Development of Cross–border Trade and Transport Geo–spatial database for The Lower Mekong Riparian Countries

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Abstract The Trade and Transport Information Database for the Lower Mekong Riparian Countries is a geo–spatial database of which main components are 1) general information of border cities in the lower Mekong riparian countries 2) cross–border trade information including border checkpoints and boundary 3) cross–border trade and transportation statistics 4) the transport network linking the riparian countries. The Google Earth program is applied for the display of the database on the computer screen. The resulted database can be visualized in both graphic and descriptive form. Hence it is quite an efficient tool for planning and analysis of trade and transportation. Moreover, the database will serve as a basis for further development to more extensively cover the cross–border trade and transport between Thailand and all her neighboring countries.

Key Words: Database, geo-spatial, cross – border, Mekong.
1. INTRODUCTION

The lower Mekong riparian countries comprise four countries namely Laos, Thailand, Cambodia and Vietnam which covers most of the Indochinese Peninsula. The end of the two–decade cold war and civil war in 1990 has brought about positive development to the three Indochinese countries, Laos Cambodia and Vietnam. This is evident by the steady increase in trade value between Thailand and the three Indochinese countries over the past six years (Figure 1). Such development leads to both co–operation and competition among the riparian countries as well as countries outside the region. It is true that the possession of complete and accurate database is one crucial factor that makes Thailand stays competitive. Hence the development cross–border trade and transport database aims to be an essential element to successful planning and strategy development which would in turn makes the actions practical.

![Figure 1 International trade between Thailand and the Indochinese countries during the year 2004 – 2009](source: Department of Foreign Trade, Ministry of Commerce of Thailand.

The development of trade and transport database and geo–spatial information system for the lower Mekong riparian countries is a continuation of the development trade and transport database and geo–spatial information system for the upper Mekong riparian countries (Sukdanont et al, 2008). The objectives of this development project are 1) to collect data related to cross-border trade and transport between Thailand and other Mekong riparian countries namely Laos, Cambodia and Vietnam and put together as a database and 2) explore the current situations on the cross–border trade between Thailand and her neighboring countries in the lower Mekong river region.

The development of the database and geo–spatial information system comprises study area selection, data collection, data analysis and development of database and spatial information system (Figure 2).
2. STUDY AREA SELECTION

The selection of study areas are divided into 2 levels as follows:

- Specification of Lower Mekong

In this study, the specification of the Lower Mekong is based on geography and the length of the Mekong River. The Mekong River is the major international river of Asia. The total length of the river is 4,880 kilometers. From the headwater origin in Tibet Plateau, Qinghai Province of China, she passed the province of Yunnan, and after that she runs southward and becomes the natural demarcation line between China, Myanmar, Laos and Thailand. The distance from the headwater down to Chiang Khong District, Chiangrai Province of Thailand is 2,462 kilometers (Mean, Chu Zheu. et al., 2005, Map) which is about half of the total length of the river. Then she enters the territory of Laos passing Bokeo which adjoins Yunnan, the south of China, and Luangprabang the major city in the north of Laos. This part is considered as the upper Mekong.
After Luangprabang the Mekong River becomes the demarcation line between Thailand and Laos again at the province of Loei of Thailand and Xayabury of Laos. In this study the Lower Mekong starts from Loei down to the Mekong Delta in the southern part of Vietnam where she approaches and empties into the South China Sea. Hence the lower Mekong riparian countries comprise four countries namely Thailand, Laos, Cambodia and Vietnam (Figure 3).

- **Selection of Study Provinces**

The study provinces are selected based on two geographical criteria; 1) provinces of Thailand and neighboring countries which are attached to Mekong River, and 2) provinces of Thailand and neighboring countries which their boundary connected to each other. The total of 12 provinces of Thailand include Loei, Nong Khai, Nakhon Phanom, Mukdahan, Amnat Charoen, Ubon Ratchathani, Si Sa Ket, Surin, Buri Ram, Sakaeo, Chanthaburi and Trat; 8 provinces of Laos PDR include Vientiane Capital, Xayabury, Vientiane, Borikhamxay, Khammuane, Savannakhet, Saravane and Champasack; 7 provinces of Cambodia include Banteay Meanchey, Battam Bang, Koh Kong, Preah Vihear, Krong Preah Sihanouk, Oddar Meanchey and Krong Pailin; 12 provinces of Vietnam include An Giang, Binh Phuoc, Dak Lak, Dak Nong, Dong Thap, Gia Lai, Kien Giang, Kon Tum, Long An, Quang Nam, Thua Thien-Hue and Tay Ninh.

### 3. DATA COLLECTION

The methodology on the development of the database depended on qualitative research methodology which includes

1) The collection of secondary data from documents and electronic media from both Thailand and other countries.

2) The collection of primary data consists of

- Site survey on the trade conditions at cross–border checkpoints in the Northeastern and East region of Thailand. The 43 field study locations are situated in provinces of Loei, Nong Khai, Nakhon Phanom, Mukdahan, Amnat Charoen, Ubon Ratchathani, Si Sa Ket, Surin, Buri Ram, Sakaeo, Chanthaburi and Trat.
• In–depth interview with key persons and agencies related to trade and transport at border in Thailand and neighboring countries. The total of 54 interviews including Provincial Chambers of Commerce, Customs Houses and Immigration Checkpoints, officers in charge of border crossing, and trade and transport operators at the border.

• Survey on international transport route in Thailand as well as Laos and Cambodia. Because of limited budget the survey had to be excluded the transport route in Vietnam.

4. DATA ANALYSIS

In this process the data collected both secondary and primary were analyzed and categorized into three groups as follows:

• Information about the border provinces of Thailand, Laos, Cambodia and Vietnam (the names of the provinces are referred to the previous section on Selection of Study Provinces) comprises a description which provides an overview of the province and a map which reveals the location of the provinces in the country (Figure 4). Most of the data are drawn from secondary sources.

• Information about border–crossing points along the borderline in northeast and east region of Thailand including 17 permanent checkpoints and 26 traditional border–crossing points. The data consist of general information of each border–crossing point, statistics of inbound and outbound goods, people and vehicles. Photographs taken at the border–crossing points are also included in the database (Figure 5). Most of the data are collected from site surveys and in–depth interviews.

• Information about transportation network which links the four riparian countries namely Asian Highways as they are critical highways linking the Mekong riparian countries. The data include the total length of each road, the origin and destination, the major cities along the route and the road map (Figure 6). The data are mostly drawn from Asian Highways Handbook (UNESCAP, 2003) and field surveys.

Figure 4 Sample of location map of border province

Figure 5 Sample of photographs taken at border – crossing points
5. DEVELOPMENT OF DATABASE AND SPATIAL INFORMATION SYSTEM

Trade and transport data are collected and developed as a geo-spatial database which comprises two main components i.e. spatial data and attribute data. In this research we choose Google Earth to display the content of trade and transport geo-spatial database for their many advantages including the free-of-charge usage policy, the availability of base data such as multi-resolution satellite images, administrative boundaries, road networks etc. Furthermore, the program is friendly. Users without expertise in geo-spatial database system can quickly learn how to use Google Earth to view maps, update the database as well as disseminate the developed geo-spatial data through the Internet (Figure 7).

In order to visualize trade and transportation data of Lower Mekong Riparian countries on Google Earth, the data that is compiled from documents and reports must be properly geo-coded. The descriptive part of the data which is linked to its spatial counterpart is graphically created as placemarks. Places such as border crossings or cities are represented by point features whereas roads are represented by paths. Descriptive data is input in HTML format and then associated to placemarks and paths. The resulted geo-spatial database for trade and transport of Lower Mekong Riparian countries is structured into layers as follows:
• **Border–crossing point layer:** The layer was developed by adding placemarks at the trade point locations. These locations are derived and geo-coded from descriptions available from documents and reports. For each province, the layer is further subdivided into 2 sub-layers i.e. permanent and temporary border crossing points. Descriptive data of each border crossing point are locations, transportation to the crossing point, cross-border trading status, imports and exports, operating time, and customs and immigration control.

• **Provinces of Thailand layer:** The layer was constructed by importing features as placemarks from existing database developed in the previous project of trade and transportation database development for Upper Mekong Riparian countries (Sukdanont et al., 2005). Attribute or descriptive data were then associated to provinces bordering countries in Lower Mekong Riparian countries.

• **Province Layer of Lower Mekong Riparian Countries:** Provinces of Laos, Cambodia and Vietnam were developed by adding locations as placemarks. These locations were results of the query of Google Earth base map. The attribute data consists of geographical data, population, administrative data, economics, and transportation. Descriptive data of each province are locations, population, administration, economy and transportation.
Asian Highway Layer: The layer consists of Asian Highway passing through countries in both upper and lower Mekong riparian i.e. AH1, AH2, AH3, AH11, AH12, AH13, AH14, AH15, AH16, AH18 and AH19. Parts of this layer are derived from road networks that have been developed from the Development of trade and transportation database of Upper Mekong Riparian Countries project. The spatial components of the layer were input as line features by employing head-up digitizing to trace roads appearing on base map of Google Earth. Attribute data were then attached and road names were added along road paths as point features.

City Layer: The layer contains major cities along the Asian Highway. It was developed by adding positions of the cities, resulting from querying base maps of Google Earth, as placemarks.

The geo–spatial database for trade and transportation of Lower Mekong Riparian countries is in .kmz format of Google Earth. Users are required to have Google Earth installed on their machines in order to use the database.

6. PROBLEMS ENCOUNTERED

The main difficulty in setting up a database is data collection. In this study, trade and transport information database for the lower Mekong riparian countries is obtained from many sources, including an on-site survey at check point, border trade, and highway route survey, in addition to the interview with corresponding personnel. Although the developed database is considered comprehensive and up–to–date, several points should be noted:

1) Since the main authority overseeing check points is not related to goods transport, statistics in terms of trade at check point border trade are not typically recorded systematically and continuously. Thus, the overall picture of border trade between Thailand and neighboring countries are difficult to achieve.

2) The goods transport database is currently from Thailand only due to limited data in neighboring countries. In addition, requesting necessary data is not easy, as some information are undisclosed. In some cases, even taking photos at some crossing points are prohibited.

3) Limited and out–of–date data from neighboring countries, especially at district and province levels. Several documents were prepared in local language.

7. SUGGESTIONS FOR FURTHER DEVELOPMENT

1) In order to get the complete trade and transport data, formal data collection and data update program should be set up by the related authorities to collect the trade and transport statistics of the traditional border–crossing points. The format of the data, and survey methodology can be standardized.

2) Formal data update process should be conducted by pooled efforts among countries. In this process, information can be verified by the original data sources of both countries.
3) The improvement on the access to this trade and transport information database can be done. Web-based operations should be made possible for easy access to the database for research and development purpose.

4) The upper and lower Mekong trade and transport databases which are both developed on Google Earth should be combined since such combination will build up a complete trade and transport geo–spatial database of the entire Mekong region.

8. CONCLUSION

The results of the study not only yield a transport and trade database but also the gathering on the understanding on the current situation on trade and transport. Several facts are listed. A key obstacle to the progress of trade and transport is that government agencies do not have complete knowledge and do not place importance on cross–border trade. In practice, there are two levels of trade; 1) formal trade with customs procedure (import–export) and cross-border, and 2) local (informal) trade at temporary border checkpoints. It is found in the study that most government agencies focus on only the first type of trade, which has not created much of local economy at border areas. Moreover, statistic on local trade has not been collected by any agencies, perhaps it implies that the importance of this type of trade is ignored. This local trade has found to be related to the prosperity of the local economy, social, and living hood of people who live in the border provinces. Moreover, the trade is important for the conciliation of people of two countries, which will also lead to better relationship between the countries.

The developed transport and trade database can be a useful tool that could assist all related agencies to acquire knowledge, information, and lead to the improvement of cross–border trade. The database consists of important trade and transport statistic at border checkpoints and is displayed on Google Earth. The geographical illustration makes it easy to see the overall picture on trade and transport between Thailand and neighboring countries.

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