

## Annex IV

Uruguay  
TC 0004017-UR

### Terms of Reference - Subprogram “B”

#### SPATIAL DATA BASE INTEGRATION TO SUPPORT RURAL INFRASTRUCTURE PLANNING AND MANAGEMENT

##### I. PROJECT OBJECTIVES

- 1.1 The *Ministerio de Transportes y Obras Públicas* (MTOP), through the *Dirección Nacional de Topografía* (DNT), has been implementing a National Clearinghouse of Geographic Data (NCGD) as part of its efforts to consolidate a National Geographic Information System (NGIS). Apart from developing and implementing the system, designed with the aim of making spatial data widely available to the country, the project has also converted to digital format a significant portion of plani-altimetric information, including 1:200.000 and 1:50.000 scale topographic maps of the country.
- 1.2 The proposed project builds upon, and strengthens, on-going development of a National Clearinghouse of Geographic Data and the development and dissemination and use of spatial digital data through integration of spatial and statistical data and application developments that will support infrastructure planning, development and management responsibilities among the participating directorates and institutions.
- 1.3 The Clearinghouse is a distributed network, electronically connected, of producers, administrators and users of geographic information. Since 1997, the databases have public access through the Internet. The central node of the Clearinghouse resides at MTOP's headquarters in Montevideo, and DNT provides the general coordination for the current ten agencies collaborating in this effort. An operator is contracted for daily operations and maintenance, and for processing inquiries and data delivery. Users pay transaction expenses and fees, as a mechanism to provide financial sustainability for NCGD's operations.
- 1.4 The Project will support the ability of the *Dirección Nacional de Topografía* (DNT) to enhance capabilities and to develop specific applications that will primarily strengthen the specific analytical and decision making requirements of the *Dirección Nacional de Vialidad* (DNV). In addition, application development support will be provided to the *Instituto de Planificación de Transporte Interurbano* (IPTI) and the *Instituto Nacional de Estadística* (INE), including specific GIS user training.

- 1.5 The DNT has converted a significant amount of needed spatial data to digital format and established the backbone of a National Spatial Data Infrastructure. The present development focus is on enhancement and expansion of spatial databases through conversion of considerable existing socioeconomic census data from INE and diverse information regarding rural areas.
- 1.6 The specific information responds to the infrastructure management and planning needs country-wide, and includes: census data for social, economic, and agricultural production characteristics; rural property maps which presently lack cartographic control for use in GIS; digital terrain models from existing topographic maps; rural land use, particularly forest plantations, irrigation systems, and related land use data which is fundamental for planning transportation of agricultural, forestry or mineral products.
- 1.7 This initiative provides further consolidation of databases and applications to contribute to other sectors such as health, education, environment and natural resources country-wide, all of which will benefit from the availability and coordination of cadastral information and spatial data.
- 1.8 Strengthening of the GIS system will contribute to the understanding of socioeconomic and environmental consequences of highway projects and of other infrastructure projects, including ones with which the bank is presently involved. Furthermore, the systems, databases and applications will provide the MTOP and the Bank with additional analytical tools and spatial data to support the studies of integration corridors. The tools and methodologies being developed for other Bank supported GIS projects will be incorporated into this project.
- 1.9 This Technical Cooperation project has two subprograms. This Subprogram “B” includes the participation of the *Instituto Nacional de Estadística* and focuses on the conversion and digital integration in the National Clearinghouse of Geographic Data of census data for social, economic and agricultural production; and data related to rural land use. This enhancement will allow the dissemination and use of digital spatial data and transportation models for purposes of infrastructure management, planning and decisions by the project participants.

## **II. SCOPE OF WORK**

- 2.1 A consulting firm that includes local participation will carry out the tasks of the program supported by this Technical Cooperation. The consulting firm must have expertise in developing solutions for transportation and environmental planning, and with capabilities and experience in spatial data conversion and GIS applications design and development.
- 2.2 The consultant will carry out the scope of work, in coordination with the *Dirección Nacional de Topografía* (DNV) and with the *Instituto Nacional de Estadística* (INE).

- 2.3 A supervisory consultant will also be hired by MTOP to provide the required analysis of the reports, evaluate the products delivered, and coordinate with local counterparts. The supervisory consultant will also provide support and coordinate with the Bank's staff (COF/CUR and RE1/FI1) in the task of integrating and making compatible this project with other GIS-related projects supported by the Bank in Uruguay and in the Region (Perú, Bolivia, Chile and Argentina).

**A. Description of Tasks**

- 1. Georeference INE's urban cartography for integration to DNT base maps at 1:50,000 scale**
- 2.4 INE's existing urban cartography in digital format, was originally compiled at 1:5,000 and 1:10,000 scales. For approximately 40 urban areas with greater than 10,000 inhabitants, the definition of urban limits, when properly georeferenced, will provided a useful update to the 1:50,000 scale digital base maps of the DNT.
- 2.5 Each of approximately 40 urban areas will be georeferenced using available control data including existing GPS measurements. Following georeferencing, the urban limits will be integrated with DNT's digital base maps at 1:50,000 scale.
- 2. Create a spatial database for INE's rural census cartography, integrated to DNT's base maps, 1:50,000 scale.**
- 2.6 Socioeconomic data for rural areas, from the most recent censuses conducted and archived by INE with rural census cartography with different levels of data aggregation, in digital format, were originally compiled at 1:200,000 scale. These census cartography units will be transferred and recompiled, with appropriate attribution of each census cartography unit, to DNT's digital base maps at 1:50,000 scale. Census aggregation units will be georeferenced.
- 3. Database design for integration of agricultural production data to the spatial databases.**
- 2.7 Agricultural production data is being collected in a current agricultural census. Prior to its release, a database design, georeferenced structure and methodology for conversion and integration will be prepared. Together INE and DNT will define the smallest area of data aggregation. These areas will correspond to the georeferenced units defined above. The database design will enable each theme of the agricultural production data will be appropriately attributed for integration into INE's and DNT's GIS.
- 4. Coordinate this project with other GIS-based projects in Uruguay and throughout the region, specifically in the Mercosur area of influence.**
- 2.8 This project will develop databases and applications that shall be coordinated made digitally compatible with other GIS-based projects. In particular, the project supported by the Technical Cooperation "Spatial Information System for National

Infrastructure Management and Planning” (TC-9811911-UR) requires access and use of the databases developed in the Conaprole sample project area.

**5. Provide Seminars, training and workshops with participants from all participating directorates, institutions, and other government agencies.**

- 2.9 A Project Seminar should be planned at the beginning of the project with those participants within MTOP (DNT, DNV, etc.), INE, and other public agencies as appropriate, to explain each aspect of the project, discuss the procedures, expected applications and products, training plans, etc.
- 2.10 Project Workshops are designed to promote, through presentations and demonstrations, a common understanding of the benefits and advantages of GIS for updating, maintenance, and analysis of census data and other INE’s databases, particularly for infrastructure planning and analyses, including its use for transportation demand modeling and environmental impact assessment.
- 2.11 Training will be required for GIS users of the databases, applications, and GIS tools developed in the project. Forty (40) hours of hands-on training will be provided to a group of up to 10 professionals from the MTOP and up to 5 professionals from INE. Training must also include fundamental GIS concepts and procedures, provide hands-on experience, and the necessary understanding of how the spatial databases developed and the tools being provided can support the activities of all participating directorates.

**6. Acquire hardware and software for microfilm scanning.**

- 2.12 The consulting firm shall provide INE with a GIS workstation with updated GIS software, compatible with DNT’s geographical information systems. All hardware acquired by the consulting firm for this program, as specified in these Terms of Reference, shall be formally donated to INE not later than the end of the project. Furthermore, any software licenses paid by the Consultant for the purposes of this project, as specified in these Terms of Reference, shall be registered in the name of INE.

**7. Prepare Terms of Reference for subsequent needs, including interface to the property registry.**

- 2.13 Terms of reference will be developed to allow for identification of further enhancements to the databases, applications, procedures, and systems that may be incorporated into other Bank supported projects. As procedures and socioeconomic, agricultural and rural land use databases are integrated into GIS applications and analyses, procedures also need to be developed in the future for countrywide coverage to enable full integration in the GIS and access to support infrastructure planning and analyses.

### **III. PRODUCTS AND SERVICES**

- 3.1 The products and services described in this paragraph are part of the deliverables. All reports shall be presented to the beneficiaries and to the Bank for review in a total of 12 copies in both hard copy and digital format for each, three copies to the Bank, four copies to INE and five copies to MTOP.

#### **B. Reports**

- 3.2 The following reports will be prepared in the course of the project.
- a. Applications Design Report -- to include the technical specifications of the applications developed. Also, to be included in this report are the Data Dictionary and Metadata information developed for the digital data produced.
  - b. Final Report – The Final Report will include a description of activities carried out during the development of the project, the Terms of Reference for subsequent phases, together with an analysis from the seminars and workshops, and recommendations for future activities. The final report will include an executive summary in both English and Spanish.

#### **C. Databases**

- 3.3 The following databases will be compiled:
- a. Urban areas database, compiled from INE's cartography and integrated to DNT's digital base maps at 1:50,000 scale (Task 1)
  - b. INE's rural census cartography, georeferenced and recompiled to DNT's 1:50,000 scale base maps and integrated into the GIS (Task 2)
  - c. Agricultural production databases - design to enable structure and methodology for georeferenced integration of future data into the GIS (Task 3)

#### **D. Spatial Applications and/or Standards and Criteria**

- 3.4 The study will include the following applications:
- a. Integration of rural and urban census cartography (Task 3)
  - b. Coordination with related GIS projects in Uruguay and Mercosur (Task 4)

**E. Hardware and Software**

- 3.5 The consulting firm will provide the hardware and software for a GIS workstation and updated GIS software licenses to support INE's GIS activities.

**F. Training and Other Materials**

- 3.6 Training Materials – all training materials utilized for the various seminars, training and workshops should be delivered in the original format. A set of training materials should be provided to each participant in the training courses and three sets of training material in both hard copy and digital format should be provided to both the Bank and each of the two beneficiaries (INE and DNT).
- 3.7 Data Dictionary and Metadata—a Data Dictionary must be developed with the listing of all data written to CD-ROM and with Metadata information for the digital data produced by the consultant (15 sets of Data Dictionary and Metadata in both hard copy and digital format will be provided, five sets to the Bank, five sets to INE and five sets to DNT).

**G. Ownership and Copyrights**

- 3.8 All reports and relevant data such as maps, diagrams, plans, statistic and supporting data acquired, compiled or prepared in the course of services provided by the consulting firm shall be confidential and shall be the absolute property of the Bank. The Bank grants the beneficiaries the right to use, distribute and disseminate the results, data and any other product resulting from this technical cooperation. Also, the Bank, and to the extent permitted by the vendor, will own the copyright to any spatial data created or acquired for use in the project, including the right to reproduce, distribute, disseminate and publish the same. Again, the beneficiaries have the right to use and disseminate these products.
- 3.9 All existing applications and relevant data previously developed or licensed to the MTOP as beneficiary, and required for the purposes of this program, will remain the absolute property of the beneficiaries. The beneficiary grants the Bank permission for using these databases and applications in projects of regional integration and for other justified purposes within the normal businesses conducted by the Bank, upon previous written notification by the Bank.
- 3.10 The Bank will also own the copyright of programs written to implement all applications except for existing previous applications already developed by the Consulting Firm or the beneficiary. The beneficiaries are granted permission to use these applications, but their right will be limited to using the application in similar GIS projects if specifically stated in the consulting firm technical proposal. The Consulting Firm may retain a copy of such materials but may not use the same for purposes unrelated to this contract without prior written permission from the Bank.

- 3.11 As a mean of maintaining an updated inventory of databases within the Clearinghouse (NCGD), the Bank will notify MTOP when the digital databases developed with this program are use, updated or modified for projects in Uruguay with other public agencies and institutions, or for purposes of planning regional development projects.

#### **IV. QUALIFICATIONS OF CONSULTING FIRM AND CONSIDERATIONS FOR THE TECHNICAL PROPOSAL**

- 4.1 Given the nature of the work the Consulting Firm must have extensive expertise and familiarity in the development of GIS applications and in the digital conversion of spatial data for GIS applications to Regional Transportation and Infrastructure Management.
- 4.2 The Consulting Firm will allocate the personnel necessary for the successful completion of the project in accordance with the methodology, work program and staff allocation, which will form part of the proposal. As such, it is the exclusive responsibility of the Consulting Firm to determine the specialties and timing of professional and technical personnel to be used.
- 4.3 In the Proposal the Consulting Firm should give special attention to the following items:
- a. Seminars, workshops and training—provide descriptions of the format of the seminars and the approach to the training environment.
  - b. Digital Data—indicate understanding of the existing data to be used in compiling the digital spatial data and discuss the methodology for developing the spatial databases (specifying hardware, software, data sources and procedures to be used).
  - c. Map projection and referencing system—provide an understanding of the issues of having different sources of spatial data, including microfilm survey plats, and utilizing different map projections and different referencing systems.
  - d. Quality Assurance and Quality Control—describe issues of quality of the spatial data being compiled and of applications to be developed and describe how QA/QC will be incorporated into the project. As part of the discussion of quality control of the spatial data indicate any metadata and cartographic standards that shall be followed.
  - e. Spanish—all reports and other materials shall be produced in Spanish (the consultant may provide additional versions or copies in English). Executive summaries of the final report shall be provided in both Spanish and English.
  - f. Budget—the proponent must provide a budget broken-down by tasks.

## **V. DURATION OF PROJECT**

- 5.1 The work should be conducted in a period of no longer than 12 months.

## **VI. REPORTING RELATIONSHIPS**

- 6.1 The supervision of the study by the Bank will be the responsibility of the Country Office in Uruguay (CFO/CUR) in coordination with and technical assistance from the Finance and Basic Infrastructure Division 1 (RE1/FI1).
- 6.2 The supervisory consultant hired will coordinate with COF/CUR and RE1/FI1 in the task of integrating and making this project compatible with other GIS-related projects financed by the Bank in Uruguay and in the Region (Perú, Bolivia, Chile and Argentina).