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UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PERU

PROJECT PAPER

ONERN-LAND USE INVENTORY AND
ENVIRONMENTAL PLANNING

LAC/DR:80-5

Project Number:527-0202

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number

DOCUMENT CODE

3

2. COUNTRY/ENTITY

PERU

3. PROJECT NUMBER

527.0202

4. BUREAU/OFFICE

LA

05

5. PROJECT TITLE (maximum 40 characters)

ONERN-Land Use Inventory and Environmental

Planning

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
 09 30 83

7. ESTIMATED DATE OF OBLIGATION
 (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 80

B. Quarter 4

C. Final FY 82

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY 80			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total			200	117	883	1,000
(Grant)	()	()	(200)	(117)	(883)	(1,000)
(Loan)	()	()	(-)	(-)	(-)	(-)
Other U.S.						
1.						
2.						
Host Country					647	647
Other Donor(s)						
TOTALS			200			1,647

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SDA	792	876				1,000		1,000	
(2)									
(3)									
(4)									
TOTALS									

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

850

877

11. SECONDARY PURPOSE

791

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

BR

ENV

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To assist ONERN in the identification of natural resources and determination of land use capabilities in the high jungle and sierra areas. Also to upgrade ONERN's capability for environmental planning, including environmental assessments, protection plans and policies on natural resource conservation.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a page PP Amendment)

17. APPROVED BY

Signature

Title

Howard D. Lusk
 Acting Director

Date Signed

MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AMENDMENTS, DATE OF DISTRIBUTION

MM DD YY

BEST AVAILABLE DOCUMENT

PROJECT AUTHORIZATION

Name of Country: Peru

Name of Project: Land Use Inventory and
Environmental Planning

Number of Project: 527-0202

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Land Use Inventory and Environmental Planning Project for Peru involving planned obligations of not to exceed \$1,000,000 in grant funds over a 3-year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.
2. The project consists of maximizing the efficient use of Peru's natural resources through the creation of natural resource inventories and improved natural resource planning and allocation.
3. The project Agreement which may be negotiated and executed by the Officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms, covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.
4. a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as stated in paragraph 4.e. below, financed by A.I.D. under the project shall have their source and origin in Peru or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.
- b. Conditions Precedent to First Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, Peru shall furnish in form and substance satisfactory to A.I.D.

 - (a) An operational plan for the life of the Project;
 - (b) A time-phased plan for the provision of required counterpart personnel.
 - (c) A financial plan which details over the life of the Project ONERN's contribution to the project.

c. Condition Precedent to Disbursement for Purchase of Computer Equipment

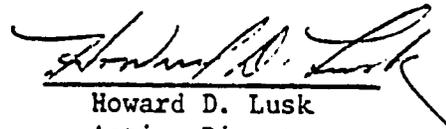
Prior to disbursement of funds for the purchase of computer equipment, or to issuance by A.I.D. of documentation pursuant to which disbursement will be made, Peru will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D., an implementation plan for either (i) the construction and equipping of a building to house the computer equipment and related equipment or (ii) the refurbishing and equipping of space available to ONERN to house the computer equipment and related equipment

d. Covenants

Peru covenants:

- (a) to provide necessary resources after completion of the project to provide for operation, maintenance and repair of the equipment procured for or repaired under the Project

e. The following waivers to A.I.D. regulations are hereby approved: imagery tapes to be financed by A.I.D. under the project, up to an amount not to exceed \$10,000, may have their source and origin in countries included in A.I.D. geographic code 941.



 Howard D. Lusk
 Acting Director

Clearance:

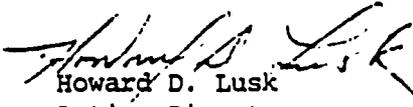
CON:JDavison JLD
 ARD:JBO'Donnell JBO
 DR :LTwentyman LT
 RD :JRosholt JR
 PRO:LSmucker LS

Date: July 10, 1980

Drafted: SWhitman

SOURCE AND ORIGIN WAIVER

Under the authority delegated to me pursuant to Delegation of Authority 99.15, I hereby waive U.S. and Peruvian source, origin and nationality requirements under the Land Use Inventory and Environmental Planning Project, Number 527-0202, to permit the purchase of imagery tapes, up to an amount not to exceed \$10,000, in countries located in AID Geographic Code 941. The waiver is justified on the basis that the tapes are not available from countries included in the authorized geographic code. See HB 1, Supp. B, 5B4b(2).


Howard D. Lusk
Acting Director

Land Use Inventory and Environmental Planning - ONERN
527-0202

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ENT ASSOCIATES*

Abbreviations

CARS	Center for the Application of Remote Sensing
CCRS	Canadian Center for Remote Sensing
CIR	Color Infra Red
CCT	Computer Compatible Tape (Digital Tape Format)
DMA	Defense Mapping Agency
ERIM	Environmental Research Institute (Michigan)
EROS	Earth Resources Observation Satellite
ERTS	Earth Resource Technology Satellite
GIS	Geographic Information System
GOP	Government of Peru
IAGS	Inter American Geodesic Service
IGM	Military Geographic Institute
IGP	Peruvian Geophysical Institute
INP	National Planning Institute
INPE	National Institute of Special Investigation (The Brazilian and Latin American Landsat Receiving Station)
LANDSAT	Land Satellite
LARS	Laboratory for Application of Remote Sensing (University of Purdue)
MSS	Multi Spectral Imagery
OAS	Organization of the American States
ONERN	National Office of Natural Resource Evaluation
PNUMA	United Nations Program for the Environment (UNPE)
SAN	National Aerial Photographic Service
SLAR	Side Looking Radar

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I. SUMMARY AND RECOMMENDATIONS

B. Recommendations

That a Grant in the amount of \$1,000,000 be authorized to the Government of Peru to be incrementally authorized as follows:

FY 80	=	\$200,000
FY 81	=	500,000
FY 82	=	300,000

C. Summary Project Description

The National Office of Evaluation of Natural Resources (ONERN) is charged with the responsibilities relating to inventory and evaluation of natural resources, as well as assessment of the state of the environment and recommendations for its protection. The proposed project will greatly strengthen ONERN's basic capabilities to carry out timely and accurate resource information of use to planners and managers in the fields of resource inventory, environmental assessment and environmental protection. The project will provide ONERN with the capability to carry out nationwide resource inventories using advanced remote sensing technology and to store and manipulate, for environmental purposes, resource data in a thematic/geographic information system (GIS). The project consists of an integrated blend of technical assistance, training, hardware purchases, and acquisition of materials and supplies. Project duration is three years. Total estimated cost is \$1,647,000 of which USAID will provide \$1,000,000 and the Government of Peru will provide \$647,000, a counterpart contribution amounting to 39% of the total estimated cost.

The project consists of three phases, each consisting of several tasks. Phase I will introduce the concepts of digital processing of Landsat data, thematic mapping, and manual geo-based information systems. In order to build a truly operational capability, sets of thematic map overlays will be prepared for 6 test sites. Each test site will be defined as that area bounded by six 30' x 30' quadrangle sheets. Mapping scale will be 1:100,000 to conform with Peruvian mapping standards. Approximately 10 theme maps, including a Landsat derived land cover map, will be prepared for each quadrangle.

Phase II will consist of establishment of a computer-assisted Geographic Information System (GIS). Into this GIS will be placed all of the mapped data of Phase I plus extensive other data available from ONERN and various other mapping agencies. The GIS will be designed to not only store and retrieve data, but to

efficiently manipulate the various themes contained therein and produce customized map products at any scale.

Phase III is an environmental demonstration and training phase. A national profile of environmental conditions, hazards, laws, and programs will be produced. Training courses, in environmental assessment methodologies, will be presented, from the technical point of view, to environmental scientists, and from the managerial point of view, to environmental program administrators. In addition, a series of nine environmental demonstrations and training programs will be conducted. These will demonstrate potential applications of the data and systems of Phases I and II.

D. Summary Findings

The Project Committee has found the Project to be administratively, technically, socially, economically and financially feasible and consistent with the development objectives of the GOP and those objectives set forth in USAID's CDSS document. These overall Project analyses are found in Section III of the Project Paper.

E. Summary Financial Plan

ONERN - Land Use Inventory and Environmental Planning
Summary Financial Plan
 (Thousands of U.S. Dollars)

	<u>A.</u> FX	<u>I.</u> LC	<u>D.</u> LC	<u>GOP</u> LC	<u>Total</u>	<u>Percentage</u>
Natural Resource Inventory and Information System	386.0	103.8	334.0	823.8	50	
Design and Implementation of Geographic Information System	205.0	3.0	37.2	245.2	15	
Environmental Planning, Assessment and Demonstrations	<u>292.0</u>	<u>9.5</u>	<u>276.5</u>	<u>578.0</u>	<u>35</u>	
	883.0	116.3	647.7	1'647.0	100%	
	61%		39%	100%		

F. USAID/Peru Project Development Committee

1. USAID Staff

Edward L. Kadunc	Capital Development Division
Cesar Espino	Capital Development Division
Jack D. Rosholt	Regional Development Division
Janet C. Ballantyne	Office of Health, Education and Nutrition

Edilberto Alarcón	Engineering Division
John R. Davison	Controller
Lee A. Twentyman	Office of Development Resources
George A. Wachtenheim	Capital Development Division
Stephen V. Whitman	Regional Legal Advisor

2. Contract Technical Assistance

Resources Development Associates

Robert W. Campbell
 Steven A. Sader
 Richard A. Ellefsen

II. PROJECT DESCRIPTION

A. Background

1. Country Setting

Peru's total land area of 1,285,216 Km² is divided by the Andes mountains into three distinct regions, with extreme contrasts in topography and climate. Between the ocean and the Andes is a narrow strip covering 11% of the country (the Costa). It is composed of arid, flat plains and sand dunes below 300 meters and of equally dry, severely eroded foothills up to 2,000 meters. There is little rain in this region despite the fact it is clouded from April to December with high humidity. The Andean Highlands (the Sierra) covers 26% of the country and consists of steep mountain slopes and rolling plateaus above 2,000 meters. The climate of the sierra varies widely during the year, depending on the altitudes. East of the Andes are vast, tropical lowlands covering the remaining 63% of the country (the Selva). This region is sub-divided into the Ceja de Selva, which consists of alternating hills and valleys along the eastern Andean slopes, and the Selva Baja (below 700 meters), a very hot and humid plain covered by dense vegetation - mostly tropical rain forest-known as the Amazon Basin.

Geographically speaking, Peru has a fourth region (the Litoral), which is a deep ocean trench channeling antartic currents along the coast, creating the cool arid climate of the costa.

The ocean currents, the rugged topography and extreme climatic features have provided Peru with a wide variety of life zones and a varied natural resource base. The most important resource is the metallic mineral deposits found throughout the Sierra and Coastal regions, giving Peru a very large proven reserve of copper, lead, zinc, silver and iron. The second natural resource asset is the Humboldt current, which is an ocean stream of cold water moving up the coast from the Antarctic. It provides Peru with one of the richest fishing resources in the world. Other important assets are the land based renewable resources of water, timber and, to a lesser extent, soils.

In contrast to mining and fishing, the utilization of the country's renewable resources is extremely limited. The bulk of Peru's water resources are located in the vast selva region, far from the sierra and costa population centers. The same applies to the timber resources. Commercial exploitation of the selva forest is limited by transportation costs to the most valuable species. Soils adaptable to agriculture area are scattered throughout the country, mostly along narrow river valleys in the andean foothills. It is estimated that soils suitable for intensive cropping cover less than 3% of the land area, and the majority are already under cultivation.

2. Rationale

Mining and fishing will continue to be Peru's most important resource assets. However, they are not sufficient to provide the employment and income needs of the country's 16 million people, and particularly the rural population scattered throughout the sierra and ceja de selva. Moreover, minerals are a non-renewable resource and Peru will be faced with enormous investment costs in order to exploit those mineral deposits in the more isolated areas of the country. Fishing also has limited expansion possibilities due to the dangers of over-exploitation of the basic breeding stock. Consequently, Peru's future is becoming more dependent upon the development and proper utilization of its renewable resource base.

Unfortunately, the development of the country's soils, water and timber resources is beset by a series of problems. The rugged topography makes transportation and communication extremely difficult and costly between regions, and, with the exception of the costa, within the regions themselves. Roads in the sierra and selva are scarce and rudimentary, and there is no all-weather road connecting the selva to the sierra and costa. This leaves many sierra and selva areas with valuable resource assets isolated from potential market and export centers.

Of greater concern to the country's future, however, is the environmental problems being created by the unplanned and uncontrolled utilization of these resources. Soil erosion, deforestation, desertification and water pollution are increasing at alarming rates. Both the costa and sierra have been deforested for agriculture and

grazing purposes, resulting in considerable loss of the very limited soils resources in those regions. The problem is becoming more severe in the ceja de selva, where slash and burn subsistence farming on steep slopes is rapidly destroying the region's timber and soil resources, while polluting the rivers with excessive sedimentation from ground water run-off. In addition, water pollution is already a major health and environmental hazard in the sierra and costa, with unprocessed urban effluents, mine tailings and industrial wasters being dumped into streams and rivers.

In summary, as the Peruvian population increases, even greater pressures will be placed on the exploitation of the country's renewable resources. It is imperative that this be done in a rational basis in order to preserve the delicate balance of the native fauna and flora. Mistakes are costly. Eroded soils and destroyed timber species cannot be replaced; areas given to desertification cannot be recuperated; and species of native fauna and flora are disappearing, never to be recovered. Thus, resource development and utilization must be undertaken with careful planning. Moreover, assessments of environmental conditions must be taken into consideration in order to minimize the destruction that accompanies man's development efforts.

3. Problem

The lack of detailed and up-to-date information on the status of resource exploitation and current land use practices is seriously retarding the adoption of sound land use planning and resource management in Peru. The problem stems partly from widely dispersed responsibilities among government institutions. Various offices of the Ministry of Agriculture and Food bear the responsibility for water, forest and soil resources; the control of water and air pollution problems is the responsibility of the Ministry of Health; and the Oficina Nacional de Evaluación de Recursos Naturales (ONERN) is charged with a multitude of responsibilities relating to inventory and evaluation of natural resources as well as assessment of the state of the environment and recommendations for its protection. Moreover, the implementation of government programs in these areas have been severely hampered by the country's economic problems during the past 15 years.

The basic problem, however, stems from ONERN's inability to respond to the country's development needs on a timely basis. In order to avoid the mistakes that have been made in the past, ONERN is attempting to monitor the national development of renewable and non-renewable resources and to evaluate environmental consequences of development activities using traditional ground mapping methods. Such methods are prohibitively time-consuming and expensive. Given the existing constraints of time, budget, and trained manpower, introduction of a new technology is the only feasible method to provide the urgently needed detailed and up-to-date information concerning the current use of the country's resources and the status of the environment.

Recently developed techniques of remote sensing can provide an effective alternative. Such techniques have gained world-wide recognition as an efficient method to provide earth resources information using satellite imagery that is often not feasible technically or economically to obtain using conventional ground methods. Remote sensing is neither a panacea for all resource information needs nor is it capable of totally replacing ground data collection methods, but it is a potentially valuable tool when used in properly designed natural resource programs, such as the one proposed by this grant funded Project.

B. Project Description

1. Goal and Purpose

The goal of the Project is to improve the economic and social well being of the Peruvian population by increasing the rational utilization of natural resources and by enhanced environmental planning.

The purpose of the Project is to:

(a) Provide assistance to ONERN in the identification of natural resources and determination of land use capabilities in the high jungle and sierra areas; and,

(b) Upgrade ONERN's capability for environmental planning, including environmental assessments, environmental protection plans and general policies on natural resource conservation.

Under the first component, A.I.D. financing will focus on strengthening ONERN's institutional capacity to carry out natural resource studies and evaluations, and to store, up-date and process the resulting information in a more efficient manner. The studies and evaluations will include a systematic reconnaissance of the sierra and high jungle regions that have not been covered by previous studies, and semi-detailed and detailed studies in selected zones where baseline studies already exist, particularly of the high jungle. The treatment of the resource information will include the design and implementation of both a thematic map overlay system and a computer-assisted graphic system, using the same geographic coordinate base.

The second component will include assistance to strengthen ONERN's institutional capability to use the source information to perform environmental impact assessments for major types of capital projects such as a mining, forestry, fishing, power, transportation, etc. As a result, ONERN will have a trained core staff of technicians capable of performing these assessments, as well as the capability to transfer environmental assessment methodologies to other government or private institutions responsible for project development and implementation.

In order to carryout the activities within these two components, the Project has been operationally divided into three phases,

which in turn have been sub-divided into a series of tasks and sub-tasks. This provides a better means to define the Project inputs and their required timing. It also allows ONERN to establish a more effective organizational management of the widely varied activities throughout the 3-year period of the Project.

Project activities under the first phase will include (i) the procurement of aerial photography and other remote sensing products; (ii) field inspection for specific resource identification; (iii) the formulation of policy for the development and utilization of the resources in the case of semi-detailed and detailed studies; and (iv) the detection of potential development zones in the case of reconnaissance type studies.

Phase two activities will include: (i) the preparation of base maps on a standardized geographic data base; (ii) the preparation of thematic maps (soils, land use, etc.) on transparent overlays to the base maps; and (iii) the design and implementation of a computerized Geographic Information Systems (GIS) using the same map base. The purpose of the manual (thematic maps) and computerized GIS is to improve user agency access to resource data and provide a more efficient means for analysing the data. However, a prerequisite to entering the resource data into the computer is the data conformity to geographic coordinates on a standard map projection. Thus, the preparation of resource overlays at standard topographic map scales will facilitate the integration of the data into the computerized Geographic Information System (GIS) to be developed by the project.

The third phase will concentrate on training activities to prepare ONERN technicians in the preparation of environmental impact studies for proposed development projects, and in the development of environmental protection and renewable resource preservation programs. Training will also be given to other GOP agency personnel in various techniques for using ONERN's resource information system in environmental assessment and planning for specific development projects, including the identification of potential environmental problems or hazards.

2. End of Project Status

By the end of the Project, the following conditions should exist indicating achievement of the Project purpose:

a. Utilization by ONERN of color infrared photography satellite imagery and other improved technologies for detailed identification and mapping of natural resources.

b. Implementation of a thematic mapping system for resource and environmental assessment;

c. Development of the capability to carry out digital processing of Landsat data to produce land cover maps and for general resource research;

d. Enhancement of the already well-established capabilities of ONERN's cartographic section;

e. Development of the capability and the awareness of the utility of a nationwide computer-assisted GIS;

f. Utilization of the data and systems by potential sectoral users, who will be trained in their applications for environmental and natural resource assessment;

g. Existence of the capability within ONERN to utilize the methodologies of environmental impact assessment; and

h. The existence of an institutional and technical capability to greatly enhance the accessibility of this much-needed data to potential users.

3. Project Inputs

The inputs for the Project consist of training, technical assistance, supplies and materials, equipment and hardware and the limited subsidy of local professional and technical personnel.

The Project purpose will be accomplished through the following inputs: (i) the procurement of aerial photography and other remote sensing products; (ii) field inspection for specific resource identification; (iii) the preparation of base maps and special thematic maps (soils, land use, etc.); (iv) the formulation of policy for the development and utilization of the resources in the case of detailed studies; and (v) the detection of potential development zones in the case of baseline studies.

Grant funded technical assistance will include long and short-term U.S. experts in the applications of remote sensing techniques. These experts will participate in the training of ONERN personnel during the implementation of the resources inventories, selection of pilot areas and undertaking of the detailed line studies. The pilot projects for the Natural Resource Evaluations will include up to six of the following areas: Pichis-Palcazú, Junin-Pachitea, San Miguel-Apurimac, Accmayo, Tambo-Urubamba, Abancay and Cajamarca. These areas are located in the sierra region and comprise an approximate total area of 600,000 hectares, and the high jungle with an approximate total area of 100,000 hectares. Baseline studies have already been made in both zones which have been identified as priority development areas in view of their resource potential. In addition funding will be provided to conduct regional reconnaissance surveys using existing information combined with satellite imagery to produce resource maps at 1:250,000 scale of the high jungle and sierra regions.

A portion of the Grant funds will be used in the procurement of some equipment units to complement and improve ONERN's available equipment. This will include optical image transfer instruments,

a multispectral camera, and complementary equipment for manual and digital interpretation of imagery products.

4. Project Outputs

The major output of the Project will be the enhanced capabilities of ONERN to effectively provide information to Peruvian user agencies in the fields of natural resource inventory, information storage and processing applications of new technology to resource analysis and environmental assessment and planning. This will be accomplished through the production of: 1) soil surveys, water surveys, land use, vegetation and similar natural resource surveys; and 2) environmental assessment, environmental protection plans and the preparation of general policies on natural resource conservation.

5. Project Design

The proposed Project is directed primarily toward building the capabilities of ONERN to effectively provide information to Peruvian user agencies in the fields of natural resource inventory, information storage and processing, applications of new technology to resource analysis and environmental assessment and environmental planning. The Project will have a duration of three years during which time it will support this institution--building goal by provision of technical assistance; acquisition of hardware and supplies, training of personnel and support of local professional and technical labor.

The Project has been divided into three Phases. Phase I covers upgrading of capabilities in natural resource inventory and resource information systems. Phase II includes design and implementation of a computer-assisted geographic information system (GIS). Phase III will provide training in environmental assessment and planning methodologies and demonstrations in the applications of resource data and information systems to environmental assessment. Each of the three Phases is divided into a series of Tasks. Serial presentation of Phase and Task descriptions in Annex II, Exhibit I does not necessarily imply that their conduct is serial. Many will run on a parallel or concurrent schedule. Section IV.A. discusses the targeted Project schedule and a brief description of the various inputs necessary for completion. These include technical assistance, training, GOP support, hardware and materials and supplies. For purposes of this paper, the following definition will apply to these inputs:

- Technical assistance includes the use of technical specialists in various fields to develop and demonstrate technological procedures, to design and install hardware and to conduct short-term training, commonly on-the-job training, in conjunction with their technical duties.

- Training includes provision of educational services as the prime function.

- GOP support is the cash and in-kind contributions by ONERN, including the labor effort by local Peruvian professionals and technicians, whether under direct hire or under sub-contract, to complete the tasks.

- Hardware includes purchase of non-expendable items of hardware necessary for completion of the task and for future institution-building.

- Materials and supplies include all expendable items necessary for completion of the task. A detailed description of these components to be provided under the Project are to be found in Annex II, Exhibits C - E.

a. Phase I - Natural Resource Inventory and Information System

Phase I will consist of seven tasks extending over the entire Project period. The Tasks consist of data collection, thematic mapping, test sites, selection, data sources, land cover mapping, cartography, map production and establishment of user assistance facility.

Digital processing of Landsat data, combined with verification from photo-interpretation and ground field studies, can produce maps of land cover. Combined with other ancillary data or themes, a thematic mapping system may be developed. This Project will develop the procedures and capabilities to produce such a system.

(1) Thematic Mapping

In only a few years of operation, ONERN has produced a large number of natural resource maps of Peru. Common map themes include: soils, geology, hydrology and drainage, minerals, climate and life zones, political and administrative (department) units, vegetation types and potential land use. Most of the resource data has been generalized for the entire country and displayed on small scale maps (1:500,000). Larger scale maps have been compiled for specific project areas, mostly within the costal and sierra regions. Maps scales for specific project areas range from 1:250,000 to 1:25,000 depending on the size of the project area, the project objectives, the resource theme of interest, and the scale of remote sensing data used as the primary information source. Project boundaries often conform to natural boundaries such as watersheds, or river and valley systems.

Although the map data is of good quality, the major problem arises in the utilization of more than one map theme for resource analysis. Natural resource analysis often requires the comparison or integration of various map themes to provide a more comprehensive description of the environmental conditions of the study area. This type of integrated resource analysis is difficult to perform when resource themes are displayed at different scales on separate paper map sheets.

The project proposes to prepare a standardized geographic data base by compiling ONERN's existing and new map data at topographic map scales of 1:100,000. Preparation of thematic maps on transparent (acetate) overlays will provide an improved means of extracting resource information to be used for preparing policy and development plans.

Other government agencies who commonly produce resource maps (Ministry of Agriculture and Food) will be encouraged to adopt the topographic map scales, where practical. The contribution of other government agencies would not necessarily inhibit their traditional data gathering methods or autonomy for stewardship or protect under Peruvian law. Each agencies contribution will be to simply supply pertinent map data to ONERN, as the data becomes available. ONERN will rescale and reproduce the data, if necessary, to conform to the topographic map scales.

The preparation of resource data at topographic map scales will facilitate the integration of the data into the computerized Geographic Information System (GIS) proposed for the project. A prerequisite to entering the resource data into the computer is the data conformity to geographic coordinates on a standard map projection. The purpose of the manual (thematic maps) and computerized GIS is to improve user agency access to resource data and provide a more efficient means for analyzing the data. Non-standardized and dispersed map sources do not lend themselves well to comparison of locational and spatial features from one map to another.

(2) Test Sites

Eventually, the natural resource information system designed in this project will be implemented on a nationwide basis. However, prior to its operational acceptance by Peruvian resource and environmental managers, it must be designed and demonstrated on a smaller scale. The project will develop efficient operational techniques which will be applicable to nationwide implementation and demonstrate techniques to the appropriate Peruvian resource of environmental agencies. In order to do so, a series of test sites will be chosen. Over each test site, all of the procedures of the inventory system will be tested. The format of the information system theme maps will follow the standard 1:100,000 scale quadrangles (30' x 30') established by the IGM. Each quad covers an area of approximately 55 Km x 55 Km or 3,025 Km². Each test site has been chosen to cover six complete and contiguous quad sheets. Thus, the area of each test site will approximate 18,000 Km². Annex II, Exhibit J contains a discussion of the election of these sites.

Intensive discussions with GOP resource managers and with USAID personnel resulted in selection of 12 candidate test sites for the project. Budget limitations have restricted the final choice to up to six test sites chosen from among the following: Pichis-Palcazú, Junin-Pachitea, San Miguel-Apurimac, Acomayo, Tambo-Urubamba, Cajamarca and Abancay. Annex II Exhibit I contains a map of locating these areas.

Multiple test sites are required for several reasons. Although the new techniques could indeed be demonstrated on only a single site, it is necessary to develop operational procedures which will be applicable to a future high volume program covering the entire country. Thus, several such sites, in total covering an appreciable area, must be used. In addition, multiple sites are required in order to provide a representative example of the terrain types and environmental conditions of a country as large as Peru. Finally, it must be stressed that eventual success of a program of this type is a function of institutional acceptance of the techniques as much as or even more than the actual technical success of the program. One must be able to cover sufficient areas to build up interest in and generate demand within the various potential user agencies. Each such user agency will obviously have his own priorities regarding geographic areas of interest. Up to six test sites distributed over a large part of the country will satisfy these requirements.

Both the geography and activities of the areas encompassed by these six test sites are varied. Geography ranges from the high sierra to the highland selva or jungle. Elevations in the sierra may range from 3,000 to 6,000 meters. Topography may be rugged and steep, although much of the area is also part of the high plains or altiplano. At high elevations, with the thin air and very high diurnal temperature variation, vegetation cover is limited to grass and sparse scrub brush. Few trees are evident, except perhaps along certain watercourses or in protected valleys. The major activities in the sierra are grazing and mining.

The high selva possesses an entirely different environment. At elevations of 1,000 to 3,000 meters, the temperatures are warmer, diurnal temperature variations is much less, and precipitation and humidity are very high. This promotes heavy vegetative cover, ranging from coniferous varieties to tropical broadleaf forest. Slopes are commonly very steep, sometimes exceeding 45°. Between the mountains of the high selva are numerous fertile and rather broad valleys. These valleys have a high potential for agriculture, both perennial and annual. Development has occurred where roads have penetrated. Transportation links to the larger population centers allow daily movement of both produce and meat.

Many of the slopes of the high selva have been seriously deforested. Usually, the trees are cut, burned on site, and the area prepared as a very marginal grazing site. In some areas, crops are grown on slopes approaching 30° - 40°. Such activity poses an active threat of uncontrolled erosion, landslides, loss of topsoil, and stream pollution.

The Junin test site covers much of the area of the Department of Junin. This Department is the location of a recent USAID project. It is entitled the "Integrated Regional Development Project" and runs from 1979 through 1984. Information gathered under

this project will be useful in and complementary to the Natural Resource Inventory Project and vice versa. USAID/Peru's next priority area for a major project will be the Pichis-Palcazú-Pachitea area. It will be the site of an integrated rural development project running from 1981-1986. This area, likewise, will profit from the overlap of these two projects. The remaining test sites have been requested by ONERN. Land cover information is lacking in these areas and there is interest in these areas for future development.

(3) Data Sources

The inventory of natural resources and generation of a manual information system will require both the acquisition of new data and the compilation and collection of previously mapped data. Major new data sources will be Landsat Multispectral Scanner (MSS) imagery and color infrared aerial photography. Ancillary data will include maps and reports of soils, water, geologic, topographic, climatological and other information.

(a) Landsat MSS Data

Landsat multispectral imagery will be the case data source for the new land cover/land air mapping effort. Because of its large area coverage (a 25,000 Km²/image) and its high frequency of potential coverage (once every 9 days with a combination of Landsats 2 + 3), Landsat offers the only economically feasible means of providing regional reconnaissance level land-cover data for a nationwide effort.

(b) Aerial Photography

Accurate classification of Landsat data will require a multistage sampling procedure. The three states required are satellite data, aircraft data, and ground data. Aerial photography must be obtained to calibrate the classification of the Landsat data and to estimate and verify the final accuracy of that classification. For determination of vegetative land cover from relatively high altitudes, it has been repeatedly shown that false color infrared (CIR) photography can provide a greater level of information than other film types. For detailed mapping and quantitative evaluation of vegetation at low altitudes, natural color aerial photography is preferable, largely because it does not exclude detail shadow areas, an unfortunate feature of CIR film. For selected subsets of each test area, photo-interpretation will provide a detailed classification of land cover according to a predetermined classification scheme (see Annex III page 32). The desired scale of the CIR photography for this task is 1:50,000. Aerial photo missions, conducted by SAN, will attempt to gather nearly full coverage (at least 80%) of each test site utilizing CIR aerial film. Since cloud coverage may be a hindrance at times, such partial coverage will be acceptable. Insistence on full coverage (the additional 20%) might begin a doubling of effort and thus costs. The film obtained

during these missions will then be processed by SAN. Final products required will be color transparencies. (Note: It may be necessary to process the CIR film in the U.S.)

(c) Ancillary Data

In order to be useful, a thematic information system must contain a variety of themes of data. The major new information obtained during the proposed project will be up-to-date land cover information from Landsat. Thematic data from other sources will be required to form the base of the information system. These other sources may include previously published maps, reports, and tabular data compiled by a multitude of various, Peruvian resource agencies. Decisions must be made regarding the priority of themes of interest. In some cases, several specific themes may be generated from a single previous data source. For example, the themes of slope class, drainage, hypsometry, and watershed delineations may all be derived from a standard topographic map. For all priority themes, an effort must be made to collect the most relevant and available data. One must attempt to find data having a level of generalization applicable to 1:100,000 scale mapping. For instance, a cadastral map of Lima at a scale of 1:2,000 would contain details much too small to be used in a 1:100,000 scale format. As a base for mapping, the standard quadrangles must be obtained. In areas not covered by such mapping, SIAR imagery at 1:100,000 scale can be mosaiced into this format.

(4) Land Cover Mapping

The basic task of land cover mapping will be performed by digital classification of Landsat data supported by verification through aerial photo-interpretation and ground field checks. Prior to actual mapping, a standard land cover/land use classification scheme must be agreed upon. An acceptable scheme to be implemented under the project has been developed by RDA and is contained as Annex III of this paper. The final output products generated will include maps at any scale (1:100,000 for the proposed project) in b/w or color indicating or all cover classes, or tabular statistics. Tabular statistics may include percentage of area covered by each cover type.

(5) Cartography

To complete the preparation of the final thematic product, all theme data, including the Landsat derived land cover maps, must be formatted to a common scale (1:100,000) and registered to common boundaries (standard 30-minute IGM quadrangles). Individual themes can then be displayed as transparent overlays registered to a base map. To achieve maximum durability and usability of the products, full production line methods will be followed. All maps will be made into scribed separation sheets. These sheets of clear plastic overlays, each carefully registered to their mates in a given series of

overlays, are prepared by using the scribing method. In this process, multi-coated sheets of stable-based plastic material have point and line features plus written material etched into their surface, thus creating, in effect, a photographic negative. All that is required to employ these in a full-color printing process is to convert each of these "scribe-sheets" to a printing plate, a routine printing process which is standard procedure at ONERN.

(6) Map/Overlay Production

The scribed thematic maps will be used to prepare direct printing plates for offset printing. For specific applications, the maps may be printed in a combined series of several overlays onto a single paper map sheet, each theme perhaps having a different color code. For more general applications to take full advantage of the thematic process, the theme maps should be printed on stable-base transparent material (acetate or mylar) as overlays. Both printing methods are within the capabilities of ONERN. By using such an offset process rather than producing positive transparencies photographically, the costs of production can be greatly reduced.

Sufficient copies of each map/overlay set should be prepared to guarantee widespread distribution to all interested agencies and to insure that all on-call requests can be rapidly supplied for a number of years. A minimum run of 200 copies/set is a reasonable estimate. Master negatives should be maintained for future update and additional runs.

(7) Map Distribution/User Assistance Facility

This Project will build ONERN's institutional capabilities in numerous areas. In addition, it will produce information potentially valuable for many uses and by several agencies. ONERN will have developed a capability to continue this mapping philosophy throughout the remainder of the country. It likewise will have developed a capability to process Landsat data for specific purposes other than land cover mapping. However, the ultimate success of any program of this sort depends on the accessibility of the information to its potential users, i.e. the resource and environmental analysts, planners and policymakers. Training courses incorporated in this project will educate these users in the applicability of the information. Accessibility to the data is also required. Toward this end, establishment of a public user assistance facility within ONERN is required.

The user assistance facility will act as an interface between ONERN and the potential users of the information and capabilities. It will provide map and report sales direct to the public and will direct and coordinate requests for specific use of ONERN's technical capabilities, such as project-specific Landsat processing or use of the computer-assisted geographic information system. Eventually, it may be possible to install a public computer terminal in the facility to allow real-time inquiries regarding data availability or actual use of the GIS.

b. Phase II - Geographic Information System

Reaching operational status of a geographic information system requires completion of several discrete, incremental tasks. These would be timed in conjunction with the other two major phases of the project so that the GIS could be brought into an operational state at the moment when its full power could be brought to bear on resource problems. The key advantage which the geographic information system has over traditional, localized resource studies is that it is modular in its organization. Traditional studies, by contrast usually concentrate on a fairly small segment of territory and are "tailor-made" to that area. Items of interest, methodology, and map scales are often unique to the study area and thus not easily matched to scales in other areas. Any alteration in these traditional area studies, such as later modification or revision requires recasting large parts of the work, usually by slow, tedious, and expensive means. In short, traditional area study methods involving manual manipulation and presentation of data can be classified as fixed in character while those employing the geographic information system approach are modular.

Several extremely important advantages accrue from modularity. Most importantly, when machines rather than humans are performing the drudgery aspects of the work, there is no need to refrain from undertaking any alterations within the system on to make comparative studies with other areas. To commence on such an operation with a fixed system required determining whether the high cost involved would be worth the effort.

The immediate practical advantages of this GIS are many. A listing, citing potential Peruvian examples, follows:

(1) Infinite Choice of Map Scales

Spatial data available at any map scale may be geo-coded and then recalled at any desired map scale. In fact, a GIS could be used to add new information or update and remanipulate old data in existing, traditional studies. Many such studies exist in Peru, those involving drainage basins are a good example. It is reasonable to presume that once the availability of GIS data were known by Peruvian users they would be quick to request maps of data (and data manipulations) at map scales to match those which they had prepared. A common case would surely be that of the researcher dealing with a small area and needed data from the GIS data bank at a large map scale.

(2) Choice of Varying Map Shapes and Area Configurations

It is almost unwritten "law" that an area chosen for study will not lie, conveniently, on a single topographic quadrangle sheet but will fall at the corners of several sheets. In undertaking a traditional study this situation requires the careful joining of these

sheets to prepare a base map. With a GIS, the problem simply does not exist. Because all of the data are geo-coded to a grid reference system which is nationwide in scope, it is possible to recall spatial data in any shape or study area from anywhere within the country. Simple examples would be a drainage basin, an areal administrative unit, or even a quadrangle map sheet.

(3) Modifying Old Spatial Data

Again, the GIS has an advantage. In conventional map revisions, an update requires producing a new map, with all the attendant costs of time and money. With the GIS, there are the dual advantages that first, only the affected module(s) is changed and that any changes are readily incorporated into the whole while taking full advantage of computer power.

(4) Adding New Information

A major problem addressed by many users is how best to monitor spatial change. Growth of large metropolitan areas are a good example. Using conventional means, the common method is simply to produce a new map. There is unfrequently enough interest to warrant the undertaking of what is really required, namely the producing of a map which plots the types of change which have taken place. Land use conversions, best handled within a matrix format, are easily plotted, measured, and analyzed using approaches readily available within geographic information system. Perhaps the greatest value of a GIS to the proposed project in Peru would be the ready facility of adding results from the computer processing of Landsat digital data. If it is anticipated that mapping of land use and land cover using Landsat data will be extensively used in resource studies, then it is imperative that the results of the computer assisted processing of these data be given an equally fast introduction into the mainstream of data available to users. The maps and data produced would be readily usable by planners and decision makers. Color graphics and projectable transparencies could easily be produced for presentation. Further, the map products could be readily reproduced by computer-assisted cartographic operations.

c. Phase III - Environmental Planning Assessment and Demonstrations

Although, ONERN and other government institutions currently lack experience in environmental analysis procedures, the proposed Project will effectively remedied this situation through the provision of technical assistance and training. As a result, ONERN will achieve the institutional capability to perform environmental impact assessment and to formulate environmental policy.

Environmental planning cannot be accomplished however, without adequate data, and data is not particularly useful unless it is

in a form that can be transformed into reliable information for planning and development activities. Thus, the development of an environmental data base is an important component of the proposed Geographic Information System. This section addresses project components designed to facilitate ONERN's capability for environmental impact assessment, evaluation and policy formulation.

(1) National Profile of the Environment .

The concept of an environmental profile encompasses a comprehensive study and data gathering procedure to provide information concerning:

(a) The extent and condition of natural resources;

(b) Policies and laws that govern the use of resources;

(c) Environmental hazards, present and potential, arising from the irrational use and uncontrolled exploitation of resources;

(d) Current and planned development programs and their effects on the social, economic and environmental condition; and,

(e) Recommendations and procedures for monitoring environmental quality and mitigation of environmental impacts.

A great majority of the information currently exists, but it is distributed among a variety of institutions that do not make a point of keeping each other informed of available information and current programs. Due to their resource evaluation and planning responsibilities, ONERN comes the closest to having complete information on inter-governmental activities concerning natural resources and environment. However, the information has not been compiled into one comprehensive report resembling an environmental impact statement with recommendations and procedures for monitoring environmental quality and conservation of natural resources. The Library of Congress, Science and Technology Division, has recently prepared a draft environmental report of Peru, as part of the "Man And The Biosphere" program. This document provides excellent background information, but its scope did not include recommendations for monitoring environmental quality, procedures for mitigating environmental impact or guidelines for land use development for different regions and ecological zones of the country. Preparation of an environmental profile would allow ONERN to prepare policy level studies (as distinct from their more technically - oriented, project or area specific studies), as well as the possibility to use the information as a basis for a national plan of action for combatting natural resource degradation and environmental pollution. The profile would cover the following topics described in Annex II, Exhibit 6:

(2) Impact Assessment Training

ONERN has received limited technical assistance in impact analysis from PNUMA and OAS which was channeled through its Division del Medio Ambiente. In addition to the experience gained by ONERN from the AID funded Huallaga Central Environmental Protection Plan, technical assistance in environmental impact analysis has been tied to project specific case studies with minimal amount of formal training passed on to ONERN personnel. An OAS contractor presented a short course on impact analysis based on his own version of the Sorenson Environmental Impact Linkage System. The course, attended by lower level technicians from ONERN, was primarily a lecture and overview of ecological principals and the relationship between development activities and subsequent environmental change. The course failed to provide ONERN personnel with a working knowledge of environmental impact analysis methods which they could apply operationally for impact analysis on development projects.

Discussions with ONERN's Director and Deputy Director during PP preparation confirmed ONERN's wishes to continue their efforts to develop an impact analysis capability. They agreed that the training program approach would be most useful with the curriculum designed to provide users with and background in the most appropriate methodologies for environmental impact assessment for development programs. A series of training programs are proposed for the project. The training programs should consist of two general types. (1) A course on environmental impact and analysis methodologies designed for technical people, and (2) an administrators or management course to aid decision making for environmental protection and development program activities. (See Annex II, Exhibit G for a description of this activity).

(3) Environmental Assessment Demonstrations and Training

Environmental assessment demonstrations have been proposed for the project to illustrate direct application of remote sensing and thematic map data to resource inventory, analysis and assessment of environmental problems in Peru. The nature of the demonstrations will vary with the information requirements of the test area. The environmental demonstrations will allow ONERN and scientist from other institutions to apply the concepts and methodologies that will be introduced to them through a variety of training programs. The demonstration will also be valuable to supply information about natural resources and environment in the test areas which will aid planning and decision making for development projects as well as national policy formulation. Annex II, Exhibit G contains a description of this activity.

C. USAID Assistance Strategy

1. Relationship Mission to CDSS Strategy

In dealing with its poverty problems the GOP has devoted considerable efforts and resources to the achievement of both growth and equity objectives with the provision of increased production and income distribution forming the basis for its equity-based programs. However, if Peru is to achieve its goals it must adopt policies and programs for maximizing the efficient use of its own resources. The USAID program is therefore focussing to a greater extent on increasing productivity and production-oriented employment. One important part of this strategy is to maximize the efficient use of Peru's land resources through natural resource inventories and improved land-use planning. This Project contributes to that effort, the result of which will improve resource utilization and through its effects on land productivity, increase the income-earning opportunities of the rural poor.

2. Relationship to Current Mission Programs

ONERN has an important role in the Mission's development strategy of assisting the GOP to improve the nutrition and income levels of the country's poor through projects designed to increase agricultural production in the sierra and ceja de selva regions. The AID loan funded Sub-Tropical Lands Development Project is designed to open up new lands to agriculture in the high jungle of San Martin. Similar projects are being planned for the high jungle areas of Huanuco, Pasco and Junin. These high jungle areas contain rich soil and water resources along undeveloped river valleys. However, they also contain adjoining areas of steep slopes and flood plains that are susceptible to erosion. Thus, ONERN's role is to identify those portions of these areas to be developed and those portions to be protected. Also, it is ONERN's responsibility to establish a system to monitor the use of the resources in these areas as they are being developed.

Other AID projects requiring timely inputs from ONERN are the Sierra Irrigation Project, the Energy Project (for the installation of mini-hydroelectric centers) and the Soils Conservation Project. The success of these projects require reliable information on stream run-off, on watershed networks, on areas susceptible to flooding and erosion and other factors concerning water resources.

The training and institution building features of this Project will enable ONERN to respond to the needs of these AID projects as well as to the needs of many other development projects being sponsored by the World Bank, BID, UNDP and other donors.

3. Other Donor Activity

a. The Canadian Government (CIDA) sponsored a remote sensing program with ONERN called Project Percep. It consisted of a

\$600,000 grant over a two year period. The funds were used for a variety of purposes relating to development of ONERN's remote sensing capabilities. Extensive training in both digital and manual interpretation techniques was provided. Twelve persons received training at the Canadian Centre for Remote Sensing (CCRS), the Laboratory for the Applications of Remote Sensing (CARS) at Purdue University, the Environmental Research Institute of Michigan (ERIM), EROS - Sioux Falls, and Goddard over a three month period. The project funded extensive hardware although most of the purchases have yet to be made. At present, the two Hasselblad 70 mm. SLR cameras have been purchased, as well as a Spectral Data Systems Color Additive Viewer. A complete color darkroom system is on order. This system will allow color additive enhancements of up to four bands of multispectral photography or imagery. The procurement of a digital image analysis system manufactured by Dipix Systems Ltd. of Ottawa, Canada is also being considered.

b. The OAS sponsored a resident technician for two years to work with ONERN's Environmental Section. The TA was mostly theoretical with very little practical applications to ONERN's needs.

c. I.B.M. is providing some funding for the application of digital analysis of LANDSAT imagery, using an IBM computer program developed by I.B.M. The material is sent to Mexico City for processing, by IBM, which has not proven to be very effective.

III. PROJECT ANALYSIS

A. Administrative Feasibility

1. Institutional Background and Organization

The National Office for the Evaluation of Natural Resources (ONERN) was created on April 27, 1962, by Supreme Decree as a Division under the Ministry of Development and Public Works, to continue and intensify the activities of the National Resources Evaluation Program implemented by the earlier Inter-American Cooperative Service for Development. When the National Planning System was founded in Peru, ONERN was incorporated into the National Planning Institute (INP) under the assumption that the activities and operations of both were interconnected and complemented each other. Further reorganization in 1965 put ONERN under the aegis of the Presidency, passing since then through various legal shifts until 1973 when ONERN, by virtue of Decree Law N° 20014, became a Decentralized Public Entity under the control of the Prime Minister. Later on April 23, 1974, the Revolutionary Government issued Law N° 20588, providing a full-fledged legal basis for ONERN's organizational structure.

The objectives of ONERN as set forth in its Organizational Law are:

a) To prepare integrated natural resource inventory studies oriented to the economic and social development of Peru.

b) To cooperate with the National Planning Institute in the formulation of policies for the use and conservation of natural resources; and,

c) To study the interactions at the national level between man and his natural environment with the intention of proposing measures to preserve balanced ecological development.

Furthermore, the GOP, recognizing the vital role played by the conservation of natural resources and the need to maintain balanced eco-systems within the context of the economic development of the country, has assigned to ONERN the following specific functions:

i) To advise the INP and the Sectoral Ministries in the formulation of policy for the use and preservation of the natural resources of the country, as well as for the programming of the inventory and evaluation of such resources in relation to the national development plans;

ii) To carry out integrated studies and/or specific analysis of natural resources in accordance with the goals established in the regional and national development plans;

iii) To cooperate with other governmental institutions, providing technical assistance in the research and evaluation of natural resources;

iv) To compile, evaluate and disseminate technical information related to evaluation of natural resources.

More recently, in view of the high deterioration experienced in some areas of the country due to indiscriminate exploitation of the natural resource base, the GOP has given ONERN the responsibility for the assessment of and development of research programs for the preservation of the environment. To carry out its functions, ONERN has the following organization (see organizational chart contained in Annex II, Exhibit B). At the highest level is the Director General who heads the General Directorate and is followed by the Technical Director who heads the Technical Directorate. The former is assisted by two advisory committees. The first is the National Committee for Natural Resources, which participates on a permanent basis in the elaboration of institutional policy and in the development of implementation plans. The second, the Technical Committee, is constituted as needed to assist in resolution of specific issues of concern to ONERN.

In accord with the Basic Law of the National System for the Control of Public Activities (D.L. Nº 19039), ONERN has established an Office of Internal Audit in charge of supervising and controlling

the activities of the institution, which is directly responsible to the Director General. ONERN has five offices responsible to the Technical Director. Three characterized as support offices: the Office of Administration; the Office of Information and Communication; and the Office of Natural Resources Cartography. The other two are advisory offices: the Office of Legal Advisor and the Planning Office. These five offices are subdivided into smaller divisions with specific tasks (see Annex II, Exhibit B). Finally, ONERN has two directorates: The Directorate of Natural Resources Integrated Studies, with the responsibility of implementing multidisciplinary inventories of natural resources; and, the Directorate of Studies for the Preservation of the Natural Environment, engaged mainly in the research and evaluation of the problems related to the interaction between man and its natural environment. Each of these directorates is also subdivided into smaller groups with specific tasks as shown in the organizational chart contained in Annex II, Exhibit B.

2. Administrative Analysis of ONERN

To carry out its activities ONERN's budget is centrally funded by the GOP. Table 1 below shows the operational budgets of ONERN for the period 1977 to 1980 broken down by type of program. Program 121 deals with the basic evaluation of the natural resources of the country. In 1980 for example S/.64.0 million will be invested in general research on the following topics:

- The Natural Resources of Peru and Strategy for its Development
- Analysis of Environmental Impacts
- Application of Remote Sensing Techniques for the Evaluation of Natural Resources
- Inventory and Evaluation of Natural Resources in Support of the Hydrologic Development Plan

It should be noted that Program 121 is conducted by direct hire personnel of ONERN. Approximately 77% of the total 1980 allocation for this program serves to defray the costs of wages and salaries.

Program 122 refers to detailed feasibility and pre-feasibility studies for specific regions. These studies are implemented mainly by long-term contracted personnel. During 1980 the following jungle areas will be evaluated: Pichis-Palcazán-Pachitea, Alto Mayo (Huallaga), Atalaya (Tambo river) and Putumayo.

The GOP budget allocations for ONERN for the period considered in Table 1 have increased annually in nominal terms, as revealed by the growth index. In real terms, taking 1977 as the base year, the series show an increasing trend in spite of the drop in 1978.

TABLE 1ONERN - Land Use Inventory and Environmental PlanningOperational Budget of ONERN: 1977-1980
(Millions of Soles)

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
<u>Program 121</u>				
Wages and Salaries	25.0	33.7	43.8	49.0
Goods and Services	4.2	8.2	7.1	11.0
Transfers (e.g. social security)	1.4	1.5	2.9	4.0
	<u>30.6</u>	<u>43.4</u>	<u>53.8</u>	<u>64.0</u>
II. <u>Program 122</u>				
Wages and Salaries, Goods and Services to Prepare Specific Investment Studies	<u>22.3</u>	<u>25.0</u>	<u>90.0</u>	<u>110.0</u>
Total (I + II)	52.9	68.4	143.8	174.0
Index of Growth	100.0	129.3	272.0	329.0
Totals Deflated (1977 = 100)	52.9	43.3	54.3	62.0 ^{1/}

^{1/} Projected.

As of May 1980 ONERN employed 154 persons, of which 58 are professionals having university degrees, 30 are skilled technicians, and the remaining 66 are administrative personnel. Professional occupations represented in this group include foresters, economists, geologists, agronomists, agriculturists, civil engineers, mechanical engineers, geographers, psychologists, sociologists and cartographers. Figure 1 contained in Annex II, Exhibit G. illustrates the occupational distribution of personnel within the various offices on ONERN.

In its 18 years of existence ONERN has accumulated considerable experience in the preparation of natural resource inventories, and in recent years it has begun to carry out environmental assessments. The most recent assessment that ONERN has carried out was prepared for an A.I.D. financed project (A.I.D. Loan Nº 527-T-061, Development of Sub-Tropical Lands). This assessment was an environmental protection plan prepared to satisfy a condition precedent under the Loan Project. Annex II, Exhibit H shows a listing of studies prepared by ONERN. It should also be indicated that ONERN has dynamic program of international technical cooperation designed to strengthen its capability to meet the objectives specified in its organic law.

3. Project Implementation and Coordination

The proposed project is directed primarily toward building the capabilities of ONERN to provide information to Peruvian user agencies in the fields of natural resource inventory, information storage and processing, applications of new technology to resource analysis and environmental assessment, and environmental planning. The Project will have a duration of three years during which time it will support this institution-building goal by provision of technical assistance, acquisition of hardware and supplies, training of personnel and subsidy of local professional and technical labor.

ONERN presently possesses a sufficient infrastructure to effectively administer the many varied aspects of this project. Since the project will require the coordinated efforts of at least three of the Offices or Directions of ONERN, it is recommended that the administrative manager of the overall ONERN effort be the Technical Director of ONERN. Reporting to the Technical Director will be the heads of each of the three sections most intimately involved: The head of the Remote Sensing Section, who will be responsible for all aspects of remote sensing, including digital classification, air photo interpretation and field work; The head of the Cartography Section, who will manage all cartographic efforts, production efforts and, working in conjunction with the head of the Remote Sensing Section, will manage the operation of the GIS; The head of the Environmental Section, who will coordinate all aspects of the environmental profile and training sessions, and, will coordinate the many varied environmental demonstrations working with the remote sensing and cartography sections.

The Technical Director, will be responsible for coordination with other agencies, most importantly, with SAN. He will also act

as official liaison with supporting agencies such as the Ministry of Agriculture and Food, and with USAID. In addition, he will oversee the operation of the User Assistance Facility.

Although the project is primarily designed to build the capabilities of ONERN, it will in fact require the assistance of several other Peruvian government agencies, and thus, will materially increase their capabilities. These groups include, but are not necessarily limited to, SAN, IGM, the Cadastral Office, the Forestry Office, and the Agricultural Directorate of the Ministry of Agriculture and Food, the IGP and the Agrarian University, as well as numerous regional development organizations.

Conclusion regarding administrative feasibility of ONERN: The Project Committee believes that ONERN has the legal powers vested by the GOP, the technical expertise, the administrative support and the experience and willingness to successfully implement the proposed project to upgrade its capability to provide timely and accurate resource information in the fields of resource inventory, environmental assessment and protection. However, given the highly technical and specialized nature of the material and equipment to be procured, it is recommended that the Mission carry out the procurement for ONERN. At present consideration is being given to a RSSA or an AID/W IQC for the provision of the technical services. This, therefore, would produce implementation of the host government contracting mode. In addition this decision is based on a formal request by ONERN contained in the letter of application.

B. Financial Analysis

1. Financial Plan

The total cost of the Project is estimated at U.S. \$1,647,000 of which up to U.S. \$1,000,000 would be financed with an A.I.D. Grant and U.S. \$647,000 would be contributed by ONERN through cash and in-kind payments. Table 2 shows the sources and application of funds for the Project. Over 80% of the A.I.D. funds will be used to defray foreign exchange costs.

The Project will finance technical assistance, training, hardware, materials and supplies. Technical assistance covers the use of technical specialists in various fields to develop and demonstrate procedures, design and install hardware and conduct short-term training, commonly on-the-job training, in conjunction with their technical duties. Training includes provision of educational services as the prime function. Peruvian support includes the labor effort by Peruvian professionals and technicians, whether under direct hire or under sub-contract, to complete the tasks. Hardware includes purchase of non-expendable items of hardware necessary for completion of the training tasks and for future institution-building. Materials and supplies include all expendable items necessary for completion of the tasks.

It is estimated that a total of 45 man/months of U.S. technical assistance will be financed with Grant funds during the implementation of the Project. ONERN will contribute approximately 649.5 man/months of support during the implementation of the three phases of the Project. The Project requires also that ONERN contribute with additional physical facilities including a computer room, an optical/digital analysis room, additional cartographic space and a room for the User Assistance Facility. The total estimated cost of the additional space-to be materialized in a new building - amounts to the equivalent of U.S. \$215,000. Annex II, Exhibit C-E show, respectively, a consolidated hardware list, a detailed summary of the required technical assistance inputs and a summary of training.

Table 3 depicts expected annual disbursements under the Grant. It is expected that cumulative disbursements by the end of the second year of project implementation will amount to 70%.

2. Recurrent Costs

During the past three years the GOP fiscal austerity program did not allow operational budgets to increase so as to maximize potential project activity for most of its public sector entities. For ONERN the budget for 1980 shows a nominal increase of 229% with respect to the 1977 level, but in real terms the increase amounts to only 17.2%. ONERN's budgetary allocations for the last three years were reduced to minimum operational levels to permit payment of salaries, utilities, basic equipment and machinery maintenance and the execution of investment studies considered of paramount importance. Peru is now slowly entering into an economic recovery phase and it is expected that national budgets will be released from the harsh fiscal austerity of the last years and increased allocations, in real terms, are expected to occur during the next few years in the public sector budgets.

Table 5 shows the operational recurrent costs of ONERN with and without the proposed project. Extrapolation has been made of the 1977-1980 nominal budgets of ONERN, within project, to reflect the worse possible case. Even so, the additional required with project counterpart operational costs are within acceptable limits. For the first year of project implementation the projected without the project budget will have to be increased by only 9% to absorb the additional Project recurrent costs, it increases to 14% for the second year and falls to 9% for the third year. It is estimated that by the fourth year, following the Project's completion, when all recurrent costs of the Project must be financed by the GOP, the budget of ONERN will have to be increased by only 7% for this purpose. Given Peru's improving economic conditions, the additional recurrent costs due to the Project, are believed to be within the financial capability of the GOP.

TABLE 2ONERN - Land Use Inventory and Environmental PlanningSources and Application of Funds
(Thousands of US Dollars)

Investment Category ^{1/}	A.I.D.		GOP	<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>	<u>LC</u>	
<u>I. Natural Resource Inventory and Information System</u>				
- Technical Assistance	100.0	8.0	-	108.0
- Training	24.0	-	-	24.0
- Implementation Support	-	-	334.0	334.0
- Hardware	262.0	-	-	262.0
- Materials and Supplies	-	95.8	-	95.8
Sub-Total (I)	386.0	103.8	334.0	823.8
<u>II. Design and Implementation of Geographic Information System</u>				
- Technical Assistance	99.0	-	-	99.0
- Training	28.0	-	-	28.0
- Implementation Support	-	-	37.2	37.2
- Hardware	75.0	-	-	75.0
- Materials and Supplies	3.0	3.0	-	6.0
Sub-Total (II)	205.0	3.0	37.2	245.2
<u>III. Environmental Planning, Assessment and Demonstrations</u>				
- Technical Assistance	152.0	-	-	152.0
- Training	60.0	-	-	60.0
- Implementation Support including new building	-	-	276.5	276.5
- Hardware	75.0	-	-	75.0
- Materials and Supplies	5.0	9.5	-	14.5
Sub-Total (III)	292.0	9.5	276.5	578.0
Total (I + II + III)	883.0	116.3	647.7	1647.0
	61%		39%	100%

^{1/} The contingency (5%) and inflation (10%) factors have been factored in the respective investment categories.

TABLE 3ONERN - Land Use Inventory and Environmental PlanningExpected Annual Disbursements by A.I.D.
(Thousands of US Dollars)

<u>Investment Category</u> ^{1/}	<u>Year I</u>	<u>Year II</u>	<u>Year III</u>	<u>TOTAL</u>
<u>I. National Resource Inventory and Information System</u>				
- Technical Assistance	64.0	44.0	-	108.0
- Training	-	10.0	14.0	24.0
- Hardware	24.0	138.0	100.0	262.0
- Materials and Supplies	5.0	28.0	62.8	95.8
<u>II. Design and Implementation of Geographic Information System</u>				
- Technical Assistance	51.0	48.0	-	99.0
- Training	-	28.0	-	28.0
- Hardware	25.0	50.0	-	75.0
- Materials and Supplies	-	6.0	-	6.0
<u>III. Environmental Planning, Assessment and Demonstrations</u>				
- Technical Assistance	26.0	56.0	70.0	152.0
- Training	-	52.0	8.0	60.0
- Hardware	-	35.0	40.0	75.0
- Materials and Supplies	5.0	5.0	4.5	14.5
Totals	200.0	500.0	299.3	999.3
	20%	50%	30%	100%

^{1/} The contingency (5%) and inflation (10%) factors have been factored in the respective investment categories.

TABLE 4ONERN - Land Use Inventory and Environmental PlanningSummary Table by Project Input
(Thousands of US Dollars)

	<u>A.I.D.</u>	<u>G O P</u>	<u>TOTAL</u>
Technical Assistance	359	-	359.0
Training	112	-	112.0
Implementation Support	-	647.7	647.7
Materials of Supplies	116.3	-	116.3
Vehicle and Spare Parts	35.0 ^{1/}	-	25.0
Hardware	<u>277.0</u>	<u>-</u>	<u>387.0</u>
	999.3	647.7	1'647.0
	61%	39%	100%

^{1/} Includes \$15,000 for a new 4 wheel drive vehicle including spare parts and \$20,000 for spare parts for rehabilitation ONERN's present vehicle fleet of 16 Dodge and 7 Chevrolet pick-ups.

TABLE 5ONERN - Land Use Inventory & Environmental PlanningONERN - Operational Recurrent Costs
(Millions of Soles)

	<u>Base Year</u> <u>1980</u>	<u>Year I</u>	<u>Year II</u>	<u>Year III</u>	<u>Year IV</u>
<u>Without Project</u>					
I. ONERN Total Operational Costs ^{1/}	174.0	219.5	263.3	307.2	351.1
<u>With Project</u>					
II. ONERN Additional Operational Costs		20.0	36.0	28.0	25.0
Percentage Increase due to Project Recurrent Costs		9%	14%	9%	7%

^{1/} Actual for 1980 and projected according to regression equation $OC=0.1 + 43.9 T$ with $r = 0.97$

C. Economic Analysis

It is difficult to quantify, with any degree of precision, what the long-range economic benefit of the proposed Project will be. This is due to the fact that one of the intended end products of the Project's activities -- an increased national capability to adequately and accurately assess the country's natural resources, and thereby be able to choose rationally among economic investment opportunities which relate to resource utilization -- is, in effect, an input into a very wide range of national policy decisions and programs, the implementation of which can easily run into the hundreds of millions of dollars over a period of only a few years.

1. Economic Rationale

The economic rationale of any natural resource inventory or survey operation is to provide a "user" or decision-maker with more complete, more accurate, and/or more reliable information concerning the resource and its condition that was originally available. This information is of economic value to the extent that it enables the decision-maker to reach a better decision than he could in its absence. In Peru, as in most of the LDCs, one of the main questions is not "What do we do with what we have?" but "What do we have?"

For example, before any effective regional development plan can be formulated it is obviously necessary to have at least some idea of what is to be developed, its location, and current condition. In Peru there is a general idea of the natural resources at its disposal but its reliability is geographically sporadic.

In many areas of the sierra and ceja de selva, the information base is incomplete, several years out of date, and may be of questionable accuracy and reliability. This is a direct result of limited budgets for resources survey and a scarcity of trained personnel. The advent of remote sensing technology, with its promise of rapid and inexpensive data collection over large areas, offers one possible solution to this information problem.

The economic utility which a natural resource inventory system can have in the determination of investment priorities is even more critical. Peru's major infrastructure investments have been (and will continue to be, over the next decade) in the following areas: transportation, irrigation, hydroelectricity, mining and petroleum. Any given project, in these categories, may cost anywhere from \$100,000 to over a billion dollars, the total amount of resources expended in any year, including both external loans and credit as well as internal resources, is likely to be in excess of \$1.5 billion.

Despite the magnitude of monetary resources expended, decisions are frequently made using incomplete information on the natural resources actually available; as a result decision-makers are unable to

choose effectively among alternatives which irreversibly commit the natural resources in question. The results of this type of decision-making have been clearly seen in the case of massive investments in areas where the potential economic return is now very much in doubt, while it is true that there is a strong political element involved in many investment decisions, an adequate natural resource information base could serve to rationalize even politically-based investment allocations.

2. Cost Effectiveness

Cost-benefit analysis, as applied to earth resources information systems, is concerned with identifying the costs associated with collecting and processing a more complete set of information and estimating the net social benefits that will derive from the "better decision" that will, presumably, be made.

The shortcomings of cost-benefit analysis as a tool for investment decision-making have been widely discussed in the literature, and it is recognized that, in any major government program, total costs may be difficult to identify. In the case of natural resources information systems, however, the principal objections center around the various methods and assumptions employed to compute benefits.

The final conclusion is that results obtained from any cost-benefit study must be a direct function of initial assumptions regarding supply, demand, consumer surplus, alternative cost, expectations and technological capability. With the possible exception of technology, none of these elements are precisely known, even in the developed countries where a substantial amount of statistical data is available. In developing countries, such as Peru, cost-benefit analysis of information systems becomes a guessing game.

Cost-effectiveness. Analysis may be a much more appropriate technique when dealing with demand for natural resources data and information. Any natural resources information system, whether based on ground, aircraft or satellite-acquired data, will be economically justifiable only if it:

- 1) Provides the executive with needed information not possible to obtain by alternative means, or
- 2) Provides the same information as alternative means but at less cost or in a more timely fashion.

The key word is needed information. If the individual decision-maker is motivated, either by governmental legislation or by profit considerations, to manage certain natural resources, then he will need reliable and valid information concerning their location, extent, condition and change over time. If the resource is widely distributed he may need data at a reconnaissance level of detail over

a wide area. If the resource is a dynamic one, changing rapidly with time, he may need repetitive data at frequent intervals. In any event, the nature of the resource and the level of management desired will define the type, quantity and frequency of information that must be generated.

Given that this information is needed, the problem then becomes one of determining the most effective, least costly approach to information generation. This requires detailed knowledge of the available technical alternatives, their accuracy, reliability, level of data aggregation, and cost. Unfortunately, there is a tendency to believe that when "new" data is collected, of a type or with a frequency of coverage previously impossible, it is automatically cost-effective, worthwhile and desirable, particularly if it involves a new or relatively sophisticated technology (the "new-must-be-better" syndrome). Remote sensing of earth resources from aircraft or spacecraft may well be worthwhile, but the conclusion is by no means automatic, particularly in the developing countries of the world where labor is abundant and cheap and capital is scarce and expensive.

Cost-effectiveness analysis is concerned with comparing alternative methods to accomplish a given task or tasks, exogenously defined as required. If a new technology can only do part of a given task where the entire task must be done, then it cannot be a total substitute and older, more conventional techniques must be used at least in part, thus adding to the cost. Further, if the new technology offers to do additional tasks that are not presently required, the benefits so derived cannot properly be included in the cost-effectiveness analysis. Unless and until these new tasks become "required", their "benefits" can only be approximated by cost-benefit analysis methods.

D. Social Analysis

1. Project Beneficiaries

Strengthening the institutional mechanism through which the GOP manages Peru's renewable natural resources will eventually benefit the entire population, benefits from the Project will thus accrue to the entire Peruvian society. While these are difficult to quantify, benefits from this Project and related activities over time will include greater availability of agricultural and forest products, reduction in soil and water losses, more effective land utilization, more equitable land structure, new income and employment and reduction of many of the social and economic ills including a decrease in uncontrolled urbanization. It is, however, the rural poor who stand to benefit most from the improved resource and land use management decisions, for which this project will provide the basis.

Direct beneficiaries of the Project will be the personnel of ONERN and the other GOP agencies who participate directly in the Project through Grant funded training and technical assistance and

equipment acquisition. The professional level of the personnel and the scope and the types of activities which they perform will be enhanced through the Project.

2. Relationship of the Project to the Target Group

The proposed Project will address two major environmental concerns of the GOP. Under the first, the Project will assist the National Office of Natural Resources Evaluation (ONERN) to identify, adapt and demonstrate appropriate procedures and techniques which support the utilization of remote sensing for inventorying, appraising and managing agricultural and other resources such as mining, forestry, etc. It is increasingly clear that the economies of all countries, especially developing ones such as Peru, are heavily dependent upon natural resources, both renewable and non-renewable. Accordingly, economic development and the welfare of the people are tied in various ways to income derived from these resources. In order to maximize returns, and thereby increase incomes, accurate assessment and rational management are vital elements of a resource development program. Resource management decisions are based upon many factors, but among the most critical is an accurate knowledge of the physical characteristics such as the quantity, location, condition, distribution, rate of change, climatic conditions, and various environmental factors related to a given resource. Remote sensing, using both satellite and aircraft data is a form of modern technology which can greatly contribute to the accuracy of these assessments while at the same time reducing the costs.

A considerable amount of general information is available on the ecology, geology, hydrology, etc. of the country, but specific information on those resources that can be exploited, particularly renewable resources, is lacking. As a result critical decisions -- such as those concerning utilization of forestry or water resources -- are generally made using an imperfect information base. The need to adopt measures to protect the country's renewable resources is urgent. The widespread salination of ground water along the coast due to excessive irrigation from wells, and the erosion of large areas of rich soils due to excessive clearing on steep slopes in the sierra, are but two examples of renewable resources being destroyed by the irrational use of the land.

Thus the benefits of improved management and more accurate quantification of Peru's natural resources will accrue to the entire population. To the extent that problems of water management, salinization, desertification and erosion are ameliorated and new hydrologic resources, agricultural land and forested areas are opened to rational exploitation, those segments of the population of most interest to A.I.D. will benefit from the increased agricultural production, food availabilities and improved environmental conditions which they permit.

3. Role of Women

The impact of this Project on women cannot be separated from its impact on the general population. However to the extent that the trend toward increased female participation continues, the information generated by this Project will result in a more constructive orientation of the role of women in Peruvian society.

E. Technical Analysis

1. Choice of ONERN

The lead agency conducting most of the work for this project will be the National Office of Natural Resource Evaluation (ONERN).

The technical objectives of ONERN, as set forth in its statutes include:

- Preparation of integrated natural resource inventory studies oriented to the economic and social development of Peru;
- Cooperation with the National Planning Institute in the formulation of policies for the use and conservation of natural resources;
- Study, on a national level, of the interactions between man and his natural environment with the intention of proposing measures to preserve balanced ecological development.

ONERN is organized into five offices, including the Office of Administration, the Office of Information and Communication, the Office of Cartography of Natural Resources, the Office of Planning, and the Office of Legal Assessment, and two Direcciones, including the Direction of Integrated Studies of Natural Resources and the Direction of Studies for the Preservation of the National State. Each of these is subdivided into smaller groups with specific tasks (Sub-Directorates, Divisiones and Areas). Part III, Section A, discusses in more detail the administrative organization of ONERN and the occupational distribution of personnel within the various offices of ONERN.

Over its 18 year history, ONERN has completed approximately 55 regional resource studies covering 30-40% of the total land area. Almost the entire western coast extending to the coast of the Andes has been so covered. Additional areas include some of the potentially rich areas of the high and low selva. In all, ONERN has produced well over 1,000 resource maps. Boundaries of the individual study areas generally correspond to watersheds. Scales of maps vary in accordance with size of the area covered; large area generally implies a small scale map product and level of detail required. Most of these studies have been conducted using the classical resource mapping techniques, i.e. relatively large scale b/w aerial photography combined with detailed ground

field work. However, in the last several years mapping from satellite imagery has been recognized as an effective tool for regional surveys and has been fully integrated into the standard and accepted procedures. ONERN relies primarily on visual interpretation of imagery, although some recent work has been done with digital processing of Landsat data.

In summary, ONERN, as a whole, is recognized as a capable resource agency. Its techniques are proven and its products are accepted. However, in order to provide timely resource on a national scale, there must be improvements in both its techniques and its efficiency. The proposed project will provide much of the increased capability necessary to do so. ONERN will be supported by several other agencies during specific tasks of the project, among them the National Aerial Photographic Service (SAN), the Military Geographic Institute (IGM), and the Ministry of Agriculture and Food. SAN will provide support to ONERN in the matter of CIR aerial photography of the test sites. IGM will provide basic maps. The others will provide short-term specialists for specific tasks.

2. Technical Capability of ONERN

The proposed project will build the capabilities of ONERN as a whole, but will concentrate mainly on these particular segments of specific offices. They include the Sub-Directorate of Remote Sensing, the Office of Cartography, and the Directorate of Environmental Protection. Thus, it is appropriate to discuss the specific capabilities of these groups.

a. Remote Sensing

The Remote Sensing Sub-Directorate is presently comprised of a staff of 3 persons with background of forestry, agronomy, and geography. All have had formal training in remote sensing in the U.S. These have all participated in the three major remote sensing programs which have been completed. The first utilized visual interpretation of Landsat imagery to map present land use and forest cover over an area of 1/2 million hectares. Black and white prints and diazo color composites were used as primary data sources. Working in conjunction with the Instituto Geofisico del Peru (IGP), a small digital software package was developed for use of the IGP Hewett-Packard computer.

The second project, Project Percep, ONERN's longest remote sensing project to date, included land cover mapping of seven frames of Landsat imagery provided by the Canadian Center for Remote Sensing (CCRS). This project was sponsored by the Canadian Government (see Part II.C.3 for a description of this program). Land cover was visually interpreted from both b/w and color composites and classified according to a modified Anderson classification. The seven frames covered a good cross-section of the country including costa, sierra and selva.

The third project was a USAID-funded small grant from OST and administered by ERIM. It was part of USAID's Remote Sensing for Resource Assessment and Management program. Consisting of two phases, an original \$20,000 grant followed by a \$11,600 add-on, it funded basic research on the utility of digital image classification to differentiate Aguaje Palm in the Equitos area of the low selva. Digital processing was provided by ERIM. ONERN directed the processing and conducted ground truth. Seven weeks of training was provided for one person at ERIM, LARS, EROS, and Goddard Space Flight Center. Hardware purchased with the grant funds included a 35 mm. SLR camera, a Diazochrome printer and developer, and various photographic supplies.

The present inventory of hardware for remote sensing is modest. In addition, ONERN maintains a fleet of approximately 21 vehicles. Most of these were originally financed with USAID funds on previous projects. They consist mainly of Dodge pickup trucks and Chevrolet carryalls, and most are of 1967-1970 vintage. A complement of spare parts will be financed under the Project, to cover increased use which the vehicles will be expected to have under the Project.

Space within the remote sensing office area is totally inadequate for the proposed program. There is no room for the proposed computer system although the image analysis terminal could be located there. No more than 2 persons could be added to the presently available space. Additional space will be needed for the computer room, an image analysis/terminal room (ideally), a visual interpretation/storage room. This will be financed by ONERN from counterpart funds.

In summary, the Sub-Directorate of Remote Sensing, while small, possesses an adequate capability to support the proposed program. The staff has a good basic understanding of the technology and can absolutely absorb training in new techniques. It can also act as a nucleus to coordinate and assist with training of the additional personnel required for the proposed program. With the addition of the new hardware provided under the Canadian program; ONERN will have a relatively bounded basic capability. With the addition of hardware proposed in this program, it will have an excellent capability, able to operationally provide timely resources and environmental assessment.

b. Cartography and Map Production

The Office of Cartography is comprised of three divisions, the Division of Photogrammetry and Basic Mapping, the Division of Thematic Mapping, and the Division of Printing and Publication. Total staff is made up of 26 persons. The basic tasks of this office are to provide support to the various resources mapping groups in ONERN in basic photo-interpretation, to cartographically prepare maps for production and to print the maps and reports put out by ONERN. In addition to basic expected cartographic skills, many of the staff have had training and experience in the fields of photointerpretation and the

basics of remote sensing. For training, the Office has relied heavily on the technical courses provided by IAGS and its Fort Clayton School of Photogrammetry in the Canal Zone.

The products produced by the Cartographic Office are of very good quality. The general procedures followed are relatively labor-intensive as is to be expected. The Office has deliberately avoided use of certain labor-saving techniques in part to "be able to maintain a higher quality" and in part to take advantage of a large stock of materials on hand from previous projects. At present, however, this stock is running very low and must be supplemented in order to support the proposed program.

Present techniques include use of the standard scribing process. In most cases, map data is manually transferred to blank scribecoat. In a few instances, photo-sensitized scribeguides are prepared by hand. Use of a mechanical "whirler" could increase the efficiency of this operation. For production of colored aerial maps, peelcoat is employed. The use of photo-engraved peelcoat has been avoided in the hope of maintaining a higher quality product. Such a technique does require more care in registration of individual separations, but can cut labor by a factor of several times, a necessity for future high volume operations and with care, a high quality product can be produced.

The Cartographic Office presently has basic facilities to support approximately 20 cartographer/draftsmen. This includes drafting/light tables, scribing tools, lettering sets, and basic drafting equipment. Space available in the cartographic laboratory will be provided to support more draftsmen with the removal of the administrative section occupying 1/4 of the room. The Office maintains photographic facilities for cartographic and general photographic purposes. At present, their capabilities are limited to b/w processing. They have a large copy camera and an inadequate small format enlarger. However, Project Percept has funded (\$30,000) a complete color photographic laboratory including a high quality enlarger, an automated film/paper processor, and miscellaneous peripheral hardware. The quality of the present dark-room "wet" facilities is marginal. Tile-lined sinks, difficult to keep clean are used for print and sheet film processing. Water used is standard tap water with a high TDS (primarily bicarbonate/carbonate). Addition of stainless steel sinks and disposable ion-exchange filter columns financed under the Project will alleviate these problems.

Most maps are printed on the Harris offset press. It has a maximum sheet size of 24 x 36". Standard procedure is a 4 color run, each color printed separately. With appropriate screening, over 20 colors can be reproduced. The addition of texture screens provided under the Project will allow almost unlimited variation.

A standard run for a report with maps in 350-500 copies with perhaps 50-100 extra copies of the maps. Most of these are automatically distributed to GOP agencies. The remainder are stored in the ONERN warehouse with a few (n 5) kept at ONERN for on-call distribution. Although there is a formal Office of Information and Public Relations within the ONERN infrastructure which is responsible for dissemination of reports, there is in fact no easily accessible means of obtaining a specific product or even of guaranteeing its availability. The present procedure requires a user to formally request the report from the Director General who then sends a memo to Public Relations which in turn send out the report if it is available. There is no "map scales" counter or user assistance facility similar to even those of SAN or IGM. Accessibility of information is a pre-requisite to acceptance of and demand for a product.

In summary, the Office of Cartography is, in general, well equipped to handle the responsibilities required of it for the proposed program. With the addition of personnel, training, supplies, and a minimum of raw hardware, it can support the program and produce a high quality product.

c. Environmental Protection

Within the last year, ONERN has designated a sub-directorate which is responsible for the evaluation of environmental impacts and recommendations for mitigation of environmental impacts. The Sub-Directorate of Studies for Conservation of the Environment has proposed adding three new divisions: (1) The Division of Programming of Studies, (2) The Division of Environmental Studies, and (3) The Division of Environmental Impact Evaluation. The Environmental Protection Sub-Directorate is presently composed of a small core staff of seven professionals. The specialists of this staff are listed below:

- a. Agronomy/Hydrological impacts
- b. Agronomy/Agricultural impacts
- c. Soils/Geomorphological impacts
- d. Industrial impacts
- e. Sociology/Human impacts
- f. Geography/Urban impacts

The core staff will be aided by specialists from other sub-directorates within ONERN to carry out necessary field work for specific environmental programs.

The Environmental Protection Sub-Directorate is responsible for preparing reports which will be submitted to the National Institute of Planning. ONERN's reports concerning specific environmental studies and recommendations on development sites are used by the National Institute of Planning for the formulation of short-term, medium-term, and long-term national plans. However, the Sub-Directorate currently has little experience in environmental impact assessment and has not yet conducted any specific studies on development sites. They are currently involved in the in-house regional (departmental) survey (diagnosticos) program and have prepared a general report on the AID-financed Plan Básico de Protección Ambiental: Huallaga Central y Bajo Mayo (published February, 1979). The diagnosticos are not so much planning in the sense of being prescriptive as they are a means of organizing environmental data to summarize the environmental problems that plague particular areas. The Huallaga Central environmental protection plan attempted to address potential development problems for the Sub-Tropical Lands Development Project. The assessment took into account Peruvian laws and policies but the study was essentially a framework document somewhat lacking in necessary descriptions of the project area, while addressing some existing environmental conditions and non-specific future trends. ONERN's Diagnosticos are currently being conducted in three departments: Ancash, Lima, and Ica.

Preparation of ONERN's Diagnosticos require considerable manpower, time and data. At the present rate of progress, at least 10 years will be required to attain nationwide coverage without consideration for update or improvement. The major problem with the diagnostico procedure, at this time, is the insignificant impact and relationship that they have on the process of development planning. The diagnosticos have not been considered with proposed on-going development projects and the information may not be of sufficient quality or in a form acceptable and useful for helping the action agencies to adequately evaluate environmental impacts.

Although ONERN appears to have the expertise to conduct environmental evaluation programs for planning and development purposes, it has not developed adequate procedures and methodologies to accomplish the task. An evaluator of the ONERN Huallaga Environmental Protection Plan reported that Peru has a "realistic potential for substantial country participation (in environmental assessment) in the immediate future" ^{1/}

Realizing ONERN's current deficiencies in environmental impact assessment capabilities, the proposed project will include a series of training programs and short-term technical assistance to strengthen ONERN's institutional and technical capabilities for

^{1/} Lausche, 1979. "Visit to AID Mission/Peru, April 30-May 4, 1979, Draft Report.

environmental impact assessment (see Part II.B.5). Considering the qualifications of the environmental protection core staff and support personnel available from the other sub-directorates, ONERN should develop a realistic and operational capability in the area of environmental impact assessment and planning as a result of the proposed AID-financed project.

3. Equipment

Major hardware funded under the Canadian Project Percep is aonly now being procured. Three major systems will be acquired. These include a completely equipped color darkroom, a color additive viewer, and a Landsat digital image processing systems. The first two have been ordered. The last will be ordered in August 1980. All of these systems will have direct use in the proposed program. The first two, the color processing capability and the color additive viewer, will provide desirable, but not critical support. Acquisition of the digital system is critical to completion of the proposed program.

4. Technical Capability of National Aerial Photographic Service (SAN)

The main responsibility of the Servicio Aerofotografico Nacional (SAN) is to collect aerial photography over Peru. SAN is an arm of the military, but is designated to provide aerial photographic support to official civilian agencies within Peru and to make such photography (over most of Peru) available to the public. Legally, SAN is the only agency or group within authorized to take aerial photography. Aerial photography by other agencies or private firms is strictly forbidden. Most of SAN's photo missions are in support of the national topographic mapping program conducted by the Military Geographic Institute (IGM). However, an increasing number support resource projects or specific mapping requirements of other agencies among them the Ministry of Agriculture and Food and ONERN. SAN contracts with the agencies for specific coverage. Costs of the service must be borne by the requesting agency.

SAN has obtained coverage of approximately 40% of Peru. Almost all of the photos are black and white panchromatic and range in scale from 1:2,500 to 1:60,000. As of 1979, total photo inventory was estimated at 860,000 vertical and 30,000 oblique photos.

a. SAN Equipment

SAN possesses the latest in high quality mapping cameras and aircraft. Its cameras inventory includes 9 mapping cameras (four Wild RC-10, two RC-9, one RC-8, and two RC-5) and several reconnaissance cameras (K-17, for example). Lenses for the Wild cameras include 12", 6", and 3.5". SAN's aircraft inventory is equally impressive. They presently operate two Lear 25B aircraft, each with two transverse camera parts. The Lear, a pressurized jet aircraft, is

capable of altitudes in excess of 40,000 feet and speeds of approximately 400 mph. In addition, SAN operates three Beechcraft B80 aircraft. These twin-engine turboprops have one camera part each and are suitable for lower altitude flights than the Learjets. If a high cargo capacity, slow-speed aircraft able to land on remote runways is needed, SAN can borrow a Pilatus Porter from the Air Force.

Processing of the b/w film is done in-house by SAN. They have two Kodak Versement automated processors for 9-inch film. Contact prints and copy negatives are made on Log E Tronic strip printers. The general quality of the b/w produced by SAN is excellent. Although they have only very limited experience with b/w infrared, there is no reason to presume that they would be other than excellent.

b. SAN Experience with Color Infrared (CIR Photography)

Color infrared photography at present is not particularly popular in Peru. This is most likely due to the fact that it is expensive and more difficult to process than black and white. Because of this, few of the resource professionals have had the opportunity to use CIR photos in an operational program, and previously they had not been sufficiently convinced of its benefits to justify the added difficulties. SAN has had limited experience in taking and processing CIR photography. However, they have experimented with it. Their first experience occurred shortly after the disastrous debris flow in Callejon de Huaylas in May of 1970 when NASA flew CIR of the area. Since then, they have taken several rolls themselves and have successfully processed them by hand in a portable reel-to-reel tank. The quality of their product is quite good, particularly given the aspect of manual processing. With minor assistance in selection of appropriate filters, and in film calibration, they should be able to provide an acceptable and useful product for this project.

c. SAN Contract Costs

Very limited data is available on costs of contracting SAN to provide aerial photography. SAN commonly contracts on a cost/hectare basis and will guarantee performance. Costs often include cost of film and processing (b/w only). The Cadastral Office of the Ministry of Agriculture and Food commonly contracts with SAN for relatively large scale photography. Other agencies, such as ONERN, may obtain the photography through the established contracts of the Cadastral Office. Example of recent contract costs are 95 soles/hectare for 1:5,000 scale (small area), 41 soles/hectare for 1:10,000 scale and 10 soles/hectare for 1:25,000 scale (large area). Using this information, a reasonable figure for average cost/hour of flight time for the Learjet can be estimated at 3000/hour.

F. Environmental Impact

The USAID/Peru Project Committee completed the Initial Environmental Examination (I.E.E) during the development of the P.I.D. The I.E.E. recommended a negative determination with which the AA/LAC concurred on February 28, 1980. Annex I, Exhibit G contains the I.E.E.

IV. IMPLEMENTATION ARRANGEMENTS

A. Schedule of Major Events.

- | | | |
|-----|---|--------------------|
| 1. | Project Agreement signed. | August 29, 1980 |
| 2. | Contract signed for Aerial
Photography of First Area. | September 5, 1980 |
| 3. | Initial Conditions Precedent Met. | September 15, 1980 |
| 4. | LANDSAT Imagery ordered from
Brazil. | September 30, 1980 |
| 5. | Participant Training in
Cartography initiated
(IAGS Cartographic School) | October 6, 1980 |
| 6. | Prequalification IFB for T.A.
published. | October 10, 1980 |
| 7. | Phase I equipment IFB prepared
(Secondary Condition for
vehicles met). | October 24, 1980 |
| 8. | Final Design Plans for Building
prepared. (Secondary Condition
for GIS Computer met). | October 31, 1980 |
| 9. | T.A. Contracted. | December 19, 1980 |
| 10. | Building Construction initiated. | January 30, 1981 |
| 11. | Additional personnel contracted
(Long Term T.A. on Board) | February 6, 1981 |
| 12. | GIS System designed. Computer
IFB prepared. | March 31, 1981 |
| 13. | Phase I Field Work initiated. | April 10, 1981 |
| 14. | Participant Training in
Remote Sensing Initiated
(IAGS Cart.School) | April 24, 1981 |

15. Phase III Equipment IFB published. July 31, 1981
16. First two floors of building completed. August 3, 1981
17. GIS System installed August 3, 1981
18. Phase I of 1st. Area completed. (Reevaluation of Phase I made). September 4, 1981
19. Phase II GIS System Programmed. December 18, 1981
20. Phase III Activities initiated. February 15, 1982
21. Phase II GIS System fully operational March 31, 1982
22. Phase I Activities terminated. November 30, 1982
23. Phase III Activities terminated. July 31, 1983
24. Project Terminated. August 31, 1983

B. Procurement and Disbursement Procedures

1. Procurement Procedures

The selection of consultants and contractors, procurement of equipment and material, shipping and insuring will be done in accordance with standard A.I.D. procedures detailed in the Project Agreement. Goods and services procured under the Grant shall have both their source and origin in countries included in Code 000 of the A.I.D. Geographic Code Book and Peru. Computer tapes of satellite imagery will be procured from INPE in Brazil and a waiver will be required for this purpose. Given the highly technical and specialized nature of the goods required for the Project, these will be procured directly by A.I.D. with ONERN's active participation in developing the technical specifications. At present consideration is being given to use of a RSSA or AID/W IQC for provision of the technical services. This, therefore, would also preclude implementation of the host government contracting mode. In addition this decision is based on a formal request by ONERN contained in the letter of application.

Approximately \$20,000 of spare parts will be procured with Grant funds for ONERN vehicles to be used under the Project. These parts will be procured from the U.S. and the list will be approved by A.I.D. prior to purchase.

2. Disbursement Procedures

A three-year disbursement period will be required for the Project (see the disbursement schedule in Section III.B.1, Financial Plan). No deviation from A.I.D. established disbursement procedures is anticipated. Materials and equipment procured in the United States will be paid through A.I.D.'s standard direct procurement procedures. Disbursement for local currency costs will likewise be made in an established manner acceptable to A.I.D., established with ONERN.

C. Project Approval Procedures

The proposed Project is funded at a level within the Mission Director's approval authority and will be authorized by him. The Mission's Project Committee consisting of representatives of the Agricultural and Rural Development Office, the Development Resources Office, the Controller's Office and the Regional Legal Advisor will review the Project and recommend its approval to the Director. Signing of the Project Agreement will take place early in August, after the installation of the new government.

D. USAID Monitoring Requirements

Monitoring will be exercised by a USAID Project Committee with the following responsibilities:

1. **Project Management.** The Project Manager for the Project will be assigned from the Mission's Office of Agriculture and Rural Development. The Project Manager will work closely with ONERN and the technical assistance provided to insure that provisions of the A.I.D. Project Agreement and Implementation Letters are met.

2. **Joint Annual Reviews.** Joint annual reviews will be an essential feature of Project Implementation, the reviews to be undertaken by A.I.D. and the GOP.

3. The Evaluation officer from the Program Office will assist in doing the annual evaluations.

4. The Mission Controller will review disbursement/reimbursement requests for conformity with A.I.D. regulations and will ensure that adequate financial controls are followed.

5. Additional Mission offices, such as the Executive Office and RLA, will be called upon as appropriate.

The following reports will be required to assist the Mission in monitoring the Project.

1. A quarterly report from the ONERN Management Division on activities and counterpart expenditures completed and projections of activities and counterpart expenditures for the next quarter.

2. ONERN will develop an annual implementation plan which will include a projection of project activities for the coming year in addition to an annual operating budget which will include inter alia GOP counterpart allocation and A.I.D. local currency requirements.

E. Conditions Covenants and Negotiating Status

1. Conditions Precedent to Disbursement

a. Initial Conditions Precedent to Disbursement

Prior to the first disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, Peru will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.

(i) An opinion of the Legal Advisor of the Ministry of Economy and Finance or other council acceptable to A.I.D., that this Agreement has been duly authorized and/or ratified by, and executed on behalf of Peru, and that it constitutes a valid and legally binding obligation of the Government in accordance with all of its terms;

(ii) A statement of the name of the person for Peru holding or acting in the office specified in Section 8.2 (Director of ONERN), and of any additional representatives, together with a specimen signature of each person specified in such statement;

(iii) An operational plan for the life of the Project;

(iv) A financial plan which details ONERN contribution to the Project over the life of the Project;

(v) A time-phased plan for the provision of required counterpart personnel.

b. Secondary Conditions Precedent to Disbursement

(i) Prior to disbursement of funds for purchase the computer equipment or to issuance by A.I.D. of documentation pursuant to which disbursement will be made, Peru will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. an implementation plan, architectural and engineering plans and a financial plan, for construction or establishing and equipping of additional office-space to house the equipment.

(ii) Prior to disbursement of funds for the purchase of vehicle spare parts or to issuance by A.I.D. of documentation pursuant to which disbursement will be made, Peru will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. a listing of the spare parts to be bought.

2. Covenants

a. Peru covenants to provide necessary resources after completion of the Project to provide for operation, maintenance and repair of the equipment procured or repaired by the Project.

b. Peru covenants to establish salary scales for all professional involved in the Project especially computer programmers, operations and data technicians which are competitive in the local labor market.

c. Peru covenants to carry out with A.I.D. annual joint evaluations of the Project which measure attainment of goals and recommend necessary adjustments in Project implementation.

3. Negotiating Status

Personnel of ONERN have been closely involved in the development of the Project. No issues remain to be negotiated, and it is expected that the Project Agreement will be signed with the new Government in August 1980.

F. Evaluation Plan

Joint annual evaluations will be carried out. In addition to checking the evaluation indicators suggested in the Project Logical framework, the annual evaluations will look at the relevance and effectiveness of Project inter-agency coordination and management mechanisms established.

Although the Grant should be signed by August 31, 1980, disbursements are not likely to begin until FY 81. Therefore, the first annual evaluation is not scheduled until August 1981. Between signing and this first evaluation, the Mission will be monitoring progress towards meeting CPS and project implementation; AID/W will be kept informed through Quarterly Project Reports.



AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES AID MISSION TO PERU
C/O AMERICAN EMBASSY
LIMA, 1 PERU

TELEPHONE: 286200

CABLE: USAID/LIMA

ANNEX I
Exhibit A

CERTIFICATION PURSUANT TO SECTION 611(e) OF THE
FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I Howard D. Lusk, the principal officer of the Agency for International Development in Peru, having taken into account among other factors the maintenance and utilization of projects in Peru previously financed or assisted by the United States, do hereby certify that in my judgment Peru has both the financial capability and the human resources capability to effectively maintain and utilize the capital assistance project: Land Use Inventory and Environmental Planning - ONERN.

This judgment is based upon the implementation record of the previous projects implemented in Peru, and the quality of the planning which has gone into this new project.

Howard D. Lusk
Acting Director
USAID/Peru

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Annex I
Exhibit B
Page 2 of 3

sarrollo de su riqueza natural. Esta situación se agrava aún más si se reconoce que la información disponible de la parte estudiada del territorio no siempre se encuentra en los niveles o grados de detalle requeridos por los planes de desarrollo nacional, las obras de ingeniería o de infraestructura civil y las de promoción económica y social del país, a nivel de proyectos y ejecución de obras.

Factores de diversa naturaleza han motivado la existencia de esta situación. Entre ellos, cabe señalar la disímil o compleja realidad de la geografía, que se manifiesta en las diferentes regiones naturales; la escasez de vías de comunicación o de acceso, principalmente en la Selva y en la Cordillera; la falta de recubrimiento cartográfico (fotos, mapas, mosaicos, etc.) de grandes porciones del país y lo reducido de los fondos presupuestarios asignados a los Organismos Públicos vinculados con la investigación, administración y control de los recursos naturales.

La creación de ONERN en el año 1962 tuvo por objeto precisamente acelerar el desarrollo de los estudios tendientes a establecer el potencial de los recursos naturales básicos del país y a proponer sus usos más apropiados como medio de implementación fundamental para alcanzar los fines de un desarrollo armónico e integral. Desde la fecha indicada, ONERN ha realizado una compleja y diversificada labor, referida principalmente a la evaluación integrada de los recursos naturales básicos (suelos, agua, bosques, clima y recursos forestales), habiendo cubierto un total de aproximadamente 42'000,000 de hectáreas de la superficie territorial del Perú, es decir, alrededor de la tercera parte del mismo, en zonas de grandes posibilidades para el desarrollo integral y, paralelamente, ha venido prestando el asesoramiento adecuado a los niveles superiores del Gobierno, principalmente al Instituto Nacional de Planificación en la formulación de uso y conservación de tales recursos.

Si bien puede considerarse que los resultados alcanzados a la fecha han respondido a los requerimientos básicos de la planificación nacional, es preciso en los actuales momentos reforzar y modernizar la capacidad técnica de ONERN para elevar su eficiencia y rapidez en la ejecución de inventarios de los recursos naturales del país así como para realizar estudios sobre impactos y protección del medio ambiente. En base a esta necesidad, es que solicitamos a la Agencia para el Desarrollo Internacional se sirva estudiar la posibilidad de colaborar con el financiamiento parcial del proyecto aludido en el primer párrafo de esta carta, mediante una donación por la cantidad indicada que, conjuntamente con una contrapartida de ONERN por el equivalente de US\$647,000 permitan a ONERN implementar un programa de evaluación de recursos naturales utilizando técnicas de percepción remota así como el almacenamiento y operación, para propósitos ambientales, de información sobre recursos naturales en un sistema de información geográfica/temática. El proyecto consiste en la combinación integral de asistencia técnica, entrenamiento, adquisición de equipo y materiales a ser ejecutados en un período de tres años. En caso de contar con la a-



OFICINA NACIONAL DE EVALUACION
DE RECURSOS NATURALES
ONERN

-3-

Calle Dieciséis No. 353
Urb. El Palomar - San Isidro
APARTADO 4002
CABLES "ONERN" LIMA-PERU

Annex I
Exhibit B
Page 3 of 3

ceptación a nuestra solicitud, nos permitimos sugerir que la adquisición de equipo y material técnico a ser importado sea realizada a través de los canales de adquisición de la AID.

Agradeciendo anticipadamente la atención que se sirva conceder a nue
tra solicitud, me es grato reiterarme de usted.

Atentamente,

Eduardo Amas Autero
Director General Nacional

ACTION MEMORANDUM

TO : Mr. Howard Lusk - Acting Director

FROM : George Wachtenheim
Chief, Capital Development Division

SUBJECT : Project Authorization

DATE : June 30, 1980

Your approval is requested for a Grant of U.S. \$1'000,000 to the National Office of Evaluation of Natural Resources (ONERN) for the financing of the project entitled "Land Use Inventory and Environmental Planning"(Project Number 527-0202). Mission authorization for the subject project was granted by State cable 052842 dated February 27, 1980. The Mission was advised in State cable 152117 dated June 10, 1980, that the Congressional Notification waiting period expired May 29, 1980.

The purpose of the project is to assist ONERN in the identification of natural resources and determination of land use capabilities in the high jungle and sierra areas. Also to upgrade ONERN's capability for environmental planning, including environmental assessments, protection plans and policies on natural resource conservation.

Recommendation: That you sign the attached Project Authorization, PP facesheet, 611(e) certification, and source and origin waiver.

Encl.:a/s

Clearance:

CON:JDavison JMD *af.*
ARD:JBO'Donnell JO
DR :LTwentyman LT
RD :JRosholt JR
RLA:SWhitman SW (Cleared in draft)
PRO:LSmucker LS

PROJECT AUTHORIZATION

Name of Country: Peru
Name of Project: Land Use Inventory and
Environmental Planning
Number of Project: 527-0202

Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Land Use Inventory and Environmental Planning Project for Peru involving planned obligations of not to exceed \$1,000,000 in grant funds over a 3-year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of maximizing the efficient use of Peru's natural resources through the creation of natural resource inventories and improved natural resource planning and allocation.

3. The project Agreement which may be negotiated and executed by the Officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms, covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4. a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as stated in paragraph 4.e. below, financed by A.I.D. under the project shall have their source and origin in Peru or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent to First Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, Peru shall furnish in form and substance satisfactory to A.I.D.

- (a) An operational plan for the life of the Project;
- (b) A time-phased plan for the provision of required counterpart personnel.
- (c) A financial plan which details over the life of the Project ONERN's contribution to the project.

c. Condition Precedent to Disbursement for Purchase of Computer Equipment

Prior to disbursement of funds for the purchase of computer equipment, or to issuance by A.I.D. of documentation pursuant to which disbursement will be made, Peru will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D., an implementation plan for either (i) the construction and equipping of a building to house the computer equipment and related equipment or (ii) the refurbishing and equipping of space available to ONERN to house the computer equipment and related equipment.

d. Covenants

Peru covenants:

- (a) to provide necessary resources after completion of the project to provide for operation, maintenance and repair of the equipment procured for or repaired under the Project.

e. The following waivers to A.I.D. regulations are hereby approved: imagery tapes to be financed by A.I.D. under the project, up to an amount not to exceed \$10,000, may have their source and origin in countries included in A.I.D. geographic code 941.

Howard D. Lusk
Acting Director

Clearance:

CON:JDavison J.D.
ARD:JBO'Donnc J.O.
DR :LTwentyman J.A.
RD :JRosholt J.R.
PRO:LSmucker J.S.

SOURCE AND ORIGIN WAIVER

Under the authority delegated to me pursuant to Delegation of Authority 99.15, I hereby waive U.S. and Peruvian source, origin and nationality requirements under the Land Use Inventory and Environmental Planning Project, Number 527-0202, to permit the purchase of imagery tapes, up to an amount not to exceed \$10,000, in countries located in AID Geographic Code 941. The waiver is justified on the basis that the tapes are not available from countries included in the authorized geographic code. See HB 1, Supp. B, 5B4b(2).

Howard D. Lusk
Acting Director

BEST AVAILABLE DOCUMENT

Annex I
Exhibit D
Page 1 of 12

COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights?

The Department of State has not so determined.

2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully?

It has not been so determined. The GOP has an active narcotics control program with USG support.

3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?

The Secretary of State has so determined.

4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?

No such case is known.

5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

The GOP is fully aware of USG requirements for prompt, adequate, and effective compensation regarding expropriation of US investments. To date there have been several expropriation claims settled to the satisfaction of both Governments, including Marcona Mining Company's claim in September 1976 and the recent Gulf Oil Corp. claim.

A.

- 6. FAA Sec. 620(a), 620(f); FY 79 App. Act, Sec. 108, 114 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Uganda, Mozambique, or Angola? No.

- 7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? No.

- 8. FAA Sec. 620 (i). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? No.

- 9. FAA Sec. 620(i). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, convertibility, or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? Information not available at Mission.

- 10. FAA Sec. 620 (j); Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters:
 - a. has any deduction required by the Fishermen's Protective Act been made? Information not available at Mission.
 - b. has complete denial of assistance been considered by AID Administrator?

- 11. FAA Sec. 620; FY 79 App. Act, Sec. 603.
 - (a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country? No.
 - (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds?

- 12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the N/A

A.12.

amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

No.

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?

Information not available at Mission.

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism?

No.

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA?

No.

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty?

No.

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY1. Development Assistance Country Criteria

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy?

Yes.

B.1.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor?

Only indirectly.

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights?

N/A

b. FAA Sec. 533(b). Will assistance under the Southern Africa program be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests?

N/A

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

N/A

d. Fi 79 App. Act. Sec. 113. Will assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

N/A

e. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina after September 30, 1978?

N/A

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?
Congress has been notified. Notification period expired May 29, 1980. Project is written OYB.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?
Yes.
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?
N/A
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?
N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?
N/A
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.
No. Project is specific to Peru.

A.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

The Project will improve the technical efficiency of industry and agriculture.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

Most goods and services under the Project will be supplied by private contractors from the United States.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

The GOP is supplying over 39% of the Project's costs. The AID funds are primarily to provide the foreign exchange costs.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. 1979 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained

The Project will serve the overall development needs of Peru and will encourage agricultural and rural development and the involvement of the poor in such development.

B.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

The assistance is being made available for agriculture, rural development, and nutrition, under Section 103 of the FAA. The Project will stress the building of institutions which can be used to serve agricultural development.
N/A.

N/A

N/A

B.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] Is appropriate effort placed on use of appropriate technology?

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

f. FAA Sec. 291(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.

j. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

The Project is specifically designed to develop, demonstrate, and disseminate technologies appropriate to the needs of ONERN and Peru.

Yes. The GOP will provide over 35% of the costs of the Project.

The Project does not involve grant capital assistance.

The Project fulfills an expressed GOP need. Peruvians were involved closely in its design. The Project will be carried out through a variety of Peruvian institutions.

Yes, the Project should cause an increase in the incomes of a large group of Peru's poor, and an increase in Peruvian food production. Thus it should directly contribute to the country's self-sustaining economic growth

N/A

N/A

AID HANDBOOK 3, App 5C(2)	TRANS. MEMO NO. 3:32	EFFECTIVE DATE June 7, 1979	PAGE NO. 5C(2)-5
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Annex I
Exhibit D
Page 9 of 12

B.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102? N/A

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities? N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed? Yes. AID procedures encouraging small business participation will be utilized for procurement of goods.
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him? Yes. Procurement is planned from U.S. and host country. Waivers for Code 941 procurement will be requested as required.
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the United States on commodities financed? N/A
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? N/A
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items? Yes.
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates. Such provision will be written in Project Agreement.
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the Yes.

A.7.

facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

Yes.

9. FY /9 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States?

Yes, such contracts will.

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?

N/A

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

N/A

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the United States not exceed \$100 million?

N/A

C. Other Restrictions

1. FAA Sec. 122 (e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

N/A

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the United States?

Yes, arrangements preclude activities as stated.

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or guaranty of such transaction?

Yes.

C.

Annex I
Exhibit D
Page 12 of 12

5. Will arrangements preclude use of financing:
- a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization?
 - b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?
 - c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs?
 - d. FAA Sec. 662. For CIA activities?
 - e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel?
 - f. FY 79 App. Act Sec. 106. To pay U.N. assessments?
 - g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.)
 - h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields?
 - i. FY 79 App. Act Sec. 601. To be used for publicity on propaganda purposes within United States not authorized by the Congress?

Arrangements preclude the financing of all items listed.

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Annex I
Exhibit E

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TAGS:
SUBJECT:
ACTION:

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N/A
ONERN - Land Use Inventory and Environmental
Planning Interim Report
Secstate WashDC

UNCLASSIFIED LIMA 0072

REFERENCE: 79 State 252539.

1. Project Purpose and Design: The Project Purpose is to assist ONERN in the institutionalization of a technically sound and operationally compatible natural resource information system that will provide the GOP with accurate up-to-date information about the distribution, quantity and quality of natural resources throughout the country. The proposed Project will introduce new and up-dated technologies in order to strengthen ONERN's technical capacity to develop better and more accurate natural resource information faster and cheaper, and to develop a resource information system that will fulfill the growing needs of other contributor-agencies. This system will be designed to provide information about factors influencing environmental changes as well as related

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APPROVED BY	DRAFTING DATE	TEL. NO.	CONTENTS AND CLASSIFICATION APPROVED BY
<i>[Signature]</i> C. J. ... :arc	12/21/79	131	H. J. Yaeger <i>[Signature]</i>

REFERENCES:
C. J. ... (in draft)
C. J. ... (in draft)

UNCLASSIFIED

OPTIONAL FORM NO. 10

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information about actual land use and potential land development.

Concurrently, the proposed institutional inputs will assist ONERN to establish the administrative and operational procedures as well as the institutional linkages to enable these other agencies and institutions to have easy access to this integrated system. For example, as the system is established, ONERN will be better able to assist the Ministry of Agriculture in estimating major crop production based on Area Sample Frame (ASF) techniques.

Since the inception of ONERN in 1962, the GOP has been concerned with the need to increase agricultural production and agro-oriented employment by using the country's natural resources more efficiently. More recently, the GOP has adopted policies for improved land use planning and resource utilization on a regional basis, which require greater inputs from ONERN for the timely identification and evaluation of available resources within each region. However, due to economic constraints, ONERN has not been able to keep abreast of the technical advances that have taken place during the past decade in satellite and other technologies that are more accurate, more cost efficient and which provide information more rapidly than the aerial photography currently utilized by ONERN. Consequently, the lack of modern technology and sufficient numbers of trained staff has resulted in the lack of adequate resource information and environmental analysis, thus hindering the GOP development

007

efforts, particularly in high jungle areas that contain considerable resource potential.

In order to assist ONERN to establish the proposed natural resource information system, the Project will strengthen ONERN's information gathering and evaluation capability using a component-type thematic approach based on a system of maps and map overlays with predetermined coordinates and standardized scales as identified in the PID. The scales are those of maps already being produced by the Military Geographic Institute and National Cadastral office and are the ones most commonly used in Peru for topographic-cadastral-source mapping. Such an approach will allow ONERN to add new or additional information of various degrees of accuracy to the system, either by geographic areas or by categories, and to store, retrieve and display the various types of information, such as soils, forestry, etc., either separately or in various combinations according to the needs of other contributor-user agencies. This approach will also enable ONERN to integrate the graphic data with a computer-assisted information system either by areas, or by components, as the need arises and as the system expands. ONERN at the end of the Project will possess the human and material resources to implement the proposed natural resource information system.

The technical inputs of the Project will include activities that train ONERN personnel in the (i) gathering and compiling

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of resource data; (ii) storing and displaying of data; (iii) updating of data; and (iv) analysis of data. Due to the nature of the technologies to be utilized, these activities will range from general reconnaissance surveys covering fairly large areas to very detailed resource studies in selected smaller areas. The four geographical regions of Peru not only have significantly different environments and renewable resources, but they contain over 100 distinct ecological life zones. Therefore, it is necessary to select several areas for the training exercises in order to expose CNERM personnel to these differences. As the resource gathering process becomes more precise and detailed, the Project will introduce up-dated methodologies for integrating aerial photography and satellite imagery as data sources, along with different options for collecting resource data using remote sensing technologies combined with varying degrees of ground truth surveys.

This highly specialized training must be conducted in the field using applied technologies that will produce natural resource data of various kinds. Therefore, it is proposed that the field exercises be conducted in those areas of the sierra and high jungle of greatest interest to the GOP. Moreover, it requires practical training in compiling and storing the data in maps and map overlays of varying formats and scales. The cartographic inputs, totaling approximately \$400,000, were

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identified in the PID and will finance activities which will provide direct on-the-job training of ONERN personnel in technologies with which they are currently unfamiliar. The balance of approximately \$700,000 under this component will finance equipment, operating expenses, technical assistance, and training.

One of the principal uses of the proposed resource information system will be for environmental impact studies, environmental assessments and monitoring environmental changes. The technical inputs of the Project will concentrate on techniques to up-date the data in the information system to meet these specific needs, and will introduce various options for analyzing the data using graphic methods combined with computer methods. Under this component as well, the purpose of the Project is not to produce environmental assessments, but to develop ONERN's technical capabilities to carry out environmental evaluations of specific development projects.

The proposed institutional inputs will assist ONERN to establish the administrative and operational procedures as well as the institutional linkages to enable these other agencies and institutions to have easy access to this integrated system.

As an initial step in this direction, detailed discussions have been held between ONERN and the Cadastral Unit and Statistics Office of the Ministry of Agriculture and Food with respect to collaboration in improvement of the existing system for the

collection of agricultural statistics. The three entities have agreed to cooperate in a program for development of an area-based sample frame. ONERN will contribute its expertise and facilities as the leading Peruvian institution in the use of satellite imagery in mapping; the cadaster service will collaborate with its excellent detailed mapping facilities, and the Office of Statistics will be the principal user of the area sample frame photo mosaics. A DSE/ST funded project with the USDA will provide support to the three agencies in this effort.

The assistance for improvement of the agricultural statistics system which was initially contemplated under the Agricultural Research, Extension and Education project has been eliminated from that project. The Mission is awaiting the completion of a joint GOP/AID evaluation of the agricultural statistics system to determine if and when an AID-supported project could be developed in Agricultural Statistics and Planning. The ONERN project will contribute to, and complement, any such future activity in ag statistics.

2. As suggested in the referenced cable the PP will address the issues referring to, (a) institutional framework, (b) training, and (c) impact on target group.
3. Assuming acceptance of interim report Mission requests approval to proceed to PP development and requests approval authority to be delegated to Mission. FYI Mission requesting

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TDY assistance from Robert Otto and intends to contract with IQC contractor in the area of satellite imagery to assist in intensive review and PP preparation. Precise timing of these inputs will be subject of separate cable following review of this interim report.

SHLAUDEMANN



ACTION: AID-2

INFO CHANGE ECON CHR/k

Annex I
Exhibit F

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NNNNVV ESB033BRA196
PP KUFELM
DE RUEHC #2539/01 2590553
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P 252252Z SEP 79
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TO AMEMBASSY LIMA PRIORITY 1200-1300
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DATE:	_____
INITIALS:	_____

AID-2

E.O. 12958 N/A

TITLE:

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INITIALS:	_____

REVIEW OF LAND USE INVENTORY AND ENVIRONMENTAL PLANNING FOR AID AND SOIL CONSERVATION PROJECT

1. SUBJECT PLS WERE REVIEWED BY THE LACS ON AUGUST 27, 1979. GUIDANCE FOR PP DEVELOPMENT IS GIVEN BELOW FOR EACH PLS.

B. LAND USE INVENTORY AND ENVIRONMENTAL PLANNING (ONEAN)

1. PLS AID IS APPROVED AND FURTHER PROJECT DEVELOPMENT AUTHORIZED, SUBJECT TO SUBMISSION AND APPROVAL OF AN INTERIM REPORT OR DISCUSSION PAPER, WHICH CLEARLY ARTICULATES THE PROJECT PURPOSE (SEE DISCUSSION BELOW).

2. PROJECT PURPOSE AND DESIGN: THE PROJECT PURPOSE SHOULD BE BOTH INFORMATION GATHERING FOR THE IDENTIFICATION OF NATURAL RESOURCES AND INSTITUTION-BUILDING FOR ONEAN AS AN INSTITUTION-BUILDING ACTIVITY. CONCERN WAS EXPRESSED REGARDING THE HEAVY INVESTMENT OF PROJECT FUNDS IN NATURAL RESOURCE SURVEYS AND LAND USE CAPABILITY MAPS. E.O. 12958. 1.3 MILLION IN THE BUDGET FOR MAPPING PURPOSES. THE RATIONALE FOR DOING BASELINE AND DETAILED RESOURCE SURVEYS OF TWO AREAS WAS NOT CLEAR. GIVEN LIMITED RESOURCES,

AND IN LIGHT OF THE AMBIGUITY REGARDING THE PROJECT'S OBJECTIVE, THE MISSION SHOULD SUBMIT AN INTERIM REPORT, OR DISCUSSION PAPER, WHICH CLEARLY ARTICULATES THE PROJECT'S PURPOSE AND DEVELOPS THE RATIONALE FOR INVESTING SIGNIFICANT PROJECT RESOURCES IN DATA COLLECTION ACTIVITIES. ADDITIONALLY, ASSUMING THE RATIONALE CAN BE ESTABLISHED, THE INTERIM REPORT SHOULD ESTABLISH A SERIES OF PRIORITIES OR CHECKLIST FOR SELECTING APPROPRIATE SITES AND DETERMINING THE APPROPRIATE LEVEL OF DETAIL (1:50,000 OR 1:25,000 OR

1:12,000) REQUIRED FOR DIFFERENT PLANNING PURPOSES. THE REPORT SHOULD ALSO EXPLAIN HOW THE PROPOSED MAPPING ACTIVITIES WILL STRENGTHEN ONERN'S INSTITUTIONAL CAPABILITIES RELATING TO PHOTO/SATELLITE INTERPRETATION AND ENVIRONMENTAL PLANNING IN GENERAL. BASICALLY, WE UNDERSTAND THAT ONERN ALREADY HAS SUBSTANTIAL TECHNICAL COMPETENCE IN THE FIELD OF NATURAL RESOURCES INVENTORY AND ENVIRONMENTAL PLANNING. WE WOULD LIKE TO CONSIDER THE PROPOSED PROJECT ACTIVITIES AS ADDRESSING A SECOND LEVEL CONCERN IN INSTITUTION-BUILDING OR, IN OTHER WORDS ENHANCING ONERN'S ABILITY TO COORDINATE EFFECTIVELY NATIONAL PROGRAMS FOR LAND USE. LASTLY, IN ORDER TO INSURE THAT THERE WILL BE NO DUPLICATION WITH THE DATA COLLECTION EFFORTS OF THE MINISTRY OF AGRICULTURE, THE INTERIM REPORT SHOULD DESCRIBE THE RELATIONSHIP OF THE ONERN DATA COLLECTION ACTIVITIES TO THE \$1.0 MILLION PROPOSED FOR AGRICULTURE PLANNING AND STATISTICS WHICH WE UNDERSTAND MAY BE INCLUDED IN THE '75 '80 AGRICULTURE' EXTENSION AND RESEARCH PROJECT. THE INTERIM REPORT MUST BE SUBMITTED AND REVIEWED BY THE BUREAU BEFORE A DETERMINATION WILL BE MADE REGARDING THE MISSION'S REQUEST TO AUTHORIZE THE PP.

3. INSTITUTIONAL FRAMEWORK: THE PID DID NOT CLEARLY DESCRIBE THE INSTITUTIONAL LINKAGES BETWEEN ONERN (A PLANNING AGENCY) AND THE VARIOUS GOV IMPLEMENTING AGENCIES, INCLUDING THE SECTORAL MINISTRIES. DURING INTENSIVE REVIEW THESE LINKAGES SHOULD BE CLEARLY ESTABLISHED AND PROJECT DESIGN SHOULD INSURE THAT INFORMATION BOTH USEFUL AND NECESSARY FOR GOV IMPLEMENTING AGENCIES' NEEDS BE PRODUCED. CONCERN WAS EXPRESSED THAT ONERN WAS NOT PRESENTLY FULFILLING THE ROLE OF SUPPORT AGENCY TO OTHER GOV MINISTRIES, BUT CHOOSING TO ACT INDEPENDENTLY. THE PP SHOULD ADDRESS THIS CONCERN AND DEVELOP A STRATEGY FOR ACHIEVING GREATER COORDINATION BY ENCOURAGING BETTER COLLABORATION AMONG THE GOV AGENCIES AND ONERN, NOT ONLY IN THE AREA OF ENVIRONMENTAL IMPACT ASSESSMENTS, BUT ALSO IN THE RESOURCE INVENTORY AREA AS WELL. THE ROLE OF THE GOV'S PLANNING OFFICE IN HELPING TO ACHIEVE COORDINATION SHOULD ALSO BE DESCRIBED IN THE PP.

4. TRAINING: THE PID PROPOSES \$113,000 FOR IN-COUNTRY AND U.S. TRAINING IN RESOURCE INVENTORIES AND ENVIRONMENTAL ASSESSMENTS FOR ONERN. DURING INTENSIVE REVIEW THE MISSION SHOULD CONSIDER INCREASING THE LEVEL OF GRANT FUNDING FOR TRAINING ACTIVITIES AND EXAMINE THE MERITS OF TRAINING NOT ONLY ONERN PERSONNEL, BUT ALSO MEMBERS OF OTHER GOV AGENCIES ENGAGED IN UTILIZATION OF ONERN GENERATED INFORMATION IN ORDER TO REINFORCE THE LINKAGES BETWEEN ONERN AND THE IMPLEMENTING MINISTRIES.

5. BECAUSE OF THE INSTITUTION-BUILDING AND DATA COLLECTION ACTIVITIES, THE IMPACT ON THE TARGET GROUP WILL MOST LIKELY BE INDIRECT. THE PP SHOULD CLEARLY DESCRIBE THE RELATIONSHIP BETWEEN THE PROJECT AND THE TARGET GROUP AND INSURE THE MAXIMUM IMPACT POSSIBLE ON THE RURAL POOR.

C. SOIL CONSERVATION FID

1. THE PROJECT WAS APPROVED FOR DEVELOPMENT AND AUTHORIZATION BY THE MISSION. THE FOLLOWING ISSUES SHOULD BE CONSIDERED DURING INTENSIVE REVIEW AND ADDRESSED IN THE PP.

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PP RUESLM
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2. PROJECT DESIGN: THE PROJECT WILL FIELD TEST AND ADAPT VARIOUS SOIL CONSERVATION TECHNIQUES IN TWO PILOT REGIONS IN PERU (SIERRA AND HIGH JUNGLE) WHICH MAY BE RECOMMENDED FOR REPLICATION UNDER THE PROPOSED FY 81 WATERSHED MANAGEMENT LOAN. IN ORDER TO INSURE THE ACCEPTANCE OF SOIL CONSERVATION TECHNOLOGIES BY THE TARGET GROUP, QUESTIONS OF SOCIAL FEASIBILITY AND BENEFIT INCIDENCE SHOULD BE ADDRESSED DURING INTENSIVE REVIEW AND IN THE PP. IN ADDITION, BECAUSE THE SOIL CONSERVATION PROGRAMS WILL OPERATE ON BOTH COOPERATIVE HOLDINGS AS WELL AS ON PRIVATE LANDS, THE INTRODUCTION OF THE TECHNOLOGIES TO THESE COMMUNITIES COULD VARY WITH THE DIFFERENT TYPES OF SOCIAL ORGANIZATIONS PRESENT. MOREOVER, THE SOCIOLOGICAL ASPECTS SHOULD BE CONSIDERED WHEN DETERMINING THE INCENTIVES REQUIRED TO INTEREST FARMERS IN SOIL CONSERVATION; THIS IS ESPECIALLY IMPORTANT BECAUSE WIDESPREAD REPLICATION OF THE TECHNOLOGIES IS PROPOSED UNDER THE FY 81 LOAN PROJECT. THE MISSION IS THEREFORE REQUESTED TO CONSIDER THE ADVISABILITY OF ALLOCATING PROJECT RESOURCES WITHIN THE \$2.8 MILLION LOAN TO FUND A LONG-TERM ANTHROPOLOGIST OR RURAL SOCIOLOGIST DURING PROJECT IMPLEMENTATION IN ORDER TO PROVIDE TECHNICAL ASSISTANCE IN EVALUATING THESE IMPORTANT SOCIOLOGICAL ASPECTS OF THE FIELD TEST PROGRAM. THE PP SHOULD ALSO DISCUSS THE FULL RANGE OF POSSIBLE SOIL CONSERVATION TECHNOLOGIES (E.G., REVEGETATION, WATER IMPOUNDMENT ETC.) WHICH WILL BE FIELD TESTED UNDER THE PROJECT.

3. SOIL CONSERVATION LAW: THE PP SHOULD CLARIFY THE DEGREE TO WHICH THE PASSAGE OF THIS LAW AFFECTS PROJECT SUCCESS AND DESCRIBE THE IMPACT ON THE PROJECT IF THE LAW IS NOT PROMULGATED. CHRISTOPHER

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AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

LAC/DR/IEE-80-12

ASSISTANT
ADMINISTRATOR

ENVIRONMENTAL THRESHOLD DECISION

Location : Peru
Project Title : ONERN - Environmental Planning and Identification
of Natural Resources, 527-0202
Funding : First FY: 80 - \$700,000
Life of Project: \$2,250,000

Mission Recommendation:

Based on the Initial Environmental Examination, the Mission has concluded that the project will not have a significant effect on the human environment and therefore recommends a Negative Determination.

The Development Assistance Executive Committee of the Bureau for Latin America and the Caribbean has reviewed the Initial Environmental Examination for this project and concurs in the Mission's recommendation for a Negative Determination.

AA/LAC Decision:

Pursuant to the authority vested in the Assistant Administrator for Latin America and the Caribbean under Title 22, Part 216.4a, Environmental Procedures, and based upon the above recommendation, I hereby determine that the proposed project is not an action which will have a significant effect on the human environment, and therefore, is not an action for which an Environmental Impact Statement or an Environmental Assessment will be required.

BEST AVAILABLE DOCUMENT

Robert W. Coe
Assistant Administrator for
Latin America and the Caribbean

Feb 28 1980
Date

Clearances:

LAC/DR: Environmental Advisor: R Otto _____
EAEC Chairman: W Brown _____

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Peru

Project Title: ONERN - Environmental Planning and Identification of Natural Resources

Project Number: 527-0202

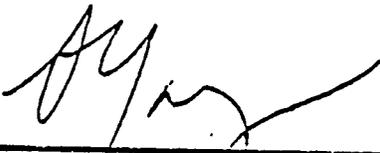
Funding: First FY: 80 - \$700,000
Life of Project: \$2,250,000

IEE Prepared by: Edilberto Alarcón USAID/Peru
Environmental Coordinator

The USAID/Peru project committee for the ONERN - Environmental Planning and Identification of Natural Resources project has undertaken a complete Initial Environmental Examination (IEE) of the project environmental impacts and has arrived at a recommendation for a Negative Determination as indicated in the Threshold Decision Section.

Concurrence: _____ Date: _____

I have reviewed the Initial Environmental Examination prepared by the Project Committee for the ONERN - Environmental Planning and Identification of Natural Resources project and concur in the Threshold Decision recommendation for a Negative Determination.



Leonard Faeger, Director
USAID/Peru

AA/LA Decision:

Based upon the Development Assistance Executive Committee review of the Project Identification Document, including the Initial Environmental Examination for the ONERN - Environmental Planning and Identification of Natural Resources project, I approve the Threshold Decision for a Negative Determination.

Assistant Administrator for
Latin America

I. Examination of Nature, Scope and Magnitude of Environmental Impacts

a) Project Description:

This project will strengthen CNERN's capacity to identify and inventory natural resources and determine land use capabilities. It will also upgrade CNERN's capability for environmental planning including environmental assessments, and general policies on natural resource conservation.

Grant funds will be used to finance technical assistance, training and operational expenses related to the development of four pilot inventory and resources management studies: two at the preliminary level in the sierra region covering approximately 600,000 hectares and two at a semidetailed level in the high jungle area with a total of 100,000 hectares. To a limited extent, funds will also be used in the procurement of certain equipment related mainly to the interpretation and use of remote sensing imagery and digital products.

It is expected that by the end of the project adequate methodologies will be established and personnel trained to continue work on resources inventories throughout the rest of the country. CNERN and other GCP agencies will also have the capability of conducting environmental assessments for reducing environmental hazards and protecting the natural resource base.

b) Identification and Evaluation of Environmental Impact:

The project's possible environmental effects have been carefully reviewed following the order established in the Impact Identification and Evaluation Form.

It has been concluded that the project will not produce any negative effect with regard to the environment. On the contrary, the objective of the project is to upgrade the institutional capacity of CNERN for planning the rational use of natural resources to avoid extinction or degradation of the resource base. The project also aims at developing within the country awareness of the importance of environmental analysis and expertise for such analysis. It is expected that this will lead to the passing of legislation requiring the development of an environmental evaluation for any capital infrastructure project implemented in the country. The project will thus fulfill one of the basic objectives of AID's environmental policy.

II. Recommendation for Environmental Action:

Based on the careful review and assessment of the possible environmental impacts, the project committee recommends a Threshold Decision for a Negative Determination.

PROJECT: ONEERN- ENVIRONMENTAL PLANNING AND IDENTIFICATION OF
NATURAL RESOURCES

Project N° 527-0202

Attachment to Annex
Initial Environmental
Examination (IEE)

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Identification
and
Evaluation 1/

Impact Areas and Sub-areas

A. LAND USE

1. Changing the character of the land through:

- a. Increasing the population _____ N
- b. Extracting natural resources _____ N
- c. Land clearing _____ N
- d. Changing soil productivity capacity _____ N

2. Altering natural defenses _____ N

3. Foreclosing important uses _____ N

4. Jeopardizing man or his works _____ N

5. Contributing to a more rational use of the
land _____ H

B. WATER QUALITY

1. Physical state of water _____ N

2. Chemical and biological states _____ N

3. Ecological balance _____ N

4. Other factors _____ None

1/ Use the following symbols: N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

- 1. Air additives _____ N
- 2. Air pollution _____ N
- 3. Noise pollution _____ N
- 4. Other factors _____ None

D. NATURAL RESOURCES

- 1. Diversion, altered use of water _____ N
- 2. Irreversible, inefficient commitments _____ N
- 3. Improved Use of Natural Resources _____ E

E. CULTURAL AND SOCIO ECONOMIC

- 1. Altering physical symbols _____ N
- 2. Changes of cultural traditions _____ M
- 3. Changes in population _____ M
- 4. Other factors _____ None

F. HEALTH

- 1. Changing a natural environment _____ N
- 2. Eliminating an ecosystem _____ N
- 3. Other factors _____ None

G. GENERAL

- 1. International impacts _____ N
- 2. Controversial impacts _____ N
- 3. Larger program impacts _____ N
- 4. Other factors _____ None

BEST AVAILABLE DOCUMENT

Annex I
Exhibit H

UNCLAS ACTION: AID-2

INFO AMB DCM CHR/k

NNNNVV ESB031BRA787
PP RUEFLM
DF RUEHC #2117 1620718
ZNR UUUUU ZZH
P 100442Z JUN 80
FM SECSTATE WASHDC
TO AMEMBASSY LIMA PRIORITY 4549
BT
UNCLAS STATE 152117

ADM AID

E.O. 12958: N/A

TAGS:

SUBJECT: ALLOTMENT OF FY 1980 FUND

1. ALLOTMENT 043-50-527-00-69-01 INCREASED BY DOLLARS 200,000 TO NEW TOTAL DOLLARS 2,727,000. INCREASE APPLICABLE PROJECT 0202, ENVIRONMENTAL PLANNING/LAND USE INVENTORY.

2. CONGRESSIONAL NOTIFICATION EXPIRED MAY 29, 1980.

3. AVICE OF ALLOTMENT NUMBER 13 FOLLOWS. MUS&I

BT
#2117

UNCLAS

ACTION: PROG (FILES)

INFO: CONT

ENGRI

D

DD

D/L

REC-
CI
CE

99 11 56

BEST AVAILABLE DOCUMENT All to 00

NNNNVV ESA525BRA994
OO RUESLM
DE RUEHC #2842 0582341
ZNR UUUUU ZZH
O 272223Z FEB 80
FM SECSTATE WASHDC
TO AMEMBASSY LIMA IMMEDIATE 3067
BT
UNCLAS STATE 052842

UNCLASSIFIED
ROOM

ANNEX I
Exhibit I

ACTION: AID 2
INFO: AMB DCM CHRON/rdg

AIDAC

EO 12065:N/A

TAGS:

SUBJECT: ONERN - LAND USE INVENTORY AND ENVIRONMENTAL
PLANNING INTERIM REPORT

REF: (A) STATE 011736 (B) LIMA 72 (C) STATE 252539

1. AS A RESULT OF BUREAU REVIEW OF THE INTERIM REPORT SUBMITTED IN REFTEL B, WE CONCUR IN THE INSTITUTION-BUILDING PROJECT OBJECTIVE AND APPROVE THE MISSION'S REQUEST FOR PP APPROVAL AUTHORITY.
2. WE WISH TO EMPHASIZE THE IMPORTANCE OF THE PARTICIPATION OF THE SECTORAL AGENCIES AND KEY NATURAL RESOURCE MANAGEMENT AGENCIES, SUCH AS THE MIN AG'S GENERAL DIRECTORATES OF FORESTRY AND WILDLIFE, WATER AND SOILS AS WELL AS SENAMHI AND INP, IN PROJECT DEVELOPMENT AND IMPLEMENTATION. THESE INSTITUTIONS ARE CRUCIAL TO RESOURCE MANAGEMENT ACTIVITIES AND, MOREOVER, HAVE NEEDS FOR RESOURCE DATA SUCH AS MIGHT BE DEVELOPED IN THIS PROJECT. DURING THE BUREAU'S REVIEW, IT WAS EVIDENT THAT BUREAU'S ENVIRONMENTAL ADVISOR HAD SOME HELPFUL SUGGESTIONS FOR FORGING LINKAGES BETWEEN ONERN AND THESE OTHER AGENCIES. THEREFORE WE AGREED WITH THE MISSION'S REPRESENTATIVE THAT ROBERT OTTO'S TDY DURING EARLY PP DEVELOPMENT WOULD BE APPROPRIATE. FIRM ETA WILL FOLLOW AS SOON AS MISSION SUBMITS FUNDING CITATION FOR 5 DAY TDY. PLEASE ADVISE. VANCE

ST 52842

BT
#2842

UNCLASSIFIED

ACTION: CD (FILED)
INFO: DA
LINT
PROG
RD
RLE
D
DD

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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

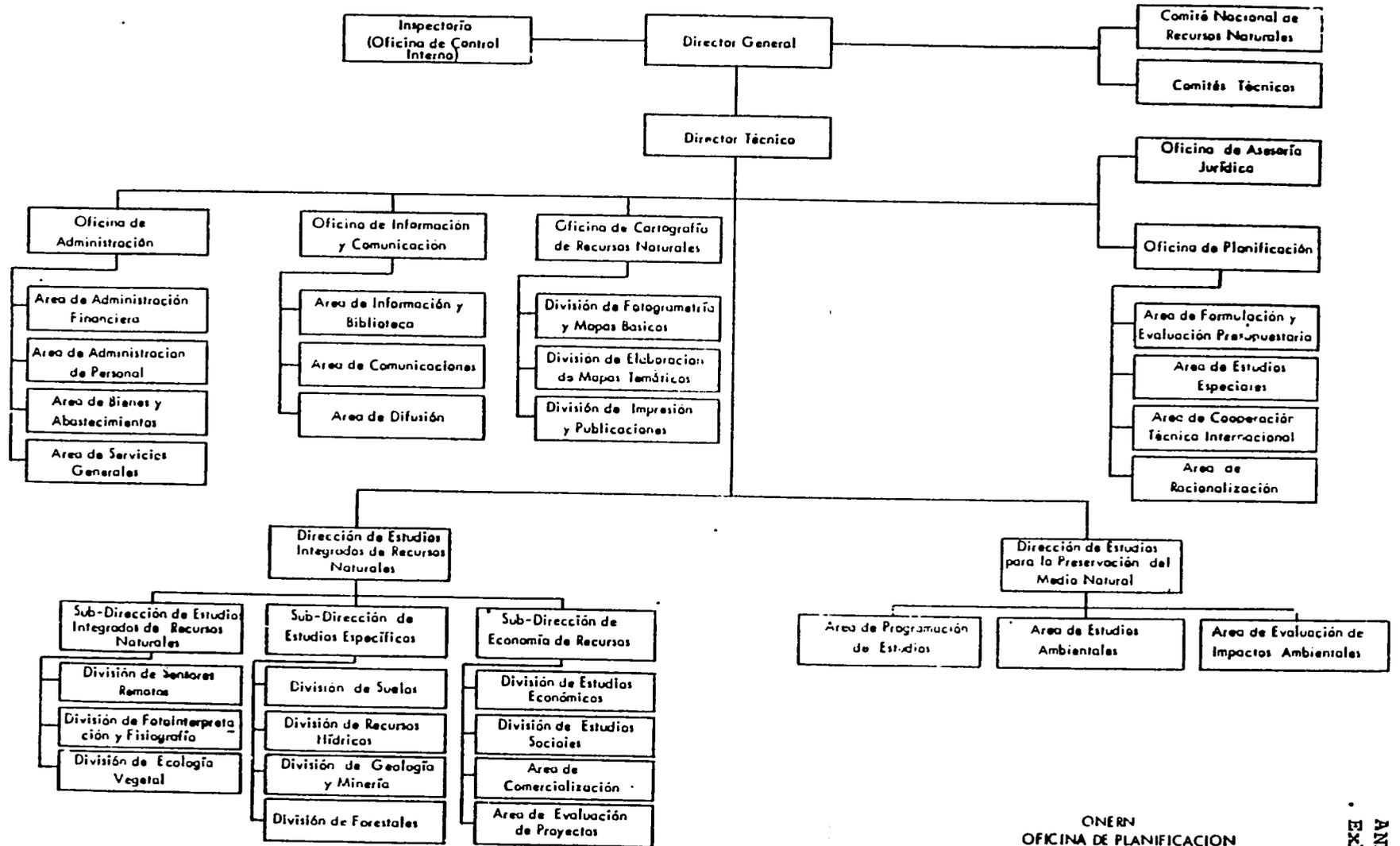
Annex II
Exhibit A

Life of Project:
From FY 1980 to FY 1982
Total U.S. Funding: \$1,000,000

Project Title & Number: ONERN: Land Use Inventory and Environmental Planning

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS																																																																																																				
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>To improve the economic and social well being of the Peruvian population by increasing the availability of natural resources and enhanced environmental planning.</p>	<p>Measures of Goal Achievement:</p> <ul style="list-style-type: none"> - Increased rate of growth of GNP due to expansion and better knowledge of the natural resource frontier. - Improvement of the employment rate of growth in view of new production possibilities. - Enhanced economic perspectives for younger generations due to rational exploitation processes framed with efficient environmental protection plans. - Expansion of touristic possibilities. 	<ul style="list-style-type: none"> - National Accounts prepared by the Central Reserve Bank. - Employment statistics published by the National Office for Statistics. - Environmental impact assessments prepared by ONERN and other public and private entities. - Tourism Development Plan 	<p>Assumptions for achieving goal:</p> <p>AREAS:</p> <ul style="list-style-type: none"> - The GOP continues recognizing the need to expand the natural resource base to foster economic and social development. - Labor-intensive production processes, when ever possible, are favored by the GOP. - Strict adherence to environmental protection plans are enforced. - Political stability prevails. 																																																																																																				
<p>Project Purpose:</p> <p>To assist ONERN in the identification of natural resources and determination of land use capabilities in the high jungle and Sierra areas. Also to upgrade ONERN's capability for environmental planning, including environmental assessments, protection plans and policies on natural resource conservation.</p>	<p>Measures of Goal Achievement:</p> <p>Assumptions for achieving purpose:</p> <ul style="list-style-type: none"> - Utilization by ONERN of color infrared photography, satellite imagery and other improved technologies for detailed identification and mapping of natural resources. - Implementation of a thematic mapping system for resource and environmental assessment. - Development of the capability to carry out digital processing of Landsat data to produce land cover maps and for general resource research. - Enhancement of the already well-established capabilities of ONERN's cartographic section; - Development of the capability and the awareness of the utility of a nationwide computer-assisted GIS. - Utilization of the data and systems by potential sectoral users, who will be trained in their application for environmental and natural resource assessment. - Existence of the capability within ONERN to utilize the methodologies of environmental impact assessment. - The existence of an institutional and technical capability to greatly enhance the accessibility of this much-needed data to potential users. 	<ul style="list-style-type: none"> - Production of land cover and thematic maps by ONERN. - Environmental and natural resource assessments prepared by ONERN. - Project Manager monitoring reports. - Annual joint evaluation. 	<p>Assumptions for achieving purpose:</p> <ul style="list-style-type: none"> - Timely acquisition of scientific equipment. - A core of ONERN's technicians are appointed to work at full time in the Project. - Technical assistance available on a timely basis. 																																																																																																				
<p>Outputs:</p> <p>(A) ONERN's capabilities will be enhanced to effectively provide information to Peruvian user agencies in the fields of natural resource inventory, information storage and processing applications of new technology to resource analysis and environmental assessment and planning.</p> <ul style="list-style-type: none"> - Soil, water, land use, vegetation and similar natural resource surveys. - Environmental assessments, environmental protection plans and the preparation of general policies on natural resource conservation. <p>(B)</p> <ol style="list-style-type: none"> 1 - Thematic Mapping 2 - Test Sites 3 - Map/Overlay Production 4 - Public User Facility 5 - Geographic Information System 6 - Environmental Profile 7 - Trained Personnel <p>8 - Additional Space</p>	<p>Measures of Outputs:</p> <p>(A)</p> <p>Miscellaneous in-depth surveys published by ONERN during project implementation.</p> <p>(B)</p> <ol style="list-style-type: none"> 1 - One system to prepare a standardized geographic data base. 2 - Six with an area per site of 18,000 Km² 3 - A minimum of 500 copies/sect. 4 - One unit with a public computer terminal. 5 - One computer assisted-system 6 - One national profile of the environment. 7 - Approximately 9.5 man/months of off-shore and in-country short-term training. 8 - One new building with four separate facilities: (i) computer room, (ii) optical/digital analysis room, (iii) cartographic space, and (iv) User Assistance Facility. 	<p>For (A) and (B)</p> <ul style="list-style-type: none"> - Project evaluation reports. - Publications by ONERN - Visual inspections. - Project Manager monitoring reports. 	<p>Assumptions for achieving purpose:</p> <ul style="list-style-type: none"> - Project Plan is implemented as scheduled. - A.I.D. and ONERN funds are disbursed as planned. - Project procurement is delivered within expected time frame. - Technical assistance provided on a timely basis. 																																																																																																				
<p>Inputs:</p> <table border="1"> <thead> <tr> <th>A.I.D. Investment Category</th> <th>Year I</th> <th>Year II</th> <th>Year III</th> <th>Total</th> </tr> <tr> <th></th> <th colspan="3">(thousands of U. S. Dollars)</th> <th></th> </tr> </thead> <tbody> <tr> <td>I. National Resource Inventory and Information System</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>- Technical Assistance</td> <td>64.0</td> <td>44.0</td> <td>-</td> <td>108.0</td> </tr> <tr> <td>- Training</td> <td>-</td> <td>10.0</td> <td>14.0</td> <td>24.0</td> </tr> <tr> <td>- Hardware</td> <td>24.0</td> <td>138.0</td> <td>100.0</td> <td>262.0</td> </tr> <tr> <td>- Materials and Supplies</td> <td>9.0</td> <td>28.0</td> <td>52.8</td> <td>95.8</td> </tr> <tr> <td>II. Design and Implementation of Geographic Information System</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>- Technical Assistance</td> <td>51.0</td> <td>48.0</td> <td>-</td> <td>99.0</td> </tr> <tr> <td>- Training</td> <td>-</td> <td>28.0</td> <td>-</td> <td>28.0</td> </tr> <tr> <td>- Hardware</td> <td>25.0</td> <td>30.0</td> <td>-</td> <td>55.0</td> </tr> <tr> <td>- Materials and Supplies</td> <td>-</td> <td>6.0</td> <td>-</td> <td>6.0</td> </tr> <tr> <td>III. Environmental Planning, Assessment and Administration</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>- Technical Assistance</td> <td>26.0</td> <td>36.0</td> <td>70.0</td> <td>132.0</td> </tr> <tr> <td>- Training</td> <td>-</td> <td>32.0</td> <td>8.0</td> <td>40.0</td> </tr> <tr> <td>- Hardware</td> <td>-</td> <td>18.0</td> <td>40.0</td> <td>58.0</td> </tr> <tr> <td>- Materials and Supplies</td> <td>1.0</td> <td>1.0</td> <td>1.0</td> <td>3.0</td> </tr> <tr> <td>Sub-total:</td> <td>120.0</td> <td>120.0</td> <td>129.0</td> <td>369.0</td> </tr> <tr> <td>U.S.G. Representation Support</td> <td>12.0</td> <td>12.0</td> <td>12.0</td> <td>36.0</td> </tr> <tr> <td>Total</td> <td>132.0</td> <td>132.0</td> <td>141.0</td> <td>405.0</td> </tr> </tbody> </table>	A.I.D. Investment Category	Year I	Year II	Year III	Total		(thousands of U. S. Dollars)				I. National Resource Inventory and Information System					- Technical Assistance	64.0	44.0	-	108.0	- Training	-	10.0	14.0	24.0	- Hardware	24.0	138.0	100.0	262.0	- Materials and Supplies	9.0	28.0	52.8	95.8	II. Design and Implementation of Geographic Information System					- Technical Assistance	51.0	48.0	-	99.0	- Training	-	28.0	-	28.0	- Hardware	25.0	30.0	-	55.0	- Materials and Supplies	-	6.0	-	6.0	III. Environmental Planning, Assessment and Administration					- Technical Assistance	26.0	36.0	70.0	132.0	- Training	-	32.0	8.0	40.0	- Hardware	-	18.0	40.0	58.0	- Materials and Supplies	1.0	1.0	1.0	3.0	Sub-total:	120.0	120.0	129.0	369.0	U.S.G. Representation Support	12.0	12.0	12.0	36.0	Total	132.0	132.0	141.0	405.0	<p>Implementation Areas (Type and Quantity)</p> <ul style="list-style-type: none"> - ONERN and USAID accounting records. - Project audit reports - Project financial reports. 		<p>Assumptions for providing inputs:</p> <ul style="list-style-type: none"> - ONERN complies with conditions precedent. - The GOP provides ONERN with pertinent budgetary allocations to implement the Project.
A.I.D. Investment Category	Year I	Year II	Year III	Total																																																																																																			
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ORGANIGRAMA DE LA OFICINA NACIONAL DE EVALUACION DE RECURSOS NATURALES - D.L. 20588



ONERN
OFICINA DE PLANIFICACION

CONSOLIDATED HARDWARE LIST

<u>DESCRIPTION</u>	<u>ESTIMATED COST</u>
PDP-11/34 plus peripherals	\$ 175,000
Video Tape Unit	3,000
Optical Pantograph	5,000
Bausch and Lomb Zoom Transformer Scope	10,000
Bausch and Lomb Zoom 240	5,000
Sinks	3,000
Filter Columns	1,000
Vehicle Spare Parts	20,000
New 4-Wheel Drive Carryall	15,000
"Whirler"	15,000
Miscellaneous Printing Hardware	10,000
3 Coordinate Digitizers \$10,000 each	30,000
5 Interactive CRT's \$2,000 each	10,000
1 Electrostatic Grey-Scale Plotter	10,000
1 Color Graphics Display	15,000
Spare Parts and Miscellaneous	10,000
Environmental Monitoring Equipment	75,000
Total	\$ 412,000

SUMMARY OF TECHNICAL ASSISTANCE

<u>SPECIALTY</u>	<u>LEVEL OF EFFORT</u> (Man-Months)	<u>ESTIMATED COST</u>
Aerial Photography/Film Types	2.0	\$ 16,000
Digital Image Processing	4.0	32,000
Land Cover	1.0	8,000
Statistical Techniques	2.0	16,000
Land Cover	1.0	8,000
Statistical Techniques	1.0	8,000
Scribeguide Preparation	1.0	8,000
Thematic Mapping	1.5	12,000
GIS Analyst	3.0	24,000
GIS Analyst	2.0	15,000
Computer Technician	1.5	12,000
GIS Analyst	6.0	48,000
Environmental Assessment	2.0	16,000
Forestry/Remote Sensing	1.0	8,000
Urban Geography/GIS	3.0	24,000
Forest Inventory/Statistics	2.0	16,000
Thematic Mapping/Statistics	1.0	8,000
Land Cover/Photointerpretation	1.0	8,000
Land Use	2.0	16,000
GIS	2.0	16,000
Remote Sensing/Statistics	1.0	8,000
Urban Land Use/Digital Processing	4.0	32,000
TOTAL	45.0	\$ 359,000

SUMMARY OF TRAINING

ANNEX II
Exhibit E

<u>DESCRIPTION OF COURSE</u>	<u>SPECIALTY</u>	<u>LEVEL OF EFFORT</u> (Man-Months)	<u>ESTIMATED COST</u>
IAGS Course: 18 Students			\$ 24,000
Four U.S. GIS Laboratories: 3 Students			20,000
	GIS	1.0	8,000
	Environmental Assessment Methodologies	4.0	28,000
	Environmental Management	3.5	24,000
	Remote Sensing/ Statistics	1.0	<u>8,000</u>
	TOTAL		\$ 112,000

Test Sites

Eventually, the natural resource information system designed in this project will be implemented on a nationwide basis. However, prior to its operational acceptance by Peruvian resource and environmental managers, it must be designed and demonstrated on a smaller scale. The purpose of this project is to develop efficient operational techniques which will be directly applicable to the national project and to demonstrate these techniques to the appropriate Peruvian resource or environmental agencies. In order to do so, a series of test sites will be chosen. Over each test site, all of the procedures of the inventory system theme maps will be tested. The format of the information system theme maps will follow the standard 1:100,000 scale quadrangles (30' x 30') established by the IGM. Each quad covers an area of approximately 55 x 55 kilometers or 3,025 km². Each test site has been chosen to cover six complete and contiguous quad sheets. Thus, the area of each test site will approximate 18,000 km².

Numerous criteria have been considered in selection of the test sites. Since these tests are a precursor to an eventual nationwide project, they must fairly represent a cross-section of the many land cover types to be found in Peru. This will guarantee that the land cover classifications to be developed will accurately represent actual conditions. Since one of the major uses of this system may be in environmental assessment and planning, it is also desirable that the test sites cover areas having known or potential environmental problems or hazards.

Most of the test sites should have a fair variety of previously mapped ancillary thematic data. The major new mapping thrust in this project will be the production of Landsat land cover maps. These maps, however, represent only one "theme" of the many necessary to make a thematic information system useful. Thus, maps of other themes; i.e., geology, soils, topography, etc., must also be available.

It is preferable that high quality base maps exist over most of the area of the test sites. Such bases will allow accurate location, registration and geometric fidelity of the thematic maps. If no base maps are available, mosaics of sidelooking airborne radar (SLAR) will be acceptable substitutes.

Availability of old aerial photographs over the test sites will provide several benefits. It will allow detection of land cover change over time and estimation of the rate of change. It will also act as a backup to the new CIR photography in areas where cloud cover prevents new coverage.

The test sites must be in an area having coverage by the Landsat satellite series. Numerous frames of data are available over Peru. However, in some areas, nearly continuous cloud cover has hampered collection of even a single frame of usable data over the eight years of

Landsat's existence. In addition, in some areas; the quality of data is insufficient to produce a computer-compatible tape (CCT) necessary for the digital classification. Test sites should be placed so that each may be covered by a single Landsat frame. This will greatly simplify the digital classification. Eventually, the problem of mapping quads lying along frame boundaries must be resolved, but to do so in the beginning stages of technology transfer is not advisable.

Finally, an important criteria for selection is the short-term relevance of the area to the interests of both USAID and the Government of Peru. Although many possible areas would be acceptable for "calibration" of the mapping system, it is logical to choose areas in which the new information generated will be of immediate use. USAID, at present, has several resource and development projects in Peru. Likewise, the GOP, through ONERN, has indicated a preference for selection of several areas.

It must be stressed here that the specific test areas suggested herein are not immutable. As the project develops, they may be moved to satisfy future needs providing they still meet the aforementioned criteria. An uncertainty in the priorities of ONERN is the upcoming general election. It is conceivable that the new government may have different development priorities than the present government. ONERN, obviously, would be required to respond to these priorities. If so, the location of some of the test areas may be changed accordingly.

Location of Test Sites

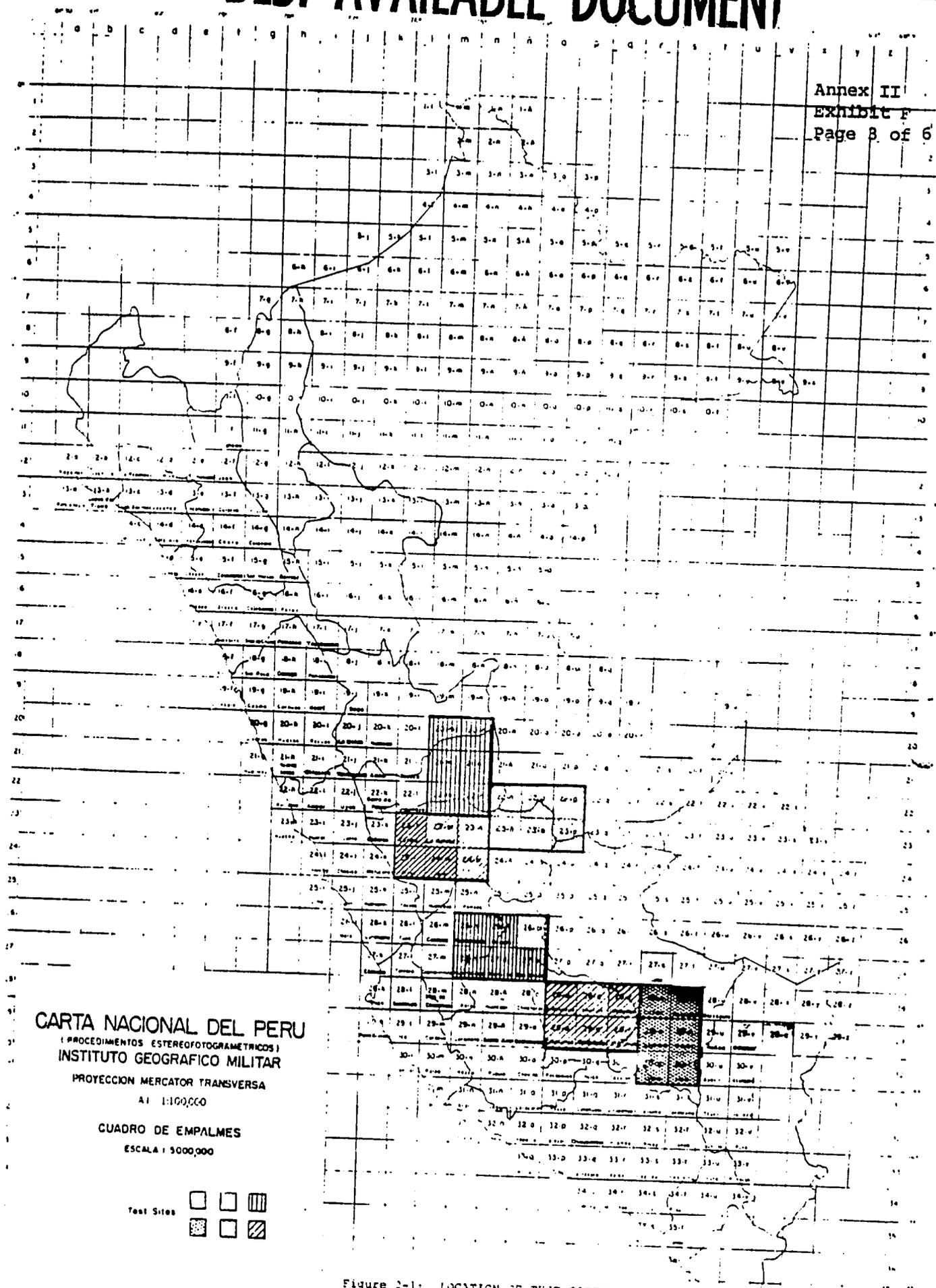
Identification of 30-minute quadrangles is facilitated by use of a grid system of IGM. Figure 2-1 is an index map of Peru showing the location of the 30-minute quadrangles. The grid uniquely locates each quad by a number/letter coordinate, numbers indicating location N-S and letters indicating location E-W.

Intensive discussions with GOP resource managers and with USAID personnel resulted in selection of 12 candidate test sites for the project. Budget limitations have restricted the final choice to six test sites.

Multiple test sites are required for several reasons. Although the new techniques could indeed be demonstrated on only a single site, it is necessary to develop operational procedures which will be applicable to a future high volume program covering the entire country. Thus, several such sites, in total covering an appreciable area, must be used. In addition, multiple sites are required in order to provide a representative example of the terrain types and environmental conditions of a country as large as Peru. Finally, it must be stressed that eventual success of a program of this type is a function of institutional acceptance of the techniques as much as, or even more than, the actual technical success of the program. One must be able to cover sufficient areas to build up interest in and generate demand within the various

BEST AVAILABLE DOCUMENT

Annex II
Exhibit F
Page 8 of 6



CARTA NACIONAL DEL PERU
(PROCEDIMIENTOS ESTEREOFOTOGRAFICOS)
INSTITUTO GEOGRAFICO MILITAR
PROYECCION MERCATOR TRANSVERSA
A1 1:100,000
CUADRO DE EMPALMES
ESCALA 1:5000,000

Test Sites

Figure 2-1: LOCATION OF TEST SITES

potential user agencies. Each such user agency will obviously have its own priorities regarding geographic areas of interest. The six test sites listed below are distributed over a large part of the country and will satisfy these requirements.

<u>Name of Site</u>	<u>Grid Coordinates</u>	<u>Latitude</u>	<u>Longitude</u>
Junin	23-24, L-N	11° - 12°S	74°30' - 76°W
Pichis-Palcazu	20-22, M-N	9°30' - 11°S	74°30' - 75°30'W
San Miguel-Apurimac	26-27, N-O	12°30' - 13°30'S	73°30' - 75°W
Acomayo	28-30, S-T		
Tambo-Urubamba	22-23, N-P	10°30' - 11°30'S	73° - 74°30'W
Abancay	28-29, P-R	13°30' - 14°30'S	72° - 73°30'W

Figure 2-1 also shows the location of the six test sites. The highest priority site is Junin. Initial project work will start with Junin. Second priority is San Miguel-Apurimac. Priorities of the remaining four will be determined as the project progresses.

General Description

Both the geography and activities of the areas encompassed by these six test sites are varied. Geography ranges from the high sierra to the highland selva or jungle. Elevations in the sierra may range from 3,000 to 6,000 meters. Topography may be rugged and steep, although much of the area is also part of the high plains or altiplano. At high elevations, with the thin air and very high diurnal temperature variation, vegetation cover is limited to grass and sparse scrub brush. Few trees are evident, except perhaps along certain watercourses or in protected valleys. The major activities in the sierra are grazing and mining.

The high selva possesses an entirely different environment. At elevations of 1,000 to 3,000 meters, the temperatures are warmer, diurnal temperature variation is much less, and precipitation and humidity are very high. This promotes heavy vegetative cover, ranging from coniferous varieties to tropical broadleaf forest. Slopes are commonly very steep, sometimes exceeding 45°. Between the mountains of the high selva are numerous fertile and rather broad valleys. These valleys have a high potential for agriculture, both perennial and annual. Development has occurred where roads have penetrated. Transportation links to the larger population centers allow daily movement of both produce and meat.

Many of the slopes of the high selva have been seriously deforested. Usually, the trees are cut, burned on site, and the area prepared as a very marginal grazing site. In some areas, crops are grown on slopes

approaching 30°- 40°. Such activity poses an active threat of uncontrolled erosion, landslides, loss of topsoil, and stream pollution.

Data Availability

Peru is very fortunate in that considerable resource data are available over much of the country. Many of the data are of regional or reconnaissance level detail, but a considerable area is also covered by more detailed studies. ONERN has recently (April 1978) published an excellent guide to the availability of cartographic information and natural resource studies in Peru. It is entitled "Guia de Informacion Cartografica y de Recursos Naturales del Peru". This guide was used to assess the availability of both basic (photography and SLAR) and ancillary thematic data over the areas of the test sites.

A summary of data availability is contained in Figure 2-2. A rating has been given to each test site to indicate the approximate proportion of the area of the site over which thematic data are available. For example, a rating of 4/6 indicates that four of the six quadrangles making up the test site possess data of a particular type.

The summary figure also indicates the availability and quality of Landsat computer compatible tapes (CCT's) for each test sites. Percentage of cloud cover for the best available image (as of February 1980) is indicated.

Figure 2-2 also includes the number of life zones present in each test site (a measure of environmental diversity), the major activities occurring in each test site, and major cities.

Relationship to Ongoing or Future Activity

The Junin test site covers much of the area of the Departamento de Junin. This Department is the location of a recent USAID project. It is entitled the "Integrated Regional Development Project" and runs from 1979 through 1984. Information gathered under this project will be useful in and complementary to the Natural Resource Inventory Project and vice versa.

USAID/Peru's next priority area for a major project will be the Pichis-Palcazu area. It will be the site of a rural development project running from 1981-1986. This area likewise will profit from the overlap of these two projects.

The remaining test sites have been requested by ONERN. Land cover information is lacking in these areas and the present government has specified its interest in these areas for future development.

Test Area Grid Coordinates	100 K. Topo	50 K. Topo	25 K. Topo	Number of Life Zones	SLAR	Airphoto - 1955	Airphoto - 1961-62	Airphoto - SAN	Geology	Soils	Forest	Hydrology	Cadastral	Integrated Studies	Major Activities	Major Cities	Relevance to USAID	Relevance to USDA	Relevance to GOP	Landsat CCT Cloud %	CCT EROS	Availability INPE
Junin 23-24, L-N	3/6			(12) Sierra High Jungle Coast Alpine	6/6 100 K.	6/6	6/6	3/6	1/6			1/6	2/6	1/6		Tarma, Satipo, Jauja, Concepción	X	X	10%		X	
Pichis-Palcazu 20-21, m-n	0/6				6/6 100 K.	6/6	4/6	5/6	5/6	5/6	5/6			5/5			X	X	80%		X	
San Miguel-Apurimac 26-27, N-O	5/6			(17) Sierra High Jungle Low Jungle Alpine	5/6 100 K.	1/6	5/6	2/6	5/6	1/6			1/6	1/6		Acobamba, Ayacucho, Huanta		X	0% 20%	X	X	
Acomayo 28-30, S-T	6/6			(9) Alpine High Jungle	2/6 100 K.	4/6	2/6	1/6	3/6				1/6			Urcos, Paruro, Yauri, Acomayo		X	0%		X	
Tambo-Urubamba 22-23, N-P	6/6			(6) Sierra Low Jungle	6/6 100 K.	6/6	5/6	4/6	3/6	5/6	5/6			3/6		Pto. Ocopa, Colonia Penal de Sepa		X	30%		X	
Abancay 28-29, P-R	5/6			(8) Sierra High Jungle	4/6 100 K.	2/6	1/6	3/6								Abancay, Tambobamba, Santo Tomas, Chal-Huanca		X	0%		X	

Figure 2-2: SUMMARY OF DATA AVAILABILITY FOR PROPOSED TEST SITES

1. National Profile of the Environment

Environmental Hazards

ONERN's in-house Diagnosticos Program has identified and plotted the location of areas experiencing various forms of man-caused and natural occurring environmental hazards. The Ministry of Health and various divisions of the Ministry of Agriculture and Food have information concerning health and environmental problems for specific areas. Government and private institutions should be consulted to bring together all relevant data for inclusion in the environmental profile. The important aspect of this information lies in its value for identifying adverse environmental trends. The capability to anticipate development problems and to implement effective techniques for mitigating environmental impacts is critical for safeguarding health, and providing for social and economic growth which are intricately tied to natural resources.

Effect of Natural Resource Laws and Policy on Environmental Protection

The Man And the Biosphere Draft Environmental Report of Peru included a list of major laws governing natural resources and environmental protection. The environmental profile should attempt to identify the degree of compliance to each law and the apparent effectiveness of the law for its intended purpose of resource conservation and environmental protection. In some cases, it is difficult to enforce natural resource laws due to the remoteness of the area, the shortage of funds for law enforcement and the difficulty of identifying violators. However, most point sources of pollution, for example, can usually be identified (e.g., mining and petroleum operations). The profile should identify areas where non compliance with law constitute major health hazards.

Natural Resource Development and Environmental Monitoring Programs

A summary of the natural resource management, rural development and environmental monitoring programs for all applicable government and private institutions should be conducted as part of the profile. This could be accomplished by ONERN filing requests with each institution to submit an updated list and short description of all ongoing and planned program activities. Compilation of the program summary will allow ONERN to identify areas of duplication as well as information gaps for particular areas and subjects that may warrant immediate or future investigation.

Recommendations for action to mitigate environmental impacts

The environmental analysis profile would allow ONERN to increase their capability for making recommendations and fulfilling their resource evaluation responsibilities to the National Institute of Planning. The National Institute of Planning may use the information for allocation of funds to various institutions for action programs to monitor and mitigate environmental impacts. Recommendations for enforcing compliance with pollution laws may be necessary to protect health and avoid environmental deterioration. The information contained in the profile would also allow ONERN to identify the most important programs for international donor assistance to increase the usefulness of donor programs in accordance with host country needs.

2. Impact Assessment Training

Environmental Analysis Methodologies

Training programs in environmental analysis methodologies conducted at ONERN will be more useful and available to a wider range of Peruvian scientists than the alternative of sending a select group to the United States to receive general training with primarily U.S. examples. The training programs will stress analytical methodologies using Peruvian case studies to demonstrate how the techniques are applied. The training will include participation of all agencies of the government involved in resource management, planning and environmental or pollution abatement programs. Training will also be open to Departmental Development Corporations to pass on appropriate methodologies to enable each department to compile pertinent environmental data for inclusion into ONERN's geographic information and evaluation program. Other agencies that would attend the courses would include the Ministry of Agriculture and Food (various divisions), the Ministry of Health, INP, Agrarian Reform, Transportation and ONERN.

Participation by other agencies besides ONERN will contribute a broader perspective to the training experience, which only professionals directly involved in the day to day process of management, development and planning activities can provide. The courses will be designed to expose attendees to a variety of analytical methods including check-lists, matrices of environmental action alternatives, overlays and impact linkage systems. ONERN will require technical assistance to design the curriculum, but they should be able to conduct follow-on workshops and training programs after the first technically assisted and comprehensive course.

Environmental Planning and Decision Making

An important aspect of environmental planning and policy formulation is the capability to make sound decisions. The technical training for environmental analysis is designed to enable ONERN and

other agencies to evaluate environmental impacts and identify alternative courses of action. The next step in the planning process is to decide on the appropriate course of action. Decision criteria must be developed to weight alternative courses of action. Some common methods of selecting alternatives include cost-benefit analysis, cost-effectiveness, net social benefit, etc. Environment protection and resource conservation involve many intangible or unquantifiable factors that cannot be expressed in purely economic terms.

ONERN is preparing for their new role as Secretaria Ejecutiva to the interministerial Council for the Environment. ONERN's legal council previously expressed interest in exploring technical assistance and training to prepare ONERN for its role under the new environmental law. Thus, a management level training course will be designed to expose ONERN personnel to the various criteria of weighing alternatives to make appropriate decisions on environmental matters. The course should also include legal aspects and explore possibilities for enforcing industrial compliance to environmental laws (e.g. levy of fines to violators, pollution control specifications) to prepare ONERN for its role in coordination and supervision of environmental and natural resource management activities.

3. Environmental Assessment Demonstrations and Training

Environmental assessment demonstrations have been proposed for the project to illustrate direct application of remote sensing and thematic map data to resource inventory, analysis and assessment of environmental problems in Peru. The nature of the demonstrations will vary with the information requirements of the test area. The environmental demonstrations will allow ONERN and scientists from other institutions to apply the concepts and methodologies that will be introduced to them through a variety of training programs. The demonstration will also be valuable to supply information about natural resources and environment in the test areas which will aid planning and decision making for development projects as well as national policy formulation.

Forest Change Detection

Deforestation is a serious problem in Peru (section In addition to the loss of a sustainable and potentially productive forest resource, deforestation causes a variety of environmental problems that will have long term damaging effects in Peru.

Forest change detection will be conducted in the test areas that have experienced some degree of forest loss in recent years. This exercise may include a mapping exercise from multidate aerial photography or visual and digital comparisons of multidate Landsat images in recently deforested areas. Sampling procedures should also be included to obtain fast estimates of forest change over large demonstration areas.

The concepts and methodologies of forest change detection will be introduced to training course attendees and they will apply the methods to obtain information for the test areas. Knowledge of past forest change rates and trends may provide insights about future trends. This type of information coupled with other components of the proposed GIS (e.g., ownership, proximity to roads, population, slope, soils, etc.) will be valuable for predicting and monitoring forest and land use change for planning and development activities. Land use planning guidelines can then be formulated in an attempt to control development activities and avoid undesirable environmental impacts.

Land Use Conversion - Urban Expansion

Greater Lima, in common with other primate cities of countries of the third world, has demonstrated extremely rapid population increase and areal expansion in the last three decades. Monitoring and understanding the accompanying rural to urban conversion of land. A key need exists to keep information on urbanization current on maps to facilitate analysis, evaluation, and formulation of effective policy. Current information is vitally needed to plan for the provision of municipal services. Beyond these immediate needs, planners have an urgent need to come to begin to formulate the ideal shape and size their cities should be taking in future needs.

Moreover, their cities - especially the capitals - are quickly becoming so areal extensive that they are beginning to consume not inconsiderable chunks of valuable agricultural land. In countries, such as Peru, where open land for food production lies at such great distance from market, the loss of agricultural land nearby cities is amplified in its importance beyond the simple, and irrevocable, loss of hectares of land.

Methodology to monitor this rapid urban growth is generally inadequate. Even in well developed countries, national census, the standard measurement of growth, are acquired too infrequently to provide information of sufficient currentness. A viable alternative is the use of remote sensing technology. Coupled with the Geographic Information System planned for this project, the infrastructure will be available for ONERN to make a valuable contribution to solution of a difficult problem and at the same time contribute to institution building.

This proposed environmental assessment demonstration seeks first to provide invaluable data on assessing just how much impact has already been caused by urbanization. It will then provide a method for continuous monitoring of growth in the future. Coupled with cost-benefit analysis, urban planners can direct growth to follow the most effective way both for the good of the city and the nation.

Forest Inventory

With the great potential contribution of forestry to the Peruvian economy, it is desirable to conduct extensive forest inventories as rapidly and effectively as possible to provide current information about the location and approximate volumes of important forest species. The purpose of forest inventory is to provide a basis for forest managers to prepare forest management and timber extraction plans in accordance with principles of sustained yield management and environmental protection. Rational management of forest resources also depends on support data (soils, topography, potential land use, etc.) which will be supplied by the resources inventory component of the project. Current Landsat and aerial photos will provide data about the location and area extent of forest resources.

Aerial photographs have been used by Peruvian foresters only to map general forest boundaries and to separate forest into broad strata. Limited forest inventories have been conducted through systematic or random locations of ground plots within forest strata (stratified sampling) which were delimited on aerial photos. The photos were used strictly for stratification ahead of field sampling. Direct area expansion formulas were applied to expand plot data to total stratum areas defined on air photos. No correlations between air photo measurements and field plot data for species identification and volume estimation has been attempted.

The forest inventory demonstration should be conducted as a partial training exercise and feasibility study. The objective would be to determine if Peruvian foresters from ONERN and the Ministry of Agriculture and Food can be trained to identify selected tropical forest species and obtain aerial photo measurements for meaningful correlation with field plot data.

A prerequisite for the aerial photo interpretation exercise would be an inventory of a selected number of field plots to serve as the basis of comparison for aerial photo measurements. 1:4000 or larger, vertical color, aerial photographs will be taken in sample strips within the test areas. The forest interpreters will be presented with aerial photos where selected dominant and codominant forest species have been identified through the ground plot data. A forest species identification key should be prepared which would consist of an artists (ONERN cartographers) representation of the crown characteristics of each species (crown shape, texture, relative size, etc.). The interpreters should compare the species identification key with the corresponding trees on aerial photos to develop identification proficiency. The interpreters should use a "parralax bar" (conventional measurement instrument used with aerial photos) to obtain tree height measurements and a templet to measure tree diameter. When the course instructor believes that reasonable proficiencies have been established through the training exercise, the interpreters can be presented with a set of

"unknown" plots to duplicate the identification and measurement exercise. This will be the feasibility test for forest species identification and volume estimates from aerial photographs. The interpretation results might include statistical analysis such as linear regression to determine the relationship between aerial estimates (x_i) and ground volume measurements (y_i).

If significant results can be obtained for the forest inventory demonstration indicating that the methods might improve standard forest inventory programs then ONERN may wish to explore the possibilities of future training and operational use of aerial photo aided inventory methods. Technical assistance and Peruvian labor support will be necessary to conduct this exercise (section

Critical Area Survey

Critical area surveys, as proposed for the demonstration, involves a comparison of thematic maps to obtain quantitative or qualitative data about environmentally sensitive areas and existing environmental hazards. For example, land cover maps might be compared with slope maps to identify areas on very steep slopes (i.e. 30°) that no longer support protective forest cover. Less suitable uses of land on steep slopes (grazing, seasonal cultivation, etc) may contribute to erosion hazard. Accelerated erosion may reduce or eliminate site productivity and cause secondary environmental problems such as river or reservoir sedimentation and watershed damage.

Other examples of critical area surveys might be the location of point sources of water pollution (mine tailings, petroleum extraction, municipal waste, pesticides from agricultural areas and air pollution (oil refineries, other industrial processing). In these cases, the identification of the critical areas might be accomplished from air photos and quantitative data (Parts per million of pesticides and other pollutants of water or air) would be determined on-site with appropriate monitoring equipment. ONER's diagnosticos (section) are attempting to conduct the latter type of surveys but they will need training in field methodologies (section

Land Cover/Land Use Mapping from Radar Imagery and Multidate Aerial Photography: Pichis-Palcazu

The presence of continuous cloud cover has prevented the acquisition of Landsat CCTS for some areas in Peru. Although most of the country is covered by suitable quality Landsat data, Pichis Palcazu is one area where Landsat data is lacking; perhaps the clouds will clear coincidentally with a future Landsat pass and new data will become available. However, considering that the eight year life of the Landsat satellite system has not produced one single useable Landsat CCT thus far for portions of the Pichis-Palcazu test site, the probability of future cloud-free coverage would appear to be very low.

Because special cases do exist where Landsat data cannot be obtained and digitally-processed for land cover identification, the use of alternative data sources should be demonstrated. Alternative data sources for Pichis-Palcazu include 1:250,000 scale radar images and aerial photographs of assorted scales and dates. The radar images can be used for broad cover type mapping for the entire test area. The radar images can provide a general level of land cover identification similar to the level obtainable from Landsat data. ONERN scientists have little or no experience with interpretation of radar imagery. An introductory lecture would be necessary to familiarize ONERN scientists and this special type of remote sensing data.

Multidate aerial photos can be used for more detailed land cover mapping for specific areas where the photo coverage is available. The land cover mapping for the Pichis-Palcazu area will be especially useful for the proposed A.I.D. development program in the area.

Structure of the Recommended Demonstration Project

The principal goal of such an evaluation study would be to determine the current status of agriculture in test pioneer areas in the Tingo Maria and Pucallpa areas. The principal question would be to determine the location and dimension of land currently in a viable state of agriculture relative to all the land which was originally cleared and settled by the agricultural pioneers.

This key question can best be achieved through the use of methods and technologies or remote sensing and resource analysis set forth in this project. Brought into use in the project would be all of the elements of the system, from aerial photography through application of the geographic information system. In addition, concurrent field work would be required. Past study interviews would also be necessary to determine reasons why area had declined.

Steps required to complete the study follow the organization of the system and are:

- Data gathering consisting of aerial photography acquired over representative areas and Landsat computer compatible digital data.

- Data analysis and manipulation handled within the geographic information system.

- Output map and data products.

- Evaluation of the results within a contextual framework by decision makers followed by an action plan.

Statistical accuracy of Landsat Land cover classification

Particular land cover types can be accurately identified through the use of Landsat digital classification (e.g. homogeneous stands of forest and irrigated crops). However, Landsat classification results may be considerably less accurate for other cover types of interest. There are many aspects of the Landsat classification procedures and the configuration and spectral reflectance of land cover types that will have a great influence on land cover classification accuracy. The important point that should be recognized is that Landsat classification output (e.g., line printer, film recorder or map display) is not an exact representation of ground conditions and systematic errors in the classification may occur.

The need to know the reliability of Landsat derived land cover maps may be directly related to the importance of the data for planning and decision making. The procedure for determining Landsat land cover classification accuracy is simple to perform and would be recommended even for the most rudimentary and reconnaissance type study. The interpretation of Landsat classification results can increase the analyst understanding of Landsat capabilities and enable the analyst to make necessary adjustments in land cover estimates. The knowledge gained from the accuracy test can indicate to the analyst how changes might be employed in the Landsat classification procedure to improve future land cover mapping.

Photo interpreted land cover can serve as "truth" or a basis for evaluating Landsat classification accuracy. This, of course, assumes that photo interpretation accuracy approximates ground conditions. For identification of general land cover types (forest vs nonforest, rangeland, mangrove, bare ground, etc.) from air photos. This assumption has been shown to have validity on the basis of investigations conducted in other countries.

Sampling Methods Applied to Remote Sensing and Environmental Data

One of the important tools of resource analysis is the use of sampling theory to extract information from remote sensing and environmental data. The ultimate objective of sampling theory is to make inferences about a population based on information contained in the sample.

As 100% field surveys are usually technically and economically unfeasible for large areas of Peru, remote sensing techniques coupled with sampling methods offer a unique opportunity to provide good estimates of a parameter at reduced costs. Remote sensing data should be supported by ground truth data to the greatest extent possible. Various sampling strategies might apply. Land cover types often represent definable strata, therefore stratified sampling is usually more efficient than simple random sampling. In Peru, where field sampling costs are high as a result of poor access to sample areas, cluster sampling can be

an efficient means to reduce those costs. Multistage sampling has recently become a popular design in remote sensing programs. Multistage sampling commonly uses two or more scales of remote sensing data, usually Landsat at the first stage and aerial photography at latter stages. In multistage sampling, it is often most efficient to make, first a large number of fast, unexpensive measurements of a parameter (x_i) on scale imagery and then correlate this with the parameter of interest (y_i). The "y" values are obtained from ground measurements or sometimes from large scale aerial photos.

Resource scientists and technicians working with remote sensing and ancillary map data should have a working knowledge of basic sampling concepts. Estimates of resource parameters from remote sensing data (e.g. irrigated land area, forest area change, timber volumes) should be accomplished by accuracy statements to provide a basis to judge the reliability and potential applications of the data to resource investigations in Peru.

A workshop is proposed for the project to introduce sampling methods and concepts to ONERN personnel and interested resource scientists from other agencies who rely on remote sensing and field data for a portion of their information needs. The course will require short term technical assistance and should be scheduled after the training programs that will introduce Landsat classification procedures and the uses of thematic map data. The application of sampling methods to remote sensing and thematic map will be better understood following the introduction of Landsat classification and thematic map concepts.

Urban Land-Use Mapping Using Computer-Aided Processing of Landsat Digital Data

The goal of the urban mapping study described previously was monitoring of historical and current urban area expansion concentrating on the nature of change at the edge of the city. This demonstration is directed, instead, at discriminating land uses within the contiguous mass of the city.

Considerable experience has been gained with studies of this type in the last eight years: The suitability of employing computer processing of Landsat data for this purpose has been reasonably well demonstrated.

Several general findings have been established. First the 0.45 hectares size Landsat pixel enables analysts to land-use class levels which are discrete enough for many urban planning purposes even though the pixel is larger than that of many urban land uses.

Often, as where a contiguous area of a land use exists (such as with residential tracts) there is little demand for identifying a small area of a different land use within the mass such as a single commercial establishment.

A second general conclusion is that the major provided, while not detailed enough for making cadastral-level planning, decisions, do provide a synoptic coverage which has high potential value for macro planning. Having a separation of land uses for an entire metropolitan area is quite valuable, especially when using a system which provides line-printer and other output maps of individual classes of land uses and at varying scales.

A third finding is that the data from Landsat, because they represent measurements of the physical characteristic of the surface (usually a man-made surface in this case), have a high level of utility for providing information on the physical nature of the city. For example, there is currently, in the U.S., an interest in knowing the effect which the impervious surfaces of cities have upon the quality of water which drains away following a rain.

Finally, the thought is frequently expressed that planners should learn how to use the computer/Landsat system now in order to prepare for the arrival of Landsat D. With this spatial resolution of 30 meters, rather than 80 meters, there will be the possibility of indentifying discretely many of the small urban features which are presently being aggregated within the larger cell size.