

# Hà Nội between the ‘waters’

*S. Fanchette, R. Orfewre, Trần Nhật Kiên*

Originally made up of urban villages dotted with ponds and pools, the Old Quarter of 36 Streets and Corporations, and a citadel where water flowed through a moat linked to the hydraulic system, the city of Hà Nội has spread out over its fringes, integrating very populous and multi-activity villages and lake replacement basins in the surrounding area.

It has been erected ‘between’ the waters and ‘on’ the waters at very variable rhythms in an environment very prone to flooding and threatened by spates from a dangerous river that flows above the level of the plain. Water is an integral part of Hà Nội City, and even if the capital turns its back on the Red River, hidden behind imposing dykes, water is visible in the multitude of lakes that permeate the city’s territory. In addition to their function countering flooding, these lakes play several other roles: economic ones for craft villages, but also cultural and symbolic. In this ‘hydraulic’ civilisation, many rituals are practised during village festivals to invoke the protection of ‘Heaven’ from flooding.

The Vietnamese government’s recent decision to integrate Hà Tây, the westerly neighbouring province, into Hà Nội Province-capital, has significant implications in hydraulic terms: this territory can be vulnerable to the Đáy and Tích Rivers overflowing in the event of Red river floods diversion in these

tributaries. In a context of urban development where land market forces dictate the profitability of building land and impose high-rise buildings, control of land usage and urban expansion is a difficult challenge to meet. Hà Nội’s Master Plan for 2030, signed in July 2011, took good note of the vulnerability of the enlarged Province-capital by stipulating the preservation of a green belt, to promote a ‘sustainable and environmental city’. However, one might well wonder just how feasible such a measure may be in this country in transition towards the market economy, of weak institutions at all level of administrative hierarchy, and of the need for both foreign and national investors (seeking a maximum return on their capital) in order to build the new metropolis.

Control over bodies of water and the spread of construction has been lacking up until now in Hà Nội City’s public policy. Already during the collectivist period, the state and the municipality, the main suppliers of housing, did not have the means to finance such infrastructure. With the liberalisation of land market and the establishment of the policy dubbed ‘The state and the people build together’, local authorities have been overwhelmed by the advance of urban sprawl. The spread of unregulated self-building on the fringes of big cities without hydraulic infrastructure, as was the case in Hà Nội in the 1990s-2000s, poses serious drainage problems during the monsoon. The creation of hydraulic polders by the dykes makes it difficult to evacuate

## Hà Nội between the 'waters'

rainwater by gravity. A complex network of gates and pumping stations allows water transit and drainage of monsoon rain from each polder.

The many lakes, ponds and paddy fields absorb some of the rainwater, but in city centres and villages they are increasingly filled in to make room for new buildings. Natural drainage happens slowly and in the absence of pumping equipment, rainwater stagnates and floods these new residential urban and industrial areas.

The lack of building land obliges many peri-urban villagers and those newly integrated into the city to fill in ponds and stretches of water to build their houses, workshops or businesses there. Only the sacred and religious function of some of these ponds, testimony to their former function in water cults for protection from the violence of 'Heaven' in the face of man's excesses, seems to have preserved some of them from building fever.

## Vulnerability of a deltaic city

### • Geographical and hydraulic factors

Hà Nội City is built on a lacustrine alluvial soil with a complex micro-topography, reshaped over millennia by the whims of the river and its distributaries fettered within a tight network of dykes. Water is an integral part of the city and plays a significant role in shaping its structure. It is so closely associated with Vietnamese land that the same term *nước* is used to designate both water and the country.

Three elements founded on hydrology, alluvial soil formations and man-made installations must be taken into account to understand Hà Nội's vulnerability in the face of flooding caused by water from the river and from the sky, concentrated into the summer months (75% of the 2,000 mm of annual rainfall pours down onto the city during the monsoon).

Firstly, the Red River, when it flows into its tightly enclosed delta, becomes one of the most dangerous watercourses on the planet: very frequent and rapid spates, water levels that rise very rapidly, fuelled upstream by torrential rains during the monsoon. Without major embankments along its flood plain, the Red River could inundate large parts of the Delta and destroy rice crops by submersion (GOUROU, 1936). In 24 hours, the river can rise from 1 to 4 m. The force of its spate makes it impossible to build a barrage to divert the river's waters at the Delta's apex. Hà Nội is protected by seven dykes, totalling 150 km (VTGEO & UMR REGARD, 2002).

In addition, by dint of the rising level of the *river bed* through aggradation the river and its various branches flow well above the level of the plain, on a natural levee formed by an embankment of alluvium (see Diagram). At its highest level, the Red River in flood, held back by a compacted dyke 14 m high, rises eight metres above Hà Nội City, located just below the river. In 1971, during the biggest flood ever recorded in its history, the water level in the Red River reached 14.6 m, while the altitude of the city below varies between 5 and 8 m. Thus, in periods of high water, the river crosses the Delta more as a stranger than as a benefactor, since its rich alluvium is lost to agriculture.

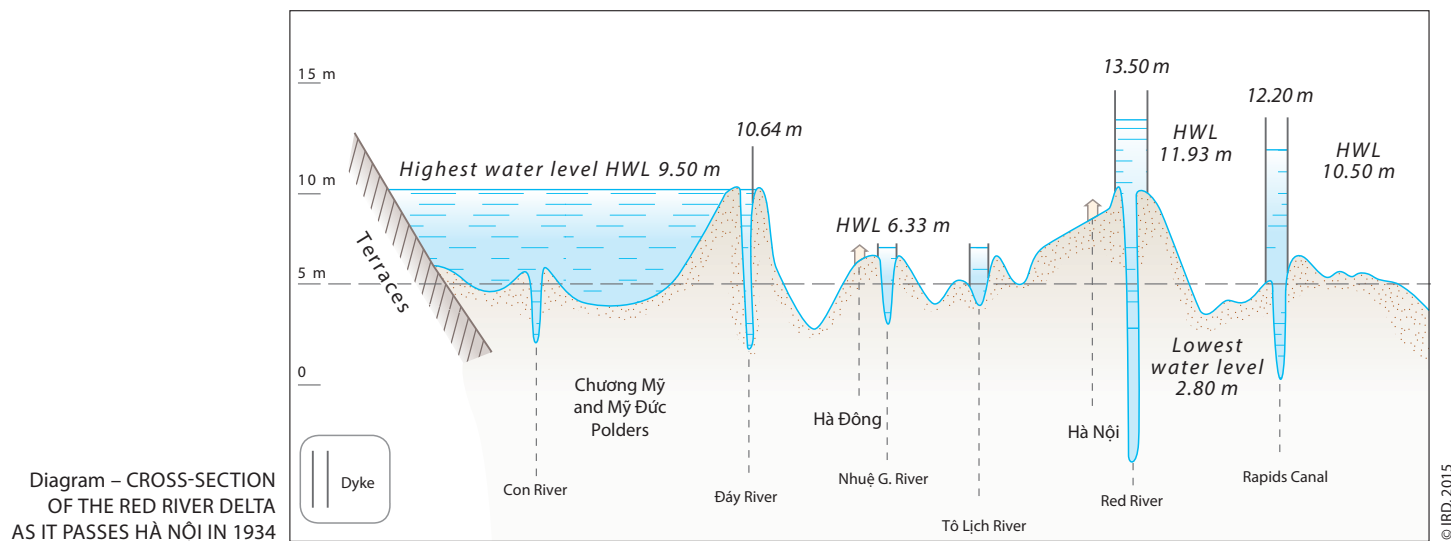
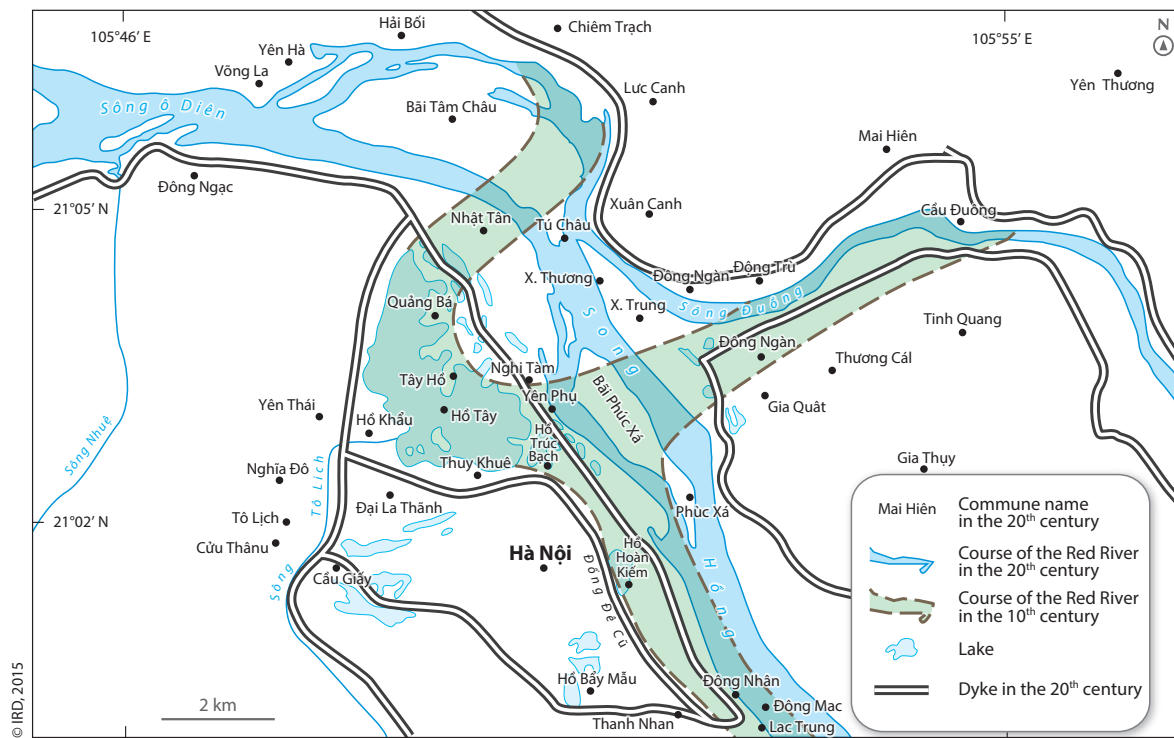


Figure 2 – DEVIATIONS OF THE RED RIVER BETWEEN THE 10<sup>th</sup> AND THE 20<sup>th</sup> CENTURY



This position of alluvial land below the level of the river's flood plain can also be observed, less obviously, along the Đáy River, to the west of the town centre. Until the 1930s, in periods of high water, it was difficult to evacuate rain and irrigation water in the polder of Hà Đông, which prevented planting in the 5<sup>th</sup> month. Closing off the Đáy River from the Red River with a sluice lowered the level of its waters and turned it into a drainage basin for the adjacent polder, as well as stopping the swamping of communes poorly protected by the dykes.

The risks of river flooding have however decreased since the construction of the Hoà Bình Damreservoir on the Black River, a tributary of the Red River (with a storage capacity of 6 billion m<sup>3</sup>), completed in 1990, as well as efforts made to control floodwaters (possibility of diversion floodwater upstream from the capital into the Đáy River or the Đường River and the reinforcement of the dyke network). The Hoà Bình Reservoir is designed to reduce the maximum level of floodwaters from 14.6 m to 13 m, while the five diversion zones upstream reduce it from 0.2 to 0.3 m (SILVER *et al.*, 2001). Better protected, the city has spread rapidly since 1995 (QUERTAMP, 2003), particularly in the zone outside of the dyke. However, efforts to contain flooding upstream from the capital have been limited by illegal housing construction and sand extraction in the river's flood

plain that hinder runoff of water and make levels of floodwater rise by as much as 0.7 m (SILVER *et al.*, 2001).

Although dyking up the river has made it possible to contain the floodwaters, it has however complicated the drainage system. The dykes built on natural levees tend to create isolated hydraulic subdivisions, polders that are difficult to drain during the monsoon. When the Red River and other rivers are flooding, a very efficient drainage system must be installed to evacuate rainwater, given that watercourses flow above the level of the plain. Improvement of the drainage system constitutes one of the most difficult challenges to be met by Hà Nội, particularly given the context of rendering land impermeable through construction of raised concrete platforms, road networks and by filling in lakes.

Added to these two factors is the nature of the deltaic soil, formed by non-stabilised Quaternary alluvial earth. The micro-relief linked to the history of aggradation, to breaches in the dykes, to the blindness of certain meanders, constitutes a testimony to the life of the river and its soil. The city is dotted with numerous lakes and pools, of which the biggest is West Lake, or Tây Lake, a closed-off former branch of the Red River, lying to the north of the city (Figure 2). Because

## Hà Nội between the 'waters'

of its alluvial nature, land is extremely prone to subsidence. But this is exacerbated by ever-increasing pumping of groundwater to supply urban consumers. There are several hundred boreholes and a multitude of family wells, around which land subsidence, sometimes of more than 10 mm/year, can be observed (QUERTAMP, 2003: 232).

### • The city outside the dykes

In the 1990s, the expansion of the city took place in the south towards the lacustrine district of Thanh Trì for reasons of accessibility to land. As well as spreading over low-lying land (altitude of 2.5 and 3.5 m) and very vulnerable to rainwater flooding, the city continues to advance onto land beyond the dyke on the flood plain. Higher up than land inside the dyke, by 9 to 11 m, this land called *bay*, replenished with alluvium every year by the flood waters, was intensively cultivated with market garden crops, corn or other plants, such as mulberry bushes for breeding silkworms. In the 1970s, the area in proximity to the Chương Dương Bridge, near the historic city centre, began to be illegally occupied by migrants and poor citizens, attracted by the very low prices of this land prone to flooding.

Table 1 – VULNERABILITY OF DISTRICTS IN THE FORMER PROVINCE OF HÀ NỘI

Arrondt/ Urban district	Area under water (ha)	Arrondt (ha)	Areas of lakes 2005 (ha)	Areas of lakes %	Flooding vulnerability index	Area under water %
Ba Đình	77.19	925	45.8	4.95	0	8.3
Đống Đa	47.14	996	34.5	3.46	0	4.7
Hai Bà Trưng	146.95	1,009	36.8	3.65	0.5	14.6
Hoàn Kiếm	89.57	529	10.7	2.02	0.1	16.9
Cầu Giấy	38.13	1,203	13.2	1.10	1.5	3.2
Long Biên	813.29	5,993	157.2	2.62	7.1	13.6
Hoàng Mai	685.27	3,981	512.4	12.87	4.3	17.2
Tây Hồ	949.75	2,401	546.9	22.78	2.9	39.6
<b>Arr. total</b>	<b>2,847.29</b>	<b>17,037</b>	<b>1,357.5</b>	<b>8</b>		<b>16.7</b>
Từ Liêm	589.66	7,533	65.8		2.2	7.8
Đông Anh	1,853	18,214			2.4	10.2
Sóc Sơn	1,505	30,651			0.5	4.9
Thanh Trì	543.69	6,294	78.8		12.6	8.6
Gia Lâm	1,225	11,473			17.7	10.7
<b>District total</b>	<b>5,716.35</b>	<b>74,165</b>				<b>7.7</b>
<b>Hà Nội total</b>	<b>8,563.64</b>	<b>91,202</b>			<b>3.7</b>	

From HAIDEP, 2007

With the construction of the Hoà Bình Dam, the risks of flooding associated with high waters in the Red River have decreased and the area outside the dyke has begun to interest rich city dwellers. In 2000, Chương Dương district recorded one of the highest densities of population in the city centre: 240 per hectare. In 2004, 160,602 inhabitants and 32,012 housing units were listed there. Some squatters extend the built-up area at the expense of the river by erecting buildings next to it. The capacity for running off the floodwaters over the flood plain are thus diminished and thus push up the level of floodwaters. With the same rate of flow, the level of floodwaters has increased by 0.60 m between 1970 and 2000 (HOÀNG VINH HUNG *et al.*, 2007). What is more, construction of housing on the banks of dykes weakens them, increasing the risks of breaching. Only these kinds of buildings were demolished in around 1995, the municipal authorities being incapable of reversing the process entirely.

### • The former province of Hà Nội in times of flooding

The former province of Hà Nội, limited to the urban districts and to the four districts of Từ Liêm, Gia Lâm, Đông Anh and Sóc Sơn, was the subject of a detailed study, abundantly documented with maps, by Haidep<sup>1</sup> in 2007, a Japanese programme originally designed to produce the city's Master Plan. It tackles, amongst other things, the fresh hydraulic challenges with which the new capital districts are confronted.

Factors of vulnerability to flooding are many:

- the altitude of the alluvial plain, and thus its capacity to be drained during the Red River floods while it flows several metres above it;
- the Red River's proximity to the Đường River and the risks associated with the breaching of dykes;
- the reduction of areas covered with water, particularly pools and ponds that act as reservoirs for rainwater during the monsoon;
- the quality of the drainage system, the location of reservoirs, the maximum rate of flow for drains and the strength of pumps.

The flood vulnerability indicator was calculated as follows:

$$\frac{\text{Flood-prone area in the zone X proportion of land by land use X Flood runoff coefficient}}{\text{Total area of land}}$$

It is noteworthy on the map of the vulnerability of communes (Plate 1) how much this is accentuated depending on the northwest/southeast slope and the



© François Carlet-Soulages / Noi Pictures

Photo 2

**West Lake and Trúc Bạch Lake seen from above: the importance of stretches of water in the city**

proximity of the Red River and other rivers. Within the context of this study carried out by Haidep, a survey was made in 2005 among inhabitants to evaluate the proportion of these who suffer more than 10 cm of floodwaters in their residence.

It is therefore apparent that the districts having a higher than average vulnerability index (3.7) are localised in the low-lying zones in the south and southeast of Thanh Trì and Hoàng Mai and near the Red River and the Đường River, at Long Biên and Gia Lâm. These last two are the most exposed to risks because they are threatened from both sides by the Red River and the Đường River and are in

a low-lying area (about 5 m). Although they are protected by imposing dykes and the risks of breaching are slight, their vulnerability remains high. To the south, the Thanh Trì basin encompasses the Sét, Lu, Kim Ngưu and Tô Lịch Rivers that make up the entire drainage system of the urban districts. In contrast, the central districts enjoy either zero vulnerability, like Đống Đa and Ba Đình, or a very low level, like Hoàn Kiếm (0.1) and Hai Bà Trưng (0.5), of which the western *phường* (or urban communes) are located along the Red River.

However, the factors for a grid map at the district scale only give average levels of vulnerability. Within district limits, flood risks are variable, as demon-

## Hà Nội between the ‘waters’

strated by a grid map at the communal scale. According to the survey carried out among inhabitants by Haidep in 2005, between 15 and 38% of communes suffer from flood levels of more than 10 cm during the monsoon. Poor maintenance of drainage and sewage channels towards the lakes, and the progressive encroachment of these by new constructions, locally increases this vulnerability. During heavy rains, there are more than 20 points particularly affected by flooding in the city centre. A recorded rainfall of 100 mm in two hours leads to flooding in four urban districts.

By superimposing the map of communal vulnerability onto that of the growth in population between 1999 and 2009, it can be observed that all of the communes with a very high level of vulnerability record the highest rates of population growth, namely more than 2.48% yearly. This exposes a growing population to the risks of flooding and, in addition, results in a densification and an extension of housing development, to the detriment of spaces given over to agriculture and water and an increase in wastewater drainage.

- *An obsolete drainage system inadequate for the expansion of the city*

Hanoi's system of drainage and evacuation of wastewater is obsolete and dates back to the colonial era. It was installed between 1905 and 1945 and only covers 1,000 ha of the city centre (Ba Đình and Hoàn Kiếm districts), the other districts of the capital having only been developed with an open sewage system. Expansion of urbanisation has not been accompanied by an appropriate system of drainage, particularly in the areas where self-building by household dominated residential construction. In addition, at the beginning of the *Đổi mới* years, the state invested little in the development of road and drainage networks when building the housing estates on public land that have replaced social housing, the KTT<sup>2</sup>. It left this responsibility to local authorities and inhabitants (PANDOLFI, 2001 and see Chapter 5).

The city's drainage system serves simultaneously for runoff water and for domestic and industrial wastewater together. Only 10% of the latter is treated before being released back into the general system, used downstream for irrigation. The runoff of this untreated water occurs by gravity into lakes, ponds and rivers, and seriously affects their environment.

The Tô Lịch River drains 930 ha to the west and from the city centre, while the Nhuệ River covers 9,400 ha and receives the waters from the Tô Lịch River as well as irrigation and drainage water. But its drainage capacity is insufficient and it would need reservoir lakes to compensate for the insufficient capacity of

pumps during the heavy monsoon rains. In the low-lying area to the south of the city, after heavy rains, Thanh Trì District has to drain away its own excess water as well as rainwater coming from Hà Nội, which represents a volume that can rise to three times that of the district itself. Almost all the wastewater of the central urban districts crosses this district. In spite of the increased investment in construction of drainage systems and pumping stations, the risks of flooding have grown. The areas theoretically determined by the development plans for drainage are less than 60% of those that require it in reality. The Yên Sở reservoir, with an area of 172 ha is saturated, the more so since this district-reservoir lost 50 ha between 1987 and 1991 that were filled in to create fresh land for development (VTGEO and UMR REGARD, 2002).

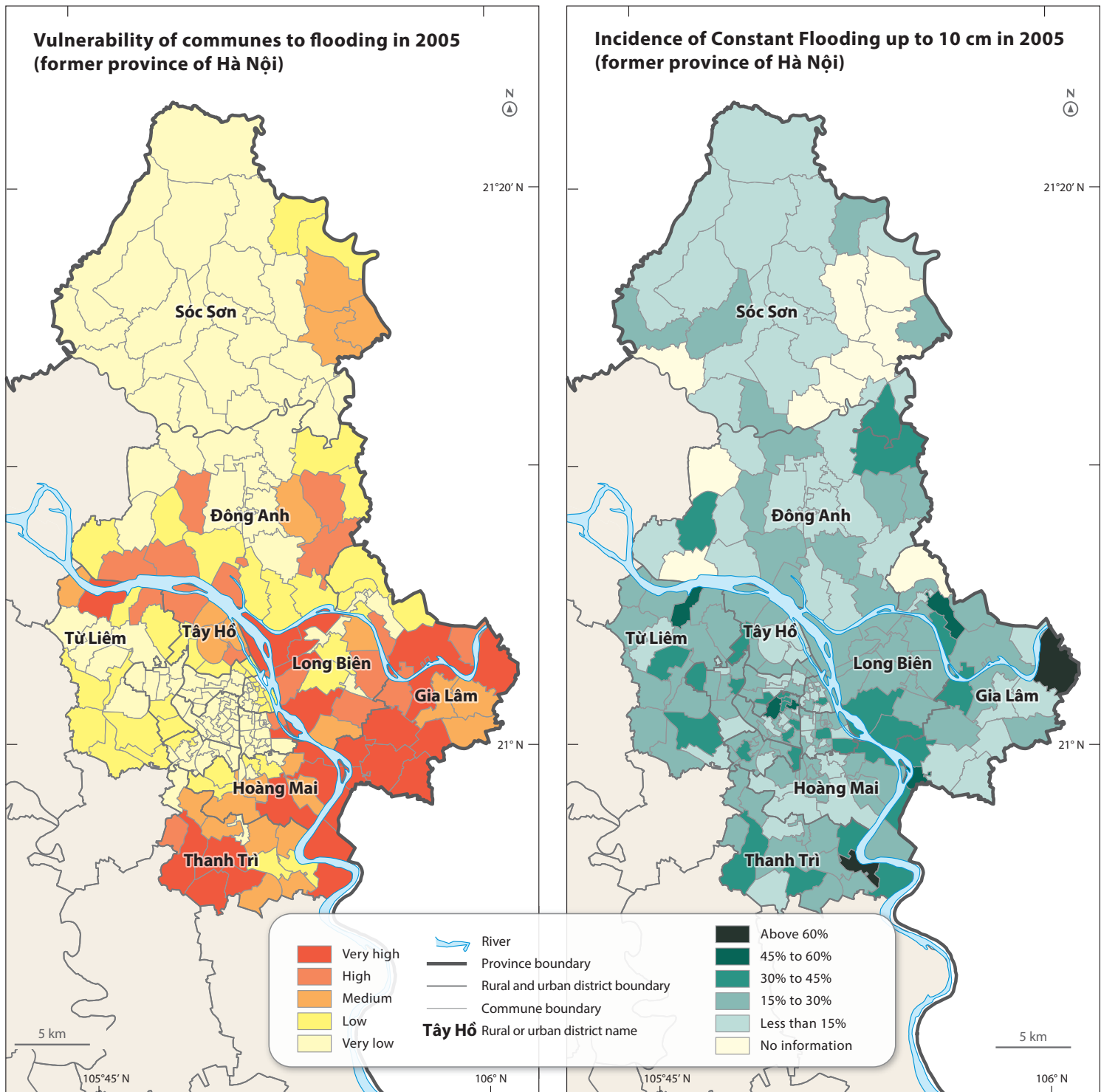
To the southeast, in Gia Lâm and Long Biên, when the water level of the Bắc Hưng Hải River is below 3 m, runoff water flows into it naturally. When the level is higher, only a powerful pumping system could evacuate the excess water into the Đường River and the Red River (HAIDEP, 2007).

During the heavy monsoon rains, a layer of 50-60 cm of water can stagnate for several days in various places in the city. Plate 1 shows the proportion of households subjected to the risks of flooding of more than 10 cm. More than 30% of households in the districts of Đống Đa, 20% in those of Thanh Trì, Từ Liêm and Cầu Giấy suffer from flooding in times of heavy rain. The communes located along the Red River and the Đường River are the most badly affected. In addition, these floods make the sewers overflow, since the same drainage system is used for wastewater and rainwater. The lakes serve as collectors of wastewater, mostly untreated. One of the most visible factors of increase in vulnerability with regard to flooding is the decrease in lakes and ponds, regulators of rains.

- **Competing for space and filling in lakes and ponds**

- *An urban history marked by the progressive filling of lakes*

Located amid various watercourses and on a substratum of villages and lakes, the city of Hà Nội has had to find its space and, from time to time, integrate or not villages and stretches of water. Abundant on this deltaic plain, lakes bear witness to the former meandering of rivers and their distributaries, to the activities of humans who have built dykes and artificial earth platforms to protect themselves from flooding and so have carried out excavations to extract earth, to extreme subsidence of this unstable alluvial ground and to the province's very pronounced northwest/southeast slope.



## Hà Nội between the ‘waters’

West Lake, Hà Nội’s biggest (more than 500 ha) is an oxbow lake formed by the Red River before it was endyked up (see Figure 2). As it has spread over its rural fringes, Hà Nội has absorbed villages and with them the ponds and lakes that are part of their living and productive space. It is the case that in each village a certain number of lakes or ponds belong to the community, located opposite the communal house and the pagoda, and whose functions were as much ritual and geomantic (Chapter 1) as for drainage of runoff water. Village dwellings featured private ponds fulfilling several functions: subsistence for rearing fish on waste material and as a place to pour away familial wastewater from clothes washing, washing-up or showering.

During the feudal era, there were 900 lakes and ponds in what was then Hà Nội: the Quarter of the 36 Streets was dotted with them (Plate 2). The policy of filling in lakes and ponds began during the colonial period for sanitary as much as urban reasons: the authorities wished to make a clean slate of the past and in particular of the semi-rural nature of the colonised capital to build new western-style districts. Only one lake survived in the old centre, Hoàn Kiếm Lake, while a few ponds were developed into parks and anti-flooding reservoirs.

Then, during the collectivist period, collective housing or KTT were built on the fringes of the city over lakes, marshes and unproductive land in rural districts. The urbanisation of highly productive agricultural land was forbidden (PANDOLFI, 2001). Kim Liên, one of the biggest residential projects of the period, was built on 40 hectares to the south of the city, on marshland. These new popular urban areas all incorporated ponds within their perimeters, of which the shores have been developed into recreational spaces.

At the end of the 1980s, under the impetus of the *Đổi mới* reforms, the new state housing policy (‘the state and the people working together’) and the 1991 land law permitting private construction, there was a construction boom and an erosion of public space (see Chapter 5).

As early as 1988-1989, wastelands, country gardens or the capital’s lakes were progressively absorbed by individual buildings or by the city authorities reclaiming land. Giáp Bát District, for example (see Chapter 5), to the south of the city, was built on a filled-in pond, following a decision from the city’s People’s Committee. The village’s former territory has been progressively encroached by unauthorised installations, while the banks of the Sét River, left undeveloped, have slowly been occupied. The local authorities were incapable of controlling

this feverish construction, particularly in a context where American bombing had greatly affected an already very limited architectural heritage.

In a study carried out using old maps, SHIBAYAMA *et al.* (2008) measured the evolution of stretches of water within Hà Nội City from 1885 onwards. In this year, the city measured 1,059.1 ha and boasted 266 lakes with an area of 275.3 ha, or a quarter of its total area. In 1936, at the end of the colonial era, stretches of water were down by a half over this same area and there were only 154 lakes over an area of 121.8 ha. In 2005, the part of the city that was once the ancient and colonial town features only 11 lakes over an area of 62.7 ha, or 22.8% of the total area under water in 1885.

The tolerance of local authorities towards illegal constructions has produced 20% of housing stock in 1984, of which a high proportion was built on reclaimed land. In this manner, over ten years, from 1990 to 2000, the number of lakes in the four urban districts of Hà Nội has shrunk from about forty to about twenty. The total surface area of lakes has decreased from 800 to 600 ha. It is estimated that the biggest lake in Hà Nội, Tây (West) Lake, has lost 40 ha to individual construction initiatives (PANDOLFI, 2001).

In the central districts of Ba Đình and Đống Đa, where demand for land is very high, between 1994 and 2005, the total area of lakes has gone down respectively from 54.6 ha to 45.8 ha and from 43.4 ha to 34.5 ha (HAIDEP, 2007 and Figure 3).

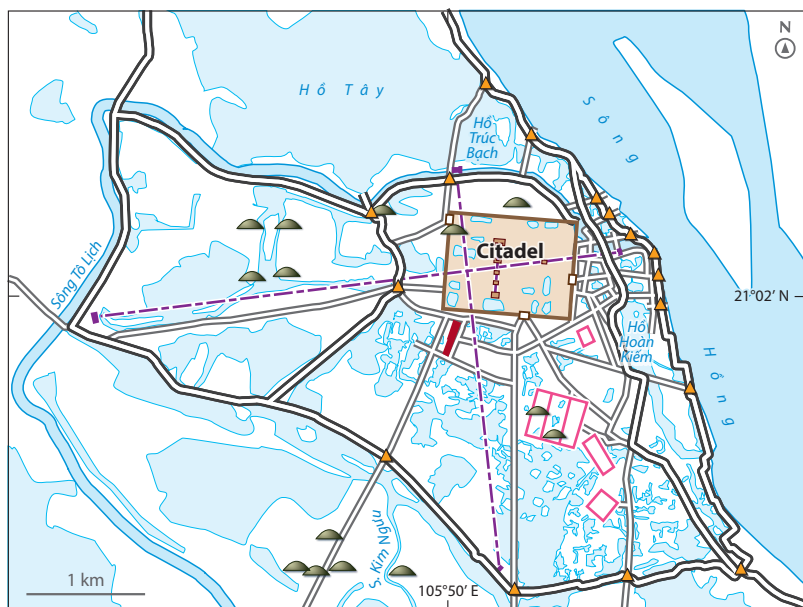
• *Residual lakes scattered very irregularly through the city and with diverse functions*

The former province of Hà Nội before 2008 contained about 200 lakes. Within the context of drawing up the city’s Urban Development Programme to 2020, Haidep carried out a survey on 155 lakes, including all the lakes in the urban districts and a high proportion of those located in the rural districts. These 155 lakes cover an area of nearly 2,000 ha and are scattered very unequally throughout urban and rural districts.

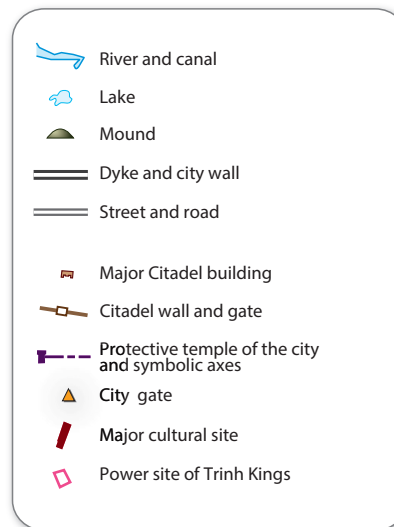
Three big lakes of more than 100 ha take up 71% of the total surface area of lakes surveyed by Haidep in 2007 (Table 2). The biggest is West Lake, 512 ha, (Figure 3), Văn Trì Lake to the north in Đông Anh District measures 355 ha and Yên Sở Lake, to the south, 172 ha, and acts as a vital drainage reservoir for the city’s waters. A certain number of lakes are linked together by a system of canals with the main function of holding part of the surplus rainwater during the monsoon.



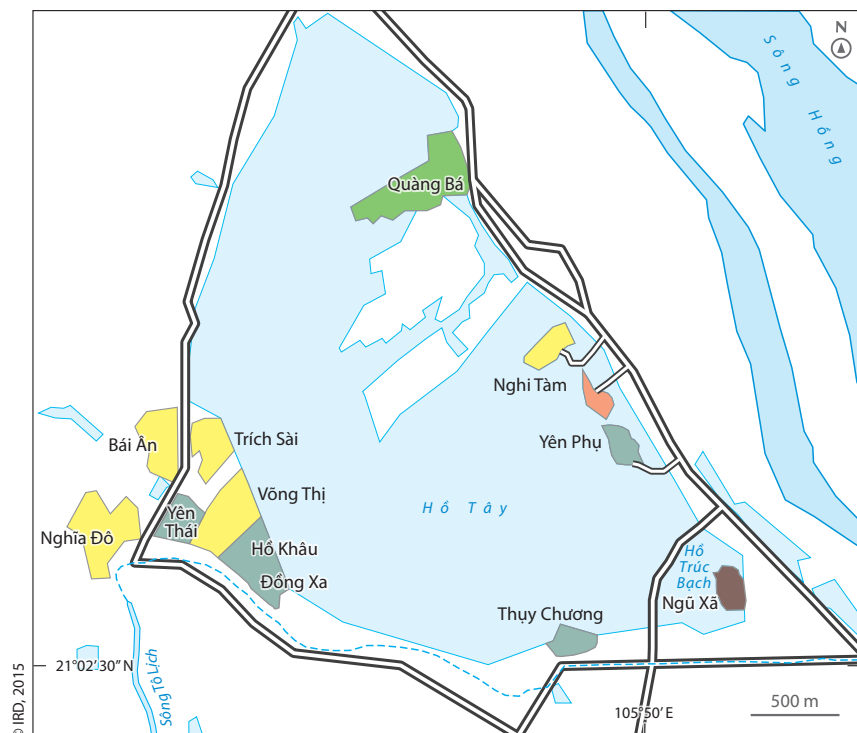
**Structure of the business quarter and the Citadel under the Lê Trinh Dynasty (16<sup>th</sup>-18<sup>th</sup> century)**



Source: ORFÈVRE R.



**Location of craft villages on the shore of West Lake during the colonial era**



© IRD, 2015

Sources: NGUYỄN THƯA HỖ, 2002, Hanoi City Map of 1890 (under supervision of M.-V. LECLANGER)



## Hà Nội between the 'waters'

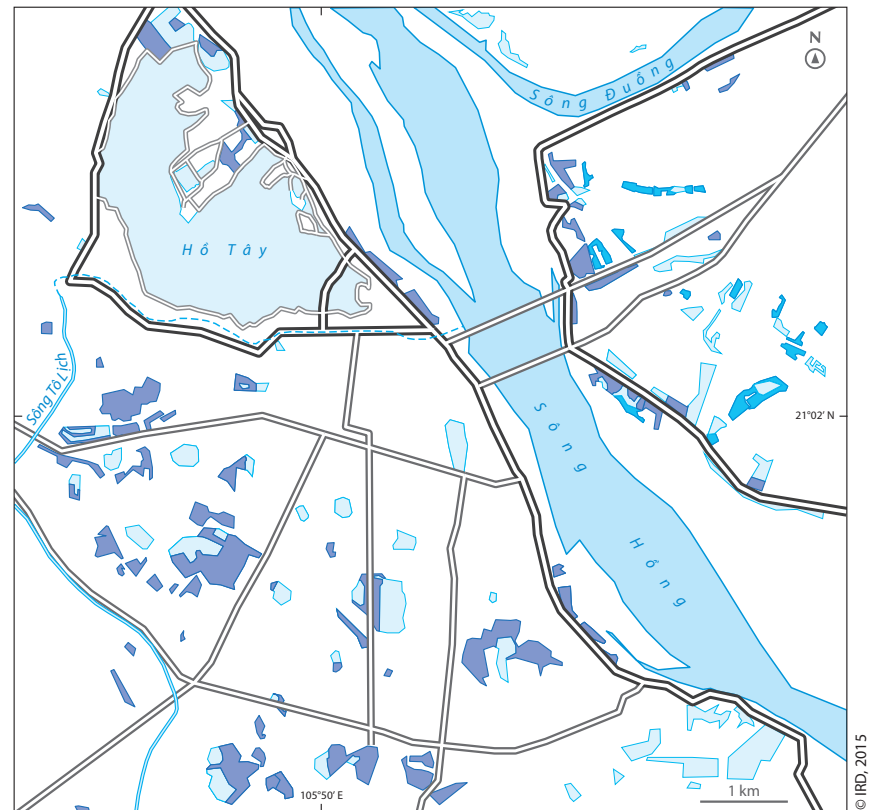
Small lakes of less than 1 ha have nearly all been reclaimed and progressively filled in by city dwellers lacking space for housing. In the four central urban districts, only three lakes remained in 2005.

These lakes fulfil several hydraulic, recreational and economic functions. According to Haidep's survey, 19 serve as reservoirs for rainwater during the monsoon and play a regulatory role when flooding occurs, 32 serve as a place for walks and 80 are used for fishing. The function of lakes regulating rainwater flooding has been greatly reduced as they have been progressively filled in. Their reclamation has been carried out both in the city and in peri-urban villages where demand for land is very high.

### The role of water in the initial structure of the city

Owing to its ideal situation at the crossroads of major waterways, the Red River, the Tô Lịch and Kim Ngưu Rivers, Hà Nội was at the centre of regional trade, then of international trade (NGUYỄN THỪA HỖ, 2002). Water is present in all the districts of this deltaic city: the Red River, the other rivers, ponds and canals form the city by imposing its limits, the presence of craft production activities that consume a lot of water and a religious heritage closely associated with water cults and situated nearby. But water occupies large spaces that are covered by individual builders and by developers, at the risk of endangering the fragile hydraulic, economic and religious balance upon which Hà Nội was built.

Figure 3 – PONDS AND LAKES ENCROACHMENT SINCE 1986 IN THE CENTRAL URBAN DISTRICTS



Sources: Tourist map at 1/23,000 Hanoi Carenga publisher, Image Google Earth 2012, map of the city of Hanoi, 1986 Vietnam Mapping Services 1/35,000

© IRD, 2015

- Secondary street
- Main street
- Road-dyke
- River
- Lake, pond
- Filled in pond or lake
- New pond

#### • Water as a limit and as an opening

During the feudal era, water was used to structure the city in several different ways. Firstly as a limit, it marks the maximum expansion (Red River, Tô Lịch River) or woven into the urban fabric (network of little lakes and outlying ponds). But water is also an integral part of the city and plays an important role as an element structuring as much the ancient city (moat, lakes) as the commercial city, given the importance of the central basins in the constitution of the neighbourhood built up with 'compartment' houses.

This complex hydraulic system is found in the densest and the most built-up district of the city. While in the citadel water is found only in ponds, indepen-

Table 2 – DISTRIBUTION OF LAKES SURVEYED BY HAIDEP IN 2007 IN THE FORMER PROVINCE OF HÀ NỘI

Size of lakes	Number of lakes	Area (ha)	Area %
0-1 ha	25	15.6	0.8
1-5 ha	76	191.8	9.8
5-10 ha	27	182.6	9.3
10-100	24	452.7	23.1
+ 100 ha	3	1,394.8	71
<b>Total</b>	<b>155</b>	<b>1,960.4</b>	<b>100</b>

dent of each other, here, everything is linked. There are more than ten lakes linked together and connected to Hoàn Kiếm Lake to the south and Trúc Bạch Lake to the north. This network is also connected to the Red River to the north and to the south, *via* Hoàn Kiếm Lake, which is linked to it in two places. Finally, to the north, one of the lakes of this network is linked to the citadel's moat. Moreover, this moat receives water from the Tô Lịch River, which was linked to the Red River *via* West Lake, and took in water from it as well, when levels were high.

Then colonial urbanism itself, with its policy of large-scale reclamation, did not totally drain water from the city's destiny, but made it a single-function element of aesthetic nature: the urban lake. Later, with independence, Vietnamese urban planners, with a different economy of means, reintroduced methods more respectful of sites. They gave back to water its central role in the workings of the city (lake in Reunification Park to the south, West Lake to the north) (PÉDELAHORE, 1983).

In this manner, water – as if by default – structures the areas that it does not occupy. In addition, over time, it has modified the face of the city during the whole history of its establishment: floods, changes in the layout of the hydrographical system, successive land reclamations. It could be said that Hà Nội was built not on land but between waters, up against water, making water its principal element.

Originally located on the Red River's flood plain, before the network of dykes was strengthened, the business quarter of the 36 Streets depended for its development on the evolution of the river's path and on its progressive embankment, in parallel with the citadel. Located between the citadel, West Lake and Hoàn Kiếm Lake, its spatial organisation depended on force lines oriented west/east (doors of the citadel/banks of the Red River) and north/south (alignment of the citadel and successive dykes). This irregular latticework marks out the development of the district and delimits the future city-blocks (it is possible that this network of earth levees and dykes was once the pattern of the paddy fields) (Plate 2). According to Christian PÉDELAHORE (2003), 'these paths, tortuous and irregular, bear no relation to either the structured grid pattern of paddy field subdivisions, or to planned tracks.'

Upon the structure of these roads/dykes is superimposed in counter-relief the structure of the hydrographical system, made up of successive variations in the bed of the Red River, which form a veritable maze of lakes connected to the Red River *via* the Tô Lịch River, canals, sluices that aid the development of

trade. Networks of successive dykes (of which the first traces date back to the 1<sup>st</sup> century BC) are progressively channelled into the Red River and have freed up an ever-bigger space for the business quarter, thus enabling its enlargement.

These roads/dykes make up the framework of the big clusters of urban development. It is along these roads that the first buildings were constructed that spread little by little towards the hearts of the city-blocks (where village elements remained: lakes, temples, village boundaries...). Their densification only took place very slowly, then accelerated with the appearance of the 'Chinese compartment'. During the colonial era, lakes in the heart of these city-block were emptied and filled in to make way for fresh construction (see Plate 7).

On either side of these 'roads/dykes', the first itinerant traders come to sell their wares and hold occasional markets, then install temporary shops and finally settle by building houses-shopsworkshops. The first markets must have been set up at the intersection between roads/dykes and canals.

#### • Silk and papermaking activities on the shores of West Lake

North of the business quarter, in the peri-urban area around West Lake, there were several village neighborhoods, or *phường*. Some grew vegetables (Nghị Tàm and Quảng Bá) or fruit, to supply the court with fresh produce; others (Yên Phụ) made paintings or smelted bronze (Ngũ Xá Peninsula, on White Bamboo Lake, Hồ Trúc Bạch). The neighborhoods on the western shore of West Lake were famous for weaving ordinary silk (Bái Ân), black silk (Võng Thi) and brocades (Trích Sài) (PAPIN, 2001). Nghị Tàm, Nghĩa Đô, Thanh Trì and Thúy Ái south of Hà Nội were known for rearing silkworms.

Other villages lived from the flourishing paper industry, such as Yên Thái, Hồ Khẩu and Nghĩa Đô. They were on the southern shore of the lake and near Paper Bridge (Cầu Giấy). The neighborhood of Yên Thái or Bưởi, originally specialised in paper for everyday use, gradually diversified its production (Plate 2).

Towards the end of the 16<sup>th</sup> century, artisans began to produce very high quality paper that was sold at the imperial court (PAPIN, 2001). This activity had developed near the lake, as papermaking needed a lot of water and enough space to build ovens. Indeed, artisans soaked *dó* bark (produced from *rhamnaneuron* tree fibres) during one to three days for retting (softening). Then, they again soaked the retted pieces of bark in a bath of lime for 24 hours. After being 'cooked' in earthenware ovens on the banks of the Tô Lịch River or on the shores of ponds,

the pieces of bark were rinsed in clean water. Finally, a second lime bath was necessary before the real stripping down of the matter to prepare the pulp. Other production stages required water: making the pulp with crushed bark, its maceration and finally raising the sheets of paper with a wooden frame fitted with a bamboo trellis in a tank containing a liquid with the paper pulp floating in it. This activity was given up at the beginning of the 1980s, a victim of competition from industrial papermaking (LE FAILLER, 2009).

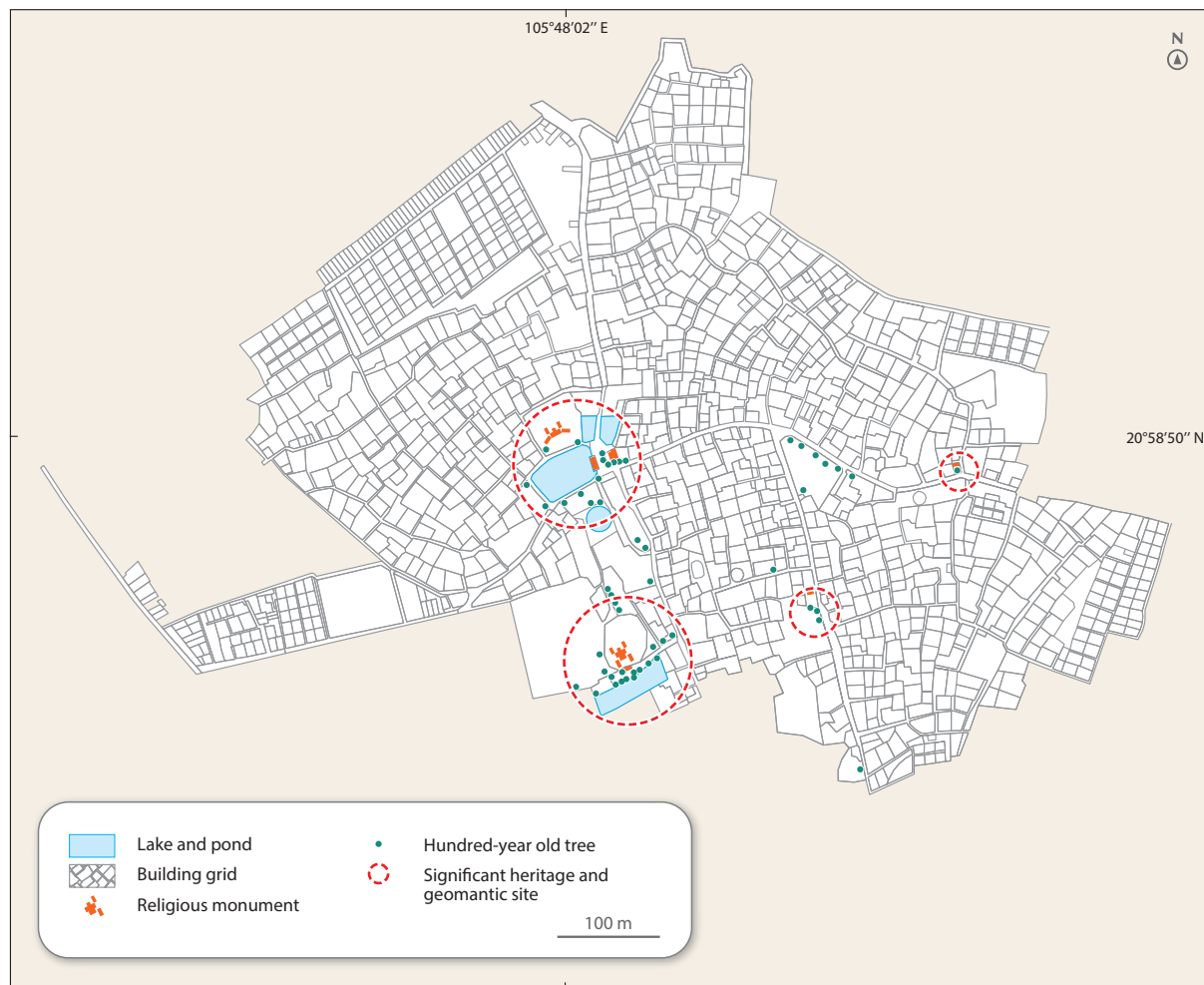
These villages benefit from proximity with the Tô Lịch River, the favoured waterway for trade between the Red River, Hà Nội and Hà Tây Province. There were several markets on the shores of West Lake where products from the surrounding villages were traded, in particular the market at Bưởi, specialised in paper.

### • Cults and rituals in the re-appropriation of hydraulic spaces

In the peri-urban regions of Hà Nội, the importance of water's role in village cultural activities is demonstrated through the presence of festivities, practices and customs. The use of hydraulic structures (ponds, lakes and canals) associated with these activities is still current, ensuring the upkeep of the places that are associated with them. Some of them have even been enlarged to cater for an increased interest in cult activities.

The art of water puppets or *rối nước* originated in the Red River Delta, in Nam Định Province, more precisely, and is one of several rituals to summon rains. It was associated with fertility cults, before becoming a village entertainment dur-

Figure 4 – WATER, AN ELEMENT OF RELIGIOUS AND RITUAL HERITAGE IN TRIỀU KHÚC VILLAGE



Source: TRẦN NHẬT KIẾN, 2010

© IRD, 2015

ing festivals. Permanent water pavilions, *thủy đình*, were built in several temples or pagodas around Hà Nội. But usually, when on tour, temporary rooms are put up for the puppeteers, made of lightweight materials (bamboo, wood) and easy to carry around to the numerous ponds dotted among the villages. Games practised during spring festivals, very numerous in Red River villages, recall the hydraulic rites. Boat races are a rite linked to the Festival of the Waters common to all rice-planting and fishing peoples in Southeast Asia. Boat races are linked to the cult of the Water Sprite celebrated at the beginning of the wet season or that of floods and the end of floods and evoke the storm with its life-giving rains for the rice (ĐÀO HÙNG, 1991).

The last lakes and ponds protected from urbanisation possess geomantic properties within villages: they are situated opposite the communal house (*đình*) or the pagoda (*chùa*) (Figure 4).

In the peri-urban villages of the first ring of outskirts integrated into the urban districts, like that of Triều Khúc, the banks of the ponds have been paved with concrete to stop them being eaten away by constructions. During the summer of 2006, the shores of the Pagoda Pond (Ao Chùa) were developed and a little bridge was built there and financed by the inhabitants. The wastewater system of those living nearby, which before flowed directly into the pond, is now connected to that of the village sewers. The pond water has been cleaned, to the point where it is now possible to swim there. The pond has regained its customary uses. In the village of Quan Nhân, the Bàu Dục Pond and the Lotus Pond (Ao Sen) have enjoyed similar treatment and their waters are periodically cleaned.

Although ritual hydraulic structures are as a matter of principle preserved, or even improved, it does come about that communal authorities fill in sacred lakes. In these rare cases, they run the risk of criticism and protests from villagers.

For example, in 2007, in Nhân Chính the district authorities had a project to fill in the Pen Brush Pond (Ao Bút<sup>3</sup>). Owing to the geomantic value of the pond – thanks to the Pen Brush Pond, many mandarins and doctors first saw the light of day in their village and it is for this reason that their village bears the name of Quan Nhân (village of mandarins) – the old people of the village protested against this project to the district People's Committee, in vain. At the beginning of 2008, the pond was filled in, and the land taken over by a villager who turned it into a car park. Several months later, the villagers were continuing to protest and demand the restoration of the pond.

Stretches of water destined for cults and rituals are the last to remain in the villages on the outskirts of Hà Nội. They contribute to storing water and to regulating it during heavy rains. In villages where all ponds have been filled in, an increase in flooding during monsoon season has been observed.

## Hà Nội since 2008: hydraulic implications of major urban projects

Until the 1990s, the expansion of urban sprawl and that of peri-urban villages took place slowly as small developers, public enterprises and individual households got hold of plots of land for building (legally or illegally). Filling in stretches of water, nibbling away at their edges, and turning paddy fields into land for building on took place on a small scale and concerned relatively limited areas covered with water. Natural drainage during heavy monsoon rains continued to work normally *via* the residual stretches of water and the cultivated land around the urbanised area. The development of a town-planning project devoid of coherence at the level of the two merged provinces and that of individual village projects, which are made possible thanks to the understanding of certain local elected officials, poses the problem of the reorganisation of the hydraulic system of a city rendered more and more vulnerable to flooding.

### • The former province of Hà Tây and the risks of flooding

Since its enlargement in 2008, Hà Nội Province is subject to fresh environmental challenges, particularly concerning the control of river and rain flooding. In addition to the problems to which the urban and rural districts of the former province are subjected (overflowing of lakes, difficulties in draining away rainwater during the monsoon, subsidence and above all water pollution) are now added the risks of flooding linked to the integration of the Đáy and Tích River valleys that split the province in two along a north-south axis. A distributary of the Red River contained by high dykes, the Đáy River has on countless occasions flooded the plain below, particularly the basin of Chương Mỹ District (see Diagram). In addition, during the high water season, it was difficult to drain the rainwater from the land in the Hà Đông hydraulic subdivision from the left bank towards this river. Therefore, in 1937, the colonial administration built a sluice at the entrance to the Đáy River to prevent the Red River waters from entering it, a sluice that would only be opened in the event of very high waters, to protect Hà Nội, situated 30 km downstream. Since 1971, this sluice has not been opened, despite very high waters in 1996 and 2003. However, since the Đáy no longer receives water from the

## Hà Nội between the ‘waters’

Red River, its banks have silted up, and the river is dying. If the sluice were to be opened, the river would no longer have the capacity to deviate the 5,000 m<sup>3</sup>/s necessary to protect Hà Nội. Since the 1970s, many inhabitants of neighbouring communes have settled in the area beyond the dyke, at their own risk.

In this manner, in the 2000s, 675,000 people from the provinces of Hà Tây, Hà Nam and Nam Định were settled in the flood plain of the Đáy River, on 41,235 ha of agricultural land, specifically in the districts of Chương Mỹ and Mỹ Đức (25,000 ha). If the sluice were opened, this land would be completely submerged, to a [surface]/depth of water from 4 to 5 m, which can stagnate from 35 to 45 days (SILVER *et al.*, 2001).

The Tịch River valley takes its source in the Ba Vì Mountains to the west of the city and empties into the Đáy River at Phú Lý in Hà Nam Province, further to the south. In September, when the river is in spate, it can submerge its valley, in the event of water from the Red River being diverted into the Đáy River. Accordingly, when waters are high in the Red River, the vulnerability of these two valleys becomes more acute.

The population that would be affected by such flooding is difficult to estimate with any certainty. A reason for this is that the population count in Vietnam is organised at the communal level, but many communes are located partly within areas protected by the dykes and partly outside them. We have therefore counted for the former province of Hà Tây the population of communes situated in areas prone to flooding by the Đáy and Tịch Rivers, those partly within protected areas and partly outside them, and those not affected by flooding from either of these rivers. In general, in the communes with dykes running through them, the population is concentrated in the area inside the dyke and only a minority takes the risk of settling in the river's flood plain.

However, these constructions are low-lying, save for a few exceptions in the very dense and industrious communes (3,000 inhab./km<sup>2</sup>) of craft villages, such as Dương Liễu, where there are factories producing foodstuffs and a market.

It is the case that the part corresponding to the former province of Hà Tây, that occupied an area of 2,198 km<sup>2</sup>, namely two-thirds of the newly formed province of Hà Nội, is made up of five kinds of commune with variable vulnerability to river flooding:

- 183 communes, namely 57% of the total population, are not affected by flooding associated with overflowing by the Đáy and Tịch Rivers, and represented 54% of the province's land;

- 57 communes, namely 15% of the population on 18% of the land, were subjected to risks of flooding from the Đáy River, in the event of deviation of Red River flood waters;
- 26 communes, namely 8% of the population on 10% of the land, were subjected to risks of flooding from the Tịch River, in the event of deviation of Red River flood waters;
- 57 communes, namely 19% of the population on 13% of the land, were in part subjected to risks of flooding from the Đáy River, in the event of deviation of Red River flood waters, as they straddle an area both outside and inside the dyke;
- 17 communes, namely 5% of the population on 5% of the land, were in part subjected to risks of flooding from the Tịch River, in the event of deviation of Red River flood waters, as they straddle an area both outside and inside the dyke.

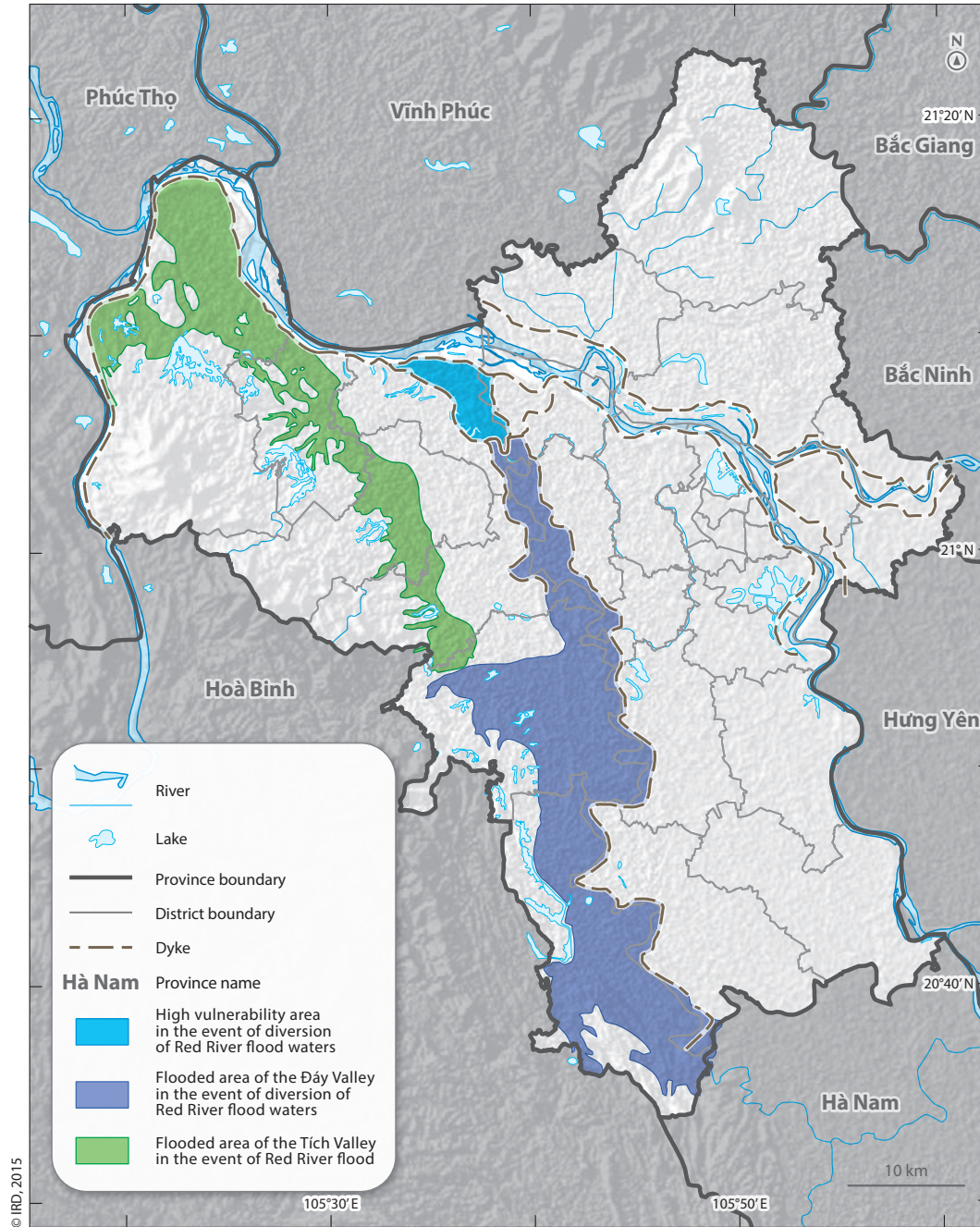
One of the original propositions of the Master Plan for 2030 for Hà Nội Province is the creation of a green belt, located in the flood-prone valleys of the Đáy, the Tịch and in the land between the two rivers protected by dykes. In this space, two processes of urbanisation will have to be controlled: urbanisation of villages, their expansion into areas prone to flooding, building upwards and the establishment of urban districts and industrial parks on agricultural land, raised concrete platforms that limit the capacity for natural drainage.

### • Filling in and concreting over of the Delta: what are the hydraulic consequences?

#### • *The major residential, highway and industrial projects*

The major urban projects being undertaken in peri-urban Hà Nội affect the hydraulic system, the drainage and irrigation of residual land and the villages located in the neighbourhood. Urban and industrial constructions hamper drainage and increase the risks of flooding: infiltration is lessened by the increase in impermeable surfaces. In addition, such constructions are often established in the most productive and least low-lying areas, since they are less prone to flooding. Low-lying agricultural land and villages become the only possible outlets and suffer significant damage caused by flooding and water pollution. The wide highways under construction act as dykes or obstacles to the evacuation of rainwater, the more so as they are not accompanied by the installation of culverts/storm drains and a suitable drainage system. These problems affect the daily lives of inhabitants, whose agricultural land and village environs are flooded more easily during the monsoon, thus limiting agricultural yields.

The prone to flooding valleys of the Đáy and Tích Rivers



Source: Ministry of Construction of Vietnam, Master Plan to 2030

## Hà Nội between the ‘waters’

The residential and industrial areas, of many hundreds of hectares, are built on embankments to protect them from flooding. However, these concrete platforms are raised up one metre above villages. When it rains, water drains away with difficulty, particularly because of the dysfunctions of the hydraulic network in areas undergoing urban and highway development; the Delta villages, which therefore stand lower than these big urban platforms, accordingly suffer still further from flooding.

Normally, it is stipulated in the protocols that govern the construction of these gated communities and other industrial projects that the developers are supposed to construct a drainage system around villages to protect them. According to an official from the Agriculture Department of one of the districts most deeply affected by urban development, such installations have not yet been added. The only action taken to limit the damage is temporary pumping using big machines to drain away excess water.

This gives the measure of how much worse the risks have been rendered on this plain already with a high risk of flooding, protected by kilometres of dykes. Some officials from the Agriculture Department of the peri-urban area are conscious of the dysfunctions in the management of agricultural land during the transition period from rural to urban and the defective protection of villages. The whole hydraulic system and above all drainage needs to be overhauled by the services concerned; in the meantime, in the absence of a definitive urban planning programme for peri-urban districts, one might suggest that the participation of private developers is the very least they can do. The privatisation of development will have serious consequences on the maintenance of public services, as developers seek an optimal short-term return on their property investments.

In addition, the dysfunctions in the hydraulic system affect land that is still cultivated. Some irrigation canals are blocked and water no longer reaches fields, while fields cut off amid multiple construction projects no longer have access to irrigation. Farmers are forced to abandon them and do not receive the compensation they deserve (FANCHETTE, 2011).

In the district of Hoài Đức, much sought-after for urban and highway development projects, a petition has been signed by the representatives of the People's Association to complain about this situation. In this district in September 2009, 148 ha of agricultural land were affected by the dysfunctions of the hydraulic system in five communes where development projects are under way. A third of the

affected land could not be cultivated, while in the remaining two-thirds, flooding to counter lack of water made it difficult to grow crops (People's Committee of Hoài Đức District, Economic Development Department, 2009).

Finally, a negative effect of urbanisation of the areas closest to the capital means that the employees of hydraulic departments, poorly paid, are less and less committed to the upkeep of irrigation canals, preferring to turn their attention to more lucrative activities.

The relocation of industrial parks and estates into peri-urban areas is accompanied by its own set of environmental problems. Indeed, most of these installations do not have wastewater treatment systems and pour most of it directly into the general hydraulic network partly designed to irrigate the paddy fields.

### • *Villages integrated into the urban sprawl*

#### *The Tây Hồ Project*

On the site set aside for the Tây Hồ Tây Project, a new international service sector centre for Hà Nội (an administrative, political, economic and commercial centre) had been planned in 2004, within the context of the city's Master Plan for 2020. Hà Nội's People's Committee ordered a survey from the IMV (Institut des métiers de la ville, the Institute for Urban Policy, a cooperation between the Île-de-France Region and Hà Nội Province) on the means of integrating existing villages into the new urban fabric and responding to threefold heritage, social and environmental issues. Here we present the part of the environmental diagnosis concerning the prevention of flooding.

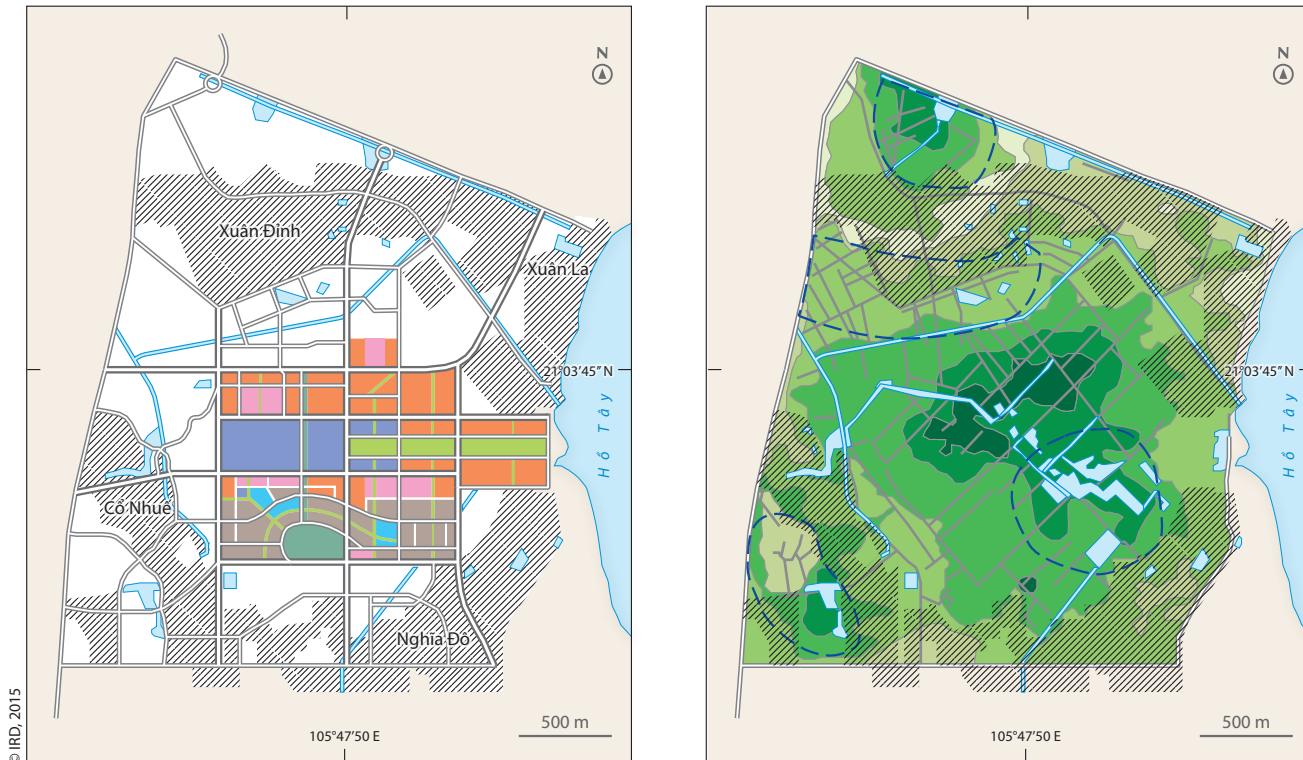
This project for a service sector centre of 240 ha will be located to the west of Tây Lake, in a basin occupied by paddy fields, with an average altitude varying between 4 and 6 m, and surrounded by four villages (Cố Nhuế, Xuân Đình, Xuân La, Nghĩa Đô). These villages are situated at an altitude slightly higher than that of the paddy fields, on top of small natural or artificial promontories in order to limit the risks of flooding. They are protected from overflow from Tây Lake by a road/dyke to the east and flanked by three others that are from one to three metres above the villages. The site is at a lower level and is exposed to risks of flooding, particularly because of the difficulty in evacuating rainwater (Plate 4).

This site is located in the heart of a hydraulic network connected to:

- Tây Lake, to the east
- the Red River, to the north
- and the Nhuệ River, to the west.

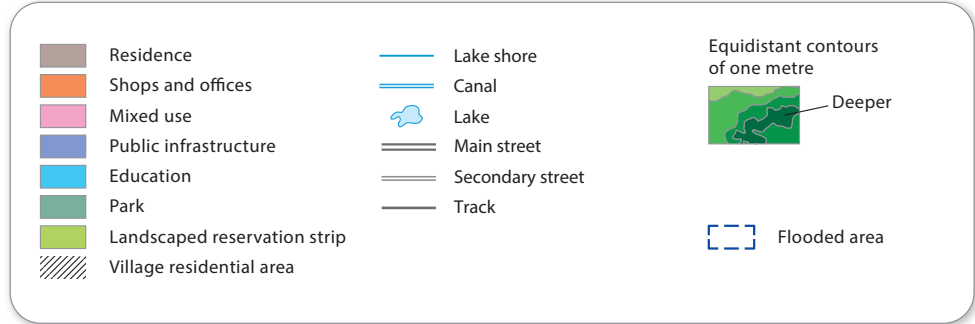


**The Tây Hồ Tây Project: a site in a basin flanked by several villages**



© IRD, 2015

Source: lmv, 2005



## Hà Nội between the ‘waters’

There is an inlet of water from the Red River *via* the Nhuệ River and another from Tay Ho Lake. Water then flows more or less freely through the now partially dilapidated network of canals then comes out:

- to the southeast, flowing back into the Nhuệ River
- and to the south towards the lagoon area.

At the time of the survey, this rice-growing area served as an overflow for rainwater and drainage; four points were especially prone to accumulating water:

- to the north and to the south of Xuân Đình
- to the south of Cổ Nhuế
- and behind Nghĩa Đô.

With the establishment of the new centre, this situation is likely to get worse. The projected services centre will be placed in the centre of the basin, raised by one metre to render it safe from flooding.

Not only will the paddy fields no longer play their part as a holding tank for rainwater, but the new elevated district will constitute just one more obstacle to the water drainage, threatening to drown out the villages below. In addition, the volume of runoff water that the villages will receive will increase as a consequence of the waterproof sealing of urbanised plots of land. Finally, the hydraulic territory, which is laid out along a northwest/southeast axis, matches the course of the Red River and therefore dykes and fall lines located on either side of it. On the 1912 historic map, this course can be seen in the paths and plots of agricultural land.

This configuration of the area to be developed was not taken into account by the developers, as the site and its road network are laid out along north-south and east-west axes. This runs the risk of jeopardising a drainage system that until now was integrated into the village fabric and gave the area structure.

#### *Reduction in bodies of water in Triêu Khúc and Nhân Chính*

Water plays an essential role in the daily life of villagers and for agricultural production, mostly wet rice. Bodies of water in the villages can be divided into three kinds:

- canals
- lakes and ponds used for growing aquatic products
- cultural and religious lakes with a geomantic role.

Since *Đôi Mối*, with the construction of new real estate projects on villages’ agricultural land, public bodies of water are shrinking rapidly. In many cases, small

ponds have been shared out within the context of the policy of the increase in population, leaving it to young couples to fill them in (QUERTAMP, 2003).

In the urban villages of Quan Nhân, with the compulsory purchase of agricultural land to build blocks of flats, all the outlying lakes and canals have disappeared. In Triêu Khúc, the communal authorities have allowed some inhabitants to fill in the bigger lakes and convert them into areas for further housing that are divided up into lots and sold in priority to villagers, and then to new inhabitants (Plate 5).

In residential areas, private bodies of water are the first to be filled in. In 2007, 100% of private ponds in the villages of Quan Nhân and Triêu Khúc had disappeared. As for public lakes, they are filled in to build new public amenities such as parking places, playgrounds, the People’s Committee building, etc.

In this manner, with the exception of sacred lakes whose importance is linked to the site’s geomancy and to religious monuments, all stretches of water have disappeared very rapidly. In Quan Nhân, in 1972, the surface area of private lakes and ponds totalled 130,937 m<sup>2</sup>. In 2007, this figure had fallen to 22,661 m<sup>2</sup>, and in 2009, it was only 20,225 m<sup>2</sup>. In Triêu Khúc in 1998, the total surface area under water was 33,837 m<sup>2</sup>; in 2006 this figure had sunk to 3,079 m<sup>2</sup>. In eight years, 91% of land covered with water has disappeared in this village (Plate 5). From 2006 onwards, only sacred ponds and lakes remain in both villages studied, because they enjoy a specific status that guarantees their survival.

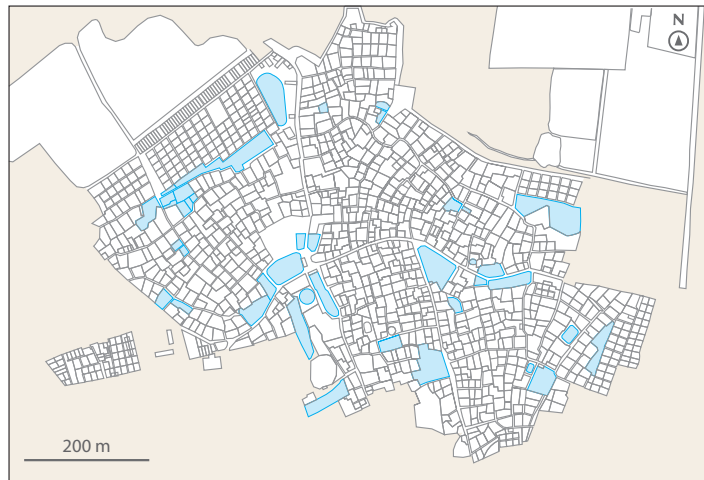
Filling in lakes and ponds in low-lying areas increases the vulnerability of newly-built districts, and during the monsoon season, it becomes difficult to drain rainwater away.

## Conclusion

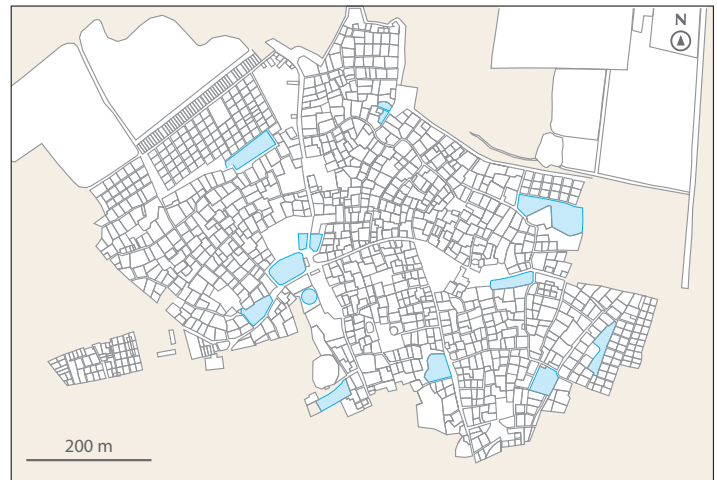
On a physical and technical level, the integration of villages into the urban perimeter is complex and entails very high costs for filling in land to level off paddy fields, on which new districts will be built, situated at lower levels than villages. It is the case that these villages are erected on embankments and levees to provide protection from flooding, and are surrounded by many ponds and lakes. Veritable reservoirs for rainwater during the monsoon season, bodies of water play an indispensable part in drainage of hydraulic subdivisions closed off by the dykes. Reclaiming land by filling them in to build on them aggravates the risks of

### Reduction in bodies of water in Triều Khúc Commune (1998 to 2009)

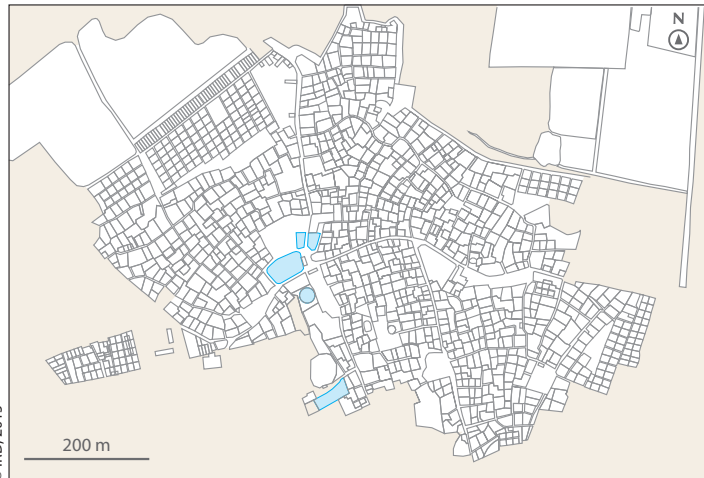
1998



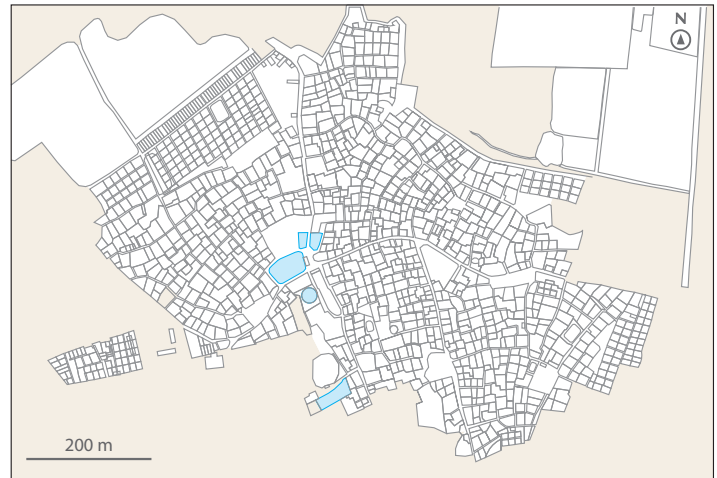
2002



2006





2009



© IRD, 2015

Sources: TRẦN NHẬT KIẾN, 2010 adaptated from Cadastre (land register / cadastral plan)

-  Street grid
-  Pond

## Hà Nội between the ‘waters’

flooding. A hydraulic planning policy for expanding urban development is now indispensable in this Delta at high risk from flooding.

However, this implies heavy investment and means of controlling bodies of water and the expansion of construction, all elements that have been lacking until now in the city of Hà Nội’s public policy. Already in the collectivist era, the state and the municipality – the main suppliers of housing – did not have the means to finance such infrastructure. With the liberalisation of the land market and the introduction of the policy dubbed ‘the state and the people building together,’ the local authorities have been overwhelmed by the advance of urban sprawl.

Moreover, plots of land filled in with earth taken from river beds are unstable and do not always easily support the densification and the verticalisation of cities, as is the case in Bangkok, a metropolis studded with towers several tens of metres high built as blocks of condominiums. This model of city design increases subsidence to a rate estimated to be 10 cm/year in the centre of Bangkok. Very costly hydraulic works calling for geographically prioritised consistency can only be undertaken by the authorities or negotiated with private investors. In addition, all drainage water from the entire delta passes through the Red River and its distributaries, along which major towns have been established, a situation that only exacerbates river flooding.

Finally, by studying the experiences of other deltaic metropolises in the region, such as Jakarta, one may question the ability of the state and Hà Nội’s city council to control urban sprawl and construction in the most vulnerable areas of the province, particularly the Đáy and Tích river valleys that will be, according to the Master Plan for 2030, the structural backbone of the green belt to be protected.

In the Indonesian capital, a protection plan for vulnerable areas was drawn up by the Public Works Ministry to monitor and control urban expansion. Five areas were identified, within which it was decided what sort of constructions were suited to the level of vulnerability.

However, as early as the 1980s, the mega-region’s urban development, based on the manufacturing industry and the construction of outlying industrial suburbs, financed by foreign investors, did not adhere to this plan. Then with the property bubble in the 1990s, major projects to build satellites towns and fresh urban districts converted outlying suburbs of paddy fields into raised concrete platforms. Financial concerns, cumbersome bureaucratic procedures and the

lack of co-ordination between the various administrative services got the better of this environmental protection plan of Jakarta. Half of the building permits granted in that period did not follow the recommendations of the protection plan: rather it was speculative concerns that determined the location of projects (DOUGLASS, 2010).

1) Haidep: Hà Nội Integrated Development and Environment Programme.

2) The *Khu tập thể* (KTT) or collective units are generally four- or five-storey blocks, with flats allocated according to very precise evaluations and ratios. This type of housing was intimately linked to the political system of this era; it was part of the control measures exerted over the population.

3) Ao Bút, Pen Brush Pond runs along the main road. Geomancers consider it as a ‘筆水-BútThủy’, which brings success in studies.

*Petit atlas urbain*

Edited by Sylvie Fanchette

# Hà Nội, a Metropolis in the Making

The Breakdown in Urban  
Integration of Villages



Collection « Petit atlas urbain »

Edited by Sylvie Fanchette

# Hà Nội, a Metropolis in the Making

The Breakdown in Urban Integration of Villages

Foreword by Rodolphe De Koninck

Atlas edited by the Cartography Department

Direction de l'information et de la culture scientifiques pour le Sud (DIC, IRD), IRD France-Nord (Bondy)

Maps (Plates) drawing: Éric Opigez

Mapping coordination: Éric Opigez

Layout: Marie-Odile Schnepf

Financial support of Ceped for English translation

Financial support of the Institut des métiers de la ville (IMV) for writing chapter 2 and buying photos

English Translation: Nicholas Stedman

Scientific and editorial coordination: Sylvie Fanchette

Photographies : Nôi Pictures Agency, Hà Nôi

Cover design: Éric Opigez

Cover photography

*A Vietnamese woman holds branch of peach tree in blossom in a street of Hà Nôi*

© Francis Roux, Nôi Pictures

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, xerography, or any information storage and retrieval system, without permission in writing from the publishers.

ISBN : 978-2-7099-2197-8



© IRD, 2016