SIECA

SECRETARÍA DE INTEGRACIÓN ECONÓMICA CENTROAMERICANA

THE TRANSPORT SECTOR IN THE REGIONAL PLAN FOR REDUCTION OF DISASTERS

Version discussed with the SG-SICA,
Based on the one approved on June 16, 2000,
In compliance with Resolution 01-2000 (COMITRAN XXII)

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ANNEX 1

RESOLUTION 02-2000 (COMITRAN XXII)

(THE TRANSPORT SECTOR IN THE REGIONAL PLAN FOR REDUCTION OF DISASTERS)

The Sectoral Council of Ministers of Transport for Central America

WHEREAS

1. That in compliance with Resolution 01-99 of the Twenty-first Meeting of COMITRAN in November of 1999, SIECA implemented, with the support of the Ministry of Public Works and Transport of Costa Rica and collaboration of the Coordination Center for the Prevention of Natural Disasters in Central America, CEPREDENAC, the OAS Unit of Sustainable Development and Environment and the Central American Commission of Maritime Transport, COCATRAM, a workshop which took place at the Condesa hotel in San Rafael de Heredia during the 2nd and 3rd of last March, for the creation of a plan directed to preventing and mitigating the disasters in the Central American transport sector.

2. That at the workshop discussions it was agreed that the countries of the region have given very little attention to the subject of preventing and reducing disasters in the transport sector, a sector of great vulnerability, as seen with what occurred at the end of 1998 with hurricane Mitch.

3. That from the workshop documents and discussions, there have been enough elements to create a regional project to tackle the subject of preventing and mitigating disasters in the Central American transport sector, which must be integrated in the regional plan for preventing disasters, coordinated by CEPREDENAC, as decided at the Summit of the Presidents of Central America in October of 1999.

4. That the document of the project to be presented at the meeting in Madrid has been created by SIECA and presented at this meeting of COMITRAN, and also at the meeting of the Planning Directors and/or Homologous Technicians of the Ministries of Transport for Central America.

RESOLVED

1. Consider received, the project titled The Transport Sector in the Regional Disaster Plan, which was prepared by SIECA as Executive Office for COMITRAN, as supporting the request for financial aid from the International Community for its implementation during the next meeting of the Regional Consultant Group for Central America, to be held in the city of Madrid, Spain.

2. Instruct its Executive Office, SIECA, so that, at its headquarters, it may summon a meeting with the representatives assigned by the Ministries of Transport of the countries, within a term of thirty days, so that said representatives, together with SIECA, may review and approve the final version of the documents to be presented in Madrid in 2001.

In the city of Tegucigalpa, Honduras, on the twelfth of May of the year two thousand.

Tomás Lozano Reyes
Secretary of Public Works,
Transport and Housing
Of Honduras

Juan Mena Murillo
In representation of the
Minister of Public Works and Transport
of Costa Rica

José Ángel Quirós Noltenius
Minister of Public Works, Transport,
Housing and Urban Development
Of El Salvador

Ernesto Ramírez Pereira
In representation of the Minister of
Communications, Infrastructure and Housing
of Guatemala

Edgar Bohorquez
In representation of the Minister of
Transport and Infrastructure
Of Nicaragua

[1] National Laboratory of Materials and Structural Models (LANAME). Transport Sector Strategy for its Incorporation in the Basic Plan of the Regional Plan for Reduction of Disasters. Universidad de Costa Rica. March 2000.

International Development Bank. The Challenge of Natural Disasters in Latin America and the Caribbean. IDB Plan of Action. March 2000.

ECLAC, IDB. A subject of Development: Reducing Vulnerability to Disasters. LC/MEX/L.428. March 7, 2000.

CEPREDENAC. Regional Plan for Reducing Disasters. Year 2000.

INTRODUCTION

The present document for the project of Incorporation of the Transport Sector in the Regional Plan for Disaster Reduction, was prepared by the Central American Economic Integration Secretariat (SIECA), as the Executive Department of the Sectoral Council of Ministers of Transport for Central America (COMITRAN), for its presentation to the cooperating community at the next Meeting in Madrid of the Central American Regional Consultant Group, GCR-CA, coordinated by the Inter-American Development Bank (IDB).

SIECA would like to thank the Coordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC), for coordinating the activities that, according to the Declaration of Guatemala II of the Central American Presidents, should be complied with in order to achieve its objectives during the 2001 to 2005 quinquennium. The Central American Quinquennium for the Reduction of Vulnerability and Disaster Impact, held for the purpose of adopting the Strategic Framework for the Reduction of Vulnerability and Disasters in Central America.

They would also like to thank the National Laboratory of Materials and Structural Models of the Civil Engineering School of the University of Costa Rica (LANAMME), for their participation and advise that made it possible to put on the regional workshop in the city of San Jose, Costa Rican, on the 2nd and 3rd of March of 2000. The document on the Strategy of the Transport Sector was presented at this workshop, to be incorporated in the Basic Plan of the Regional Plan for Reduction of Disasters.

EXECUTIVE SUMMARY

In compliance with Resolution 02-2000 (COMITRAN XXII), the Sectoral Council of Ministers of Transport approved, on May 12, 2000, the presentation of the Program titled **THE TRANSPORT SECTOR IN THE REGIONAL PLAN FOR REDUCING DISASTERS**, to the international community for its technical cooperation and financing.

The object of this Program is to correct technical aspects of the infrastructure of the means of transport that constitute the Central American trade corridors, at those points identified as highly vulnerable to the natural and man-made phenomenon, caused by a combination of climatic factors, geographic characteristics, mismanagement of the environmental impact, and by other processes caused by man.

The infrastructure of the system of the Central American transport sector is what allows the handling of the cargo from the foreign and inter-regional trade, and therefore, the governments of the isthmus are greatly interested in procuring its permanent operation.

The Central American international and inter-regional trade have three road corridors: Natural (Pacific), Alternative A (Central), Alternative B (Atlantic) and some connections (mainly access roads to the important seaports of the region).

The activities described in this document, are aimed at developing a management system for the transport sector, in order to decrease its vulnerability to the impact of natural and man-made disasters, composed of three main phases:

a) Evaluation of the existing risk,
b) Identification and creation of specific mitigation programs to be implemented within a certain timeframe, and
c) Execution, follow-up (watch or monitor) of the improvements and their time evaluation.

These activities translate into products corresponding to the reduction in the vulnerability of the Road Corridors, as well as the main Seaport and Airport facilities of the region, and which are to be carried out during the 2001 to 2005 quinquennium.

The costs shall be shared by the countries and the International Community, which is expected to provide technical and financial cooperation for the amount of US$ 4 million.

THE TRANSPORT SECTOR IN THE REGIONAL PLAN FOR REDUCTION OF DISASTERS

1. BACKGROUND AND JUSTIFICATION

1.1 REGIONAL CONTEXT

Because of its geomorphology and geographic position, the Central American isthmus is a region highly favorable to natural disasters. Geological and Hydrometeorological type conditions that affect its Orography, result in disasters of various degrees that cause frequent damages to the regional infrastructure. As a result of the lack of preventive programs of a structural and non-structural nature in the governmental policies, the proper measures of prevention and mitigation are not implemented when needed. Since these disasters are not limited by borders, the vision to face them must be regional.

The most common factors that threaten the region can be summarized in the following manner: a) heavy rainfall; b) hurricanes (direct and indirect effects); c) unstable ground; d) high seismic activity; e) volcanic eruptions and f) deforestation. These elements are responsible for floods, mud slides, avalanches, landslides, erosion, destruction of landfills and a collapse of the existing infrastructure, and affect the isthmus every year.

Added to these adverse circumstances, in many cases the impact of the disasters is amplified as a consequence of the differences in the design and construction standards of the infrastructure (civil and road), technical deficiencies in relation to the implementation of said infrastructure (means of communication, human settlements, etc.), or due to a lack of protections measures (walls, breakwaters, drainage ditches), provided by disaster prevention and mitigation plans.

As the end recipients, the population is directly affected by damages to their health, loss of life and economic loss, which can reach a state of crisis when their emotional stability is also endangered. Entire communities are left homeless, and this can have a great impact on the social, economic and political stability of the country.

The Sustainable Development and Environmental Unit (UDSMA) of the Organization of American States (OAS), together with the ministers of transport and the entities having to do with disaster prevention and attention, and the support given by the United States Department of Transportation (USDOT), is carrying out collaboration activities for Central America for reducing the vulnerability of the Transport sector of the region. These activities include:

1. A study of Central America for the creation of vulnerability profiles of the PanAmerican Highway and its alternate corridors.
2. Document on the mechanisms of mutual aid in case of an emergency in the transport sector of Central America.
3. Training in the use of information concerning the natural dangers in the creation and evaluation of the projects for the transport sector.

In general terms, the high indices of social vulnerability that prevail in the Region find their historical essence in the poverty conditions that affect a great part of the population. This is just one more reason to classify the reduction of vulnerability as an inherent challenge to Central American integration.

In accordance with Resolution 02-2000 (COMITRAN XXI), that the Sectoral Council of Ministers of Transport of Central America approved at its Twenty-second Meeting in Tegucigalpa, Honduras, on May 12, 2000, the final version of the present document was approved on June 16, 2000, by the Meeting of Planning Directors and/or Homologues of COMITRAN, for its remittance to the General Secretary of the Central American Integration System. SC-SICA.

1.2 INSTITUTIONAL ACTIONS RELATED TO NATURAL DISASTERS

At the Twentieth Summit of the Presidents of Central America, held in Guatemala on October 18th and 19th of 1999, the presidents of the region subscribed the Declaration of Guatemala II, which establishes the 2000-2004 period as the Central American Quinquennium for the Reduction of Vulnerability and the Impact of Disasters, and adopted the Strategic Framework for the Reduction of Vulnerability and Disasters in Central America, appointing the Coordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC), to coordinate the activities resulting from the compliance with the objectives planned for said quinquennium.

By means of Resolution 01-99 adopted at its XXI Meeting on November 18, 1999, the Sectoral Council of Ministers of Transport (COMITRAN) instructed the Central American Economic Integration Secretariat (SIECA), to hold a regional workshop for the purpose of creating an action plan for the prevention and mitigation of natural disasters in the Central American transport sector. Said workshop was held in the city of San José, Costa Rica, on the 2nd and 3rd of March of 2000, with the collaboration of the Minister of Public Works and Transport of Costa Rica, the OAS, CEPREDENAC and COCATRAM.

On this occasion, with the support offered by the National Laboratory of Materials and Structural Models of the School of Engineering of the University of Costa Rica (LANAMME), approval was given to the document, Transport Sector Strategy, for its incorporation in the Basic Plan of the Regional Plan for Reduction of Disasters[i]. See the corresponding Reference Document, which served as the foundation for creating and justifying this project.

SIECA is currently implementing, through a consulting firm and individual consultants, the new Study of Central American Transports (ECAT 2000), which will serve as a master regional plan for the transports, and that, among other results, will contain the proposal of an investment program for the first decade of the twenty-first century. This Proposal will also take into account aspects concerning natural disasters and vulnerability.

SIECA is also carrying out a program with AID, which refers to the reduction of vulnerability to natural disasters, taking into account five large issues concerning road regulations, and which are: 1. New manual of road signs. 2. Revision of the agreement on traffic flow on the roads, including new weights and sizes of vehicles. 3. Road construction specifications. 4. Geometric standards for road design. 5. Road maintenance manual. The proposals are currently being studied at a national level, at 15 workshops to be concluded at the beginning of 2001.

2. GENERAL DESCRIPTION OF THE PROJECT AND ITS OBJECTIVES

2.1 DESCRIPTIÓN

The main object of this Program is to correct technical aspects of the infrastructure of the regional transport system, at those points identified as highly vulnerable to the natural and man-made phenomenon, caused by a combination of climatic factors, geographic characteristics, mismanagement of the environmental impact, works constructed at a time when the importance of this subject was not yet appreciated and by other processes generated by man, such as deforestation which causes soil erosion, deliberate flooding and soil manipulation.

The infrastructure of the Central American transport sector is what makes it possible to move people and manage freight from foreign and inter-regional trade, therefore, the governments of the isthmus are greatly interested in procuring its permanent operation

It is important to take into account that the vulnerability of the transport sector directly affects the increase in the vulnerability of other programs of social programming, especially public health, production and education. Reciprocally, the effectiveness of the rehabilitation and reconstruction projects implemented in disaster situations, presupposes the recuperation and strengthening of the infrastructure.

The roadways that make up the Central American trade corridors are the main transportation arteries of the region, moving tons of merchandise between the countries of the isthmus. These communication routes are of vital importance in connecting the main cities of the countries. These routes have promoted the growth of large productive regions and have resulted in the strengthening of important development areas. The International and inter-regional trade of Central America has three land corridors at its disposal: Natural (Pacific), Alternative A (Central), Alternative B (Atlantic) and some connections (mainly access roads to the important seaports of the region).

Some railways are used as transport links for foreign trade, but they do not have the inter-regional capacity that some studies would attribute them, for establishing the northern and southern railway corridors, inter-connecting these with the rest of the Central American transport system.

The seaports and airports comply with the need to transfer passengers and freight to sea and land transportation.

2.2 OBJETIVES

Reduce the vulnerability of the infrastructure of the regional transport system, for specific stretches and sectors defined as the most vulnerable to natural and man-made phenomenon, through the creation of projects and the implementation of protective and corrective operations, as well as the correct application of environmental protection measures.

3. METHODOLOGY AND PRIORITIES OF THE PROJECT

3.1 BRIEF DIAGNOSTIC

The tremendous impact that Hurricane Mitch had on Central America at the end of October of 1998 was not an isolated event. The isthmus has the sad distinction of being located in the path of many tropical storms. In fact, the word "hurricane" is believed to have originated with the Taino Aborigines that inhabited the Caribbean in the Pre-Columbian times. During the colonial period, the sea records from Spain and other European powers inform us of enormous loss of ships as a result of severe storms, many which were hurricanes. Even though Mitch was considered a highly destructive storm, the damages to the region could have been greatly reduced if appropriate mitigation measures would have been taken after Hurrican Fifi in 1971.

The integral management of disasters is not a luxury that only the more developed countries can enjoy. In fact, the developing countries are even more obligated to think of preventing new disasters when they take on the work of reconstructing, in order to guaranty the country that the immense investments needed are safe.

Central America is vulnerable to a variety of disasters due to its geological and climatic makeup, some of the most important are: earthquakes, hurricanes, volcano activity, floods and landslides. The disasters result from a lack of compatibility of the human activities with the environment in which they live; the lack of resources is another factor linked to the vulnerability of the infrastructure to the forces of nature, as this means that action is not taken in time to reduce the vulnerability and lessen the impact. The experts agree that the most important sources of vulnerability for the Regional Transport Sector are derived from:

- Inadequate planning of the infrastructure.
- Inappropriate design and construction techniques.
- Lack of policies to prevent and mitigate the disasters.
- Inadequate management of the natural resources.
- Inefficient planning of land use.
- Not enough support from the existing organizations for disaster management.

The strategic investments that are made in these areas will reduce the vulnerability and risk of greater losses resulting from natural disasters. They will also produce tangible long-term benefits and will achieve a sustainable development by incorporating the planning based on the concept of risk in the decisions to develop. They will improve the quality and

productivity of the natural resources, by building a more resistant infrastructure that will guaranty greater levels of financial and social competence when faced with extreme events.

3.2 RECOMENDED PROCESS

The proposal intends, first of all, to service the main road corridors, and also the airport, seaport and the railway sub-systems.

The Central American Ministers of Transport should, through their Planning Offices, collaborate in preparing studies to determine the critical points of the most vulnerable stretches of the Central American Land Corridors (Natural, Alternative A and Alternative B), and of the other means of transport used for trade (seaports and international airports). The main factors to be determined in the study are the vulnerability of this infrastructure to the historically known, potential natural threats, that have occurred repeatedly through the years, particularly the direct or indirect effects of hurricanes, high intensity rains, floods, unstable slopes ripe for mudslides, history of seismic activity, topographical areas and/or problem soil, inadequate drainage, unfavorable location of structures and of the road bed, etc..

3.3 METHODOLOGY FOR DEVELOPING THE PROJECT

It is proposed that a management system be developed for the transport sector, in order to decrease its own vulnerability and to strengthen its role in the overall reduction of the vulnerability and the rehabilitation and reconstruction operations needed. This system shall have three main components:

a) Evaluation of the risk conditions and of their transformations.
b) Identification and creation of specific projects, directed at eliminating, controlling or mitigating said conditions. The space projection for these short-term projects may be regional (two or more Central American countries) or national.
c) Implementation and follow-up (observing and monitoring) of the improvements and their time evaluation.

The inputs from the OAS/UDSMA-USDOT activities shall be incorporated in the development of the project, as well as other inputs that can be identified.

3.3.1 RISK EVALUATION

The following points shall be considered in evaluating risk:

a) <u>Evaluating the threat</u>.

• Hurricanes
• Intense rain
• Tremors
• Less frequent events, such as volcano activity.

• A determining/probability model and a risk map (zoning) is needed for each threat.

b) <u>Evaluating vulnerability.</u>

- Design standards (physical vulnerability).
- Construction standards (physical vulnerability).
- Preventive maintenance (physical vulnerability).
- Institutional vulnerability.
- Redundancy of the systems (functional vulnerability).

c) <u>Contrast threat/ vulnerability.</u>

- Degree of exhibition of lineal and point-to-point elements and nodes.
- Determination of the critical points of the system (physical and/or functional vulnerability, and high level threat).
- Calibration of the risk models and the fragility curves.

3.3.2 IDENTIFICATION AND CREATION OF SPECIFIC PROJECTS

- Project profiles that require execution, with emphasis on the historical points of high vulnerability and exposed infrastructure.
- The priority given to the investments should be decided by a cost/benefit analysis.
- Reduction of the vulnerability => mitigation.
- The physical and functional vulnerability is corrected with structural measures.
- The institutional vulnerability is corrected with non-structural measures.

➢ **First project:** homogenize the plans for creating the profiles of the specific projects.

3.3.3 EXECUTION, FOLLOW-UP AND EVALUATION OF PROJECTS

- Updated data bases on the existing vulnerability, project portfolios and works in execution.
- Include the concepts of risk, vulnerability and risk analysis in future projects.
- Invest not only in re-educating and preparing for contingencies, but also in strict quality control and proper maintenance. Concept of technical audit.
- Scientific investigation to adjust and re-educate the designs and codes.
- Adapt technological advances.
- Train and educate the personnel involved.

4. DESIRED END PRODUCT, INSTITUTIONAL RESPONSIBILITY AND OVERALL TIMEFRAMES.

4.1 REDUCING VULNERABILITY IN THE REGIONAL ROAD SYSTEM

The initial evaluation of risk in the regional road system, will involve the analyses and investigations already carried out and new ones to be effected. This activity, as well as the preparation of the project portfolio, must be executed with the participation and full support of the Planning Office of the Ministries of Transport, during the first year of activities.
During the second year, the operations of identifying and creating specific projects should be carried out.
The implementation, follow-up and evaluation of the results should be carried out from the third to the fifth year.

These steps are likely to overlap in time.

4.1.1 RISKS

1. Risk Analysis.

- Seismic zoning / possibility of micro-zoning.
- Studies on liquefaction of soils / alluvial sand deposits.
- Studies of potential landslides.
- Hydrometeorological phenomenon.

2. Vulnerability analysis. Inventory of information on the road corridors and their connections.
   - State of the art systems of road administration.
     - Exposed infrastructure.
     - Structural conditions.
     - History of rehabilitation.
     - Condition of pavement.
     - Technical specifications.
     - Road signs.
     - Studies on rehabilitation and reconstruction.
     - Traffic flow and loads per axle.

- Criteria of uniformity of terms and methodologies.
- Analysis of physical vulnerability.
  - Identification of deficient constructions.
  - Zoning of physical vulnerability.
    - Historical basis of damages.
    - Survey / mapping.
    - Data base.
- Analysis of functional vulnerability
  - Analysis of coincidence of physical vulnerability and lack of redundancy in: a) trade nodes, b) political interest nodes, c) population nodes.

4.1. 2 SPECIFIC PROJECTS

- Profiles of projects for preventing / mitigating disasters, in zones of high vulnerability, offering technical solutions.
  - Corrective interventions.
  - New specifications.
  - Evaluation of risk for the new projects.
  - Cost of investment.
  - Probability of occurring.
  - Economic impact of damages.
  - Social-economic aspects.
  - Alternate routes and means of transport.
  - Budget restrictions.
- Search for sources of financing.
  - Common Central American front.
  - Meeting in Madrid, 2001.

<u>Type of Projects</u>:

- Re-education / relocation of infrastructure.
- Infrastructure for reducing vulnerability.
- Modification of codes and regulations.
- Evaluation of criteria for mapping roads.
- Design of drainage systems.
- Durability of pavement materials.
- New technologies in materials.
- New technologies in control / quality assurance.

4.1.3 EXECUTION, FOLLOW-UP AND EVALUATION OF PROJECTS

- Departments that are dedicated and have authority should be assigned to follow-up on the projects (data bases).
- Technical audits of the design and construction of the road infrastructure.
- Inspection.
- Verification of compliance.
- Scientific investigation.
- Training.
- Transfer of technology.
- Develop contingency plans.
  - Quantification of damages.
  - Prioritize problems.
  - Mechanisms for immediate action.
  - Responsibilities and tasks.
  - Feedback.
- Plan of action for preventing and mitigating disasters in the Transport Sector.
  - Guidelines for general specifications of design and construction.
  - Guidelines for road management systems.

- Integrated data base.
- Dissemination and comments.
- Report of results.

4.2 REDUCING VULNERABILITY FOR SEAPORTS AND AIRPORTS

The evaluation of the risks and vulnerability, as well as the preparation of the project portfolio, must be executed during the first year of activities.

The second year shall be used in creating projects.

The evaluation and follow-up activities shall be carried out from the third year to the fifth.

4.2.1 RISKS

- Main risks: seismic activity and hurricanes.
- Critical installation in emergencies.
- With highly sensitive, high cost equipment.
- Must pay attention to permanent deformities and vibrations.

1. Risk analysis

- Particular studies for each case.
- Seismic micro-zoning.
- Geotechnical and topographic characteristics.
- Possibility of permanent deformities / vibrations occurring.
- Hurricane risks: liquefaction.
- Tsunamis risks: geometric characteristics.
- Man-made risks: oil spillage and of other pollutants.

2. Analysis of vulnerability

- Inventory of structures and equipment.
- Study of vulnerability by structure and equipment.
- In cases where liquefaction may occur: vulnerability of runways and transport systems (airports); and cranes and their rail lines (seaports).
- In cases of seismic threat: effect of vibrations on cranes.
- Behavior model of the structures when there is seismic activity.
- Fragility curves for structures.
- Evaluation of airport equipment, due to permanent deformation of the ground.
- Effects of the vibrations on the equipment.
- Behavior model of the structures when hit by hurricanes and tsunamis.

4.2.2 IDENTIFY AND CREATE SPECIFIC PROJECTS

- Active participation of the Seaport and Airport authorities.
- Profiles of the projects for preventing and mitigating natural disasters.
- Possible financing.
- Regional vision.
- Joint action in preparing and presenting the projects to the international financing agencies.

4.2.3 EXECUTION, FOLLOW-UP AND EVALUATION OF THE PROJECTS

- Updated data bases of the existing vulnerability, the project portfolio, the works in process and/or executed for the purpose of preventing / mitigating disasters.
- Include the elements of threat and vulnerability in the new projects.

5. CALENDAR AND FINANCING

In order to show the time in which the program is to be executed, as well as the financing required from the International Community, Table 5.1 has been prepared:

TABLE 5.1: INCORPORATION OF THE TRANSPORT SECTOR IN THE REGIONAL PLAN FOR REDUCTION OF DISASTERS.

Calendar and Financing

PHASES AND PROJECTS	PERIOD					FINANCING REQUIRED FROM THE INTERNATIONAL COMMUNITY (Thousands of US$)
	2001	2002	2003	2004	2005	
TOTAL						4,000
3.3.1 Evaluation of risk						2,000
a) evaluation of threat						
b) evaluation of vulnerability						
c) contrast between threat and vulnerability						
3.3.2 Identify and Create Specific Mitigation Projects						2,000
3.3.3 Execution, Follow-up of Projects for Mitigating and Evaluating Results*						

* The amount of the funds corresponds to the type of project to be implemented.