

# TECHNICAL COOPERATION PROFILE

Chile

January 30, 1998

**PROJECT NAME:** GIS-Based Planning Information System for Regional Transportation Planning and Infrastructure Management

**PROJECT NUMBER:** TC 9608011-CH

**PROJECT TEAM:** Henry Green (RE1/FI1), leader; Rolando Castañeda (COF/CCH), Wendy Venance (SDS/ENV) and David Stevens (consultant)

**UNIT WITH BASIC RESPONSIBILITY:** Finance and Basic Infrastructure Division 1 (RE1/F11) in coordination with the Ministry of Public Works of Chile, the planning offices of Region I, of the Municipalities of Arica and Iquique and those of the second selected region.

**BENEFICIARIES:** Ministry of Public Works, Chile

**FINANCING PLAN:**

IDB (Japan Special Fund):	US\$ 725,000
Local counterpart funding:	US\$ 100,000
Total Estimated Cost:	US\$ 825,000

**TENTATIVE DATES:**

Next Mission:	February 1998
Approval:	March-April 1998

## I. Background

- 1.1 South American economies are once more experiencing growth with Latin America's exports growing at twice the world rate during this decade. But in order to avoid bottlenecks and complete strangulation of the existing infrastructure annual investments through the year 2005 of between \$14 and \$18 billion are needed. The "lost" decade of the 1980s left approximately 50% of the paved roads in deteriorated conditions; not only was there a decline in the needed investments for the expansion of the existing transport infrastructure but a severely reduced expenditure for replacement and maintenance.

- 1.2 Transportation networks in developing countries historically had their origins at the principal ports and penetrated into the hinterland following the agricultural and mineral production patterns of exported products. The national highway networks have expanded greatly in recent decades, but 1990 tendencies for highway integration have been in a north-south orientation connecting major urban areas and production zones.
- 1.3 The increased intra-zonal commerce requires attention to the interconnection of the national systems and development of integration corridors along both axes and not just North-South. The development of these corridors will improve commerce among the production centers and stimulate development of the intermediate areas along the corridors. The recent XX Inter-American Congress of the Construction Industry (Oct-Nov, 1996) in Mexico highlighted the importance of three 'bioceanic' corridors connecting the major cities of the Atlantic (Buenos Aires, Montevideo, Porto Alegre, São Paulo and Rio de Janeiro) with the Chilean Ports of Valparaíso, Antofagasta and Arica (also ILO/Matarani in Peru). These bioceanic corridors have as main objectives to support the export of goods to North-America, Europe and Pacific Asia, using either Atlantic or Pacific ports and crossing through third countries when needed; also, it will increase exchange of goods and tourism between these regional countries, increasing regional markets and diminishing the cost of goods.
- 1.4 Globalization of the economy has prioritized the export sectors of each country, which in turn in the next few years will dramatically increase the flow of people and goods between South American countries and also with the rest of the world, particularly with North America, Europe and Pacific Asia. Contributing to this increase are the various commercial agreements such as the Mercosur, which will facilitate exchange of goods between Brazil, Argentina, Uruguay, Paraguay, Chile and Bolivia. Sustained growth in most of these countries' economies, together with a greater political stability has proportioned ideal conditions for significant investments by foreign corporations, which will increase the need for improved infrastructure. An integrated multi-modal transportation system is central to the development of a successful export-oriented economy.
- 1.5 In this new world scenario Chile finds itself in a strategic position, and it is aiming to transform itself into a major option for Mercosur countries that need to export through the Pacific Ocean, particularly the Argentinean border cities and along the Arica-Santa Cruz-Cuiabá corridor. Not only does Chile have the geographic advantage but also a very favorable economic situation and significant political stability. To materialize these east-west corridors and make them competitive with other transportation alternatives, significant investments in the area of infrastructure are needed to not only recover existing roads but also improve existing corridor options. Resources are limited, even more so now, adding importance to a GIS-based decision making process that can contribute to finding multi-modal transportation alternatives that will maximize the benefits to society, and which will also focus on issues of sustainable development.

- 1.6 In developing countries, and even true to a certain extent in more developed countries, fully operational GIS systems that already form a part of the decision-making process are non-existent. Even though the private sector has a key role in such areas as real estate development, marketing and forestry, it is the public sector that still carries out and consolidates most planning activities.
- 1.7 Presently, the Ministry of Public Works has insufficient planning capabilities, both at the national and regional level, to display and manage information on existing and planned infrastructure. The Regions do not have any GIS-based information system or even the information base needed to support routine decision-making regarding maintenance expenditures.

## **II. Project Objectives and Description**

- 2.1 The principal objectives of the proposed operation are implementation of a GIS-based (Geographic Information System) Planning Information System for Regional Transportation Planning and Infrastructure Management and the strengthening of existing GIS-type capabilities of the Ministry of Public Works. The focus will be on the development of a pilot planning system that will encompass one of the transversal corridors (Arica-Santa Cruz-Cuiabá) and another of the regions in Chile that will coincide with one of the prioritized passes being considered by the Andean Mountain Passes Program being developed with the Argentinean government (AR-0202).
- 2.2 The scope of the work, to be carried out by a consulting firm in coordination with the MOP, is planned in six phases as summarized below:
  - a. Phase I - Inventory of GIS users and providers in Government and Non-Government Institutions, conducting introductory GIS seminars and developing user groups.
  - b. Phase II - Institutional Assessment, Feasibility and Conceptual Design.
  - c. Phase III - Database Model and Applications Design; Software and Hardware Acquisition and Installation
  - d. Phase IV - Data Conversion; Application Development; Prototyping and System Operation.
  - e. Phase V - GIS Implementation Seminars and Workshops.
  - f. Phase VI - Preparation of Terms of Reference for subsequent phases.

**A. Initial Phases: Phase I and Phase II**

- 2.3 In order to assess GIS capabilities in the country, a survey will be performed visiting relevant and related public and private institutions to determine the extent of GIS development in the country, the available data sets (maps and alphanumeric), the availability of human resources, and current technology used. At least three introductory seminars are planned: one national and two regional ones. These seminars will help promote a common understanding of the benefits and advantages of GIS and its use for highway planning and management, providing a forum for receiving comments and feedback, and an opportunity to discuss related topics. The seminars will also be utilized to foster the formation of GIS user groups for continuing communications among the interested users and providers; as well as promoting the interchange of relevant information.
- 2.4 The consulting firm will analyze the work processes, information flow and current capabilities of the MOP, and the regional planning offices of Arica and a third location to be determined during Phase I. A conceptual design for a Mercosur level, multi-modal, GIS-based Planning Information System for Regional Transportation Planning and Infrastructure Management will be developed. Priority uses of this GIS-based system will be identified, and the spatial database model and applications design will be sketched. An intermediate report will be produced presenting the results of the GIS and Existing Data Inventory, Needs Assessment and Conceptual Design of the System. The conceptual design will take into consideration the need for a (i) a MERCOSUR level, multi-modal, GIS-based transportation database and two regional databases, one for the corridor and one for the chosen region; (ii) future development of an integrated GIS-based information system that can be accessed by the various offices of the Ministry; (iii) creation of transportation based computerized applications for transportation planning including but not limited to, road and waterway engineering designs, automated maintenance of engineering drawings, network and site analysis, as well as market, social and environmental assessments of projects, and; (iv) training and human resource development.

**B. Intermediate Phases: Phase III and Phase IV**

- 2.5 Based on the database and applications design to be completed in the beginning of Phase III, existing datasets (spatial data and alphanumeric) will be incorporated or converted to digital format. At the Mercosur level, spatial data will be compiled using 1:1,000,000 or larger maps (if existing digital spatial databases at a larger scale than 1:1,000,000 are identified then they will be incorporated). At the regional level, spatial data will be compiled using 1:100,000 or larger maps and satellite imagery that will be acquired. The Mercosur level spatial data base will include all readily-available data for Mercosur countries (from digital or analog sources) and will have at the least the following layers of information: administrative boundaries (down to the municipal level), transportation

network (including all transportation modes), conservation areas and indigenous lands, existing infrastructure (energy production, airports, ports), hydrography, transportation modeling zones (for Chile only), urban centers and extent, and corridor passes. Two regional spatial databases will be developed both at the 1:100,000, or larger, scale. One will be in the "I" Region, which corresponds to the Chilean portion of the buffered transverse corridor of Arica-Santa Cruz-Cuiabá. The second area will be in one of Chile's administrative Regions, still to be determined. The same layers of information will be compiled and updated with the satellite imagery acquired.

- 2.6 An integrated computer network linking the various offices of the MOP will be designed and the initial hardware equipment and software needed to implement this GIS-Based Planning Information System for Regional Transportation Planning and Infrastructure Management will be acquired and installed. At least three PC computers and related GIS software will be acquired and installed during Phase III; one at the MOP planning department (DIRPLAN), one at the regional office in Arica and one in the regional office of the chosen region. During installation, specific GIS training will be provided at each location, thus giving each office the opportunity to start acquiring expertise in the software before the delivery of the final products.

**C. Final Phases: Phase V and Phase VI**

- 2.7 Following the implementation of the system, three seminars will be given introducing the planning capabilities provided by such a system to the same audience; initially one national seminar and two regional ones. A workshop will also be given at each site that the system will be installed, aiming at providing technical training to those that will be in charge of using the system. Finally, Terms of Reference will be provided to allow for identification of further enhancements to the system.

**III. The Bank's Strategy In The Country And The Region**

- 3.1 The Bank has supported several GIS initiatives in the region, promoting the overall awareness of GIS technologies and seeking to strengthen the capabilities of each country's Transport Ministry and highway department. In Bolivia there is a proposal for developing GIS transport applications for the Transport Secretariat and promotion of its use. This system will support the planning process of choosing transportation alternatives for marketing products from Bolivia and Brazil, through Chilean ports. General GIS surveys and seminars have been carried out during 1995 and 1996 in Argentina and some agricultural applications have been advanced. The Bank has been requested to provide financing for strengthening the GIS capabilities in Transport which will directly support the integration corridors to Chile and with the rest of Mercosur. Similar GIS projects are envisioned for Brazil, Paraguay and Uruguay.

- 3.2 The Andean Highway Passes Program (to be partially financed with project AR-0202) will directly contribute to reducing transportation costs, further consolidating the highway integration between Argentina and Chile, which will positively impact the productive sector, supporting the increase of production at more competitive prices, in accordance to the Bank's strategy for the region. This proposed project will directly support the Andean Highway Passes Program by providing a planning tool that will guide the continuous flow of decisions that have to be made with regard to finding transportation solutions that optimize the objectives of the program from the Chilean side. At the same time it will provide those responsible for highway planning and management, modern tools that will support not only the transportation network directly related to the Andean Highway Passes Program but the whole country's highway network.
- 3.3 This program could certainly have a decisive impact on structuring and supporting a planning process which will optimize the actions needed to plan and manage existing and future transportation infrastructure, the benefits of which would extend to the countries in a region that has already taken essential steps toward integration of its economies through the establishment of MERCOSUR.

#### IV. Action Plan

- 4.1 It is envisaged that an International firm in Transportation Planning and GIS Development and also employing local experts will carry out the study. The study will cover a period of 8 months and will have an intermediate report consisting of the GIS and Existing Data Inventory, Needs Assessment and Conceptual Design of the System. Approval of this report will be a condition before initiating and completing remaining tasks.
- 4.2 Specialized supervisory consultants will also be hired to provide the needed analysis of this report, evaluation of the products delivered, and support to Bank's staff in the task of integrating this project with other GIS-related projects being supported by the Bank in Argentina, Bolivia and Brazil.
- 4.3 In the execution of this Technical Cooperation, DIRPLAN of the Public Works Ministry will provide basic office space at its headquarters in Santiago, and arrange for the cooperation of its regional offices and those of the highway department of the selected regions.

Approved by: \_\_\_\_\_

  
RE1/MGR

Date: \_\_\_\_\_

*Jan 30, 98*