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Ecuador's Amazon Region

Development Issues and Options

James F. Hicks
with the collaboration of
Herman E. Daly,
Shelton H. Davis, and
Maria de Lourdes de Freitas

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75



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FOREWORD

Providing support for sustainable economic development is the cornerstone for the World Bank's assistance to its member countries. As part of this assistance, the Bank undertakes studies of the overall performance of these countries' economies, as well as of their key sectors. These provide a basis for the development of country strategies directed to implementing sound policies for sustainable economic development. Prudent management of a country's environment and natural resources, both renewable and non-renewable, is, of course, a primary concern for development policy. When these natural resources are of a special nature and spatially concentrated, national economic development policy may need to be informed by specific regional analyses. Such studies can clarify how regional natural resource management can contribute to national economic development policy. This is the case with Ecuador's Amazon Region.

This report was prepared initially to support a dialogue between the World Bank and the Government of Ecuador regarding issues and options for the sustainable development of Ecuador's Amazon Region. Special attention is given to environmental issues because Ecuador's Amazon Region has a very fragile renewable natural resource base, a rich biological diversity, significant native populations, and large, but diminishing, petroleum reserves. Along with these unique regional characteristics, however, certain national trends, especially population growth and migration out of the Sierra and Costa Regions, are creating extraordinary pressures on the Amazon Region, and these present significant threats to the region's social stability and environmental integrity, as well as to its potential to make long-term contributions to Ecuador's economic development.

Because of the relevance of, and broad interest in, sustainable economic development within the constraints and trends noted above, the Government of Ecuador and the Bank have agreed to make this report broadly available, presented in the original English and Spanish translation (published as a separate Discussion Paper). It is hoped that publication of this study will provide an example of how Bank/member country dialogue may contribute to improved decision-making before policy options are severely constrained and reach crisis proportions. In addition, and more importantly, we hope that this study can contribute in a modest way to the important discussions and decisions within Ecuador regarding the role of the Amazon Region in the nation's development.

Through the present study, the World Bank is pleased to contribute to the national dialogue regarding measures to enhance the sustainable development potential of the Amazon Region. A clearer understanding of the region's development issues and options, together with an enlightened public debate, should result in improved formulation and implementation of public policy for the nation and the region.

S. Shahid Husain
Regional Vice President
Latin America and the Caribbean
The World Bank

PREFACE

This report is based partially on the findings of a mission that visited Ecuador in November 1988. The mission comprised the following members:

James Hicks (Sr. Urban Finance Specialist, LATIE, and Mission Leader);
Herman Daly (Sr. Environmental Economist, ENVDR); and
Maria de Lourdes de Freitas (Environmental Planner, Consultant).

Mr. Shelton Davis (Sr. Sociologist, LATEN) collaborated through an earlier mission and assisted in preparation of the material on native communities.

The study also benefitted significantly from work prepared especially for it by the Fundacion Natura under contract with the World Bank. The Fundacion Natura is a not-for-profit NGO dedicated to promoting the rational use of Ecuador's natural resources, and its report, "Development Policy Issues for Ecuador's Amazonia", was prepared during the January to April 1988 period. The Fundacion Natura's report served as the focus of an in-house Bank seminar in July 1988, and as a baseline study for the November 1988 mission. Of course, the present report is the exclusive responsibility of the World Bank.

An earlier version of this report was delivered to the Government of Ecuador in June 1989, and preliminary discussions on it between Bank staff and government officials took place in July 1989. In November 1989, in-depth discussions between a Bank mission and a broad representation of government officials were held, and agreement to present the study as a public document was reached.

This report presents a rather broad analysis of the Amazon Region within the framework of Ecuador's national economic development. This results from a conscious decision to emphasize national/regional policy linkages in this study. As with all efforts, this work was influenced by constraints, and as a result, analyses of more specific sectoral issues and options are not presented here. These will need to be the object of future economic and sector work.

TABLE OF CONTENTS

	<u>Page No.</u>
GLOSSARY OF ABBREVIATIONS.....	vii
EXECUTIVE SUMMARY.....	ix
CHAPTER I. GENERAL CHARACTERISTICS OF THE AMAZON REGION	
A. The Region in National Perspective.....	1
Population.....	1
Employment.....	1
Public Sector Organization and Provision of Services.....	3
B. Unique Regional Features.....	5
Biological Diversity and Fragility.....	5
Native Populations.....	6
Petroleum Development.....	6
C. National Policy for Regional Development.....	7
CHAPTER II. ASSESSMENT OF THE REGION'S CURRENT SITUATION AND TRENDS	
A. Methodology.....	8
B. Directly Productive Activities.....	9
Petroleum and Mining.....	9
Agricultural Production.....	10
Cattle Production.....	14
Forestry.....	14
C. Land Settlement.....	16
D. Native Populations.....	17
E. Public Infrastructure and Conservation Areas.....	19
CHAPTER III. DEVELOPMENT ISSUES AND POLICY OPTIONS	
A. Development Issues.....	21
The Concept of Carrying Capacity.....	21
Carrying Capacity Applied to Human Populations.....	21
Carrying Capacity of the Ecuadorian Amazon.....	22
Scenarios of the Region's Development.....	22
B. Regional Policy Options.....	24
Regional Petroleum Development Policy.....	24
Regional Land Use Policy.....	24
Institutional Policy.....	25
C. Specific Recommendations.....	25
Population and Carrying Capacity.....	25
Petroleum and Mining Developments.....	26
Natural Resources Policy.....	27
Agriculture and Forestry.....	27
Transportation.....	28
Native Communities.....	29
Biodiversity and Protected Areas.....	29
Municipal Development.....	29

TABLES

Table 1.1: Regional Population, 1974, 1982, 1990.....	2
Table 1.2: Regional Employment Indicators, 1982.....	4
Table 1.3: Petroleum Reserves.....	7
Table 2.1: Productive Agricultural Land, 1983-1986, and Production Volume, 1986.....	11
Table 2.2: Agricultural Productivity, Amazon vs. National Average, 1985, 1986.....	12
Table 2.3: Soils of the Amazon Region.....	13
Table 2.4: Forest Coverage of the Amazon Region, 1978.....	15
Table 2.5: Protected Areas of the Amazon Region, 1978.....	20

ANNEXES

1. Ecuador - Native Populations and their Organizations.....	30
2. Ecuador - Summary of Principal Legislation Affecting the Amazon Region.....	35
BIBLIOGRAPHY.....	39

MAPS

IBRD 22047	Population Distribution
IBRD 22048	Settlement Frontier
IBRD 22049	Potential Use of Local Soils
IBRD 22050	Fertility of Soils
IBRD 22051	Forest Areas
IBRD 22052	Oil Exploration and Exploitation vs. Natural Reserve Areas
IBRD 22053	Regional Provinces
IBRD 22054	Physical Regions

GLOSSARY OF ABBREVIATIONS

AIMA	Asociacion de Industriales Madereros del Ecuador	(Ecuadorian Assoc. of Wood Producers)
API	American Petroleum Institute	
BNF	Banco Nacional de Fomento	(National Development Bank)
BP	British Petroleum	
BRASPETRO	Petrobras Distribuidora	(Brazilian Petroleum Distributors)
CEDIG	Centro Ecuatoriano de Investigacion Geografica	(Ecuadorian Center for Geographic Research)
CEPAR	Centro de Estudios de Poblacion y Paternidad Responsable	(Center for Study of Population and Responsible Parenthood)
CONAIE	Confederacion de Nacionalidades Indigenas del Ecuador	(Confederation of Indian Nationalities of Ecuador)
CONFENIAE	Confederacion de Nacionalidades Indigenas de la Amazonia Ecuatoriana	(Confederation of Indian Nationalities of the Ecuadorian Amazon)
DIGEMA	Direccion Nacional de Medio Ambiente	(National Environment Directorate)
DINAC	Direccion Nacional de Avaluos y Cadastros	(National Directorate for Land Appraisal and Cadastres)
DINAF	Direccion Nacional Forestal	(National Forestry Directorate)
FAO	Food and Agriculture Organization	
IERAC	Instituto Ecuatoriano de Reforma Agraria y Colonizacion	(Ecuadorian Institute for Agrarian Reform and Land Settlement)
INCRAE	Instituto de Colonizacion de la Region Amazonica Ecuatoriana	(Institute for Settlement of Ecuador's Amazon Region)
INEC	Instituto Nacional de Estadistica y Censo	(National Institute of Statistics and Census)
ORSTOM	Organization Francaise de Recherche Scientifique Pour le Developement et Cooperation	(French Scientific Research Organization for Development and Cooperation)
PETROECUADOR	Empresa Estatal Petrolero del Ecuador	Ecuadorian State Petroleum Company
UNEP	United Nations Environment Program	
USAID	U.S. Agency for International Development	
PRONAREG	Division de Regionalizacion Agraria/MAG	(Agrarian Regionalization Division)
RAE	Region Amazonica Ecuatoriana	(Ecuadorian Amazon Region)

EXECUTIVE SUMMARY

1. Why single out a national region for specific analysis as part of the Bank's country economic studies? The need to undertake this special regional study is based on the following observations:

- (a) Ecuador's Amazon Region has several unique features, among which are the extreme fragility of the region's natural resources, its rich biological diversity, its significant native populations, and its large, but diminishing, petroleum reserves; and
- (b) Certain national trends, especially population growth and migration out of the Sierra and Costa Regions,¹ are creating extraordinary pressures on the Amazon Region, and these present significant threats to the Amazon Region's potential to make long-run contributions to Ecuador's economic development.

Unique Characteristics of the Amazon Region

2. Ecuador's Amazon Region presents very special characteristics, some of which may be considered constraints, others unique opportunities. Perhaps the foremost characteristic that conditions the range of options for the region is the extreme fragility of the region's natural resources. With few exceptions, the tropical rainforest is based on extremely fragile soils with very complex, and easily depleted, nutritional systems. With careless economic and land use management for the region, these resources may be forever destroyed.

3. The region also offers extraordinary and unique biological diversity. Much of this diversity is not yet documented, and the economic and commercial potential for the region and the country (and, indeed, for all mankind, in the case of pharmaceutical breakthroughs, for example²) may be considerable. This potential may remain unknown and lost forever if the tropical rainforest is permanently destroyed through inappropriate land use.

4. The region is also home to approximately 85 thousand to 100 thousand native peoples that have retained a relatively autonomous life style. Over the past years, some of these indigenous groups have remained isolated; others have retained their cultural identity while incorporating some services (e.g., education, health care) offered by the broader Ecuadorian society. The opportunity for preservation of cultural choice (including sophisticated ecological knowledge and resource management strategies) for the Amazon's native populations is another of the region's unique characteristics.

1 See Map IBRD 22054, located at the end of this report.

2 Approximately one-fourth of the pharmaceuticals in use in the U.S. today contain ingredients originally derived from wild plants.

The Amazon and National Economic Development

5. This report presents a rather broad analysis of the Amazon Region within the framework of Ecuador's national economic development. This approach is based on the observation that isolated policy analyses that focus narrowly on a region of concern generally result in policies that are (a) wrong from a national development perspective and/or (b) ignored, unless the region in question has decisive political influence.³

6. This choice of study scope has costs and benefits, of course. On the cost side, some specific sector recommendations presented here may need to be detailed in future economic and sector work. As a benefit, the broad analysis sharpens the difficult trade-offs (in space, among economic activities and over time) that must be faced by national decision makers in considering development issues and policy options for the Amazon Region. In summary, policies and actions conceived and implemented at the regional level are necessary but far from sufficient. If the Amazon Region is to have a long-term, positive effect on the nation's economic development, then a national perspective in the analysis of issues and policies (e.g., population pressures, sustainable land settlement, rational use of resources) is indispensable. These are summarized below.

National Trends and Issues for the Region's Development

7. Ecuador's total population is estimated at about 10 million people, of which some 350 thousand currently live in the Amazon Region. The growth in national population is estimated to be between 2.5 and 3.0 percent per annum; this means that Ecuador's total population will approximately double over the next 25 to 30 years if current trends continue. The rural areas of the Sierra and Costa Regions already are experiencing net emigration because of demographic pressures, ecological deterioration and droughts. Thus, urban areas and the Amazon Region would appear to be logical "escape valves" for demographic pressures. However, it is clear that the Amazon Region can make only a very limited contribution to solution of the national population problem because even if the Amazon were populated to the same density as of all of Ecuador, it would absorb less than four million people, a figure far beyond its carrying capacity, yet much below the projected increment of 10 million additional Ecuadorians over the next generation (25 to 30 years).

8. In spite of these limitations, the Amazon population has been growing at almost 5.0 percent per year. If this trend persists, and the fragility of the Amazon Region's natural resources is not properly recognized, the Amazon Region may be projected to absorb a significant part of the next generation's population growth. Furthermore, under existing, and currently foreseen technology, rapid population growth in the region founded on agricultural, cattle, timber and mining activities would result in:

- (a) irreversible loss of the region's renewable and non-renewable

³ See J. Friedmann and W. Alonso, "Regional Development as a Policy Issue", Regional Development and Planning. (Cambridge: The MIT Press, 1964), pp. 1-7.

resources and of their potential to produce regional and national economic benefits;

- (b) diminishing returns of economic activities over time as the fragile resource base is depleted;
- (c) social conflicts between indigenous and migrant populations; and
- (d) eventually, reverse migration as people must abandon the then resource-poor Amazon Region, thus contributing to even greater population pressures in non-Amazon Regions.

9. If the results noted above are to be avoided, policy and actions at the national and regional scales are required. At the national level, policies directed at (a) expanding economic opportunities (and therefore population carrying capacity) country-wide, but especially in the Sierra and Costa Regions, and (b) reducing the national rate of population growth, are indicated. These would require a long time to show significant effects, however. In the meantime, other national efforts would be necessary, and one, or a combination, of the following may be explored as a preferred alternative to rapid agricultural settlement of the region:

- (a) significant increases in productivity of existing agricultural areas located in the Sierra and Costa Regions;
- (b) expansion of agricultural areas outside the Amazon Region, especially the Costa Region; and/or
- (c) significant expansion of the urban labor market in the Sierra and Costa Regions.

10. In addition to the national measures noted above, regional policies and options, designed to give an opportunity for the region to reach its long-run development potential, may be explored. Chief among these are:

- (a) a regional petroleum development policy that is consistent with a national natural resource management policy founded on sustainable development;
- (b) regional land-use policy that strictly adheres to prudent environmental standards and that represents a responsible trade-off between (i) the country's short-term needs for economic stabilization and growth, and (ii) longer-term sustainable development of the region's natural and human resources; and
- (c) strengthening of the institutions, national and regional, that are primarily responsible for the region's land-use and infrastructure standards and implementation, moving from a sectoral perspective in which regional development concerns are concentrated in the Ministry of Agriculture, to an institutional framework that recognizes that the Amazon Region's contribution to sustainable national development should be incorporated into broader national development policies and decisions.

Report Organization

11. The rest of the report is presented in three chapters. The first two chapters present general characteristics of the Amazon Region and an assessment of the region's current situation and trends. This summary and the last chapter, Development Issues and Policy Options, present the study's major conclusions and normative suggestions. Finally, there are two Annexes, one presenting a more detailed description of the region's native populations and their organizations, and the second, a summary of national legislation especially relevant to the region's development.

I. GENERAL CHARACTERISTICS OF THE AMAZON REGION

A. The Region in National Perspective

Population

1.01 Ecuador's Amazon Region (RAE) is comprised of four Provinces (Napo,¹ Pastaza, Morona Santiago and Zamora Chinchipe -- see Map IBRD 22053, located at the end of this report), with a population estimated at approximately 350 thousand, about half of which lives in Napo. The region's population density is only two inhabitants per km², compared to about 60 for the rest of the country. Thus, although the RAE accounts for almost half of Ecuador's total territory, its population represents only about four percent of the country's total.

1.02 Although the RAE still has a very low population density, it has recently experienced a high rate of population growth. Over the 1974-82 period, the region's population grew at 4.9 percent per year, versus 2.5% for the country as a whole. The Province of Napo's population grew 8.0 percent per annum over the period, and several of its municipalities recorded double-digit annual growth rates (Table 1.1).

1.03 This fast population growth has been fueled primarily by immigration to the region. As of the last census year, 1982, almost half (47 percent) of RAE's population was born outside the region, with two-thirds of these immigrants coming from the Sierra Region (UNEP, 1986, pp. 38-39). This strong migration pressure has been relatively recent, with 70 percent of the total immigrants to the RAE in 1982 having established residence there after 1972 (Fundacion Natura, 1988, pp. 10-11), when significant petroleum development began.

Employment

1.04 From the national perspective, the region's economy is dominated by the petroleum industry, which produced an average of almost 90 million barrels per year during 1980-85. This production was concentrated in Napo Province, coming from 700 thousand ha. of concession areas. The national petroleum monopoly, PETROECUADOR,² manages the overall production, and it may do so either alone or through consortia. By the end of 1987, almost three million ha. were under exploration in 11 blocks located in Napo and Pastaza Provinces by PETROECUADOR in consortia with international petroleum companies (Map IBRD 22052).

1/ In January 1989, the Province of Napo was subdivided, with the southern portion retaining the Napo name. The northern part of the former province, comprising the Cantones of Gonzalo Pizarro, Lago Agrio, Shushufindi, Putumay and Sucumbios, is now the Province of Sucumbios, with Nueva Loja (Lago Agrio) as its capital. Because all of the data for Napo Province available for this report refers to the pre-1989 provincial boundaries, all subsequent references to Napo Province refer to these past boundaries.

2/ The Ecuadorian State Petroleum Company changed its name from CEPE (Corporacion Estatal Petrolera Ecuatoriana) to PETROECUADOR (Empresa
Continued on next page

Table 1.1: ECUADOR - REGIONAL POPULATION, 1974, 1982, 1990

Region, Province, County	Population 1982 ('000)	Density per/km ² 1982	Growth rates 1974-82	Population projection 1990 ('000)
AMAZON	263.8	2.0	4.9%	407.3
NAPO	115.1	2.2	8.0%	192.1
Tena	22.1	4.6	4.4%	36.3
Archidona	15.0	-	2.9%	20.7
Aguarico	3.2	0.2	1.3%	4.0
Orellana	29.2	3.0	14.3%	42.3
Putumayo	3.1	3.5	14.5%	5.1
Lago Agrio	23.9	-	15.0%	47.8
Quijos	9.2	3.0	1.5%	13.3
Sucumbios	5.5	1.1	5.7%	8.4
Shushufindi	-	-	-	14.2
PASTAZA	31.8	1.8	3.9%	44.4
Pastaza	27.6	1.0	4.4%	39.3
Mera	4.1	5.1	0.9%	5.1
MORONA SANTIAGO	70.2	2.9	3.5%	99.4
Morona	23.7	2.0	6.3%	37.1
Gualaquiza	10.5	4.0	2.8%	14.2
Limon-Indanza	10.7	4.1	0.1%	14.0
Palora	5.4	2.0	3.0%	7.6
Santiago	7.6	2.9	1.9%	9.6
Sucua	12.3	6.5	3.0%	16.9
ZAMORA CHINCHIPE	34.9	3.4	4.4%	71.5
Zamora	21.6	6.8	4.4%	35.2
Yantzatza	13.3	-	-	20.7
Chinchipe	8.7	2.3	1.9%	11.6
Yacuambi	3.0	2.3	3.7%	4.0
SIERRA	3,799.6	58.7	2.2%	-
COSTA	3,994.2	59.1	2.5%	-
GALAPAGOS	6.1	0.8	4.9%	-
ECUADOR	8,072.7	29.8	2.5%	10,781.6

Source: Fundacion Natura, 1988, p.7

Continued from previous page

Estatal Petrolero del Ecuador) through Special Law No. 45, of September 26, 1989.

1.05 From the perspective of employment generation within the region, however, the petroleum industry is basically an economic "enclave" with few backward or forward employment generation linkages. Factor inputs, including materials and labor, predominantly are imported into the region, and skilled, as well as semi-skilled, labor live almost exclusively in petroleum camps during their "shifts" in the region, leaving their families, and most indirect employment generation potential, outside the region.

1.06 Although the RAE accounts for less than four percent of the country's total employment, it contributes a disproportionately high share of national employment in the primary sector: 5.6 percent in agriculture and related activities; and 23 percent in mining, including petroleum extraction. This comparison of regional concentration of employment by sector is conveniently summarized through Location Quotients, defined for this analysis as the share of a given sector's regional employment in a region's total employment divided by the total sector's share in total national employment.

1.07 Analysis of regional Location Quotients indicates a relative concentration (Quotient greater than one) of Ecuador's primary sector employment (Sectors 1 and 2 of Table 1.2) in the RAE. From the perspective of sectoral contribution to total RAE employment, however, mining contributes a very small proportion (2.2 percent) of total regional employment. The sectors that provided the most regional employment in 1982 were agriculture (56.4 percent) and housing services (22.5 percent). Recently, however, regional agriculture and housing services employment have experienced rather dramatic shifts: down from 68 percent of total regional employment in agriculture in 1974 to 56 percent in 1982; and up from 15 percent in housing services in 1974 to 22 percent in 1982. These shifts in employment are reflected in the region's increased urbanization, with RAE urban population increasing at 12.2 percent per year over the 1974-82 period, compared to an increase in national urban population of 5.1 percent per year.

Public Sector Organization and Provision of Services

1.08 Although not formally having a federal system of government, Ecuador has a significant proportion of its total public sector services provided by sub-national governments, primarily denominated Provinces and Municipalities. These accounted for 2.6 percent and 9.2 percent, respectively, of total public expenditures in 1987. Although the Central Government dominates total public expenditures, municipalities have significant, formal responsibilities, including water, sanitation, solid waste management and land use.

1.09 There has been a notable increase in the number of sub-national governments. From 1974 to 1987, there was a 40 percent increase in the number of municipalities (108 to 150), and in March 1989, total municipalities numbered 162. Although municipalities legally are supposed to have an economic and fiscal base sufficient for substantial municipal autonomy, this frequently has not been the case in newly formed municipalities, resulting in either a substantial financial burden on the Central Government in order to provide basic municipal services or a lack of these services. In fact, municipalities of the RAE are noteworthy for their general lack of basic municipal services, especially in the sanitation area (Fundacion Natura, 1988, pp. 19-20).

Table 1.2: ECUADOR - REGIONAL EMPLOYMENT INDICATORS, 1982

SECTOR	EMPLOYMENT ('000)												LOCATION QUOTIENTS 2/			
	Amazon Region						Sierra Region			Costa Region						
	Morona	Pastaza	Zamora	Santiago	Chinchipe	SubTotal	Regional %	Column %	Costa Region	Column %	National Total 1/	Column %	Amazon	Sierra	Costa	
1. Agricult., Silviculture Cattle, Fishing, Etc. Row %	18.5	4.0	13.2	8.2	:	43.9	56.4%	401.8 51.4%	34.5%	335.8 43.0%	30.8%	781.5 100.0%	33.5%	1.68	1.03	0.92
2. Mining Row %	1.1	0.1	0.1	0.4	:	1.7	2.2%	3.0 40.5%	0.3%	2.7 36.5%	0.2%	7.4 100.0%	0.3%	6.88	0.81	0.78
3. Manufacturing Row %	1.2	0.6	0.7	0.4	:	2.9	3.7%	168.9 59.1%	14.5%	113.9 39.9%	10.5%	285.7 100.0%	12.3%	0.30	1.18	0.85
4. Construction Row %	1.8	0.7	1.2	0.7	:	4.4	5.7%	86.1 54.7%	7.4%	66.9 42.5%	6.1%	157.4 100.0%	6.8%	0.84	1.09	0.91
5. Commerce (Retail, Transport, Finance, Etc.) Row %	2.4	0.9	1.1	0.6	:	5.0	6.4%	174.6 42.2%	15.0%	233.7 56.5%	21.5%	413.3 100.0%	17.7%	0.36	0.85	1.21
6. Housing Services Row %	6.8	3.6	4.0	3.1	:	17.5	22.5%	274.9 49.8%	23.6%	259.5 47.0%	23.8%	551.9 100.0%	23.7%	0.95	1.00	1.01
7. Others Row %	1.3	0.3	0.5	0.3	:	2.4	3.1%	55.8 41.6%	4.8%	76.0 56.6%	7.0%	134.2 100.0%	5.8%	0.54	0.83	1.21
8. TOTALS Row %	33.1	10.2	20.8	13.7	:	77.8	100.0%	1165.1 50.0%	100.0%	1088.5 46.7%	100.0%	2331.4 100.0%	100.0%	1.00	1.00	1.00

1/ Excludes Galapagos.

2/ Defined as $LQij = (Rij/Rj)/(Ni/N)$ where:

LQij = Location Quotient for Sector i in Region j;

Rij = Employment in Sector i in Region j;

Rj = Employment in all sectors of Region j;

Ni = Employment in Sector i in the Nation; and

N = Employment in all sectors in the Nation.

SOURCE: Employment data presented by Fundacion Natura, 1988, p. 13, based on INEC, 1982 data.

B. Unique Regional Features

1.10 Although the RAE has numerous characteristics that make it unique, three features stand out as conditioning its development options: biological diversity and fragility; native populations; and petroleum production.

Biological Diversity and Fragility

1.11 The term biological diversity (or biodiversity) refers to the variety and variability among living organisms and among the ecological systems in which they occur. Diversity is demonstrated by the relative number of interacting ecosystems, taxa, genetic systems, and their abundance within a geographic area (Cabarle, et. al., 1989, p.3).

1.12 By any standard, Ecuador in general, and the RAE in particular, are characterized by extraordinary biological diversity. Although Ecuador has a land area approximately equivalent to that of the State of California, its number of plant species is estimated to be between 20,000 and 25,000, compared to some 17,000 for all of North America. Animal diversity is also impressive, with 2436 terrestrial vertebrate species estimated in 1988. This compares to 1394 for the continental United States and accounts for 55 percent of all such species estimated for the Tropical Andes Region, and 25 percent of the known species for all of Latin America and the Caribbean (Cabarle, et. al., 1989, pp.3-4).

1.13 The potential contribution of this biological diversity to Ecuador's economic development appears to be considerable but currently not quantifiable in reasonably precise terms. Potential economic benefits currently are unknown in many cases, but appear to be most promising in modern tropical forest management,³ pharmaceutical products and tourism. However, in almost all cases it appears that a reasonably long planning horizon will be necessary if the biological diversity present in the RAE is to produce national economic development benefits. This presents a potential dilemma for national development policy, as many areas of national concern are perceived to be quite urgent, thus leading to a potential neglect of the longer-term benefits of rational exploitation of the region's natural resources. In economic terms, taking advantage of the region's biological diversity may be relegated to a very low national priority if the nation's social time preference is very short, or, in other words, if its economic discount rate is very high.

1.14 The dilemma regarding timing of resource development is compounded by the fragility of the region's resources. Contrary to temperate climate forests, the region's tropical rainforests are founded on soils that generally are poor for uses other than forest maintenance. Furthermore, if

3/ A study undertaken by North Carolina State University and financed by U.S.AID indicates that forest production investments in Ecuador produce real (not considering fiscal incentives) financial rates of return in the range of 6 percent to 12 percent. The study included the *Cordia Alliodora*, *Schizolobium Parahyba* and *Tectona Grandis* species in the Amazon Region. See Ian McCormick, ed., Analisis Economico de Inversiones en Plantaciones Forestales en Ecuador, (Quito: AIMA, 1987).

the region's rainforests are destroyed in order to make way for other land uses, with current levels of technological knowledge, this destruction would be largely irreversible. Thus, large-scale conversion of the tropical rainforest to alternative uses for short-term gain may result in the permanent loss of the long-term economic potential offered by the region's diverse natural resources.

Native Populations

1.15 The region's native population is estimated to represent between one-third and one-fourth of its total population, some 85 to 100 thousand people. This population is composed of six native groups that have retained a relatively autonomous life style, with the Quichua and Shuar groups representing about 85 percent of the total.

1.16 Prior to significant petroleum development in the RAE, the government's policy toward the region's Indians was effectively to delegate their acculturation to missionary groups. More recently, with development of the region's petroleum reserves, official policy has shifted to integration of the native populations into the national society, primarily through agricultural land settlement policies. As a response to this national policy, native populations have organized themselves into regional federations such as CONFENIAE, calling for state recognition of native culture, land rights and resource control. For additional information on native populations and their organizations, see Annex 1; for their geographical distribution, see Map 22047.

Petroleum Development

1.17 Essentially all of Ecuador's known petroleum reserves are located in the RAE. As of June 1988, proven and developed petroleum reserves were estimated at about 1,100 million barrels (World Bank estimates). At the current production rate of about 310,000 b/d they would last for about 10 years. After the discoveries of the late 1960s and early 1970s, exploration was neglected. As a result of the lack of new discoveries and increased extraction, reserves declined rapidly to a low of about 880 million barrels at the end of 1983, reducing the reserves-to-production ratio below 10. Since 1983, this ratio has recovered. In addition to proven and developed reserves, official sources classify another 40 million barrels as probable. Finally, it is estimated that Ecuador has important additional reserves of heavier crudes, which should be studied for use early in the next century (see Table 1.3 below). It must be emphasized that all figures are estimates and there is always considerable uncertainty present in estimating probable and possible oil reserves. Recovery costs are likely to be an increasingly important consideration as most of the recent discoveries are small separate pools of crude and of average (15-25 API) or higher (8-15 API) densities.

1.18 Development of the petroleum industry has opened up the region to other economic activities. The primary determinant in the spatial occupation of the region has been the road network constructed primarily to build and service the petroleum fields, pipelines, and transformation areas. Although primarily designed to support the petroleum industry, this transportation network has made viable significant migrations to the region. The region's migration patterns and land settlement are discussed in paras. 2.23 to 2.27 below.

Table 1.3: ECUADOR - PETROLEUM RESERVES

	Million Barrels
Proven Reserves (developed)	1,100
Proven Reserves (not developed)	40
Probable Reserves	<u>700</u>
Total	1,840

Source: World Bank estimates, June 1988.

C. National Policy for Regional Development

1.19 Ecuador's policy for development of the RAE is based essentially on the Law for Settlement of the Amazon Region (Ley de Colonizacion de la Region Amazonica; see Annex 2). This Law has the status of "special law", meaning that it takes precedence over any other legislation pertaining to the same matter. It establishes that settlement of the RAE should be encouraged as an urgent national priority, and that the Ministry of Agriculture's Institute for Settlement of Ecuador's Amazon Region (INCRAE) is responsible for formulating settlement policy and for providing settlers with legal land titles through the Ecuadorian Institute of Agrarian Reform and Land Settlement (IERAC).

1.20 As will be noted below (para. 3.32), the present study concludes that Ecuador's land settlement policy for the RAE is fundamentally flawed. However, at least Ecuador has not established other policy instruments that could make the situation worse. For example, Ecuador does not have (as in the case of Brazil) credit or tax policies that favor certain regions, and it does not have regional development authorities or banks.

1.21 The Government of Ecuador appears to be reassessing its policy to promote significant land settlement in the RAE. For example, in late 1988, the Government created an inter-ministerial commission for the RAE. Although the commission's membership favors the Ministry of Agriculture,⁴ the inclusion of mining, energy and forestry representatives is an indication that consideration of the region's development options is going beyond that of settlement frontier, and this is an encouraging step.

^{4/} The Commission is composed of representatives from the following: Ministry of Agriculture -- Regional Subsecretary for the Amazon, IERAC, DINAF and INCRAE; Ministry of Energy and Mining -- PETROECUADOR and DIGEMA.

II. ASSESSMENT OF THE REGION'S CURRENT SITUATION AND TRENDS

A. Methodology

2.01 Assessment of the region's status and trends is based here on the assumption that sustainable development is a fundamental goal of the Ecuadorian society, with sustainable development defined as one that "optimizes the economic and other societal benefits available in the present, without jeopardizing the likely potential for similar benefits in the future" (Goodland, 1987).

2.02 From the perspective of economic programming and evaluation, this definition of sustainable development may be stated as a constrained objective function:¹

Maximize the present value of the region's contribution to national income, subject to the following constraints:

- (a) preservation of cultural choice for the region's native populations; and
- (b) preservation of the region's biological diversity and renewable resources so that the region may contribute significantly to national income over many generations.

2.03 The maximization expression could apply to almost any region or sector of any country; the constraints focus concern on the Amazon Region's unique characteristics. The first constraint, of preserving cultural choice, clearly is a normative statement outside of generally accepted economic concerns. Emphasis is on preservation of choice, and over time this may become a more or less binding constraint, depending on the degree to which the native populations choose to become integrated into, or remain as distinct cultural groupings within, the larger society. The second constraint is more within traditional economic analysis and reflects the concern with inter-temporal time preferences. Because of our limited knowledge of precisely how, and when, the region's biologically diverse resources may contribute significantly to economic development, preservation of these potential development inputs requires a long planning horizon. Placing this preservation as a constraint effectively forces the "present value" criterion to include a relatively low discount rate; it may be interpreted as a "shadow price" for preserving options for future generations.

2.04 In the sections below this general methodological framework is used for assessing the current status and trends of the RAE's directly productive activities, land settlement, and native populations, as well as of the public sector's activities in the region.

1/ In order to focus on the key regional development variables of this analysis, the objective function presented is highly simplified, specifically "assuming away" for discussion purposes additional constraints such as the production function, budgetary limitations, and inter-personal and inter-regional income distributions.

B. Directly Productive Activities

Petroleum and Mining

2.05 Following the discovery and development of important reserves in the late 1960s and early 1970s, petroleum became the main element in Ecuador's energy balance and an important source of growth, foreign exchange earnings and fiscal revenues. Although the benefits of petroleum development have been largely national in impact, many of the costs have been concentrated in the Amazon Region. The financial costs of the region's petroleum industry appear on the balance sheet of PETROECUADOR and/or its affiliates and development partners. The economic costs are concentrated in the region, and they frequently have negative impacts on the objective function's constraints. When these negative impacts are not assessed, however, the overall economic development impact of the activity may be much less favorable than is possible and desirable.

2.06 Substantial economic costs of the region's petroleum industry do not appear to be adequately considered in the industry's production and pricing decisions; these costs may be classified in two broad categories: direct and indirect. The industry's direct, generally not measured, economic costs may be summarized according to its production cycle, as follows.

- (a) During the petroleum production phase, water systems surrounding extraction sites frequently are devastated through uncontrolled petroleum drainage pools and emulsion processes.
- (b) During the petroleum transportation phase, external costs result from leakages or major spills that may be produced from poor maintenance, from natural disasters such as earthquakes or landslides,² and from sabotage.

2.07 Although the direct economic costs resulting from the region's petroleum industry may be significant and may result in distorted economic decisions, they appear to be small when compared to the industry's indirect economic costs. Direct costs may be classified in generally known categories, and with sufficient effort in data gathering and analysis, these costs may be estimated and used with some confidence in decision-making models. In turning to evaluation of the indirect costs of the region's petroleum industry, however, the picture is quite different: explicit value judgements are equally important yet much less clear. For example, it is clear that the road networks built to support petroleum development have provided an essential pre-condition for much of the region's land settlement. As noted in paras. 2.20-2.22 below, this settlement is resulting in significant, and apparently irreversible, destruction of the tropical rainforest and its rich biological diversity.

2/ These have occurred at least twice. First, more than 30 km of the Trans-Ecuadorian Petroleum Pipeline was destroyed by the March 1987 earthquakes. The emergency reconstruction of the pipeline was financed by Loan No. 2803-EC. In May 1989, another spill resulted from landslides that apparently were caused by heavy rains combined with deforestation.

Evaluation of this indirect cost requires a judgement on the absolute value of the benefits expected (but not guaranteed) to be received from these resources, as well as a judgement (social time preference) on the relative value of short-term, generally certain, benefits to be received from immediate land settlement versus the long-term, uncertain, benefits to be received from preserving the region's biologically diverse resources.

2.08 In planning for a society with many urgent, material needs, it is understandable that arguments calling for evaluation of biological diversity based on stochastic models with wide ranges of benefits' probabilities have a very limited appeal. In contrast, petroleum development offers immediate, predictable benefits for which the most influential social groups are clamoring. Thus, it appears evident that petroleum development will continue in the Amazon Region for at least another generation. For the region's longer-term contribution to national income, it appears that the best that may be achieved is to develop the petroleum industry with a minimum of irreversible destruction of the region's renewable resources.

2.09 Mining is another sector for which the region's potential is being identified. Mineral reserves appear to be concentrated in the region's watersheds, and include: metallic and non-metallic ores; radioactive ores; raw materials used to prepare cement, ceramics, carbon and oil products, and glass; and precious and semi-precious stones. Of particular concern is artisan mining of gold in the region's rivers; if undertaken without proper safeguards, this may result in dangerous mercury pollution, with damages reaching beyond the borders of Ecuador. This problem is shared by Ecuador's Amazon Basin neighbors, and significant gains may be achieved through joint research and action plans.

Agricultural Production

2.10 The area devoted to agricultural production in the RAE has boomed. Between 1983 and 1986, the area under production doubled for the region as a whole, with a greater than three-fold increase in Napo Province (Table 2.1). This production may be classified in three broad production systems (Fundacion Natura, 1988, pp. 43-44).

- (a) Traditional subsistence systems -- Common to most indigenous groups, these systems are characterized by hunting, fishing, food collection and itinerant farming. As the region has been opened to settlers, with more area put into production, this system has been threatened and in some areas replaced by cattle ranching and sedentary agriculture.
- (b) Corporate plantations -- These are located in Napo province and are primarily monoculture plantations, especially of palm oil and tea, using relatively capital-intensive and chemically based (fertilizers and pesticides) cultivation methods.
- (c) Mixed systems -- Practiced mainly by the settlers, these systems generally include three activities on the "family farm": vegetable garden for household consumption; a pasture area; and an area devoted to cash crops, primarily coffee, naranjilla and cocoa.

Table 2.1 - ECUADOR: AMAZON REGION

PRODUCTIVE AGRICULTURAL LAND, 1983-1986,
AND PRODUCTION VOLUME, 1986

Crops	1983 (ha)	1986 (ha)	(% change)	Prod. Vol. 1986 (metric tons)
rice	491	300	-39%	291
kidney beans	411	1,500	+264%	813
hard corn	8,487	14,700	+73%	13,332
sweet potato	673	n.d.	--	n.d.
potato (papa china)	3,612	n.d.	--	n.d.
manioc (yuca)	6,421	8,200	+27%	48,734
bananas	995	3,100	+211%	n.d.
citrics	648	400 *	-38%	n.d.
naranjilla	2,404	n.d.	--	n.d.
papaya	402	n.d.	--	n.d.
ananas (pina)	198	n.d.	--	n.d.
plantain	3,402	8,600	+152%	89,083
oil palm	400	7,700	+1825%	105,350
cocoa	1,080	6,300	+483%	1,712
coffee	19,202	38,700	+101%	63,806
tea	284	n.d.	--	28,315
sugar cane	3,414	n.d.	--	n.d.
 total:				
RAE	53,088	106,000	+99%	
Napo	19,646	65,300	+232%	
Pastaza	6,775	7,900	+16%	
Morona-Santiago	20,191	17,000	-15%	
Zamora-Chinchipe	6,476	15,800	+143%	

* Only oranges

Source: Fundacion Natura, 1988, p. 39

2.11 Although the RAE accounts for only some five percent of Ecuador's agricultural production in volume terms, it is a significant producer of several crops, including tea (100% of national production), naranjilla (79%), "papa china" (43%), manioc (41%), papaya (16%), palm oil (16%) and coffee (14%). In terms of the value of agricultural production, the RAE contributes some seven percent of the national total. This production is highly concentrated in three crops, coffee, plantain and manioc, that account for about 85 percent of the region's total value of agricultural production.

2.12 Agricultural productivity in the Amazon generally is lower than in other regions (Table 2.2). However, the region appears to offer a slight comparative advantage in some commercial and cash crops, especially palm oil, coffee and plantain.

Table 2.2 - ECUADOR

AGRICULTURAL PRODUCTIVITY, AMAZON vs. NATIONAL AVERAGE
1985, 1986 (metric tons per hectare)

Crops	AMAZON REGION		NATIONAL AVERAGE	
	1985	1986	1985	1986
rice	1.74	1.00	2.70	2.50
kidney beans	0.51	0.50	0.60	0.50
hard corn	1.07	0.90	1.70	0.30
potatoes	6.80	4.60	4.70	--
manioc (yuca)	6.66	5.90	10.30	5.90
plantain	9.87	10.40	13.80	9.90
oil palm	18.14	13.70	13.40	15.00
cocoa	0.36	0.30	0.50	0.30
coffee	0.52	1.60	0.28	1.20
tea	7.14	--	7.10	5.90
bananas	9.07	9.10	30.20	20.70

Source: Fundacion Natura, 1988, p. 42

2.13 National policy and public investments for the region send mixed signals to the sector. On the one hand, national policy has encouraged agricultural settlement of the region (see paras. 2.23-2.25). However, public infrastructure has been focused on support to the petroleum industry and generally has lagged behind population growth.³ Thus, new agricultural production areas have followed the petroleum transport network, and this has produced agricultural settlement patterns frequently not in harmony with the region's soils and productivity potential (see Table 2.3 and Maps 22048, 22049, and 22050).

3/ Although the RAE accounts for three to four percent of the nation's population, it received on average less than two percent of national public sector investments in the agricultural sector during the 1981-84 period.

Table 2.3 - ECUADOR:
SOILS OF THE AMAZON REGION

Area	Terrain	Order	Sub-Order	Great Group	Soil Type	Notes on Use Potential
1. Settlement frontier	piedmont	inceptisols	andeps	hidriandeps (Id1)	ashy, water retention>100%	low fertility
2. Lago Agrio	alluvial plains	inceptisols	andeps	distrandeps (Id3-If3)	volcanic projections; recent ash	medium fertility
3. N-E of Lago Agrio	alluvial plains	inceptisols	tropepts	eutropepts (Ig2-HO)	sedimentary, recent, fine clay, lime, sandy; swampy	limited use due to water saturation
4. Lower basin, in between rivers	hilly	inceptisols	tropepts	distropepts (If2)	sedimentary, ancient, red, compact clay, shallow, high toxic Al contents	low fertility; compaction risk
5. Center-east; mid-plateau; Pastaza, Bobonaza & Curaray	hilly, plateau	inceptisols	tropepts	distropepts (If3)	sedimentary, recent, clay, compact, poorly drained, high toxic Al contents	very low fertility; compaction risk
6. South, Santiago & Morona heads	broken hills	entisols/inceptisols	orthents/tropepts	troporthents/distropepts (Es4-If1)	sandy, severely eroded	very low fertility
7. South, Zamora river	broken hills	inceptisols	tropepts	distropepts (If1)	sandy, severely eroded	low fertility
8. River edges	flood-plains	enceptisols	aquepts	tropaquepts (Ia1)	sedimentary, alluvial clay over organic horizon	high fertility seasonal use

Source: Fundacion Natura, 1988, p. 22.

2.14 The new agricultural settlers have tended to produce the same crops, using the same basic technology, as they did in their regions of origin (Costa and Sierra), and this technology frequently leads to rapid depletion of the region's generally poor soils. Recent studies on soil erosion (CEDIG, 1986) identify both natural and human influences on soil deterioration in the region. In the more recently settled areas, soil erosion was identified as potential or active, with the probability of active erosion increasing with the settlements' age. In the areas settled for longer periods, and concentrated near the urban areas of Zamora, Puyo, Tena, Baeza and the valleys of Nangaritza, Upano, Puyo and Tena, erosion is active, with substantial soil compaction and some land slides. Technical assistance for improved soil management in the region has not been available on a significant scale.

Cattle Production

2.15 Cattle production has grown significantly in the RAE, and it may soon supplant agriculture as the region's largest, non-petroleum, productive sector. The number of hectares of pastureland increased by 22 percent (to 483 thousand ha.) over 1983-85, and the number of heads by 47 percent (to 340 thousand) over 1983-86.

2.16 Although low levels of animal nutrition and health care technology result in the region's relatively long animal growth periods and large pasture requirements, the expansion of the region's cattle production may be attributed to the following main reasons (Fundacion Natura, 1988, pp. 49-51).

- (a) Conversion of forest area to pasture use has been used as sufficient evidence of productive land possession that is consistent with land tenure legislation (see Annex 2); and pasture land generally has been developed at lower unit costs than agricultural land.
- (b) Generally inadequate transportation support to rural development areas makes the marketing of all products risky, but cattle can be moved from farm to market on foot, slowly but predictably.
- (c) Cattle production generally requires less labor than agriculture.
- (d) Urban centers of the country are growing rapidly, with increasing demand for meat.
- (e) The Government has provided preferential credit to cattle production through the Banco Nacional de Fomento.

2.17 Thus, cattle raising presents several financial advantages for production. However, significant economic costs are associated with cattle production, including deforestation and soil compaction and erosion. These costs generally are higher than those of rotational agriculture.

Forestry

2.18 There are no reported forest plantations in the region. Thus, all of the RAE's forest resources are natural, predominantly tropical moist forests (Table 2.4).

Table 2.4 - ECUADOR
FOREST COVERAGE OF THE AMAZON REGION, 1978

Forest Types	Surface area (ha)	Mean Annual temp.(cent)	Mean Annual precip.(mm)	Altitude Range (m)
-Tropical Moist forest	6,750,000	>23	2,000-4,000	100-600
-Tropical wet forest	230,000	>23	>4,000	100-600
-Pre-montane rain forest	360,000	18-22	>4,000	600-2,000
-Pre-montane tropical wet forest	1,850,000	18-22	2,000-4,000	600-2,000
-Pre-montane moist forest	970,000	18-22	1,000-2,000	600-2,000
-Tropical dry forest	150,000	>23	1,000-2,000	0-600
Total	10,310,000			

Source: Fundacion Natura, 1988, p. 27.

2.19 Information regarding the current status and trends for the region's forest coverage is spotty and incomplete. It has been more than a decade since a field survey was conducted on land occupation, and estimates of more recent trends vary greatly. For example, estimates of the Amazon Region's contribution to the nation's forest industry wood supply have varied from eight percent, based on 1982-83 data (UNEP, 1986, p. 20), to 40 percent, based on a 1987 survey (Cabarle, et. al., 1989, p. 55).

2.20 Estimates of deforestation vary widely, but all provide concern. Cabarle, et. al. (1989, p. 8) cites estimates that 75,000 ha. of lowland forests are being cleared annually. All estimates indicate a significant deforestation that could lead to a total depletion of closed forests as soon as the year 2030.

2.21 Approximately two-thirds of the region's forest area has been assigned to private firms for timber production. To the extent that these firms act in accordance with the policies expressed by their representative body, AIMA, however, they do not appear to be the chief contributors to

deforestation. Rather, some of these firms have demonstrated a concern with the long-term sustainability of the region's forestry production through rational tropical forest management (McCormack, 1987). The primary contributors to the region's forest depletion appears to be the settlers (UNEP, 1986, pp. 20-21), as well as those timber extraction firms that do not follow their Association's guidelines. In clearing new land for agricultural and/or cattle production, relatively little of the forest's resources is exploited commercially, and almost no provision is made for replenishment. Rather, the forest resources of the settlement frontier (Map 22048) tend to be used on-site, locally for construction purposes, and/or destroyed.

2.22 Deforestation of the Amazon represents a significant waste of natural resources. These resources are being depleted, perhaps irreversibly, with a potentially huge opportunity cost over several decades, and with very few compensating short-term economic benefits.

C. Land Settlement

2.23 Migration to the Amazon from the Costa and Sierra regions has been significant since the 1960s, and encouraged by national policy (see para. 1.19 and Annex 2). The explanation for this migration may be found in two broad categories: socioeconomic and geo-political (Fundacion Natura, 1988, pp. 31-37). At the core of the socioeconomic explanation is the perception of the Amazon region as a huge area with almost infinite resources. This makes the region an excellent "escape valve" for socioeconomic imbalances in other regions; it offers a "land without people" to "people without land". Thus, the Amazon has been viewed as a natural frontier apt for absorbing people displaced from traditional areas because of the nation's general population growth pressure, technological changes requiring less rural workers per area of productive land, business cycle downturns and/or natural disasters, such as prolonged droughts. This perceived frontier vocation has been enhanced significantly by the petroleum boom, especially beginning in the 1970s, that has resulted in road networks, designed for support to petroleum development, but that also have served as the natural locational determinants of land settlement by the migrants.

2.24 The perception of the Amazon as an "escape valve" also has had appeal for geo-political reasons. First, a continued high rate of population growth could be maintained without major social upheavals, at least in the short-term. Furthermore, frontier settlement has been perceived as contributing to national security, as unoccupied land in remote areas has been viewed as a risk to the nation's physical integrity.

2.25 Thus, the socioeconomic needs of the migrant have been perceived to be met at a relatively low cost. Public forest land was converted (generally into areas in the range of 10 to 100 ha.) to the settler's ownership if he presented evidence of agricultural and/or cattle production, according to the provisions of 1978 Law for Settlement of the

Amazon.⁴ Although not meeting rational land use criteria, transportation infrastructure was provided to the settlers at little marginal cost, as settlers took advantage of the petroleum industry transportation network.

2.26 Initially, this settlement policy produced a relatively homogenous size distribution of land settlement. In the mid-1970s, the Gini Coefficient for land settlement (percentage distribution of rural land units by size categories vs. percentage distribution of rural land by size categories) of the Amazon was 0.36 vs. 0.67 for the Sierra and 0.63 for the Costa. However, with longer tenure in the region, the settler has encountered numerous, unanticipated difficulties. Among these are poor soils, with a propensity to erosion, and market demand for more commercially oriented products, such as cattle and palm oil. These difficulties probably have resulted in an increased concentration of land in fewer, larger property owners (Fundacion Natura, 1988, pp. 34-36).

2.27 In summary, data provided by the Military Geographical Institute indicate that 23 percent of the region's land has been legalized by IERAC, 15 percent is designated as conservation areas, three percent as native territories, 10 percent are new settlement areas and 49 percent has unknown or unclassified use (including military installations and indigenous areas; see UNEP, 1986, pp. 55-57). Although precise data sufficient to evaluate this land settlement pattern are not available, it is illustrative to compare actual use with the PRONAREG/OSTROM classification of land use zones (see Map 22049): areas that should be protected and with soil and other natural conditions that indicate only limited, low density land use is appropriate account for 86 percent of the region's territory; three percent should be protected from any use; six percent may have unrestricted use; and information is insufficient to classify five percent of the region's territory (UNEP, 1986, pp. 58-65). Although these data should be interpreted cautiously, there appears to be a serious imbalance between settlement areas (some one-third of the region's territory) and areas that may provide sustainable production under existing technology (perhaps five to 20 percent of the region's territory).

D. Native Populations

2.28 The major problem faced by the indigenous groups of the Amazon region, and one which has created tension between the government and the native communities, is that of the recognition, titling and protection of native lands. The reasons for such land tenure insecurity are two fold. First, there is a legal vacuum in Ecuador in terms of native land rights, especially in relation to the indigenous groups who occupy the lowland forest region and whose traditional land tenure and use systems are different from those of the indigenous peasant communities in the Sierra Region. The current legislation on land and natural resources--the 1964 Agrarian Reform Law, the 1978 Law for the Settlement of the Amazon Region, and the 1981 Forestry and Natural Areas and Wildlife Conservation Law--refers to the land rights of indigenous communities, but within the

^{4/} In addition to the Law for Settlement of the Amazon, the primary legislation regulating property rights in the Region (as well as the rest of the country) are the laws of "Unoccupied" Lands and Settlement, and of Agrarian Reform. For additional information, see Annex 2.

framework of their increasing integration into national agrarian reform, land settlement, and forestry development programs (Ley de Reforma Agraria, 1964; Ley de Colonizacion de la Region Amazonica, 1978; and, Ley Forestal y de Conservacion de Areas Naturales y Vida Silvestre, 1981).

2.29 Under current law, the lands occupied by indigenous communities in the eastern part of the country are classified as tierras baldias ("unoccupied lands"⁵) and are subject to state ownership and regulation. The Ecuadorian Institute of Agrarian Reform and Land Settlement (IERAC) is supposed to set aside and title such lands in the names of indigenous communities, but only if they organize themselves in ways which are similar to those of non-Indian settler populations (i.e., into cooperative organizations) and agree to convert their lands to pasturage or other "productive" purposes (MacDonald, Jr., 1984).

2.30 The second reason for the insecure land tenure situation of the lowland indigenous communities is the frequent shifts which have taken place in state policies toward these communities and their organizations. Government policies, especially of agencies such as IERAC, have undergone abrupt changes, moving away from the regularization and granting of communal titles for lands which were "self-demarcated" by native communities toward the granting of lands claimed by native communities to large agribusiness enterprises. This has resulted in the paralysis of practically all indigenous land regularization (Trujillo, 1987).

2.31 In general, the building of roads and the settlement of the Amazon by migrants have been given greater priority by IERAC and other government agencies than the demarcation and titling of native lands. In the Napo River region, for example, only 24 of 78 Quichua communities have received titles to their lands; while, among the Shuar, only 83 of 265 "centros" have had their lands fully adjudicated (Fundacion Natura, 1988).

2.32 The indigenous federations have highlighted the need to demarcate native lands which are large enough to: (a) satisfy the needs of present and future generations, (b) provide communal rather than individual titles for native lands, and (c) delay road-building and land settlement programs until native land claims are fully settled. They have also argued for the state recognition and promotion of native land use systems, including various resource management strategies which combine itinerant agriculture with wildlife and forestry protection (Shakai, 1987; Federacion de Organizaciones Indigenas del Napo and Cultural Survival, 1988).

2.33 The situations of the Huaorani, Siona-Secoya and Cofan pose special problems because of their smaller size and greater dependency upon forest resources (wildlife, fish, gathered products, etc.). In the case of these groups, there is an overlap between their traditional or legally assigned territories and various protected areas: relatively isolated and nomadic groups of Huaorani occupy the area of the Yasuni National Park; Siona-Secoya communities live inside or bordering upon the Cuyabeno Wildlife Reserve; and, a community of Cofan occupy the Cayambe-Coca Biological Reserve. Although Article 38 of the 1981 Forestry and Natural Areas and Wildlife Conservation Law recognizes the use rights of indigenous groups to some forest resources, it severely limits the rights of native

5/ Although these lands are categorized as "unoccupied", they are often within the traditional territories of native communities and are used by them.

communities to exploit timber and wildlife resources in "protected forests" and various categories of nature and wildlife reserves (Cabarle et. al., 1988).

2.34 The Siona-Secoya and Huaorani are perhaps the most critical indigenous land-use cases. In both, the indigenous groups and the forest habitats which they occupy are threatened by oil exploration, road building, and chaotic land settlement activities. At the same time, there is a growing awareness about the need to manage and protect these areas in order to ensure their biological diversity, the cultural integrity of the occupying indigenous groups, and their potential for more sustainable forms of development.

E. Public Infrastructure and Conservation Areas

2.35 The rapid and recent settlement of the Amazon makes the statistical evaluation of public service levels difficult, as the collection and publication of official data have not kept pace with rapid population growth. Field visits to the urban areas of Napo Province indicate, however, that local public service levels and coverage are in a calamitous condition. From one perspective, this may be viewed as a transitory situation in areas that are rapidly growing, and improvement may be expected as local economic bases are solidified and local tax efforts follow. From another perspective, however, provision of public infrastructure may be viewed as a fundamental dilemma if the longer-term feasibility of local economies is questioned because of doubts about the sustainability of their economic activities. If these doubts are well founded, it may be rational not to invest in permanent infrastructure.

2.36 The national protected area system, established in 1979, is considered a minimum biological protection area. It covers 1.6 million ha. in the RAE (see Table 2.5 and Map 22052), and accounts for 57 percent of the total protected land in Ecuador. The protection offered these areas is limited, however, for the following main reasons.

- (a) True protection is limited effectively to areas remote from the settlement frontier (Map 22048); in other "protected" areas, limited public control over settlement may be predicted, especially if operational budgets for preservation of these areas remain at less than US\$ 0.10 equivalent per ha.
- (b) National pressures for petroleum development are so intense that when reserves are identified in protected areas it is unlikely that protection will over-rule exploration; however, when biological protection and petroleum development areas coincide geographically, measures may be taken to ameliorate environmental damage, especially in minimizing access to new settlement areas through petroleum support transport systems.

2.37 Whether private and public infrastructure investments will complement or conflict with stated public objectives for conservation areas remains to be seen. With public and private infrastructure investments apparently focussing on short-term financial concerns, it appears that the

current trend is one of conflict. Unless longer term economic development concerns, that tend to favor maintenance of conservation areas, take on added weight in regional infrastructure decisions, this trend is likely to continue, with the eventual destruction of these areas.

Table 2.5 - ECUADOR

PROTECTED AREAS OF THE AMAZON REGION, 1978

Area's Name	Date Established	Total Area (ha)	Area in Amazon Region (ha)
CAYAMBE-COCA Ecologic Reserve	1979	403,000	320,000 (80%)
SANGAY National Park	1979	271,000	225,000 (83%)
PODOCARPUS National Park	1982	146,000	140,000 (96%)
YASUNI National Park	1979	678,000	678,000 (100%)
CUYABENO Faunal Reserve	1979	255,000	255,000 (100%)
LIMONCOCHA Biologic Reserve	1985	5,261	5,251 (100%)
Total			1,623,261

Source: Fundacion Natura, 1988, p. 53.

III. DEVELOPMENT ISSUES AND POLICY OPTIONS

3.01 In this chapter, the trends identified in the preceding chapter are analyzed in terms of development issues for the region. The concept of carrying capacity is a useful tool for this analysis and two broad scenarios for the region's development are defined. Finally, policy options for Ecuador's Amazon are discussed, followed by specific recommendations for governmental initiatives.

A. Development Issues

The Concept of Carrying Capacity

3.02 The remaining sparsely inhabited portions of the world (polar regions, deserts, tropical rainforests) have been "saved for last" for good reason. They are difficult to inhabit and have low average carrying capacities. Sparse populations are all that have ever been sustainably supported by the ecosystems of such areas. The concept of carrying capacity is an indispensable tool for planning the rational use of these areas, as has been demonstrated by Kirchner, Ledec, Goodland and Drake (1985) and by Fearnside (1986). Kirchner et. al. offer the following definition:

"The carrying capacity of a particular region is the maximum population of a given species that can be supported indefinitely, allowing for seasonal and random changes, without any degradation of the natural resource base that would diminish this maximum population in the future. The concept of carrying capacity is familiar to biologists and wildlife managers, who devised it to express the capacity of natural areas (ecosystems) to support animal life. With modifications, it is also an important measure of the ability of regions to support human populations. Carrying capacity is, therefore, an important concept for the work of development economists, planners, and decision makers" (p. 45)

Carrying Capacity Applied to Human Populations

3.03 For humans the calculation of carrying capacity is far more complex than for other species. Non-human species have "standards of living" that are constant over time (animals and plants do not experience economic growth). Also, they have relatively uniform "standards of living" (i.e., per capita resource consumption levels) throughout their populations at a given point in time. The technologies of non-human species are also constant - genetically given (endosomatic) technologies that have co-evolved with the environment and are consequently well-adapted to it. For humans these three constants become variables. The calculation of human carrying capacity requires, therefore, some assumptions about: (a) living standards (per capita resource consumption levels), (b) degree of equality in the distribution of these levels, and (c) technology. As these three variables change, carrying capacity will change. However, the concept remains useful because these three variables do not change discontinuously, unpredictably, or beyond all limits. There is inertia and there are ultimate limits.

Carrying Capacity of the Ecuadorian Amazon

3.04 One need not and should not try to prove that the Ecuadorian Amazon will never support more than x people. It is sufficient for policy purposes to argue that it is very unlikely that within the next generation (25 years) the Amazon could support more than x people living at the average Ecuadorian standard, using known technologies available to Ecuador,¹ and assuming Ecuadorian patterns of wealth and income distribution.

3.05 A simple approximation to an extreme upper bound of the value of x may be obtained by assuming that all of the Amazon Region could have the same population density as Ecuador as a whole. The Amazon has about 132,000 square kilometers and Ecuador as a whole has a population density of 30 persons per square kilometer. This gives roughly four million people as an estimate (overestimate) of x in the preceding paragraph. If the Amazon's carrying capacity were above the average for Ecuador, then its settlement would not have been left for last by rational people seeking to maximize income. This common-sense historical reason for believing that the Amazon's carrying capacity is below the national average is supported by abundant direct information on low average soil fertility of the region (paras. 2.23-2.27, and Fearnside, 1986). Therefore the crude calculation above gives an overestimate of true carrying capacity, and consequently arguments based on that overestimate have an a fortiori character, i.e., the conclusions are robust with respect to disagreements over the exact number different people might estimate the carrying capacity for the region to be.

Scenarios of the Region's Development

3.06 Using the robust concept of carrying capacity described above, two broad scenarios of the Amazon's potential development may be outlined. The first scenario is a simple projection of past trends; the second is based on a planned adaptation to, and gradual expansion of, the region's carrying capacity.

3.07 Using past trends to project the future, how many people might the Amazon be required to support in the next generation? At the current 2.5 percent to 3.0 percent annual growth rate, the population of Ecuador will double from 10 million to 20 million in about 25 to 30 years (about one generation). The rural areas of the Sierra and the Costa are already experiencing net emigration due to demographic pressure, ecological deterioration and droughts. Five provinces in the Sierra and Costa (Bolivar, Chimborazo, Loja, Manabi, and Carchi) have actually experienced population decline (net emigration greater than natural increase) between 1972 and 1982 (Landazuri and Jijon, 1988, pp. 36-37). Aside from the cities this leaves only the Amazon as the area of net immigration. Just the additional ten million natural increase, however, represents 2.5 times the extreme upper limit (para. 3.05) of Amazonian carrying capacity. Even if one were to count nonrenewable petroleum reserves as a part of Amazonian carrying capacity, it would make no difference in the fundamental dilemma because these reserves are expected to be thoroughly depleted over the next 25 years: proven reserves in some ten years, and proven plus probable

1/ Of course, as technology changes, carrying capacity may expand. See para. 3.09.

reserves in less than twenty years, assuming 1988 annual extraction rates (World Bank estimates of June 1988).

3.08 In the face of such a population increase, and without increased population carrying capacity outside the Amazon, any policy of protecting the Amazon by limiting new land settlement appears doomed to failure. How can any government tell millions of poor people that their immediate survival is less important than the potential benefits of biological diversity? Given current land settlement trends and with 10 million extra people in the next 25-30 years, there is little hope for saving the Amazon's natural resources from destruction, nor of avoiding a great deal of misery.

3.09 For an alternative scenario, the future as planned adaptation to, and gradual expansion of, carrying capacity, the following would be key national inputs: (a) increased economic productivity, especially in the Sierra and Costa Regions, expanding carrying capacity outside the Amazon Region and decreasing migration pressures; and (b) national population policy, seeking to reinforce the demographic transitions expected from economic development through providing support and incentives to a slower population growth compatible with carrying capacity.

3.10 Expanding economic activity, productivity and employment opportunities outside the Amazon Region is critical not only for Ecuador's development as a whole, but also for taking pressure off the RAE. Sound national economic development policies, including measures to increase savings and investment and to raise the efficiency of investment, should increase the productivity of land currently in use and thus decrease demographic pressure on the RAE.

3.11 As for population policy, it is important to look at fertility patterns to get some idea of how much scope there is for fertility reduction by voluntary means. The most salient fact about this pattern is that for women with no education average completed fertility is 6.4 births, while for women with university education it is 2.3 births. In other words, the fertility of the least educated women is almost triple that of the highest educated (CEPAR, 1988, pp. 34-35). This education difference is much greater than the rural-urban difference (4.1 births for urban women, 6.1 for rural), although the latter is also significant. These comparisons indicate that, with broader education and general economic improvement, fertility levels may be expected to drop.

3.12 Recent surveys indicate that: of women having two children only 38 percent desired to have more; of women having three children only 20 percent desired to have more; and of women who have four children only 8.5 percent desired to have more. For all women on average the desired number of children is three (CEPAR, 1988, p. 74). However, completed fertility for all women in Ecuador averages 4.3. Some 35 percent of all births in Ecuador in the last five years were either not wanted or not wanted at that time (p. 89). Clearly the first step in population control is the voluntary elimination of unwanted fertility, which would have a significant demographic effect in helping to avoid the overshoot of carrying capacity. Thus, promoting broad access to voluntary birth control is a policy option that should be explored, in spite of strong traditional opposition from the extremes of the political spectrum.

3.13 The above issues, of general development and population policies, obviously are national in scope, although they also set the conditions under which development issues and policy options may be analyzed at the Amazon Region level. Below, general regional issues are addressed, regarding petroleum development, land use and institutional policies. Finally, in Section C, specific recommendations are presented.

B. Regional Policy Options

Regional Petroleum Development Policy

3.14 Perhaps the most important short-term measure to preserve sustainable options for the region's development is to promote a regional petroleum development policy that is consistent with a national natural resource management policy. The foundation of natural resource management is sustainable development, with the Amazon Region's special characteristics calling for preservation of biological diversity and of cultural choice for indigenous population.

3.15 A petroleum development policy consistent with natural resource management would address at least the following areas of concern:

- (a) minimize the external costs of petroleum extraction, production and transportation, through the implementation of a comprehensive environmental management and control program; and
- (b) ensure that the indirect consequences of petroleum development (particularly opening of new areas to settlement) are consistent with regional land use policy.

Regional Land Use Policy

3.16 The region's fertile soils are limited and located primarily along its river basins, and these areas are already largely occupied by settlers and/or native groups. Thus, the region offers few new opportunities for sustainable agriculture and cattle-raising. Some areas not suitable for traditional agriculture may offer potential for sustainable tropical forest management, but the other areas appear to offer sustainable uses limited to ecotourism, scientific research, agroforestry and extraction of renewable forest products.

3.17 Ecuador has established an extensive system of natural reserve areas for preservation of biological diversity and for protection of the native populations. Especially in the eastern portion of the Amazon Region, however, the integrity of this system has been jeopardized by petroleum exploration and exploitation (see Map 22052).

3.18 It is clear that petroleum is an important natural resource that will be developed in the near-term, and this will require some resource trade-offs. However, these trade-off decisions should be made consciously and explicitly. Especially important for these decisions are:

- (a) strict adherence to prudent environmental standards in petroleum

development; and

- (b) infrastructure development that represents an acceptable trade-off between short-term economic stabilization and growth and longer-term sustainable development of the region's fragile natural and human resources.

Institutional Policy

3.19 A key obstacle to the region's sustainable development is the capacity of Central Government institutions to promote this development. An overriding problem is the perception that the Amazon is predominantly a sectoral concern under the responsibility of the Ministry of Agriculture. If the region's potential, long-term contribution to the country's economic development is to be realized, however, the management of its resources must be understood as a national economic and social, and not just sectoral, concern. Creation of the inter-ministerial commission for the RAE (para. 1.21) is an encouraging step.

3.20 Thus, if the Amazon Region is to be part of a coherent, national natural resource management policy, there appear to be three key areas in which existing, or new, institutions must take energetic initiatives:

- (a) petroleum development and natural resource management policies;
- (b) design of regional infrastructure; and
- (c) natural resource management and economic development in the post-petroleum era.

C. Specific Recommendations

3.21 Although the scope of this report does not permit detailed, sectoral analyses, the following recommendations are presented as an agenda for additional study, and as a basis for program planning and policy formulation in the Amazon region.

Population and Carrying Capacity

3.22 The government should consider population policy as a necessary, but not sufficient, condition for sustainable development. It should attempt to facilitate the demographic transition expected to result from the country's economic development. An important part of this policy would be to provide knowledge of and access to contraception and family planning services with the immediate aim of eliminating unwanted fertility, currently estimated at around 35 percent of live births.

3.23 The government should initiate a population carrying capacity study for each major region of the country, especially for the Amazon. By specifying reasonable expectations of improvements in technology, standards of living, and distributional equity, it should be possible to make an estimate of how many people each region and the entire country can sustainably support. These figures should be compared with actual demographic patterns and projections.

3.24 However, because even with population control a large increase in population appears inevitable, the government should seek ways to increase and maintain carrying capacity, such as:

- (a) by investing petroleum receipts in renewable resource developments (e.g., reforestation, land reclamation, fisheries, etc.). It should consider a policy which explicitly seeks to balance the rate of depletion of nonrenewable resources with the rate of creation of renewable substitutes. The government's national accounts should also recognize that petroleum receipts represent largely capital consumption, not income;
- (b) by formulating an industrial pollution policy which keeps waste emission rates equal to natural absorption rates;
- (c) by formulating a renewable resource policy which keeps harvest rates equal to regeneration rates; and
- (d) by promoting agricultural policies which reduce the amount of land devoted to cattle production and encourage the use of the best valley lands for agriculture and hillsides for grazing.

Petroleum and Mining Developments

3.25 PETROECUADOR should increase its institutional capacity to assess and manage the direct environmental effects of petroleum developments in the Amazon region. This should include:

- (a) completion of the Environmental Management, Pipeline Contingency and Water Pollution Control Plans being carried out under the Bank-financed Emergency Petroleum Reconstruction Project (Loan No. 2803-EC);
- (b) significant strengthening of the technical and operational capacity of PETROECUADOR's Environment Assessment Unit -- eventually, this unit might be transformed into a department and be responsible for environmental management of all aspects of petroleum activities (exploration, production, storage, transportation, etc.); and
- (c) greater coordination between PETROECUADOR and DIGEMA, the government agency responsible for environmental monitoring and regulation.

3.26 DIGEMA should design and execute a standard Environmental Impact Assessment procedure for all petroleum and mineral (e.g., gold mining) developments, including those carried out by private companies. The procedure should include an analysis of the full economic, including environmental, costs of such developments, measures for mitigating or reducing these costs, and ways of increasing public and scientific review of Environmental Impact Statements.

3.27 PETROECUADOR and other companies operating in the region should devote more resources to the public health and safety aspects of petroleum

developments. Pipelines should be sufficiently distant from roadways or buried underground so as to prevent ruptures from traffic accidents, and other unpredictable events. Petroleum wastes should not contaminate local drinking water supplies or fishing areas, and large industrial facilities (e.g., the new Shushufundi gas refinery) should have adequate accident control systems and emergency evacuation plans.

3.28 PETROECUADOR should develop a more systematic approach, going beyond its current Community Assistance Fund,² for compensating indigenous communities and local governments for the social and environmental costs of petroleum development. For example, part of petroleum revenues might be directed to indigenous community development, municipal services, and environmental protection activities. Such measures need not require complex budgetary earmarking or inter-governmental transfers. Rather, they could be implemented as a normal part of the cost of doing business in the petroleum sector, with this cost reflecting the full economic impact of petroleum development.

3.29 The Government should consider permitting petroleum developments in protected areas, such as National Parks, only when viable measures for adequate natural resource management are in place and ensure that the integrity of these areas is preserved. Minimally disruptive techniques should be included among the alternatives evaluated in the economic appraisal of petroleum development projects in such areas.

Natural Resources Policy

3.30 The government should design an overall natural resources policy for the Amazon region based upon the concept of sustainability of its renewable and nonrenewable resource base. The policy should be based upon: the most reliable scientific information on the region's natural resources; the carrying capacity studies described in paragraph 3.23; and, a realistic assessment of the region's long-term prospects for settlement and economic development.

Agriculture and Forestry

3.31 Such a natural resource policy should begin with the design of an agro-ecological zoning map for the region. The map should define: those areas which should remain in intact forest, because of their unique physical or cultural characteristics (e.g., areas of great biological diversity or aboriginal territories of indigenous groups); those areas which are appropriate for commercial agriculture (e.g., limited livestock raising; coffee, cacao or naranjilla production, etc.); and those areas which are best suited to commercial forestry or some mix of forestry and agricultural activities.

3.32 While the agro-ecological zoning map is being developed, the government should commission a study of the most appropriate fiscal, credit, land-use and land tenure policies for the region. Special attention

2/ This Fund currently supports scattered, rather small, community facilities.

might be focussed on the following.

- (a) The government should review its current policy of subsidized credit lines for agriculture and livestock. Although this policy does not target the RAE, it has impacts prejudicial to the region's long-term development (para. 2.17), by making activities such as cattle raising financially feasible, but with high economic costs (deforestation and soil erosion). Tax policies also should be reviewed in the light of their impact on the region. For example, Ecuador has no national land tax,³ and the municipal rural land tax is limited in impact. A progressive rural land tax may improve land use patterns by penalizing those who engage in environmentally unsound activities (Mahar, 1989, p. 50).
- (b) The basic policy of promoting settlement of the RAE should be thoroughly reviewed because it has promoted activities that are incompatible with the region's sustainable economic development. This review would include an evaluation of the roles of INCRAE and IERAC.
- (c) The capacity of the National Forestry Directorate (DINAF) to implement forestry protection and development policies should be strengthened. DINAF's current levels of staff and other resources are insufficient for it to be an effective institution.

3.33 The government should initiate and provide resources for the establishment of an applied science and technology program for the Amazon region. Important areas in need of research are: the agricultural potential of Amazonian soils; agroforestry and wildlife management techniques; the social and environmental effects of monocultural agricultural developments (e.g., palm oil plantations); and the environmental and public health impacts of pesticide use in the tropical lowlands.

Transportation

3.34 The government should formulate a coherent regional transportation policy to accompany its natural resources, agricultural and forestry development policies. There should be much greater coordination between PETROECUADOR and the Ministry of Public Works and Transportation in highway planning and construction, and more attention paid to the potentialities of fluvial transportation in the Amazon. DIGEMA, or some other appropriate agency, should require a standard Environmental Impact Assessment to accompany all highway feasibility studies.

3/ Although DINAC (Direccion Nacional de Avaluos y Catastros) is a national organization that collects the land tax and the Central Government retains part of these revenues, the land tax authority is municipal, and DINAC collects land taxes on behalf of the municipalities.

Native Communities

3.35 The wishes and needs of native communities, as reflected in the programs of their representative organizations and federations, should be taken into account in all development planning in the Amazon region. The most important element in this regard is the legal recognition and regularization of indigenous land claims. The government should clarify its policy on indigenous land claims, and an important step in this direction is resolution of the draft Law on Indian Nationalities submitted to the Congress in August 1988. In addition, it should: provide adequate resources for the demarcation and titling of indigenous lands; protect indigenous forestry, fish and wildlife resources; and give greater support to indigenous designed health, education and community development programs.

Biodiversity and Protected Areas

3.36 The government should increase its support of the region's protected areas through the completion of management plans, the resolution of conflicts between conservation objectives and private and public infrastructure investments, and the providing of adequate infrastructure, forest guards and other park personnel. Where feasible, protected area management should combine conservation and economic development objectives through the establishment of sustainable resource management projects with settler populations in the "buffer zones" surrounding conservation areas and forest-dwelling indigenous groups within these areas. Non-governmental organizations can play an important role in the maintenance of these areas, through assistance in the design of management plans and as intermediaries in special financial arrangements such as "debt-for-nature" swaps.

Municipal Development

3.37 Lastly, the national government should focus more attention on how to strengthen local municipal governments in such areas as planning, programming and budgeting for the provision of municipal services. One key municipal service that should be strengthened is land use management and the protection of forest and wildlife resources. A well-defined partnership between the central government, municipal governments, the private sector and non-governmental organizations appears to be a more reasonable institutional response to the development needs of the Amazon Region than the creation of a centralized regional development agency. Such a partnership would only be effective, however, if all participants, but especially municipalities, are strengthened so that they can implement policies for sustained economic development of the region.

ECUADOR -- NATIVE POPULATIONS AND THEIR ORGANIZATIONS

Overview

1. The indigenous peoples who inhabit modern Ecuador are the survivors of ancient ethnic groups that have been transformed as a result of inter-tribal wars, conquest and colonization, missionary encounters, invasions of their territories by rubber collectors and cattle ranchers, and the expansion of the oil frontier and its associated road-building and land settlement activities (Whitten, 1978).
2. The contemporary indigenous population of the Amazon region is estimated to number between 85,000 and 100,000 people, or approximately one-quarter to one-third of the total population of the region. There are six indigenous groups in the region, the largest of which are the Quichua (40,000) and Shuar (35,000), who make up nearly 85 percent of the Amazonian indigenous population. These groups have had longest contact with the agents of national society and their populations are in a phase of both demographic and geographical expansion.
3. Other groups, which are much smaller in size and still dependent upon forest resources for their survival, are the Achuar (2,000), Huaorani (850-900), Siona-Secoya (400-500), and Cofan (350-400). The Huaorani, some subgroups of which are nomadic and remain uncontacted, occupy the Yasuni National Park and are threatened by petroleum exploration, road building, and other activities (Fundacion Natura, 1988).
4. Traditionally, state policy has delegated responsibility for the "protection" and "civilization" of these lowland Indian groups to foreign missionary societies, initially to various orders of the Roman Catholic Church but in more recent decades to North American evangelical missionaries. With the oil developments, road building and land settlement activities of the past twenty years, state indigenous policies have been increasingly defined within the framework of agrarian reform and land settlement legislation. In both cases, the purposes of state policies have been to integrate the indigenous population into national society and development programs, with minimal regard for their cultures and social organizations and little understanding of their traditional ecological adaptations, land-use practices, and resource management strategies (Vickers, 1984; Whitten, et. al., 1985).
5. However, since the establishment of the Shuar Federation in 1964, the native populations have been forming regional indigenous federations, the purposes of which are to reaffirm native culture and ethnic identity and ensure state recognition and protection of native land rights. In 1980, a number of the Indian organizations which had formed during the previous decade established the Confederation of Indian Nationalities of the Ecuadorian Amazon (CONFENIAE), which has since focussed national and international attention on native land rights. CONFENIAE has also stressed the importance of state recognition and promotion of indigenous ecological knowledge and land-use practices, as a strategy for the conservation and rational development of the resources of the Amazon region (Mashinkia and Awak Tentets, 1986; and, Naikiai, 1987).

6. In 1984, CONFENIAE joined with a number of Sierra and Coastal indigenous organizations to form the Confederation of Indian Nationalities of Ecuador (CONAIE), the confederation which provides national-level representation for the country's large and highly diverse indigenous populations. Among other programs, CONAIE has successfully lobbied the Ecuadorian Congress to establish a special Commission on Indian Affairs and to draft a Law of Indian Nationalities. The latter project, which was submitted for Congressional approval in August 1988, for the first time recognizes the plurinational and multi-ethnic character of the Ecuadorian state, as well as the territorial rights of the country's indigenous groups (Comision Especial de Asuntos Indigenas, 1988).

Indigenous Populations

7. The Quichua (Quijos, Canelos, Yumbos or Inganos) have shown great adaptive capabilities. Throughout their history, they have overcome the influence of colonizers and missionaries who tried to reduce them to concentrated settlements where they would be more accessible as a labor force.

8. This group is undergoing a process of population expansion, which has led to their migration toward forest areas that are not part of their traditional territory. This migration is particularly strong in the lowlands along the San Miguel, Aguarico and Napo rivers.

9. The Quichua live in patrilineal extended family units and patrilocal villages (i.e., they trace descent and assign residency through men). Their territory is divided into family areas called "lactas," within which each nuclear family maintains its own houseplot and lands. In addition, each family holds a series of larger plots of land called "carutambo" or "purina" where they move during certain parts of the year.

10. Generally, a number of these extended families join together to form a "comuna" or "centro," a type of cooperative organization. In Napo and Pastaza, the joining of these first degree organizations has given rise to several second degree organizations, the federations. The federations include: "Federacion de Organizaciones Indigenas del Napo" (FOIN), "Federacion de Comunas Union de Nativos de la Amazonia Ecuatoriana" (FCUNAE), "Jatun Comuna Aguarico" (JCA), "Organizacion de Pueblos Indigenas de Pastaza" (OPIP), and the "Asociacion de Indigenas Evangelicos del Napo" (AIEN). These, in turn, are organized into a third degree grouping, the Confederacion de Nacionalidad Indigenas de la Amazonia Ecuatoriana (CONFENIAE).

11. The modernization process is gradually transforming the Quichua's traditional production forms and land use practices and, in recent years, leading them to take up cattle raising and other forms of commercial agriculture (e.g., coffee and cacao production). These changes have had profound consequences for their cultural habits and community structures and have led to the destruction of the habitat upon which their cultural survival depends.

12. One of the principle problems faced by the Quichua, like other indigenous groups of the Ecuadorian Amazon, is the lack of sufficient lands

and legally established land tenure. The areas which have been set aside for the Quichua communities near Puyo, Tena and Archidona are not sufficient for their populations, and the subdivision of plots which were titled earlier has left numerous families unable to subsist from their own production. This has forced people to move toward other areas where their land rights are less secure and created conflicts with both outside settlers and other native groups.

13. The Shuar and Achuar are "Jivaroan" speakers and occupy neighboring territories in the center-south of the Amazon area. The Shuar (called "Untsurí Shuar" by other "Jivaroan" groups) live mainly in the Sub-Andean or "Ceja de Selva" region, in the Upano and Zamora river valleys and, in lesser numbers, in the upper reaches of the Morona and Palora rivers. The Achuar live mainly in the upper Morona and Huasaga basins and along the edges of some of the affluents of the Pastaza river, such as the Copataza, Bobonaza and Ishpingo.

14. There is great socio-economic and cultural heterogeneity among the Shuar and Achuar. In terms of their productive systems, there are some groups that live principally from subsistence activities and others that are strongly market-oriented; among the latter, some are farm workers for settlers or other native communities. Culturally, there are some communities that are isolated from or have resisted outside influences, while others have assimilated the customs, language and other traits of the national society.

15. The more traditional Shuar and Achuar live in extended families, which form endogamous areas and have a single leader. Like the Quichua, the modernization process is gradually transforming the social and political structures of these groups, as teachers, health promoters, and religious workers replace shamans or "curanderos" as the leaders of local groups.

16. To defend their lands from outside encroachments, the Shuar and Achuar have formed first degree organizations called "centros," and wider associations and federations. The Shuar Federation, which is the oldest indigenous federation in the Ecuadorian Amazon, represents 260 "centros" organized into 23 associations; the "Asociacion Independiente del Pueblo Shuar del Ecuador (AIPSE) represents 70 "centros." The Shuar Federation has been internationally recognized for its very successful bilingual radio school and publishing program, and has been at the forefront of the national Indian movement in Ecuador.

17. The Huaorani, who are in permanent contact with Ecuadorian national society, are concentrated around the headwaters of the Curaray river, in a 66,000 hectare "protectorate" that was ceded to them by the government in 1969 and legally adjudicated in 1983. The traditional territory of the Huaorani was on the right side of the Napo River, and smaller groups, who remain relatively isolated and only in intermittent contact with outsiders, still live in the Napo Province, particularly in the upper Yasuni area and near the Shiripuno (the Tagueiri group) and the Cononaco (the Huepeiri group) rivers.

18. Despite great exposure to change in recent decades, the Huaorani culture remains strong. The Indians still maintain their traditional subsistence production based upon shifting horticulture, hunting, fishing

and food collecting. The principle sources of acculturation are contacts with missionaries of the Summer Institute of Linguistics/Wycliffe Bible Translators, unrestricted tourism and the presence of oil exploration facilities. There are also settlers moving in the direction of the Cononaco river region, and increasing contacts between Huaorani and pioneer Quichua communities.

19. Recently, there has been an intensification of kinship relationships among the Huaorani and exchanges with neighboring Quichua groups. Several female leaders have also emerged among the Huaorani and serve as cultural intermediaries with the outside world.

20. The Cofan is the indigenous group which has been most affected by recent oil exploration and land settlement activities. The Cofan, who live in the settlements of Dureno, Dovino and Sinangue, inhabit a reduced area which is hardly sufficient to maintain them and poses a threat to their survival as a distinct cultural and ethnic group. Their traditional territory, which once supported a relatively large indigenous population, is now criss-crossed by a complex of roads, oil storage facilities and thousands of settler families.

21. Since the 1950s, almost every aspect of the Cofan culture has experienced change. This includes their house types, tools and weapons, traditional medical practices, the behavior of community members, and their traditional food taboos. Although some of their subsistence practices still survive, they have been forced to seek additional income through the sale of timber, wildlife resources and handicrafts. Today, they are dependent upon external markets and forced to over-exploit their forest habitat in order to survive and obtain cash income.

22. As a result of outside contacts and pressures, the Cofan have suffered a process of social disorganization, rapid acculturation and near cultural extinction. However, some of the younger leaders are trying to counter these processes and, partly as a result of their efforts, the government has assigned land to them as "comunas." More recently, the Cofan and the Siona-Secoya have joined CONFENIAE to increase their bargaining power before the government.

23. Lastly, the Siona-Secoya group, which is actually comprised of two ethnic groups, lives in Ecuador, Colombia and Peru. In Ecuador, there are four main communities: the Secoya of San Pablo; the Secoya who live along the Aguarico River; the Siona of Biana, also along the Aguarico; and, the Siona of Cuyabeno who live near the lagoons of the same name in the Cuyabeno Wildlife Reserve.

24. The Siona-Secoya live along the rivers and use canoes made of tree trunks. They live in dispersed patrilineal and patrilocal family groups throughout their territory, although they tended to concentrate around the settlement of San Pablo de Kantesiaya during the 1970s. However, to defend their territory, they have again dispersed to strategic points, where they have created small settlements such as Secoya at the eastern corner of their territory.

25. The Indian culture is intimately related to the tropical forest environment, and they still depend upon hunting, fishing, and food

collection for subsistence. Hunting, which is a masculine activity, furnishes more than 80 percent of the protein in the Siona-Secoya diet; and, horticulture, which is conducted by the women, provides 70 to 80 percent of the calories in their diet (Vickers, 1979).

26. In 1983, the Ministry of Agriculture recommended an expansion of the land area legally assigned to the group, but there has still been no action to comply with this recommendation. Currently, the Siona-Secoya are surrounded by settler cooperatives and African oil palm plantations.

ECUADOR

SUMMARY OF PRINCIPAL LEGISLATION AFFECTING THE AMAZON REGION

1. The baseline analysis for this summary was done by the Fundacion Natura (1988). This indicates that the following Ecuadorian laws are particularly relevant to the administration of the RAE's human and natural resources:

"Ley de Colonizacion de la Region Amazonica"
"Ley de Cultura"
"Ley de Mineria y de Hidrocarburos"
"Ley de Seguridad Nacional"
"Ley de Reforma Agraria"
"Ley de Regimen Municipal"
"Ley de Tierras Baldias"
"Ley Forestal y de Conservacion de Areas Naturales y Vida Silvestre"

2. This legislation is discussed below as it affects the Amazon Region in three ways: (a) land use policy, (b) cultural policy, and (c) national security policy.

Land Use Policy

Ley de Colonizacion de la Region Amazonica

3. The primary legal regulation affecting the RAE is the Ley de Colonizacion de la Region Amazonica (1978), which has the status of "special law", meaning that it takes precedence over any other legislation pertaining to the same matter. It declares settlement of the RAE to be an urgent national priority objective. To this end, all local authorities and administrative bureaus are required to work together to facilitate an organized settlement process in the four provinces of the RAE. Private sector initiative is encouraged, and coordination of all settlement efforts is made through public sector institutions--primarily INCRAE (Instituto Nacional de Colonizacion de la RAE). INCRAE is responsible for the formulating policy, and providing settlers with legal land titles through the IERAC (Instituto Ecuatoriano de Reforma Agraria y Colonizacion).

4. Settlement will be aimed at relieving Ecuador's most densely populated areas, and will be undertaken by organized groups of Ecuadorians. Only as an exception can expatriates participate in these programs, and even then, they cannot establish themselves within an area 50 km from the border. The Armed Forces are to participate in the selection of the settlers.

5. All settlement programs are to take into account the appropriate land use for the region's various zones, ensuring the conservation of its forestry resources fostering agricultural development and mining, as well as creating human settlements, tourist reserves and agroindustrial facilities.

6. This legislation states as its objectives a full array of possible uses for the RAE without providing clear priorities among them. Therefore, the decision regarding potential conflicts among competing interests is left to the judgement of the implementing institutions. However, the general spirit of the law is that of fostering intensive use of the region.

Ley de Tierras Baldias

7. This law affects the settlement process through defining the "tierras baldias" or "unoccupied" land which is IERAC's patrimony and constitutes the principal land reserve for settlement. "Unoccupied" lands are those that (a) being part of the nation's territory, have no other owner; (b) have been returned to the State due to any legal cause; or (c) have been uncultivated for more than 10 years. By this definition, IERAC legally owns most of the land in the RAE and may dispose of it as considered proper.

8. This law also provides that as a requirement for legal titling, a settler must clear the forest and replace it with crops or pasture to show domain and use of the land.

9. The concept of "baldio" has recently become controversial because it does not recognize that (a) indigenous groups have occupied such lands for centuries, (b) much land in forest and fallow is used periodically by native groups, and (c) forested land fulfills useful ecological functions. In other words, the question exists as to whether such lands should be considered "unoccupied" and how much this juridical classification may contribute to deforestation and cultural conflicts.

Ley Forestal y de Conservacion de Areas Naturales y Vida Silvestre

10. This law defines as the State's forestry patrimony all natural forests, forest plantations established by the State, and the accompanying flora and fauna. The Ministry of Agriculture and Livestock is responsible for its administration. This Ministry also is responsible for promoting exploitation and industrialization of the forestry resources through organized groups. The Ministry leases these resources to private companies, provided the latter reforest the area. Incentives for reforestation are provided. However, reforestation often does not occur due to inadequate enforcement of those obligations. This is in part due to the Ministry's insufficient production of replacement plants (plantules).

11. The law also provides for the creation of natural reserves under a number of categories, although this provision does not necessarily result in actual protection or competent management of these reserves.

Ley de Regimen Municipal

12. This law is used as a basis for local land use planning throughout Ecuador. Its stated objectives are to foster the material welfare of the population and contribute to the protection of local interests. Municipalities have the formal responsibility of providing local public services to all settlements. In the RAE, provision of these services has fallen far behind demand, and when provided, generally has been limited to provincial capitals.

13. This law includes the municipalities' responsibility to preserve the forests as part of a town's public services. Yet in reality, forests are generally cleared by towns for further urban development.

Ley de Mineria y de Hidrocarburos

14. This law provides for the concession of prospecting areas to private enterprises. Some pollution control clauses were included in 1985 amendments. As with other legislated controls, difficulties of enforcement thwart environmental management efforts.

Cultural Policy

15. Cultural policies for the RAE directly affect two groups of people: native Ecuadorians, and settlers. Two distinct and potentially conflictive processes are at work: preservation and integration. Particularly, the legislation regarding the indigenous population has conflicting objectives of protecting the native cultures and of integrating them into the national culture.

16. Regarding native Ecuadorians, the Ley de Colonizacion de la Region Amazonica establishes that the State, through the Ministry of Agriculture and Livestock, will select those territories that are to be used for settlement and development of indigenous peoples, to protect their culture and promote their full integration into the national culture. In contrast, one of the objectives stated in the first article of the Ley de Colonizacion de la Region Amazonica is the promotion and preservation of indigenous cultures.

17. The most important reference to settlers in the RAE is found in Ecuador's Constitution, which states their function as a national objective: "land settlement is to be organized and fostered, as a means of enhancing the agricultural frontier and in order to obtain a balanced population distribution in the nation's territory" (Fundacion Natura, 1988, Annex B., p. 1). The Ley de Colonizacion indicates the basic principles behind this policy as being: (a) respect for the individual's freedom, (b) the right to free association, (c) the acquired rights, and (d) the abhorrence for any form of human exploitation.

18. The Ley de Reforma Agraria gives the State the responsibility for selecting those regions, zones or intervention-priority territories whose resource (ecological, social and physical) potential allows for the settlement of the maximum number of peasant families for the immediate contribution to regional development. This implies the concomitant creation of sufficient physical, commercial, communications, housing, education, health and sanitation infrastructure. Through the Ministry of Public Health, the State will provide the rural sector with sanitation, as well as preventive and other health services, following the national health plan.

National Security Policy

19. The Ley de Seguridad Nacional regulates the defense of Ecuador's borders and sovereignty. It states that it is the State's responsibility to ensure the Ecuadorian community's survival, to defend the national patrimony, and to contribute to the pursuit of national objectives. No specific reference to the RAE is found in this law, which is national in scope. However, under the auspices of this law, the establishment of frontier settlements, which are aimed at showing Ecuadorian presence in remote territories, has been encouraged. Considering the priority given national security legislation, it would appear that no other considerations (for resource or native culture protection, for example) can be claimed as overriding.

General Environmental Legislation

20. In conclusion, it is noteworthy that Ecuador does not have a comprehensive environmental and natural resource protection law, although a project is pending before the Congress. To date, most environmental protection and regulation functions have been assumed by the General Directorship for the Environment (DIGEMA), an agency within the Ministry of Energy and Mines.

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