United Mexican States

Agencia Espacial Mexicana (Mexican Space Agency)

Collaboration Program with the Private Sector for Disseminating Japanese Technology for Creation of the Infrastructure for Space Development and Utilization in Mexico
Final Report

February 2018

Japan International Cooperation Agency (JICA)

NEC Corporation

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ABBREVIATION LIST

Abbreviation	Original Full Name	English Full Name
AEM	Agencia Espacial Mexicana	Mexican Space Agency
CENAPRED	Centro Nacional de Prevención de Desastres	National Center of Disaster Prevention (Mexico)
CNEE	Comisión Nacional del Espacio Exterior	National Commission of Outer Space (Mexico)
CONABIO	Comisión Nacional para el Conocimiento y Uso de la Biodiversidad	National Committee for Knowledge and Use of Biodiversity (Mexico)
CONACyT	Consejo Nacional de Ciencia y Tecnología	National Council of Science and Technology (Mexico)
CONAFOR	Comisión Nacional Forestal	National Committee of Forest (Mexico)
CONAGUA	Comisión Nacional del Agua	National Committee of Water (Mexico)
CONANP	Comisión Nacional de Áreas Naturales Protegidas	National Committee of Protected Natural Areas
DLR	Deutsches Zentrum für Luft	German Aerospace Center
ECOSUR	El Colegio de la Frontera Sur	College of South Frontier (Mexico)
EOS	Earth Observing System	Earth Observing System (NASA, USA)
ERIS	Estación de Recepción de Imágenes de Satélite	Receiving station of Satellite Images (Mexico)
ERMEX	Estación de Recepción México	Receiving station in Mexico for SPOT constellation
EVISMAR	Estación Virtual de Imágenes Satelitales de Muy Alta Resolución	Virtual station of Very High Resolution Satellite Image (Mexico)
FEMIA	Federación Mexicana de la Industria Aeroespacial	Mexican Federation of Aerospace Industry
GIS	Geospacial Information System	Geospatial Information System
IAC	International Astronautical Congress	International Astronautical Congress
ICT	Information and Communications Technology	Information and Communications Technology
INEGI	Instituto Nacional de Estadística y Geografía	National Institute of Geography Statistics
INIFAP	Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias	National Institute of Forest, Agriculture and Livestock Investigation (Mexico)
IPN	Instituto Politécnico Nacional	National Technical College (Mexico)
JAXA	Japan Aerospace Exploration Agency	Japan Aerospace Exploration Agency
JBIC	Japan Bank for International Cooperation	Japan Bank for International Cooperation
JETRO	Japan External Trade Organization	Japan External Trade Organization
JICA	Japan International Cooperation Agency	Japan International Cooperation Agency
JSS	Japan Space Systems	Japan Space Systems

MRD	Mission Requirement Definition	Mission Requirement Definition
NASA	National Aeronautics and Space Administration	National Aeronautics and Space Administration
NSDI	National Spatial Data Infrastructure	National Spatial Data Infrastructure
PEMEX	Petróleos Mexicanos	Mexican Petroleum
PNAE	Programa Nacional de Actividades Espaciales	National Program of Space Activities
PND2013	Plan Nacional de Desarrollo 2013-2018	National Development Plan 2013-2018
PPP	Public Private Partnership	Public Private Partnership
REDD	Reducing Emissions from Deforestation and Forest Degradation	Reducing Emissions from Deforestation and Forest Degradation
REDD+	REDD, plus the role of conservation, sustainable forest management and enhancement of forest carbon stocks	REDD, plus the role of conservation, sustainable forest management and enhancement of forest carbon stocks
REDD+ MRV	REDD+ Measurement, Reporting and Verification	REDD+ Measurement, Reporting and Verification
RESTEC	Remote Sensing Technology Center of Japan	Remote Sensing Technology Center of Japan
RFP	Request for Proposal	Request for Proposal
SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación	Ministry of Agriculture, Stockbreeding, Rural Development, Fishing and Food (Mexico)
SCT	Secretaría de Comunicaciones y Transportes	Ministry of Communications and Transportations (Mexico)
SEDENA	Secretaría de la Defensa Nacional	Ministry of National Defense (Mexico)
SEMAR	Secretaría de Marina	Ministry of Navy (Mexico)
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales	Ministry of environment and Natural Resources (Mexico)
SENER	Secretaría de Energía	Ministry of Energy (Mexico)
SGM	Servicio Geológico Mexicano	Mexican Geological Service
SIAP	Servicio de Información Agroalimentaria y Pesquera	Agriculture, Feeding Fishery information Service (Mexico)
SJAC	Society of Japanese Aerospace Companies	Society of Japanese Aerospace Companies
SMN	Servicio Meteorológico Nacional	National Meteorological Services (Mexico)
UAV	Unmanned Aerial Vehicle	Unmanned Aerial Vehicle
UNAM	Universidad Nacional Autónoma de Mexico	National Autonomy University of Mexico

1. EXECUTIVE SUMMARY

This project aims to contribute to construction of infrastructure for space development and utilization in Mexico through trasfering satellite operation system and offering technology and facility of satellite manufacturing by utilizing NEC's technology of small standard satellite bus.

Mexico has suffered large loss of human and economy from many types of natural disasters. Currently, the public institutions responsible for providing information of disaster prevention and warnings use the limited information gathered by ground equipped sensors. They have not been in operation of constant observation of wide areas, prediction and information provision by utilizing the data from earth observation satellites.

AEM (Agencia Espacial Mexicana), founded in 2011, aims to own Mexican Earth Observation Satellite (EOS) in order to utilize EOS data, with its width and periodicity, for effective countermeasure for large-scale natural disaster, and to establish a space equipment industry and space information utilization infrastructure.

Following are summary of accomplishment from this project in accordance with the above-mentioned AEM's intension.

1) Result of On-site Activities

- Clear understanding of situation of space information utilization infrastructure in Mexico (including situation of satellite utilization by related organizations) and possibility of role sharing among universities and private companies on development, manufacturing and operation for future Mexican self-developped satellite.
- Mutual agreement with AEM on "Road Map" of Mexican Data Platform by sharing a concept of the Platform as ideal model in 2030, after rounds of discussion with AEM about "Ideal Mexican space information utilization infrastructure", which is in line with Mexico's National Development Plan (PND).

2) Result of Discussion with AEM

Agreement with AEM was reached on concrete approach (system engineering method based on experience in Japan) for realizing "Mexico's own EOS" (planned to be launched after 2022) defined in the above "Road Map."

2. OUTLINE OF PROJECT

2.1 Background and Purpose of Project

Mexico has suffered large loss of human and economy from many types of natural disasters. Currently, the public institutions responsible for providing information of disaster prevention and warnings use the limited information gathered by ground equipped sensors. They have not been in operation of constant observation of wide areas, prediction and information provision by utilizing the data from earth observation satellites. AEM aims to utilize its own EOS for effective countermeasure for natural disaster, and to obtain development technology for satellite bus toward Mexican own EOS development.

This project aims to contribute to establishment of space development and utilization infrastructure in Mexico through trasfering satellite operation system and offering technology and facility of satellite manufacturing by utilizing NEC's technology of small standard satellite bus.

From the viewpoint of utilization of satellite technology, areas of disaster prevention and management system / technology in Mexico will be improved by learnig from Japanese experiences of disaster prevention / mitigation.

2.2 Activities

A long duration of development and a great deal of cost are required for the construction of space development and utilization infrastructure, and reliable basic plan based on the information at the starting point is necessary. Therefore, the "Road Map" towards its realization is essential. In this project, requirements and restrictions for this infrastructure in Mexico were defined by the following on-site activities supported by both Japanese and Mexican organizations (JSS, JAXA, JBIC from Japan, Embassy of Japan in Mexico, JICA office in Mexico from Mexico) and presentation of Japanese technologies (during training program in Japan) to AEM.

- Visiting and investigation on the satellite data utilization organization and satellite manufacturing organization (including research of the satellite manufacturing facilities, satellite operating facility location candidate and legal problems for constructing the infrastructure.)
- Making a "Road Map" with AEM / presentation of prototype model for satellite data utilization infrastructure construction.

2.3 Project Organization

The Figure 2.3-1 shows project organization.

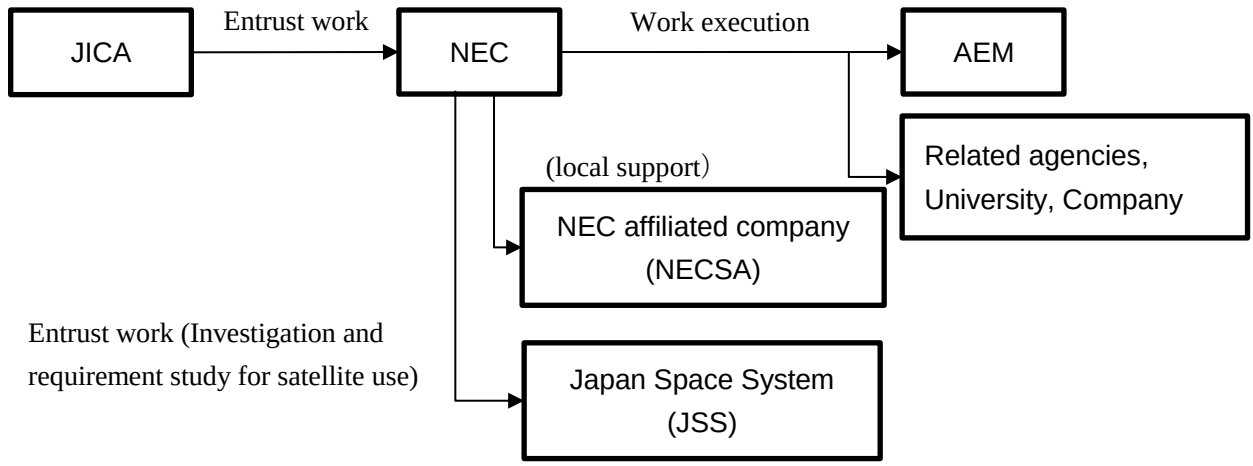

Figure 2.3-1 Project execution organization

NEC, as main body, executed the works toward AEM and other related agencies as business counterparts. NECSA (NEC de Mexico S.A. de C.V.: NEC's affiliated company in Mexico) supported the coordination with related organizations in Mexico. NEC appointed JSS to entrust the following works because it has expertise in the area of satellite data utilization.

- Research on satellite data utilization by satellite data utilization organization in Mexico
- Consideration on trends of satellite data utilization in Mexico based on above research result.

2.4 Schedule

Table 2.4-1 shows the execution schedule.

Table 2.4-1 Execution schedule

Work	2016							2017										
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
On-site activity		▽		▽	▽				▽			▽					▽	
Training Program in Japan													▽					
Visiting and interview to satellite data utilization organization and satellite manufacturing private companies		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬					
Discussion and "Road Map" construction on space development and space utilization infrastructure with AEM		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	
Education and constructing partnership with National Technical College		▬	▬															
Selecting satellite manufacturing facility location and satellite operation facility location		▬	▬															
Research and discussion in financing scheme / tool									▬	▬	▬	▬	▬	▬	▬	▬	▬	

3. PRESENT SITUATION IN MEXICO

3.1 The Situation of Disaster Prevention, Disaster Management System / Technology

United Mexican States suffers many types of natural disasters and is said that the country has been affected by all kinds of natural disasters except snow damage. After Mexico City Earthquake in 1985, the governmental organization CENAPRED (National Center of Disaster Prevention (Mexico)) was established in 1988 for responsibility for disaster prevention and disaster alarming function. Also, SINAPROC (National citizen Protection Security) was enacted for definition of national crisis management including large-scale natural disasters.

On the other hand, utilization of satellite data for countermeasure toward large-scale natural disasters is limited, for example, using ALOS-2 (Daichi-1) data for grasping fold damage by utilizing the International Charter 'Space and Major Disasters' found through the research at 1st on-site activity.

As shown in Figure 3.1-1, large-scale natural disasters in Mexico are analyzed as,

- 76% of Economic loss is due to Storms and Floods.
- Two major cause of human loss are Earthquake with 53% and Storms and floods with 36%.

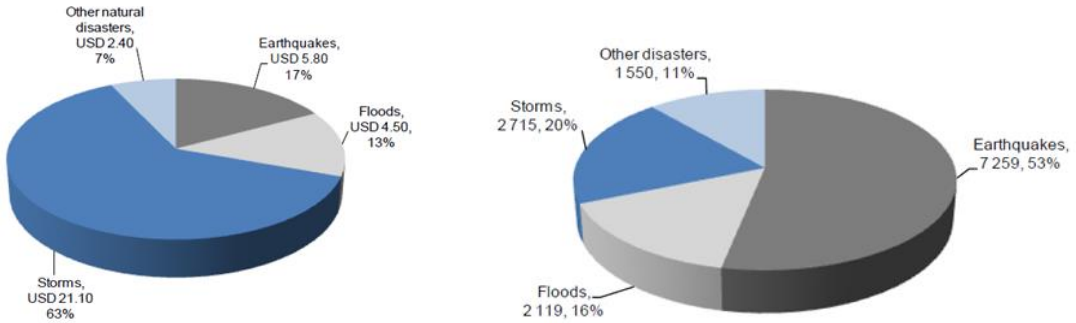

Figure 3.1-1 large-scale natural disaster in Mexico (left: Economic loss, right: human loss)

3.2 Situation of Space Development and Utilization

3.2.1 Outline of Governmental Organization

Space technology is used in various ways and supervising and related agencies vary depending on countries. Therefore, it is important to understand the agencies' role across the organizations in the government.

Table 3.2-1 shows the roles of agencies in Mexico. Through the forthcoming discussion on the space development and data utilization infrastructure construction, it is anticipated that these roles will be consolidated into AEM to establish a systematic structure for space use in Mexico. By establishment of this structure, new business opportunity is expected.

Table 3.2-1 Roles of satellite use organization in Mexico

	Name of agency, organization	Role in space related	Use	Remarks
Supervise work	SCT	・Supervising AEM ・Space policy decision ・Controlling radio use		
	AEM	・Draw up and execute space policy ・Support space development		
	CONACyT	・Support technology research development		
	ProMEXICO	・support import / export		
Receiving and controlling satellite data	INEGI	・GIS information control	National Geology information, Map information control, Damage evaluation at disaster occurring, City planning, Land use	Using WV-3 data
	SEMAR	・Coastal Defense, Security ・EVISMAR station operation	Harbors planning, chart, security, ship control	EVISMAR station operation Receiving High Resolution data of GeoEye-1, etc.
	SEMARNAT		Conserve, Environment and control	
	SEDENA	・National Defense, Security ・ERMEX-NG station joint control		Receiving Spot satellite, internal dissemination
	SIAP/SAGARPA	・Agri, fishery analysis information control ・ERMEX-NG station joint control	Agriculture production control, Environment policy, Forest control, biomass, breeding control, damage evaluation at disaster occurring	ERMEX-NG station operation, Receiving Spot satellite, internal dissemination. Mexican internal organizations such as CONABIO、SIAP、SEDENA can use the data for free. RapidEye is also used.
	CONABIO	・Biological diversity control ・ERIS station control support	Researching, biological diversity maintaining and controlling	ERIS station operation, Receiving MODIS data of NASA Purchasing RapidEye Images, Mexican internal organization as SIAP can use the data at no charge
	CONAGUA	・Receiving meteorological satellite data, dissemination of data	Hydraulic and metrological information	Receiving GOES satellite data, internal dissemination
	CONAFOR		Researching forest environment maintaining and controlling	Early detection of fire spot of forest fire
	CENAPRED	・Controlling and disseminating disaster related information	Satellite information regarding disaster control	In addition to SPOT 5/6 data utilization, CENAPRED purchased and uses RadarSAT (Canada MDA) Images, Taking measures on forest fire occurrence
others	FEMIA	・Federation of Aerospace industries		
	Universities	・Research and Development	Component research regarding space	UNAM、IPN、ECOSUR etc.

3.2.2 Space Policy of AEM

As shown in previous Section 2, AEM is in a position to manage overall space policy in Mexico in principle. However, in fact, AEM focuses on starting up Mexico's own EOS project while the actual communication satellite project : MEXSAT is handled by SCT directly.

In planning space policies, AEM adapts the "five pillars" featured in "Development Plan (National Development Plan PND 2013 (between 2013-2018)" at National Level to the "Sectorial Program" of SCT, upper Secretary of AEM. In addition, AEM defines three directives in "National Program of Space Activities PNAE" as space related activities (Figure 3.2-1).

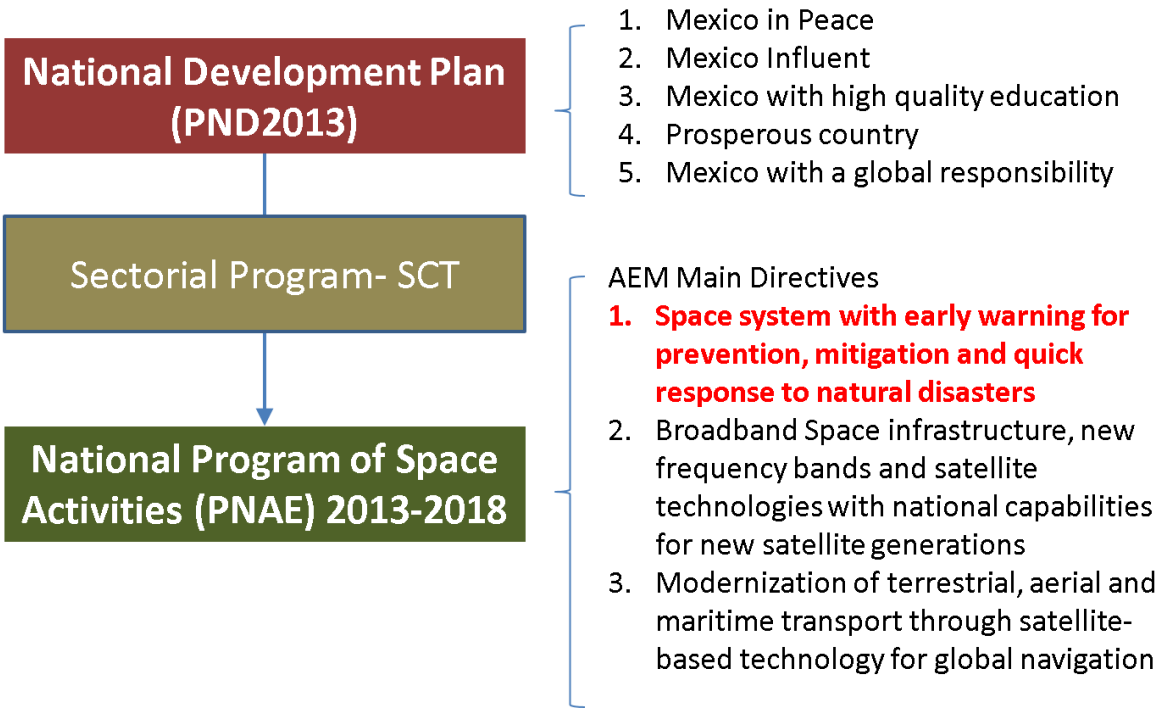

Figure 3.2-1 AEM's aiming 3 Directives

As one of main directives, AEM raises "Space system with early warning for prevention, mitigation and quick response to natural disasters" as RATIONALE for starting up the Earth Observation Satellite of own country project and is promoting government organization's understanding and budget allocation.

AEM also mentions the direction to do "climate change monitoring" in order to contribute to achievement of ambitious target committed by Mexico at the last COP21 by utilizing the merit of Earth Observation Satellite. While Brazil and Chile are in advance of Mexico in terms of possession of "Earth Observation Satellite of own country", AEM has intention to proceed capacity building for satellite development of own country through technology transfer."

3.3 Outline of Private Sectors

Aerospace industry in Mexico is formed by about 200 companies registered to FEMIA (Federation of Aerospace Industry). There are about 6 space related companies in it and majority of others are aircraft manufacturer related companies from overseas. The reason for small number of space related companies is lack of definitive plan of space in Mexico, especially plan related with manufacturing. However this means that possibility of same movement in space industry can be seen as in the past aircraft industry and automotive industry that component and part suppliers and manufacturer will increase as related plans of industry increases.

Aircraft related industry in Mexico is expected as main industry in the next generation. Structure parts of aircraft are exported to the US mainly, and engine parts and a part of wire harness are exported to Europe. Especially, North American aircraft related companies like Goodrich or Honeywell has a subsidiary in northern cities of Mexico and they provide the country with foreign currency and employment.

Space industry is expected as next generation industry bringing foreign currency and employment in the same way as aircraft industry.

4. RESULTS OF PROJECT AND ACTIVITY REPORT

4.1 Summary of On-site Activities and Training Program in Japan

In this project, totally 6 times of on-site activity and 1 Training Program in Japan were conducted. The summary of each on-site activities is shown in Table 4.1-1 and the summary of Training Program in Japan is shown in Table 4.1-2.

Table 4.1-1 Summary of on-site activity

	Period	Visit place	Activity summary
1st visit	2016/7/4～8	IPN, SIAP, CENAPRED, CONABIO, AEM, JICA Mexico office, Embassy of Japan in Mexico	・Constructing the partnership and Education with National Technological college ・Visit and research satellite data utilization organizations
2nd visit	2016/9/26～30	-	・Exhibit at IAC2016
3rd visit	2016/10/10～14	AEM, INECC, CONAFOR, CONABIO, CONAMP, SCT, JICA Mexico office, Embassy of Japan in Mexico	・Discussion on “Road Map” ・Visit and research satellite data utilization organizations
4th visit	2017/2/17～24	-	・Held a workshop. It includes the following. ・Discussion on “Road Map” to construct space development and space use infrastructure with AEM ・Enlightenment to satellite data utilization organization and satellite manufacturing private sectors ・Study and discussion on disaster prevention and disaster control system / technology improvement and the possibility of applying them on other development subjects
5th visit	2017/5/8～12	AEM, private sectors, SMN	・Visiting, researching and enlightening satellite data utilization organization and satellite manufacturing private sectors.
6th visit	2017/10/22～26	AEM, JICA Mexico office, Embassy of Japan in Mexico	・Discussion on “Road Map”

Table 4.1-2 Summary of Trainig Program in Japan

Period	Visiting place	Activity summary
2017/6/26～30	- NEC innovation world - Public Work Research Institute (PWRI) - International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM) - National Research Institute for Earth Science and Disaster Resilience - The Tokyo Rinkai Disaster Prevention Park - JSS	・ Inspection on Japanese disaster prevention and disaster control system / technology
	- JAXA - NEC Fuchu	・lecture of satellite design and manufacturing process ・ lecture and observation on manufacturing line and test facilities

4.2 Summary of Satellite Data Utilization in Mexico

Satellite data are used in National land control, agriculture, forestry, disaster prevention, security and so on in Mexico. Main use cases are shown in Table 4.2-1.

At the workshop held during 4th on-site activity (2017, Feb.), some satellite data utilization organizations got together for discussion. There has been little chance like this before. Some participants came to know for first time which data should be used for which output, and what kind of data each organization has.

In this work shop, it was defined that the necessity of the facility which can virtually collect and jointly own information, like facilities called “Mexican satellite date center” and “Mexican data platform,” which can store satellite data and field obtained data as mentioned above. For example,

- Necessity of the community that Mexican internal user organizations meet each other
- Archiving place of not only satellite data but also various field obtained data
- Necessity of jointly owning not only satellite data but also thematic map.

Table 4.2-1 Satellite data utilization areas and examples in Mexico

Area	Use purpose		Means, technique to use	Main satellite data
Land Management	Create basic map	Preparing land basic information (e.g. topographic map, land use map, contour map etc.)	Land cover classification etc.	Landsat, SPOT, RapidEye
			DEM	SPOT, ASTER
Meteorology		Basic Meteorological information map, Monitoring cyclones.		NOAA, GOES-E, GOES-W

Disaster Management	Disaster prevention	Provide meteorological forecast. Issue weather warning		
		Hazard map	3D display, Geotectonic	Landsat, Digital Globe satellite date, SPOT
		Monitoring Wild Fire occurrence (on line delivery)	Detect temperature anomaly	NOAA, MODIS, Suomi NPP
	Disaster monitoring	Grasping situation of damage, monitoring flood area	Image interpretation Flood area extraction. Tsunami going upstream area	Digital Globe satellite data, SPOT
				ALOS, LiDAR, Sentinel-1
		Monitoring oil spill	SAR data analysis	
		Monitoring land subsidence	Interferometry technique	ALOS-2, TerraSAR-X / TANDEM-X
Agriculture	Production management	Yield prediction	Classification technique	SPOT, Landsat, RapidEye
		Nitrogen content estimation	NDVI	
		Growth monitoring	Biomass estimation, NDVI	
	Farm control	Grain classification cropping distribution, farm alteration	Classification, change extract	
Forestry	Forest degradation mitigation	REDD+、MRV、Forest distribution	Land cover classification, forest extract	SPOT, Landsat, RapidEye
Environment	Biological diversity preservation, ecological system control	Monitoring mangrove forest, coastline corrosion	NDVI, interpretation technique	Aerial photograph, SPOT, Landsat, Sentinel
		Early detection of coral whitening	Sea water temperature, Chlorophyll	NOAA, MODIS, Suomi NPP
	Blue carbon evaluation	Mangrove, swamp distribution	Biomass estimation	WorldView
Natural Resources	Oil exploration	Oil slick detection	SAR analysis	SAR data
	Monitoring facility	Pipeline leakage detection	Interpretation technique	Aerial photograph, Digital Globe satellite data
	Mineral exploration	Geological map, mineral distribution, endowments evaluation	Geological analysis, mineral classification	Landsat, ASTER, SPOT, Hyperspectral data

4.3 “Road Map” Establishment with AEM and Prototyping of Satellite Data Utilization Platform Development

4.3.1 “Road Map” Establishment

AEM, showing its policy direction by PNAE flow down from PND 2013, has orientation to creation of new space utilization industry, including not only space equipment industry but also expansion of SPOT satellite data utilization from present limited use, which centers establishment of “Space system contributing Early Warning system of large-scale natural disaster”.

The concepts of space utilization infrastructure which Mexico should aim are

- Taking in present data utilization system of SPOT satellite step by step and expansively
- Platform which harmonizes not only satellite data but also UAV / various ground sensor data to create new industry

The project team discussed with AEM many times and defined “Mexican Data Platform” shown in Figure 4.3-1 as the goal and further discussed the “Road Map” which leads to the goal.

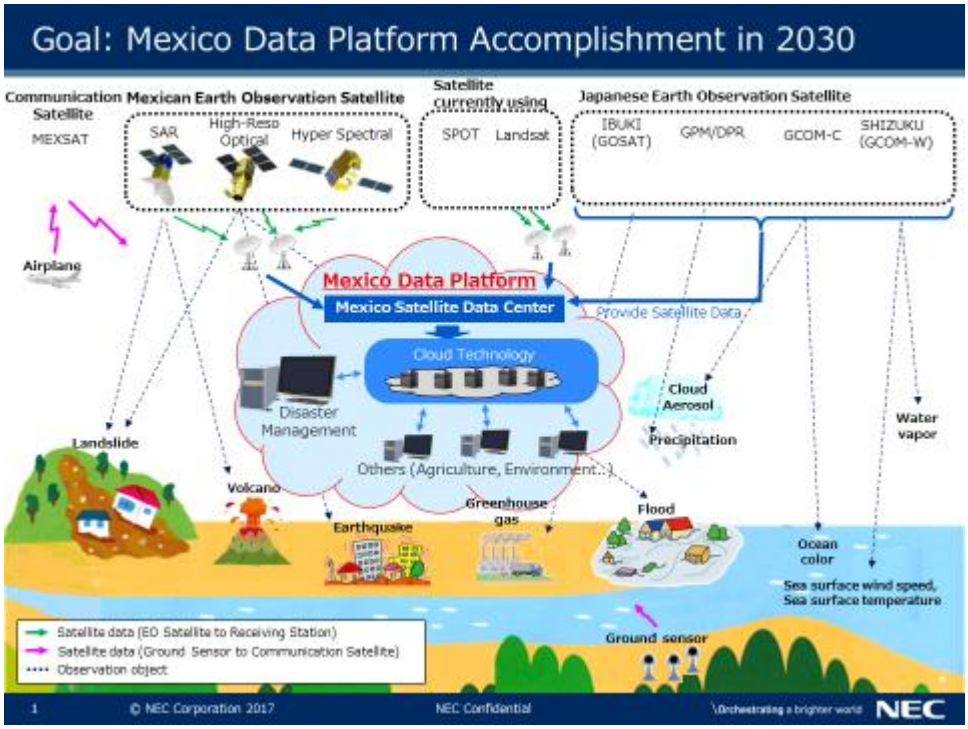

Figure 4.33-1 Concept of “Mexico Data Platform”

Figure 4.3-1 is the ideal (Goal) of Mexican Earth Observation system in 2030. The “Road Map,” which is for realizing this ideal, consists of two parts. 1st part is for developing Earth Observation Satellite of Mexico. 2nd part is for constructing user system on ground base (refer to Figure 4.3-2 to -5).

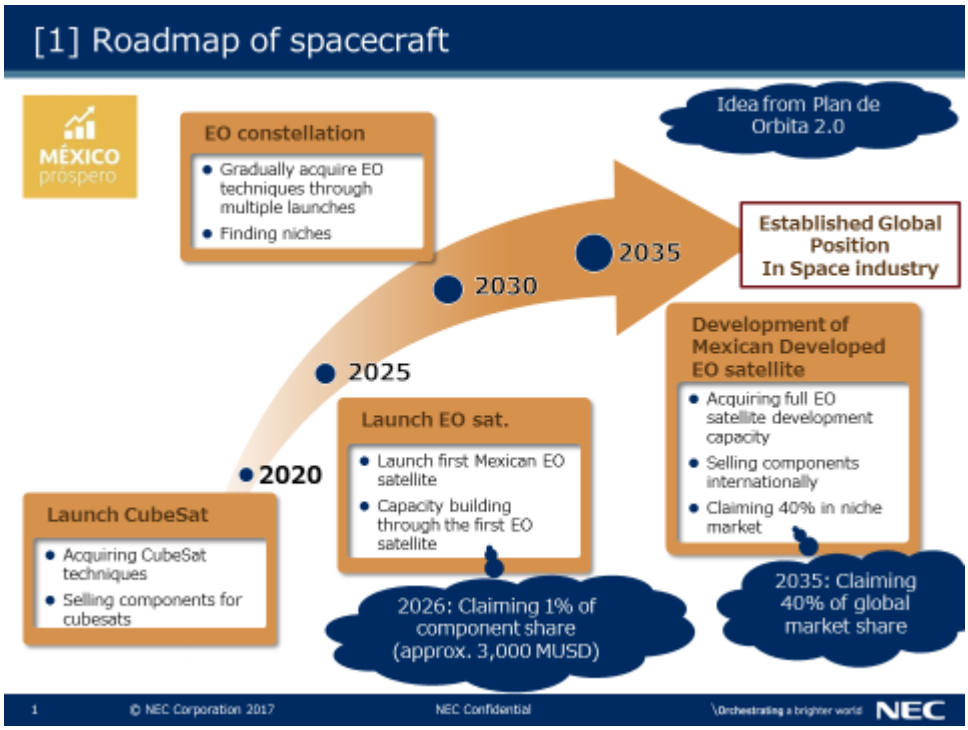

Figure 4.3-2 Roadmap of Spacecraft

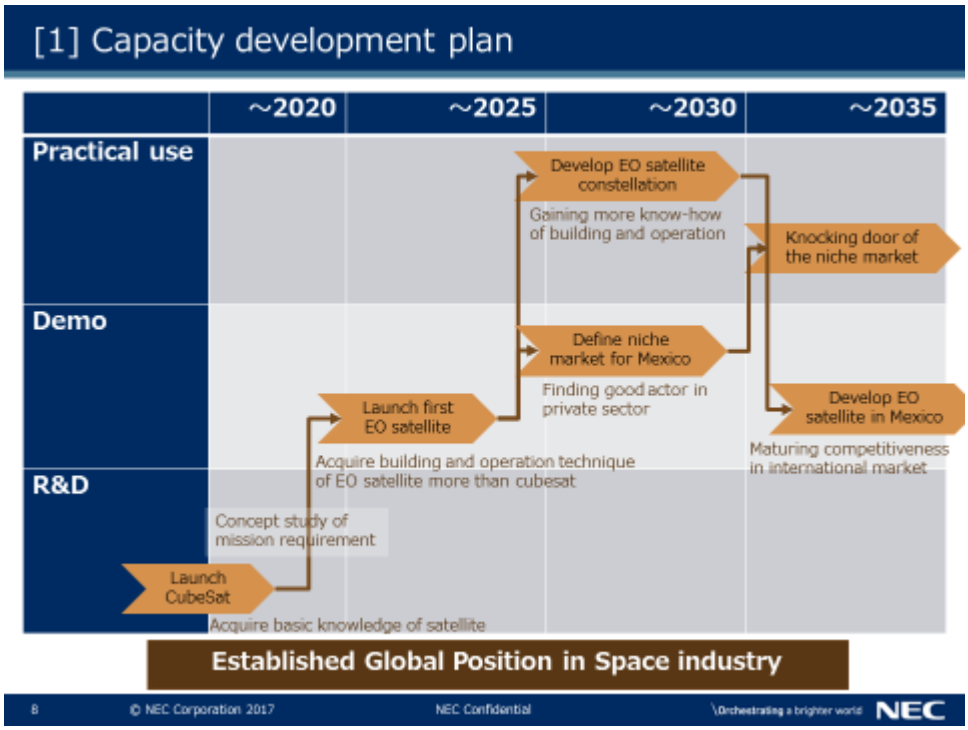

Figure 4.3-3 Capacity Building Plan for Spacecraft

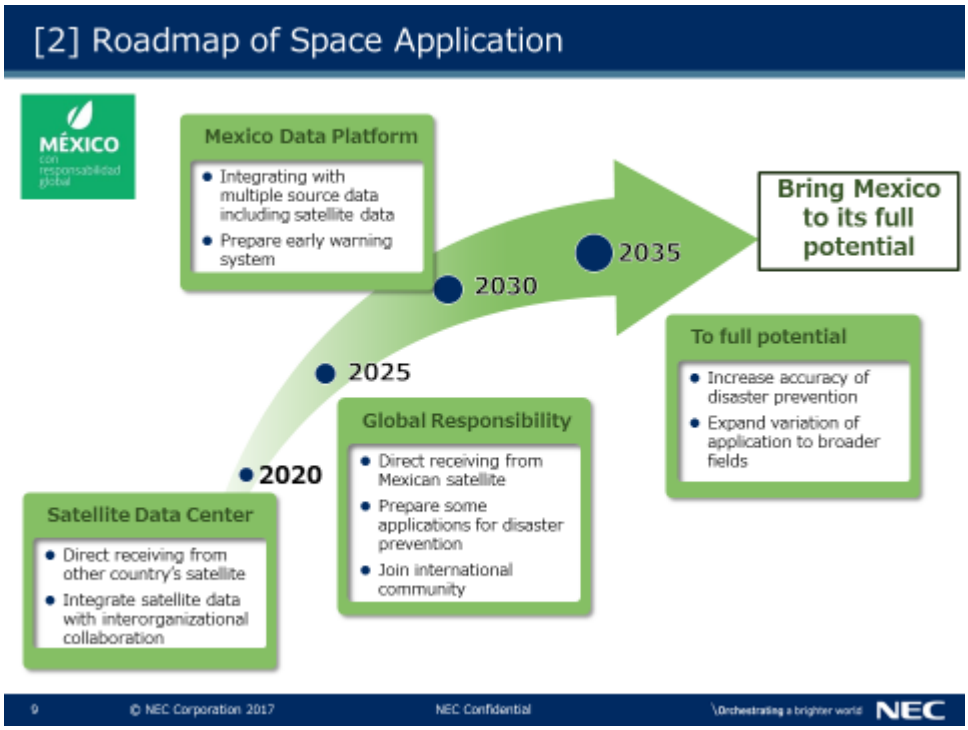

Figure 4.3-4 Roadmap of Space Application

Figure 4.3-5 Capacity Building Plan for Space Application

4.3.2 Prototyping Satellite Data Utilization Infrastructure

Regarding prototype plan for satellite data utilization infrastructure construction based on the "Road Map" of the previous section.

- Present satellite use infrastructures have many issues (found at the workshop organized by AEM at the 4th on-site activity)
- The project team proposed a study work to solve the above problems during 5th on-site activity, but found it difficult due to complicated concerns among many stakeholders on current satellite data utilization infrastructure.
- AEM intends to proceed as first priority the study on mission requirement definition for the Mexico's own Earth Observation Satellite.

Based on above situation, as the first step to realize Mexico's own Earth Observation Satellite, the project team proposed Phased Approach based on the system engineering integrated with satellite development programs in Japan.

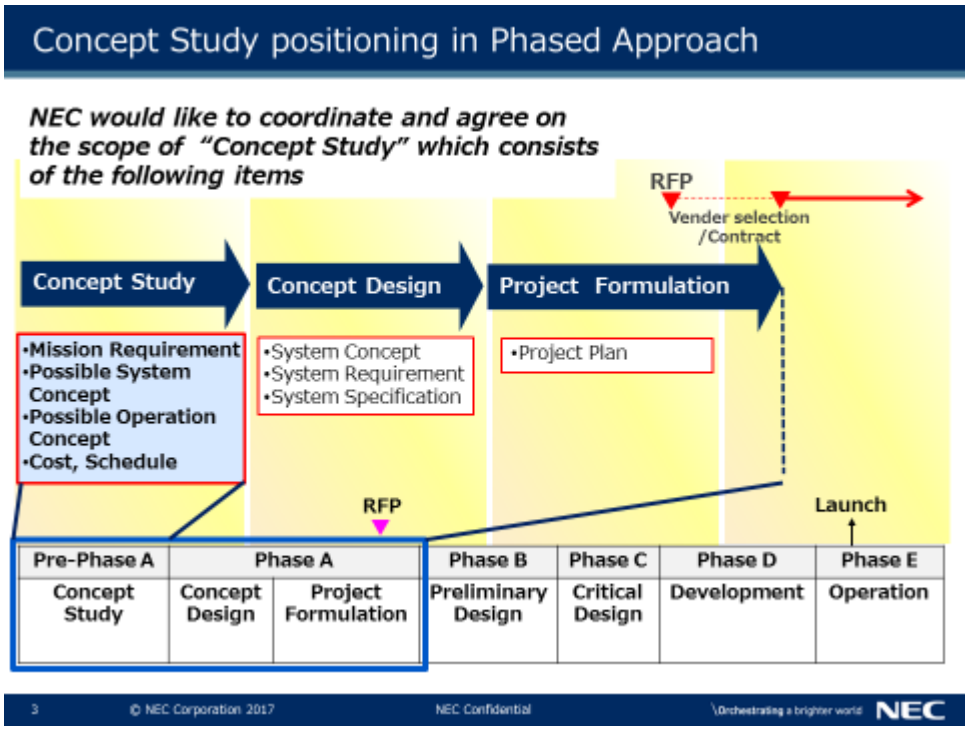

Figure 4.3-6 Prototyping Proposal based on Phased Approach

Regarding study work proposal based on the above system engineering, the project team proposed a concrete MRD study work shown in Table 4.3-1 (with three options as MINIMUM, MEDIUM and FULL depending on the work volume) with AEM's response as follows.

- MINIMUM option is preferable
- Finance for the MRD study work contract is pending

Table 4.3-1 Outline of Proposed MRD Study

R: Responsible, S: Support

ID	Contents	Output	Detail	Work share			
				AEM	Contractor		
					Min.	Med.	Full
1	To establish Pre-Phase A Study execution plan	Pre-Phase A Study execution plan	Purpose, goal, policy, scope, outcome, organization with responsibility and authority, process, WBS, schedule, resource, review, etc. for Pre-Phase A Study are defined.	R		S	S
2	To identify all end customers and stakeholders	End customer list and stakeholder list	Prior to gathering and analyzing wants and needs for the system, all end customers and stakeholders should be identified since it is not always true that end customers and stakeholders are definitely clear from the beginning.	R		S	S
3	To gather, digest and analyze end customers' and stakeholders' issues, challenges, wants and needs	Objective needs for the system	Issues, challenges, (subjective) wants and (objective) needs for current early warning system of Mexico are gathered from end customers and stakeholders followed by digesting and analyzing them with interpretation into engineering words	R		S	S
4	To conduct concept study on the early warning satellite system for Mexico	Concept study report	Concept of the early warning satellite system for Mexico is studied based on the analyzed needs with best compromise that seems possible (Item 3 and 4 can be iterated when needed)	R	S (only rough sketch)	S	S
5	To create the draft of Mission Requirement Definition (MRD) document	The draft of MRD document	MRD is drafted based on the concept of the system	R			S
6	To conduct MRD review meeting	Minutes of review meeting	Draft of MRD document is reviewed and commented by AEM, end customers and stakeholders	R			S
7	To finalize the MRD document	The finalized MRD document	MRD document is finalized reflecting AEM's, end customers' and stakeholders' comments	R			S

5. BUSINESS DEVELOPMENT PLAN AFTER JICA PROGRAM

From mutual understanding on situation of 'satellite data utilization and space use infrastructure in Mexico' as a result of on-site research with satellite user organizations and through discussions with AEM on space development and establishment of utilization infrastructure, it was understood by AEM that the target of space use infrastructure in Mexico is establishment of "Mexico Data Platform which will contribute to solution of social and economical issues in Mexico, such as countermeasures toward large-scale natural disasters and climate change, including floods, land slide, and so on.

In addition, AEM agreed on "Road Map", as premises for securing the budget, to achieve the goal, covering both Mexico's own Earth Observation Satellite development and construction of use infrastructure, including capacity building.

The step by step approach to the Mexican data platform construction as shown below from mid-term point of view is confirmed with AEM.

Step 1: Satellite Data Center Development (improving the utility of existing satellite use system and preparation of data center for Mexico's own Earth Observation Satellite)

Step 2: Development of Mexican Earth Observation Satellite and data network.

Step 3: Development of Mexico Data Platform.

The project team confirmed AEM proceeds the steps with a middle and long term viewpoint.

The business development after executing this project with the above-mentioned results will be proceeded by the steps with the master schedule shown in the Figure 5-1.

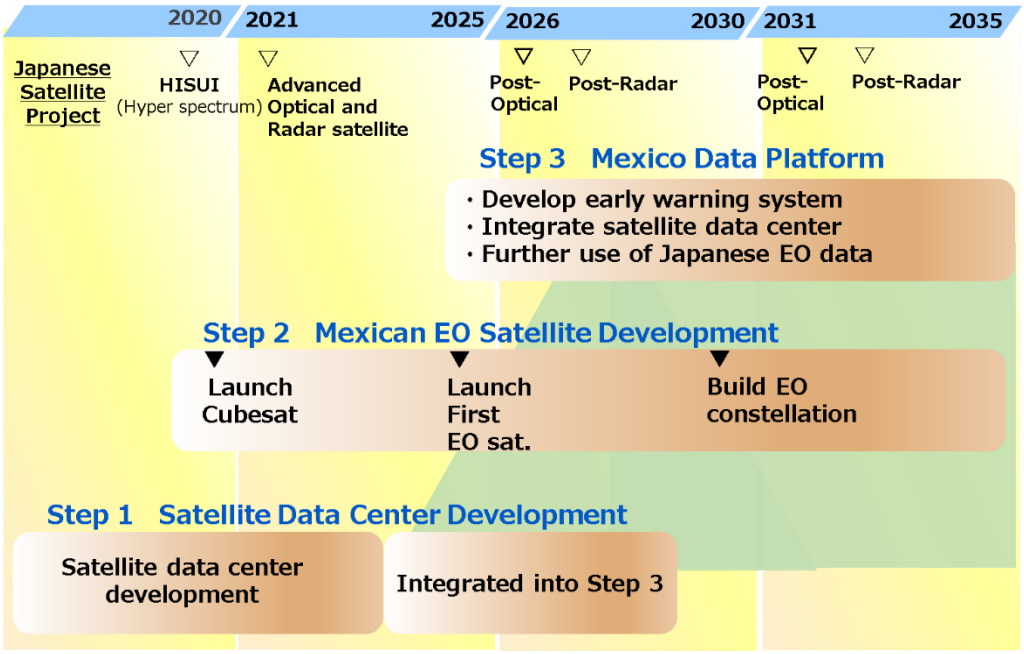

Figure 5-1 Draft Master Schedule for Business Development after JICA Activity