Territorial Information Management in Chile

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Key Words: Chile, Land Information, Land Information Management, National System of Land Information, Land Information Policy.

ABSTRACT

Chile, through its National Territorial Information System (SNIT, its acronym in Spanish), is currently making institutional efforts to consolidate its Geospatial Data Infrastructure. These efforts are supported by a Policy initiative based on the principles of transparency, institutional cooperation, decentralization and deconcentration and by the active participation of the Administrative Regions and the efficient and effective use of resources involved in the utilization of geographic information. All this is focused on modernizing Territorial Information Management in Chile, in accordance with efforts in the country for reforming and modernizing the State, also for achieving transparency, economic growth and social development.

All of this is based on georeferencing and management of land data, integrated in on-line information networks and on its processing through IT systems.

Government institutions that develop and use land information will form the SNIT. The system is aimed at ensuring, supporting and optimizing the implementation and full performance of the Policy on Land Information Management and will have the political authority and technical capacity to do so.

The SNIT will not replace or substitute any functions which belong to or are specific to each institution, their reporting and administrative or functional bodies or their legal capacities either.

However, in order to achieve an efficient use of resources and to optimize the utilization of land data, it is necessary to overcome some problems previously encountered by:

- Implementing standards on territorial information to allow for the automatic information exchange between institutions (interoperability process). This task shall continue permanently.
- Implementing technical management solutions for institutions to promptly determine if any specific land information has been developed, as well as its characteristics, use restrictions, transfer and access.
- Integrating continuing training and education as a response to the increasing demand for knowledge on the use of these technologies. Therefore, proper procedures should be adopted to make it possible.

- The State should provide its institutions with adequate and permanent funding to meet Territorial Information requirements in the areas of:
  - Procurement, maintenance and training on new technologies as well as human resources to use them.
  - Formulation of standards and procedures on Territorial Information.
  - Ongoing updating of Territorial Information, considering its dynamics.
  - Building the new base mapping and territorial information that may be required.

An effective response to the situation described in the previous paragraphs would demand new and more efficient cross-institutional coordination on issues related to a modern management of land information, policies aimed at addressing the new dilemmas presented by communications and IT development and institutional adjustments to ensure policies will not be discontinued.

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1. CHILE NATIONAL CONTEXT

Chile is situated in the southwest end of South America, between 17º 30' and 56º south latitude and 66º 30' and 74 40' west longitude, this not including its islands scattered in the Pacific Ocean and its section of the Antarctica. Its continental area is 756,626 km^2 but including the Chilean Antarctic Territory the total area of the country amounts to 2,006,626 km^2.

Chile features a diverse geography that, from north to south, shows an arid desert in the northern portion, a warm central region that stretches into the lake district and damp forests in the south, canals and fiords bordering the southern plains (*pampas*), and—finally—the Antarctic Territory. Going laterally west to east, the country features the coastal plains, the Coastal Mountains, the Intermediate Depression (central valley) and the Andes Mountain Range.

Several factors shape the climate and provide the conditions for different climate types. These factors include the altitudinal extension that means a wide range of climates, with temperatures dropping and rainfall rising as one goes southwards. The Pacific High Pressure System is situated along the coast. The Pacific Ocean moderates temperatures, especially on the coastal areas; the Humboldt Current cools down the air and allows the formation of the littoral fog. The Andes Mountain Range is a geographical obstacle to the inter-tropical climate system.

According to the last census, Chile has a population of 15,116,435 people, of which 13,090,113 live in cities and 2,026,322 in rural areas.

Sex distribution is fairly proportional: 7,447,695 are men and 7,668,740 are women.

Geographically, most of the population resides in the central valley, between the V and VIII Administrative Regions. The rest of the country is sparsely populated.

2. INSTITUTIONAL ARRANGEMENTS

2.1 Background of the State of Chile[1]

The Political Constitution of the Republic, in its Chapter on "Institutional Basis" sets forth the principles that guide the legal and political arrangements of Chile and express the continued republican legacy of the National State.

[1] The Basic Principles of the State of Chile are written in the Political Constitution of the Republic of Chile and in the Book for the National Defense published by the Chile National Ministry of Defense in 2002.

These are principles recognized by other countries that share the same democratic premises and respect for human beings and their rights. However, each country makes these principles effective in daily practice with its own individual style.

Chile has a profound respect for human beings, their dignity and rights as well as for the communities where individuals develop, first of all, the family.

From the intrinsic dignity and values of equality inherent in all people are derived social and economic objectives as a priority for the country, such as social cohesion, integration and poverty eradication.

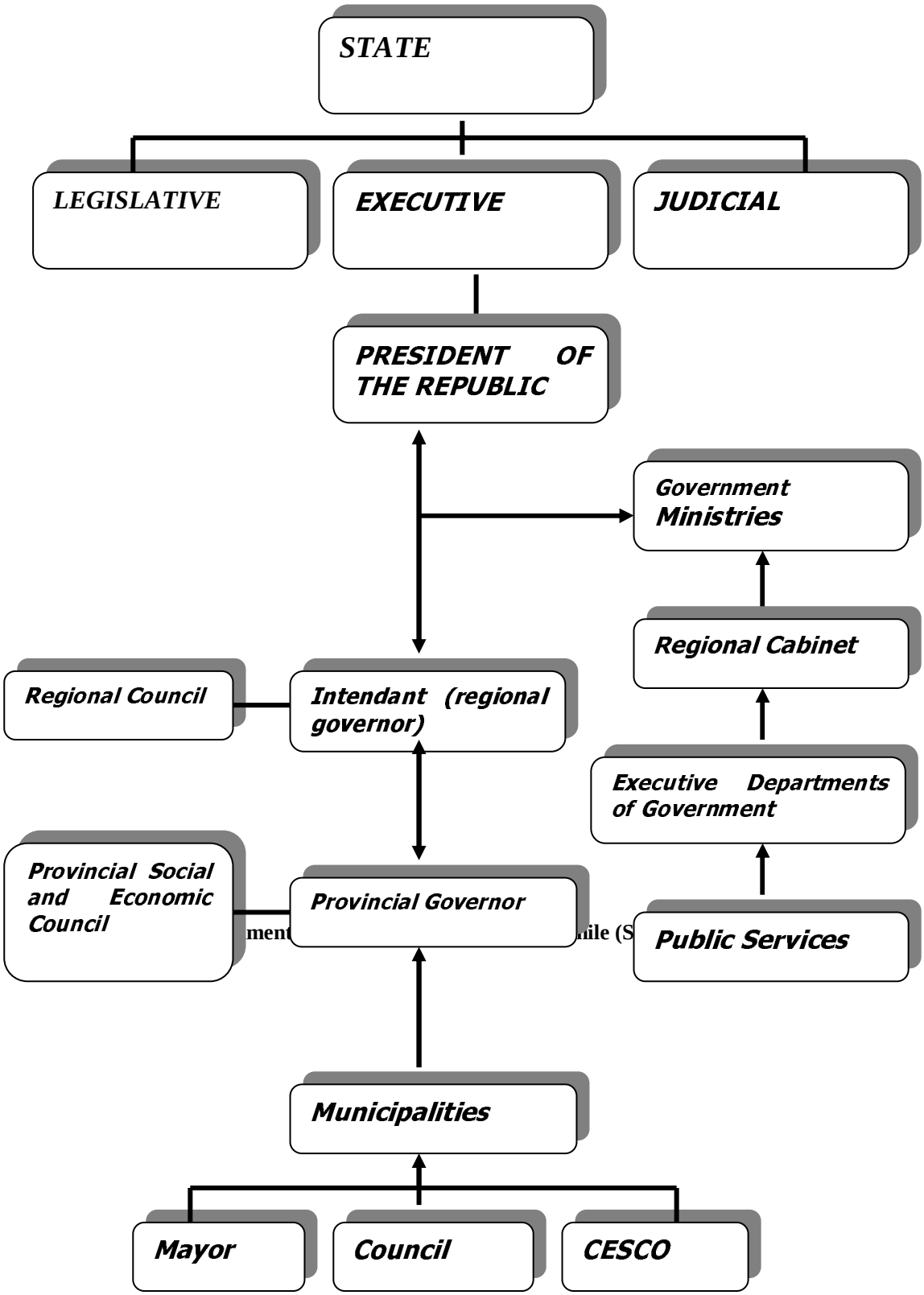
The State of Chile is Unitarian and sovereign over its continental area, islands and Antarctic Territory, as well as on its air and maritime claims, under relevant international laws and treaties. Sovereignty is held by the people and their elected authorities pursuant to the Political Constitution and acknowledging that the essential rights derived from human nature set forth the limits to any Government action.

Internationally, Chile fully adheres to the principles of peaceful resolution of conflicts, non-intervention in the internal affairs of other states and respect for international laws.

2.2 National Objectives

The State of Chile pursues general objectives that are written in the Constitution which, in turn, result from the historical experience and the cultural and political wealth of the Chilean people. Such objectives define certain targets that may be considered the aspiration of the vast national majorities. Lasting national objectives are defined under the Chilean constitutional tradition, and each administration should, based on its own postulates, update and turn them into concrete actions, instruments and decisions that express the political will of Chilean democratic institutions.

In order to fulfill these objectives, the Chilean Government has three branches: the Executive, Legislative and Judicial powers, each having jurisdiction in its own sphere. The Executive is structured as shown in Figure 1.


STATE
LEGISLATIVE
EXECUTIVE
JUDICIAL
PRESIDENT OF THE REPUBLIC
Government Ministries
Regional Cabinet
Regional Council
Intendant (regional governor)
Executive Departments of Government
Provincial Social and Economic Council
Provincial Governor
Public Services
Municipalities
Mayor
Council
CESCO

The Political Administrative Divisions.

Chile is divided into thirteen administrative regions, each sub-divided into provinces that hold administrative units (*comunas.*) This regional administrative structure is a programme of political and administrative definitions and actions aimed at setting the basis for social, economic and political development in the country. An Administrative Region is defined by an area containing similar physical and human features. The highest authority is the 'Intendant' or regional governor.

The Province is a mid-size territorial unit, with similar economic and demographic characteristics. Its highest authority is the Governor.

A *comuna* is a smaller territorial unit with direct forms of governance, which enables a more efficient local organization. It highest authority is the local Mayor (*Alcalde*.)

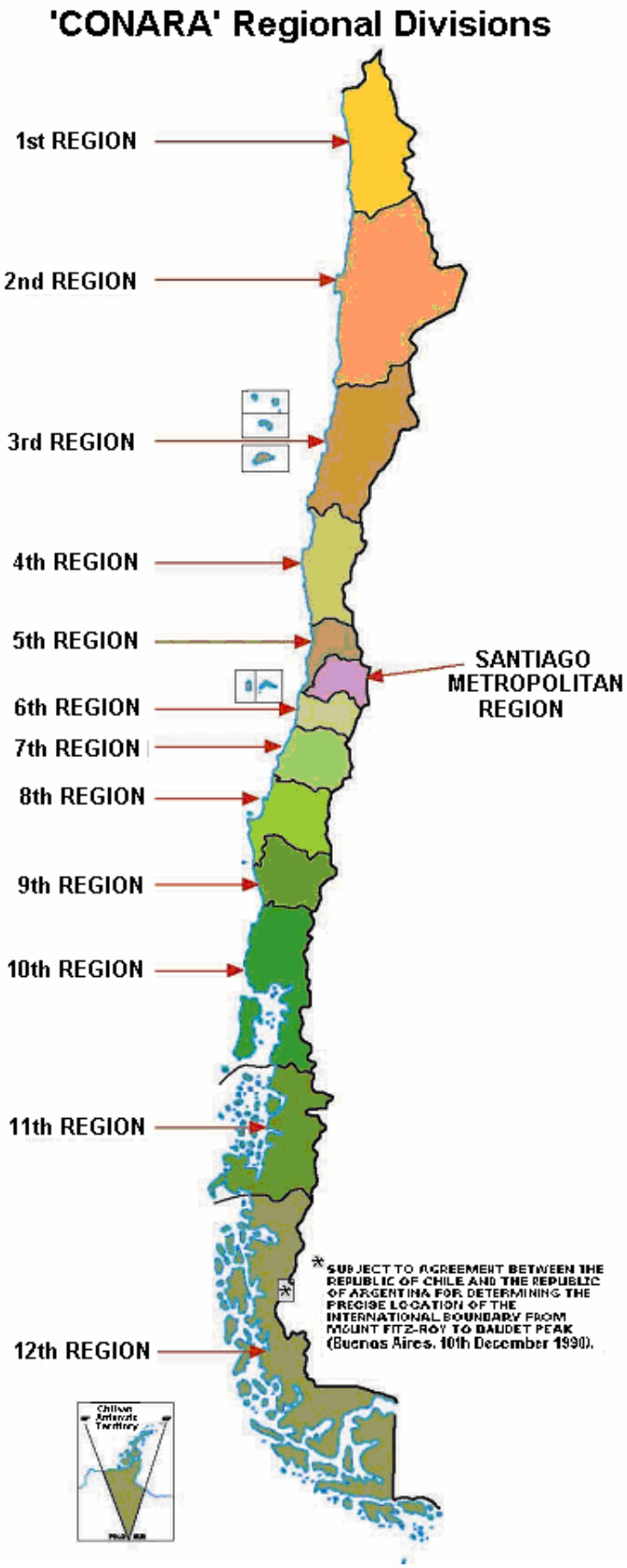


Fig. 2: Sketch map showing the Administrative Regions of Chile. Source: Instituto Geográfico Militar de Chile

3. TERRITORIAL POLICY

Currently, the country is at the proposing stage for a Territorial Information Management Policy to match the Government's efforts to consolidate a State able to provide services to its citizens with efficiency and efficacy, with probity and transparency.

To such end, the Government aims at ensuring its citizens' right to have access to land information of public nature and at guaranteeing the State will perform its duty to make such information readily available.

Actions are supported by the constant maximization and optimization of available technological resources, for the capture and use of land information and for the streamlining of administrative steps, the reduction of costs and bureaucracy and the fostering of every action that may enhance efficiency in the provision of territorial information services by the State to its citizens.

Based on the above, every administration processes—of any nature, planning, land administration, economic development, policies, etc.—implemented in the country will need appropriate and true territorial information, guaranteed by the State that has resorted to available technological advances. Under the current historical context, with the contribution made by informatics and communication technologies, the advantages in territorial information management may be evident in the exponential increases achieved in:

- The precision and velocity of land data capture,
- Data processing, flow and validation,
- Data storage,
- Simultaneous crossing of multiple information layers,
- Land and territorial information display
- Timely display of phenomena affecting land; it is even possible to do this in real time,
- Growing, widespread use of land information in areas which traditionally had not considered this data in their decision-making processes (thematic mapping on almost every field, economy, education, social issues, environment protection, etc.)
- Reduced costs of the procedures involved in territorial information management

3.1 Policy Rationale

The Policy on Territorial Information Management is based on:

- The principle of transparency as seen by the public
- The principle of institutional cooperation
- Decentralization and deconcentration with active participation of Administrative Regions
- Efficient and effective use of resources involved in Territorial Information Management (GIT, its acronym in Spanish)

3.2 General Objective

Modernizing Land Information Management in Chile, in accordance with the efforts the country is making to reform and modernize the State, achieve transparency, economic growth and social development.

3.3 Specific Objectives

- Implementing a new style in territorial information management that will be systemic and cooperative and that will ensure:
  Citizens' access to public territorial information developed by State departments, guided by the principles of transparency, probity and legality.
  - Full knowledge of existing territorial information and of its conditions of access and use so as to make it available to decision makers, both from the public and private sector.
  - Use of Internet-based technology to manage the territorial information of the country and its institutions.
  - Information interoperability through readable, compatible and digitally or electronically transferable products.
  - Development and enforcement of rules and standards aimed at ensuring information is compatible and interoperable.
  - Sustained development of territorial information management in the country, in agreement with technological advances that directly impact on the quality and precision of the territorial information that it is possible to capture.
  - Permanent presence and representation of the country in the international community of spatial data, land information systems and in all types of activity related to the modern management of territorial information, through official representatives.
  - Awareness of any requirement for new land information, on the part of the country or of its institutions.
  - Fostering and developing innovative projects on GIT matters.
  - Optimizing the use of public resources.
  - Setting up a national community in which both the Government organisations assigned to these issues and representatives from the private sector and the civil society can interact.
  - Ensuring good maintenance of historical territorial information records.

- Examining and suggesting specific solutions for territorial information management on the following issues:
  - Data Access
  - Data Use.
  - Data Validation
  - Ongoing updating.
  - Access costs.
  - Copyright.
  - Inventory.

  - Standardization.
  - Training.
  - Funding.

- Basing the country's new territorial information management on three technological pillars:
  - Georeferenciation of land data to provide exact spatial location, based on a single and homogeneous geodesic system used throughout the country. The system should be updated and maintained over time.
  - Territorial data management in *IT networks* and *on-line*.
  - Computer data processing.

- Fostering and developing any necessary institutional agreement and adjustment for Government Departments to be able to fulfill the above described objectives.

4. TERRITORIAL INFORMATION

4.1 State-of-the-art Management of Territorial Information in Chile.

The inventory of land information carried out by public institutions that report to the Executive and the sustained work done under the coordination ordered by Presidential Instructions towards the creation of a National System of Territorial Information has proven that:

- Public institutions base their decisions on formal procedures on land information development, manage and use.[2]
- Territorial information management involves several themes: some relate to the building of basic land information, others focus on knowing the existence and condition of natural resources and the environment; the country's infrastructure; land tenure; social issues; economic themes; land administration; national heritage, etc.
- Some institutions only create land information whereas most institutions both create and use land information, that is, they develop new, themed, layers of information and add value to the information developed by other institutions that has been used as base data from centralized origins. This phenomenon is duplicated in the Administrative Regions and in local and municipal governments.
- Institutions show increasing interest in their modernization, especially in: digital geographic information, new remote sensing techniques, satellite positioning and georeferencing. Also, interest in IT developments that turn analogue, mechanical technology obsolete (data capture, access, storing, rendering, transfer, etc.).

[2] The findings of the project "Building the Inventory of Land Information existing in Institutions that report to the Executive and others related with the Administration of the State of Chile", carried out in 2002, a total of 207 public instances declared they produce and/or use land information to perform their institutional tasks. These instances include government departments and agencies, Regional Administrations, Executive Regional Departments of Government and other autonomous bodies of the State.

- Easy and fast handling of territorial information that allows a wide range of practical applications due to increasing investments made in land information management, both in human and in technical resources, in compliance with Government Guidelines on "Electronic Government".

5. FUNCTIONS OF TERRITORIAL ORGANISATION

The Policy on Territorial Information Management will be applied and implemented by institutions that are part of the State administrative structure.

These institutions will be coordinated by the SNIT only to ensure and facilitate the proper fulfillment of the policy but without interfering with their organizational or administrative capacities.

Government institutions that develop and use land information will form the SNIT. The system is aimed at ensuring, supporting and optimizing the implementation and full performance of the Policy on Land Information Management and will have the political authority and technical capacity to do so.

The SNIT will not replace or substitute any functions which belong to each institution, their reporting and administrative or functional bodies, or their legal capacities either.

5.1 SNIT Specific Functions

- Thematic grouping of State institutions to facilitate their coordination in matters which are exclusive of the GIT Policy.
- Analyzing, suggesting and ensuring correct application of GIT policies on:
  - Data Access
  - Data Use
  - Data Validation
  - Ongoing updating
  - Access costs
  - Copyright
  - Inventory
  - Training
  - Funding

- Analyzing and submitting legislative proposals to allow the proper implementation of the GIT Policy.
- Maintaining and managing the Land Information Portal with updated metadata.
- Fostering the creation of the GIT national community.

5.2 SNIT Organizational Structure

Based on the principles and rationale behind this policy and organizational system structure, the essential operating idea is the coordination between and within institutions.

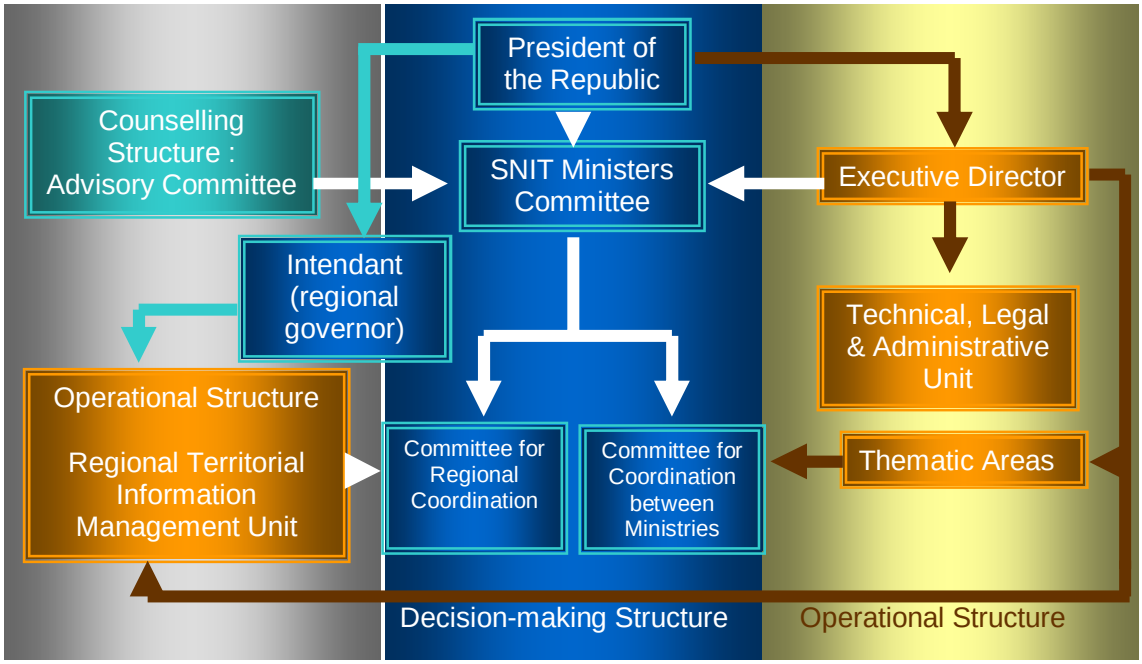
The experience lived in these past two years by the Inter-Departmental Commission, structured around allied thematic areas—a scheme that allowed the inclusion of most public institutions[3]—made it evident that there is a need to enter into agreements on land information management to facilitate its use, transfer and application under common policies and standards in order to avoid any duplication from its turnout to later stages of application and the consequent waste of human and financial resources. To such end, the following should be noted:

- The organizational structure of the system is supported by institutions that are a part of the State administrative structure, under a special coordination on GIT Policy matters.
- The System is based on the concept of Electronic Government that derives from the potential strengths enabled by information and communication technologies that allow a more efficient, less bureaucratic governance management.
- Since these institutions are part of the State administrative structure, they commit their own institutional management and become accountable while they also build the necessary structural adjustments to fulfill the GIT Policy.[4]

Therefore, the SNIT is formed by a Committee of Department Secretaries, an Inter-Ministerial Coordination Committee, a Director, an Assistant Director, an Administrative, Legal and Technical Unit, the Thematic Areas, the Regional Coordinator, an Inter-regional Coordination Board, the Regional Territorial Information Management Units and an Advisory Committee, as shown in Figure 3.

[3] This is based on the Presidential Instruction Nº 14 of September 25, 2001; and Nº 2 of April 7, 2003. So far, almost 800 professionals are involved in the successful implementation of this initiative.

[4] Just as an example, the adoption of a standard on the country's political and administrative division means that databases including such information should be available following the official coding. It will be unnecessary and unacceptable to use or create new names to refer to territory spaces. This will eliminate a common source for lack of coordination, errors and waste of time associated with incomplete or wrong denominations or with codes which logics and origin is not known.



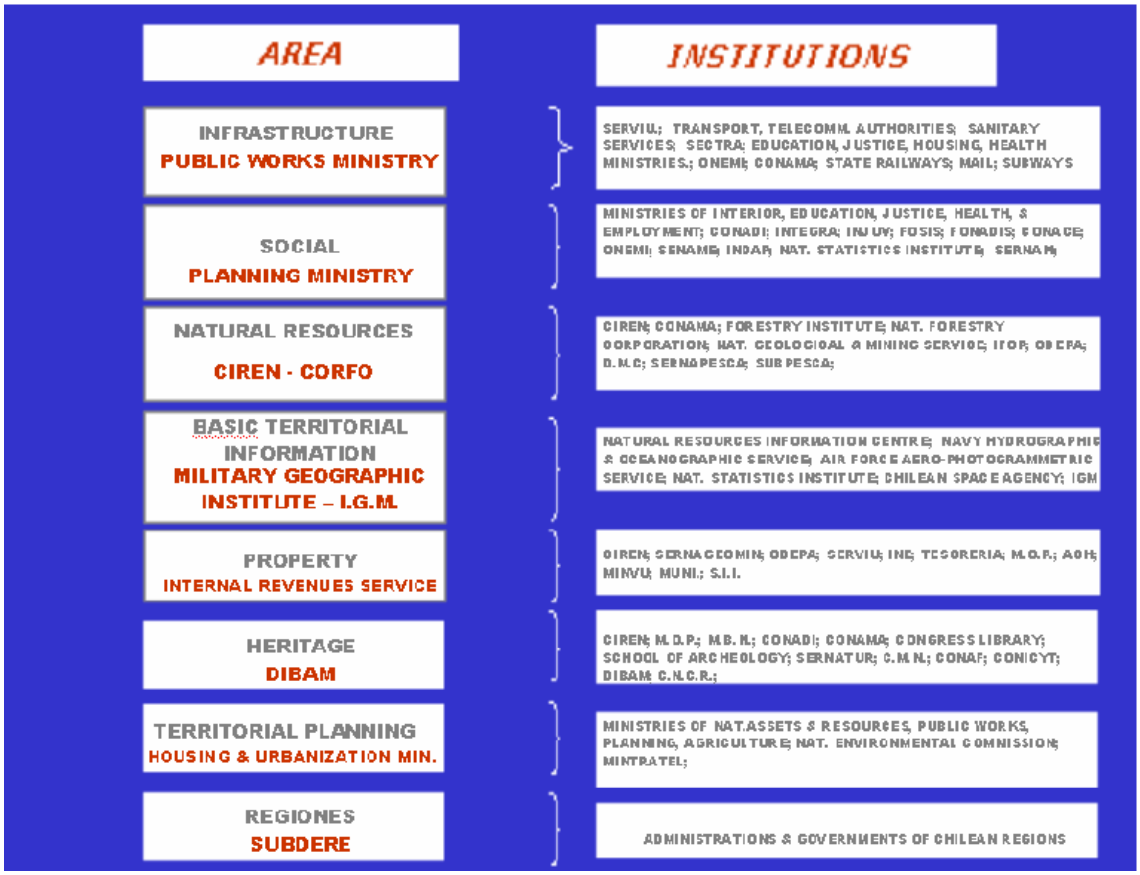


Fig. 3: SNIT Organizational Structure (Source: www.snit.gob.cl)
Accomplishments of SNIT

The SNIT was created by Presidential Instruction Nº14 of September 25, 2001 and has since consolidated its activities by accomplishing the following:

5.3 In 2002

- It built the country territorial information inventory, which provided the actual land information situation in the whole country.
- It set the basis for standardization, procurement, building and transfer of land data.
- It developed the National Plan for Territorial Information Capture and Standardization (2003-2005), approved by the President of the Republic through his Presidential Instruction Nº 2 of April 7, 2003.

5.4 In 2003

- It continued analyzing regulations related to land information standardization.
- It defined the structure of Core Data to be used in the country.
- It started contacts to foster the adoption of land information international standards, focusing on ISO/TC211 Committee, proposals made by the Open GIS Consortium, the U.S. Geographic Data Commission (FGDC), etc.
- Regional Committees to support the SNIT project were created.
- The website with access to land information was designed and its prototype was developed.
- Projects to capture missing spatial information were formulated at a scale of 1:10,000 in rural areas, 1:5,000 on the coastal area and 1:1,000 in urban areas.
- The SNIT Advisory Committee was created with representatives of the civil society, academics, labor unions, private sector, etc.
- Integration in the international community of Geospatial Data Infrastructures is fostered.
- A State Policy for a modern management of Territorial Information was formulated to provide SNIT with legal support.
- SNIT thematic areas consolidated their respective coordination levels to comply with the National Plan on Territorial Information Standardization (2003-2005).

5.5 In 2004

Activities aimed at fulfilling the objectives of SNIT continued and in June, the proposal for a law on Territorial Information Policy in Chile was submitted to the President of the Committee of Urban & Territorial Ministries.

6. ASSESSMENT AND IDENTIFICATION OF PROBLEMS AND CONSTRAINTS

The developments described above face two major challenges that need to be overcome so that the resources the country is dedicating to modernize the GIT can be used with efficiency and efficacy:

It is crucial to overcome the traditional territorial information management, which has always been sector-oriented and compartmentalized: because this leads one institution to be

unaware of the land information built by others and, therefore, to duplication in the building or capture of the same information. Moreover, it is an obstacle to compatible land information because each institution applies its own standards.

Spatial information management has not developed homogeneously in the different State institutions: On the one hand, there are some institutions enjoying a high level of development and expertise in matters related to GIT, such as: Instituto Geográfico Militar-IGM (*Military Geographic Institute*), Servicio Hidrográfico y Oceoanográfico de la Armada-SHOA (*Navy Oceanographic and Hydrographic Service*), Servicio Aerofotogramétrico de la Fuerza Aérea-SAF (*Air Force Aero-Photogrammetric Service*), and Centro de Información de Recursos Naturales-CIREN (*Natural Resources Information Center*) because of the nature of their activities. On the other hand, there are some institutions with an intermediate level of development but that are increasingly basing their decision-making process on spatial information, such as: Ministerio de Obras Públicas, Transporte y Telecomunicaciones-MOPTT (*Public Works, Transport and Telecommunications Ministry*), Ministerio de Vivienda y Urbanismo-MINVU (*Housing and Urbanism Ministry*), Ministerio de Bienes Nacionales-MBN (*National Assets & Resources Ministry*), Ministerio de Planificación Nacional- MIDEPLAN (*National Planning Ministry*), Ministerio del Interior-MININT (*Interior Ministry*), Ministerio de Agricultura-MINAGRI (*Ministry of Agriculture*), Corporación Nacional del Medio Ambiente-CONAMA (*National Environmental Corporation*), Servicio Nacional de Geología y Minería-SERNAGEOMIN (*National Service of Geology and Mining*), Corporación Nacional Forestal-CONAF (*National Forestry Corporation*), Instituto Nacional de Estadísticas-INE (*National Institute of Statistics*), Servicio de Impuestos Internos-SII (*Internal Revenue Service*), Servicio Nacional de Pesca-SERNAPESCA (*National Service of Fishing*) and some regional administrations. Finally, there are institutions where development is only starting.

Despite these problems, there is an unequivocal move towards a fast, growing incorporation of land and territorial information into the formal processes of Government institutional activities, with a consequent build-up of technological support in all bodies of the State. It is evident that the use of accurate and true spatial information facilitates decision-making enormously.

7. POTENTIAL CHALLENGES TO CONSIDER

In order to overcome the above problems, it is necessary to:

- Implement standards on territorial information to allow for the automatic information exchange between institutions (interoperability process). This task shall continue in the future.
- Implement technical management solutions for institutions to promptly determine if any specific territorial information has been developed, as well as its characteristics, use restrictions, transfer and access.

- Integrating continuing training and education as a response to the increasing demand for knowledge on the use of these technologies. Therefore, proper procedures should be adapted to make it possible.[5]
- The State should provide its institutions with adequate and permanent funding to meet spatial and territorial Information requirements, including:
  - Procurement, maintenance and training on new technologies as well as human resources to use them. [6]
  - Standards and procedures on Territorial Information.
  - Ongoing updating of spatial data, considering the dynamics it is subject to.
  - Building the new base mapping and territorial information as needed.
- An effective response to the situation described in the previous paragraphs would require:
  - New and more efficient inter-institution coordination in matters related to the modern management of territorial information,
  - Policies that respond to the new dilemmas that IT advances create in the building of territorial and spatial information.
  - Institutional adjustments to implement policies on a permanent basis.

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[5] The Inventory built in 2002 determined the existence of 3626 required training positions, a figure that is consistent with the high investment on software and land information.

[6] At present, most government institutions are modernizing their management process by integrating land information as a factor. They fund the initial investment and operating costs with projects. However, since these projects lack continuity, the investment made and the expertise achieved by professional and technical staff is lost together with the historical memory on GIT.

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