2.4. Understanding Past Crises to Better Manage the Present: Initiation to Geo-Historical Risk Modelling (The 1926 Red River Swelling)

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The aim of this workshop is to introduce trainees to a methodological approach referred to as geo-historical modelling. This method allows us, by working from documents, eyewitness reports, maps and historical hypotheses, to conceive realistic computer models of past events with the objective of allowing contemporary players to understand them in a dynamic and active manner and thus place current assessment or risk management strategies concerning comparable facts in a historical perspective. The emphasis is particularly placed on the experimental possibilities offered by this approach. The whole workshop is devoted to the study of the July/August 1926 flooding of Hà Nội and in the province of Bắc Ninh, which has been chosen for its well-documented character that allows an accurate reconstitution of the event in time and in space.
The principal stages of this training will be conducted according to the following programme:

- A presentation of the historical, geographical and political context;
- A methodological perspective about the constitution of a documentary corpus and data collection concerning this type of event;
- Collected data indexing methodology via the incremental construction of a specific geographical information system (GIS);
- Dealing with missing or fragmented data, incorporation of hypotheses and documents for the construction of the GISs;
- Represented risk modelling (swelling, flooding): Which models should be chosen? What links should be established with collected data?;
- Modelling of risk management and ways of combatting flooding. Which players should be represented? Which models should represent them? How should we choose the behaviours and decisions to represent?;
- The presentation of a possible model of flooding in Hà Nội in 1926.

The two final days of the workshop will be devoted to group work under the supervision of a trainer. The final stage is an implementation of the presented model to explore the different hypotheses surrounding risk management: representation and assessment of alternative decisions, enrichment of a model in order to take into account supplementary players or data, etc.

On Sunday 21st July, the trainers devote a half-day to introducing the trainees to the different types of computer tools that will be used during the training. This session allows the trainers to install the necessary software tools on the trainees’ computers, to verify that no technical problem will prevent their correct functioning and also to provide the trainees with an introduction about how to use the software.

(Transcript)

Day 1, Monday 22nd July

Introduction of trainers and trainees (cf. trainers’ biographies, list of trainees added at end of chapter).

2.4.1. Presentation and Methodological Targets

[Alexis Drogoul]

The starting point of our workshop is to use a piece of information, the local recollections of a community, in order to construct a living memory that will allow us to better prepare the management of future risks. Learning from past events entails the resolution of at least three problems:

- Accessing historical data (written and archaeological sources, etc.);
- Building information from this data and giving it meaning;
- Being capable of building logical scenarios for contemporary communities.
The idea is not to take the place of the historian but to constitute a collection of tools in order to accompany the historical method. These tools belong to the domain of computer sciences and technologies. They allow us to predict, analyse and reduce the different risks in order to issue the first warnings, educate people, organise escape routes, etc.

The domain of computer science allows us to deal simultaneously and rapidly with large volumes of data – this implies the acquisition of past and present information from different systems. Digital information has the advantage of being registered and memorised.

Over the last ten years, we have witnessed a veritable explosion in the production of digital information concerning disasters, whether it is institutional – online access to different works, reports, and theses about disasters – or informal, that produced by individuals on social networks for example, (Facebook, Twitter, etc.). Measures of scientific origin – satellites, stations on earth – are instantaneously shared via these social networks (the case of the Fukushima disaster), resulting in a correlation between physical dynamics and dynamics of opinion.
All this information represents extraordinary material for tomorrow’s historians. The existence of social networks is recent, however, and there was still little digital information available only ten to twenty years ago. In order to fill this gap, two strategies may be considered: the digitisation and analysis of physical documents – the majority of digital information of which we have access to concerning past disasters; automatic analysis and exploitation by data-mining techniques of already digitalised documents, which will eventually allow us to create new information through the exploitation of relationships between the documents.

How can we then reconstruct today events from this data? Geo-historical modelling provides a response that is based on an extrapolation from the available and sometimes processed digital data, a response that entails attempting to reconstruct past disastrous situations through a computer model by using dynamic simulations. These simulations represent a new type of digital information and the data they produce is not equivalent to the data found in the field: it is artificial and recreated. Geo-historical modelling is not a faithful reconstruction of the past but the conception of a series of plausible scenarios that can serve our understanding of how and why a disaster occurred and how it was managed.
During this workshop, our work will aim to conceive a model of a precise disastrous event and use this model as a field of digital experimentation to test different hypotheses about how the event unfolded.

2.4.2. Protection Against Flooding in Tonkin

[Olivier Tessier]

The first part of Olivier Tessier’s presentation refers to a previous presentation given during the plenary sessions of the JTD 2012 (Tessier, 2013). Here, the author develops questions concerning the hydrological development of the Red River Delta by taking a historical perspective of the role of the state from the 12th century to the first half of the 20th century. We refer the reader here to the different aspects dealt with: the geomorphological and hydrological characteristics of the delta; water mastery through the progressive implementation of a powerful network of dykes (12th to 18th centuries); the global and innovative vision of the Nguyễn Dynasty, and finally the rationalising of hydrological infrastructure during the colonial period.

Finally, the bibliography used for the presentation, in French and in Vietnamese, provides essential historical landmarks concerning the hydrological policy implemented in the Red River Delta at the period dealt with.

Presentation by the trainer of the files from the “Archives Centrales de l’Indochine” concerning the 1926 flooding – sources that cannot be disseminated to the public of the workshop; the references used are mentioned at the end of the chapter. Two organisation charts are presented of the players and their interrelations in the management of the crisis in the summer of 1926 in the district of Gia Lâm:

- The first organisation chart gives us a global vision of the politico-administrative organisation that was mobilised during the swelling of the summer of 1926 in the Gia Lâm district, then in the combat against flooding and the sealing works of the three dyke bursts on the left bank of the Red River. It is based upon the analysis of the only archive files consulted; we cannot affirm that it mentions all the actors that were indeed involved during the crisis at a given moment at different politico-administrative levels, nor can we affirm that it comprehensively reflects the variety of roles played and the actions taken by each of the actors;

- The second organisation chart deals with the transcript of the interrelationships between the Vietnamese actors (the indigenes) who intervened at the provincial level on a local scale. Only the identified actors whose status is mentioned and whose actions were catalogued in the consulted archives appear, knowing in addition that it is partly based upon their declarations during their respective interviews.
Let us give a rapid chronological narrative of the swelling at the end of the month of July 1926:

- In May, by decree, the provincial authorities issue a reminder of the measures to be taken for the protection dykes in the event of swelling – name a responsible person in each district, determine the number of workers to be mobilised, etc.;
- From the 25th of July, archive sources announce the Red River swellings. The measures to be taken are the clearing of vegetation from the dykes and the sealing of holes and cracks;
- On the 27th July, a Red River level of 10.60 metres is registered in Hà Nội. The order is given to the communal agents of the Gia Lâm and Văn Giang districts to construct small dykes of 0.7 to 0.8 metres in height. At this date, the swelling is understood to be exceptional and the limits of the dykes’ capacity to protect are reached;
- In Hà Nội, the first evacuations are made of a part of the major floodplain (cf. Map 16). The first evacuation took place on 27th July. The population requested help and some of them sought refuge on the roofs of houses surrounded by water. Straw huts were evacuated to avoid drownings and around 400 people were housed in the former cotton mill to escape the swelling;

Map 16 Evacuations of 27th to 29th July 1926

Photo credits: ÉFEO photo library (Paris).
Source: Author’s construction.
- 28th July, the Canal des Rapides overflowed on both banks. The heads of the Gia Lâm and Vân Giang districts, as well as the heads of the cantons, had to permanently monitor the dykes and supervise the building of small dykes;

- Before the floodings and bursts, the railway was flooded; the sheer volume of water was impressive, in the order of 30,000 - 40,000 m³ per second (cf. photo 29);

- During the night of 28th to 29th July, a first dyke burst occurred at the old Gia Lâm dyke;

- At 9 am, the new Gia Quất dyke burst; the Red River rushed through the breach (cf. photo 30);
Hà Nội–Hải Phòng Railway During the 1926 Flooding

Evening of 28th July.
Breach of ancient dyke

29th July, 9 am,
breach of new dyke.

After breach

After flooding
- At 4 pm, a second large dyke breach occurred at the village of Ái Mộ. The third breach occurred between 4 pm and 5 pm at the village of Lâm Du – three months of work were necessary to seal this third breach, whereas the first two were sealed during the month of August;

- On the other side of the river, in Hà Nội, the river level was 60 cm higher than the dyke, but the construction of small dykes was generalised. The city was not flooded (cf. photo 31);

- 29th July, at 10 pm, the Résident Supérieur de France, the highest authority in Tonkin, decided to send in the army to protect the population of Gia Lâm, which was in danger;

- 30th July at 7 am, the Vietnamese authorities in the province of Bác Ninh informed the Résident Supérieur of Tonkin about the widening of the breach at Lâm Du and of the direct contact of the latter with the Red River: a channel formed naturally between the River and the breach. The access ramp to the bridge was submerged. Nearly 1,000 people sought refuge in the hangars and train wagons at Gia Lâm station (cf. photo 32).
Photo 31 Construction of a Small Dyke Outside Hanoi by the Tirailleurs Tonkinois

Photo credits: ÉFEO photo library (Paris).

Photo 32 1926 Flooding, Access Ramp of the Gia Lam Bridge

Source: Gourou (1936).
The rainfall and the height of the swelling were very accurately measured; the progress of the swelling could thus be observed hour-by-hour (Graph 53). The provinces of Bắc Ninh and Hưng Yên were submerged beneath the waters of the Red River that rushed through the Lam Du dyke. During the night of the 30th July, 40,000 hectares of paddy fields disappeared under the water.

**Graph 53** The Swelling of 28th to 31st July 1926

![Graph](image)

*Source: Author’s construction.*

**Photo 33** Provinces of Bắc Ninh and Hưng Yên Under Water

![Photo](image)

*Photo credits: ÉFEO photo library (Paris).*

The events took place over a period of three days. Most of the water came from the Lâm Du breach on which we are going to work this week.
Stéphane Lagrée

The origin of the swelling was linked to exceptional rainfall upriver. Was it possible, at this period, to evaluate the time of arrival of the swelling in the capital?

[Olivier Tessier]

A monitoring system was first established in 1917 and then later consolidated: surveillance posts by the dykes at the communal level; stations upstream on the Red River (Lào Cai). We must bear in mind two factors: at that period, knowledge about rainfall in the two-thirds of the Red River basin situated in China was fragmentary; communication channels did not allow rapid access to information. Finally, it was only from the city of Lào Cai that we could deduce what was happening in China, and from that moment there remained only about 48 hours before the swelling arrived in Hà Nội. There was nothing more to do other than build small protection dykes.

[Alexis Drogoul]

We are going to use the information given by Olivier Tessier to design an experimental model that retraces the sequence of the event.

We must ask questions about space, time and its dynamic, and the players. How can we represent the space in which the narrative unfolds? Who are the players? What role do they play? How can we represent these roles by using computer formalisms?

2.4.3. Representation of Space and Chronology

[Nasser Gasmí]

We are going to establish the link between social sciences – history – and modelling, which belongs to physical sciences. Our objective is to transform archive sources into digital format.

We are going to address questions concerning representation of space and territory – where did the events unfold? What geographical sources are available? We shall define the GIS, which allow us to establish the link between a piece of digital and non-digital information. We shall then deal with the representation of a chronology – how can we use a computer to exploit a piece of temporal information?

Representation of Space

Where did the 1926 swelling take place? What data is available concerning this swelling? Which space are we going to study? We are going to concentrate on Hà Nội and the district of Gia Lâm (province of Bắc Ninh) situated on the left bank of the Red River in the East North-East quadrant in relation to the historical centre of the capital of Indochina (cf. Maps 18 and 19).
**Map 18** Historical Maps and Documents

- **Goal:** Delimit the study area and collect information to construct the form of the study
- **Hanoi and surroundings: Gia Lâm**
- **Maps from 1925 and 1926**
- **Sources:**
  - National Archives Center #1, Hanoi
  - Institut Géographique National (IGN)
  - EFEO

Source: Author’s construction.

**Map 19** Map of the City of Hà Nội (1925)

Source: Department of Maps and Plans, Bibliothèque Nationale de France-Paris.
A first visual extraction may be carried out using this map from that period: the Red River, the lakes, inhabited spaces, contour lines, etc. On the other hand, since the dyke bursts are not represented, we have to use other cartographic records.

New information may be mobilised: presence, cuts, and breaches (in the left part) (cf. Diagram 30).

We also have to incorporate information about the Red River: daily measuring of water levels, data about the flooding and the levels of the Red River, census data of 1913 to 1926 floods, etc.

Naturally, the integration of old data has a certain number of constraints: at that period, there was no digital terrain model (DTM); demographic census surveys were not very accurate. How can we estimate the heights of built-up areas? The archive documents are not always well conserved and certain ones are undated.
An information session is devoted to GIS:
- Creation, organisation and presentation of geo-referenced data;
- An information system (IS) is an organised collection of resources (material, software, human resources, data and procedures), which allows us to collect, group together, classify, process and disseminate information about a given environment;
- Five essential components: acquiring of data, storage of data, data management, data analysis and restitution of data in the form of a map, and geographical information support in paper or digital format;
- Two types of format: “raster” format – an image or space is divided regularly; for each small rectangle (pixel) one or several values are associated describing the characteristics of the space; vector format, space is represented in the form of dots, lines and polygons;
- Projection: mathematical operation that allows us to pass from data coordinated in longitude and latitude towards a point \( x, y \).

We refer the reader who wishes to know more about these questions to the works listed in the bibliography (Bertin, 1998; Combe, 2007).
Day 2, Tuesday 23rd July

[Alexis Drogoul]

We have worked on the historical context of the event and on the first methodological approaches that consist in delimiting space and representing it by using computer tools. Today, we are going to take a look at two other dimensions of the event: its chronology and the social actors that participated in its management.

[Nasser Gasmi]

Chronological Representation

Which methodology should be adopted to represent the chronology of events?

As the archival files represent more than ten thousand documents, a clear and organised methodology is essential.

Diagram 31 Inventory of Archival Documents from Multiscale Analysis

At the Centre of Archives n° 1, the documents are classified by theme according to their scale of study. The work consists of first listing the sources on the scale of Indochina, of Tonkin, then finally the city of Hà Nội and the province of Bắc Ninh, with more and more accurate documents.
Diagram 32  Building a Calendar of Events and their Impacts

Goal: Build a calendar with the succession of impacts and measures

July 26th 1926
July 27th 1926
July 28th 1926
July 29th 1926
...

Source: Author’s construction.

Diagram 33  Ranking Data by Themes

♥ Goal: Set a theme for each document identified

July 26th 1926
July 27th 1926
July 28th 1926
July 29th 1926
...

Source: Author’s construction.
The objective is to create a calendar with a succession of events and their impacts from the classified and dated archives. Each document is listed by theme: dykes, Red River, cuts and breaches, interaction between actors, etc.

Thus arises the problem of representing time in a system of geo-historical representation: how can we link a piece of temporal information to a piece of spatial information? How can we represent this spatiality in a GIS?

Different documents are available to allow us to georeference the dykes. For example, a telegram from the French administrator in Bắc Ninh highlights the height of the Red River at a precise spot: 10.6 metres on 27th July 1926 – the measures were taken daily. The second document, in Vietnamese, refers to the different heights of the dykes, and thus to where they were situated (cf. Diagram 35).

The specificities of GIS also allow us to map different fields: the documents are listed according to date (cf. Diagram 36).
Goal: Give an attribute "date" to georeferenced documents in order to represent documents by a specific date.

All this spatial and temporal data will make it interactive GIS: example with interactive mapping. Goal: Incorporate dates to GIS. GIS will become dynamic and interactive. It will be “Geohistorical” Information System.
The insertion of a timescale allows an interactive application of Internet: we can use Internet to navigate on the maps and observe, for each date and according to the query systems, the references of the archival document used.

A “Web Mapping” manipulation is demonstrated by the trainer using the example of the interactive application of the 1926 swelling.

[Alexis Drogoul]

This technique allows a representation of space and the adding of chronological information – the creation of a web-accessible index that is infinitely more simple than those consultable at the National Centre of Archives, for example. It is a dynamic indexation since the database can be added to very simply: adding of information to the map, new layers of information. It is an extremely powerful tool that allows us to construct dynamic indexes from a collection of archival documents.

2.4.4. Representation of the Management of an Event

[Olivier Tessier]

In Tonkin, which was a French protectorate from 1885, there was a dual French and Vietnamese administration.

The protectorate is divided into provinces, districts and prefectures, cantons, communes and villages. The French presence officially ceased from a politico-administrative point of view at the level of the province. Beyond this

Diagram 37 An Intuitive Introduction to Class Diagrams: The Hierarchical Organisation

Source: Author’s construction.
level, the administration was Vietnamese. In theory, the protectorate was a guardianship. The representative of the French colonial system was the Résident de France of the province, of Bắc Ninh for example; his Vietnamese counterpart was the Mandarin Governor of the province. In practice, the French administration exercised real de facto power at a district level, even though the only French structures present at the district level were the gendarmerie or decentralised technical units, such as railway stations and the Highways Department. Diagram 37 only represents the players in our study; there were evidently other players in different domains.

Tống Thị Huyền Ái

In the framework of our study, which administration made the final decision?

[Olivier Tessier]

The French often made decisions that should have been made by the Vietnamese; the Vietnamese part had an executive role that transmitted an order and had it carried out.

Trần Xuân Duy

The system's complexity limited emergency reactions. Did the administration to a certain extent add to the catastrophic level of the 1926 flooding?

[Alexis Drogoul]

This question is going to interest us over the next three days. One of the roles of simulation modelling is to show how a system succeeds in responding to a threat, and if this conforms to its theoretical organisation to cope with a disaster.

[Nasser Gasmi]

How can we represent the complex relationships between this multitude of actors? (cf. Diagram 36).

We are going to present four types of relationship by way of an example (cf. Diagram 39).
What is the Nature of Relationship between Two People?

Diagram 38

<table>
<thead>
<tr>
<th>Sender</th>
<th>RST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressee</td>
<td>RFBN</td>
</tr>
<tr>
<td>Nature of relationship</td>
<td>RST &gt; RFBN (order)</td>
</tr>
</tbody>
</table>

Note: Résident Supérieur de Tonkin (RST), Résident de France in Bắc Ninh (RFBN)
Source: Author’s construction.

Diagram 39

Hierarchical Relationship (1)

Source: Author’s construction, Centre of Archives n° 1 of Hanoi.
Firstly, we can remark a descending hierarchical relationship, a harsh reminder, from the Résident Supérieur of Tonkin to the Résident de France at Bắc Ninh: “You should have realised that your position as Résident did not allow you to send me a warning of this type. Neither on this matter, nor another. I regret having to remind you of this.”

In turn, the Résident de France at Bắc Ninh may give instructions or orders to the Mandarin Governor of the province of Vietnamese administration. The Résident and the Governor had, in theory, the same status, but archival sources reveal the real nature of the relationship between these two representatives of two different authorities that were unequal by nature.
In the same way, if it was normal that the Mandarin Governor give orders to the district head who was administratively and hierarchically his inferior, the Résident de France of Bắc Ninh should not have intervened on a district level, which he did however. Consequently, he asked the district head directly to send him workers to build small dykes (cf. Diagram 42).

In this latter scenario, the district head asks the notables of Gia Quat to go to the observation point of the dykes that passed through their village.

From these different readings, we can partially recreate the outline constructed by Olivier Tessier (cf. Diagram 43).
Hierarchical Relationship (4)

Note: Trợ Tá: Mandarin.
Source: Author’s construction, Centre of Archives n° 1 of Hà Nội.

Recreate the Hierarchical Relationships between the Various Actors

Source: Author’s construction.
In these documents there is information from lower levels that is rarely present in the archives: we place ourselves at the level of the canton or the commune. But in this particular case, we have at our disposal a police inquest that was carried out at administrative levels in order to discover who might have been responsible.

Let us return for a moment to the possible relationships between the different actors.

**Box 29 Interactions Between Players**

Deciders: uniquely the colonial administration at a central level (RST and technical services) and provincial level (RFBN), the Mandarin Governor of the province (Vietnamese administration) being de facto excluded. This level of “order givers” is at the origin of 86% of dispatches and written traces conserved at the Centre of Archives n° 1 (telegrams, letters, notes).

Transmitters of orders: (intermediate level playing a role of interface) according to a descending hierarchical system that uniquely concerned the colonised: at the provincial level, (the Mandarin Governor of the province intervened uniquely during the beginning of the crisis from the 24th to the 29th July) and at district, canton and communal levels.

Those who carried out the work: the voluntary and/or involuntary workforce that concretely implemented the decisions taken and transmitted.

Source: Author’s construction.

A priori, the hierarchical relationship between the settlers and the colonised province should not have existed because the regime was that of a protectorate. The reality was again quite different. The system was of the top-down variety, that is to say hierarchised between the deciders, the transmitters and those who carried out the work. The decision-making power was exclusively in the hands of the colonial apparatus. The Vietnamese part did not make any major decision. It only transmitted and carried out orders, which was contrary to the theoretical scheme of the protectorate. An investigation was carried out. Only the responsibility and the supposed and committed errors at the level of the transmitters and those who carried out the orders were noted. At no point was the system questioned. At no point was the quality of the decisions (relevance and rapidity) brought into question. The colonial apparatus was “naturally right”: in this totally biased system, the problem did not stem from decisions but from the fact that they were badly transmitted and/or badly implemented. The system was authoritarian and could not be questioned.

**Benoit Gaudou**

Olivier Tessier has constructed a hierarchy of players who intervened in the disaster: the system was clear and structured, but uses a language of representation that is difficult to generalise. In computer sciences we have similar graphic modelling languages such as the “Unified Modelling Language” (UML), which gives us the possibility of then transforming diagrams into models. In UML, we are going to take an interest in three types of diagrams.
Let us take an example.

**Diagram 44** Focus on Three Kinds of Diagram

- Sequence Diagram
- Class Diagram
- Activity Diagram

Source: Author’s construction.

**Diagram 45** The Hierarchical Organisation: Zoom on Township and Commune

Among these 11 actors:
- How many kinds of actors can we identify?
- What are the common characteristics of each element of a kind?

Among these 11 actors:
- 2 kinds: LA and Head of Township
- Common characteristic:
  * For each Tông Lý: name of the township
  * For each LA: name of the commune

Note: Tông Lý: Head of canton; LA: Local Authorities; Đồng Đư: village name.
Source: Construction by Olivier Tessier and Benoit Gaudou.
We have extracted a part of the diagram constructed by Olivier Tessier that includes eleven players from archival documents. The objective is to establish the structure between these players – the local authorities, the canton heads.

The diagram represents the static structure of a model with classes and their attributes and operations. It shows a group under the generic theme of "local authorities". As well as the name of the class, the type of player and the attributes that all the "local authority" actors share, we may add a type of behaviour.

Certain parameters may be specified: the actors may order the construction of small dykes; the agent may set out towards a destination.
On Diagram 45, we can also remark that the Tổng Lý (heads of canton) have command relationships with the local authorities.

**Box 30 Details on Operations**

Operations:
- They express behaviours of elements
- They are performed by instances (e.g.: build_small_dyke()) and can have an influence on other objects (e.g.: build_small_dyke() will increase the height of a dyke)
- Syntax: name [(parameters list)][type of the returned value]
- Examples: build_small_dyke(); move_toward(target: location)

**Source:** Author’s construction.

**Box 31 Describe General Relationships between Classes: the Association**

An association describes a relationship between classes.

Notation:
- Line linking classes in relation.
- The meaning of the association is expressed by a name on the link.
- The direction is denoted by ▶ or ◀.
- Ends carry information about multiplicity and roles.

**Example:**

Source: Author’s construction.
We may include other entities of the system such as dykes and rivers to the classes of players identified on Olivier Tessier’s diagram.

We have a hierarchical relationship, superiors to inferiors, between the local authorities and the workforce; furthermore, the local authorities are responsible for the system of dykes and the workforce when it works on the dykes. There also exists a relationship between the Résident de France or the Mandarin Governor of the province and the observations concerning the river’s water level (cf. Diagram 48).

In order to specify the social space of the actors and real space, we can add to certain players that we wish to situate a supplementary attribute that represents their position in space. We are then interested in the sequence diagram that represents the interactions between the actors and the activities’ diagram that represents the behaviour of a particular actor (cf. Diagram 49).
Each actor is/can be spatially located:
- New attribute: location
District-related actors will move in their district:
- New operation: move Toward (target: Point)

Source: Author’s construction.

Sequence diagram: to represent interactions between entities.

Activity diagram: to represent the behaviour of an entity.

Source: Author’s construction.
Let us take a concrete case by returning to the information communicated by Olivier Tessier.

Examples of interactions between actors

| RST 73081 | TDBN > TP & TH | Height of the Red River at Hanoi: 10.60 m. The TDBN request to conform to the dyke protection decree, in particular the rallying of Tà Pí Ly and inhabitants. |
| RST 73081 | THGL>TTag | Order to go to Gia Thuong dyke: small dykes in all low-level locations are not high enough. |
| RST 73081 | TTaGL>LyGT | The LyGT received the order to immediately build a small 0.8 m dyke, then the TTaGL went to another village |

Summary:
- Given the water level in the Red River, the province Governor (TDBN) orders TP&TH to respect the dyke protection decree.
- THGL orders the TTaGL to go to the Gia Thuong and orders Ty Long to build higher small dykes.
- TTaGL orders LyGT to build higher small dykes.

Source: Author’s construction.

We can remark on the first line that the Mandarin Governor of the province orders the heads of canton to implement the decree of dyke protection subsequent to the rise of river waters; the head of canton transmits the order to his assistant to go to Gia Thuong in order to begin the raising of the dykes and the construction of small dykes in order to raise the global height of the works. The order is transmitted. The chain of interactions between the actors is represented in this form (cf. Diagram 51).

What does not appear in the archival documents is the fact that once the person responsible has received the order to build the dykes, he in turn gives the order to the workforce to begin the task (cf. Diagram 52).
Diagram 51 Representation with a Sequence Diagram

Source: Author's construction.

Diagram 52 Sequence Diagram Elements

Source: Author's construction.
Let us now return to the diagram representing the behaviour of an actor.

The diagram is read from its initial to final state. When we observe the interactions of the Mandarin Governor of the province with all the heads of districts, we notice that the level of the river is high: the order for the construction of small dykes is given. In the diagram, the rhombus represents a choice. If this condition is verified and if the level of water is higher than the threshold, the actor gives an order.

The principle is identical to the class diagram that we presented in the 2011 JTD (Drogoul and Gaudou, 2012).

These three types of diagram are adapted to the cross-cutting discussion and the participative construction of models.
The training continues with the development of three principal sessions entitled: From Representation to the Model; The Hydrological Model in GAMA; Dynamic Reproduction of Decisions. For the first two sessions, we refer the reader to our publications linked to the 2012 JTD when a plenary session and a workshop were devoted to these questions (Drogoul and Gaudou, 2012; Drogoul et al., 2012). The particularly technical training of the last session, notably concerning dynamic representation cannot be included in the simple framework of this publication. In order to clarify its content, we invite readers to contact the trainers of the team constituted by Alexis Drogoul and also refer them to the different research programmes described in the biographies included at the end of this work.

The end of the week is devoted to an implementation of the different sessions presented during the first two and a half days. Five groups are constituted under the supervision of a trainer. The general objective of each project is to re-examine the principal stages already developed: study of historical context, extraction of information and mode of representation, and the establishment of new scenarios. The construction of models is punctuated by the presentation of each group of their state of progress on days 3 and 4. Trainees are reminded that the exercise of modelling is not a simple representation of the event: by adding and testing hypotheses, we wish to generate new information by simulation rather than reproduce the information available in the archival documents.

Exercise 1: Sheltering refugees from the 1926 flooding and evacuation procedures. Identify, situate and model the population affected by the flooding. Identify and represent the actors and evacuation procedures.

Exercise 2: Modelling local players and their organisation. Identify and situate the villages and the work force. Identify and model the behaviour of new actors and their interaction in the system.

Exercise 3: Localisation and visualisation of the flooding’s management dynamic.

Exercise 4: Identification and localisation of the risks of flooding in the containment system. Identify and model the new behaviour of actors.

Exercise 5: The economic vision of the crisis. Identify and locate the necessary resources for the construction of small dykes. Identify and model the actors involved in the supply of resources. Model behaviours according to constraints.

Reading Texts
(www.tamdaoconf.com)


Archival Sources

Direction d’État des Archives du Vietnam. Centre n° 1, Fonds des Archives Centrales de l’Indochine. Résidence Supérieure du Tonkin (RST) 37057, Crues et inondations dans les
provinces de Bac Giang, Bac Ninh, Ha Dong, Hai Duong – 1926, Hà Nội.


Bibliography


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Biographies of Speakers