

Project for Strengthening of Spatial Data Infrastructures in member countries of the Association of Caribbean States

Advances

SEPTEMBER, 2014

Content

- Diagnosis Results
- Project Plan
 - Strengthening the geodetic network
 - Digital Map of the Caribbean
 - Map of Land Cover
 - Capacity building

DIAGNOSIS



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PARA LAS AMÉRICAS



Association of Caribbean States
Asociación de Estados del Caribe
Association des Etats de la Caraïbe

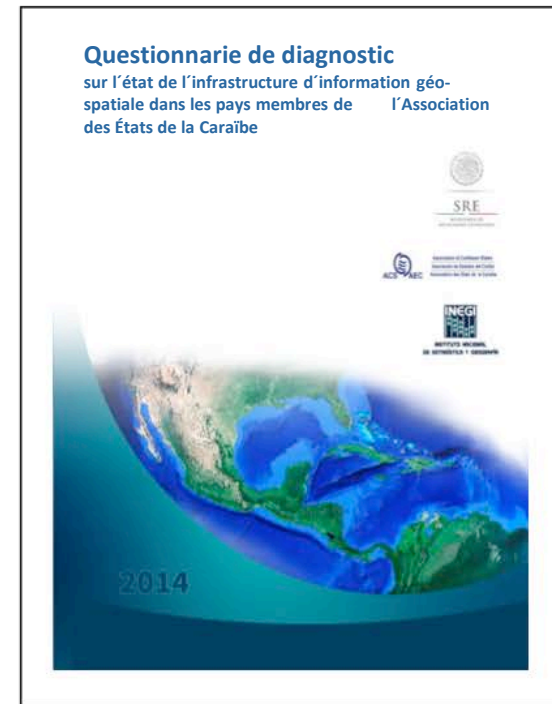
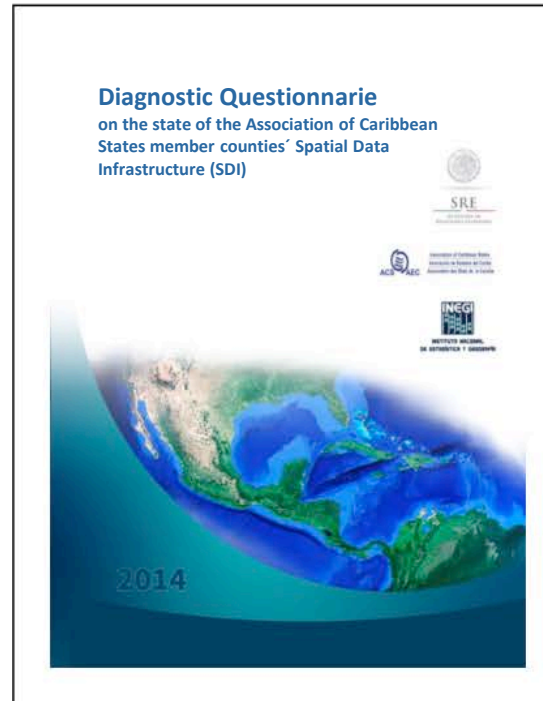
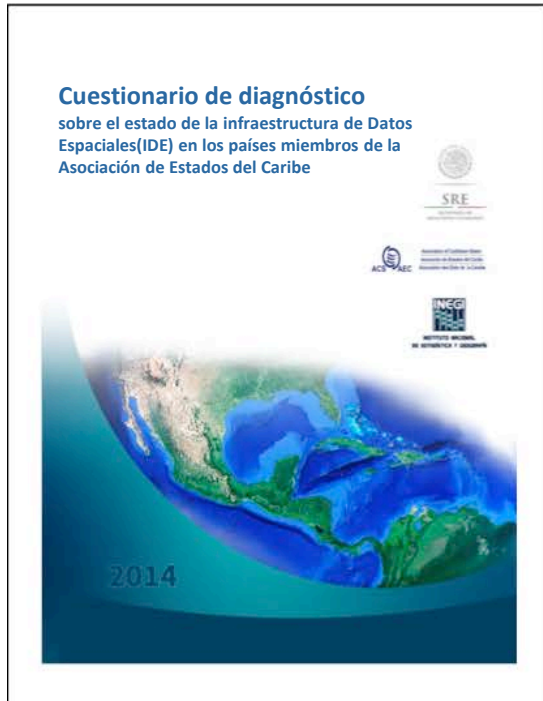


SECRETARÍA DE
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**INSTITUTO NACIONAL
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Diagnosis of the state of geospatial information



Elements considered in the diagnosis

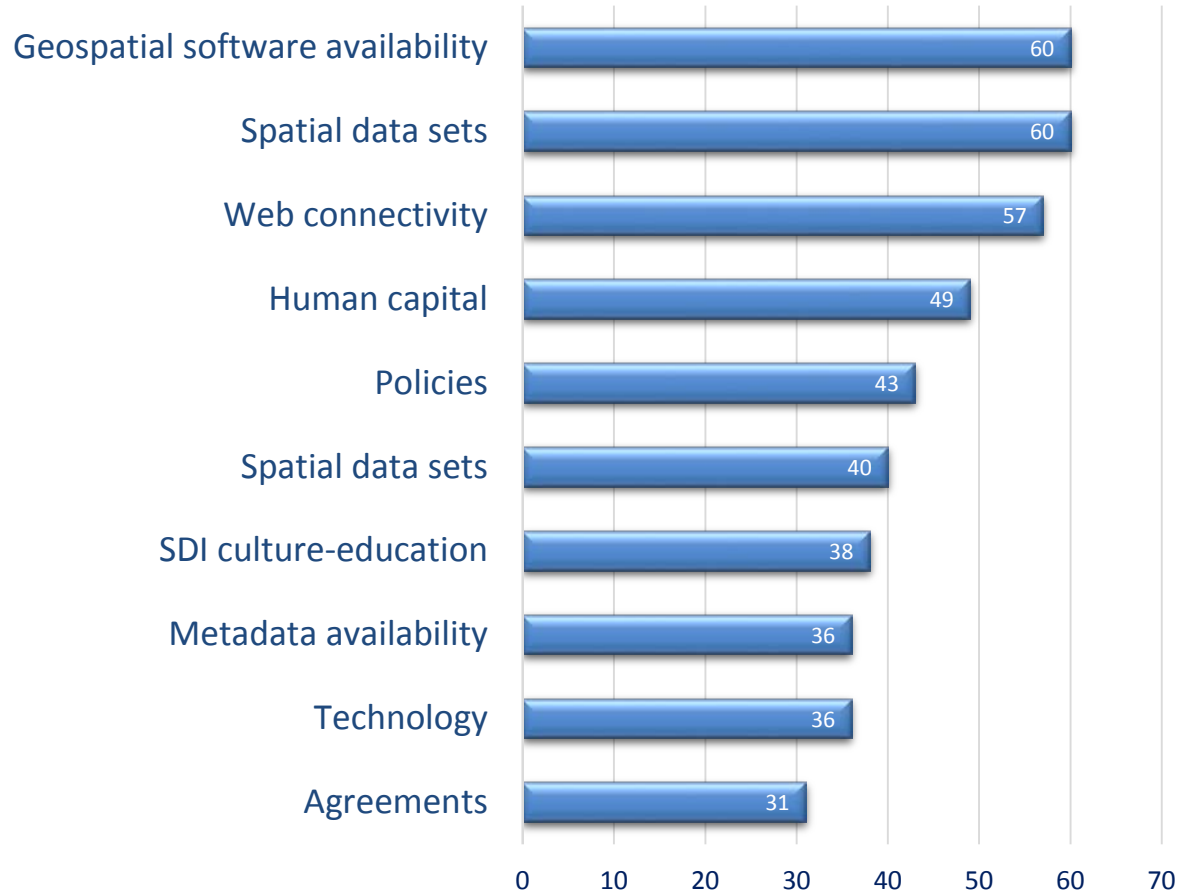
ELEMENT	DESCRIPTION
Spatial data sets	Reported products and geographic inputs
Spatial data services	Geographic data services through networks
Policies	Best practices for the procurement and availability of information
Availability of metadata	Metadata reported for each type of information and related activities
Human capital	Trained personnel (in general and by specific activity)
SDI culture, education and training	Training, education level and SDI knowledge
Agreements	Collaborations, use of standards & information
Connectivity	Types of available network connectivity
Technology	Technological conditions and features
Availability of geospatial software	Use of geographic software and development of applications

Diagnosis results

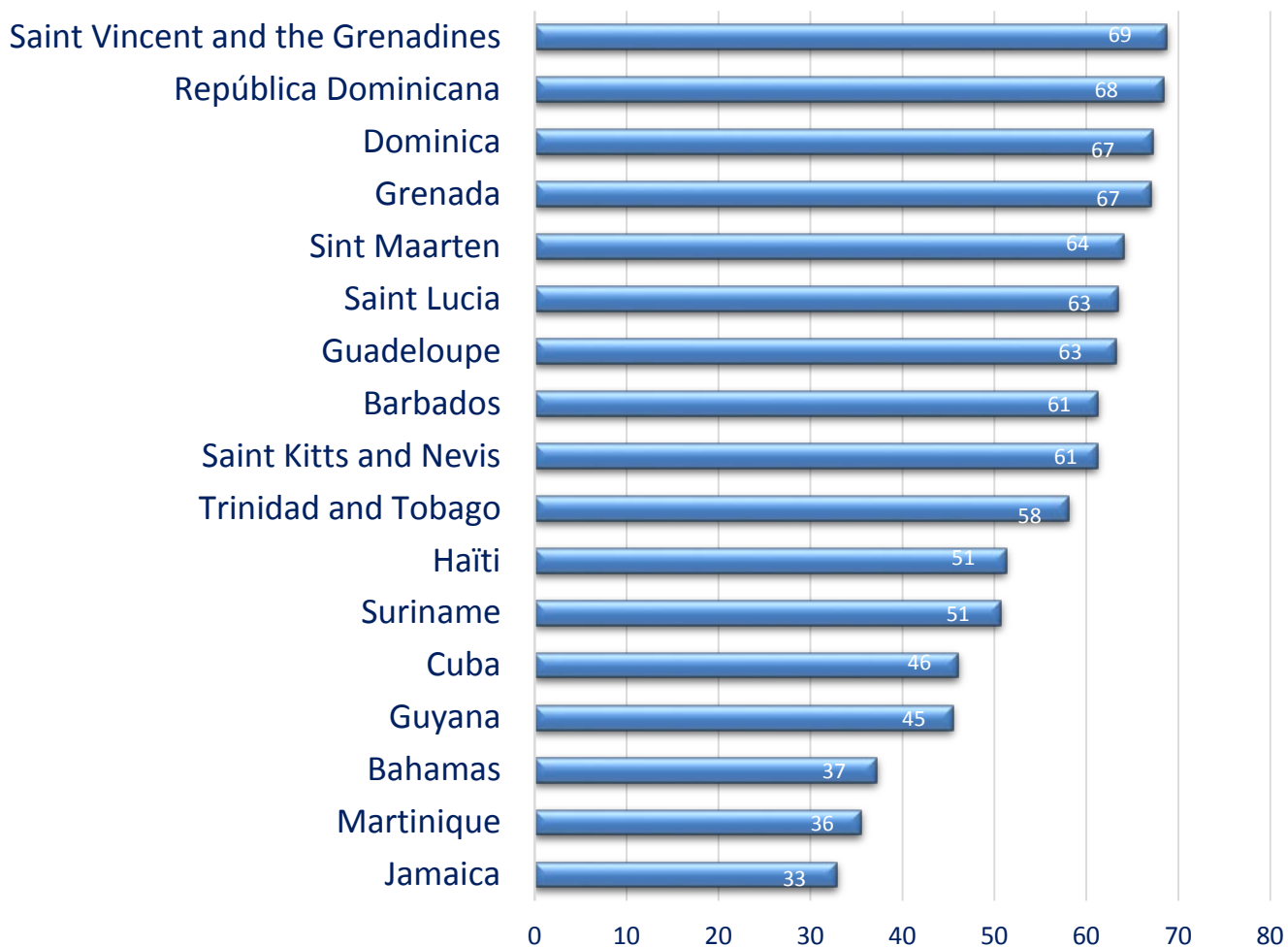
Country	Spatial data sets	Spatial data services	Policies	Metadata availability	Human capital	SDI culture - education	Agreements	Web connectivity	Technology	Geospatial software availability
Bahamas	73.43	68.00	72.78	75.00	39.46	56.35	47.78	72.33	34.29	81.40
Barbados	33.56	17.11	26.67	51.00	63.25	36.15	11.11	43.33	44.00	55.60
Cuba	77.78	71.00	66.67	34.75	63.45	25.80	38.67	54.33	41.00	46.60
Dominica	47.33	29.67	24.44	0.00	80.88	10.00	14.44	26.67	33.00	54.20
Grenada	53.11	37.00	24.44	25.00	33.50	24.35	0.00	48.33	24.29	60.00
Guadeloupe	46.43	20.78	50.56	71.75	0.00	13.00	43.56	60.00	0.00	44.00
Guyana	55.22	68.78	45.63	29.00	37.50	48.56	24.89	61.00	75.71	86.60
Haiti	78.11	39.89	46.67	44.00	64.00	39.00	16.11	40.00	54.86	56.80
Jamaica	85.67	75.44	62.22	74.00	66.00	52.65	69.22	56.00	50.86	77.80
Martinique	78.11	74.11	56.11	50.00	60.94	70.50	47.00	69.00	52.86	79.40
República Dominicana	75.56	20.33	22.22	25.00	18.56	25.00	16.33	53.33	21.43	30.00
Saint Kitts and Nevis	60.44	15.44	30.56	43.00	29.00	39.85	34.33	67.33	11.00	56.80
Saint Lucia	38.33	44.44	34.44	25.00	49.23	34.23	0.00	50.00	27.29	62.20
Sint Maarten	54.89	25.67	37.78	12.00	44.44	39.00	0.00	64.33	23.57	57.60
Suriname	34.00	32.00	67.00	52.00	75.00	49.00	37.00	69.00	52.00	64.00
Saint Vincent and the Gren	54.11	13.67	15.56	5.00	52.69	37.65	0.00	59.33	28.57	46.60
Trinidad and Tobago	71.72	25.96	44.44	0.00	55.13	27.63	23.78	72.33	35.71	67.40
Average by region	59.87	39.96	42.83	36.26	49.00	36.98	24.95	56.86	35.91	60.41
Stándar deviation	16.79	22.60	17.75	24.46	20.95	15.55	20.43	12.48	18.29	14.84

As an example, to increase the low value in agreements required standards and share best practices for the use and distribution of information.

Results per item



Gaps by country



PROJECT PLAN



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Scope of the IDE for the Caribbean

Mission

- Fundamental element for decision making
- Improve resilience to natural and anthropological risks.

Vission

- **Truly useful tools based on:**
 - The knowledge and geospatial information domain
 - The implementation and application of standards in its processes
 - The organization and integration of information in databases
 - The promotion and dissemination of information in Geoportals
 - The adoption of best practices in an environment of constant learning and high sense of service and responsibility of those involved.

Strategic analysis

SWOT ANALYSIS

They can cause **PROBLEMS**

They can generate **COMPETITIVE ADVANTAGES**

INTERNAL

W Weaknesses

- 1 Limited use of standards
- 2 Some technological gaps
- 3 Limited availability of metadata
- 4 Reduced policy for distribution of information
- 5 Skills and abilities of human capital
- 6
- 7

S Strengths

- 1 Management of computer technology
- 2 Web connectivity
- 3 Management of geographic information in Database
- 4 Using intranet
- 5 Digital mapping and geographic information
- 6
- 7

For the ENVIRONMENT

T Threats

- 1 Risks for natural phenomena
- 2 User dissatisfaction spatial information
- 3 Decisions without satisfaction
- 4 Loss of interest of society in the SDI
- 5
- 6
- 7

O Opportunities

- 1 Integration and coordination through the ACS
- 2 Contributing resources of the mexican government
- 3 Boost of UN-GGIM Américas in the region
- 4 Improved technological offer lower cost
- 5 Support from international organizations
- 6 Training
- 7

Strategies

SWOT		Opportunities		Threats	
		<p>Management and Integration through the AEC</p> <p>Providing resources of the mexican government</p> <p>Boost of UN-GGIM Americas for the region</p> <p>Technology offer improved at lower cost</p> <p>Support from international organizations</p> <p>Training</p>		<p>Risks from natural phenomena</p> <p>Dissatisfaction of users spatial information</p> <p>Decisions without information</p> <p>Loss of interest of society in the IDE's</p>	
Strengths	OS	OFFENSIVE strategies	TS	DEFENSIVE strategies	
Management of Information Technology	1	Disseminate information through Internet	1	Flexible information exchange	
Internet Connectivity	2	Promote the use of Geographic Information	2	Promoting informed decisions	
management of geographic information in DB	3	Develop geographic knowledge	3		
Using intranet	4	Strengthen the geodetic network	4		
Digital mapping and geographic information	5		5		
	6		6		
Weaknesses	OW	REORIENTATION strategies	TW	SURVIVAL strategies	
Limited use of standards	1	Capacity building	1	Reduce the impact of natural phenomena	
Some technological gaps	2	Promote the use of standards	2		
Limited availability of metadata	3	Update technology	3		
Policies for sharing information	4	Build geographic metadata	4		
Human Capital Capabilities	5		5		
	6		6		

Deployment

Strategic objective		Strategies		Monitoring indicators	Goals / Objective concrete		
					minimum	medium	optimum
1	Strengthen the geodetic network	Increase stations	Increase number of stations	5% further in the region	3%	5%	10%
Increase data availability							
Increase security location							
2	Share Geographic Information	Create Digital Map of the Caribbean	Increase the number of geoportals	10% further in the region	5%	10%	15%
Increase dissemination of information							
Increase the number of users							
3	Promote the use of I.G.	Construct map of the vegetation cover	Consider project countries	90% compliance	80%	90%	100%
To ensure the quality of the project							
Disseminate results in the geoportal							
4	Capacity building	Training in geographic skills	Increase basic skills	90% of the countries in the project	80%	90%	100%
Increase intermediate skills							
Increase transversal competences							
5	Using standard geographical	Apply standard processes	Increase in production processes	20% processes	10%	20%	30%
Increase in integration processes							
Increase in dissemination processes							
6	Update computer technology	Renew computers	Update servers	2% of the equipment for the geographic activity	1%	2%	3%
Update computers							
Upgrade network equipment							
7	Geographic Metadata	Promote your app	Agree a model	20% of the countries in the project	10%	20%	30%
Train them to their application							
Implement use							

STRENGTHENING OF THE GEODETIC NETWORK



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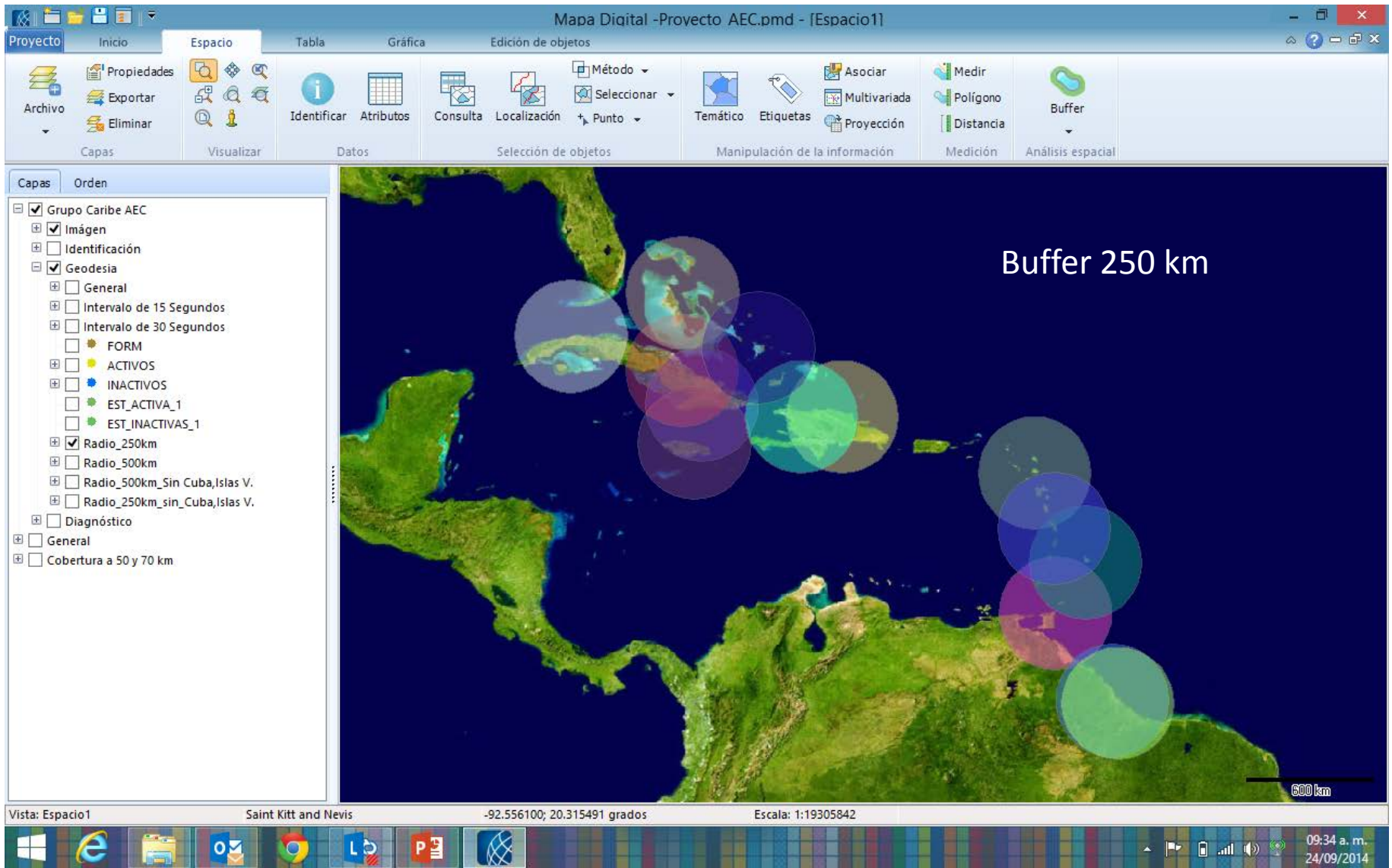
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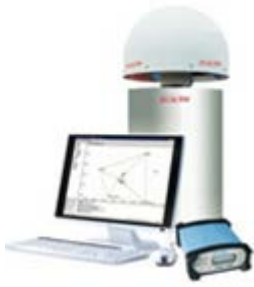
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Increase GNSS stations



Geodetic kit for the region

13 GNSS station equipment



36 Equipment for satellite positioning two frequencies (2 per country)

54 Equipment for satellite positioning one frequency (3 per country)

Strengthening the geodetic reference frame

MACRO ACTIVITY	2014					2015												2016												DELIVERABLES	
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
Defining sites	■	■	■	■	■																								Sheet		
Purchase of equipment						■	■	■	■	■	■																			Acceptance	
Adequacy of sites and monumentation						■	■	■	■																					Report	
Meeting requirements and specifications								■																						Document	
Recruitment of temporary staff								■																						Recruitment	
Training provider													■	■															Materials		
Training and equipment installation														■	■	■													Report		
Transmission tests and calculation																■	■	■												Report	
Support																		■	■	■	■									Report	
Monitoring the ongoing operation																					■	■	■								Report

DIGITAL MAP OF THE CARIBBEAN



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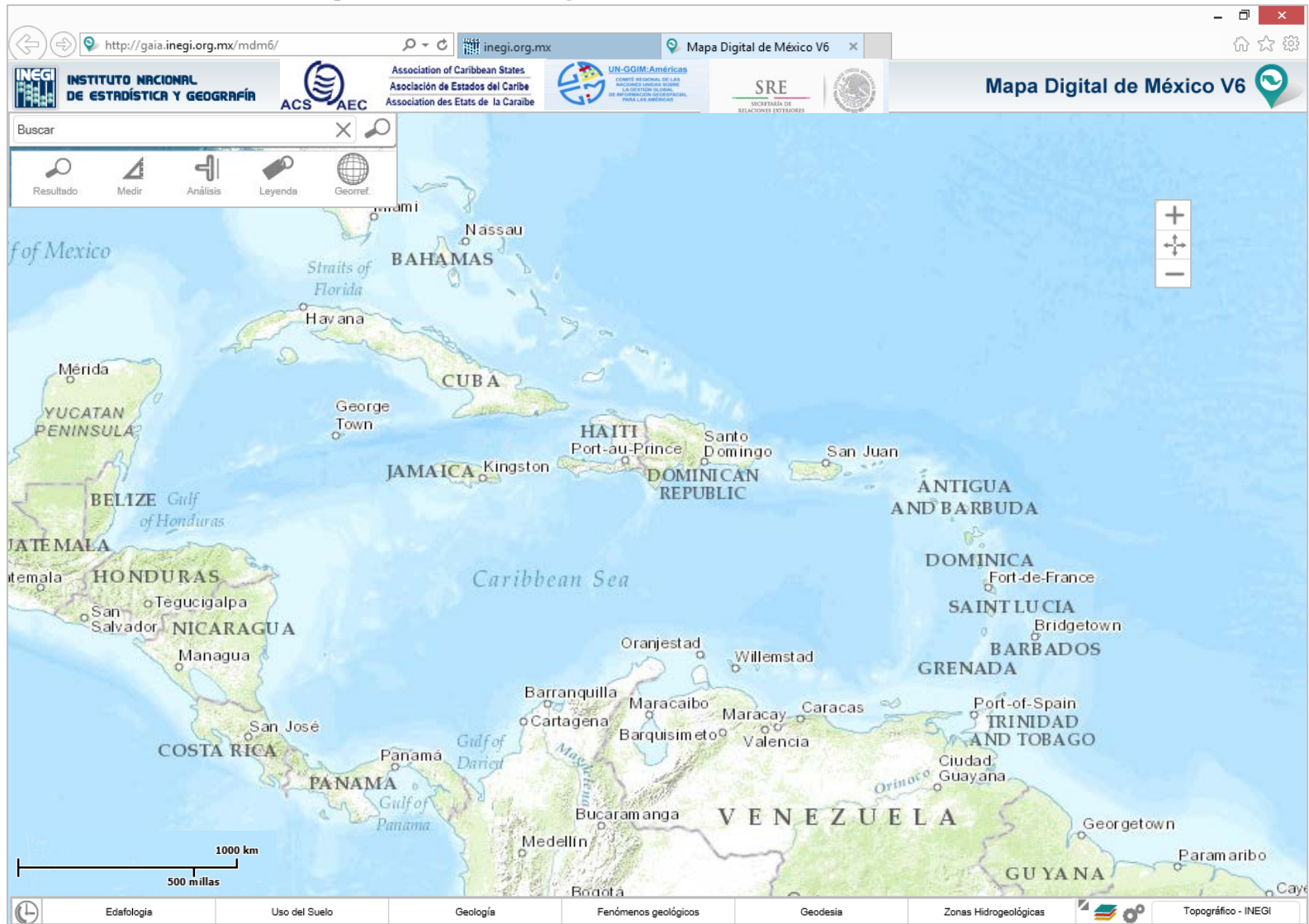
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Digital Map of the Caribbean



Computer kit by country

Server



3 Workstations



MAP OF LAND COVER



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Map of Land Cover



Map Program Land Cover

	2014					2015												2016												
MACRO ACTIVITY	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	DELIVERABLES
Acquisition of satellite images																												Images		
Acquisition bibliography and cartography																												Materials		
Acquisition geographic software																												2 licenses		
Site visit to validate the classification																												Tables		
Validation criteria																												Reports		
Final report																												Reports		

CAPACITY BUILDING



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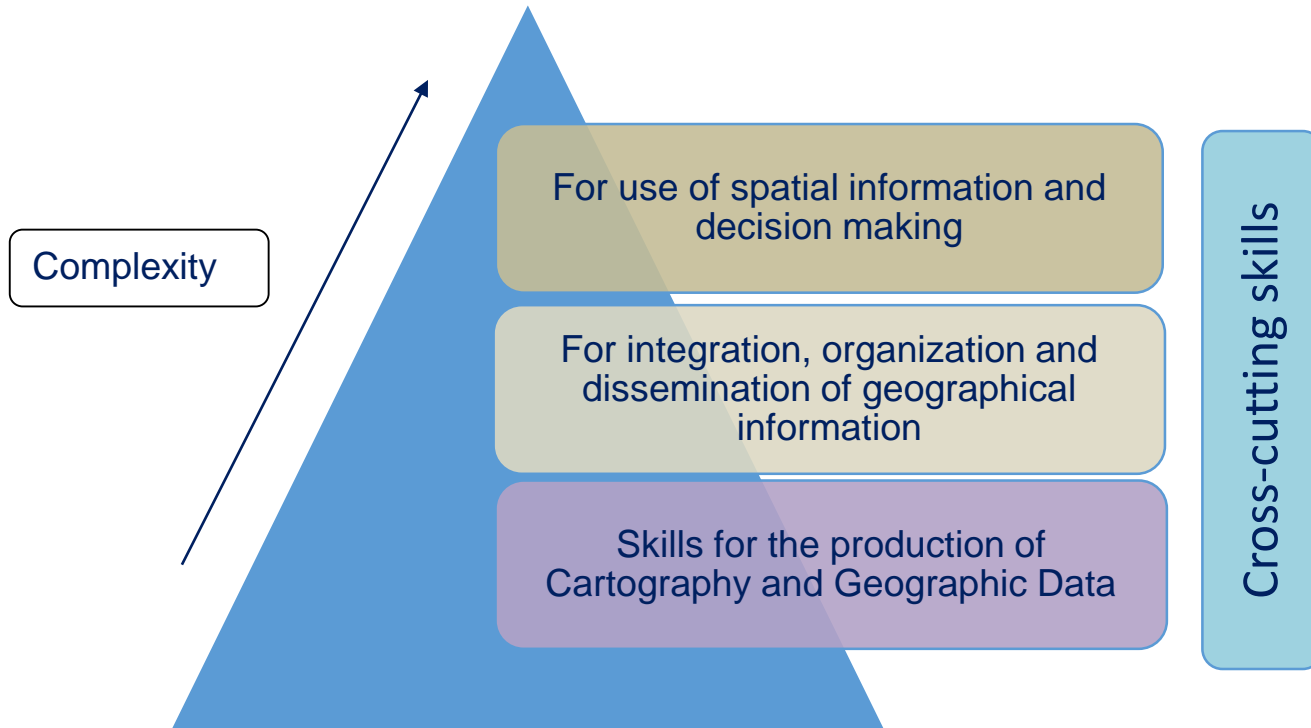
General objective:

Strengthen the capacities of human capital to produce, integrate and use geospatial information for decision-making and define strategies to increase resilience in member countries of the Association of Caribbean States; through courses and workshops and exchange of best practices.

Specific Objectives

- Addressing the major needs for training in Geodetic and acquisition of geographic data.
- Developing the skills to integrate geographic databases, extending the use of standards and management tools.
- Promote the exchange of best practices to standardize and improve the quality of products and geographic services.
- Expanding the knowledge, use and application of geographic information as an essential tool for decision making.

Schematic architecture competency



Classification of Capacities and Competencies for IDE

1. Skills for the production of Cartography and Geographic Data	2. Integration, Organization and Dissemination of Geographic Information	3. For Using Spatial Information and Decision Making
<p>Geodesy</p> <p>Cartography</p> <p>Remote Sensing</p> <p>Photointerpretation</p> <p>Photogrammetry</p> <p>Field Compilation</p> <p>Cadastral</p>	<p>Geographic Metadata</p> <p>Geographic Databases</p> <p>Geographic Information Systems</p> <p>Geoportals and Geoservices</p>	<p>Geostatistics</p> <p>Applications of Geographic Information Analysis and Use of Geographic Information</p>
4. Cross-cutting skills		
<p>Use and Application of Geographic Software</p> <p>Programming and Application Development</p> <p>Geographic Information Standards</p> <p>Policies</p>		

Training needs by country

COUNTRY	Geodesy	Cartography	Photogrammetry	Cadastre	Field Compilation	Remote Sensing	Photointerpretation	Geographic Databases	Geoportals and Geoservices	Geographic Information Systems	Geographic Metadata	Analysis and Use of Geographic Information	Digital Elevation Models	Geostatistics	Geographic Information Standards	Programming and Application Development	
Bahamas	1	1	2	1	1	5	3	1	1	1	1	1	1	2	1		29
Grenada	1	1	1	2	1	1	3	2	1	1	1	1	2	2	1		28
Barbados	3	1	2	1	1	3	3	1	1	1	2	1	2	3	1		26
Saint Kitts and Nevis	1	1	2	1	1	3	2	1	2	1	1	1	3	3	1		26
Saint Lucia	2	1	4	1	2	2	3	1	2	1	2	3	2	3	1		24
St. Maarten	4	1	5	&	2	4	5	2	2	1	2	1	3	3	2		24
Guyana	1	3	2	3	5	2	4	1	1	2	1	3	3	3	2		22
Saint Vincent and the Grenadines	4	2	4	2	3	4	4	2	3	2	2	2	3	3	3		21
Cuba	1	1	2	1	3	2	2	1	3	3	&	1	2	2	2		20
Haiti	2	4	1	2	1	4	3	3	1	5	2	2	5	1	1		20
Trinidad and Tobago	1	1	1	1	3	2	1	2	1	3	1	4	1	5	2		20
Jamaica	3	1	1	3	3	2	2	2	2	4	3	3	3	2	3		18
República Dominicana	1	&	1		&	&		1	1	1		1	&	&			10
Martinique	1	5	2	5	4	2	4	5	5	5	5	5	5	4	5		7
Dominica																	0
Guadeloupe																	0
Suriname																	0
Antigua and Barbuda																	
	58	55	54	49	48	42	39	59	58	51	49	55	43	42	53		

Classification of Capacities and Competencies for IDE

1. Production Cartography and Geographic Data

Geodesy	Cartography	Photogrammetry	Cadastre	Field Compilation	Remote Sensing	Photointerpretation
Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda
Bahamas	Bahamas	Dominica	Bahamas	Bahamas	Dominica	Dominica
Cuba	Barbados	Grenada	Barbados	Barbados	Grenada	Guadeloupe
Dominica	Cuba	Guadeloupe	Cuba	Dominica	Guadeloupe	República Dominicana
Grenada	Dominica	Haiti	Dominica	Guadeloupe	República Dominicana	Suriname
Guadeloupe	Grenada	Jamaica	Guadeloupe	Haiti	Suriname	Trinidad and Tobago
Guyana	Guadeloupe	República Dominicana	República Dominicana	República Dominicana	Cuba	Cuba
Martinique	Jamaica	Suriname	Saint Kitts and Nevis	Saint Kitts and Nevis	Guyana	Jamaica
República Dominicana	República Dominicana	Trinidad and Tobago	Saint Lucia	Suriname	Jamaica	Saint Kitts and Nevis
Saint Kitts and Nevis	Saint Kitts and Nevis	Bahamas	St. Maarten	Grenada	Martinique	Bahamas
Suriname	Saint Lucia	Barbados	Suriname	Saint Lucia	Saint Lucia	Barbados
Trinidad and Tobago	St. Maarten	Cuba	Trinidad and Tobago	St. Maarten	Trinidad and Tobago	Grenada
Haiti	Suriname	Guyana	Grenada	Cuba	Barbados	Haiti
Saint Lucia	Trinidad and Tobago	Martinique	Haiti	Jamaica	Saint Kitts and Nevis	Saint Lucia
Barbados	Saint Vincent and the Grenadines	Saint Kitts and Nevis	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Haiti	Guyana
Jamaica	Guyana	Saint Lucia	Guyana	Trinidad and Tobago	Saint Vincent and the Grenadines	Martinique
Saint Vincent and the Grenadines	Haiti	Saint Vincent and the Grenadines	Jamaica	Martinique	St. Maarten	Saint Vincent and the Grenadines
St. Maarten	Martinique	St. Maarten	Martinique	Guyana	Bahamas	St. Maarten

Classification of Capacities and Competencies for IDE

2. Integration, Organization and Dissemination of Geographic Information

Geographic Databases	Geoportals and Geoservices	Geographic Information Systems	Geographic Metadata
Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda
Bahamas	Bahamas	Bahamas	Bahamas
Barbados	Barbados	Barbados	Cuba
Cuba	Dominica	Dominica	Dominica
Dominica	Grenada	Grenada	Grenada
Guadeloupe	Guadeloupe	Guadeloupe	Guadeloupe
Guyana	Guyana	República Dominicana	Guyana
República Dominicana	Haiti	Saint Kitts and Nevis	República Dominicana
Saint Kitts and Nevis	República Dominicana	Saint Lucia	Saint Kitts and Nevis
Saint Lucia	Suriname	St. Maarten	Suriname
Suriname	Trinidad and Tobago	Suriname	Trinidad and Tobago
Grenada	Jamaica	Guyana	Barbados
Jamaica	Saint Kitts and Nevis	Saint Vincent and the Grenadines	Haiti
Saint Vincent and the Grenadines	Saint Lucia	Cuba	Saint Lucia
St. Maarten	St. Maarten	Trinidad and Tobago	Saint Vincent and the Grenadines
Trinidad and Tobago	Cuba	Jamaica	St. Maarten
Haiti	Saint Vincent and the Grenadines	Haiti	Jamaica
Martinique	Martinique	Martinique	Martinique

Classification of Capacities and Competencies for IDE

3. For Using Geospatial Information and Decision Making

Analysis and Use of Geographic Information	Digital Elevation Models	Geostatistics
Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda
Bahamas	Bahamas	Dominica
Barbados	Dominica	Guadeloupe
Cuba	Guadeloupe	Haiti
Dominica	República Dominicana	República Dominicana
Grenada	Suriname	Suriname
Guadeloupe	Barbados	Bahamas
República Dominicana	Cuba	Cuba
Saint Kitts and Nevis	Grenada	Grenada
St. Maarten	Saint Lucia	Jamaica
Suriname	Trinidad and Tobago	Barbados
Haiti	Guyana	Guyana
Saint Vincent and the Grenadines	Jamaica	Saint Kitts and Nevis
Guyana	Saint Kitts and Nevis	Saint Vincent and the Grenadines
Jamaica	Saint Vincent and the Grenadines	Saint Lucia
Saint Lucia	St. Maarten	St. Maarten
Trinidad and Tobago	Haiti	Martinique
Martinique	Martinique	Trinidad and Tobago

Classification of Capacities and Competencies for IDE

4. Transverse competences

Geographic Information Standards	Programming and Application Development
Antigua and Barbuda	Bahamas
Bahamas	Dominica
Barbados	Guyana
Dominica	Martinique
Grenada	República Dominicana
Guadeloupe	Saint Vincent and the Grenadines
Guyana	St. Maarten
Haiti	Trinidad and Tobago
República Dominicana	Antigua and Barbuda
Saint Kitts and Nevis	Barbados
Saint Lucia	Cuba
Suriname	Grenada
Cuba	Guadeloupe
St. Maarten	Haiti
Trinidad and Tobago	Jamaica
Jamaica	Saint Kitts and Nevis
Saint Vincent and the Grenadines	Saint Lucia
Martinique	Suriname

PRIORITY COURSES

1. Geodesy
2. Cartography
3. Digital Map of Mexico

GEODESY

PROPOSED AGENDAS



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COORDINATE SYSTEMS

General Objective: Understand the elements and geodetic reference systems to delimit the location of coordinates on the Earth's surface

Theme	Objective	Sub themes	Time	Bibliography
1. Celestial Sphere	Know and locate elements of the celestial sphere for application in positional astronomy.	1.1. The celestial sphere: planes, poles and axes 1.2 Link between astronomical triangle and spherical triangle 1.3 Curvilinear coordinates 1.4 Astronomical yearbook	4 h.	BOMFORD, G. Geodesy 3th edition Oxford Oxford University Press, 1971
2. Celestial coordinate system	Know celestial coordinate systems	2.1 Elliptic system. 2.2 Equatorial systems. 2.3 Horizontal system. 2.4 Variations in the right ascension system. 2.5 Link between coordinate systems.	4 h.	CHAUVENET, William. A manual of spherical & practical astronomy New York Dover, 1960 Tomos I y II
3. Topocentric coordinate systems	Know topocentric coordinates system	3.1 Topocentric systems. 3.2 Local astronomical system. 3.3 Local geodetic system. 3.4 Satellite topocentric coordinates.	6 h.	Brouwer, D. & G.M. Clemence Methods of Celestial Mechanics New York Academic Press, 1961
4. Transformation between coordinate systems	Know the transformation of celestial and terrestrial coordinate systems	4.1 From the horizontal system to hour angle. 4.2 From hour angle to right ascension. 4.3 From right ascension system to elliptic. 4.4 Local astronomical system to local geodetic.	6 h.	Didactic suggestions Oral exposition Audiovisual exposition Readings for support Worksheets
5. Orbital coordinate systems	Know the orbital coordinate systems	5.1 Elliptic orbit and orbital anomalies. 5.2 Orbital coordinate systems. 5.3 Keplerian elements. 5.4 Transformation of right ascension orbital system. 5.5 Variations in Keplerian elements	4 h	Evaluation Diagnostic Partial Final
			Total 24 h.	

FUNDAMENTALS OF GEODESY

General Objective: Know the main geodetic elements and methods to delimit the position of coordinates on the Earth's surface

Theme	Objective	Sub themes	Time	Bibliography
1. General Concepts	Understand the basics of Geodesy	1.1 Definitions and concepts 1.2 Real shape of the Earth. 1.3 The Ellipsoid and Geoid. 1.4 Height systems. 1.5 Coordinate systems.	4 h.	HETCH, Eugene. Óptica Madrid Addison Wesley Iberoamericana, 2000 CHAUVENET, William. A manual of spherical & practical astronomy New York Dover, 1960 Tomos I y II
2. Modern methods of measurement	Understand the measurement methods currently used in Geodesy	2.1 Horizontal. 2.2 Vertical. 2.3 Three-dimensional. 2.4 Gravimetry.	4 h.	MULLER, Ivan. Spherical & practical astronomy as applied to geodesy New York Elsevier (Frederick Ungar), 1969
3. Corrections to observations	Understand the sources for fluctuation in observations and suitable corrections to estimate accuracy of results	3.1 Arbitrary and systematic errors. 3.2 Refractive error correction. 3.3 Parallax correction. 3.4 Semidiameter correction.	8 h.	Didactic Suggestions Audiovisual Exposition Readings for support Worksheets
4. Least squares adjustment	Understand the application of least squares for adjustment process	4.1 Theory of least squares adjustment. 4.2 Practical exercise of adjustment into a network of observations.	8 h. Total 24 h.	Evaluation Diagnostic Partial Final

GRAVITY FIELD AND HEIGHT SYSTEMS

General Objectives: Understand the different reference surfaces used in Geodesy and apply mathematical methods used in the calculations

Theme	Objective	Sub themes	Time	Bibliography
1. Gravity field of the Earth	Recall gravitational field equations, its potential function and phenomena that modifies gravity	1.1 Newton laws 1.2 Definition of gravitational fields. 1.3 Gravitational potential. 1.4 Earth's gravitational field vectors. 1.5 Normal gravity.	5 h.	HEISKANEN W., y H. Moritz Physical Geodesy Spain National Geographic Institute and Astronomical Institute, 1985
2. Gravimetric methods	Understand the instruments and methods used to measure the Earth's gravity and phenomena which modifies it	2.1 Measurement of Earth's gravity. 2.2 Gravity measurement by satellite and plane. 2.3 Gravity anomalies. 2.4 Global and Local models	4 h.	BOMFORD, Guy Geodesy 4th edition [s.l.i.] USA Clarendon Press, 1980
3. Vertical geodetic datum	Understand the different ways of elevation reference currently used	3.1 Geoid and W_0 value. 3.2 Mean sea level and SST 3.3 Local and international datum definitions	3 h.	VANICEK P., y E. Kraklowsky Geodesy the Concepts 2nd edition Amsterdan Elsevier Science Amsterdam, 1986
4. Height systems	Undersand the different height systems used in Geodesy	4.1 Dynamic heights. 4.2 Orthometric heights. 4.3 Normal heights.	4 h.	Didactic Suggestions Oral Exposition Audiovisual Exposition Readings for support Worksheets
5. Heights measurement by levelling and GPS	Understand the principles, advantages and limitations of the two most used height measurement techniques	5.1 Geodetic levelling. 5.2 Geodetic slopes corrections. 5.3 GPS levelling. 5.4 Digital elevation models and its datums.	8 h. Total 24 h.	Evaluation Diagnostic Partial Final

COURSE WORKSHOP GLOBAL POSITIONING SYSTEM (GPS)

General Objective: Apply the knowledge of physics and mathematics for geodetic satellite positioning and the process

Theme	Objective	Sub themes	Time	Bibliography
1. Electromagnetic waves	Mathematically describe the behavior of electromagnetic waves	1.1 Introduction to waves study. 1.2 Function and wave equation. 1.3 Maxwell's equations and electromagnetic waves. 1.4 Irradiance 1.5 Electromagnetic spectrum. 1.6 Electromagnetic waves in continuous media.	1 h.	HOFMANN-WELLENHOF, B. , LICHTENEGGER, H. , COLLINS, J. GPS Theory and Practice 3a. Edición Austria Springer Verlag, 1994
2. Description of global positioning system (GPS)	Understand the nature of the three segments: control, space and GPS system.	2.1 Basic concepts. 2.2 Space segment. 2.3 Control segment. 2.4 User segment. 2.5 Applications.	1 h.	LEICK, Alfred GPS Satellite Surveying 2a. Edición New York John Wiley and Sons, 1995
3. Satellite signal characteristics	Understand the fundamentals of the satellite signal structure and its components.	3.1 Time systems. 3.2 GPS signal structure. 3.3 Signal process. 3.4 Important events.	2 h.	SEEBER, Gunter Understanding GPS: Principles and Applications New York Walter De Gruyter, 1993
4. Observables	Understand the noticeable pseudo distance code and phase, and error effects in measurments.	4.1 Data registry. 4.2 Data combination. 4.3 Atmospheric effects.	2 h.	Didactic suggestions Oral exposition Audiovisual exhibition Readings for support Worksheets Fieldwork

COURSE WORKSHOP GLOBAL POSITIONING SYSTEM (GPS)

General Objective: Apply the knowledge of physics and mathematics for geodetic satellite positioning and the process

Theme	Objective	Sub themes	Time	Bibliography
5. Surveying with GPS	Understand the planning, methodologies and process of a GPS survey	5.1 Observation equipment and techniques. 5.2 Survey planning. 5.3 Survey methodologies. 5.4 Data processing.	6 h.	Evaluation
				Diagnostic Partial Final
6. Mathematical models	Apply mathematical models that relate the measurements with the station coordinates	6.1 Precise positioning. 6.2 Relative positioning. 6.3 Linear combinations.	4 h.	
7. Practices	Apply the learned concepts by making measurements in the field and processing them for the positioning in different modalities.	Functions and operation of the GPS receiver. "Average" static positioning in standalone mode. Dynamic positioning in single mode. Navigation mode "to go". Static positioning in differential mode. Kinematic positioning in differential mode. Applications to a specific project.	8 h.	
			Total	
			24 h.	

CARTOGRAPHY

PROPOSED AGENDAS



UN-GGIM:Américas

COMITÉ REGIONAL DE LAS
NACIONES UNIDAS SOBRE
LA GESTIÓN GLOBAL
DE INFORMACIÓN GEOESPACIAL
PARA LAS AMÉRICAS



Association of Caribbean States
Asociación de Estados del Caribe
Association des Etats de la Caraïbe

SRE
SECRETARÍA DE
RELACIONES EXTERIORES



**INSTITUTO NACIONAL
DE ESTADÍSTICA Y GEOGRAFÍA**

CARTOGRAPHY

General Objective: Apply different methods for representing the Earth's surface on a flat surface

Theme	Objective	Sub themes	Time	Bibliography
1. Introduction to Cartography	Understand the importance of Cartography, concepts applications and its relation with other sciences	1.1 Basics of cartography. 1.2 Classification of maps. 1.3 Classification on scales. 1.4 Classification on level of information. 1.5 Classification for the purpose of the map. 1.6 Classification according to precision. 1.7 Classification according to origin. 1.8 Classification by the form of presentation. 1.9 Classification for the type of information.	8 h.	Cartography. Francisco Hansen Albites. INEGI.
2. Scale	Understand the linear relationship of the map dimensions regarding the actual dimensions of the area, and the relationship between a measured distance on the map with the corresponding measure of the area	2.1 By the representative fraction. 2.2 By the graphic scale. 2.3 By the determined scale.	2 h.	LMALING D.H. Coordinate system and map projections 2nd edition New York Pergamon Press, 1992
3. Coordinate System	Identify the importance of a Coordinate System to geographic location and facilitate the use of metric characteristics of the map	3.1 Cartography systems. 3.2 Rectangular system.	2 h.	

CARTOGRAPHY

General Objective: Apply different methods for representing the Earth's surface on a flat surface

Theme	Objective	Sub themes	Time	Bibliography
4. Cartographic reference system	Recognize its importance for cartographic production	4.1 Datum 4.2 Horizontal datum. 4.3 Ellipsoid and geoid concepts. 4.4 Vertical datum.	2 h.	PERARSON, Frederic Map projection methods Washintong D.C. Sigma Scientific, 1984
5. Conical Projection	Identify the mathematical aspect involved in the construction of conic projections	5.1 Simple conic projection. 5.2 Lamber Conformal Conic projection with one and two parallels. 5.3 American polyconic projection or Hassier-Ferdinand projection.	5 h.	Didactic suggestions Oral expositions Audiovisual exhibitions Readings for support Worksheets
6. Cylindrical Projection	Identify the mathematical aspect involved in the construction of cylindrical projections	6.1 Simple cylindrical projection. 6.2 Cassini projection. 6.3 Mercator projection. 6.4 Transverse Mercator projection. 6.5 Universal Transverse Mercator projection.	5 h. Total 24 h.	Evaluation Diagnostic Partial Final

AUTOMATION OF CARTOGRAPHIC PROCESSES (Course-Workshop)

General Objective: To apply different techniques of representation, in 2 and 3 dimensions, of the different projection systems through digital cartography.

Theme	Objective	Subthemes	Time	Bibliography
1. Analysis of raster information	To know the different applications of raster information	1.1 Raster type formats 1.2 Elaboration, acquisition and capture of raster data 1.3 Data capture with a specific program/software 1.4 Storage and management of raster data	2 h.	BURROGH, P.A. Principles of GIS for land resource assessment New York Oxford University Press, 1986
2. Vectorial information analysis	To know the different applications of vectorial information	2.1 Vectorial type formats 2.2 Elaboration, acquisition and capture of vectorial data 2.3 Data capture with a specific program/software 2.4 Storage and management of vectorial data	2 h.	STARR, Jeffrey & ESTES John Geographic information systems: An introduction New Jersey Prentice Hall, 1990
3. Georeferenciation of data	To know the tools that define Geographic reference systems and their transformation into relational data	3.1 Selection of digital map projection 3.2 Ellipsoid, geoid, and spheroid for cartographic programs 3.3 Automatic conversion of geographic coordinates 3.4 Coordinate systems, origins and transformations	4 h.	ARONOFF, Stan Geographic information systems: a management perspective 2nd ed. Berkeley WDL Publications, 1991
4. Query creation and execution	To create and execute queries on relational databases	4.1 Finding objects by location and properties 4.2 Query criteria 4.3 Query creation 4.4 Compound queries 4.5 Cleaning options for digitized objects.	8 h.	Didactic suggestions
				Oral presentation Audio-visual presentation Supporting readings Class exercises Use of computer equipment
5. Map algebra	To know the different ways to analyze, process and model raster and vector type data	5.1 Interpolation methods 5.2 Logical, arithmetic, boolean, trigonometric and spatial operations 5.3 Digitalization of linear objects 5.4 Raster and vector data interactions and analysis 5.5 Object susceptibility based on location and attributes 5.6 Spatial data modelling (2-D and 3-D)	8 h.	Evaluation
			Total 24 h.	Diagnostic Partial Final

GEOGRAPHIC SOFTWARE

PROPOSED AGENDAS



UN-GGIM:Américas

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LA GESTIÓN GLOBAL
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**INSTITUTO NACIONAL
DE ESTADÍSTICA Y GEOGRAFÍA**

Digital Map of Mexico - Desktop version (Course-workshop)

General Objective: To learn and use the Digital Map of Mexico software tools for desktop

Theme	Objective	Subthemes	Time	Bibliography
1. Overview and introduction	To learn the general concepts of the MDM software and its GIS applications	1.1 General information 1.2 The Digital Map of Mexico (MDM) software 1.3 Geographic Information Systems (GIS)	1 h.	Manual Digital Map of Mexico Desktop Version 6.0 INEGI, Mexico 2014
2. Building projects	To identify the main tools to administer information into views, space, tables and graphs	2.1 Projects and visits 2.2 Opening a project 2.3 Creating a project with geographic information 2.4 Adding layers and inserting views 2.5 Administering views 2.6 PDF files 2.7 Inserting DBF files and acquiring metrics	4 h.	
3. Use of basic tools	To apply tools for configuration, definition of coordinates and use of tabular information	3.1 Editing spatial views and using the portfolio 3.2 Configuring group properties and information layers 3.3 Defining and configuring coordinate systems 3.4 Connecting to a database and using its information layers 3.5 Modifying table properties and associating descriptors 3.6 Selecting by query, locating, ordering and filtering 3.7 Associating and identifying file/reference information 3.8 Generating SQL queries 3.9 Unifying tabular information 3.10 Importing and relating tables	8 h.	
				Oral presentation Audio-visual presentation Supporting readings Class exercises Use of computer equipment
4. Creating and editing geographic objects	Using tools to create and edit geographic objects	4.1 Editing of geographic objects 4.2 Creating and editing geographic objects	2 h.	Evaluation
				Diagnostic Partial Final

Digital Map of Mexico - Desktop version (Course-workshop)

General Objective: To learn and use the Digital Map of Mexico software tools for desktop

Theme	Objective	Subthemes	Time	Bibliography
5. Information analysis	To apply statistical analysis tools to construct thematic and spatial maps	5.1 Spatial analysis 5.2 Spatial analysis I 5.3 Spatial analysis II 5.4 Descriptive statistics and linear correlation 5.5 Statistical analysis 5.6 Univariate stratification 5.7 Data transformation 5.8 Graphics 5.9 Creating graphics 5.10 Thematic maps 5.11 Creating thematic maps 5.12 Multivariate stratification 5.13 Multivariate analysis	7 h.	
6. Disseminating and presenting information	Using tools to export and print tabular and spatial information	6.1 Exporting vectorial layers and extracting views 6.2 Exporting tables 6.3 Printing and saving space views as images 6.4 Printing table reports	2 h. Total 24 h.	

GEOGRAPHIC INFORMATION SYSTEM USING QGIS FREE SOFTWARE (COURSE-WORKSHOP)

General Objective: To acquire GIS-related knowledge in order to capture, process and analyze spatial information using Quantum GIS

Theme	Objective	Sub themes	Duration	References
1. Introducción to Quantum GIS (QGIS)	To identify the interface and the properties of QGIS files	1.1 The QGIS graphic GUI interface. 1.2 Access to different data types. 1.3 Properties of a QGIS project. 1.4 Working with data layers.	2 h.	Manual de Quantum GIS User Guide publicacion 2.2 Open Source Geospatial Foundation September 2014
2. Displaying information into maps	To apply the use of tools to managing raster and vectorial data	2.1 Creation and edition of vectorial layers. 2.2 Importing and exporting data from different sources. 2.3 Working with raster data. 2.4 Attribute tables.	6 h.	Didactic suggestions
				Oral presentation Audio-visual presentation Supporting readings Class exercises Use of computer
3.Editing geographic objects	To use QGIS software editing tools on geographic objects and their attributes	3.1 Adding nodes, metric rules and style definition. 3.2 Drawing and converting polygons into polylines. 3.3 Object editing: giving objects position and size. 3.4 Change of attributes and shape of an object on a map.	4 h.	Evaluation
				Diagnostic Partial Final
4. Georeferencing raster images	Applying tools associated with raster data management	4.1 Types of raster images. 4.2 Control points: precision. 4.3 The georeferentiation process	2 h.	
5. Selecting and querying data	Using tools for tabular data management and editing	5.1 Selection tools. 5.2 Spatial queries. 5.3 Joining tables.	2 h.	
6. Thematic Maps and Spatial Analisis Tools	Building thematic maps and using tools for spatial analysis	6.1 Design of thematic maps. 6.2 Tools for the elaboration of thematic maps. 6.1 Buffers: concept, creation, methods and types C. 6.2 Creating Territories by combining objects. 6.3 Creation of Voronoi polygons r.	8 h.	
			Total 24h.	

CALENDAR



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Care schedule

CAPACITIES	2014			2015												2016													
	O	N	D	E	F	M	A	M	J	J	A	S	O	N	D	E	F	M	A	M	J	J	A	S	O	N	D		
Geodesy (theoretical course)																													
Cartography																													
Photogrammetry																													
Geodesy (workshop)																													
Cadastre																													
Field Compilation																													
Remote Sensing																													
Photointerpretation	This capacity is attending by remote sensing																												
Geographic Databases																													
Geoportals and Geoservices																													
Geographic Information Systems	This capacity is attending by geographic software																												
Geographic Metadata																													
Analysis and Use of Geographic Information																													
Digital Elevation Models																													
Geostatistics																													
Geographic Information Standards																													
Programming and Application Development	This capacity serves as part of the Digital Map of the Caribbean																												
Use and Application of Geographic Software																													
Symbology																													
Strengthening Geodetic Network																													
Map of Land Cover																													
Digital Map of the Caribbean																													
Capacity Building high priority																													
Capacity Building medium priority																													

Project for Strengthening of Spatial Data Infrastructures in member countries of the Association of Caribbean States

Advances

SEPTEMBER, 2014



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