Project for the Strengthening of Spatial Data Infrastructures in Members States and Territories of the Association of Caribbean States

Capacity Building Programme

Use of Geodetic Equipment

The National Geodetic Network in Mexico

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Background

Applicable results to new infrastructure projects, implementation of new productivity activities and economic planning for the country development.

As a basic element to locate in more precise way natural and cultural features, increasing the richness of the information.

Photo interpretation for the inventory of natural resources, facilitate its rational exploitation for its development.

Photogrammetry.

1961

Idea of making geographic surveys and studies for society and government focused in national progress.

1963

Territory topographic survey elaboration.

1966

It is submitted to take the study to the Republic President's consideration.

1967

It is submitted to a technical revision by many agencies technicians and gets the Presidential approval.

1968

October 1st, 1968, by Republic President instructions, was created the Studies Commission of the National Territory and Planning (**CETENAP**) as an administrative unit of the Direction General of Planning, Secretary of the Presidency

1970

CETENAP stops belonging to Direction General of Planning, acquiring the title of Studies Commission of the National Territory (CETENAL). During the first six years of the 70's, CETENAL enlarges its structure, in the face of jobs acceleration, specialization for products elaboration; watch itself quality and the need to making them available to the public provision.

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Background

1977

CETENAL changes its adscription to the Programming and Budget Secretary, gets the category of Direction General of Studies of the National Territory (DETENAL), being adscript to the Coordination General for the National Information System (SNI).

Socioeconomic cartography is made, state and regional monograph; definition of geostatistics basic units for census ends (80-81); hydrologic studies and cartography of the country are made, crops quantification, forest and oceanography inventory, thematic cartography making and representation.

In the last three years of the decade is modified its structure and new areas are created, other areas modification and fusion.

Change to participate with geographic information in the integration of the National Information System contributing with country's economic and social development.

1980

Publishing of the new SPP internal regulation, February 28th, administrative restructure, SNI changes to Coordination General of the Statistics, Geography and Informatics National Services (CGSNEGI).

DETENAL becomes the Direction General of National Territory Geography (DIGETENAL). New areas are made and the Geographic Information Synthesis of each federal entity is made. Standards and regulations proposals are made for the production of geographic information for the public sector, the promotion of the use of cartography and consultation to Federal Public Administration in geographic matter.

1983

January 25th. CGSNEGI changes its denomination to the National Institute of Statistics, Geography and Informatics (INEGI), deconcentrated organization of the Programming and Budget Secretary.

INEGI's basic objective was to strengthen caption labors, production, processing and geographic and statistic information divulgation generated by the country.

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Background

In the beginning the Institute was structured by Statistics, Geography, Informatics Politics and Information Integration and Analysis General Directions, in addition to 10 Regional Directions strategically located all around the national territory to attend statistic and geographic offer and demand within each state jurisdiction.

1990

Direction General of Geography was considered as a priority inside the INEGI's modernization project, giving the result of suffering several important changes in the procedure used during the last 25 years.

1991

Geographic activity transition, through new methodologies and the acquisition of vanguard equipment in world ambit, which derived in substituting analogical methods for digital methods to the generation of geographic and cartographic products.

1992-1993

1994

Organizational structure modification.

1998

It is incorporated to the Direction of Census Cartography.

2003

Itis incorporated to the Direction General of Cadastral Cartography

2004

Organic restructuration, to strengthen normative functions, research and Geographic Information National System integration, in which geographic information of name registers are included, territorial division and cadastres, as well as remote sensing images.

2005

Areas names adequacy as a part of restructuration.

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Background

2008

April 14th, Mexican United States President issues, in exercise of the power conferred by Article 89 section I, from the Political Constitution of The Mexican United States, for the right application and observance, the Decree by which is issued the Statistic and Geographic Information National System Law (LSNIEG by its Spanish acronym), and gives its Public Organism nature with autonomy and management, legal personality and own patrimony, responsible for ruling and coordinating the Statistic and Geographic Information National System (SNIEG by its Spanish acronym).

2009

DGG assumes new attributions; it is modified its structure and denomination: Geography and Environment General Direction (DGGMA), with four Attached General Directions: Geography Basic Information Attached General Direction (DGAIGB by its Spanish acronym), Natural Resources General Direction, Environment Statistics Attached General Direction, Geospatial Information Integration Attached General Direction (DGAIIG) and three Area Directions: Technologic Development Direction, Management Improvement Direction and Administration Direction.

April 16 and March 31, 2009

It is published Statistic and Geography Information National System Law and INEGI's Internal Regulation respectively.

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Background

2010 (August 31st)

Attached Cadastral and Registration General Direction is created and Attached General Directions get fused: Attached Natural Resources and Environment Statistics General Directions become Attached Natural Resources and Environment General Direction (DGARNMA), fulfilling DGGMA powers and duties and since then organic basic structure remains as DGAIGB, DGARNMA, DGAICR, DGAIIG.

Additionally, Attached Geographic and Environment Information National Subsystem Technical Assistance General Direction (DGATSNIGMA) is incorporated as a specialized adviser.

Normative Frame

Statistic and Geographic Information National System (SNIEG)

Background

On April 7th 2006, on the Federation Official Journal was published the Decree by which were declared reformed 26 and 73 articles, XXIX-D section, of the Mexican United States Politic Constitution, through which was added an append B to 26 constitutional article, where establishes that the Mexican State will have a Statistic and Geographic Information National System (SNIEG) and that the responsibility to ruling and coordinating such System will be on an organism with technical and management autonomy, own legal personality and patrimony.

Later, on April 16th 2008, on the Federation Official Journal was published the Decree by which were issued the Statistic and Geographic Information National System Law (LSNIEG), which is regulatory of Append B from 26 Mexican United States Politic Constitution article. It is of public interest, social interest and general observance all around the Republic and rules:

- **A. Statistic and Geographic Information National System**
- **B. The rights and obligations for the system informers.**
- **C. The organization and functioning of the Statistics and Geography National Institute.**
- **D. Administrative faults and the administrative defense before Institute acts or resolutions.**

At the same time establishes INEGI's autonomy with the object that it will be the responsible for ruling and coordinating the System.

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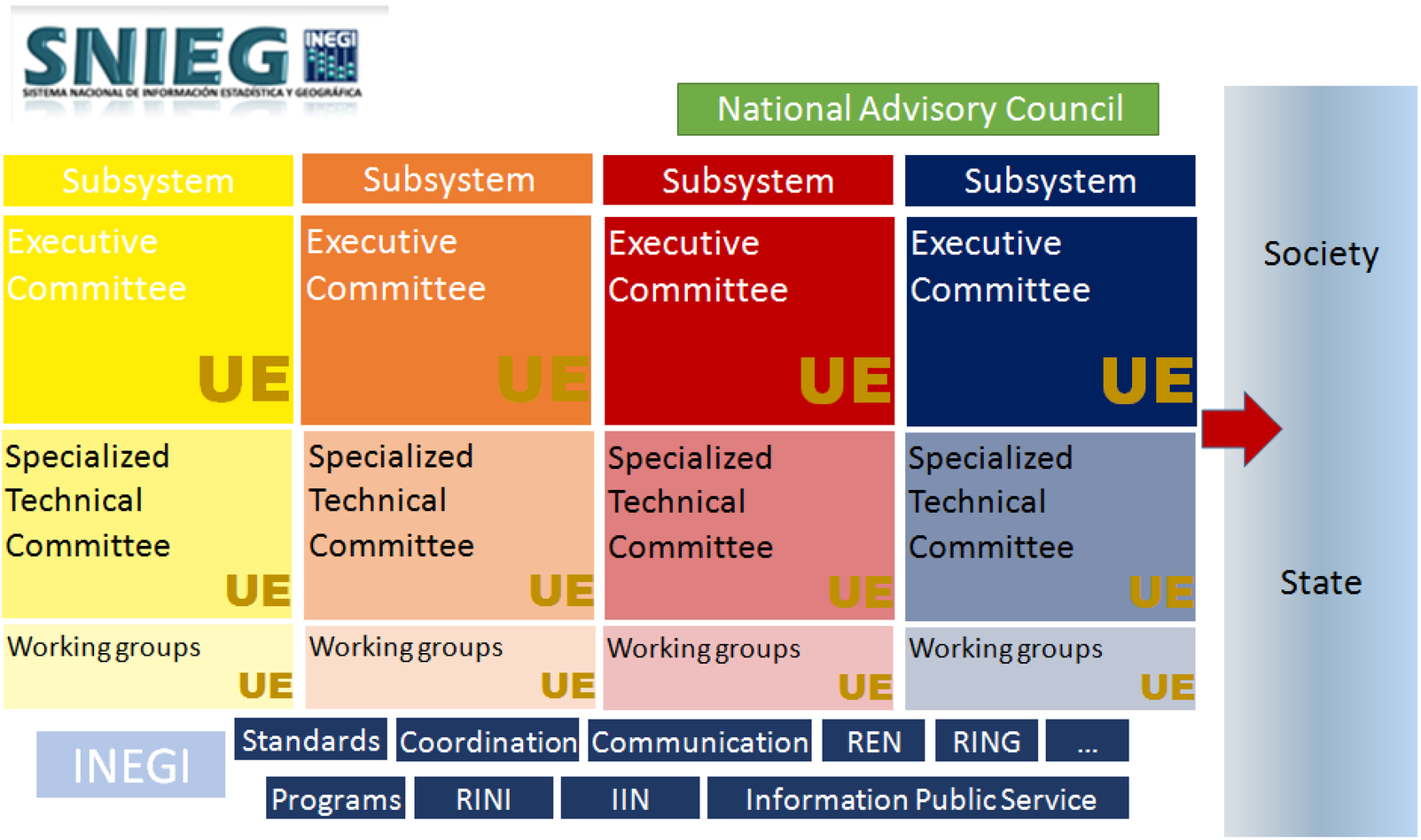
Normative Frame

Statistic and Geographic Information National System (SNIEG)

The System

Statistic and Geographic Information National System is the set of organized Units through Subsystems, coordinated by the Institute and articulated through the Information National Network with the porpoise of producing and diffusing National Interest Information.



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Normative Frame

Statistic and Geographic Information National System (SNIEG)

System Members

System is integrated by:

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Normative Frame

Statistic and Geographic Information National System (SNIEG)

Characteristics, guiding principles and objectives

Likewise, it has as a finality supply society and State information with the following characteristics, guiding principles and objectives:

Characteristics	Guiding Principles	Objectives
•Quality	•Accessibility	•Produce information
•Pertinent	•Transparent	•Diffusing opportunely the information through easiness consultation mechanisms
•Truthful	•Independent	•Promote the knowledge and use of the information
•Opportune	•Objectivity	•Keep the information

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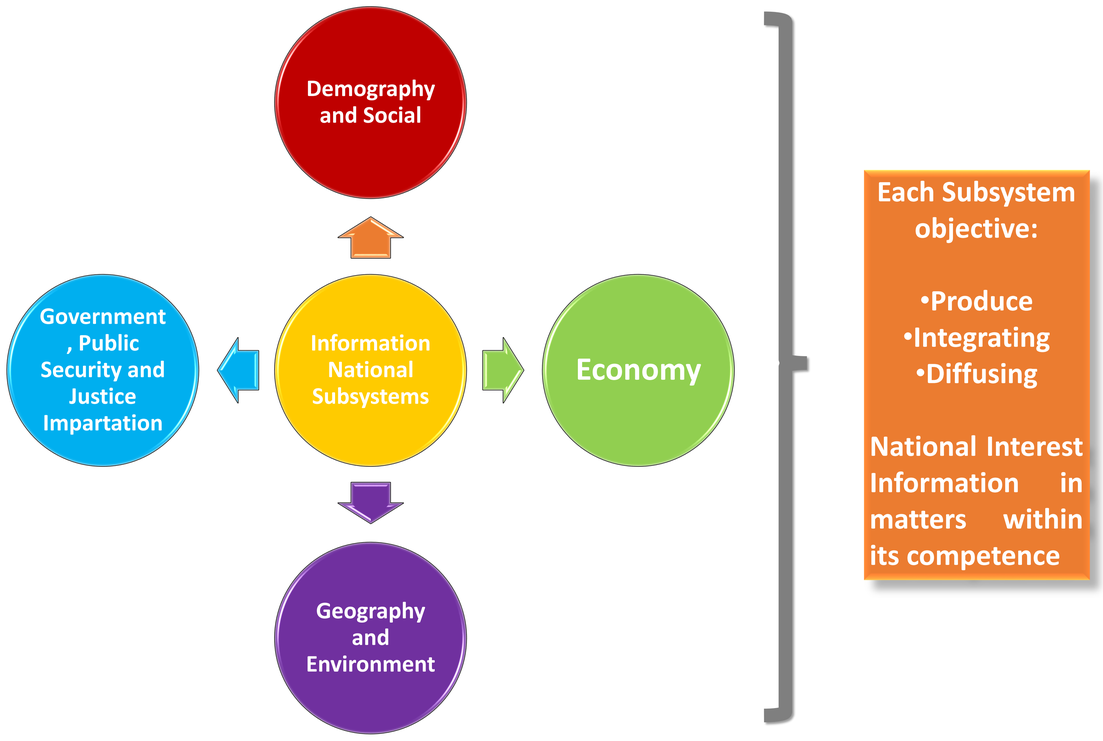
Normative Frame

Statistic and Geographic Information National System (SNIEG)

Subsystems

To organize the Subsystem are established four Information National Subsystems where on each of them has the objective of producing, integrating and diffusing the National Interest Information in matters within its competence.



In case of being necessary the creation of other Subsystems, INEGI's Government Board will be, favorable previous opinion of the National Consultive Counsel, who authorize its formation, having to point out as minimum its information infrastructure, key indicators that most build and the sources from where the basic information will be obtained, with the Units support. For its organization, each Subsystem counts with an Executive Committee.

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THE NATIONAL SYSTEM OF STATISTICAL AND GEOGRAPHICAL INFORMATION (SNIEG)

SNIEG INEGI
SISTEMA NACIONAL DE INFORMACIÓN ESTADÍSTICA Y GEOGRÁFICA

Information of National Interest

With the purpose of producing and disseminating

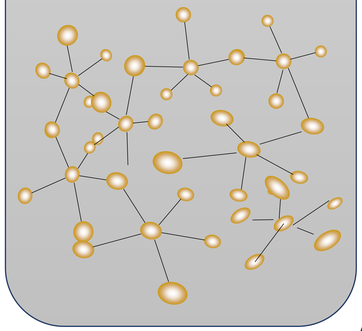
Coordinated by

Articulated by the

Units of the State

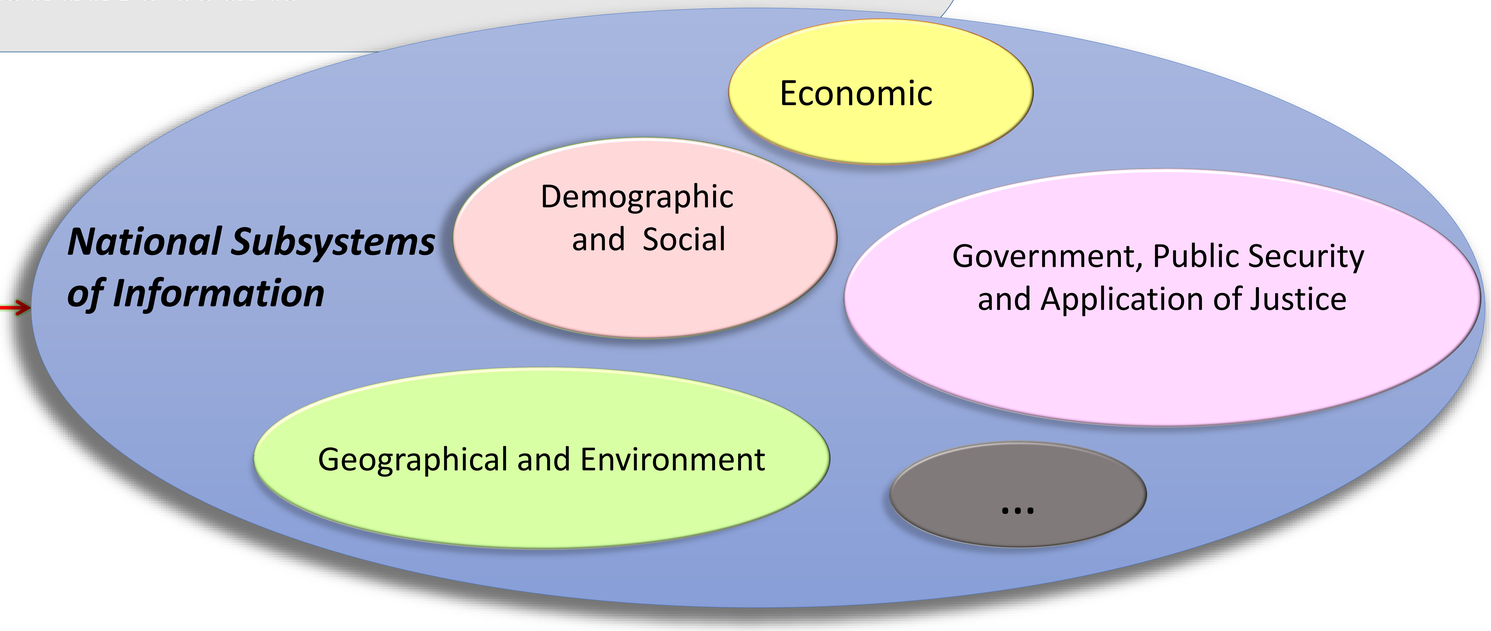
- **Federal Public Administration**
- **Presidency of the Republic**
- **General Attorney's Office**
- **Legislative and Judicial Powers**
- **States**
- **Municipalities**
- **Constitutional autonomous organizations**
- **Federal administrative courts**

National Information Network



Organized by

National Subsystems of Information



HOLISTIC VISION OF THE SNIEG

Subsystem of GOVERNMENT, PUBLIC SECURITY and Application of JUSTICE Information

Subsystem of DEMOGRAPHIC and SOCIAL Information

Data

Information

Wisdom

Territory

Economics

Society

Knowledge

Understanding

Subsystem of ECONOMIC Information

Subsystem of GEOGRAPHICAL and ENVIRONMENTAL Information

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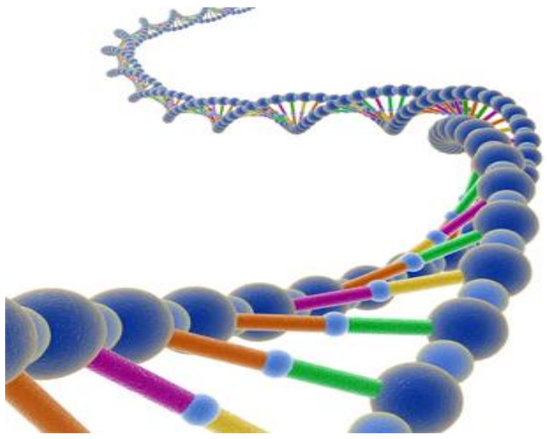
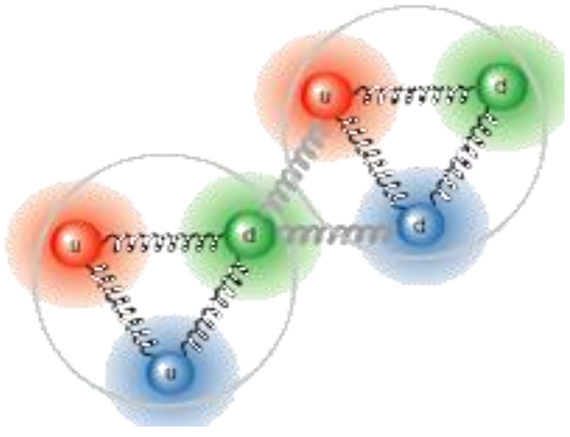
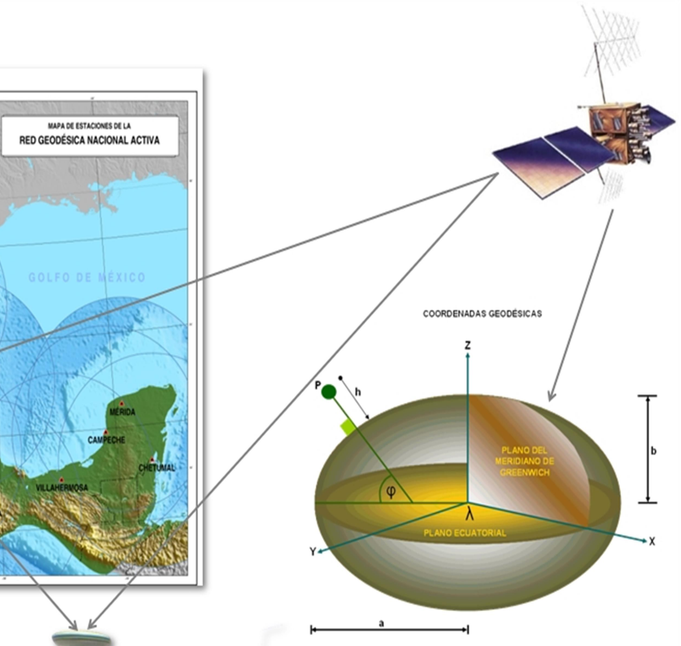
Normative Frame

National geodetic System Technical Norm

Standard that contains the minimum dispositions that define the National Geodetic System, from which it is possible to integrate geodetic data and information generated by the Units of the State, to clarify the needed conditions for the geodetic Frame to be homogeneous, compatible, comparable and useful for the generation of geographic information properly georeferenced.







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Normative Frame

Positional Accuracy Standards System

Standard that establishes the minimum dispositions concerning to accuracy values for different kinds of geographic features that must be adopted for every referencing work located within National Territory made by either the Institute or Units of the State that integrates the Statistic and Geographic Information National System, either by itself or by third, as well as promote its harmonization and homogeneity.

Horizontal Geodetic Network **Vertical Geodetic Network**

Accuracy: ***5 cm order*** ***1 dm order*** ***Order and Class dependent***

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Normative Frame

Geodetic Data Dictionary

As normative documents contains the particular specifications that rules spatial data production processes at a spatial object levels. Describes each object in its definition terms, its attributes and values domains, as well as its spatial representation and the integrity restrictions

Background

Vector Data Model was developed back in 1993 and was used for spatial data production activities for more than a decade. Later with avant-garde technology the renovation of forms and contents occurred in processes with what was the need to develop a new version according to changes. Reason by which in 2005, it is retaken such model as a base to generate the Spatial Data Model version in which are included vector and raster structures for spatial objects representation, new concepts related to data quality, metadata and horizontal and vertical reference systems are added.

It is important to point out that data dictionaries elaborated in the 1993 to 2005 period, correspond to the Vector Data Model specifications and elaborated later to Spatial Data Model.

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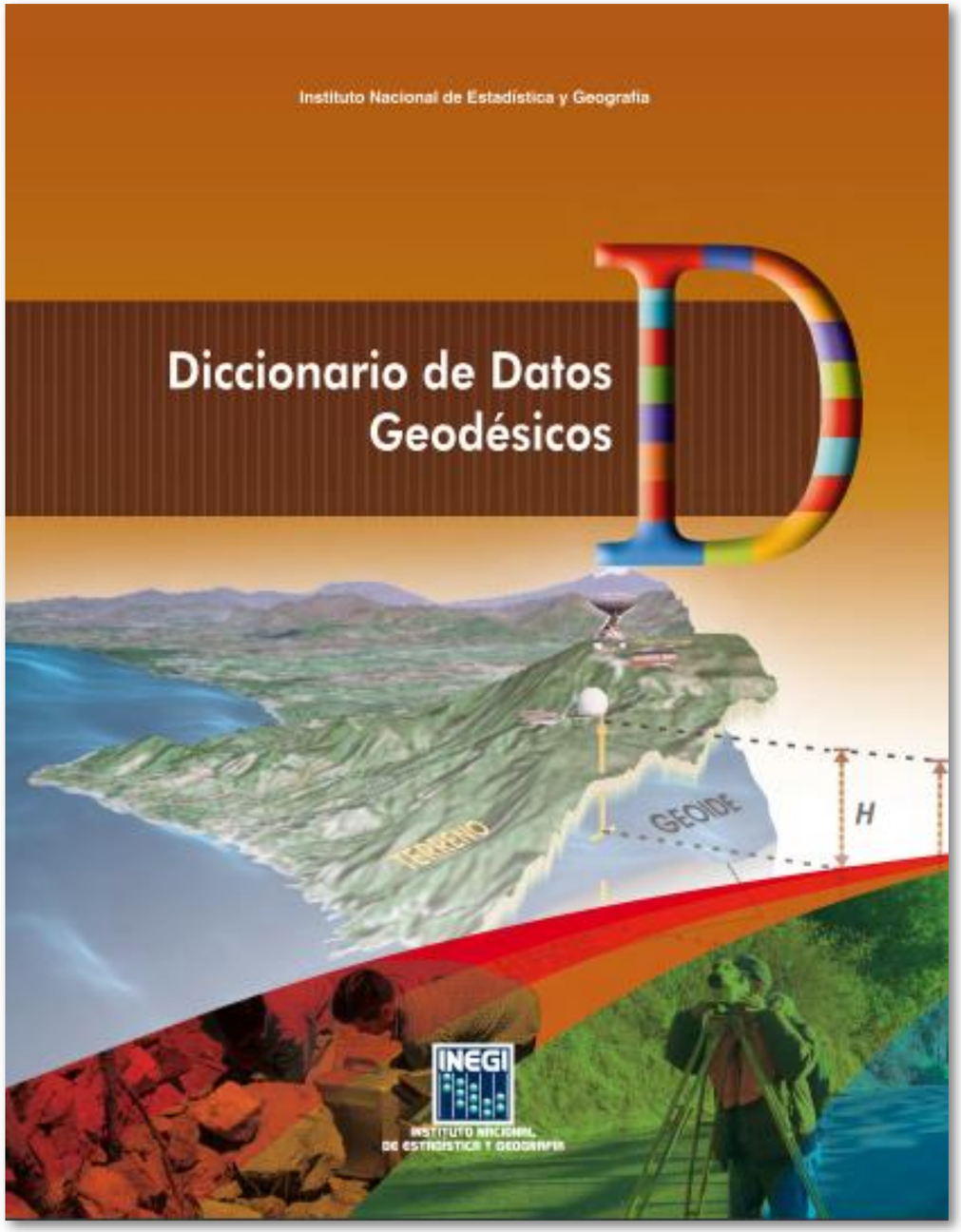
Normative Frame

Geodetic Data Dictionary

Geodetic Data Dictionary started with the change and development of analog cartography to digital cartography, back in 1993. Coupled to this, GPS technology was started to used and reference frame ITRF92 was adopted, associated to GRS80 ellipsoid, in consequence INEGI put in operation the Active National geodetic Network. This version published in 1997 included four entities: benchmarks, Gravimetric Station, Horizontal Positioning Vertex and GPS Station from the National Active geodetic Network.

Geodetic Data Dictionary shows the way in which the geodetic information produced in INEGI, has been structured and conceptually described to be able to be integrated to the Geographic Data Base.

2011 version is sustained in the Spatial Data Model, sticking to the National Geodetic System and Positional Accuracy Standards updating. Spatial objects defined on the Data Dictionary, before conceptualized as entities, have a geographic referencing that allows representing them in a punctual way, through its coordinates, inside data sets, in its many scales.



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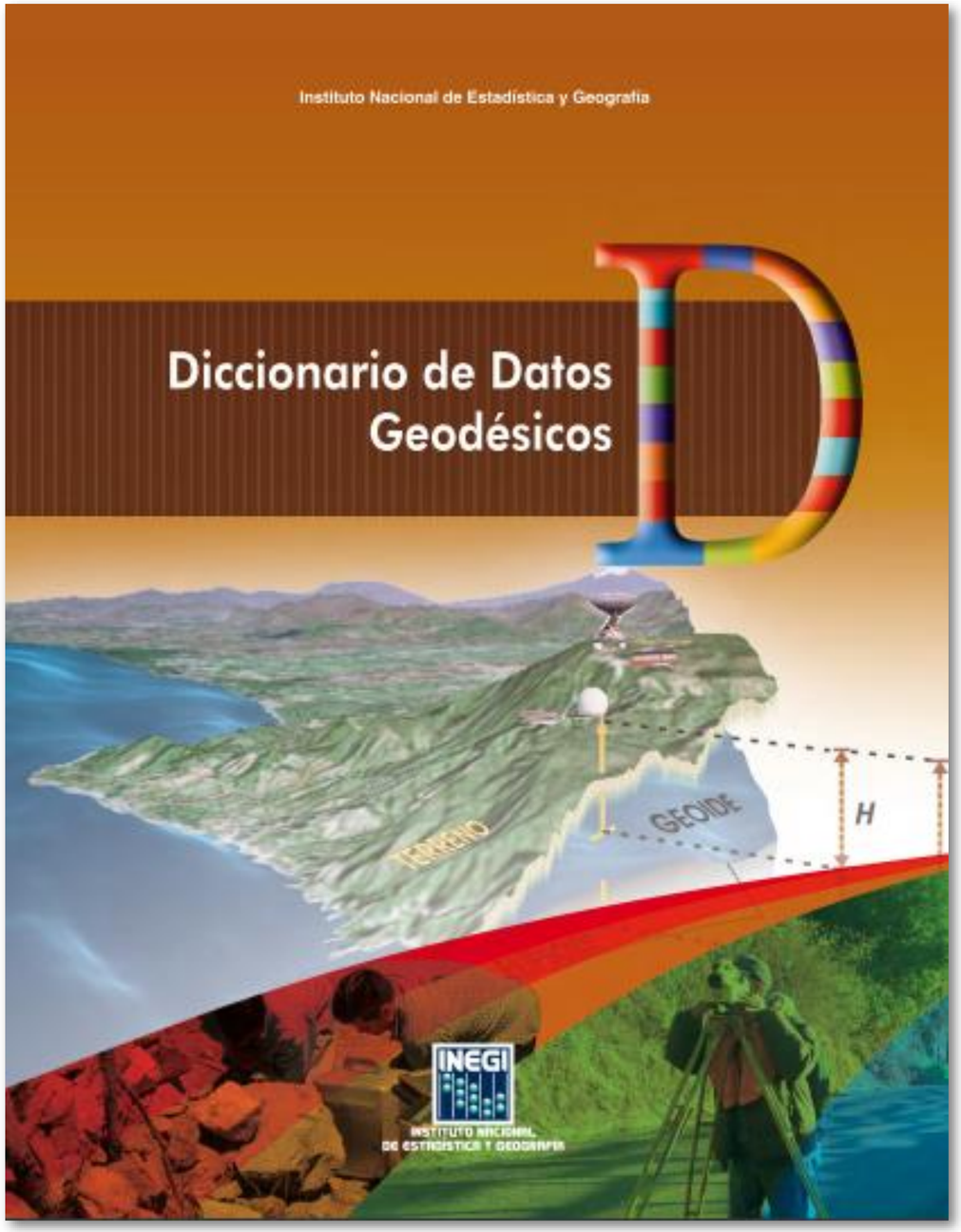
Normative Frame

Geodetic Data Dictionary

Data Dictionaries as normative documents contain the particular specifications that rule the spatial data production. The basis to elaborate data dictionaries from different matters and scales is constituted by the Spatial Data Model, and together with dictionaries, most be considered as the obligatory compliment specifications group. Geodetic Data Dictionary, that applies to every scale, contains the names, definitions and spatial objects characteristics that described under communes specifications gives a place to spatial data generation.



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Normative Frame

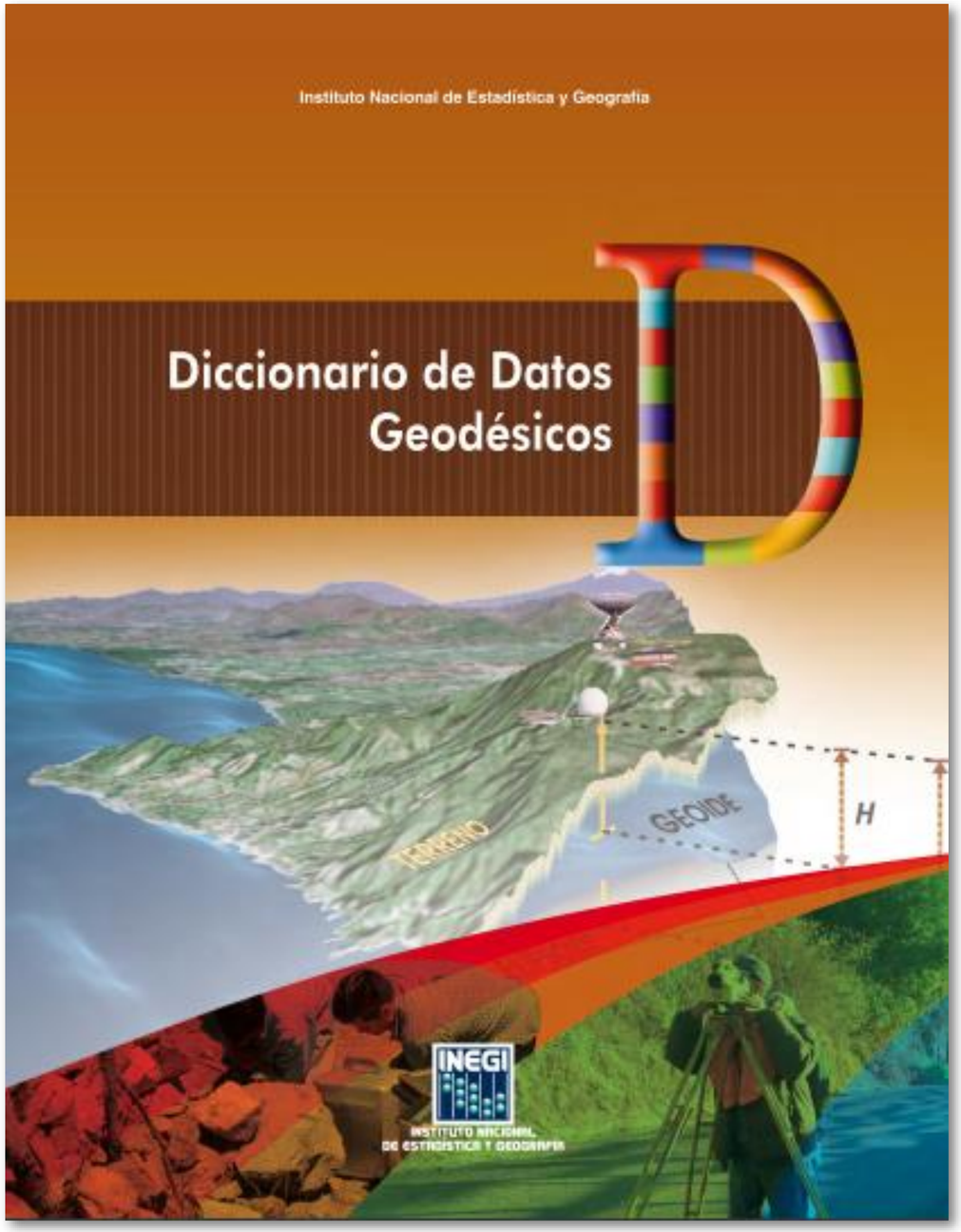
Geodetic Data Dictionary: Spatial Objects

Vertical Geodetic Station or benchmark: Location represented by a recessed plate on a monument, structure or natural place, with an elevation or high datum determined by geodetic measures respect a reference level. Each Station belongs to a level line, which in turn is part of the Vertical Geodetic Network.

Gravimetric Geodetic Station (EGG): Place that can be represented with a metallic recessed plate on a monument or structure, with a gravity acceleration value, determined by geodetic measures respect a determined reference system. Each station is part of the Gravimetric Geodetic Network.

Horizontal Geodetic Station (EGH): Location represented by a metallic plate, recessed on a monument or a part of a structure, with coordinates determined by geodetic measures respect an specified reference frame. Each station is part of the Horizontal Geodetic Network.

Horizontal Geodetic Station from the National Active Geodetic Network: geodetic vertex with coordinates in the official country horizontal geodetic reference frame, in which the monitoring and continuous data register, is made of the Global Navigation Satellite System. In its whole this vertex shape country's fundamental network, denominated National Active Geodetic Network (RGNA) and it has a strategic national coverage.



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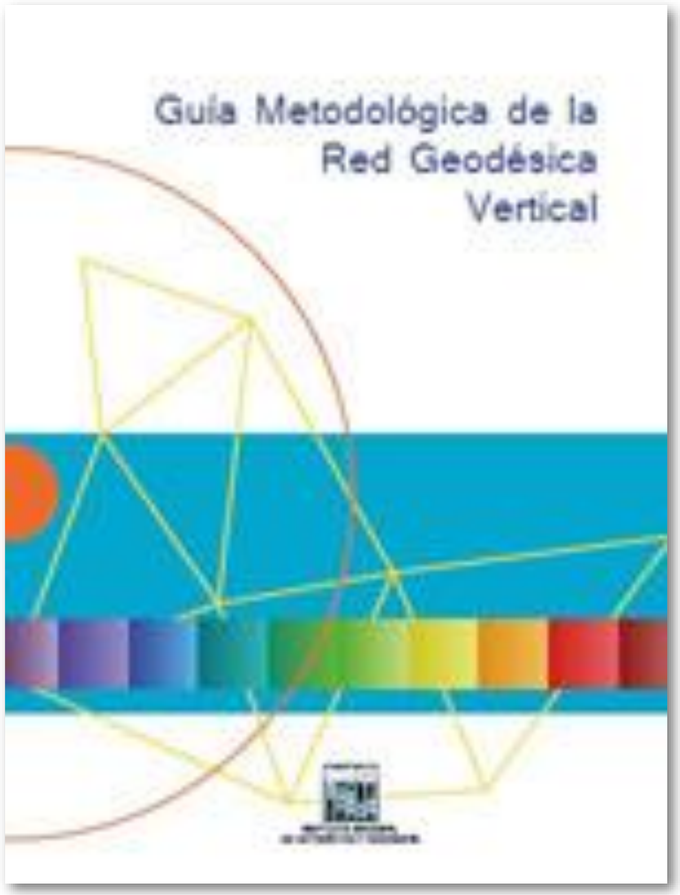
Normative Frame

Methodological Guides



Describes the necessary field surveys for the establishing of Vertical Geodetic Stations or benchmarks by differential leveling methods.

Describes how the establishing of gravity base stations is made and gravimetric stations regional surveys.

Describes how the establishing of Horizontals Geodetic Stations is made with GPS / GNSS.

Privileging standardized procedures and according to the actual normativity which allows the information compatibility and comparability for its system integration.

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Normative Frame

Metadata

Section 1: Spatial data or product set identification

Section 2: Spatial Data or product set related dates

Section 3: Spatial data or product set responsible party

Section 4: Spatial data or product set geographic location

Section 5: Reference system

Section 6: Information quality

Section 7: Attributes

Section 8: Distribution

Section 9: Metadata contact information

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National Geodetic Network

The Network is composed by geodetic stations (horizontal, vertical and gravimetric) physically established and distributed all over the national territory, where precision measurements have been made in order to obtain physical geodetic parameters according to international standards that allow the stations interconnection and calculation of their position and height, as well as the associated external gravimetric field, and related to the considered reference system. It is the basic structure for the geodetic referencing of the country.

Components:

Horizontal Geodetic Network

Vertical Geodetic Network

Gravimetric Geodetic Network

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The relevance of using geodetic information

Objects Precise spatial location

Where they are

Above

Close

Earth’s surface

Guarantees

Data reference

Statistics

Geographic

Generated

Units of the State

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National Geodetic Network

Objective of the information: to provide the users of all the government levels and sectors with geodetic data and information available all over the national territory, to be used as support for the development of programs and projects requiring geodetic stations in the cartography, geographic information systems and research fields, as well as geographic applications. Information services are provided:

- Through the Geodetic Information Integral System (SIIG: Sistema Integral de Información Geodésica).
- Through the Geodetic component of the Digital Map of Mexico. http://gaia.inegi.org.mx/mdm5/viewer.html
- By downloading the System of the Mexican Gravimetric Geoid.
- http://www.inegi.org.mx/geo/contenidos/geodesia/ggm06.aspx?dv=C3
- By downloading the System of the National Active Geodetic Network information.
- http://www.inegi.org.mx/geo/contenidos/geodesia/default.aspx

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National Geodetic Framework

National Geodetic Passive Network

National Geodetic Active Network

Horizontal Surveys

Vertical Surveys

Gravimetric Surveys

It is the materializing of the National Geodetic System

Legal Base: Statistic and Geographic Information National System, Articles 2, 26, 65, 78 y 99.

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National Active Geodetic Network (RGNA)

Presentation

The National Active Geodetic Network (RGNA) is defined as a continuous recording set of stations of the Global Navigation Satellite System (GNSS) data, strategically located in the national territory. This net materializes the National Geodetic System in its horizontal dimension, and provides services to users for geodetic positioning through online RINEX data and coordinates in the official national geodetic reference frame (currently ITRF08, epoch 2010.0).

Every station of the RGNA to which a geodetic survey is tied plays an active role, working as a reference point to determine the differences between its highly precise positions and the positions of new points derived directly from the information transmitted by the (GNSS) System. In this way, and through differential positioning, the RGNA offers geodetic information with the high precision provided by geodetic GPS equipment.

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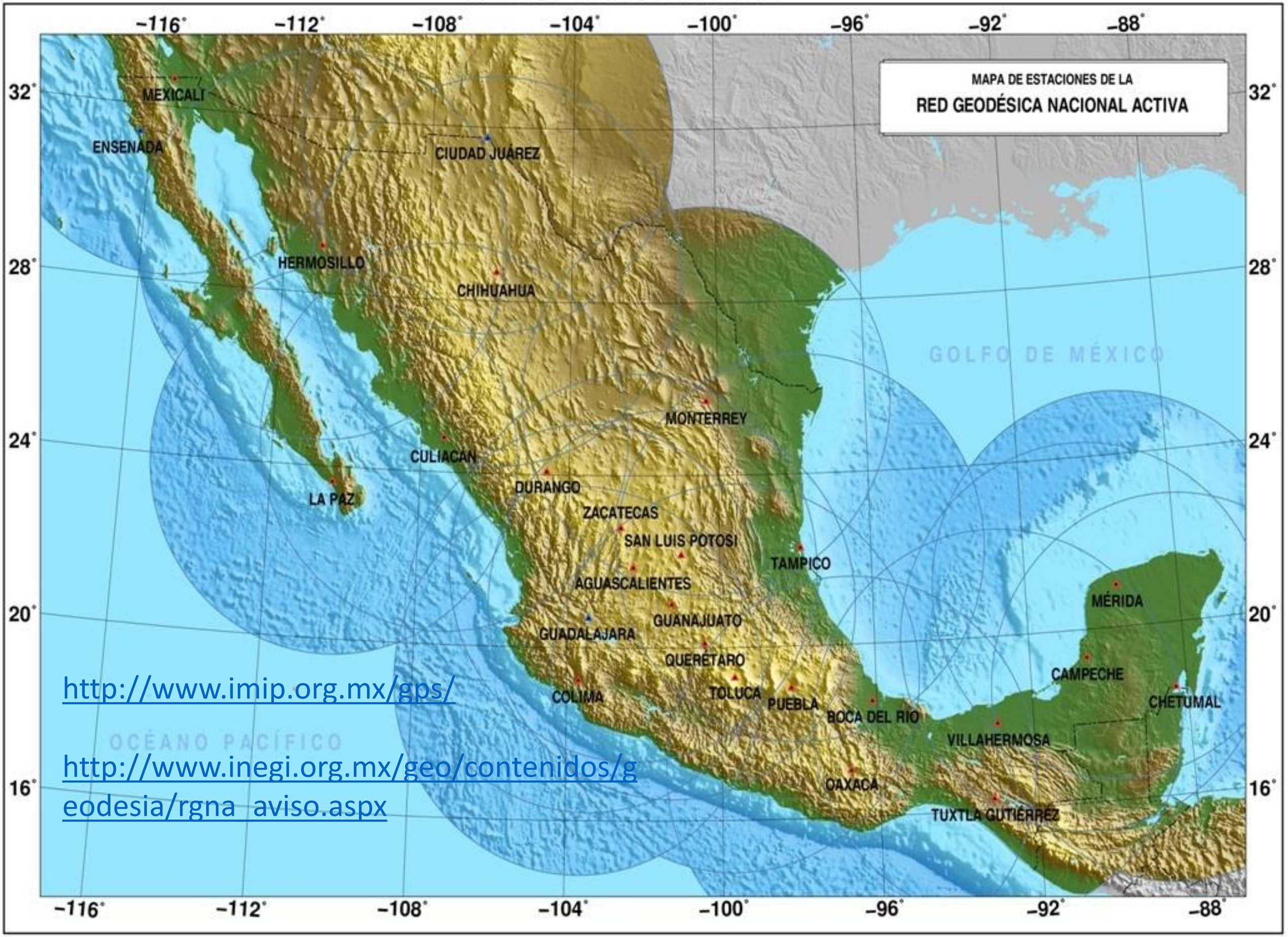
ESTADOS UNIDOS MEXICANOS



http://www.imip.org.mx/gps/

http://www.inegi.org.mx/geo/contenidos/geodesia/rgna_aviso.aspx

Operational Structure

Context

Geodetic activity is performed in the following areas:

- Centrally, in the headquarters building in Aguascalientes
- 10 Regional Offices
- 32 State Coordinations

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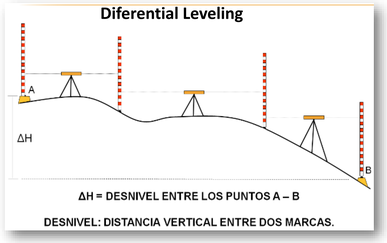
Operational Structure

Functional characterization

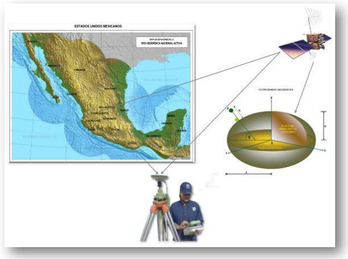
- Central Area: Coordination and regulation
- Regional Areas: Organization and supervision
- State Coordinations: Operational context (Most Field Operations)

Geodetic operation cycle

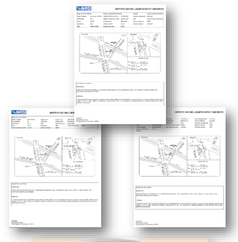
Vertical Geodetic Network



Horizontal Geodetic Network



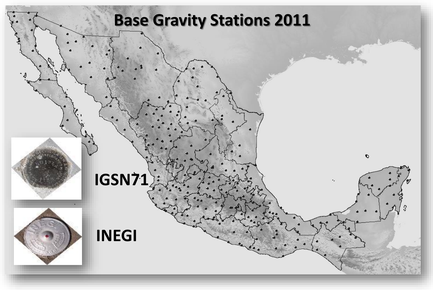
Training in order of programming: annual, national, strategic; Reference Frames and Systems; Normaitvity.

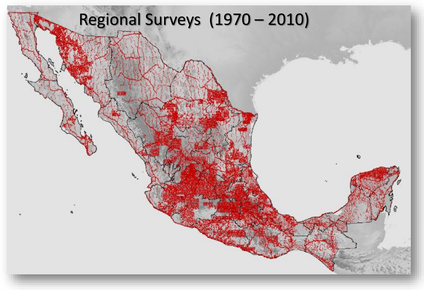


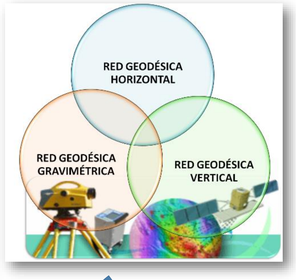
Publishes data and gives the Public Service of Basic Geography Information through WEB applications.

Gravimetric Geodetic Network

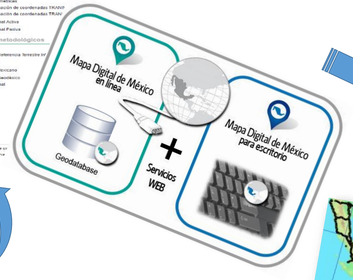
Gravimetric networks orders:

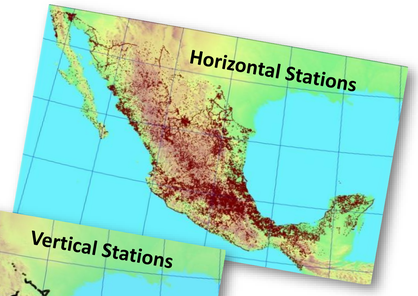






Validates and integrates geodetic data according to Quality Model, Geodetic Data Dictionary. Metadata making.





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Horizontal Geodetic Network

Conveniently selected points on the surface to determinate its coordinates relative to a horizontal reference system, generated through surveys made with Global Positioning System and GNSS.

Ties to the geodetic reference frame to establish: geodetic networks, cadastral networks, ground control for infrastructure work, subsidence studies and others of scientific nature.

ITRF08: International Terrestrial Reference Frame of 2008 (Marco de Referencia Terrestre Internacional del 2008)

Products:

- Horizontal coordinates (latitude, longitude)
- Geodesic Height (h)

Equipment:

- RGNA: 26 Continues Monitoring Stations
- RGNP: 96 NSS hardware (acquired in 2015-2016)
- > 100 GPS hardware older than 10 years

Brigade:

- Two or more persons
- At least one vehicle

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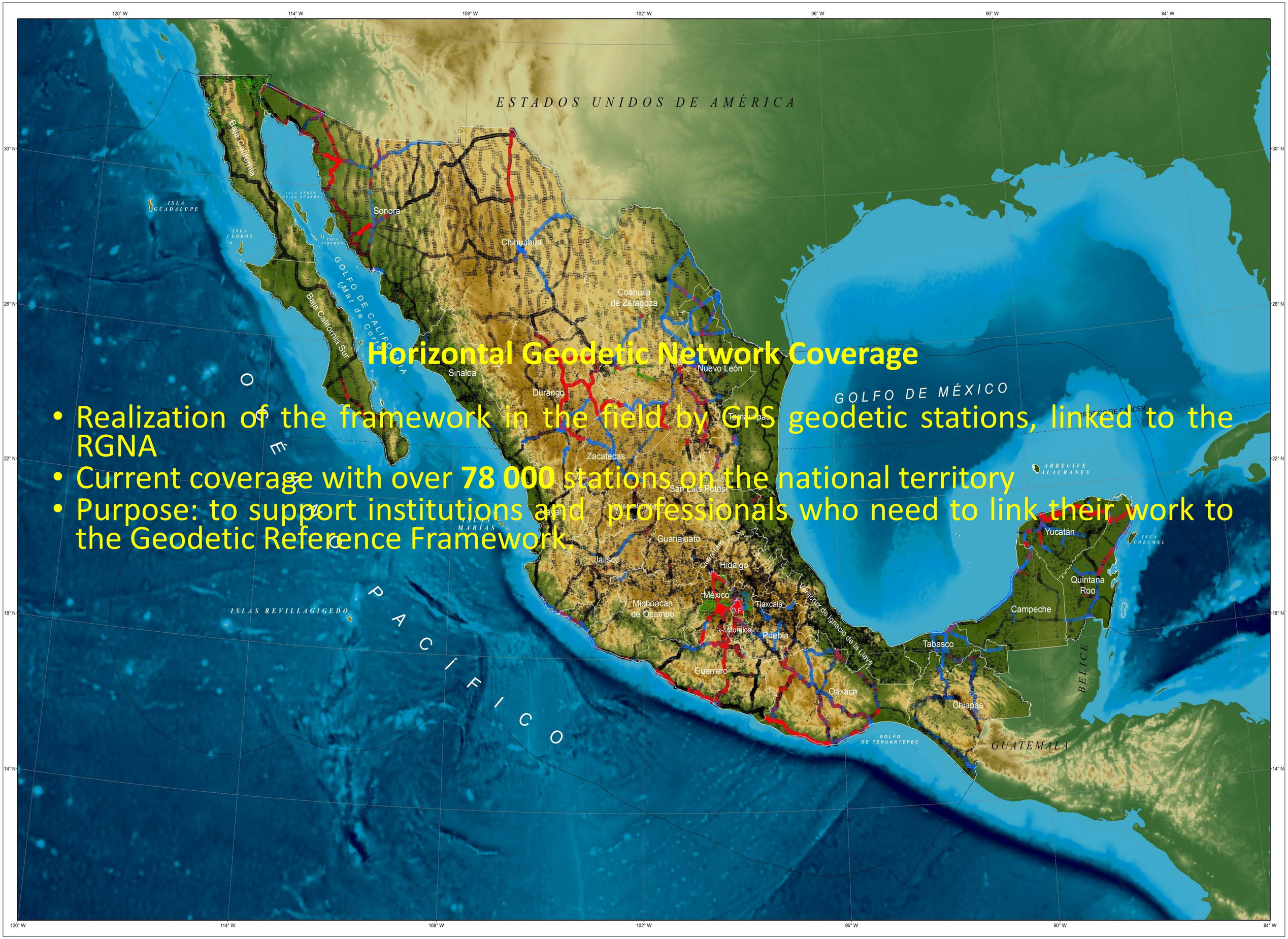
RED GEODÉSICA NACIONAL PASIVA
RED GEODÉSICA HORIZONTAL



Horizontal Geodetic Network Coverage

- Realization of the framework in the field by GPS geodetic stations, linked to the RGNA
- Current coverage with over **78 000** stations on the national territory
- Purpose: to support institutions and professionals who need to link their work to the Geodetic Reference Framework

Vertical Geodetic Network

Elevations relatives to a reference surface for giving support to the referred heights in cartography.

Products:

Orthometric Heights

NAVD88: North American Vertical Datum of 1988 (Dátum Vertical Norteamericano de 1988)

Equipment:

- 39 acquired hardware in 2015-2016
- >15 hardware previous models

Brigade:

- Five persons
- One vehicle

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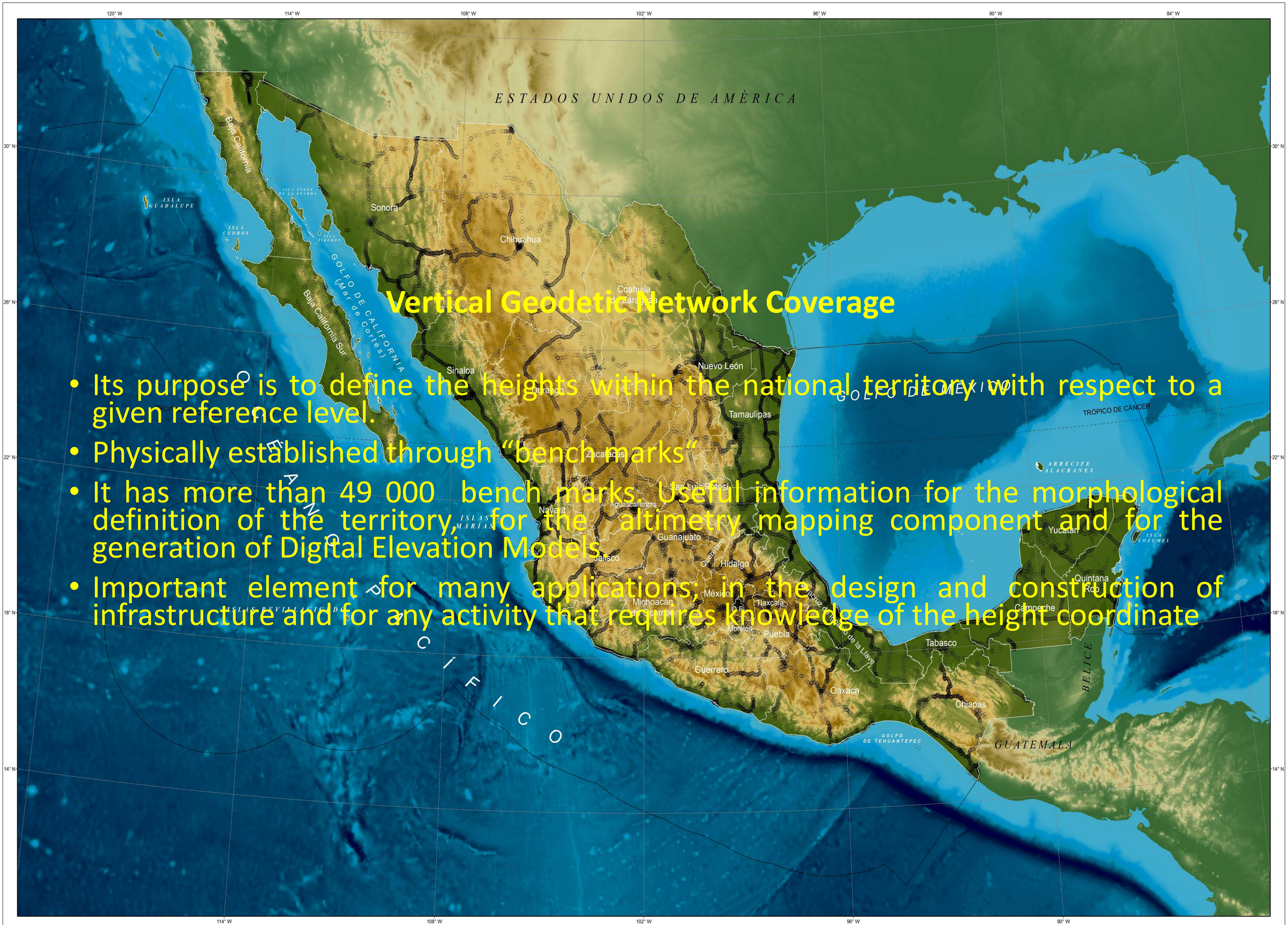

Vertical Geodetic Network Coverage

- Its purpose is to define the heights within the national territory with respect to a given reference level.
- Physically established through “bench marks”
- It has more than 49 000 bench marks. Useful information for the morphological definition of the territory, for the altimetry mapping component and for the generation of Digital Elevation Models.
- Important element for many applications; in the design and construction of infrastructure and for any activity that requires knowledge of the height coordinate

Gravimetrical Geodetic Network

Earth Gravity values to provide the basic input in the determination of the Geoid in Mexico.

Mexican Gravimetric Geoid is useful for the orthometric heights obtaining through the differencing between ellipsoidal heights provided by the Global Positioning System and geoid heights.

IGSN71: International Gravity Standardization Net of 1971 (Red Internacional de Estandarización de la Gravedad de 1971)

Products:

Earth gravity values.

Gravimetric anomalies

Equipment:

- 10 electronic gravimeters; 6 acquired in 2000s; 4 acquired in 2015.

Brigades:

- Two persons
- One vehicle

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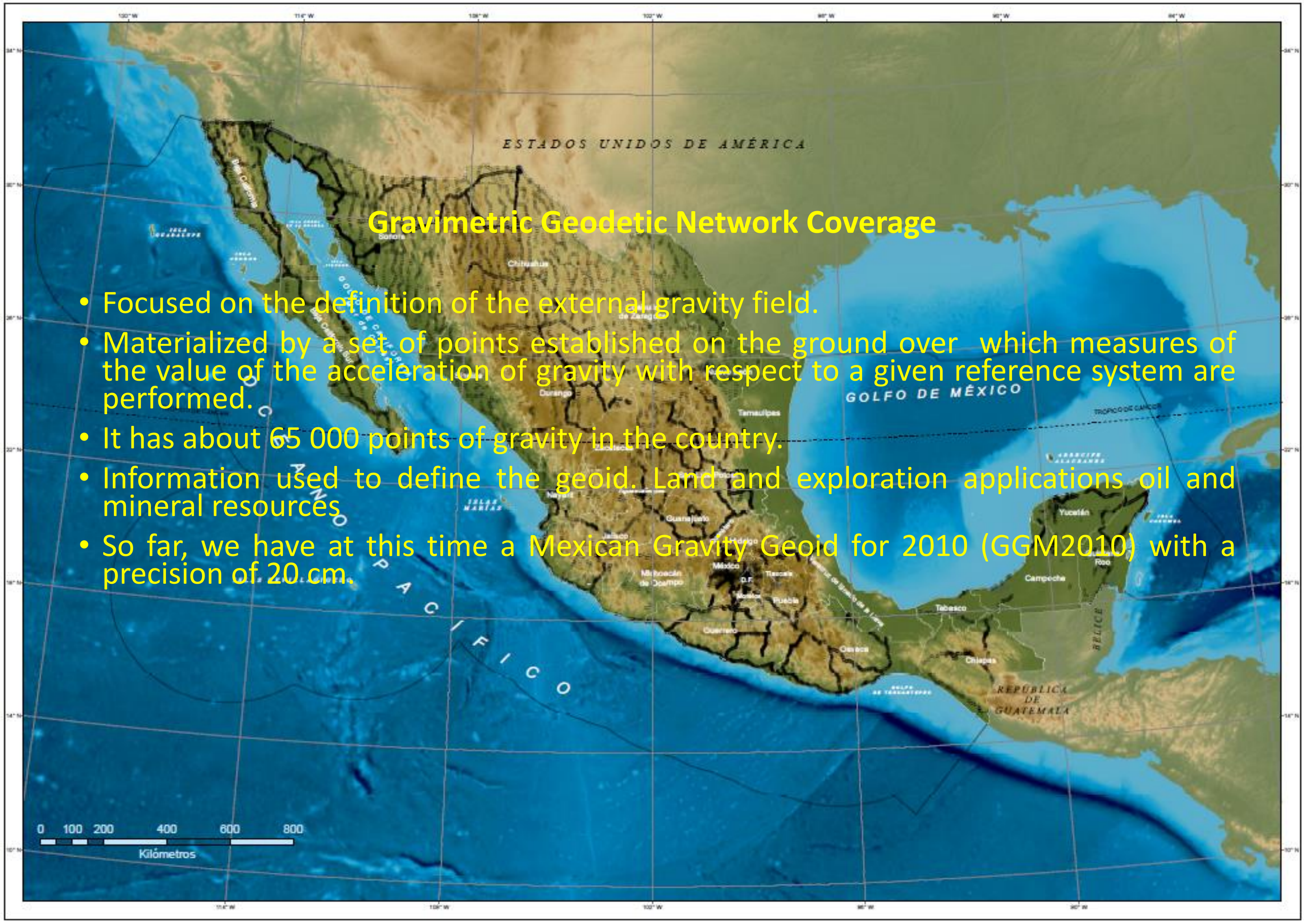
RED GEODÉSICA NACIONAL PASIVA
RED GEODÉSICA GRAVIMÉTRICA



Gravimetric Geodetic Network Coverage

- Focused on the definition of the external gravity field.
- Materialized by a set of points established on the ground over which measures of the value of the acceleration of gravity with respect to a given reference system are performed.
- It has about 65 000 points of gravity in the country.
- Information used to define the geoid. Land and exploration applications oil and mineral resources
- So far, we have at this time a Mexican Gravity Geoid for 2010 (GGM2010) with a precision of 20 cm.

Geodetic Information Access Mechanism 1/2

RGNA Stations

FTP: Files Transfer Protocole

FTP Protocol

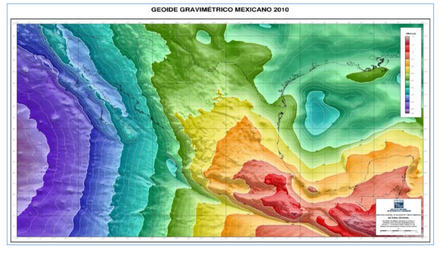
RGNA FTP Server

FTP Protocol

Internet INEGI's site

HTTP Protocol

HTTP: Hypertext Transference Protocol.



RNGA and Geoid Data

Units of State, National and International Users

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Geodetic Information Access Mechanism 2/2

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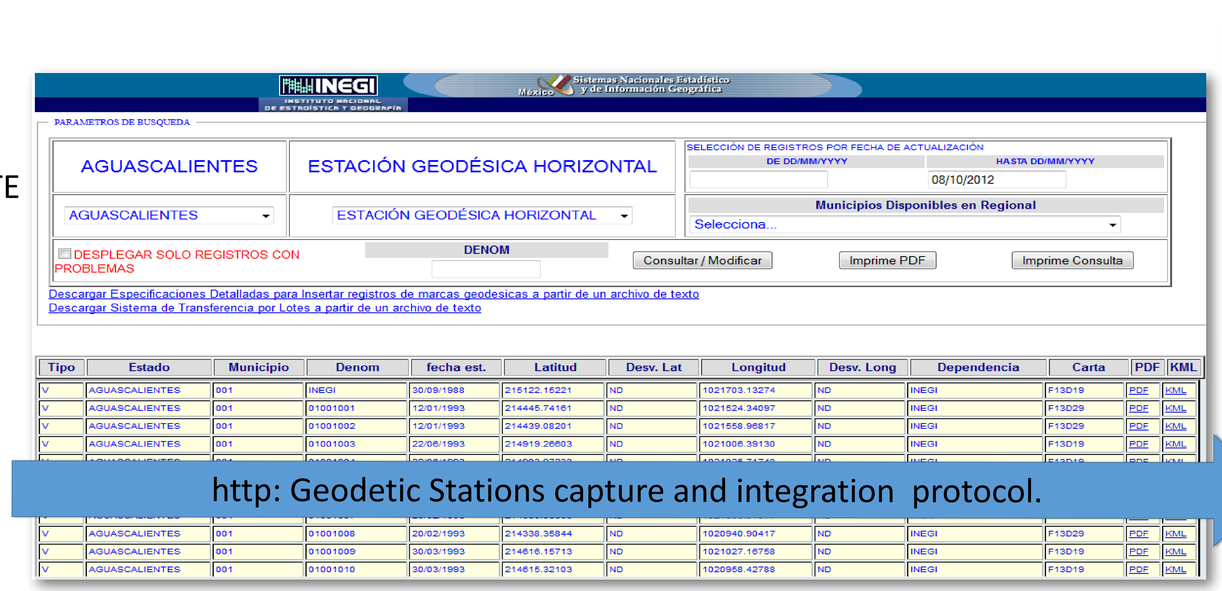
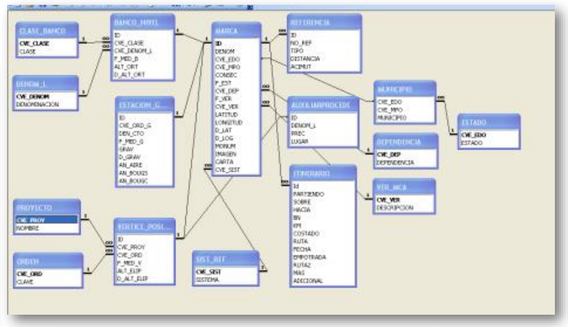
UNITS OF STATE

ACADEMY

RGNP Stations



http: Geodetic Stations capture and integration protocol.



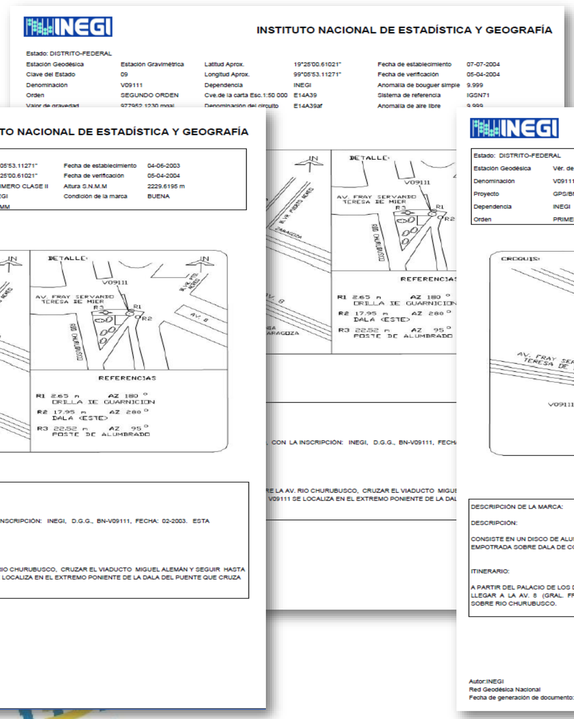
Integration according to geodetic data dictionary. Metadata generation.

Geographic Database Server

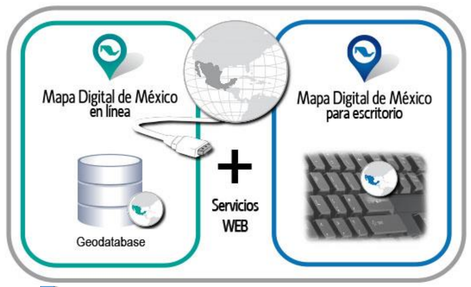
Validated data transfer to BDINEGI

http Protocol

PDF Geodetic stations sketch on PDF file



User http Protocol



Consultation and download through Mapa Digital de México

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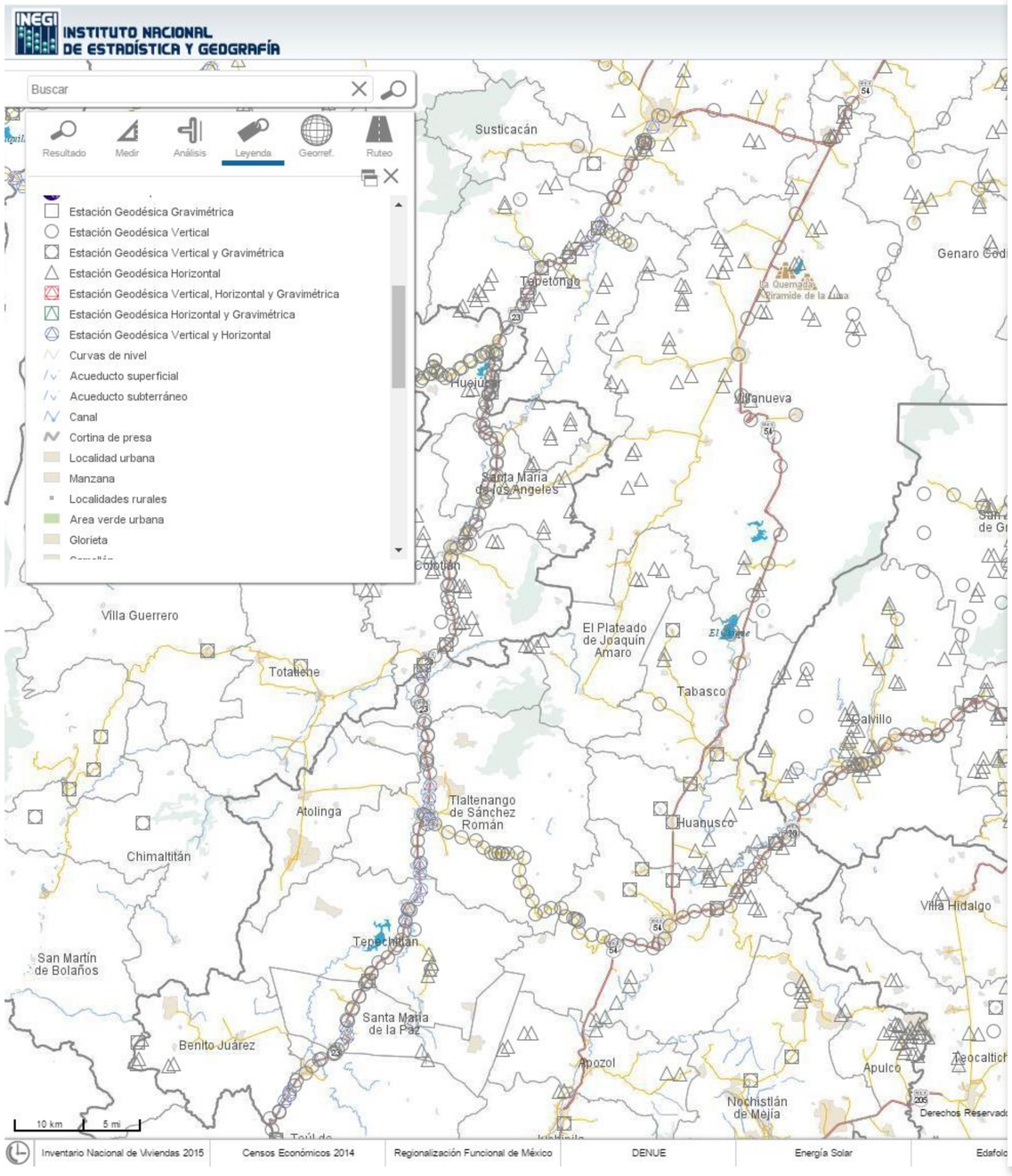

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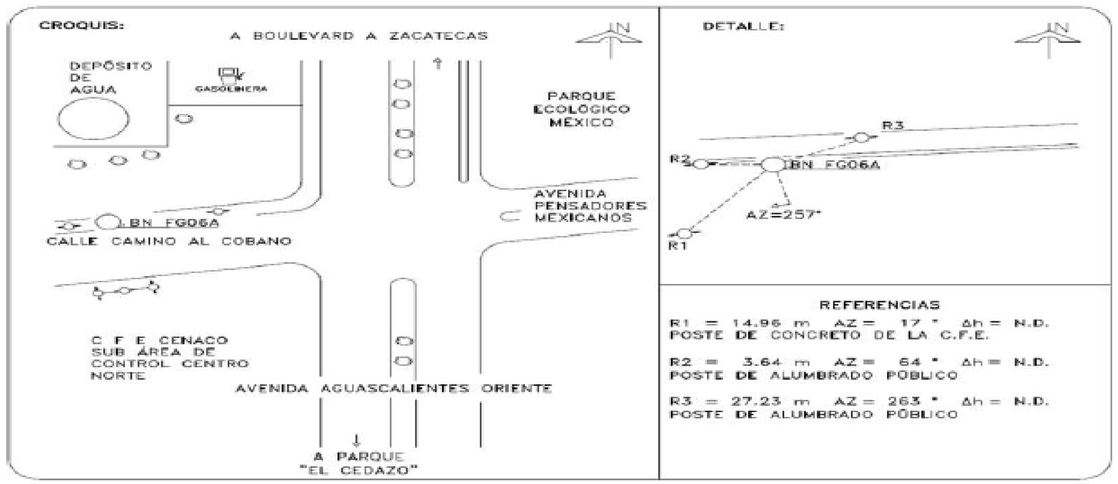
Denominación:	FG06A	Latitud aproximada:	21°54'30.8"	Condición de la marca:	BUENA
Estación Geodésica:	Vertical (BN)	Longitud aproximada:	102°16'24.5"	Fecha de establecimiento:	20-03-2003
Dependencia:	INEGI	Altura Ortométrica:	1906.7793 m	Fecha de medición:	28-03-2011
Estado:	Aguascalientes	Marco Geodésico de Referencia Vertical:	NAVD29	Fecha de verificación:	28-03-2011
Municipio:	Aguascalientes	Clasificación:	PRIMERO CLASE II	Fecha de validación:	01-08-2011
Carta Esc. 1:50 000:	F13D19	Proyecto:	DENSIFICACIÓN AGUASCALIENTES		



DESCRIPCIÓN DE LA MARCA:

PLACA DE ALUMINIO DE 0.095 m DE DIÁMETRO CON LA SIGUIENTE INSCRIPCIÓN: "INEGI, D.G.G., BN FG06A, FECHA: 03-2003", EMPOTRADA EN: GUARNICIÓN DE BANQUETA QUE MIDE 0.15 m DE ANCHO X 3.00 m DE LARGO X 0.20 m DE ALTURA SOBRE EL TERRENO.

ITINERARIO:

PARTIENDO DEL CRUCERO DE AVENIDA AGUASCALIENTES ORIENTE Y CALLE CAMINO AL COBANO SOBRE CALLE CAMINO AL COBANO, EL BN FG06A SE ENCUENTRA A 70.00 m AL COSTADO "NO" DE LA RUTA, A 9.50 m DE SU EJE.

EL EJE DE LA RUTA A LA PLACA ESTÁ 0.10 m MÁS ABAJO.

INFORMACIÓN ADICIONAL:

EL BN FG06A SE ENCUENTRA FRENTE A LA SUB ÁREA CENTRO NORTE DE LA COMISIÓN FEDERAL DE ELECTRICIDAD.

Autor:INEGI
Red Geodésica Nacional
Fecha de generación de documento: 27/2/2013

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Conoce la versión Beta de nuestro Sitio

Ir a sitio Beta

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Geodesia

Red Geodésica Nacional Pasiva

Acervo de Estaciones Geodésicas – consulta

Entidad federativa	Estación Geodésica Horizontal	Estación Geodésica Vertical (BN)	Estación Geodésica Gravimétrica
Aguascalientes	731	413	249
Baja California	1,517	1,531	1,281
Baja California Sur	804	935	615
Campeche	1,175	1,127	196
Coahuila de Zaragoza	3,020	1,307	613
Colima	568	347	117
Chiapas	2,656	1,789	284
Chihuahua	2,742	3,390	1,816
Distrito Federal	450	450	279
Durango	4,568	2,516	928
Guanajuato	2,135	998	338
Guerrero	2,427	2,194	1,398
Hidalgo	3,276	716	96
Jalisco	2,520	2,419	524
México	4,068	1,300	1,007

Las estaciones geodésicas pueden compartir más de una medición

Cantidad	Descripción
12,686	Estaciones Geodésicas Verticales tienen información de Gravedad
1,539	Estaciones Geodésicas Horizontales tienen información de Gravedad
6,915	Estaciones Geodésicas Verticales tienen información de Horizontal
3,643	Estaciones Geodésicas Verticales tienen información de Horizontal y Gravedad

Nota: Última fecha de actualización: **15/08/2016**

http://www.inegi.org.mx/geo/contenidos/geodesia/inventarioPuntos.aspx

Consulting date: August 12th, 2016.

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CENTRAL

Normativity and Reference Frames applications

Annual Program

(Regulate and special projects)

Field operations

RGNA

Training

User support

Advance report and programmatic adjusts

Consultation with Regional, programs and budgets

REGIONAL TO CENTRAL:

Collected, processed and validated data deliver

RGNA reports, geodesic data integration, user support.

CENTRAL TO REGIONAL:

Annual Goal distribution

Annual Goal assignation

REGIONAL:

Operational supervision and operation

(States Coordination)

CENTRAL TO REGIONAL:

Normative and programmatic following

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General Methodology

Planning

Programming

Assignation-Execution

Validating

Planning

Program progress review
On a monthly basis, program progress is reviewed according to an annual programming, the review is made in terms of geodetic station quantity, geographic coverage, budget year and another aspects of interest, in order to diagnose the optimum program progress and in its case, implement corrective actions in the operation.

Input availability
Input availability is reviewed (geodetic stations) to determinate its reuse and optimize operative costs.

Installed capacity
Installed capacity review allows to measure workloads that could be fulfilled with available resources within a regular work program or special Project.

Planning

Operating conditions

Operational conditions are analyzed and evaluated for a better decision making of the topographic conditions in which the Project will be make; meteorological and climate aspects according to the season; security conditions for field personnel; as well as socio-cultural conditions so the technical staff may act with decorum and responsibility.

Provider-client consulting

Consultation with clients and providers allows to measure the working input availability and know client needs, know the interest working zones and the working program for a better operational planning and operating resources distribution.

Planning

Program (annual/national/strategic)
In Mexico, annual working programs are part of a six-year national program and at the same time, of a strategic program, so that each program adds to a bigger one to strengthen and maintain the Statistic and Geographic National Information System.

Budget: operating, investing, training, etc.
Based on allocated resources it is determined the best operational strategies to maximize field operations benefits, data collect, input-product generation and Statistic and Geographic National Information System integration.

Documentation and management
Every working program shall be duly registered according to institutional active normativity; programmatic elements are made, objectives, goals, products are determined, among others.

Programming

Calendar

Goals calendar allows to compare monthly progress and foresee input for field projects, made adjusts if it is need, the calendar also allows to predetermine adjusts according to goals progress.

Projects elaboration

Projects implies to integrate material resources, cartographic input, SIG tools work, sensing remote images (as could be for Terrestrial Control Points for photogrammetric processes), images are very useful because they help to locate in field and select features of interest; every resources are integrated to generate production unities that allow to evaluate production and productivity. In the Vertical Geodetic Network is included previously to geodetic surveys monumentation of each vertical geodetic station or benchmark.

Programming

Input accumulation

Input for data collect and geodetic horizontal stations establishments are: SIG administration system, geodetic stations sketch, format for attribute register according to geodetic data dictionary, digital cartography, sensing remote images, GNSS equipment, accessories, etc; for geodetic vertical stations or benchmarks images are not used however they are important, besides working equipment (electronic level) and accessories, as well as metallic plates if a recovery of a mark is needed, pocket navigator for a proximate monument location in leveling works. In the gravimetric network a gravimeter is incorporated and a GPS navigator; of course, in all cases the user specifications.

Documentation, register, following

As in planning programming, it is documented to preserve a memory of the projects and it is backed up on a designated data server. Documentation facilitates the following and evaluation of projects as when they are finished on its field state. Each project is registered administrative and technical for its following and transparent accountability.

Assignation-Execution

Assignation-documentation
Project assignation is made through an official document and controls are made to supervise and control operating work, assignation dates are registered, field work periods, data process, validating and results delivery.

Field activities and field documentation
On field activities, specified working methods on the working methodology are applied, data is collected and baked up, binnacle or register sheets of each survey, as appropriate for each geodetic network.

Back ups
Back ups are made for every project according to intern rules which in turn observe best practices in the field.

Control

Supervision (direct-indirect), and following according to indicators

Supervision has two components: normative and operative; from a central ambient is supervised the normative aspects compliance and compliance according to technical rules and client specifications; in regional headquarters are supervised state headquarters field operations (State Coordination). Supervision could happen under remote controls such as phone calls, videoconferences, e-mails, documentation and data revisions, as well as adjustment report of geodetic data; on the other side direct field visits are made to ascertain the adequate equipment and accessories use, formats fill, work uniform use, work schedules, etc. Every supervision result is documented, when the supervision is taken in office operating activity a questionnaire and a supervision minute is filled.

General Methodology

Validating

Data processing (field and/or desk)

Data process could be made on both field or cabinet having all the input for its processing, reference system application according to geodetic data type, use of all field formats and collected data, project configuration according to survey methods, geoidal models, and every single useful attributes according to the project nature and products to deliver; data processing most anticipate the generation of every needed attribute according to its domain range, logic consistence and completeness and to be evaluated for its incorporation into the Statistic and Geographic National Information System.

Validating: program, technical standards, dictionary(ies), client-user specifications, formats, completeness, logic consistence, metadata, etc.

As a natural part and posterior to previous phases and activities, a program validations is made, standards fulfillment, generation of every spatial data attributes specified on a data dictionary, fulfillment verification of the specifications needed by our users, and all the elements that guaranty the quality of the product on the context of a spatial data infrastructure.

Input-product delivery

Already validated data is integrated to the Statistic and Geographic National Information System and is delivered to clients and made available for the own-system users for its better exploitation based on the requirements of its working projects.

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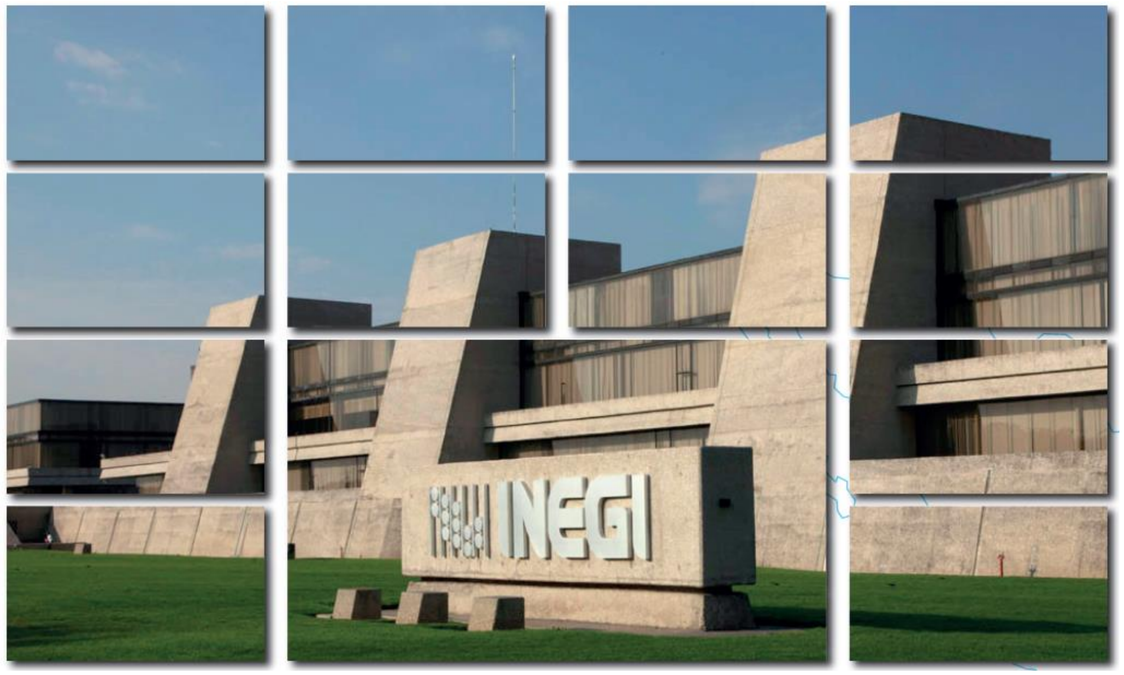

¡GRACIAS POR SU ATENCIÓN!

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Timeline – technical aspects - Geodesy

1968

Acquisition of aerial equipment for photographs taking, geodetic, photogrammetric and laboratory equipment. Personnel is hired and trained. The country is divided into 86 working zones.

1969

The first aerial photographs are taken, initiating the topographic and natural resources cartography.

1971

CETENAL, along with the Secretariat of the Navy and the Secretariat of Foreign Affairs, delimits the Exclusive Economic Zone of Mexico.

The first cartographic chart is published, scale 1:50,000
The first gravimetric surveys take place .

The first gravimetric surveys take place .

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Timeline – technical aspects - Geodesy

1977

At the request of both the Sate of Queretaro and the Secretariat of the Agrarian Reform, CETENAL launches the Rural Cadastre, called as Queretaro Plan, establishing the methodological criteria for the following rural cadaster surveys.

1985

The Technical Standards for Aerial Photographic surveys and the Minimum Technical Standards for Geodetic Surveys are published in the Official Journal.

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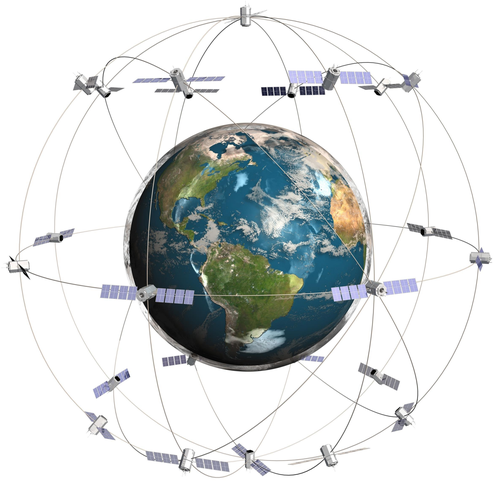
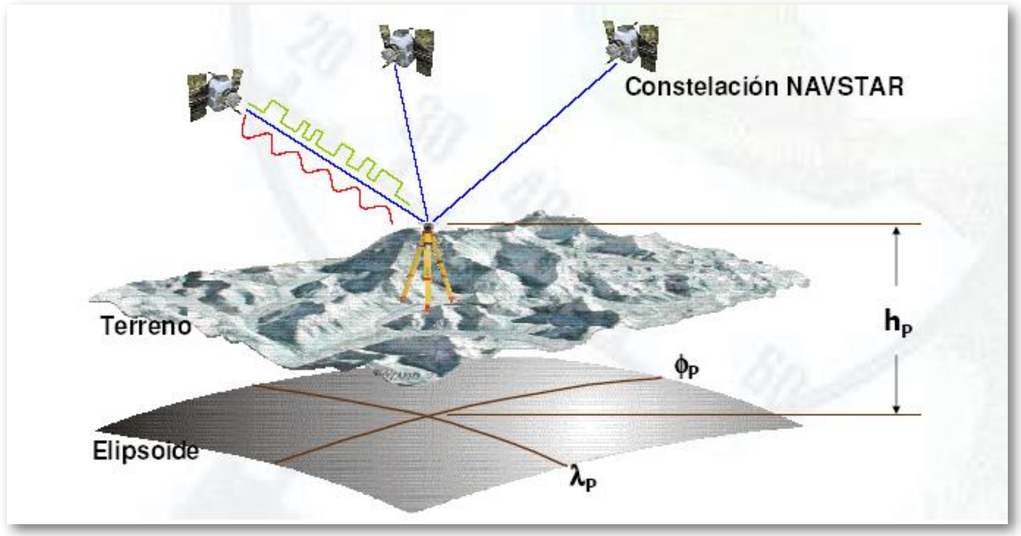
Timeline – technical aspects - Geodesy

1990

The Global Positioning System (GPS) is implemented at the INEGI as a new technology for the geodetic positioning.





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Timeline – technical aspects - Geodesy

1992-1993

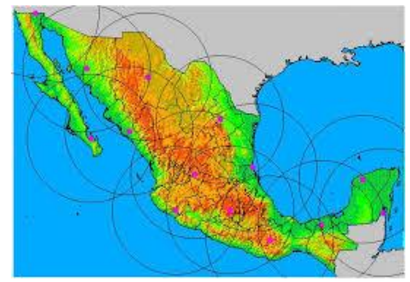
In response to the reforms made to the Article 27 of the Political Constitution of the United Mexican States with respect to the social property, the Certificate Program of the Shared Lands Rights and Urban Plots Titling (PROCEDE) is established together with the Directorate General of Cadastre Cartography, in order to survey the information related to the social property.

The INEGI modernization of the geographic activity with digital technology begins by means of modules, such as cartography conversion to digital format, production, updating, geographic databases, visual display, spatial analysis and automized reproduction.

The Project for the Mining Geodetic Subnet concentrated with the Secretariat of Energy, Mines and Semi-official Industry is begun.

1993

Active National Geodetic Network (RGNA) with 14 continuous operation fixed stations, uniformly distributed nationwide is implemented, and becomes the basis for the National Geodetic Survey



Formal change of the Geodetic Reference System, NAD27, Clark Spheroid 1866 to the ITRF92, epoch 1988.0 in the GRS80.

Timeline – technical aspects - Geodesy

1994

GPS measurements are made at the Mexico-Guatemala border, horizontal positioning on the border monuments at the request of the Secretariat of Foreign Affairs.

1997

The use of airplanes is included in the INEGI, airborne GPS, for geodetic reference control of aerial photographies.

1998

Reforms and additions to the Technical Standards for Geodetic Surveys are published in the Official Journal of the Federation.

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Timeline – technical aspects - Geodesy

2004

- The first results on the GPS monitoring of the subsidence in the city of Aguascalientes.
- The 2004 Mexican Gravimetric Geoid is published at the INEGI web site (GGM04).
- The topographic information survey with LIDAR technology equipment is implemented.
- ISO 9001-2000 Certification of the RGNA data availability process.
- The participation of the INEGI in the operation to obtain satellite imagery using ground stations: Receiver Mexican Imagery Station SPOT (ERMEXS) begins together with the Secretariat of the Navy and SAGARPA.
- The topographic information survey with LIDAR technology equipment begins.
- ISO 9001-2000 Certification of the RGNA data availability process.

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Timeline – technical aspects - Geodesy

2005

The Treaty on the Maritime Delimitation between the Mexican United States and the Republic of Honduras Governments is signed based on the GPS surveys performed by the DGG and agreed with Honduras.

The activities to generate the Topographic Chart scale 1:20,000 from the photogrammetric flight scale 1:40,000 are initiated.

Timeline – technical aspects - Geodesy

2006
The 2006 Mexican Gravimetric Geoid (GGM06) is published at the INEGI web site {2006}.

2007
The GPS surveys are performed to update the Mexico-United States border monument coordinates at the request of the International Boundary and Water Commission (IBWC NORTH).

2010
The institutional aerial fleet activity is concluded and the use of high resolution satellite imagery is implemented, along with aerial photographies taken by a third party as input for the basic geographic production.

The Technical Standards for the National Geodetic System, for the Geographic Metadata Production, for Geographic Addresses, and for the Positional Accuracy Standards are published.

2010
SEDESOL – INEGI sign an agreement for the Modernization Program of the Public Registry of Property and Cadastre.

The 2010 Mexican Gravimetric Geoid (GGM10) is published at the INEGI web site.

The PROCAMPO land property georeferencing is initiated in 28 states.

The first version of the National System of Cadastre and Registry information is produced.

2011
Formalization of the INEGI Processing Center of the RGNA and international stations to obtain ITRF solutions with the Geocentric Reference System of the Americas (SIRGAS).

Organization of the International Workshop on the Geoid for Mexico, Central America and the Caribbean.

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