

Ominous waters

By Claude Arpi for FNVA

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Speaking about the water situation in China, Xinhua recently mentioned a 'domino effect on water supply'. The Chinese news agency was commenting on a comprehensive study into China's glacial ice which shows that an average a 244 sq km of glaciers disappears every year. Xinhua explained: "China's glaciers have retreated by 18% over the past half century". The Chinese glaciologists "had warned of 'chain effects' that could have an impact on water supplies in the country's western regions" ...and one should add, on India.

The figures come from the survey of China's glaciers conducted by the Chinese Academy of Sciences, which found that, "China had 48,571 glaciers in its western provinces, including Xinjiang, the Tibetan region as well as Qinghai, Sichuan and Gansu provinces [also part of the Tibetan plateau]."

Most of the glaciers are receding fast. This is not encouraging news.

Despite the impending shortage of water in the long-term, China nevertheless continues to dam rivers originating from the Third Pole (as Tibet is known in environmental parlance).

The strategic importance of the Tibetan rivers

The waters of Tibet are vital for Asia as most of the rivers originate from the Tibetan plateau, the principal watershed in Asia and flow downstream to Asian countries.

Rivers such as the Brahmaputra (or Siang in Arunachal Pradesh and Yarlung Tsangpo in Tibet), the Yangtze, the Mekong and the Huang Ho (or Yellow River) have their headwaters on the Tibetan Plateau. The other major rivers which originate in Tibet are the Salween, the Irrawaddi, the Arun, the Karnali, the Sutlej and the Indus. About 90% of their runoff flows downstream to China, India, Bangladesh, Nepal, Pakistan, Thailand, Myanmar, Laos, Cambodia and Vietnam; eleven countries are benefiting; these rivers are said to bring fresh water to over 85 percent of Asia's population, approximately 50 percent of the world's population.

It is roughly estimated that 10-20% of the Himalayan region is covered by glacial ice while an additional area ranging from 30-40% has seasonal snow cover.

The perennial flow of the rivers originating from these glaciers also result in a stable source of water to regions which are usually dominated by monsoon rainfalls. Consequently, the Tibetan rivers, independent of seasonal precipitation patterns, are an important factor in sustaining hydrological regimes, particularly in South Asia.

Water is perhaps the most serious issue facing the Communist leadership today. One of the solutions touted to 'save China' is to divert the water from the South to North. The mega water diversion projects are mentioned in *The Draft Outline of the Tenth Five-year Plan for National Economic and Social Development (2001 2005)*.

According to the Plan, waters will be diverted from the South via three channels in the eastern, central and western regions, respectively. The western route draws water to the upper reaches of the Tibetan rivers to solve water shortage in the north-western regions. It is where the waters of Tibet are vital.

One can understand that whatever happens to these rivers, particularly the Yarlung Tsangpo and the Indus is vital to India.

The Zangmu Hydropower Plant

In November, the Indian press reverberated with anxiety at the launching of the first unit of the run-of-river (ROR) hydropower plant at Zangmu on the Yarlung Tsangpo. Xinhua announced: "Tibet's largest hydropower station became partly operational, harnessing the rich water resources of the Yarlung Zangbo [Tsangpo] River to develop the electricity-strapped region."

The power plant (costing 1.5 billion U.S. dollars) is located at 3,300 meters above sea level; once completed, it will have a height of 116 metres for a length of 390 meters; it is 19 meters wide at the top and 76 meters at the bottom.

Xinhua says that "five other generating units are due for completion no later than next year", adding "the huge project, which straddles the middle reaches of the roaring Yarlung Tsangpo River, will have a total installed capacity of 510,000 kilowatts [510 MWs] upon completion. It is designed to generate 2.5 billion kilowatt hours of electricity annually."

According to Chinese official statistics, Tibet's per capita electricity consumption in 2013 was slightly over 1,000 kilowatt hours, less than one third of the national average.

One question immediately comes to mind: will the entire production of electricity of the 5 or 6 planned dams on the Yarlung Tsangpo be used on the Tibetan plateau or will it be sent to the mainland?

The official news agency is obviously mum on the subject, though Liu Xiaoming, an official of the State Grid's Tibet Electric Power Co affirms: "The hydropower station will solve Tibet's power shortage, especially in the winter."

Tibet's Development and Reform Commission (local Planning Commission) asserts that "the region's installed power generating capacity was 1.48 million kilowatts. Tibet has annual water resources totaling 448.2 billion cubic meters, with potential water power resources reaching 201.36 million kilowatts. It holds nearly 30 percent of the nation's total water power resources."

It is a boon or a curse for the Roof of the World?

A Cascade of dams

If Zangmu, once completed, was the only hydro-power plant on the Yarlung Tsangpo, it may be acceptable to India, but the problem is that China plans a cascade of five other dams along the river at Jiacha, Lengda, Zhongda, Jiexu and Langchen.

In April 2013, the Indian Inter-Ministerial Expert Group (IMEG) on Brahmaputra stated: "Jiacha could be the next hydroelectric project on the mainstream of Brahmaputra River. It may be followed by hydroelectric projects at Lengda, Zhongda, Langzhen, where dam related peripheral infrastructural activity (including 4 new bridges) has gathered speed."

More frightening is the possibility of a mega-dam in the Great Bend of the Yarlung Tsangpo, the IMEG warned: "China is carrying out series of cascading ROR projects in the middle reaches of Brahmaputra, the same may be replicated in the Great Bend Area as a viable alternative to a single mega project".

For China, it probably makes sense, technically and economically.

The opening of the tunnel to Metok, near the Indian border, in October 2013 is a piece of the gigantic puzzle; it may have been the turning point for the proposed mega project.

What can India do?

To start with, India should carefully and scientifically monitor, not only the flow of the Siang, but also the quality of the waters, when it enters Upper Siang.

Article 12 of the 'Implementation Plan' signed in June 2014 between India and China for providing 'Hydrological Information of the Yarlung Tsangpo/ Brahmaputra River in Flood Season by China to India' says that "after mutual consultation through diplomatic channels, the parties may dispatch hydrological experts to each other's country to conduct study tour".

Why doesn't Delhi ask Beijing's permission to send a team of hydrological experts to visit the area and get some clarity on what is going on?

As a lower riparian country, India is rightly worried and though Delhi has often taken up the issue with Beijing, but nothing has clarified as China has repeatedly assured India that no large project is on the cards, only 'some' run-of-the-river (ROR) hydropower plants.

What about the environment?

ROR plants may not be as damaging for the environment as large dams with extended reservoirs, since the latter usually submerge entire valleys and trigger large scale displacement of people; however, the ROR plants are not without danger for the environment.

China says that it is aware of the issues.

Xinhua affirms: "A total of 320 million yuan has been invested in the Zangmu hydroplant project to build environmental friendly facilities such as sewage treatment plants, garbage recycling stations and fish protection stations."

If it is true, China should let Indian environmentalists visit the site and study the state of the river before the diversion and after the power station.

According to Bo Lunzhang, an official of the regional environmental protection bureau, "The Yarlung Tsangpo River requires much higher protection standard than any other rivers in China, and the experience of Zangmu station may be learnt by other hydropower projects in Tibet."

China may learn from the Zangmu experience, but ROR plants elsewhere in the world, particularly in India, have had devastating consequences for the environment (particularly for the aquatic life of the river).

Once again India should monitor the waters entering Arunachal Pradesh, once the dams are constructed one by one.

A Comparison with the ROR Plants in Uttarakhand

It is interesting to look at what has happened in Uttarakhand in June 2013. First the Government of India declared that it was just seasonal floods, but in December 2014, *The Indian Express* reported the case of the RORs in Uttarakhand for which clearance has been pending: "In a curious submission, the Centre told the Supreme Court that it turned 'wiser' about the adverse impact of hydropower projects on the environment following the 2013 Uttarakhand floods, which killed hundreds and left thousands homeless." The government's counsel told the Supreme Court bench: "We are learning every day. We became wiser about the cumulative impact of the projects after the Uttarakhand tragedy. We did not know about several aspects earlier. We are in the process of knowing."

Then the bench asked the counsel why they gave clearances when they had no idea about the effects of mushrooming projects in the state, and what had prevented them from completing their study till date: "You are still not taking a stand if you want to scrap all the projects since they are bad for environment. On one hand, you gave clearances for these projects and on the other, you say they adversely impact environment" asked the judges.

Earlier the bench had slammed the environment ministry for failing to file a comprehensive project-wise environment and ecological impact report on all the pending 24 hydroelectric power projects on Alaknanda and Bhagirath river basins in Uttarakhand. The Supreme Court then hinted at ordering a further report giving details about how each of the hydroproject contributed to the environmental degradation in Uttarakhand in 2013.

Though Lobsang Gyaltsen, the head of the Tibetan government declared: "The [Tibet] region has strived to protect the environment throughout construction. The hydroplant is a good example of clean energy development," ROR plants are not 'clean'.

Mr. Gyaltsen is probably not aware that ROR plants are not today considered 'clean' anymore, as the life of the river between the 'intake' of the diversion and the power station downstream gets badly affected.

The case of Uttarakhand is an example to ponder for the Yarlung Tsangpo.

The Yarlung Tsangpo

It is necessary to come back on the Yarlung Tsangpo which has an immense bearing on the life of hundreds of millions in the sub-continent.

It is the largest river on the Tibetan plateau, originating from a glacier near Mt Kailash. It is considered to be the highest river on earth with an average altitude of 4,000 meters. It runs 2,057 kilometers in Tibet before flowing into India, where it becomes the Brahmaputra. One of its interesting characteristics is the sharp U turn it takes at the proximity of Mt. Namcha Barwa (7,782 meters) near the Indian border.

Like the Nile in Egypt, the Yarlung Tsangpo has fed the Tibetan civilization which flourished along its valleys, particularly in Central Tibet. The two larger tributaries of the Tsangpo are the Kyichu (or Lhasa River) and the Nyangchu.

The Yarlung Tsangpo enters in India in Siang district of Arunachal Pradesh. When it penetrates Assam, it is joined by two other rivers (the Dihang and Lohit). Entering Bangladesh, the river unites with the Ganga and is known as the Padma, before becoming the Meghna-Brahmaputra after merging with the river Meghna. Finally it divides into hundreds of channels to form a vast delta which flows into the Bay of Bengal.

In Tibet, just before entering India, the Tsangpo takes a sharp U turn known as the Great Bend. In May 1994, Xinhua News Agency already noted: "Chinese geologists claim that a remote Tibetan canyon is the world's largest, bigger and deeper than the Grand Canyon. The Yarlung Zangbo Canyon, in the vast Himalayan range that encircles China, averages 3.1 miles (5 km) in depth and extends 198 miles (317 km) in length."¹

The Grand Canyon in Arizona is much smaller in comparison.

Some Historical Facts

For years, rumors have been circulating about (1) the diversion of the Yarlung Tsangpo (2) the construction of the world's largest hydroelectric plant that would generate twice the electricity produced by Three Gorges Dam. According to the latest information available, if China decides to go for it, the hydroelectric plant on the Great Bend of Yarlung Tsangpo would dwarf all other projects with a planned capacity of 38,000 Megawatts.

Regarding the diversion of the waters of the Yarlung Tsangpo, it has been envisaged by some Chinese engineers to send waters northward across hundreds of kilometers of mountainous regions to China's north-western provinces of Xinjiang and Gansu.

A project which got a lot of media coverage is the Shuotian Canal, sometimes associated to the Great Western Route. The project is the brainchild of Guo Kai, a retired PLA general and the secretary-general of the Shuotian Canal Preparatory Committee.

Guo Kai's life mission is to save China with Tibet's waters. He calculated that if waters from the Salween, the Mekong, the Yangtze, the Yalong and the Dadu (last two are Yangtze's tributaries) were diverted and directed to the Ngawa Prefecture of Amdo Province (Qinghai), the problem for the recurrent water shortage in north and northwest China could be solved. Let us not forget that today, the Yellow River is dry for more than 250 days in a year.

Guo not only worked closely with experts from the Ministry of Water Resources and the Chinese Academy of Sciences (CAS), but he also made several on-the-spot investigations and surveys, before coming up with the details of his pharaonic scheme.

¹ *Tibet World News* (May 4, 1994), *China Claims Tibetan Canyon is Largest*.

According to him, the 'Great Western Route' diversion could solve the water shortage in north China, bring drinkable water to Tanjing and even counter the desertification facing the north-northwest provinces. It is why it is considered so vital to the country's strategic security.

The day after President Hu Jintao left India after his State visit in November 2006, the Chinese Minister for Water Resources, Wang Shucheng, declared that the proposal was "unnecessary, unfeasible and unscientific." He added that it had no government backing: "There is no need for such dramatic and unscientific projects." He however admitted: "There may be some retired officials that support the plan, but they're not the experts advising the government." It has been the position of the Chinese Government since then.

A New Diversion Scheme

Though always denied by the Chinese government, the diversion of the Brahmaputra is still very much on the drawing boards of some Chinese engineers.

On February 17, 2013, a new scheme appeared on the website of the Yellow River Conservancy Commission² of the Chinese Ministry of Water Resources. It describes in detail a pharaonic project known as the Yellow River Waterway Corridor of the Great Western Water Diversion.

It mentions a preliminary feasibility study prepared by officials of the Ministry of Water Resources. The idea of the Chinese engineers is to divert 150 billion cubic meters of water and pump these waters into the drying Yellow River to irrigate northern China. A giant reservoir near the Yellow River 'Maqu' Great Bend would regulate the flow of the river.

The first great bend of the Yellow River is located in the Maqu County, in the southwestern part of the Gannan Tibetan Autonomous Prefecture. 'Maqu' or 'Ma chu' ('River of the Peacock' in Tibetan) is the local name of the Yellow River. The purported Water Diversion Project would take waters from the Yarlung Tsangpo to from the Nujiang (Salween), the Lancang (Mekong) and Jinsha (Yangtze), Yalong (Yalung) and Dadu rivers and before joining the upper reaches of the Yellow River. The website of the Chinese ministry gives many details.

- 50 billion cubic meters would be diverted from the Yarlung Tsangpo/Brahmaputra (about 30% of the average annual runoff of 165.4 billion cubic meters)
- 24 billion cubic meters from the Salween (35% of the average annual runoff of 70 billion cubic meters)
- 26 billion cubic meters from the Mekong (some 35% of the average annual runoff of 74 billion cubic meters)
- 28 billion cubic meters from the Yangzi (20% of an average annual runoff of 143 billion cubic meters)
- 12 billion cubic meters from the Yalung (20% of the average annual runoff of 60.4 billion cubic meters)
- 10 billion cubic meters from the Dabu (20% of of the annual runoff of 50 billion cubic meters)

It could cross the Yellow River to reach the Yellow River Ma Chu Great Bend Reservoir where the waters could be stored.

How feasible is it to realize such a mega project? It is impossible to say.

But one can well imagine what would happen to lower riparian States if this scheme is implemented.

The first leg, before the transfer reaches the Salween, seems impossible, but the Chinese engineers like to think of the 'impossible'.

The fact remains that China is still working on a feasibility study of this megalomaniac project; it has not been shelved as Indian officials were told.

The problem is that China is thirsty; China needs water very badly.

Intensive infrastructure development in the mega dam area

The Metok road

Having followed the events on the Yarlung Tsangpo for the past 15 years, at the turn of the 21st century, it seemed practically impossible to reach the Great Bend of the river. I had then written: "For the Tibetans, it is one of the most pristine regions of their country. They consider the area around the Bend as the home of the Goddess Dorjee Pagmo³, Tibet's Protecting Deity. Many believe that this place, locally known as Pemakö is the sacred realm often referred to in their scriptures: the last hidden Shangrila."

Today, the situation has drastically changed. The infrastructure in this area (and leading to this area) has developed at an neck-breaking pace.

When Wen Jiabao, the then Chinese Premier landed in Delhi in December 2010, Xinhua dropped a bombshell: "The tunnel of highway linking Tibet's Metok completed". As often, the Indian media did not notice the 'bomb'! The new tunnel however, heralded one of the most important strategic changes for the defence of the Indian north-eastern border ...and for the dam.

² See: http://www.yellowriver.gov.cn/hdpt/wypl/201302/t20130217_128113.html

³ In English: *The Diamond Sow*.

The official Chinese news agency then reported: "Construction of the tunnel on a highway that links Tibet's Metok County to the outside world was completed when explosives blasted through the final section. The construction crew announced the success of the blast, which took 152 kg of explosives, and workers from both ends met."

Considering that Chinese engineers and contractors are several times faster than their Indian counterparts to build roads (or dig tunnels), the enormity of the project was obvious; construction workers had taken some two years to complete the construction of the 3,310-meter Galongla tunnel, built at an altitude of 3,750 meters. It was the most difficult section of the highway which was to link Metok County to the mainland (and allow equipment and workers to come in a much shorter time).

In 2010, *Xinhua* explained that snow and rain used to render the mountain roads impassable for nine months of the year, and the trek to cross the Galongla pass could take 10 hours or more: "The new road will dramatically shorten the time as the journey through the tunnel will take just half an hour."

At that time, some 90 km of highway remained to be built, which was done in 2013. Metok was indeed symbolic. With a population of just 11,000, it was not only China's last county without a highway, but the road was a crucial link to the area bordering the Upper Siang district of Arunachal Pradesh.

On October 31, 2014, *China Tibet Online* reported that the 117km Metok Highway had been opened to traffic. CNTV affirmed that the people in Metok country can now reach the highway linking their remote place to the nearby Bomi County by cars or buses; if the weather conditions are good, the journey takes hardly seven to eight hours. The Chinese correspondent added: "Getting out of Metok used to be very dangerous, involving climbing two snow mountains 4,000 meters above sea level." When the Bomi-Metok road joins the National Highway No 318 near Zhamog township, it has already crossed six rivers.

The path to the Great Bend is now opened.

Lhasa-Nyingchi Railway

Then, on March 21, 2014, *ChinaTibetnews.com* announced: "Lhasa-Nyingchi Railway is expected to start construction within 2014 soon after the completion of Lhasa-Shigatse Railway construction that is scheduled in September⁴." For the first time, details were given about the strategic line: "Running 433 kilometers and covering 34 stations including nine major ones, Lhasa-Nyingchi Railway will build 402-kilometer new lines, which is designed to have a speed of 160 kilometer per hour with a declared investment of 5.4 billion US dollars."

Yang Yulin, a deputy director of railway office of Tibet explained that the Lhasa-Nyingchi Railway would start from the Shelong Station on the Lhasa-Shigatse Railway and then cross the Yarlung Tsangpo River (Brahmaputra) and heads towards the Lhoka Prefecture to finally arrive in Nyingchi. The article speaks of abundant natural resources; it probably refers to the rich mineral resources of Tibet which are wildly exploited, but also to the power generation potential of the Great Bend of the Yarlung Tsangpo/Brahmaputra.

It means that everything is slowly coming into place to make the mega project feasible.

The Xinhua article also announced a future railway network covering Chengdu-Nyingchi Railway, Yunnan-Tibet Railway, Qinghai-Tibet Railway and Lhasa-Shigatse Railway. China plans to complete the loop, Xining-Lhasa-Shigatse-Nyingchi-Chengdu-Kunming, to promote tourism and "harness Tibet's rich natural resources", which probably includes waters.

Lhasa-Nyingchi Highway

Apart from the railway lines, the roads are also developed.

On June 5, 2014, *China Tibet Online* reported the progress of the construction of the Lhasa-Nyingchi Highway. Quoting *tibetnews.com*, the Chinese website said: "As a main trunk connecting a dozen of key highways in Tibet, Lhasa-Nyingchi [Nyingtri] Highway bears great significance in building a flexible traffic network covering China's border provinces as well as upgrading China's national defense capacity."

It is interesting that the 'defence capacity' is mentioned; this is usually not the case. It is probably an answer to India's determination to build roads to the border areas in Arunachal Pradesh.

Upon completion it will save at least 2 hours to travel from Lhasa to Nyingtri. China National Highway 318 (known as G318) which runs from Shanghai to Zhangmu on the China-Nepal border, passes through Taktse County. G318 is the longest National Highway in China (5,476 kilometres). From Lhasa to Zhangmu, also known as the Friendship Highway, it connects China to 'friendly' Nepal (via the 115 km long Araniko Highway to Kathmandu).

Once again, this will improve the transportation of goods and people to the Great Bend.

The Sichuan-Tibet Railway line

⁴ It was done on August 15.

In December 2014, Xinhua announced the construction of a new railway line on the Tibetan plateau: "Construction begins on Chengdu-Ya'an section of Sichuan-Tibet railway," titled Xinhua. The Chinese news agency said that the work has begun on the rail line from Chengdu, capital of southwest Sichuan Province to Ya'an, a city located west of the capital. Xinhua explained: "The 42-km Chengdu-Ya'an section is an important part of the Sichuan-Tibet railway, and will have a journey time of about eight hours from Chengdu to Lhasa, capitals of Sichuan and Tibet," adding the usual rationale: "Transport is a bottleneck for tourism in Tibet and currently, there is no direct railway service between the two cities. After completion, the Sichuan-Tibet railway will connect with the Qinghai-Tibet railway."

Once the first segment is completed, the next stage will probably be Ya'an-Dartsedo (or Kangding), the seat of Garze Tibetan Autonomous Prefecture in western Sichuan. The town, which is administratively part of Kangding County, has a population of more than 100,000 inhabitants.

The line will then continue towards Nyingtri.

The New Power Grid

Another interesting event is the launching of a new electricity grid linking the Tibet Autonomous Region (TAR) to Sichuan Province. The ceremony was presided over by Yu Zhengsheng, the member of the Standing Committee of the Politburo (by video-conferencing from Beijing).

Xinhua reported that the 1.08 billion U.S. dollar project, linking Chamdo in the TAR to Garze in Sichuan Province, aims at "putting an end to the electricity shortages of the 500,000 residents of the Chamdo region and ease power strain in Tibet as a whole".

Why does Tibet require so much electricity, if Tibet produces its own?

Could this investment be used to build the mega-dam? There is no answer as yet to the question.

The news agency reported: "The project will cost over 6.6 billion yuan (\$1.08 billion), and should be completed in the first half of 2015, solving the power shortage and transmission problems in parts of Tibet. More than 1,521 kilometers of lines will connect Qamdo [Chamdo] prefecture in Tibet and the Tibetan autonomous prefecture of Garze in Sichuan, with four substations."

It further elaborated: "The project covers some very harsh terrain and work conditions are difficult with an average altitude of 3,850 meters. Shu Yinbiao, general manager of the State Grid, said that environmental protection and safe working conditions are vital to the project's success. Medical services for construction workers include 26 health centers and four hyperbaric oxygen chambers." This could be linked to a future mega-project.

A Chinese Scientist on the Dams

The Chinese geologist Yang Yong often goes to Tibet for his work. He recently wrote: "Driving into Tibet is already an increasingly popular choice for tourists – the pristine scenery is some of the best anywhere in the world. But the views are now spoiled by dense networks of power lines and pylons. And as the power grid develops these eyesores will spread to every corner of the Qinghai-Tibet Plateau."

Yang Yong mentions a new angle to the issue, which is usually not considered: "Most of the hydroelectric plants I have studied at an altitude of 3,500 metres or more in Sichuan, Qinghai and Tibet suffer from ice blockages during the five months or so of freezing temperatures every year, meaning little or no electricity is generated. The cold weather also damages equipment and greatly increases maintenance costs."

Yang Yong's conclusion is that Tibet is not suited to large-scale hydropower development. For this, the scientist gives two reasons. First, the Tibetan Plateau is mostly fed by glacier meltwater, not by precipitation: "This means flows are highly seasonal and changeable and so power supply is unstable and the frozen winters and iced-up rivers can damage generating equipment."

The second rationale is that due to the topography of the high mountains and the geological conditions: "creating reservoirs to regulate water flow is problematic. This reduces the ability of dams to regulate power generation and respond to higher demand. These two factors make development of hydropower in Tibet more technically and economically challenging."

Till now, the Chinese government has always spoken of ROR projects, which means dams without reservoirs. The RORs make regulation more difficult.

Yang Yong, the outspoken and courageous scientist argues that the plateau "should be developed for its environment, rather than for its hydropower, and the region itself does not need large amounts of power. Wind and solar power and other complementary sources of electricity should be used to supply the region's own needs".

Another argument, which is also valid for the Indian Himalayas, is that Tibet is a world-class tourist destination, once grid lines are erected everywhere, Tibet will lose its charm. Yang suggests small-scale domestic hydropower generation as well as wind and solar power, with smart power grids: "hydropower should not be relied upon to supply Tibet with power, much less for exports. The costs and dangers are too great."

Another point made by Yang Yong is that the Qinghai-Tibet Plateau is one of the world's most seismically active regions. In India, the August 15, 1950 tremor is still remembered; the then NEFA and Assam witnessed the consequences of one of the worst earthquakes of the century, which had its epicenter near Rima, north of the McMahon line (now Anjaw district of Arunachal).

The geologist concludes: "The effects of climate change on hydropower development are unknown. Large hydroelectric plants may also exacerbate climate change – most will be built in arid valleys and so the resulting reservoirs will cause local climate change, increasing the overall complexity of the problem."

Will China listen to its own scientists or will the thirst for water prevail? Only the future will tell us.

Slow Progress on the Diplomatic Front

On the diplomatic front, progress is rather slow. In October 2013, during the visit of Dr. Manmohan Singh to China, a Memorandum of Understanding on Strengthening Cooperation on Trans-border Rivers was signed by the Chinese and Indian Ministries of Water Resources. The Memorandum says: "The Chinese side agreed to extend the data provision period of the Yaluzangbu/Brahmaputra River [Yarlung Tsangpo] which was agreed upon in the MOU between the Ministry of Water Resources, the People's Republic of China and the Ministry of Water Resources, the Republic of India upon Provision of Hydrological Information of the Yaluzangbu/Brahmaputra River in Flood Season by China to India of May 2013 from 2014, that is to start from May 15th instead of June 1st to October 15th of the relevant year. The two sides shall implement this in accordance with related Implementation Plan. The Indian side expressed appreciation to the Chinese side in this regard."

This is not much.

As mentioned earlier, an 'Implementation Plan' was signed in June 2014 between Indian and China for providing 'Hydrological Information of the Yarlung Tsangpo/ Brahmaputra River in Flood Season by China to India'. The attitude of China remains minimalist on the issue.

One can only hope that further scientific studies will be conducted, whether it is on the Chinese or the Indian sides of the Himalayan watershed before wrong decisions are taken.

But it is perhaps too much to ask.