection of health, morals, safety, and general welfare of the community.

Several articles in the Law on the Land, Law No. 7501, dated 19 July 1991, relate in some way to land use planning and regulations or controls on certain land, particularly agricultural land, in both urban and rural areas of Albania. The purpose of the Law on the Land is to divide the land in the country into categories, divest certain land from state ownership, and privatize the land. Under Article 1, the land is divided into three categories: (1) agricultural land, irrespective of size and regardless if it is located in the countryside, villages, cities, or other inhabited areas; (2) forest, pasture, and meadow land; and (3) nonagricultural land. Article 2 grants state-owned land to physical (individuals) or juridical (legal entities) persons who enjoy the rights of ownership; however, those rights do not include sale and purchase. Article 3 provides that state-owned agricultural land is given in ownership or for usufruct (use) to local (Albanian) physical or juridical persons. However, Article 5 restricts the divestiture and privatization of state-owned agricultural land to that in cooperative farms by stating such land is given to families that are members of the cooperatives. Agricultural land in cooperative farms can, as previously stated, include land used for agricultural purposes in villages, cities, and other inhabited areas. Portions of land in former state farms now come under the Law on the Land by virtue of Council of Ministers Decision No. 452, "For Restructuring State Agricultural Farms," dated 17 October 1992.

Article 11 of the Law on the Land maintains that agricultural land received in ownership or in use must be kept in agricultural production and those local physical and juridical persons receiving it are obligated to preserve and increase its productive capacity and to develop systematic plans for its protection. Article 14 restricts the construction of buildings and other projects on agricultural land to only those for agricultural and livestock purposes and then only in accordance with regulations specified by the Council of Ministers. The Council of Ministers, therefore, has some opportunity for establishing land use controls over the construction of buildings and other projects on agricultural land.

Article 4 of the Law on the Land provides that foreign physical or juridical persons may lease land to build on, with the purposes and terms of use defined by special contract. This article prohibits the ownership of land by foreign investors, but it does permit their leasing land. More importantly, from a land use planning and regulation or control standpoint, the future use of that leased land must be defined in a special contract, which would be the lease instrument. Such a lease instrument could contain some land use regulation or control provisions.

The location of all new buildings not used for agricultural and livestock purposes is controlled under Article 13 of the Law on the Land, which says, "Dwellings, houses, economic, sociocultural and any other type of building are built within a border line (the 'yellow line')." This means that all new buildings must be constructed within the established boundaries of cities, towns or villages, or other areas established for such purposes. A second paragraph of Article 13 states, "Land for construction is given with or without remuneration (payment) according to the criteria set by the Council of Ministers." The Council of Ministers has the opportunity not only to establish criteria on remuneration or payment but to establish land use criteria, such as location, type of use permitted, type of buildings or construction permitted, size of the buildings, and number of residents if dwellings. Article 13 adds, "It is prohibited to build any type of project outside the settlement border (the yellow line) without special decision of the respective competent organ."

Building and construction plans must be approved under Article 18 of the Law on the Land, which states, "With the proposed approval of the draft proposal and area of construction by the respective organ (agency), the land is given as ownership or for use to those who carry out the construction, but not before three months after work has begun. The change in the land registry is made when construction work begins." The government agency could establish standards, such as building regulations or codes, upon which to base approval of the draft proposal; however, those standards must be published and be uniform.

Land use planning and controls for environmental purposes are contained in Article 17 of the Law on the Land, which says, "Industrial waste, mining refuse and waters containing chemicals harmful to agriculture must be channeled and gathered in special places in order to protect the land and plants, prevent water pollution and not endanger the life of people, animals and poultry." The location of such places and the area where a project is to be built need approval. If approval is not given, no construction nor functioning of the project can begin.

The Law on the Land also has articles that provide methods for enforcing the land use planning and controls it mandates. Article 16 states, "When juridical or physical persons [who] get land as ownership or in usufruct (use) for construction or other economic activities do not respect terms for completing the project according to prior agreement, they are obliged to pay an amount equal to the average annual rent of the land." Article 21 says, "The organs of local state power in the relevant

jurisdiction shall prohibit every trespass and misuse of the land within their jurisdiction that is contrary to this law and other relevant regulations.” If a trespass or injury to the land is observed, the members of the people’s councils of the relevant jurisdiction, owners or users of the land, officials in the land survey office, jurisdictional urban planning staff, or police in charge of public order are obliged to issue a complaint and the offender is asked to return the land to its former state within three days. Continuing, Article 21 provides that if the offender fails to comply, the government may eliminate the trespass and return the land to its former state at the offender’s expense.

RECOMMENDED LEGISLATION

The People’s Assembly of the Republic of Albania should enact legislation enabling the people’s councils of districts, communes, municipalities, towns, and villages to plan and regulate or control the future use of land within their relevant jurisdictions. Legislation enacted by the People’s Assembly would not order land use planning and regulations or controls be performed at the national level, but would enable local governments to perform those functions. Districts could have jurisdiction over rural or nonurban areas outside cities, towns, and villages (outside the yellow line) and cities, towns and villages could have jurisdiction within those areas. The present provisions in the Law on the Land are too fragmented for adequate land use planning and regulation or control.

LAND USE PLANNING LEGISLATION

Some of the article headings which should compose a law enacted by the People’s Assembly authorizing local governments, such as districts, communes, cities, towns, or villages, to create planning commissions and perform land use planning, prepare master plans, and adopt those master plans are:

- I. Purpose of the law.
- II. Definitions of terms used in law.
- III. Designation of planning area subject to particular local government’s authority.
- IV. Grant of power to local governments to create a planning commission and perform land use planning.
 - A. Creation of planning commission.
 - B. Number and qualification of members.
- V. Appointment of members.
- VI. Relationship of regional planning commission, if any, with local planning commissions.
- VII. Relationship of district planning commission, if any, with local planning commission.
- VIII. Organization, meetings, and rules of planning commission.
- IX. Staff of planning commission.
- X. Finances of planning commission.
- XI. General powers and duties of planning commission.
- XII. Miscellaneous powers of planning commission.
- XIII. Operating procedures for transaction of business of planning commission.
- XIV. Matters to be referred to planning commission.
- XV. Preparation of master plan.
 - A. Geographic area of master plan.
 - B. Items to be included in master plan.

- XVI. Procedure for adoption of master plan.
 - A. Notice.
 - B. Public hearings.
 - C. Planning commission approval.
- XVII. Adoption of master plan by governing body.
- XVIII. Legal status of master plan.

ZONING LEGISLATION

Valid zoning regulations or ordinances must be authorized by an enabling authority and the validity of the provisions of a regulation can be tested on the basis of conformity to the enabling authority. Article headings which should compose a law enacted by the People's Assembly enabling local governments, such as districts, communes, cities, villages, or towns, to create zoning commissions and boards of adjustment, prepare zoning control regulations, and adopt zoning control regulations are:

- I. Purpose of law.
- II. Definition of terms used in law.
- III. Purpose of zoning control regulations or ordinances.
- IV. Grant of power to local governments to adopt zoning control regulations.
- V. Authority of local governments to adopt zoning control regulations.
- VI. Criteria for creation of land use districts or zones.
 - A. Types of districts or zones that may be created.
 - B. Authority for special development districts.
- VII. Regulation of uses within districts or zones.
- VIII. Regulation of size and use of buildings.
- IX. Building setback requirements.
- X. Compliance of zoning control regulations with master plan.
- XI. Procedure for adoption of zoning control regulations.
 - A. Public nature.
 - B. Public hearings.
 - C. Zoning commission approval
- XII. Governing body adoption of zoning control regulations.
- XIII. Procedure for amending zoning control regulations.
- XIV. Creation of zoning commission.
 - A. Number and qualification of members.
 - B. Appointment of members.
- XV. Organization, meetings, and rules of zoning commission.
- XVI. Staff of zoning commission.
- XVII. Finances of zoning commission.
- XVIII. General powers and duties of zoning commission.
- XIX. Operating procedures for transaction of business of zoning commission.
- XX. Nonconforming uses.
 - A. Definition.
 - B. Types permitted.

- C. Distinction between repair and expansion.
- D. Discontinuance or elimination.
- XXI. Variances.
 - A. Conditions required for granting.
 - B. Procedures for granting.
- XXII. Special exceptions and special use or conditional use permits.
 - A. Definitions.
 - B. Conditions required for granting.
 - C. Procedures for granting.
- XXIII. Authority for extraterritorial zoning.
- XXIV. Board of adjustment or board of appeals.
 - A. Number and qualification of members.
 - B. Appointment of members.
 - C. Powers and duties of board.
 - D. Operating procedures of board.
 - E. Adoption of rules for Operation of board.
 - F. Meetings and record keeping requirements of board.
 - G. Types and procedures for appeals to board.
 - H. Procedures for hearing appeals.
 - I. Voting on appeals.
- XXV. Appeal of board of adjustment or board of appeals decisions to courts.
- XXVI. Inspections.
- XXVII. Enforcement and remedies.
 - A. Types.
 - B. Procedures.
- XXVIII. Penalties for violation.
 - A. Types.
 - B. Procedures.

ANNEX 2 QUESTIONS WHICH NEED ANSWERING FOR PREPARING SOIL EROSION CONTROL LEGISLATION

Albania should adopt a comprehensive Soil and Water Conservation Law to control soil erosion and protect surface water from pollution. Some of the decisions that must be made regarding such a law include:

1. Land and activities applicable to the law.

Should the law apply only to privately owned or privately used agricultural land? Should the law also apply to state-owned forestland and pastureland and undistributed state-owned agricultural land? Should the law apply to land in cities and villages? Should the law apply to soil erosion control only on agricultural land, forestland, and pastureland, or should it also include land disturbances for industrial and housing construction?

2. Administrative structure for national support.

What national agency should administer the law and what are its functions, powers, duties, and responsibilities? What is the national administrative agency's relationship to local governmental units? Should a national-level soil and water conservation board, commission, or committee be created and attached to the administrative agency? If so, what are its functions, powers, duties, and responsibilities as well as its relationship to local governmental units? Generally the functions of such a board, commission, or committee are to provide informational, planning, and financial assistance to local governmental units. Additional powers may be given if the national government establishes soil loss limits or land disturbing restrictions. How many members should make up the board, commission, or committee, and who appoints them and for how long?

3. Establishment of national standards.

Does the national administrative agency want to establish national standards or goals in the law and, if so, what are they? How are they to be enforced and by whom?

4. Administrative structure at the local governmental level.

What local governmental units are going to administer the law or plan and what are their functions, powers, duties, and responsibilities? Should an advisory committee be established at the local level and, if so, what is its functions, powers, duties, and responsibilities?

5. Regulatory powers of local governmental units.

Must local governmental units adopt regulations or may they voluntarily adopt them? If regulations are mandatory, must they be approved by the national administrative agency? Do mandatory regulations enforce only the national standards or goals?

6. Administrative procedures at the local level.

What administrative procedures are to be used by the local governmental unit to administer the law and regulations and how? Are permits required?

7. Enforcement of regulations and appeals.

What are the enforcement mechanisms? Are there penalties? What are the appeal procedures?

8. **Soil erosion control and water pollution program or plan.**

Who prepares the soil erosion control and water pollution program or plan at the national and local levels? What is included in the program or plan? Who approves the local plan or program?

9. **National funding for soil erosion control.**

Is the national government going to provide cost-sharing funds to landholders or land occupiers to initiate and implement soil and water conservation practices? If so, how much or what percentage of the cost will be shared and for what practices? Practices that could be cost-shared include the establishment or improvement of permanent vegetative cover, terracing, water diversions, grazing protection, windbreaks, reservoirs, stream protection, sod waterways, and tree planting. If cost-sharing is to be provided, are the areas in need going to be prioritized and funding limited only to critical areas?

SOIL AND WATER CONSERVATION LEGISLATION

Some of the article headings that should be included in a Soil and Water Conservation Law enacted by the People's Assembly are:

- I. Title of the law.
- II. Purpose of the law or declaration of policy.
(A few general statements on why the country is adopting the law.)
- III. Definition of terms used in the law.
(Make sure that a definition of land occupiers is given, that is, who are they?)
- IV. National soil erosion control goals.
(Give tolerable erosion levels if that is what you want and time schedule for meeting those goals.)
- V. Land over which law applies.
(Does the law apply only to privately owned or privately used land? Does law apply only to agricultural land or does it include state-owned land such as forestland and pastureland?)
- VI. Duties of ministry of agriculture and food or other national administrative agency.
(List all powers, duties, and responsibilities.)
- VII. Creation of soil and water conservation board or commission.
(If a board is to be created, list its membership, who appoints, terms of office, and powers and duties.)
- VIII. National regulations.
(List the regulations or standards relating to soil erosion control.)
- IX. National soil and water conservation plan.
(Creation, purpose, preparation, identification of priority areas, review, implementation, and noncompliance.)
- X. Local governmental units.
(Who are they and what are their powers, duties, and responsibilities?)
- XI. Creation of local committees.
(If committees are to be created, list their membership, who appoints, term of office, and powers and duties.)

- XII. Local regulations on soil and water resource management practices.
(Adoption, mandatory or voluntary, approval, and enforcement.)
- XIII. Entering land for inspection.
(Give authority to do so.)
- XIV. Complaints for noncompliance.
(Who may make complaints and how are they handled?)
- XV. Land disturbing activities.
(Are land disturbing activities for constructing industrial buildings and housing developments to be included in the law and local regulations, and, if so, what are they?)
- XVI. Public cost-sharing funding.
(Availability, restrictions, loans, application for funds, practices eligible for funding, and priority areas.)
- XVII. Cooperation with other agencies.
- XVIII. Agreements with local governments.
- XIX. Penalties.
- XX. Appeal procedures.
- XXI. Separability clause.

The country should be divided into regions or zones and land capability maps should be prepared for each region or zone. Such maps can indicate the suitable uses of the land for various types of production. Ministry of Agriculture and Food personnel must be trained on soil erosion, how to detect it, and methods of control. After an Agricultural Extension Service has been established, personnel from that service must be trained in soil erosion problems and solutions so that they can provide information and educational programs to farmers and others on soil erosion, methods of controlling it, damages caused by it to the land and environment, and its relationship to water pollution. Education is needed before a law can be enforced, and education will create a public awareness of soil erosion and other forms of land degradation. Technicians must be trained in management practices and physical structures to prevent and control soil erosion so they can provide technical assistance to farmers and others.

ANNEX 3 SOLID WASTE MANAGEMENT

Providing the means for the proper disposal of municipal solid waste and refuse is a governmental function and responsibility to protect the health and safety of its citizens. That function and responsibility should lie with the incorporated cities and towns in urban areas and the villages and communes in rural areas. Industrial and hazardous solid waste should be disposed of separately from domestic waste; more caution must be taken with hazardous waste to prevent ground water contamination. Most solid waste facilities or landfills will have to be located in agricultural or other rural areas. At the present time, Albania does not have any laws specifically relating to the location or siting of solid waste disposal facilities or landfills, the proper management of disposal facilities, separating the hazardous or toxic wastes, record keeping, closure of facilities or landfills, or enforcement and penalties for violations. All of these items should be included in a solid waste management law.

The proper location of solid waste disposal facilities or landfills may conflict with saving productive agricultural land. Soil types that are the most productive for crops may, at the same time, be those that are the best for preventing leakage from landfills which will pollute the ground water. Priority should be given to landfill protection over agricultural use of land because ground water pollution can last for 100 years or more and is very costly to eliminate. People depend upon ground water for drinking and other domestic uses. Land use planning and zoning laws can be helpful in locating solid waste disposal facilities or landfills; they should be included as an element of the local comprehensive land-use master plan. Research should be conducted on the use of recycling to save landfill space or incineration. Regulations would have to be issued providing standards to prevent excessive air pollution from incinerators.

The Law for Protection of the Environment (Law No. 7664), dated 21 January 1993, contains provisions that relate to and must be followed in siting solid waste disposal facilities or landfills, particularly for hazardous and toxic substances. Dangerous substances and wastes are defined in Article 2 of the law, and Article 3 provides that environmental protection from pollution by such substances and wastes is the obligation of all state institutions and legal entities and individuals. Article 8 requires an environmental impact assessment before locating a solid waste disposal facility or landfill; it also provides that such an assessment is required for programs and activities that affect the environment or which are particularly dangerous to human health. Article 14 sets forth the specific contents of impact assessments. Article 18 requires licenses only for certain disposal activities, that is, for processing and destroying toxic substances or wastes; Article 18 should be amended to require a license to operate a solid waste disposal facility or landfill. One of the articles in chapter 4, "Inspection and Information for the Environmental Situation," should be amended to require inspections of solid waste disposal facilities or landfills, as are required for other activities affecting the environment. Chapter 5, "Duties and Rights of Central and Local Institutions for Environment," and chapter 6, "Responsibilities and Sanctions," could also be amended to include solid waste disposal facilities or landfills. Although solid waste disposal facilities are not specifically mentioned in the Law for the Protection of the Environment, the law could be construed to apply to them because of the effect they have on natural and human elements and factors of the environment.

SOLID WASTE MANAGEMENT LEGISLATION

Albania needs a Solid Waste Management Law; some of the article headings in that law should include:

- I. Title of law.
- II. Purpose of law.
- III. Definition of terms.
- IV. Regulation powers to establish management standards.
- V. Powers and duties of national agency.
- VI. Powers and duties of local governmental units.
- VII. Location and siting requirements.
- VIII. Operating licenses.
- IX. Inspections.
- X. Hazardous and toxic wastes.
- XI. Incineration.
- XII. Recycling requirements.
- XIII. Record keeping.
- XIV. Closures.
- XV. Abandonment.
- XVI. Liability for damages.
- XVII. Fees.
- XVIII. Enforcement.
- XIX. Penalties for violations.

ANNEX 4 SUMMARY OF TECHNICAL LAND RESOURCE DATA FOR ALBANIA

PHYSIOGRAPHY AND TOPOGRAPHY

Land satellite imagery for Albania exists at a scale of 1:250,000, with three photos covering the entire country. The PMU has 1:5,000 aerial photographs and 1:2,000 parcel maps for land registration.

In addition to a national topographic map at a scale of 1:250,000, topographic maps at a scale of 1:50,000 exist for each of the former 26 districts (10 districts were subdivided so that there are now 36 districts). Albania can be divided into three broad physiographic provinces that extend roughly north to south; these include the Western Lowlands or coastal plain, the Central Uplands or dissected piedmont, and the Eastern Highlands or mountains.

BEDROCK AND SURFICIAL GEOLOGY

A national bedrock geology map at a scale of 1:200,000 was produced in 1983 by the Albanian Ministry of Mines, the Geologic Institute, and the Petroleum Institute. Apparently, there are no detailed bedrock geology maps of various districts, nor are there surficial geology maps. About two-thirds of the country is underlain by sedimentary rocks, primarily limestone with some sandstone flysch; the remaining one-third is comprised of igneous rocks, including volcanic rocks and serpentinite. The surficial deposits include glacial sediments in the Northern Albanian Alps, colluvium throughout much of the uplands and highlands, and alluvium, lacustrine and marine deposits in the lowlands.

CLIMATOLOGY AND VEGETATION

There are 208 weather stations distributed throughout the country that monitor maximum and minimum temperature and precipitation. The International Fertilizer Development Center (IFDC) has entered data collected from these stations over the past 20 years onto the computer and produced 1:500,000 maps of Albania showing annual rainfall and temperature. Rainfall varies from under 1,000 mm in the Lushnja district to over 3,000 mm in the northern Eastern Highlands. About 80 percent of the precipitation falls during the period November through February. The mean annual temperature varies from under 6°C in the Northern Highlands to over 14°C throughout the Eastern Lowlands.

As part of its Crop Yield Surveys, the IFDC has produced a land-use map of Albania at a scale of 1:500,000 and more detailed maps (1:50,000) of each *prefektura*. Thematic maps at scales of 1:10,000 to 1:25,000 were prepared by the IFDC for selected areas. According to the most recent survey (IFDC 1994), 23 percent of the country (662,000 hectares) is arable, 15 percent (430,000 hectares) is in pasture, and 38 percent (1,044,000 hectares) is forested, and 20 percent (620,000 hectares) is unproductive land. The remaining areas are in military installations (1.1 percent), lakes (2.0 percent), major cities (0.3 percent), and other features (0.7 percent). In 1993 the dominant arable crops included winter wheat (155,233 hectares), maize (114,475 hectares), and alfalfa (45,815 hectares). Tree crops (118,455 hectares) include vineyards, orchards, and olives.

The Albanian Forestry Research Institute has 1:50,000 maps of forest and pasture land. Maquis, a Mediterranean scrub tree, grows below an elevation of 300 meters, along with *shiblijak*, or Christ's

thorn. Oak forests (*Quercus* spp.) occupy the lowlands from 300 to about 1,000 meters (32.4 percent of forest area), with beech (*Fagus* spp.) occurring at intermediate elevations (17.3 percent of forest area), and conifers at elevations above 1,800 meters (16.8 percent of forest area). The dominant coniferous species include black pine (*Pinus nigra*), Balkan white pine (*P. halepensis*), and Macedonian fir (*Abies* spp.) The remaining 33.5 percent of forest area contains mixed broad-leaved species, including maple (*Acer* spp.), ash (*Fraxinus* spp.), beech, and oak. Because of the diversity of environments, Albania contains 3,200 plant species, 489 of which occur only in the Balkans, and 40 species occur only in Albania.

WATER

The average water flow in Albania is 42,000 million cubic meters. Hydropower facilities on the 11 major rivers provide 82 percent of the nation's electricity. Lakes occupy 58,362 hectares. Only 5 percent of the water used for irrigation originates from ground water; 95 percent comes from the 650 reservoirs.

SOILS

The Ministry of Agriculture and Food's (MOAF) Soil Research Institute (SRI) produced a national soil map at a scale of 1:200,000. This map is based on the zonal Russian system and is strongly dependent on topography, climate and vegetation. The map contains 12 soil types and 18 subtypes. These maps are colored by hand and are of limited distribution. The IFDC has digitized this map and converted the legend into the FAO/UNESCO soil map units. There are 17 soil units in the legend. The soils of Albania include Fluvisols, Lithosols, Rankers, Rendzinas, Vertisols, Cambisols, and Luvisols, with lesser areas of Halomorphic soils (Solonchaks and Solonchaks) and Histosols.

Dr. Pandi Zdruli of the SRI is digitizing the national soil map and converting the legend into *Soil Taxonomy* (ST), a global system of soil classification that is useful for land-use interpretations and necessary for crop modeling. This work is being done in cooperation with the World Soil Resources, U.S. Department of Agriculture Soil Conservation Service (now Natural Resources Conservation Service). The dominant soils in Albania according to ST are Fluvents, Rendolls, Xererts, Xerochrepts, and Xeralfs, with lesser areas of Natriborolls and Histosols. In March 1994, the SRI in cooperation with the U.S. Soil Conservation Service collected samples from 18 pedons (soils) throughout Albania. The samples were characterized by the U.S. Department of Agriculture National Soil Survey Center in Lincoln, Nebraska.

In addition to the national soil map, soil maps at a scale of 1:50,000 are being prepared by the SRI for each of the former 26 districts. These maps were upgraded during the period 1980–1985 and are based on the Russian approach to soil taxonomy. The IFDC is digitizing these maps and converting the legend into the FAO/UNESCO soil map units. It would be desirable to convert these maps into *Soil Taxonomy* for land-use interpretations and crop modeling.

Apparently, agricultural suitability maps were made at a scale of 1:10,000 for some of the former collective farms. However, the location of these maps was not known at this time.

Only a few Albanian technical natural resource publications are readily available. In addition to the previously mentioned maps, the SRI prepared guidebooks to assist the former collective farms in (1) making fertilizer recommendations, (2) reclaiming saline and sodic soils, (3) managing ultramafic

(serpentinitic) soils, (4) managing soils for fruit trees, and (5) making recommendations for irrigation. Soil survey reports are available for each of the former 26 districts. These reports contain a description and analytical data for each soil taxon, a 1:50,000 soil map, and interpretations on the suitability of the soils for agricultural crops.

In 1988 all of the agricultural soils data were analyzed as part of a land evaluation program. The study includes data from 684,497 hectares (24 percent of the country) of agricultural land. For each district areas are given for broad textural groups, soil depth class, salinity class, pH class, ultramafic conditions, and stone content class. In addition the percentage of the district is shown by soil organic matter class, total soil nitrogen class, extractable soil phosphorus class, and exchangeable soil potassium class. For example, 36 percent of the agricultural soils have “heavy” clay (>50 percent clay), 11 percent are less than 40 cm deep, 2 percent are saline or sodic, 2 percent are ultramafic, 11 percent are stony (–15 percent coarse fragments), 44 percent have >1.5 percent organic matter, 37 percent are nitrogen deficient, 33 percent are low in phosphorus, and 8 percent are potassium deficient.

Ten land evaluation classes were established by the SRI based on a numerical weighting of soil properties, slope class, and climatic parameters. Classes I through III include the most productive agricultural soils; class IV contains moderately productive soils that could be made more productive with fertilizers, lime, and/or irrigation; classes V and VI are marginally suitable for cultivation; and classes VII through X are generally unsuitable for cultivation. Forty percent (277,221 hectares) of the agricultural land (10 percent of the land area) contains class I to IV soils.

Although there are abundant data on arable soils, there are fewer data for soils in pasture or forest. According to personnel in the Forest and Pasture Research Institute, soil characterization data are available for approximately 40 percent of the land afforested prior to 1990 (about 72,000 hectares).

LAND DEGRADATION MAPS

To date there have been no attempts to construct maps depicting the aerial distribution of land degradation, such as soil erosion rate, potential hazard for landsliding, susceptibility to flooding, risk of groundwater contamination, and chemical soil pollution by industry. These maps could readily be constructed from overlays of land resource maps using geographic information systems.

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