



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

Synopsis sheets

Rivers of the World

THE GANGES

The Ganges

The source of the Ganges springs from the Gangotri glacier in the State of Uttaranchal, in India, close to the border with Tibet, from where it flows to cross Bangladesh and finally reach the sea in the Gulf of Bengal. It is joined on the way by the Brahmaputra, another great river born in Tibet. Its basin is one of the most fertile and densely populated in the world: a huge watershed covering more than 800,000 km², it is the home of 500 million people. The pressure placed on the river by the country's growing needs for water and energy and its pollution intertwine with the ritual and ancestral uses of this sacred resource, a living divinity lying at the core of the Hindu religion.

A sacred river in agony



The origins

The most sacred of all rivers for the Hindus, the Ganges takes its name from the goddess Ganga, the daughter of the god of the Himalayan mountains. According to legend, King Bagheeratha prayed to the goddess to bring prosperity to his land. She granted him his wish, but fearing that the flows of the river would inundate the land, she placed them in the hair of the god, Shiva, who freed them. Varanasi, the capital of Hinduism, stands on the banks of the Ganges.

Technical sheet

<u>Average discharge</u>	200 m ³ /s to 6,000 m ³ /s during the monsoon
<u>Length</u>	2,700 km
<u>Watershed</u>	860,000 km ²
<u>Countries crossed (watershed)</u>	China, India, Nepal, Bangladesh
<u>Main tributaries</u>	Gomati, Gandak, Son, Jamma, Yamuna, Gaghara, Kosi
<u>Cities crossed</u>	Varanasi (Benares), Calcutta, Kanpour, Allahabad

Characteristics

The Ganges, the Brahmaputra and the Meghna converge to form the Delta of Bengal, considered to be the largest in the world (about 93,000 km²), which encompasses plains and marshes crossed by countless branches and canals. It is also the location of one of the largest mangrove forests in the world, the Sundarbans (140,000 ha). The monsoon, which lasts from June to October, generates 90% of annual rainfall and can cause severe floods aggravated by the melting ice of the Himalayas.

Multiple uses

The Ganges basin covers 11 States with 50 cities and is the home of nearly half the country's population. It is the source of 40% of the country's GNP, but more than 200 million inhabitants of this region live below the poverty line.

The basin covers more than a third of India's surface water, 90% of which is used for irrigation.

Irrigation

Although the water of the Ganges has always been used for irrigation and agriculture (sugar cane, cotton, oleaginous crops), it was the green revolution instigated by Nehru in 1948 that allowed the country to attain food self-sufficiency. India is now the world's largest producer of tea and milk, and the second largest for rice and wheat. Agriculture represents a quarter of the country's GNP and employs more than 60% of the active population. It has led to the country equipping itself with efficient irrigation infrastructures, although it has also exacerbated inequalities between the small farmers, obliged to modernise their infrastructures or leave the countryside, and the large farmers who also contribute to polluting the water with chemical fertilisers.

Hydroelectricity

The potential for hydropower development on the Ganges is estimated at 13 million KW, of which 2/5 in India and 3/5 in Nepal.

The national register of large dams listed 4,845 large dams already built and 347 under construction in India. Most were built following the country's independence in 1947.

The existing dams, mostly diversion dams for irrigation, and those earmarked for projects, give rise to major disputes between India and Bangladesh which have not yet reached a satisfactory agreement over how the river water should be used.

India has launched a huge programme to revamp its energy policy, with the development of hydropower infrastructures, especially in northern India which suffers from frequent power shortages. 14 dams are being built and 39 are planned on the Ganges and its tributaries, mainly in the State of Uttarakhand (northeast), which suffers from severe electricity shortages due to its outdated energy installations. Nonetheless, these installations, often built to the detriment of the environment and local populations (who are obliged to move away), have already caused fatal accidents in the country: in the region of Uttarakhand, several hydroelectricity and road projects have been implemented despite the eco-sensitivity of the Himalayan mountains. In June 2013, the region was hit by violent floods, aggravated by the structures. More than a thousand people lost their lives, so the Indian authorities decided to slow down the works on the river. Many of the structures built on the Ganges now represent major ecological and human risks.

A report by the "Wildlife Institute of India", a governmental body, recommended giving up 34 dam projects on the Ganges and its tributaries due to their estimated ecological impacts.

A few installations

Sardar Sarovar dam

The controversial dam of Sardar Sarovar, on the river Narmada in the State of Gujarat (western India), was inaugurated at the end of 2017. The project had stirred bitter arguments over its environmental impacts since the first stone was laid in 1961 and its construction was held back until 1987.

The second largest dam in the world, it supplies 9,000 municipalities and its electricity is distributed to three States: Gujarat, Madhya Pradesh and Maharashtra.

Bhimgoda dam

This dam, located in the town of Haridwar, was built in the 19th century and has been considerably modified several times since. The last modification dates back to 1979. Before becoming a tourist attraction, the dam took its name from a Hindu myth: while the Pandava, at war with their cousins, the Kaurava, for the throne, were wandering in a forest, a wife of Bheem (Draupadi) suffered from thirst but found no water. Failing to find a source, Bheem, struck the ground with her knee with superhuman strength, gouging a hole that filled with water. That is how the place got its name Bhim-goda (meaning knee in Hindi). Its proximity with the ornithological reserve of Neel Dhara contributes to the dams' popularity.

The dam is 455 metres long, has 15 spillways and a total capacity of 19,300m³/s. The catchment surrounding the dam covers about 23,000 km² and its waters are diverted to the upper Ganges canal.

Farakka dam: a seat of conflict between India and Bangladesh

Farakka dam lies in the Ganges delta, a few kilometres from the border with Bangladesh. In 1975, the Indian authorities decided to launch this gigantic project in order to divert the water of the river to another one, the Hooghly. This ensures navigability and irrigation in the region of West Bengal, but the diversion of half the water of the Ganges threatens Bangladesh's capacity to satisfy its needs, by depriving it of its main source of river water.

Climate change, which causes the gradual melting of the ice of the Himalayas, as well as the demographic explosion in the region, is leading to increasingly damaging hydric stress for both countries. Studies foresee that water resources will become rare by 2050. These challenges rekindle tensions linked to sharing water, after they had been settled by the signature of the Ganges Water Sharing Treaty in 1996.

This water shortage also has environmental impacts. The fall in the river's water level causes salinization in the delta in Bangladesh, degrading and even destroying its forests, which are sources of income for the country. Salinization also affects the quality of drinking water and threatens the surrounding population. Sharing the river disturbs the balanced distribution of sediments between the two rivers, and the discharge of the Ganges in Bangladesh has slowed considerably due to this concentration of sedimentation. It also leads to the erosion of the river banks and aggravates flooding in the delta.

Alternative solutions have been proposed but it appears that India has not decided to abandon the Farakka dam.

Multiple uses

Navigation

Before the 19th century, the Ganges was a highly developed waterway but river traffic declined with the construction of roads and the development of irrigation, which affected its navigability. However, it's still one of the main uses for Bangladesh and Western Bengal which use the river for transporting goods.

Culture and religion

The river's cultural and spiritual influence extends far beyond its watershed. The banks of the river harbour the main sites of Hindu pilgrimage (Haridwar, Allahabad, Varanasi) and the river is the focal point of specific religious practices during the gatherings of Sangam, Sagar Mela and Kumbh Mela. A place of bodily and spiritual purification, it is linked to a large number of rites.

Its banks (ghats) are scattered with places of worship and direct points of access from the cities to the river have been built to allow pilgrims to take their spiritual baths. The Ganges has been attributed with the power to heal and the ashes of the cremated are dispersed onto the river to guide the souls of the departed directly to paradise.

Governance and international cooperation

The distribution of freshwater resources gives rise to great tension between the Indian States and between India and its neighbouring countries, principally Bangladesh.

The main reasons for conflict regarding the management of the Ganges came into being in the 1960s, when the Indian government built the Farakka dam in the State of Western Bengal, some ten kilometres upstream of the border between the two countries, to divert part of the flow of the Ganges to the Hooghly – a tributary of the Ganges that flows through Calcutta.

Emergence of shared management

- **19 March 1972:** signature of a 25-year friendship, peace and cooperation treaty between India and Bangladesh, providing for consultation between the two countries regarding the management of floods, hydroelectricity, irrigation and the development of river basins.
- **July 1972:** setting up of the joint commission on shared rivers, which permits holding regular exchanges on sharing the river.
- **1977:** five-year agreement on sharing the water of the Ganges during the dry season. India undertook to provide a pre-defined quantity of water to Bangladesh.
- **1985:** Ganga Action Plan, aimed at cleaning up the river.
- **1986:** Environment Protection Act; it made the Ganges the "national" river of India.
- **1996:** Signature of a 30-year bilateral agreement, the Ganges Water Sharing Treaty, which provided for more equal sharing of the Ganges' water between India and Bangladesh. Once again, this decision failed to satisfy Bangladesh, which struggled to restore an ecological balance where the discharge of the Ganges had plummeted. Since then, negotiations between the two countries have remained in a state of deadlock, especially since Bangladesh accuses India of hiding information on the discharge of the river and not upholding treaties.
- **2009:** setting up of the NGRBA – National Ganges River Basin Authority, a government organisation responsible for protecting the river that installs pollution cleaning infrastructures (integrated management). It brings together the governments of the States crossed by the Ganges and civil society and is linked to the Ministry of Water Resources. It has 24 members including 15 from the government; the rest are from NGOs.
- **2011:** Launching of the national project for the Ganges basin by the World Bank, endowed with a \$1 billion to combat pollution. **A Ganges basin management plan is being implemented** in this framework and at the request of the NGRBA. Objective: to eliminate all untreated discharges into the Ganges from now to 2020 (cf. p. 8).

Governance and international cooperation

The bodies managing the Ganges

Since India's independence, water management has been the responsibility of the States, under the authority of the *State Pollution Control Boards (SPCB)*, which are in charge of enforcing water pollution standards. The SPCB come under the authority of the *Central Pollution Control Board (CPCB)*, the competent national authority. This system has numerous shortcomings, notably due to the SPCBs' lack of resources and the overwhelming stakes involved in cleaning the river.

Several programmes have been implemented to combat the growing problem of contamination in the Ganges.

The Ganga Action Plan (GAP) was set up in 1985 with the main mission of implementing actions to treat urban wastewater. The GAP lasted around twenty years though its results were mediocre and it was even accused of being completely inefficient by its critics.

The NGRBA, which has both central and regional authority, is responsible for funding, planning and implementing measures to protect and clean-up the river. For the first time in India's history, the creation of this body has generated a long-term vision of the entire basin. Before it was founded, each State and city close to the river managed its own stretch of river according to its needs and capacities.

The NGRBA is divided into a national agency, the *Program Management Group (PMG)*, and regional agencies (called State agencies, since India is divided into States), the *State Program Management Groups (SPMG)*. To date, there are 5 SPMGs, in the States of Uttarakhand, Uttar Pradesh, Bihar, Jharkand and West Bengal. An *Executing Agency* is selected for each investment, whether local or national. It can act as a technical agency with authority over water management in a State (notably regarding wastewater).

The World Bank has been linked to the NGRBA, and has made available an initial sum of a billion dollars in exchange for several initiatives: the installation of drainage systems in large cities bordering the river, the organisation of better water management between agriculture and industry, the decentralisation of wastewater treatment plants, etc.

The Wildlife Institute of India was founded in 1982 to protect Indian natural habitats and make the general public and leading decision-makers more aware of the importance of conservation and biodiversity. It is also active in restoring the species of the Ganges, thanks to the founding of a scientific centre specialised in the study of the aquatic life of the Ganges, implementing programmes to reintroduce threatened species, the dissemination of the information gathered to the general public, etc.

Governance and international cooperation

Projects supported by funding bodies

The mission of the National Ganga River Basin Project (2011-2019), supported by the World Bank, is to assist the Indian government to enhance and develop the river.

The project can be broken down into two main objectives:

- Support the development of institutions functioning at central and State level, the action programmes of the stakeholders and means of communication; organise technical assistance for environmental regulation agents and a water quality control system. This part of the project amounts to \$200 million.
- Implement a series of investments in infrastructures to reduce pollution at source at the priority sites of the Ganges. This part of the project amounts to \$800 million, distributed in four sectors:

Public administration - Water, drainage and flood protection	30%
Collecting and transporting wastewater	27%
Drainage	22%
Solid waste management	21%

Thus the total cost of the project amounts to \$1.55 billion, of which \$1 billion is invested by the World Bank.

There are many international initiatives in favour of the Ganges, such as the project of the International Cooperation Agency of Japan, which carried out a study of water quality in the Ganges from 2003 to 2005.

The South Asia Water Initiative (partnership between the World Bank Group and the British, Australian and Norwegian governments) implemented long-term projects to exploit the Ganges basin.

What river for tomorrow?

Part of the river is clinically dead

The sacred dimension of the Ganges and the presence of densely populated cities on its banks subjects the river to severe ecological pressure. It is used for the cremation of bodies and purifications, but it also receives urban wastewater (more than three billion litres of wastewater are discharged into it every day), pollutant chemical wastes from industry and agriculture, and solid waste from the population, the carcasses of animals and whole human bodies that do not undergo cremation.

These sources of pollution, in addition to those linked to climate change, lead to the river's clinical death in certain places: no flora or fauna can survive in this hostile environment. This is the case of the **Yamuna, the Ganges' largest tributary**. Following its passage through New Delhi, the rate of oxygen in the river is zero, cancelling all life.

The **impacts on the population's health** are considerable and disastrous: in India, the main cause of infant mortality is waterborne diseases: diseases like cholera, typhoid and hepatitis A are very common in the river basin.

A resource under pressure

According to a report published by the organisation 2030 Water Resources Group in 2009, if no change occurs in water management, India will only be able to satisfy half its needs for water in 2030. Also according to the same report, the demand for water from cities, households and Indian farmers should double from now to 2030, while the needs of industry should increase fourfold.

The irregularity of the monsoons and the country's strong economic and demographic growth lead to uncontrolled withdrawals of surface water while pollution makes this water unfit for consumption.

In the absence of adapted infrastructures, and given the dire state of environmental governance and the insufficiency of technical expertise to manage these extreme environmental constraints, **the quality of the water has rapidly deteriorated over the last four decades. Environmental awareness should be brought to the fore, at the same level as economic development.**

Furthermore, regarding its governance, the Ganges suffers from a tangle of responsibilities between the different levels of national, regional and municipal government. Conflicts between Indian States are on the rise, linked to the unfair sharing of rivers for irrigation. **Climate change, the demographic explosion and the modernisation of India will all further complicate these problems of governance.**

What river for tomorrow?

Hydroelectricity: geopolitical challenges

The issue of water sharing has given rise to many conflicts between India and its neighbours, and the number is set to increase with climate change about to cause considerable hydric stress. The Farakka dam, which has already been a bone of contention with Bangladesh, should be redeveloped more fairly if climatic conditions worsen. This Bangladeshi combat does not appear to be completely lost, since India might find an advantage in drawing closer to its neighbours in view to strengthening its geopolitical position versus China.

The future of the Sundarbans region

The Sundarbans region is part of the Ganges delta shared between India and Bangladesh, and harbours a wealth of biodiversity (mangrove forests, 260 species of birds, the last Bengal tigers and many other endangered species). This region, listed as a UNESCO World Heritage Site since 1987 and a RAMSAR site (wetland of international importance) since 1992, is confronted by numerous threats: demographic pressure, drying and salinization, rising sea level due to climate change. The estimated rise in the sea level in the Bay of Bengal is more than 3 mm in comparison to 2 mm in the other oceans.

The disappearance of this land will cause major displacements of the population, estimated to reach 30,000 families from now to 2020.