

APPENDICES

**with the advice on the specifications
for the content of a strategic
environmental impact statement
for the Rio Paute catchment,
Ecuador**

(Appendices 1 to 9)

APPENDIX 1

Letter of DGIS dated December 28th 1993, in which the Commission has been asked to submit an advisory report

Ministry of Foreign Affairs

The Hague

	Commissie voor de m.e.r. OS
Ingekomen:	ONTVANGEN 5 JAN. 1994
Nummer:	006-94
Dossier:	0003-1
Aanpak naam:	Sc. 1 Pol/Kau / Pres Bies / kad

Netherlands Commission for EIA
att. Mr. drs. J.J. Scholten
Postbus 2345
3500 GH Utrecht
The Netherlands

Directorate-General
International Cooperation

Date : dec. 28th 1993

Re : EIA - Paute
Act. nr. WW/92/850
(JR 593/7)

Ref : DDI-DST
ML/93/686

The Rio Paute in Ecuador has suffered serious problems as explained in the letter of Dr. Cristóbal Cordero Vega, the director of CREA (annex 1). In order to be able to take environmental considerations of alternative development strategies to solve the afore mentioned problems into account, CREA requested support of DGIS in preparing a strategic Environmental Impact Assessment.

The area of study would be the direct surroundings of La Josefina and, if deemed necessary for proper considerations, a wider area of the river and the region involved. The purpose of the strategic Environmental Impact Statement to be made on the basis of the advice of the independent Netherlands Commission for Environmental Impact Assessment for the ToR, is to obtain insight in the major problems in the La Josefina area, possible activities to overcome the problems and a priority setting.

In order to prepare the ToR for the envisaged strategic EIS, the Commission is requested to install a Working Group for this purpose (within the arrangement Commission-DGIS) and submit a budget accordingly.

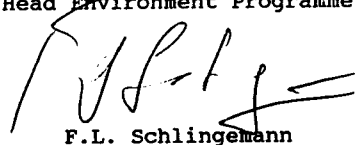
For further information and/or preparation of the mission Mrs. Klokke (DLA/ZA - the Hague, phone 070-3486184) and Mrs. Coolman (OS-Quito, phone 593-2-231507 and fax -567912) can be contacted.

Ministry of Foreign Affairs

The Hague

...
For your information some background documents are attached.

THE MINISTER FOR DEVELOPMENT COOPERATION
For the Minister
Head Environment Programme ⁴²



F.L. Schlingemann

APPENDIX 1A

Letter of CREA, in which CREA presents its plans to execute an Environmental Impact Assessment in the Río Paute catchment with support of the Netherlands Technical Mission in Quito, Ecuador



CENTRO DE RECONVERSION ECONOMICA DEL AZUAY, CAÑAR Y MORONA SANTIAGO

29 SET. 1993

1478

9°-4495
R 1-10.93
File 610.33

Señor Doctor
Galo Abril
SECRETARIO GENERAL DE
PLANIFICACION DEL CONADE
Quito

De mi consideración:

El presente, tiene por objeto manifestar a usted el interés institucional del CREA, de realizar un Estudio de Tasación de los efectos en el Medio Ambiente Ambiente, para la Cuenca del Río Paute, como una nueva opción que asegure el desarrollo autosostenido en el mediano y largo plazo, sobre cuyo propósito la Sra. Bea Colman, Representante de la Cooperación Técnica de los Países Bajos en Quito, ha mostrado su interés de buscar financiamiento holandés.

Como es de su conocimiento, la Cuenca del Paute ha experimentado en los últimos años un acelerado proceso de deterioro y contaminación del medio ambiente, como efecto de malas prácticas agrícolas, la falta de higiene industrial, la irracional explotación minera y la acumulación sin ningún tratamiento de desechos humanos, industriales, etc.

En este contexto y como efecto directo del descuido y falta de protección del medio ambiente; se ha producido el desastre natural de La Josefina, que ha generado profundos cambios en la geografía y la economía regional, ocasionando un retroceso en el nivel de desarrollo de la Región de más de 40 años, según criterios especializados.

Entre las causas principales de esta situación, se pueden señalar las siguientes:

- a) Las inadecuadas prácticas agrícolas, determinadas por la presión demográfica sobre el suelo, la ampliación de la frontera agrícola en suelos en pendientes extremadamente frágiles, como son los páramos andinos, el mal manejo del agua y la tala indiscriminada de las ya limitadas zonas de

AV. MEXICO ENTRE UL. NACIONAL Y LAS AMERICAS
TELEFONOS: CONMUTADOR 817800 817700
TELEX 8810 CREA - CU - ED
FAX (593) 07- 817134
CASILLA 01.01.1993
CUENCA - ECUADOR

REPRESENTACION CREA - QUITO
ROBLES 843 Y AMAZONAS EDIFICIO PROMCO 5to PISO OFICINA 504
FAX (593) 02-802876 TELEX 2048 - CREA - ED
CASILLA 17.15.1001-C
TELEFONOS: 550448 - 547632
QUITO - ECUADOR



bosque y el uso exagerado de productos químicos que contaminan los cultivos, cuyo corolario son los bajos rendimientos, que agrava la situación de inseguridad alimentaria que soporta la población.

- b). La falta de higiene industrial, carencia derivada de la inexistencia de una política que controle y garantice la seguridad ambiental, cuyos aspectos principales son la contaminación del agua de los ríos, del suelo y del aire.
- c). La explotación minera sin control, constituye una práctica muy difundida en la Región Austral y en especial en la cuenca del Paute, debido al uso indiscriminado de mercurio, plomo, etc. que produce una alta contaminación de los suelos, el agua y el aire.
- d). La acumulación de basura en los principales centros poblados como son las ciudades de Cuenca y Azogues, y en especial su falta de tratamiento, además del riesgo inminente que significa para la salud de los habitantes, afecta su estética y su atractivo turístico.
- e). No existe evaluación de los impactos ambientales en la construcción de carreteras y otras obras de infraestructura económica; situación que tiene efectos negativos en el deterioro de los recursos naturales renovables.

Como objetivo central del Plan de Valorización Ambiental, se plantea:

Conocer a profundidad los efectos e impactos de la actividad económica arriba mencionadas, para tener una base suficientemente sustentada para la formulación y diseño de acciones y proyectos que permitan eliminar o mitigar la contaminación ambiental causada por las mismas.

Adjunto se encuentra, un anexo con los programas y proyectos de control ambiental existentes en la ciudad de Cuenca y la provincia del Azuay.

En razón de lo expuesto Sr. Secretario General, solicito a usted sea presentada esta propuesta



CENTRO DE RECONVERSION ECONOMICA DEL AZUAY, CAÑAR Y MORONA SANTIAGO

del CREA, a la representante de la Cooperación Técnica de los Países Bajos en Quito, a fin de que se realicen los trámites correspondientes y se suscriba el respectivo convenio de Cooperación Técnica.

En la seguridad de que brinde favorable atención a lo expuesto, suscribo.

Atentamente
DIOS, PATRIA Y LIBERTAD


Dr. Cristóbal Cordero Vega
DIRECTOR EJECUTIVO DEL CREA

C.C.: Sra. Bea Colman, Representante de Cooperación Técnica de los Países Bajos en Quito.

CQ/gp.

AV. MEXICO ENTRE U. NACIONAL Y LAS AMERICAS
TELEFONOS: CONMUTADOR 817300 817700
TELEX 8810 CREA - CU - ED
FAX (803) 07-817134
CASILLA 01.01.1953
CUENCA - ECUADOR

REPRESENTACION CREA - QUITO
ROBLES 453 Y AMAZONAS EDIFICIO PRONCO 9na PISO OFICINA 908
FAX (803) 02-502978 TELEX 2048 - CREA - ED
CASILLA 17.15.1001-C
TELEFONOS: 550448 - 547632
QUITO - ECUADOR

APPENDIX 2

Project information

Proposed Activity: The Ecuadorian organisation Centro de Reconversión Económica del Azuay, Cañar y Morona Santiago (CREA), has requested support of the Netherlands Government in preparing a strategic Environmental Impact Assessment (to be referred to further as strategic EIA). The study area would be located in the Río Paute catchment, and especially the direct surroundings of La Josefina. La Josefina is the area where a massive landslide took place on 29 March 1993. The purpose of the strategic EIA is to obtain insight in the major environmental problems in the study area, to define alternative strategies to alleviate the problems and to set priorities.

Categories: Strategic environmental impact assessment on a regional level

Project numbers: DDI-DST/ML/93/686 (DGIS)
Act. nr. WW/92/850 (JR 593/7)
Os 003 (Commission for EIA)

Progress: In a letter dated 28 December 1993 (see Appendix 1), the Netherlands Minister for Development Cooperation has requested the Commission for EIA in the Netherlands to advise on terms of reference for a strategic EIS to be prepared in the region involved. The request was made within the framework of an agreement between the Netherlands Minister for Development Cooperation and the Netherlands Commission for EIA (dated 23 March 1993). The intention of the advice is to specify the contents of the strategic EIS and to delineate the abiotic, biotic and man-induced environmental aspects which must be investigated and described in the Strategic EIS. In this context a Strategic EIS is defined as an environmental survey and strategy for a specific geographic region, whereas a conventional EIS is basically project orientated.

During the preparation of the advice, the working group of the Commission visited the Río Paute area as well as several governmental and non-governmental agencies in Quito and Cuenca from 12-26 March 1994.

The advice was submitted to the Netherlands Minister for Development Cooperation on the 27th of June 1994.

Composition of the working group of the Commission for EIA:

The Strategic EIA is prepared by a working group of the Commission for EIA, consisting of independent experts of Ecuadorian, Colombian and Dutch nationality:

- mr. J.W. Kroon (chairman)
- mr. J. Rupke
- mr. L. A.A.J. Eppink
- mr. J.G. Bruins
- mr. J.L. Terwey
- mr. A. Cardona (Colombia)
- mr. P. Vázquez (Ecuador)
- mr. G.A. Yanchapaxi (Ecuador) acted as a consultant for the working group

- mrs. I. A. Steinhauer acted as technical secretary of the working group

APPENDIX 3

Work programme Scoping mission for the River Paute catchment, Ecuador from 11-27 March 1994

- Saturday 12 March:**
- Arrival KL-758 at Quito at 10.30 hours
 - Reception by Mrs. B. Coolman (OS-Quito) and Mr. L. Fransen (SNV-Quito)
 - Transport to hotel Embassy
 - 11.30 hours. Introductory meeting with Mrs. Coolman
- Sunday 13 March:**
- 10.30 hours. First meeting of working group (division of tasks, programme, role Ecuadorian and Colombian experts)
 - 13.00 hours onwards. Studying literature provided by OS-Quito and second draft of the advice
 - 19.00 hours. Meeting with Guido Yanchapaxi (Ecuadorian consultant)
- Monday 14 March:**
- 8.30 hours. Briefing working group with OS-Quito
 - Meeting with Olmedo Washima (representative of Centro de Reconversión Económica del Azuay, Cañar y Morona Santiago (CREA) and Paciente Vázquez (Ecuadorian working group member)
 - 10.30 hours. Meeting with Luis Carrera de la Torre, chairman of the Comisión Asesora del Medio Ambiente (CAAM)
 - 14.00 hours. Meeting at the Ministerio de Energía y Minas with Dr. Marcelo Ramos, national director for Environment
 - 15.00 hours. Meeting at the Banco Interamericano de Desarrollo (BID) with Ing. Tomás Muñoz, responsible for the Paute Programme of the BID
 - 16.30 hours. Meeting with Centro de Planificación y Estudios Sociales (CEPLAES), with Mariana Naranjo, responsible for the elaboration of a development profile for Azuay, Cañar and Loja
 - 18.00 hours. Video demonstration about La Josefina disaster at OS-Quito
- Tuesday 15 March:**
- 08.30 hours. Meeting at the UNDP office in Ecuador with Mrs. Kim Bolduc, deputy resident representative
 - 09.30 hours. Meeting at Ministerio de Agricultura y Ganadería with Ing. Jorge Barba González, executive director of Instituto Ecuatoriano Forestal y Areas Naturales y de Vida Silvestre (INEFAN) and with representatives of Conservación de aguas y suelos
 - 11.00 hours. Meeting at the Escuela Politécnica Nacional with the team of Othón Zevallos, responsible for study about causes and effects of the disaster of La Josefina
 - 14.00 hours. Meeting at the Instituto Nacional de Meteorología e Hidrología (INAMHI), with Ing. Luis Rodríguez Fiallos, general director
 - 15.00 hours. Meeting at the Consejo Nacional de Desarrollo (CONADE) with Dr. Galo Abril, secretary-general of planification

- 16.55 hours. Flight to Cuenca, SAN WB-837 of the working group members Bruins, Terwey, Vázquez and of Mr. Washima (CREA). Stay at hotel Conquistador

Wednesday 16 March: - Programme Quito

- 8.30 hours. Meeting at Fundación Natura, with Ing. Alvaro Encalada, responsible for the programme on environmental advice for the Andean region and with Mr. Roberto Troya, executive director
- 11.00 hours. Meeting at the Corporación Geológica Minera (CODIGEM), with Ing. Ramón Vera, chairman
- 12.00 hours. Meeting with Fietje Huwer, Stichting Tropenbos about legislation on environment
- 14.00 hours. Meeting at Instituto Geográfico Militar (IGM)
- 16.55 hours. Flight to Cuenca, SAN WB-837 of the working group members Eppink, Rupke, Kroon and Steinhauer and consultant Yanchapaxi. Stay at hotel Conquistador

Programme Cuenca

- 08.30 hours. Meeting at Empresa de Teléfonos, Agua Potable y Alcantarillado (ETAPA), with Ing. Agustín Rengel, director
- Meeting with the Mayor of Cuenca
- Visiting the zone of Paccha, with minor landslides
- Visit to the environmental division of ETAPA in Ucabamba, meeting with Mr. Alfonso Neira Alvarado
- 14.30 hours. Meeting with several directors of CREA and with the Civil Defense, with Dr. Raúl Gómez

- Thursday 17 March:**
- Field visit to the upper catchment of the river Paute
 - 09.00 hours. Meeting with the Mayor of Azogues, Dr. Segundo Serrano

- Friday 18 March:**
- 08.30 hours. Meeting in CREA with representatives of INEFAN (regional office Cuenca), with Pablo Ventimilla, Emilio Escóbar and Julio Cornejo and with Julio Torrachi, Jaime Torres and Eduardo Aguirre from the project Unidad de Manejo de la Cuenca del Río Paute (UMACPA)
 - 11.00 hours. Meeting at the Cámara de Comercio with Consejo de Programación de Obras emergentes del Río Paute with Ing. Alejandro Serrano
 - 14.00 hours. Meeting at the Facultad de Ingeniería de la Universidad de Cuenca, with Ing. Fabián Jaramillo
 - 17.55 hours. Flight to Quito, SAN WB-838 (Mr. Bruins), with a connection on Saturday flight KL 758 to Holland

- Saturday 19 March:**
- 07.30 hours. Arrival from Quito, Mr. Aldo Cardona
 - 08.00 hours. Field visit to forest project in Cañar
 - 09.30 hours. Meeting at the IFAD-FAO Holanda project with Mr. Remigio Padrón, head technical assistance, with several sitevisits (El Tambo, Patacocha)

- Sunday 20 March:**
- 08.00 hours. Field visit to several parts downstream of the La Josefina disaster

- 09.00 hours. Meeting with the Mayors of Paute, Gualaceo and Sevilla de Oro and with representatives of the Comité Paute Construye, Arq. Ivan González

- Monday 21 March:**
- 08.30 hours. meeting with representatives of several NGO's;
 - Fundación Ecológica Mazán, Boris Jerki
 - Habitierra. Pablo Mera, Cecilia Molina
 - Fundación Vida, Eugenia Arévalo
 - Centro de Desarrollo e investigación rural (CEDIR), Felix Morrocho
 - Fundación DONUM
 - Fondo Ecuatoriano para el progreso (FEPP)
 - Centro de Educación y Capacitación del Campesinado (CECCA), Ivan Gonzalez y Paciente Vázquez
 - SENDAS
 - Fundación para asentamientos de la Cúria
 - Proyecto HOPE
 - Universidad de Cuenca, facultad de biología, Fernando Larrea
 - 11.00 hours. Meeting with the working group members
 - 13.30 hours. Elaboration of concept text proposals
- Tuesday 22 March:**
- 08.30 hours. meeting at the Regional Office of the Ministerio de Agricultura with the provincial director and representation of INEFAN
 - 11.00 hours. Meeting at the Regional Office of the Ministerio de Energía y Minas with Ing. Loayza
 - 14.00 hours. Meeting at the Universidad del Azuay, departamento de Suelos y Geología, with Mr. Mario Jaramillo, Mrs. Rafaela Ansaloni, Mrs. Rebecca Webster and Mr. Jacinto Guillán
 - 16.00 hours. Meeting with the working group members
 - 17.55 hours. Flight to Quito; SAN WB-838 of Mr. Yanchapaxi
- Wednesday 23 March:**
- 09.00 hours. Interview with the local television at the office of CREA
 - 10.00 hours. Elaboration of text proposals
 - 14.00 hours. Meeting at the Instituto Ecuatoriano de Recursos Hídricos (INERHI) with Mr. Carlos Chica
 - 19.00 hours. Meeting with the working group members
- Thursday 24 March:**
- 07.30 hours. Field visit to La Josefina landslide
 - Elaboration of text proposals
 - 13.00 hours. Lunch and debriefing at CREA with Olmedo Washima and Guido Crespo
 - 16.00 hours. Meeting with the working group members
- Friday 25 March:**
- 10.00 hours. Flight to Quito SAN WB- 846
 - 11.00 hours. Meeting with Guido Yanchapaxi
 - 11.30 hours. Meeting at INERHI, with Mr. Milton Silva C., director of planning, Mr. Elder-Aragundi and Mr. Bolivar Muñoz
 - 16.00 hours. Debriefing OS- Quito
- Saturday 26 March:**
- 10.55 hours. Flight to Amsterdam KL 758
- Sunday 27 March:**
- 06.00 hours. Arrival Amsterdam

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- mr. J.L. Terwey
- mr. A. Cardona (Colombia)
- mr. P. Vázquez (Ecuador)
- mr. G.A. Yanchapaxi (Ecuador) acted as a consultant for the working group

- mrs. I. A. Steinhauer acted as technical secretary of the working group

APPENDIX 4

Names and Addresses¹ of Key Institutions / Organisations

1. Cooperación Internacional de Los Paises Bajos (OS-Quito)
Bea Coolman, representante en Ecuador
Francisco Pizarro 127 y Sta. María
Casilla 17.21.13.84
Quito
Tel: (593-2) 224507 / 525461
Fax: (593-2) 567917
Telex: 21-320
2. Comisión Asecora del Medio Ambiente (CAAM)
Ing. Luis Carrera de la Torre, presidente
Av. 10 de Agosto 3560 y Mariana de Jesús
Edif. METROCAR, 4^{to} piso
Quito
Tel: (059-2) 540455 / 524304 / 524304 / 547387 / 540920
Fax: (059-2) 565809
3. Centro de Reconversión Económica del Azuay, Cañar y Morona Santiago (CREA)
Dr. Cristóbal Cordero Vega, director ejecutivo
Ec. Olmedo Washima, director planificación
Ing. Guido Crespo, director planificación
Av. México y Las Américas
Casilla 01.01.1953
Cuenca
Tel: (593-7) 817500 / 815844
Fax: (593-7) 817134
4. Ministerio de Energía y Minas
Dr. Marcelo Ramos, director nacional de medio-ambiente
Santa Prisca 223 y M. Larrea
Quito
Tel: (593-2) 570341
5. Banco Interamericano de Desarrollo (BID)
Ing. Tomás Muñoz Martín, encargado del Programa
Paute del BID
Av. Amazonas 477 y Roca
Quito
Tel: (593-2) 550011

1 In some cases addresses were not available

6. Centro de Planificación y Estudios Sociales (CEPLAES)
Mariana Naranjo, encargada del perfil de desarrollo del Austro
Alejandra Ayala, directora ejecutiva
Av. 6 de diciembre 2912 y Alpellana
Casilla 17.12.6127
Quito
Tel: (593-2) 548547 / 232261
Fax: (593-2)566207
Correo Electrónico CD α CEPLAE.EC Red ECUANEX
7. UNDP
Kim Bolduc
Mario Salzmann
Foch 265 y Av. 6 de Diciembre
Quito
8. Ministerio de Agricultura y Ganadería (MAG)
Ing. Jorge Barba, director INEFAN, Ing. Segundo Jadán, jefe CC-CH (Tel y Fax: 500041)
Instituto Ecuatoriano Forestal y Areas Naturales y de Vida Silvestre (INEFAN)
Av. Eloy Alfaro y Av. Amazonas 8 piso # 807
Quito
Tel: (05932)- 541955 /541988/548924
Fax: (05932)-564037
9. Escuela Politécnica Nacional
Othón Zevallos, responsable del estudio sobre causas y efectos del desastre de La Jose-
fina
Sr. Narváez, miembro del equipo
Sr Galo Plazo Nieto, miembro del equipo
Ladrón de Guevarra s/n
Apartado 2759
Quito
Tel: (593-2) 563077
10. Instituto Nacional de Meteorología e Hidrología
Ing. Luis Rodríguez Flallos, director general
Ing. Aníbal Vaca, proyecto INSEQ (Tel: 593-2 -456728).
Av. 10 de Agosto y Naciones Unidas
Quito
Tel: (593-2) 433935 / 433936 / 248268
Fax: (593-2)433934
11. Consejo Nacional de Desarrollo (CONADE)
Dr. Galo Abril, secretario general de planificación
Calle Arenas y Manuel Larrea
Quito
Tel: (593-2) 503430

12. Fundación Natura
Ing. Alvaro Encalada, encargado del programa de asesoría ambiental para la región andina
Sr. Roberto Troya, director ejecutivo
Maria-Elena Jervis, comité ecuatoriano de IUCN (International Union for the Conservation of Nature)
Vicente Polit, Comité Ecuatoriano de Entidades trabajando en Medio Ambiente (CEDENMA)
Av. América 5653 y Voz Andes
Casilla 17.01.253
Quito
Tel: (593-2) 437341 / 2 / 3 / 4
Fax: (593-2) 434449
- Capítulo Quito
Isla San Cristóbal 1167 y Río Coca
Tel: (593-2) 245 274
- Capítulo Guayaquil
Av. Carlos Julio Arosemana
Km 2½, Edif. Investamer
2do. Piso
Tel: 201628,
Fax: 202073
- Capítulo Azogues
Edif. Municipal
Tel: 241524
13. Corporación de Desarrollo e Investigación Geológico Minera Metalúrgica (CODIGEM)
Ing. Ramón Vera, presidente ejecutivo
Av. 10 de Agosto y Villa Lengua
Quito
Tel: (593-2) 459379 / 434579
14. Centro de Levantamientos Integrados de Recursos Naturales por Sensores Remotos (CLIRSEN)
Calle Pazmiño y Senierges
Edif. Instituto Geográfico Militar
Apartado 2435
Quito
Tel: (593-2) 582447
Fax: (593-2) 569 097
15. Empresa Pública Municipal de Teléfonos, Agua Potable y Alcantarillado (ETAPA)
Ing. Agustín Rengel, gerente
Ing. Alfonso Neira Alvarado
Ing. Pedro Basabe, miembro del cuerpo de socorro.
Casilla 297
Cuenca
Tel: (593-7) 831 900
Fax: (593-2) 833 048

16. **Municipalidad de Cuenca**
Cuenca
17. **Defensa Civil**
Dr. Raúl Gomez, director
Cuenca
18. **Municipalidad de Azogues**
Dr. Segundo Serrano
Edificio Municipal
Azogues
Tel: 240060-240359
Fax: 241 673
19. **Oficina Regional de INEFAN**
Pablo Ventimilla, Emilio Escobar, Julio Cornejo
Cuenca
20. **Unidad de Manejo de la Cuenca del Río Paute (UMACPA)**
Project of Banco Interamericano de Desarrollo (BID) and Instituto Ecuatoriano de Electrificación (INECEL)
Ing. Julio Torrachi, Jaime Torres and Eduardo Aguirre
Frederico Proaño 3-0 y Aurelio Aguilar
Casilla 01.05.1831
Cuenca
Tel: (593-7) 810 339/ 816085
Fax: (593-7) 817 143
21. **Consejo de Programación de Obras emergentes del Río Paute**
Ing. Alejandro Serrano
Cuenca
22. **Facultad de Ingeniería de la Universidad de Cuenca**
Ing. Fabian Jaramillo Palacios (Decano)
Av. 12 de Abril
Cuenca
Tel: (593-7) 832183/814116
Fax: (593-7) 832183
23. **IFAD, FAO-Holanda, Cañar Development Project**
Mr. Rudolf Mulder, Mr. Padrón
Cuenca
Tel: (593-2) 235 266
24. **Municipalidades de Paute, Gualaceo y Sevilla de Oro**
El Alcalde de Paute.
Mr. Juan Leon, alcalde de Gualaceo
Mr. Cesar Leon, alcalde de Sevilla de Oro.

25. Comité Paute construye
Arq. Ivan González
Paute
26. Coordinadora de ONG's, amongst which
Centro de Educación y Capacitación del Campesinado (CECCA)
Arq. Ivan González, Paciente Vázquez, Hernan Rhodas
Huo. Miguel 6-72
Cuenca
Tel: (593-2) 830 638
Fax: (593-2) 821 775
27. Oficina Regional del Ministerio de Agricultura
Cuenca
28. Oficina Regional de Energía y Minas
Ing. Loayza
Cuenca
29. Universidad del Azuay, departamento de suelos y geología
Sr. Mario Jaramillo de Paredes
Tel: (593-7) 811-188
Fax: (593-7) 815-997
30. Oficina Regional del Instituto Ecuatoriano de Recursos Hidráulicos
(INERHI)
Ing. Carlos Chica
Cuenca
Tel: (593-7) 833041
31. INERHI
Quito

Names and addresses of persons/organisations not visited, but which might be consulted for the strategic Environmental Impact Statement.

32. Sr. Ec. Enrique Paredes Roldán
Ex. Director del Proyecto Plan del Desarrollo Integral de la Provincia del Azuay
P.O. Box 775
Cuenca
Tel: (593-7)- 806 223
33. Ing. José Calle Astudillo
Presidente de la Comisión de Inversión y Fiscalización
Plan de Desarrollo Integral de la Provincia del Azuay
H. Consejo Provincial del Azuay
P.O. Box 775
Cuenca

34. Instituto Ecuatoriano de Reforma Agraria y Colonización (IERAC)
35. Instituto Nacional de Investigaciones Agropecuarias (INIAP)
36. Proyecto de Conservación de Suelos y Sistemas Agrosilvopastoriles (PROCOSA) (Joint project of INEFAN and GTZ)
37. PROMACH
38. Proyecto de Manejo y Uso Sostenible de Tierras Andinas (PROMUSTA/CARE)
39. Programa Nacional de Regionalización (PRONAREG)
40. PLANFOR
41. Programa para la Forestación (PROPAFOR)
42. Instituto Ecuatoriano de Obras Sanitarias (IEOS)

APPENDIX 5

List of key references

1. Diagnóstico de Paute (IAP)
Arq. Ivan Gonzalez A.
Febrero de 1993

Summary:

The report contains a description of the Cantons of Paute and Pan y Sevilla de Oro in Azuay Province. The study area is 780 km² and has 35,565 inhabitants (1990). The report describes all physical, economic and ecological resources and it pays attention to education, health- care, migration, organization of the people, agriculture, watersheds, commerce, infrastructure, development institutions, history and culture.

2. Bibliografía sobre pobreza y medio ambiente en El Ecuador
Jorge Leon T.

Summary:

The document contains an comprehensive list of titles of papers wich may be useful for environmental studies in Ecuador.

3. Inventario y análisis de los proyectos Amazónicos Ecuatarios
CAAM/FAO/DGIS/CE
Febrero de 1994

Summary:

The report presents a description and an analysis of all projects, regarding development and environment, in the Amazon region of Ecuador. Conclusions were drawn as to (i) politics and strategies for sustainable development in the study area, (ii) the actors, (iii) the role of the actors and their institutional capacities, (iv) interinstitutional coordination and (v) the characteristics of the projects executed in the study area.

4. La gestión ambiental en El Ecuador
Ministerio de Relaciones Exteriores del Ecuador
Abril de 1993

Summary:

This report is supplementary to the national report for UNCED-92. It was prepared with assistance from the Government of Canada. The report describes proposals for:

- policies and strategies for environmental management in Ecuador for immediate application, on the basis of existing legislation and institutions;
- institutional development for environmental management;
- priority measures.

The proposed policies and strategies for environmental management in Ecuador are described in terms of:

- background and reasons for environmental management;
- basic environmental problems;
- strategic sectors for environmental management;
- regional strategies for environmental management.

5. Evaluación preliminar de los daños causados por el represamiento y desfogue del Río Paute
CREA/Universidad de Cuenca, Instituto de Investigaciones Sociales (IDIS)
Mayo de 1993

Summary:

On March 23, 1993 a massive landslide took place in the Josefina area. In the Canton Paute. The landslide caused the formation of a dam with a length of 800 m, a width of 300 m and a height of 120 m. The dam created a lake with an area of 920 ha and a volume of 200 million m³ at the confluence of the rivers Cuenca, Burgay, Déleg and Jadán. This report presents a preliminary evaluation of the damage caused by the landslide. The damage and losses, caused by the disaster are described in quantitative and qualitative terms with respect to:

- damage to the population and buildings;
- loss of employment;
- industrial and agricultural losses;
- loss of infrastructure (roads, railways, bridges, schools, public services, energy supply, irrigation systems, river embankments).

The adverse impacts on environment and ecological resources are not evaluated in the report. The estimated costs of the damage and losses, with respect to public and private property only, amount to 245,466 million Sucre. The disaster entails a serious setback in the development of the provinces Azuay and Cañar. The report gives, amongst other, the following recommendations for priority actions:

- introduction of special legislation to enhance reactivation of the economy in Azuay, Cañar and Morona Santiago;
- reconstruction of the roads system and financing of the procurement of construction equipment;
- implementation of projects to re-activate productions in the sectors: agriculture, agro-industry, mining, handicrafts and tourism;
- geological surveys;
- identification of new quarries;
- permanent monitoring and conservation of affected zones.

6. Evaluación preliminar de los daños causados por el represamiento y desfogue del Río Cuenca
CREA/Universidad de Cuenca, Instituto de Investigaciones Sociales (IDIS)
Junio de 1993

Summary:

This report is basically the final edition of Ref. no. 5.

7. La situación de las entidades de investigaciones sociales y de medio ambiente en El Ecuador
Jorge Leon T.
Abril de 1993
8. Document received from INEFAN including:

- 8.1 Banco Mundial - INEFAN
Temas y posibles preproyectos para consideración del banco
Jorge Barra G., Director Ejecutivo del INEFAN
8 de Diciembre de 1993
- Summary:
This document contains proposals for possible projects in the fields of reforestation, forest management and physical planning for Ecuador, including a project for reforestation and protection in 7 watersheds of national importance in the Sierra.
- 8.2 Temas y posible preproyectos para consideración del Banco Interamericano de Desarrollo (BID)
Jorge Barra G, Director Ejecutivo del Inefan
- Summary:
This document contains proposals for (i) protection of the Amazon area, (ii) reforestation of the Coastal Zone, studies regarding the tropical forests and (iv) institutional strengthening.
- 8.3 Plan maestro de forestación
INEFAN
Mayo de 1993
- Summary:
Master Plan for reforestation and reversing the process of deforestation. Ongoing projects are concentrated in the Andes (Sierra Central and Cuenca de Río Paute), including the project "Reforestación de la Sierra Central (BID)". These projects mostly concern agroforestation and watershed protection by means of integration of forestation in agricultural practices.
The Paute project is executed under the responsibility of INECEL, through UMACPA. The Forest Action Plan for Ecuador (PAFE), initiated in 1989, is supported by the FAO and the governments of The Netherlands, UK and USAID. It comprises 55 sub-projects.
9. Programa de obras emergentes de la Cuenca del Río Paute y sus afluentes
Consejo de Programación de Obras Emergentes de las Cuencas del Río Paute y Sus Afluentes
Julio de 1993
- Summary:
This report contains a summary of the evaluation of the consequences and effects of the Josefina landslide.
It further lists proposed mitigative and regional development projects and studies in the fields of: production, education, administration, geology, roads, land use/urbanization/housing, sanitation/solid waste management/water supply, public health, hydrology, agriculture and electrification.
10. Legislación ambiental, compilación de leyes, reglamentos y normas relacionadas con el medio ambiente y la conservación de la naturaleza, para el sector hidrocarburífero y minero.
Ministerio de Energía y Minas
Septiembre de 1993

11. Reconstrucción Paute (Habitat)
Varios documentos de UNDP
1993

Summary:

Proposal from Habitat for the reconstruction of housing for the affected population of Paute. This proposal envisaged the reconstruction of 1500 prefabricated houses adapted to the needs of the population at a low cost and with the participation of the communities in the assembly of the module. This proposal was not supported because the inhabitants were more interested in houses builded with locally available materials and technologies in order to be able to extend the constructions with more resistant materials in the course of time.

12. Deslizamiento-obras de emergencia
Varios documentos
1993

Summary:

Various plans from CREA for the reconstruction and reactivation of the region, amongst which:

- diagnosis and contamination of soils
- transport and infrastructure
- economy
- ecology
- social aspects

13. 15 fotos aéreas y 5 mapas topográficas de Cuenca
Mapas con escala de 1:50.000 de
Guachapala, Cuenca, Chiquintad, Azogues (copia) y Gualaceo
14. El deslizamiento La Josefina en el valle de Paute
(version original en castellano)
Bern, Suiza (DHA/SDR), 1993
15. Colóquio científico (copies of most interesting parts are made by CREA)
El deslizamiento de la Josefina
Escuela Politécnica nacional
Julio 1993, Quito
16. Mas allá de las lágrimas
La Josefina...y después?
Jaime Galarza
Cuenca, Octubre 1993
17. Agenda para el Desarrollo
Plan de acción del gobierno 1993-1996
República del Ecuador
Consejo nacional de desarrollo
18. folleto Gestion Ambiental en el Ecuador
Caam (Comisión Asesora del Medio-Ambiente)
Diciembre 1993

19. Folleto CREA, indicadores básicos región centro sur
dirección de planificación
Enero 1994
20. Datos sobre Pobreza en Ecuador
21. Folleto de INAMHI
Insec, cooperación franco-ecuatoriana
inundaciones y sequías en el Ecuador
22. Mapa de INAMHI de la Cuenca del Río Paute
Ministerio de Energía y Minas, Instituto de Meteorología e Hidrología
1994
23. El deslizamiento de la Josefina
Ministerio de Obras Públicas y Comunicaciones
Uzcategui, G. 1993

Summary:

This is a report of the sub-secretary of Public Works of all the activities executed in the Josefina disaster zone. Also the reports of the Chilean and the Italian Commission which analyzed and approved those activities have been presented, as well as the technical reports of the mathematical simulations which have been elaborated.

24. Estudio de intensidades
Instituto Nacional de Meteorología e Hidrología. Departamento de Hidrología, sección estudios.

Summary:

The study presents the methodology used to calculate the maximum rainfall intensities for different return periods for twelve stations in the mountain, nine in the coastal area and two in the eastern part of the country. The results have been presented in tabular form. Intensity-Duration-Return period curves have been presented in graphical form.

25. Listado de principales especies forestales que pueden ser utilizados para el PLANFOR
PLANFOR s.a.

Summary:

The list presents the scientific and common names, as well as the principal uses (industry, energy, protection, agroforestry and silvo-pastoral) of 13 species of the humid mountain forest, 6 of the dry mountain forest, 27 of the coastal tropical rain forest, 10 of the coastal tropical dry forest and 9 species of the tropical rain forest in the oriental zone.

26. Breve resumen de los suelos de las provincias del Azuay y Cañar
INEFAN 1994

Summary:

From both the Azuay and the Cañar Province very short characteristics of the soils are given, including the USDA Classification and the zonation.

27. **Monitoreo de la calidad del agua del lago La Josefina ETAPA**

Summary:
Project of one year, has started in January 1994
Project costs: 22 milj. sucres ETAPA and 70 milj. sucres Emergency council
Components:
- Study of the apportioning waters
- Study of the lake
- Study of the waters downstream
Project description and detailed working plan
Project execution by ETAPA, Environmental Management Department.
28. **Fundación Natura**
Programa de asesorio ambiental para la región Andina
Informe de actividades septiembre 1993-febrero 1994
29. **Fundación Natura, datos institucionales**
30. **Fundación Natura**
Evaluación del Impacto Ambiental, casos de estudio de Ecuador, Peru, Bolivia.
31. **Fundación Natura**
Qué está sucediendo en nuestra provincia?
Folleto
1993
32. **CREA et al., 1993. Diagnóstico de los recursos naturales renovables y propuestas de rehabilitación de las áreas afectadas por el desastre de 'La Josefina'. Cuenca, Ecuador.**

Summary:
CREA, the Universities of both Cuenca and Azuay, the Provincial Direction of the Ministry of Agriculture and Animal-Husbandry, INERHI, the Commission of Nuclear Energy, INEFAN and the International Cooperation of both the Netherlands and Italy have made an inventory of the damage by inundation upstreams of the barrier (940 ha, mainly agricultural land) or by flooding after dam break downstreams (1378 ha, also mainly agricultural land). The main effects on the renewable natural resources have been: destruction of crops, deposition of fine materials over the whole inundated area, silting up of irrigation canals and destabilization of slopes.
The proposals for rehabilitation consist of: drainage, re-establishment of the crops, stabilization of slopes, removal of deposited materials, river bank protection, exploitation of coarse deposited materials and recuperation of land.
The pertinent maps and annexes are available at CREA, Cuenca.
33. **INEC, 1993.**
Informe sobre los Servicios Básicos en el Campo. Instituto Nacional de Estadística y Censos. Vicepresidencia de la República, Ecuador.
(Guido Yanchapaxi)

34. INECEL, 1988. Proyecto de Manejo de Cuenca del Río Paute. UMACPA, Cuenca, Ecuador.

Summary:

This document contains the original proposals and details of what later has been replaced by the proposal as described in INECEL, 1992.

35. INECEL, 1992. Ejecución del Proyecto de Manejo de la Cuenca del Río Paute; Propuesta del INECEL. UMACPA, Cuenca, Ecuador.

Part 1. Proposal

Part 2. Annexes

Summary:

Part 1 begins with a short historical review of the original proposal of the project as accorded by INECEL and BID on 28-9-'89 and of the contracts between INECEL with MAG, CREA, INIAP, IERAC, IGM and CLIRSEN (till 17-10-'90). As MAG, CREA, INIAP and IERAC did not fulfil the contracts, the execution of the proposal was delayed. According to the new proposal UMACPA is directly responsible for the execution.

The objectives of this proposal are:

- management and conservation of the natural resources of the River Paute watershed;
- maintenance of the lifetime of the Amaluza reservoir;
- obtention of technical and socio-economic information, required for the preparation of the inversion programmes; and
- development of a institutional and legal structure.

A description of the components, activities and budgets are given in § 3.

The organization and functions of UMACPA are presented in § 4.

In § 5 the inversion costs and financing sources are detailed, whereas in § 6 the procedures for contracting and acquisition are given.

Part 2 gives all the corresponding annexes of part 1.

36. INSTITUTO GEOGRAFICO MILITAR, 1991.

Guía cartográfica del Ecuador.

Quito, Ecuador.

Summary:

This guide gives an overview of the existence and numbering of maps at different scales and types.

- Topographic maps at scales 1: 25.000, 1: 50.000, 1: 100.000 and 1: 250.000
- Planimetric maps 1: 50.000 and 1: 5.000 (of the cantonal capitals)
- Index of the city maps
- Index of airphoto surveys of special projects
- Thematic maps for different projects (e.g. soil map, ecologic map)

37. Indicadores cantonales para el desarrollo rural. Instituto Interamericano de Cooperación para la Agricultura (IICA). Oficina IICA Ecuador.

Landin, R. Varela, C. & Chiriboga, M. 1993.

(Guido Yanchapaxi)

38. La tragedia del Austro.
Lopez Monsalve, R. 1993
Ediciones La Golondrina, Cuenca, Ecuador.

Summary:

The first chapter gives a chronological sequence of the events: the landslide, the formation of the lakes, the break of the barrier and the remaining smaller lake.

The second chapter deals with the technical aspects: the geology, the topography, the barrier and the technical approach of the situation.

Chapter 3 describes very shortly the future tasks.

The booklet ends with conclusions.

39. PROCOSA, s.a.
Proyecto de Conservación de Suelos y Sistemas Agrosilvopastoriles PROCOSA Leaflet.

Summary:

A short historical description is given of use and abuse of land and forests and the consequent soil degradation. The Project aims at the development of systems required for the permanence of the rural people in the zones where they live reducing the migration to the Amazonia-areas. Therefore improvement of the production conditions like conservation and agro-forestry measures, is required. A brief description of the work strategy is given and the results obtained are presented. The project will be continued.

40. Instituto Geográfico Militar, 1991
Map of Ecuador, Geográfica Física, escala 1:1.000.000

41. Cantaro, cuestiones sobre desarrollo en el Austro
Quarterly publication of the society 'Cantaro' founded by NGO's: CECCA, CICDA-CEDIR, COOPIBO, FEPP, SENDAS, OFIS
Regional development in Ecuador, special issue Josefiná
Cuenca no. 5, 1993

42. Fundación Ecológica Mazan
Operational Plan 1994, Cuenca, Ecuador.

43. Plan de Reactivación económica y social del area afectada por el desastre de la Josefiná.
Universidad de Azuay

Projectproposal to: Consejo de Programación de obras emergentes del Río Paute.

Progr. 1 Fortalecimiento Municipal para la Reconstrucción. Capacidad de gestión técnica y administrativa. Ec. Sucres: 571.786.200

progr. 2 Programa de apoyo a las actividades productivas del area afectada por el desastre de la Josefiná. Ec. Sucres: 887.510.000
Cuenca Febr. 1993.

44. Convenio INERHI-CREA
Hidro-meteorología (Recursos del agua)
TOMO I 1980 TOMO II 1981
Cuenca. Sept. 1981.

45. Consejo provincial del Azuay (HCPA)
Fondo Nacional de preinversion (FONAPRE)
Plan de Desarrollo Integral de la provincia del Azuay
Resumen Gerencial
Cuenca, Ecuador 1993.

46. Medio ambiente y desarrollo en el Ecuador:
reflexiones sobre un diagnós
M.A. Encalada Reyes
United States Agency for International Development (USAID) (Washington, D.C.)
Quito: Salvat Editores Ecuatoriana, 1983.

47. Urgent aid follows landslide: upstream from major hydroelectric plant
The IDB (juni 1993).

48. Environmental NGO's in Ecuador: an economic analysis of institutional change
C.A. Meyer
The Journal of Developing Areas, jrg. 27, nr.2
Jan. 1993.

49. Ecuador: Mining Development and Environmental Control Technical Assistance
Project.
World Bank
Sept. 1993.

Summary:
Environmental aspects:
- erosion caused by the cutting of forests and opening of mine shafts in mountain slopes
- intensvie use of mercury and heavy discharges of mercury and heavy metals in the
nearby river systems.
An EIA report was made, its recommendations used in project design.
Environmental mitigation through:
- monitoring of pollution and occupational health issues
- containment of wastes in sensitive areas
- environmentally sound mining and processing methods.

50. Landslide la Josefina on the Paute river, Cuenca, Ecuador: report on disaster manage-
ment (English version of the consultancy report)
Department of Humanitarian Affairs - United Nations (DHA) (Genève)
Geneva: UN/DHA, United Nations Department for Humanitarian Affairs, 1993.

51. Biodiversidad en el Ecuador: historia y realidad
E. Estrella
Quito: Tallpa Editores, 1993.

52. **Rio Mazan - a people's forest**
A. Barnett
The Ecologist, jrg. 18, nr. 2-3 (1988)
- Summary:
Inhabitants of the city of Cuenca located in the Cajas mountain range in Ecuador, have bought 3300 ha of forest -grazingland in order to protect the river basin and fauna in this area. Considerations on this project.
53. **Sustainable livelihood development in the Andes: local institutions and regional resource use in Ecuador.**
A. Bebbington
Development Policy Review, jrg. 11, nr. 1. (mrt. 1993).
54. **Beleidsplan voor de periode 1992-1995: regio Andes**
Directoraat-Generaal Internationale Samenwerking van het Ministerie van Buitenlandse Zaken (DGIS/BUZA) (Den Haag)
(Den Haag): DGIS, Directoraat-Generaal Internationale Samenwerking, 1992.
Serie landen- en reglobeleidsplannen: 7
55. **Atlas del Ecuador**
bajo la dirección de A.C. Pelavaud con el patrocinio de G. Laclavère y la participación de J.C. Jaramillo... [et al.]
Instituto Geográfico Militar
Banco Central del Ecuador
Paris: Editions J.A., 1982
Atlas del mundo

APPENDIX 6

Checklist for Descriptive analysis of the current situation and impacts (belonging to paragraph 5.2)

In the following paragraphs in the part '*Description*' the items are indicated which can be described. In the part '*Analysis*' guidelines and preliminary indications are given for the main problems, impacts and trends which can form part of the Strategic EIS. This appendix should be considered as a checklist; not all items have to be described into detail. Parts indicated with an asterix (*) however, should be described into detail. Most of the required data might be readily available in reports, books and maps. They can be compiled and updated easily. It is not the intent that all the required data are investigated once more.

5.2.1 Abiotic factors

Climate

Description

The Strategic EIS has to describe the climatic conditions in the study area in general terms, on the basis of records of local weather stations.

- rainfall in mm;
- temperature in oC;
- wind in m/s;
- evapotranspiration in mm;

The most important climatic factors are to be presented in the form of overview maps.

Analysis

The impacts of specific or extreme climatic conditions or patterns on the environment (physical, ecological, agricultural etcetera) have to be evaluated in the Strategic EIS.

Geology/geomorphology (*)

Description

- compilation of available geomorphological/geological information at regional scale; 1:200.000 to 1:50.000 scale (sources: Ministerio de Energía y Minas, INECEL, Ministerio de Obras Públicas, Escuela Politécnica Nacional);
- comparison of all sequential Aerial Photography, supported by Satellite Imagery of data selected on the basis of knowledge of growing season (sources: CLIRSEN, CREA);
- description of several factors which have triggered the La Josefina disaster and indication in a zoning map;
- inventory and zonation of slope and flood hazards, including smaller and equally large potentially reactivated slides based on Aerial Photographs of various dates from 1979 onwards;
- appraisal of the geostructural framework of existing faults, minerals and hydrothermal activity for geotechnical purposes;
- investigation of faultzones with brecciation, gouge formation reducing rock strength (the seismic vulnerability may be low for human life and most structures, it may be sufficient to trigger slideprone masses with a stability factor near to unity);
- zoning of quarrying for building materials like sand and gravel, near the city of Cuenca from existing deposits of Quaternary terrace/fan deposits.

Analysis

Geological and geotechnical problems and impacts have to be covered in the Strategic EIA, which may include/work on the basis of the following preliminary observations:

- in a wider context an overall geologically/geomorphologically medium scale knowledge may help in understanding and allow building a zonation for several styles of land-use. The following relationships have to be further investigated;
 - * the volcanism in Northern Ecuador is more recent than in the present Cuenca region, this has led to generally thick recent ash mantles in the northern parts of Ecuador and only thin ash relicts on the low gradient, generally highly situated and uplifted water divides and interfluvial zones in the Cuenca region. This relationship often controls water retention in the volcanic fertile porous Andosols lying over old tropical, deeply weathered surfaces that have been uplifted to more than 2500 m. Local springs originate at the base of the volcanic ashes and this in turn often controls local irrigation and agricultural production. On the other hand it may be a source of instability at this contact;
 - * old tropical weathering surfaces in the pre-tertiary formations have deep leaching profiles that in certain places has led to the formation of kaolinite (used in the ceramic industry);
 - * geotechnical consequence of the deep tropical weathering is also advantageous; no explosives are needed for excavation;
 - * the presence of, intermediate composition, intrusive bodies in the Miocene formations give rise to spring horizons (irrigation) at the contact with the surrounding material;
 - * deeply weathered granodiorites are arkosic and may easily be eroded. This occurs in the pre-tertiary complex and has consequences for road construction, slope stability and erosion.
- inconsistency of planning-construction related to the Josefina disaster:
 - * no evaluation of slope risk is used, construction is taking place without evaluation of natural conditions of the substrate (example: the intake sector of the Paute main irrigation canal is reconstructed at the foot of another possibly reactivated old landslide mass of equal dimensions as La Josefina);
 - * in the sector El Descanso-Tahual-Josefina) several old slides may be reactivated;
 - * minor earthquakes (< 3.5 Richter) have to be considered.

Soils (*)

Description

- data on soil types have to be represented on a reconnaissance map at a scale of at least 1:100.000 or preferably 1:50.000 (Preliminary map available at CREA, Soil map of the Centro-Sur at INEFAN);
- the following characteristics have to be given:
 - * soil taxonomy;
 - * physical properties like organic matter content, depth, texture, bulk density/porosity, aggregate stability, infiltration rate, water retention characteristics;
 - * chemical properties, like pH, carbonate content, CEC, exchangeable cations, potential and actual fertility (N,P,K, Na, Mg).

- an erosion survey (of both wind and water erosion) over the whole catchment has to be made, by due analysis of the erosion causing factors : climate, soil, relief and vegetation (sources: an erosion map of the catchment of the Río Paute has been made by CREA- INERHI in 1981);
- soil conservation and erosion control measures have to be described;
- suitability and sustainability of land for different forms of land use like crop land, forest or range land;
- occurrence and sources (e.g. agrochemicals and pesticides) of soil contamination.

Analysis

Current problems and impacts have to be described, such as (un-)suitability for different forms of land-use and erodibility (i.e. the vulnerability of the soil for water or wind erosion):

- a thorough analysis of the erosion hazard in the area is necessary in order to be able to give priorities to soil conservation projects and to analyse the types of measures to be taken. Planning, design, execution and maintenance of erosion control measures require a careful weighing of technical efficiency, economic feasibility, social acceptability and ecological tolerability. Special attention has to be given to the following subjects:
 - * in the higher parts of the catchment (Azogues, Deleg), the farmers are able to produce on very steep slopes (up to 70 or 80 %) without causing substantial erosion. Most erosion in the area occurs on sites which apparently have been affected by land slips and smaller land slides. After the mass movement the remaining area is very prone to sheet, rill and gully erosion. This can quickly result in badlands-like conditions: deeply dissected areas of steep slopes, almost without any or only scarce vegetation. Though these areas must be considered as unsuitable for any form of land use, they are actually used for grazing, which leads to acceleration of the degradational processes by further land slides, increased erosion and consequently to an accelerated silting up of downstream reservoirs;
 - * the zone of Paute, Gualaceo and San Bartolo show on many places surface erosion as part of a degradational system on steep slopes: an almost parallel system of downslope gullies with extreme sheet erosion on the shoulders of the areas in between the gullies. Sheet erosion - and probably rill erosion - also occurs on many spots elsewhere. The main causes of these forms of erosion have to be determined in the Strategic EIS. It seems that it is mainly soil property (erodibility), slope, cover and management. The zone of the cantons Pan and Sevilla de Oro being at the edge of inhabited country show the same degradation although to a lesser degree. This area could possibly serve as a comparison sample area showing a more initial phase of land degradation;
 - * a greater intensity of erosion, degradation of soil is for a large area coinciding with the presence of Miocene argillite formations in the Azogues/Cojitambo area. Reversal of conditions seems impossible here, local sediment traps are a must at the outlets of second/third order streams. The eastern margin of the Cuenca/Rio Jadán area suffers from the same process.

Water (*)

Description

- surface water quality and quantity, origin and potential (analysis of various physical, chemical, biological and pollution parameters, thermal stratification and eutrophication);
- groundwater quality, quantity, origin and potential (analysis of the same parameters as mentioned above);
- aquifer characteristics and potential in volume and composition;
- demand for drinking water, industrial and agricultural purposes (use and distribution in both urban and rural areas);
- relationship water-soil-vegetation;
- fluctuations in the waterlevels of the La Josefina reservoir;
- natural and artificial reservoirs.
- sources of water pollution (urban/industrial, waste waters, solid wastes, run off etcetera).

Analysis

The major environmental impacts related to water have to be described in the Strategic EIS, including e.g.:

- inventory of water resources data and evaluation of water availability in terms of quantity and quality:
 - . expansion of urban areas and subsequent construction or paving of new and old roads changes the surface runoff considerably, possibly leading to high peaks and risks of more flooding in downstream areas;
 - . the alteration of the existing river hydrology regime should be predicted and an analysis made of the effects on the water balance including losses of water from reservoir evaporation and possible seepage into the underlying subsoil;
 - . amounts of sediments expected to accumulate in the natural reservoir should be estimated: sedimentation will reduce the storage capacity. Reduced downstream transport of silt may introduce erosion problems in the riverine zone. Changes in water velocity and discharge, sedimentation and erosion, require constant monitoring. Actual erosion rates and changes in these as related to development should be collected and evaluated;
 - . drinking water in the community of Paute and other minor urban centres in the valley is of questionable quality and insufficient, it is taken from small springs in the upper slopes above the villages;
- assessment of present water use, taking into account different purposes and determination of short-term and long-term waterneeds;
 - . increasing water demand in the urban areas because of population increase, urban extension and industrialization;
 - . increasing water demand in the rural areas because of population growth, expansion of cultivated areas and increase in cultivation intensity (available irrigation potential);
 - . irrigation water, both surface and subsurface water;
 - . methods and efficiencies of farmers irrigation methods;
 - . relationship between irrigation and erosion hazard.

- identification of problem areas that need priority actions, with special attention to pollution:
 - . urbanization increases the amounts of waste water and solid waste for disposal. At present the major urban centres like Cuenca, Azogues, Biblián, Paute, Gualaceo lack any type of sewage treatment. Untreated municipal waste water is discharged directly into the rivers. In Cuenca construction of a sewage treatment plant is expected to start this year. No such plans exist for the other above mentioned urban centres;
 - . nutrients from domestic and industrial wastewater discharges or excess fertilizer disappears as runoff directly into the river and may result in eutrophication problems in the reservoir;
 - . industrial wastewater effluent affects the water quality and so does the dumping of solid waste products into the river. Hazardous and toxic substances such as certain heavy metals are a potential risk since their effects may be irreversible;
 - . at present the reservoir acts as an effective sediment trap. Contaminated waters of the upstream catchment decrease in flow velocity here and loose their heavy metal load as these elements are adhering/fixed to the clay particles. This process would lead to an improvement in waterquality downstream of the natural dam.

5.2.2 Biotic factors

Description

- reconnaissance maps of natural vegetation zones, including natural grasslands and natural forests e.g. Mazán;
- inventory of flora and fauna, their interrelations and threatened species;
- interrelations, stability and vulnerability of ecosystems (regional, national and international importance of ecosystems);
- maps of reserves and national parks in the study area (Cajas and Sangay) with brief description of importance;
- description of other nature values in the area (e.g. Baños);
- description of conservation practices in agriculture.

Analysis

An analysis of the problem areas and impacts concerning the biotic factors must include the following subjects:

- extension of the agricultural frontier affecting the natural vegetation (forests, shrubs and natural grasslands);
- disappearance of natural vegetation because of an indiscriminate use for fuelwood and construction, mining and road construction;
- degradation of natural grasslands caused by the grazing of herds;
- lack of conservation practices in agriculture (living barriers, terraces, crop rotation, contouring, stripcropping etcetera);
- excessive and inadequate use of pesticides and fertilizers;
- the national parks in the area (with great hydrological and ecological potentials) do not dispose of adequate management plans and controlling systems.

5.2.3 Infrastructure and utilities

Description

The Strategic EIS has to describe the main ongoing and planned road construction works, including major bridges, according to the following characteristics:

- type (paved or not, all weather or seasonal);
- siting/construction/design;
- traffic use, density, frequency;
- hazardous zones;
- sensitive or protection areas or habitats (parks, reserves).

An equal inventory has to be made for:

- all larger and smaller mining actions in the catchment with consequent pollution risks;
- power plants;
- existing and planned dumps of solid waste;
- high tension posts and wires;
- irrigation infrastructure;
- infrastructure for drinking water.

Analysis

The impacts of roads and other infrastructural operations must be estimated and described in the Strategic EIS, such as:

- roads as sources of gully erosion, land degradation, vegetation damage, landslides, loss of top soil, altering surface runoff, drainage, infiltration and sedimentation, coverage of fields by excess construction materials;
- health hazards and environmental risks through air and soil pollution, noise, dust, oil spills, increase of accidents, death tolls, disruption of local land use, resettlement, expansion of urban centres along routes etc;
- in the eastern part of Azuay a great number of informal gold mining operations are taking place with major consequences for the adjoining surface and subterranean waters (mercury pollution). Moreover indiscriminate cutting of forest takes place in this context;
- the mining industry receives little government attention as compared with the extraction of hydrocarbons. Finances for controlling mining operations are lacking and have to be asked from the mine owners;
- domestic solid waste is dumped along roadsides, high in the mountains, as has been observed along the road between Azogues and Paute. The solid waste is not covered, so odours and smoke occur, litter is blown into the surrounding fields and solid waste products cover mountain slopes. Apart from the aesthetic effect, hazardous materials in the solid waste may contaminate underlying soil and surface runoff.

5.2.4 Socio-economic factors

Population

Description

- total population;
- population density;
- distribution and growth according to age, sex and urban or rural residence;
- fertility;
- birth rates, death rates;
- child mortality;
- family size;
- economic active population;
- different users groups;
- different socio-economic groups.

For these demographic indicators, with the help of maps, zones have to be distinguished that have different intensities. The reasons for these differences have to be described. The distinct intensities also have to be crossed with the state of the environment in each zone.

Finally the indicators have to be compared to the corresponding provincial and national indicators.

Analysis

The most significant problems in relation to the environment have to be described, such as:

- pressure of the population on the natural resources, resulting in a mean farm size of less than 0,5 ha. (minifundism);
- migration from zones with high environmental degradation;
- lack of family planning especially in the poorest part of the population, which gives rise to a more than average family size, nurturing in that way a vicious circle of poverty, malnutrition, child mortality and environmental degradation;
- conflicting interests between different groups.

Poverty (*)

Description

- nutrition; local supply of basic food products in relation to the local demand, changes in food patterns (abandonment of traditional and nourishing food products);
- living circumstances: distribution and quality (materials, rooms and spaces, services like electricity, water, sewerage or latrines, waste disposal);
- health services: distribution and quality (illness and death rates in general and as a result from contamination);
- health indicators such as quality of drinking water, elimination of excretes, treatment of waste matter;
- malnutrition of children, pregnant women and nursing mothers;
- employment and income: qualification of working labour, type of profession, income of the economic active population (urban and rural), unemployment and under-employment;
- distribution of income and access to production means for the distinguished socio-economic groups;
- internal and external migration: rural-rural, urban-urban, rural-urban, (daily, weekly, seasonal and permanent), including the economic, cultural and family impacts of migration;
- actual and potential roles of women in production, family care and development of the community.

Analysis

Poverty is cause and effect of human degradation and of degradation of natural resources. In the Strategic EIS interrelations and interactions have to be described. The following chain of causes and effects or resembling ones have to be explained:

- inadequate or insufficient knowledge in the management of natural resources;
- poor quality of land (sloping, less suitable or unsuitable soil for the main crops or land use);
- scarce production;
- unemployment and underemployment;
- low incomes;
- environmental deterioration;
- migration and new roles of women.

Production (employment and economy, human activities) (*)

Description

- agricultural production (including grazelands and fruit trees):
 - . resources (use, distribution and quality of water, soils, vegetation);
 - . main products;
 - . cultivated areas and yields, comparison to national yields;
 - . use of agrochemicals and pesticides and the effects on health and the environment;
 - . use of new seeds;
- craft production (urban and rural): employment and income and resources needed in production;
- industrial production in relation to the generation of employment;
- tourism (recreational, sports, ecotourism): time, costs, impacts on natural resources;

The Strategic EIS has to describe how and where the effects of an inadequate way of production affect human health and natural resources (urban and rural), both of production processes and of residues (chemical runoff etcetera) of production.

Analysis

The main problems and impacts concern:

- way in which the production is organized (lack of infrastructure for tourism, inadequate credit system for peasants/craftsmen, inefficiency of credit lines to the bottom of the rural society, no cooperative system providing credit facilities, seeds, implements and expertise);
- marketing, commercialization.

The Strategic EIS has to investigate which of the production sectors offers a development potential, taking into account the environmental impacts.

Social organization

Description

The Strategic EIS has to make an inventory of rural and urban social organizations, and of their role in environmental management or protection. Possibilities and limitations of these organizations have to be investigated. The organizations involved may include:

- producers organizations;
- organizations in residential areas;
- peasant unions;
- syndicates.

Analysis

The Strategic EIS has to analyse the main problems in the social organizational framework:

- popular and peasant organizations may suffer from a general crisis. There may be a need for new objectives and working methods and an urgency for incorporating environmental conservation in the organizational objectives.

Education and environmental training

Description

The Strategic EIS should describe aspects of:

- formal education concerning environment (quality, access and permanent presence, contents, methods, results);
- non-formal education: (institutions, contents, influence);
- formal and informal training in the area of production and the effects in the management of natural resources.

The Strategic EIS has to describe the educational outputs in terms of knowledge, skills, competence and new behaviour.

Analysis

In the formal and non-formal education the essential problems could be formulated in the Strategic EIS in the following way:

- absence of education in the poorest population groups, which exercise strong pressure on the environment;
- limited and scattered environmental education in non-formal education.

5.2.5 Institutional factors (*)

Description

The Strategic EIS should include an inventory of the institutions which have direct responsibilities in environmental and natural resources management, either of the public or private (Non-governmental organizations, NGO's) sector. See also appendix 7. Attention should be given to:

- capacities of the institutions involved (national, regional and local levels) with:
 - . existence of sufficient and trained staff;
 - . capacity for effective management and planning of natural resources and the environment;
 - . sufficiency or insufficiency of equipment and materials available for realizing its tasks;
 - . available economic resources to cover working expenses and investments;
 - . geographical reach (area covered, number of benefited persons, number of communities and groups attended per sector, type of activities developed);
- the existence of mechanisms orientated towards coordinated action at plan and programme level, specific projects and/or actions (mechanisms of exchange of information and experiences: networks, panels, database etcetera);
- the existence of an appropriate legal framework for control and monitoring systems for:
 - . water management (water pollution control, application and distribution of water and watershed management);
 - . soil management (soil conservation);
 - . solid waste management;

- emergency response/disaster prevention;
- natural risk management in planning and execution of works;
- protection of natural and wild life areas (ecological resources);
- protection and management of catchments;
- exploitation of mines and quarries;
- regulation of practices that pollute the environment and affect human health.

Analysis

The Strategic EIS has to analyse the most eminent aspects of the institutional shortcomings in terms of:

- weakness of policies, mechanisms and instruments for planning directed to environmental management;
- lack of institutional coordination (generalised duplicity of functions);
 - especially in the management of the preliminary and posterior actions concerning the disaster of La Josefina the problems of institutional coordination became evident (intense struggles because of the management of economic resources and leadership). In spite of the existence of permanent regional institutes, like CREA, the Government chose to form an ad-hoc committee, which was responsible for the actions of reconstruction (El Consejo de Programación de Obras Emergentes);
 - the actions of this Consejo de Programación, because of its interim and emergency character do not form an orderly package of projects, but merely a set of disperse actions attacking specific problems;
 - about 15 NGO's and governmental agencies (CECCA, Fundación Mazán, Habiterra, Vida, Donum, FEPP, SENDAS, CREA, MAG, MOP, INAMHI, INECEL, Universidades, Consejos cantonales etcetera) carry out works of different size and reach with total autonomy and independence and with minimal coordination. This reduces considerably the potential impact of the actions;
- existence of a staff that is not familiarized with environmental issues (in terms of knowledge, expertise and management concerning environmental issues) at public level;
- execution and enforcement of existing regulation; in spite of the existence of numerous laws and institutions that regulate and are responsible for an adequate environmental administration, these are not fulfilled in an appropriate way;
- the capacity of the intervention of the State in solving the most important problems in the region is doubted due to generalised institutional weakness;
- the new government has proposed the following measures for institutional strengthening and efficiency improvement:
 - radical decrease of the number of institutions and staff;
 - change of roles: the central government mainly has a normative role in the determination of policies;
 - decentralization: sectoral and local agencies are responsible for execution of plans and enforcement of regulations;
 - privatization: the state stops being 'impresario' and will hand over the responsibility for the productive sectors to the private sector;
- actually the Government promotes as a legal instrument of decentralization the new law of 'Regional Development', that establishes the regions as decentralized governmental units, strengthening the actual regional instances (CREA amongst others) and forming others where they do not exist (North, capital and Chimborazo). However, these new regions will be formed according to criteria of political-administrative division that do not take into account natural regions.

APPENDIX 7

Institutions and their functions in environmental administration in Ecuador

(from reference 4, Appendix 5)

Area Estratégica de Gestión Ambiental	ORGANISMOS PRINCIPALES RESPONSABLES DE GESTIÓN AMBIENTAL, POR FUNCIONES					
	Administración	Inventario	Investigación	Planificación	Protección	Control
1.- Biodiversidad	Ninguna	INIAP, CLIRSEN, MAG, Universidades, ONG's	INIAP Universidades, ONG's	Ninguna	Parcialmente MAG e INEFAN	Ninguna
2.- Areas Naturales Protegidas	INEFAN	INEFAN, Fundación Natura y otras ONG's	INEFAN Fundación Natura y otras ONG's	INEFAN, CETUR	INEFAN, INECEL	INEFAN
3.- Bosques	INEFAN (parcialmente)	INEFAN PREDESUR, CREA, CLIRSEN	INEFAN, INIAP Universidades, ONG's	INEFAN (parcialmente)	INEFAN (parcialmente), INECEL	INEFAN (parcialmente)
4.- Recursos Costeros	MAG, MICIP, MEN, MDN, MIT, INERHI, INEFAN, CETUR, PETROECUADOR, CODIGEM, IERAC	MAG, MICIP, MEM, MIT, INERHI, INOCAR, INP, CODIGEM, IERAC, CLIRSEN, CETUR	MAG, MICIP, INOCAR, INP, CODIGEM	MAG, MICIP, MEM, MDN, MIT, INEFAN, CODIGEM, INERHI, INP, CETUR	MAG, MICIP, INEFAN, INP, INERHI, MEM, CETUR	MAG, MICIP, MEM, MDN, MIT, INERHI, INEFAN, IERAC, CETUR
5.- Sistemas Ecológicos Importantes	MAG, INEFAN, INGALA, GP Islas Galápagos	MAG, INEFAN, E. Charles Darwin, ONG's, IERAC, CLIRSEN, MIT, CETUR	INIAP, E. Charles Darwin, INEFAN, ONG's, MIT, CETUR	MAG, IEA, INEFAN, MIT, CETUR	MAG, IEA, INEFAN, CETUR	MAG, INEFAN
6.- Atmósfera	Ninguna	IEOS, ONG's INAMHI, INECEL	ONG's Universidades, IEOS	Ninguna	CIPA	CIPA, MICIP
7.- Suelos	Ninguna como recurso Parcialmente MAG, INEFAN, IERAC, MDN, Municipios, INCRAE	MAG, INERHI, CLIRSEN, CEDEGE, CREA, CRM, PREDESUR, INEFAN, INECEL, INEC	MAG, INIAP	MAG	Parcialmente MAG, CIPA	Parcialmente MAG, IERAC, INEFAN, MDN, Municipios, INCRAE
8.- Agua (dulce)	INERHI	INERHI INAMHI	INERHI	INERHI, INECEL, IEOS, CEDEGE, CRM, CREA, PREDESUR, Municipios	INERHI, CIPA	INERHI, CIPA, MDN
9.- Bellezas Escénicas	Ninguna en conjunto Parcialmente INEFAN, MIT, CETUR	MIT, CETUR, INP, INEFAN	MIT, CETUR, ONG's	MIT, CETUR, INEFAN	Ninguna en conjunto Parcialmente INEFAN	MIT, CETUR, INEFAN
10.- Recursos Hidroeléctricos	INECEL	INECEL, INE	INECEL, INE, ONG's	INECEL, INERHI, Empresas Eléctricas, ONG's	INERHI, INECEL	MEM
11.- Recursos de Energía Nuclear	Ninguna	CEEA	CEEA, Universidades	CEEA, MSP	CEEA, Usuarios	CEEA
12.- Recursos de Energía no convencionales	INE	INE	INE, Universidades, otros organismos, ONG's	INE, Varios organismos y ONG's	INE, usuarios	INE
13.- Minerales y rocas	CODIGEM	CODIGEM	CODIGEM Universidades ONG's	CODIGEM, ONG's	CODIGEM, MEM	MEM, MAG
14.- El Petróleo	PETROECUADOR	PETROECUADOR	PETROECUADOR	PETROECUADOR Empresas Concesionarias	PETROECUADOR	MEM
15.- Población	CONADE	INEC	CONADE, INEC, MSP	CONADE	Ninguna Especifica	CONADE
16.- La Pobreza	Ninguna	Ninguna	CONADE y muchas instituciones y ONG's	Ninguna	Ninguna en forma especifica	Ninguna
17.- Salud	MSP	MSP, INEC, IESS	MSP, varias instituciones y ONG's IESS, JBN	MSP, IESS, MDN	MSP, INERHI, MAG, CIPA	MSP
18.- Saneamiento	MVDU, IEOS, Municipios	IEOS	IEOS, Municipios, ONG's	IEOS, Municipios	IEOS Municipios	MVDU, IEOS
19.- Drogadicción	CONCEP	CONCEP, ONG's	MSP, CONCEP, ONG's	CONCEP, MSP, varias instituciones de salud	CONCEP	CONCEP, Policía, INTERPOL

Área Estratégica de Gestión Ambiental	ORGANISMOS PRINCIPALES RESPONSABLES DE GESTIÓN AMBIENTAL, POR FUNCIONES					
	Administración	Inventario	Investigación	Planificación	Protección	Control
20.- Educación	MECD	MECD, Fundación Natura y otras ONG's	MECD, Fundación Natura y otras ONG's	MECD, ONG's	MECD	MECD
21.- Ciencia y tecnología	CONACYT	CONACYT	CONACYT Universidades, Centros de Investigación tecnológica, INIAP	CONADE, CONACYT	Ninguna	CONACYT
22.- Calidad de Vida Urbana	MVUD, MG Municipios, Policía, CNT	MVUD, Municipios, INEC, ONG's, MSP, IEOS, CME	MVUD, Municipios, Universidades, ONG's MSP, IEOS, CME	MVUD, Municipios, IEOS	Policía, Municipios	MVUD Municipios
23.- Calidad de Vida Rural	MBS, MG, Municipios MAG	MBS, Municipios, MAG INEC, ONG's	MBS, MAG, IERAC, ONG's	MBS, Municipios, Consejos Provinciales MAG	Ninguna	Ninguna
24.- Organización Social para la Gestión Ambiental	MBS, MAG	MBS, MAG, ONG's	MBS, ONG's Universidades	MBS, ONG's	Ninguna	MBS, MAG
25.- Infraestructura de desarrollo	MOP, MBS, INERHI, INECEL, DAC, CEDEGE, CRM, CREA, PREDESUR, Consejos Provinciales, Municipios	MOP, MBS, INERHI, INECEL, DAC, CEDEGE, CRM, CREA, PREDESUR, Consejos Provinciales, Municipios CPE	MOP, INERHI, INECEL, DAC	MOP, INERHI, INECEL, DAC, CEDEGE, CRM, CREA, PREDESUR, Consejos Provinciales, Municipios	Ninguna	Ninguna
26.- Impactos Ambientales de la Actividad Industrial	MICIP	MICIP, CENDES, INEC, Cámaras de Industrias, ONG's	CENDES, Universidades, ONG's	MICIP, Cámaras de Industrias	MICIP, CIPA, INERHI	MICIP, INERHI, CIPA, IEOS, MAG
27.- Riesgos, Desastres y Emergencias Ambientales	Defensa Civil	DDC, INEMIN, INERHI, INOCAR	INEMIN, INERHI, INOCAR, Universidades ONG's	INEMIN, INERHI, INOCAR, MICIP	Defensa Civil	Defensa Civil INERHI, INOCAR, INEMIN, MAG
28.- Los medios para la Gestión Ambiental	MECD, CONACYT, CLIRSEN, MAG, MFCP, MRE, SENDA, MIT	MECD, CONACYT, CLIRSEN, MAG, SENDA, MIT	SENDA, MIT, CONACYT, MECD, ONG's	MRE, SENDA, MIT, CLIRSEN, MAG	Ninguna	Ninguna

List of abbreviations

AME:	Asociación de Municipalidades del Ecuador
CEDEGE:	Comisión de Estudios para la Cuenca del Guayas
CEEA:	Comisión Ecuatoriana de Energía Atómica
CENDES:	Centro de Desarrollo Industrial
CETUR:	Corporación Ecuatoriana de Turismo
CI:	Cámaras de Industrias
CIPA:	Comité Interinstitucional de la Protección del Medio Ambiente
CLIRSEN:	Centro de Levantamiento Integrado de Recursos Naturales con Sensores Remotos
CNT:	Consejo Nacional de Tránsito
CODIGEM:	Corporación de Desarrollo e Investigación Geológico Minero Metalúrgica
CONACYT:	Consejo Nacional de Ciencia y Tecnología
CONADE:	Consejo Nacional de Desarrollo
CONSEP:	Consejo Nacional de Control de Sustancias Estupefacientes y Sicotrópicas
CP:	Consejos Provinciales
CPE:	Consejo de Puertos Ecuatorianos
C.P. Islas Galápagos:	Comisión Permanente para las Islas Galápagos
CREA:	Centro de Reversión Económica de Azuay, Cañar y Morona Santiago
CRM:	Centro de Rehabilitación de Manabí
DAC:	Dirección de Aviación Civil
DDC:	Dirección de Defensa Civil
E Ch D:	Estación Charles Darwin
FN:	Fundación Natura
IEA:	Instituto para el Ecodesarrollo Regional Amazónico
IEOS:	Instituto Ecuatoriano de Obras Sanitarias
IERAC:	Instituto Ecuatoriano de Reforma Agraria y Colonización
IESS:	Instituto Ecuatoriano de Seguridad Social
INAMHI:	Instituto Nacional de Meteorología e Hidrología
INCRAE:	Instituto de Colonización de la Región Amazónica Ecuatoriana
INE:	Instituto Nacional de Energía
INEC:	Instituto Nacional de Estadísticas y Censos
INECEL:	Instituto Ecuatoriano de Electrificación

INEFAN:	Instituto Ecuatoriano Forestal y de Areas Silvestres y Areas Naturales
INERHI:	Instituto Ecuatoriano de Recursos Hidráulicos
INGALA:	Instituto Nacional Galápagos
INIAP:	Instituto Nacional de Investigaciones Agropecuarias
INOCAR:	Instituto Oceanográfico de la Armada del Ecuador
INP:	Instituto Nacional de Pesca
INPC:	Instituto Nacional de Patrimonio Cultural
INTERPOL:	Policía Internacional
JBN:	Junta de Beneficencia Nacional
M:	Municipios
MAG:	Ministerio de Agricultura y Ganadería
MBS:	Ministerio de Bienestar Social
MDN:	Ministerio de Defensa Nacional
MECD:	Ministerio de Educación, Cultura y Deportes
MEM:	Ministerio de Energía y Minas
MFCP:	Ministerio de Finanzas y Crédito Público
MGP:	Ministerio de Gobierno y Policía
MICIP:	Ministerio de Industrias, Comercio, Integración y Pesca
MIT:	Ministerio de Información y Turismo
MOP:	Ministerio de Obras Públicas
MRE:	Ministerio de Relaciones Exteriores
MSP:	Ministerio de Salud Pública
MVDU:	Ministerio de Vivienda y Desarrollo Urbano
ONG's:	Organizaciones no Gubernamentales
PETROECUADOR:	Empresa Petrolera Ecuatoriana
PN:	Policía Nacional
PREDESUR:	Subcomisión Ecuatoriana de las Cuencas Puyango-Tumbes y Catamayo-Chira, Programa de Desarrollo Regional del Sur del Ecuador
SENDA:	Secretaría Nacional de Desarrollo Administrativo

APPENDIX 8

Definitions used by the Commission for EIA

A natural hazard is the set of conditions in the natural environment leading to such a decrease in e.g. the stability of a slope (landslide) or the probability of extreme discharges of a river (flood) that the safety factor is reduced to or below unity.

A man-induced hazard is the set of environmental conditions, resulting from human activities, potentially leading to natural and man-made disasters, diseases and degradation of ecological, natural and economic resources.

Risk as based on hazard then qualifies and quantifies the probability of the danger to human life or property when the conditions underlying hazard are given free way.

Effects denote the expression of the results after a hazard has translated itself in a disaster. It will measure the damage or advantages resulting in the affected area in terms of environmental, quality of life and economic parameters.'

Problems are the disadvantages and impediments to human activity and the further safe exploitation of the affected system (area with all its utilities).

Mitigation is considered as preventing or reducing negative effects.

Sustainable regional development should include:

- Conservation of ecological resources;
- Sustainable exploitation of natural and economic resources;
- Reversal of processes causing environmental degradation;
- Minimization of natural and man-induced hazards;
- Minimization of adverse environmental impacts from all human, public and economic activities and infrastructural works.

Environmental management is defined as the managerial and operational system to fulfil the targets for environmental improvement and sustainable development in a region. As such environmental management includes:

- ecologically/environmentally sound land use/urban planning;
- management of all systems for pollution prevention and control;
- provision of adequate health-related public services;
- disaster preparedness/prevention and emergency response;
- environmental awareness and training.

APPENDIX 9

Methodology of hazard analysis

The methodology of hazard analysis (and specifically in stability analysis) in the earth sciences is based on gathering the following information: geological, geomorphological inventories of materials, form and processes underlying landform. Data on vegetation, land-use, hydrology, seismic activity and meteorological conditions are also necessary and are normally coupled via attribute tables in a geographic information system (GIS).

Three main approaches depending on time available, type of problem and expertise may be recognized:

- the first consists mainly of a quantitative geomorphological inventory in which the experienced specialist classifies land units in the field survey (supported by airphoto interpretation) directly as to their hazard potential according to a previously tested legend. The land units then receive a rating;
- the second method adds a quantitative element through testing of rock strength, hydrological data et cetera;
- the third method making use of the former methods bases itself also on a statistical use of data describing land units and feeds these into a GIS.

The difference in map scales and involved time is clear. The latter more quantitative approach still makes use of a qualitative delimitation of land units.