

# GIS and geomorphology studies to determine ancient trade routes and harbors in the Red river delta, Vietnam

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**Abstract:** In XVI-XVIII century, Vietnam has emerged Western merchants come to trade and this time appeared some trading center (Thang Long, Pho Hien, Hoi An...). Domea and Rockbo are two of the names were be written in VOC (Vereenigde Oost-Indische Compagnie), East India Company document and maps but it was disappear, not to mention in any Vietnamese history document. By geomorphology, remote sensing and GIS method; the information of ancient riverbed combine with sandbar line and history document can determine Domea harbors is on the Thai Binh river dike at An Du, Tien Lang, Hai Phong. Tonkin River, the main trade route to Thang Long that time can determine is through Thai Binh river turn left to Luoc river and turn right to Red river to Thang Long. Rockbo gate is on the area that have the most coastal line change in Viet Nam. The coastal line in XVI century was reappear by landform analyzing together with historical relic of ancient dike. Position of Rockbo gate was determine by combine coastal line in XVI century, ancient riverbed and information in VOC document is in Yen Khanh, Ninh Binh.

## 1. Introduction

In XVI-XVIII century, Vietnam has emerged Western merchants come to trade and this time appeared some trading center (Thang Long, Pho Hien, Hoi An...). Domea and Rockbo are two of the names were be written in VOC (Vereenigde Oost-Indische Compagnie), East India Company document and maps but it was disappear, not to mention in any Vietnamese history document. To determine Domea, Rockbo and ancient trade routes, the terrain in the past was reappear to combine with historical information by GIS.

## 2. Documentation and methodology

Follow describe of Western document, Domea is an important harbor of European trade ship at Thai Binh river gate. Together with Domea, Rockbo is the secondary trade route to Thang Long but the document only describe the gate of river not the location of Rockbo harbor. The note of Western trader and sailor is the significant document, special is the maps about trade route and related terrain. In these documents, we focus on writing of William Dampier[6] and his quantitative information. Other materials in this research is fieldwork data, topographic maps, ASTER satellite image, Landsat satellite image, some recent geomorphological, historical geological, document about sandbar, ancient riverbed, ancient coastal line and terrain changes

In this approach, the methodology is geomorphological method in analyzing terrain changes, remote sensing to read information on satellite image about ancient riverbed, sandbar and ancient coastal line. Fieldwork can improve visual look of the study area, positioning some relic, can determining the age of ancient coastal line and recheck the result of research. GIS is the tools for combine the layers of information and analyzing them.

To have the key to work in GIS, we analyze the position of some other ancient harbors to identify geographical conditions of Vietnamese ancient harbors:

- On the mainstream or large branch of the river
- Build in side the estuary not build in coastal line
- Build on high and stable terrain like nature levees or sandbar formation by sea-level change
- Near lagoons or bay to anchoring the ships

## 3. Ancient maps and Tonkin river trade route

Ancient maps of VOC and East India Company draw Tonkin river is one of most valuable document to determine Domea and the most important international trade route of Vietnam In XVI-XVII century. In this research, we focus on three most noteworthy maps

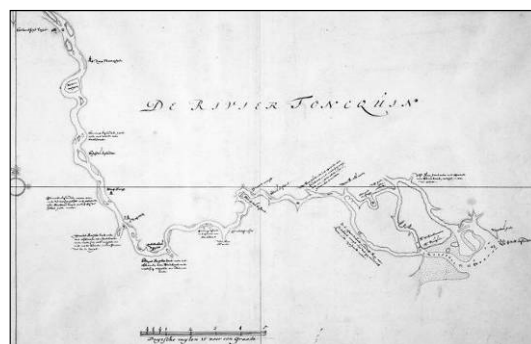


Figure 1. Map “De Rivier Toncquin” Century XVII of VOC

Maps: “De Rivier Toncquin” Century XVII of VOC draw the entire route from the sea to Thang Long of Western merchant. Many words in this map we cannot read because is Old Dutch but this map draw very detail even any mudflats and river meander. This map also have clearly orientation and a latitude. This latitude can be 20 degree 45 minute, because this latitude go through Pho Hien (Hung Yen city now) and Domea. The latitude of Domea was describe by William Dampier[6] is 20 degree 45 minute too.

Therefore, we can conclude this map was draw exactly in map mathematics. Compare with modern maps and satellite images we explant about Tonkin river: The river from Thang Long to Pho Hien is Red river, meet the triangle Red river Luoc river turn left to Luoc River, follow to the end of Luoc River and turn right to Thai Binh river. The upper river can be Van Uc river, in that time is smaller than nowadays, so the main route to Domea is Thai Binh river.

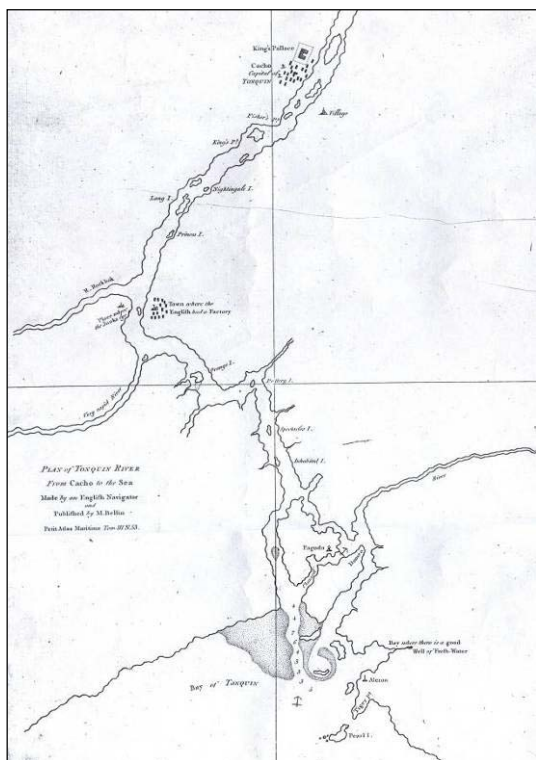


Figure 2. Map “Plan of Tonquin River from Cacho to the Sea” century XVII of East India Company

Map “Plan of Tonquin River from Cacho to the Sea” century XVII of East India Company seen difference with the first map, although both two maps are draw the same route. When deeply analyzing this map, we can see this map do not have an orientation or this map do not have north – south orientation like a normal map, they rotate the map to fit portrait paper. So to rotate this map we use two point at the same latitude is Pho Hien and Domea to rotate this map and 2 map are very similar but the map of VOC are more accurate. The advantage of this map is the information in English. One of information is opposite site of Domea or on right side of Thai Binh river have a pagoda, at Pho Hien is the town where English had a factory.



Figure 3. Map “Lariujere De Tonquin” year 1728 of VOC

Map “Lariujere De Tonquin” 1728, this map only draw from the sea to Luoc river but this map in large scale and very detail, so it can be use to compare with recent maps to see the route and terrain changes.

#### 4. The position of Domea

Through analyze of geographical conditions of Vietnamese ancient harbors, Domea can be on the left side of main ancient Thai Binh riverbed and on a sandbar of downstream Thai Binh river.



Figure 4. Remnant of ancient riverbed on ASTER images

The area can be remnant of ancient riverbed is line of low land, have a dark color in satellite images and in fieldwork we can find sand in sediment of these area. Therefore, we can mark the ancient river in satellite image. By this method, ancient Thai Binh river was very big but nowadays it was shrunk. We also find some other branches of Thai Binh river was disappear.

Together with ancient riverbed is the sandbar, formation by sea level changes. Base on some geological research[3,5] about sandbar we determined sandbar on

satellite image. In downstream of Thai Binh river has 3 system of sand bar.



Figure 5. The position of Domea on Landsat image

After combine all the information by GIS, we have the red dot is the place have a good geographical conditions for ancient riverbed. However the palace in An Du, Khoi Nghia, Tien Lang is converging all geographical conditions and suitable with historical information for Domea.

### 5. The position of Rockbo gate

As the secondary trade route to Thang Long, William Dampier[6] just describe location of Rockbo gate is at 22 degrees 10 minute, near the North-West of bay. Have an island about one miles to the gate. Moreover, the most difficult to find Rockbo gate is this area is one of most coastal line changes in Vietnam. Than Phu gate in this area is been a famous water front in Vietnam history now far 30 Km to the sea, area of Kim Son district increased 3 times in 200 years. Therefore, to determine Rockbo gate we must reappear riverbed and coastline in XVI century.

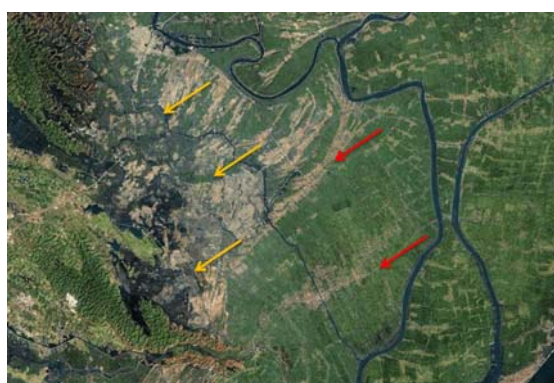


Figure 6. Remnant of ancient riverbed and coastline on Live earth image

After reappear ancient coastline and riverbed we conducting fieldwork to determine the date of coastline.

In one of coastline, we find the relic of Hong Duc dike, a sea dike build in late XV century. Therefore, we can determine the XV-XVI coastline. Combine with ancient riverbed and Western document information, we locate Rockbo gate is gate of Vac river meets the sea at Yen Khanh, Ninh Binh nowadays.



Figure 7. The position of Rockbo gate on Live earth image

### 6. Conclude

Through terrain analysis, ancient maps analysis, remote sensing image interpretation and history document we can determine location and explant the ancient trade routes and harbors in Red river delta, Vietnam in XVI-XVII century

Interdisciplinary between history and geography can complement, increased accuracy and combine effectively in resolve some science issue.

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