CHAPTER 3

Implications for ASEAN Policies of Better Integration and Connectivity

The previous chapters emphasised the benefits of spatial and geospatial technology (SGT) for the Association of Southeast Asian Nations (ASEAN), focusing on issues in a wide range of areas such as logistics, disaster management, and public health. This chapter adopts another perspective by looking at the implications for ASEAN policies of the enhancement of ASEAN connectivity through SGT.
This chapter is organised as follows:

1. What can be achieved with coordinated ASEAN policies?
2. ASEAN policies on physical infrastructure.
3. ASEAN policy directions on sustainable value creation from data.

What can be Achieved with Coordinated ASEAN Policies?

To benefit from the full potential of SGT, ASEAN countries will need to adopt coordinated policies aimed at establishing both a strong infrastructure supporting the use of SGT and a legal framework to organise SGT data utilisation.

1. Physical infrastructure:
   - Space systems: observation, positioning, and communication; and
   - Ground-based systems: base station networks, satellite communication points, and ground data networks.

2. Data policies and associated public/industrial policies:
   - Sustainable value creation from data by respecting the rights and concerns of data producers and associated stakeholders;
   - Separation of data holdings/ownership and advanced usage by value creators/producers; and
   - Sharing benefits amongst data producers and value creators.

The next two sections further develop these necessary political goals.

ASEAN Policies for Physical Infrastructure

While it has immense potential benefits for the region, the utilisation of SGT requires important initial investments for the establishment of highly advanced technological infrastructures, both in outer space and at ground level.

Space systems: observation, positioning, and communication

Earth observation

Concerning the use of earth observation technologies, the authors recommend different approaches, depending on the kind of application requested.

1. In the case of global earth observation, the cost of establishing a large constellation of expensive satellites would be too high for ASEAN countries, even if they were united behind this goal. Therefore, it would be beneficial for ASEAN to join global earth observation open data clubs such as the Group on Earth Observations.
2. In the case of local observation, ASEAN countries could develop indigenous capabilities through the establishment of regional policies, balancing competition and collaboration. We recommend two approaches that can be pursued in parallel:
   (a) ASEAN satellites. Joint development/operation of ASEAN satellites by member countries under the banner of ASEAN. We could even imagine the establishment of an ASEAN satellite constellation.
   (b) National satellites. Individual development of satellites by member countries, eventually participating in an ASEAN constellation.

Two further comments can be made regarding the development of local observation capabilities:

1. There has been a strong focus on the importance of the establishment of an ASEAN constellation. Facing the same challenges on a relatively similar environment and having SGT as a solution, transcending national boundaries, it would be highly inefficient for ASEAN member countries to develop in parallel similar technologies without collaborating. Moreover, beyond simple data sharing, the coordinated operation of various ASEAN satellites would improve the efficiency of SGT by allowing an increase in covered area and/or revisiting the frequency of the satellites.
2. Beyond regional utilisation, the data produced by ASEAN satellites could then be shared in a previously mentioned global earth observation open data club.

Satellite positioning systems

The ongoing Global Navigation Satellite Systems (GNSS) operations are operated by independent bodies, though the operations have potentials to collaborate for better services supported by high-precision and real-time positioning technologies. It is useful to design such collaborative systems by i) space segment, ii) control segment, and iii) user segment.

-Space segment

The space segment covers designs operations of satellites, such as structuring constellation satellites. As well as its usefulness for earth observation, regional cooperation in satellite operations will be beneficial to participating countries through infrastructure sharing. Currently, the Asia and Pacific region has more intensive GNSS coverage than other regions owing to the global positioning system (GPS); GLONASS; Galileo; Compass; the Indian Regional Navigation Satellite System or IRNSS; and the Quasi–Zenith Satellite System (QZSS). QZSS is a GNSS constellation dedicated to East Asia, Southeast Asia, and Oceania, with its orbits focusing on these areas. International cooperation of QZSS applications could be expected to be a model promoting regional positioning satellite systems.

-Control segments

Control segments include infrastructure to observe movements of satellites and the computing orbit data (ephemeris), and monitor the satellite clock and compute their correction parameters, which are the bases of high-precision positioning techniques such as Real Time Kinematic (RTK) and Precise Point Positioning (PPPo). MADOCA high-precision positioning is realised by data management and processing of signals from space and delivery of processed data to user segments. The Continuous Operational Reference Station (CORS) can be included in the control segment because of its position as a ground infrastructure, though it could also be part of the user segment as it comprises user segment technologies.

While PPPo does not need cooperation amongst operational bodies because of its independence from ground reference points, RTK needs cooperation amongst operational bodies as the positioning accuracy of RTK is affected by its proximity to reference stations. The integration of the reference stations infrastructures, especially the CORS network, should be beneficial for GNSS user segments to provide high-precision positioning data to applications. There are two key issues regarding the regional integration of the CORS infrastructure.

Intra-country cooperation – It is sometimes challenging to integrate CORS networks even within a country because CORS operation bodies spread from the public sector to the private sector, where data policy varies widely. International cooperation requires dialogues with each operating body, unless single-window mechanisms are established. For example, in Thailand, the public CORS operating bodies are the Royal Thai Survey Department, Hydro and Agro Informatics Institute, Department of Land, Geo-Informatics and Space Technology Development Agency (GISTDA), Department of Public Works, and Town and Country Planning. An international mission had to construct agreements with each agency to use their CORS infrastructure. Recently, the Government of Thailand has concluded a single-window policy of international cooperation on the use of the CORS network in Thailand, with the Royal Thai Survey Department taking responsibility for the coordination of international cooperation amongst operating agencies. Thailand will be a good model for better integration of CORS networks within ASEAN countries.

Inter-country cooperation – The CORS networks sometimes contribute to high-precision positioning beyond borders, especially for border areas with

little density of reference stations. Data transfer beyond borders is another challenging issue because CORS data contain sensitive military information. Developing agreements will be initiated by specific applications with tangible benefits favourable to political considerations. When a certain number of agreements has been concluded, ASEAN may recommend that states develop a multilateral agreement on the use of CORS networks amongst ASEAN states.

-User segment

In the past, RTK–GPS instruments had been mainly for professional surveys and cost tens of thousands of dollars. Only hand-held GPS devices were affordable to consumers. However, in the last few years, low-cost RTK devices have become available at cheaper prices. In addition, more smart phone penetrations reach high-precision positioning service due to the hybrid positioning using GNSS and cell tower-based positioning. Although such consumer market trends and growth are fairly independent from governments' policies, the ASEAN policy will include such conditions and projections.

Satellite communications

While satellite communications are regarded as a key technology for Internet of Things (IoT) applications, operation costs are high for ASEAN states. Store and forward is a technique to reduce costs of satellite communications, in which a satellite receives data from a ground transmitter when at its vertical, stores the data on the satellite, and transmits the data to a ground receiver when at the vertical of the ground receiver. Store and forward reduces communication costs at the expense of a lower update frequency. The store and forward technique is expected to interconnect sensor networks in areas without landline Internet connections, such as remote areas and oceans. The technology could support ASEAN states in the continuous monitoring of the environment and disasters in a sustainable way through low-cost advantage.

Ground-based systems

The second type of infrastructure that will need to be promoted through ASEAN policies is ground systems. The authors recommend the development of three categories of ground systems.

1. Base station networks. National development of base stations. This is necessary to downlink data produced by observation satellites or gathered by communication satellites from ground measurement stations to form international networks. By having a large network of interconnected base stations, real-time data exchange will be available to ASEAN countries; however it would require an absolute interoperability of all base stations.
2. Satellite communication points. Individual development with interoperability.
3. Ground data networks. Individual development of ground measurements stations, emitting in-situ data towards ASEAN communication satellites. The adoption of common data standards will be necessary for the functioning of the full system.

The key word here is interoperability. Contrary to satellites that move in outer space, which is a neutral area for international law, ground stations will be placed on the exclusive territories of ASEAN Member States. Therefore, to use the potential of such a wide network, it is necessary to ensure the compatibility between all infrastructures and to facilitate the adoption of common standards throughout ASEAN.

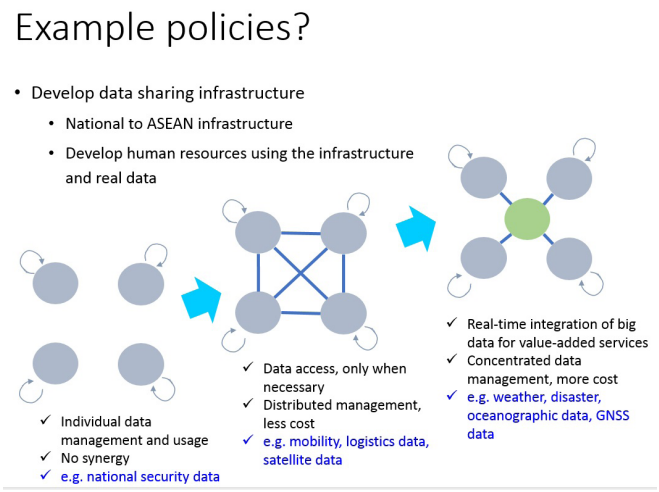
ASEAN Policy Directions for Sustainable Value Creation from Data

This section aims to answer the following question: How to sustain value creation from data while respecting the rights and concerns of data producers and associated stakeholders?

To answer this question, the authors recommend that specific policy directions, consisting of the adoption of coordinated data policy for advanced usage, be followed. Focus should be placed on:

1. Separating data holdings/ownership and advanced data usage, and integration by value creators, as well as respecting the rights and concerns of data producers/stakeholders. In other words, ensuring a smoother flow of data and a clearer responsibility for data usage.
2. Sharing the benefits of value creation from data amongst data producers and value creators.
3. Monitoring and assessing the risks and benefits of data usage and data market competition/concentration in a coherent manner.
4. Accelerating human resource development for value creation.

Figure 21: Example Policies



ASEAN = Association of Southeast Asian Nations, GNSS = global navigation satellite systems.