



INITIATIVES POUR L'AVENIR
DES GRANDS FLEUVES
INITIATIVES FOR THE FUTURE
OF GREAT RIVERS

Synopsis sheets

Rivers of the World

THE RED RIVER

THE RED RIVER

1,200 km long, the source of the Red River lies in China from where it crosses Vietnam until reaching Hanoi, before forming a huge delta from which it flows into the Gulf of Tonkin. Its watershed covers 26 provinces and is the home of 30 million people, of whom 20 million live in the delta. Subject to regular and sometimes very violent floods, its hydroelectric potential is attracting increasing interest, making the integrated management of its resource a crucial challenge.

A history of developments

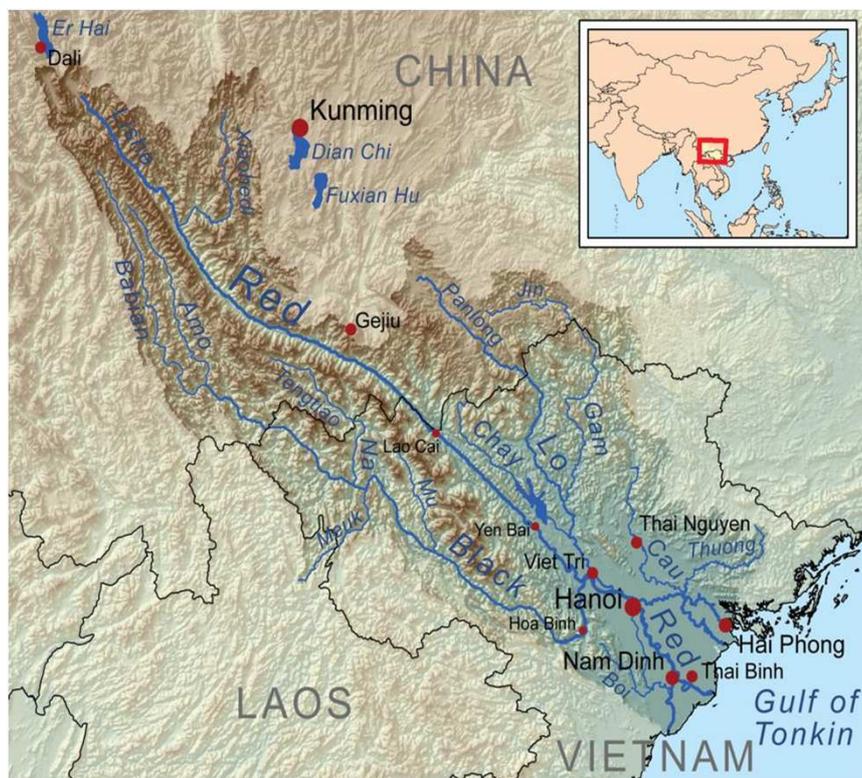
The origins

Dikes were built as early as the 5th century to tame the river, control its floods and make the water available for consumption and irrigation.

New developments were carried out in the second half of the 20th century, with in particular the diversion of the river to protect Hanoi from overflows. Dams were built in the 1970s to control flooding and manage irrigation.

To satisfy the needs of the growing population, in the 1990s the government started to reform the water management system, in line with the recommendations of international bodies. Various river basin organisations were set up, notably that of the Red River.

More recently, Vietnam has sought to exploit the river's hydroelectric potential and has launched a large number of hydropower plant projects.



Technical sheet

<u>Discharge</u>	3,640 m ³ /s (between 430 m ³ /s and 30,000m ³ /s)
<u>Length</u>	1,200 km
<u>Watershed</u>	160,000 km ²
<u>Countries crossed</u>	China, Vietnam
<u>Main tributaries</u>	Claire River (Lo), Black River (Da)

Characteristics

The deforestation of the slopes along the Red River and the intensity of the monsoons has led to erosion and the transport of the reddish mud that has given the river its name. Its two main tributaries (Black River and Claire River) also flow from Yunnan and the greater part of their courses run parallel with that of the Red River.

Multiple uses

Historically, the developments on the Red River have above all been devoted to controlling floods and irrigating agriculture. However, hydroelectricity production has developed rapidly since the 1970s.

Irrigation

Most of the developments located on the Red River are intended to improve the management of water for irrigation: levees and embankments for flood protection, pumping stations.

The traditional economic activity of Vietnam is concentrated in the delta of the Red River, often considered as the cradle of Vietnamese civilisation. 80% of the land there is devoted to agriculture and the delta generates more than a quarter of the country's GNP and 20% of its rice production. Rice is grown in two cycles, during the "monsoon" from July to November, then during "spring" from February to June. A third cycle comprising market garden crops is being developed on the most fertile land, with maize, mulberry trees (needed for breeding silk worms) and livestock breeding with cattle and pigs.

The river's natural hydrographic network has been modified, especially in the delta to exploit the most fertile land, with the installation of a mix of natural and artificial branches and canals. The plain is divided into 30 irrigation and drainage zones which form artificial watersheds.

Navigation

The Red River has always served for the transport of goods and people, and navigation infrastructures have been developed on its banks. Of the the 33 river ports in Vietnam, the four main ones, located on the Red River and its tributaries, are managed by the Vietnam Inland Waterways Administration (VIWA)*: Ninh Binh (in the delta), Bac Ninh (also in the delta: Cau, Thai Binh, Duong), Việt Trì (at the confluence of the Red River with the Blue River, and finally Hoa Binh (Black River).

Hydroelectricity production

Hydropower installations have been built, mainly on the Black River, which flows into the Red River on its right bank, in the province of Phu Tho, sixty kilometres upstream of Hanoi. Projects are being studied for the future.

* Cf. Governance

Internal governance

The emergence of management by watershed

1961: The Red River Commission was founded

1995: the **Ministry of Agriculture and Rural Development** was created by merging three ministries: those of agrofoodstuffs, forests and natural resources.

1986: An attempt to organise integrated water resource management was made with the major economic reform known as **Doi Moi** or the Renewal; which launched new laws and national policies relating to water.

1998: The law on water resources was adopted.

2000: An interministerial committee was set up (National Bureau of Hydraulic Resources), to deal with the different uses of water and not only agriculture.

2001: Three basin organisations, including that of the Red River (the two others concern the Mekong and the Dong Nai River) with three executive levels were set up: a management board, a management office, and a secretariat. They are placed under the supervision of the MARD in Vietnam.

2002: The **Ministry of Natural Resources and the Environment** came into being. It is an important cog in the reform to modernise the State as it marks the separation of water management (the responsibility of the Ministry) from construction operations. It is responsible for "managing land, hydraulic resources, minerals, the environment, meteorology, etc..".

2008: Publication of the decree on the development of Integrated Water Resource Management policy (IWRM).

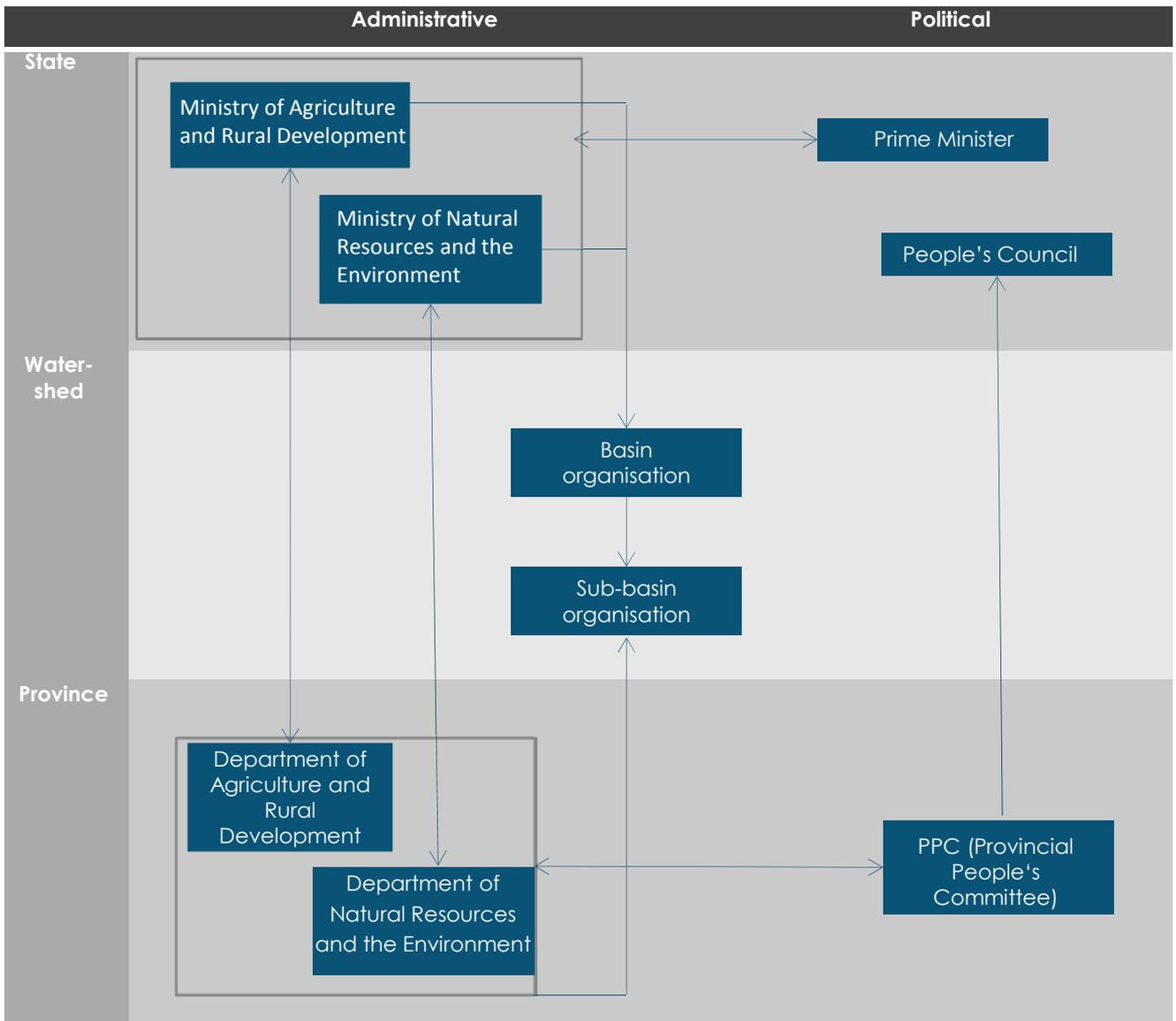
2011: Pilot project for the Dong Nai basin.

The problems of vertical and sectoral integration

The water reform of 1986 was a major step in formulating a solution for integrated water resource management. However, by setting up a **basin organisation** and, later, the **Ministry of Natural Resources and the Environment**, it disturbed the water governance system already present and led to conflicts of authority. The **Ministry of Agriculture and Rural Development** saw this Basin Organisation as a threat that would dispossess it of certain financial and decision-making prerogatives.

The management of the Red River's water is emblematic of cooperation problems between sectoral administrative departments and levels of governance.

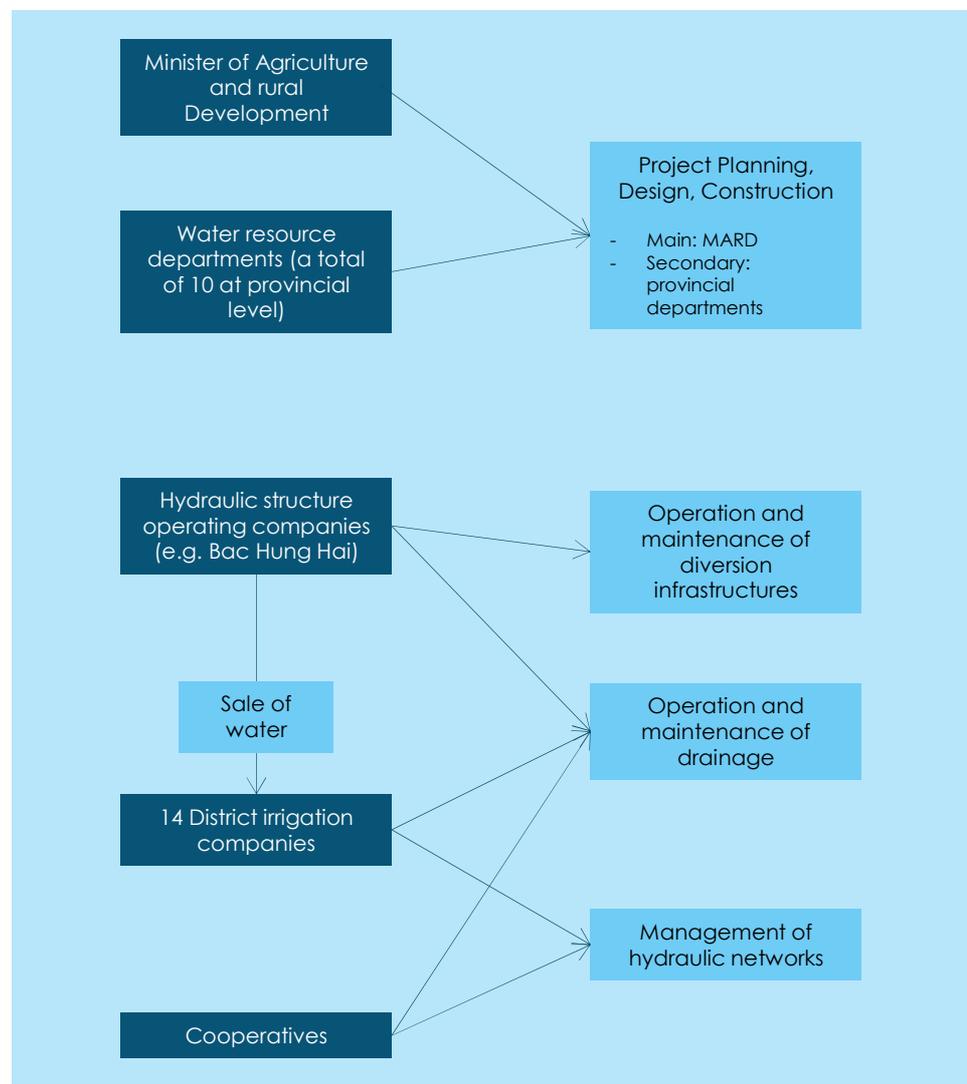
Internal governance



Source: *Implementing Integrated River Basin Management: Lessons from the Red River Basin, Vietnam*

Internal Governance

Example of entanglement of competences relating to irrigation:



Internal governance

The Vietnam Inland Waterways Administration

The VIWA is the governmental agency of the Ministry of Transport and is responsible for managing and maintaining Vietnam's ports and navigable rivers, canals and lakes. Its head office is in Hanoi.

Organisation

The VIWA comprises a management board, 15 river management branches and joint stock companies (and 140 sub-branches), 4 port authorities (maritime), and a management team. The governmental agency has three professional schools at Nam Dong Village, Ho Chi Minh City and Hai Phong.

River management

VIWA manages 6,000 km de of waterway of which the main elements are the Mekong and Red Rivers. It determines the traffic development plan and strategy for the entire country: regulations, infrastructures, fleet management, security problems.

Ports

VIWA manages 77 ports, including 33 river ports, and oversees the management of five of the latter, all located in the north of the country: Hai Phong, Ninh Binh, Bac Ninh, Viet Tri, Hoa Binh.

Projects

A major transport infrastructure project was carried out in the north delta (Red River). Started in 2008, it will be completed before 2020 in view to improving the efficiency, environmental sustainability, and safety of transport infrastructures and services, and providing technical assistance to strengthening the VIWA's resources. The total cost of the project was \$200 million of which US\$170 million came from the World Bank. CNR, present for more than 20 years in Vietnam, has been in charge of designing river and port developments and monitoring their implementation, as well as transferring skills and technologies. This engineering contract represents \$ 10 Million and 6 years of work.



Projets de développement des infrastructures de navigation dans le delta du fleuve rouge

International cooperation

China –Vietnam:

Cooperation relating to the management of the resource is fairly limited, since the Red River is above all considered a challenge for Vietnam. An bi-annual international forum on the Red River Basin brings Chinese and Vietnamese officials together. It provides the occasion for announcing the orientations of a cooperation policy (economic and cultural cooperation, environmental protection, sustainable development, etc.).

Funding bodies:

The Asian Development Bank (ADB) was both the technical and financial promoter of the Vietnamese project to reform its water management. The ADB provided the government a three year plan of technical assistance called the Red River Water Resource Management Project, aimed at supporting the government to set up a basin committee.

France, through the French Development Agency (AFD), also participated in setting up a template for basin management. In particular, the AFD started two projects in the Red River delta aimed at improving the management of water for irrigation and at improving the protection of areas against flooding and resist the potential impacts of climate change.

The Red River Basin:

Between 2001 2008, the first Red River Basin project was financed by, among others, the Asian Development Bank and the Vietnamese government. The AFD contributed 20% of the total cost (i.e. a loan of €35 million). This initial project led to the restoration of infrastructures and provided institutional support for managing water resources: technical assistance for monitoring water quality, bolstering the capacity of water supply services, and the review of the new law on water resources. In particular the project led to the restoration and enlargement of levees and embankments against floods. Irrigation and drainage infrastructures were also modernised and restored.

The sub-division of Bac Hung Hai:

The second project aimed at building and restoring the hydraulic infrastructures of the sub-division of Bac Hung Hai, the largest polder of the Red River. Actions were carried out to improve irrigation and flood protection and assistance was given to the management of water resources. Funds were earmarked for improving university education. The project was launched in 2010 and lasted six years. The project cost a total of \$190 million to which the AFD contributed €20.5 million alongside the ADB and the Vietnamese government. (Source: AFD)

Structures

Flood protection infrastructures

The political, economic and cultural importance of Hanoi gives it privileged and priority status relating to flood protection. In 1975, the Vietnamese government commissioned a diversion canal 35 km north of the city. This canal diverts part of the surplus water of the Red River during flood periods. It has a capacity of 5,000 m³/s, is directly linked to the river Day and fulfils the function of lessening the impact of floods on the Vietnamese capital.

Dams

Vietnam's main hydroelectric infrastructures have been built on the Black River, the main tributary of the Red River.

Hoà Bình (Black River)	1994 Installed capacity: 1,920 MW Annual production: 8,160 GWh 8 turbines Management: EVN (Vietnam Electricity)
Son La (Black River)	2010 Installed capacity: 2,400 MW 6 turbines Annual production: 10,246 GWh Management: Vietnam Electricity
Lai Chau (Black River) Province of Lai Châu / district of Mường Tè	Project (planned for 2017) Installed capacity: 1,200 MW 3 turbines Annual production: 4,670 GWh Management: Vietnam Electricity (design: Hydroproject, Russian company)
Huoi Quang (Nam Mu River, tributary of the Black River)	End of 2015 (first turbine) Installed capacity: 520 MW 2 turbines Annual production: NC Management: Vietnam Electricity (Finance: loan of \$100 million from the AFD)

Other installations: Dam of Yen Son (project, planned for 2016), Plant of Thac Ba (artificial lake resulting from the diversion of the Song Chay River), created in 1971; Chiêm Hoa, ban Chak (*non exhaustive list*).

References

Son La Dam

Locality	Nam Mu, tributary of the Black River, about 250 km upstream of Hoa Binh Dam, 360km north west of Hanoi.
Construction	2005- 2013 (commissioned in service en 2010)
Annual production	10,246 GWh
Installed capacity	2,400 MW
Turbines	6
Uses	Supplying electricity, irrigation, flood protection
Management	EVN (Vietnam Electricity)

A dam of international dimensions

Initiated in the 1970s, the Son La dam project gave rise to several studies carried out by the Moscow Institute of Hydroelectricity and Industry, the Electricity and Power Distribution Company (Japon), the Designing Research and Production Shareholding Company (Moscow) and SWECO (Sweden).

After having postponed the decision in 2000, the National Assembly of Vietnam approved the project in December 2002. Planned for 2015, the dam became operational two years ahead of schedule.

Finance:

The World Bank also participated in financing the feasibility studies. The cost of the project was paid wholly by the Vietnamese government, with the support of the Asian Development Bank for financing the relocalisation of the population.

References

The Huoi Quang hydropower plant

Locality	Nam Mu, tributary of the Black River
Construction	2008- 2016 (commissioning of the 1st turbine end 2015)
Annual production	NC
Installed capacity	500 MW
Turbines	3
Uses	Hydroelectricity
Management	EVN (Vietnam Electricity)

The AFD project

Objectives of the project

The Huoi Quang hydropower plant project, financed by the AFD, is aimed at:

- Supporting the development of electricity in Vietnam,
- Encouraging the choice of renewable energies through hydroelectricity,
- Promoting conformity with international standards relating to the treatment of the project's environmental and social impacts.

Description of the project

The Huoi Quang Dam is part of an integrated development scheme of five hydropower plants in cascade. The dam, located in the province of Lai Chau, will be 99 metres high.

The funds granted by the AFD concern the dam's electromechanical equipment, the works and two panels of experts. The first examines the safety aspects while the second the project's environmental and socioeconomic impacts: the mitigation of the project's impacts on the quality of the water and fish habitats, the compensation of the displaced population and the restoration of their sources of income.

Finance

Non sovereign guaranteed loan (the first granted to Vietnam) to the public operating company, Vietnam Electricity (EVN) of \$100 million.

Impacts

This project contributes to the combat against climate change by avoiding the construction of a coal or gas fired plant that emits greenhouse gases and pollutants. The project's carbon balance shows that it will permit a reduction of 1, 120, 000 t eq. CO₂ a year during the next few decades of operation. Set alongside the cost of the project, this amounts to US\$10.5 (€8.1) per ton eq. CO₂ saved, which is fairly low in comparison to similar projects (the usual range for hydroelectric projects is from €6 to €15 per ton).

EVN is implementing an Environmental and Social Management Plan to mitigate the negative impacts on the local environment and the populations affected as much as possible. A panel of independent experts (the French consultancy ARTELIA) visits the site regularly to control the application of these risk mitigation measures.

Nearly 900 families have been rehoused. They have received financial compensation for the loss of their former fields and property. In addition, the project is committed to assisting this local population to negotiate this change in their lives. The challenge is to restore the incomes of the families who have lost their paddy fields and other crops, by getting them to take on new activities such as tree management and fish farming on the dam reservoir.

This project will have positive social impacts : the supply of electricity will mainly benefit industry and trading, thereby leading to the creation of jobs and reducing the poverty and vulnerability of the most disadvantaged rural populations.

(Summary of the text of the AFD site. The full sheet can be accessed on <http://minu.me/dem4>)

What river for tomorrow?

A new approach to managing the river has to be found in the face of the new challenges of climate change and the evolution of uses, internal conflicts of authority, and the lack of international cooperation.

Predicting floods

The Hanoi diversion canal, excavated in 1975, has preserved the capital from disastrous floods. However, it has led to flooding downstream of the capital and most notably in the province of Ninh Binh, making the land south of Hanoi a spillway for the Red River's overflows. The risk of flooding has thus been transferred from Hanoi to the now densely populated flood plain of the Day River (nearly 500,000 inhabitants) where many activities, mainly agricultural, have sprung up.

Although studies of the Red River had long focused on irrigation problems, research projects were launched in the 2000s to solve difficulties in managing the resource linked to its new uses and the new stakes it represents:

2001-2005: **National Flood Control Project**

2001-2003: **Decision aid system** to improve the ecosystem and flood control in the framework of the sustainable development of the Red River.
– pilot phase, backed by the European Commission.

2005-2007: **Multipurpose operation of reservoirs upstream of the Black River and the Claire River (Song Lo)**, (Ministry of Agriculture and Rural Development) to implement rules for multipurpose operations (flood protection, hydroelectricity production, water supply, environmental protection, etc.) of the upstream reservoirs.

Furthermore, the AFD plans to carry out a study on the impact of climate change in the Red River Delta, in view to setting up adaptive measures such as new infrastructures for flood protection and irrigation, integrated water resource management, strengthening the capacity of actors, etc.

The study also intends to make use of the knowledge acquired through university education, with the construction of a new campus dedicated to the University of Water Resources. Its competences will be widened to cover the issues of management and adaptation to climate change.

The Red River

What river for tomorrow?

Satisfying national demand for electricity

To satisfy the increasing demand for electricity (10% on average a year), Vietnam plans to boost its production capacity from 3 to 6 GW/year. The country had an installed capacity of 25 GW in 2012, but the Vietnamese government has set a target of 80 GW by 2020. Renewable energies are being developed alongside nuclear energy (the first two nuclear power plants are in the design phase). Thus hydroelectricity is an essential resource: it represents a large share (32%) of the country's electricity production.

Clarifying the system of governance

Vietnam has not yet developed an operational model of integrated resource management.

In 2007, a joint research project for the integrated management of the River Cau Basin (sub-basin of the Red River, for which a sub-basin organisation was set up in 2006) was implemented by the National Institute of Scientific Research (INRS), Canada and the Vietnamese Academy of Science and Technology, for the period 2007-2012). It consisted in data collection, building databases, field surveys, developing management scenarios, and evaluating the results and perspectives of the system. Developed at small scale, it is intended to drive water resource management structures in larger basins such as that of the entire Red River.

Studying cross-border issues in depth

China and Vietnam have not yet reached the stage of concrete cooperation relating to the Red River. However, such cooperation would be useful to solve current issues, ranging from the construction of reservoirs and the discharge of waste by China to the impacts of climate change with transformations in the intensity and frequency of storms, the type of rainfall and other meteorological characteristics affecting both coastal and inland areas.