

The Yangtze River and the Three Gorges Dam

By Daniel Fisher

September 10, 2010

Holland Professional Club

- Overview:
 - The Yangtze River originates in the glacial marshlands of the 20,000 foot high Tibetan plateau. It runs 3,900 mile thru central and eastern China eventually discharging into the East China Sea near Shanghai. Part of its trek takes it thru the beautiful Three Gorges situated between Fengjie and Yi Chang, about 1,000 miles upstream from Shanghai.
 - In the year 2000, a friend of mine, traveled by boat thru the three gorges and brought back information regarding the construction of the largest dam in the world being built on the Yangtze River.
 - After reading thru the materials, I became fascinated with this project and began doing my own research. And the more I learned, the deeper my interest became. I suppose part of that interest came because I'm an engineer and studied the design of large structures like building and bridges. From an engineering point of view, it's an amazing project. Also, I had spent a lot of time in China and had learned to love the country. And partly because the project was so controversial with interesting and diverse points of view provided by both the Chinese government, who was building the dam, and many people both in China and internationally who were opposed to it.
 - So, in 2003, I got on a boat in Chongqing and headed downstream on the Yangtze River passing small towns and cites that were being dismantled, passing thru the stunning beauty of the Three Gorges, and then arriving at the dam site and passing thru its mighty ship locks. After a brief stop taking photos from "tourist hill", the boat proceeded downstream to Yi Chang where we disembarked. I immediately hired a taxi and headed back to the dam area to get a closer look. At that time, the dam was at a very interesting stage of its construction. Although they had completed the spillway, the Left Power Generation Station and the Ship Locks, and began to raise the water level to 135 meters, they were also just starting the foundations of the Right Power Station behind a 400+ foot temporary wall holding back the force of the Yangtze River upstream. It was pretty unbelievable sight.

- Two weeks ago, I hopped on a plane from Shanghai to Wuhan, then traveled 4 - 5 hours by car to the Dam Site. A good friend of mine, arranged for me to get special access to the Dam. Previously, in 2005, I got special access to the largest dam on the Yellow river in areas the tourists couldn't go. Since that time, I've been suggesting to use whatever connections or contacts they could find to get me special access to Three Gorges Dam. My friend finally delivered.
- As I walk you thru this project, just a couple things to note. First, this is a very controversial project and I intend to present both points of view, hopefully without prejudice.
- Second, I will be showing you many photos so you can get a clear image of what this project is about. Any photos that have a yellow smiley face on it came from my camera.
- Here is a story of the Yangtze River; it's people, and China's Three Gorges Project. I'm going to talk about:
 - The Yangtze River
 - Why build a dam. The governments perspective
 - The Three Gorges Dam. A guided tour
 - The issues and controversy
- History
 - Dr. Sun Yat Sen, forerunner of China's democratic revolution, first proposed the construction of the dam in the three gorges back in 1919. In an article written in both English and Chinese, he illustrated the benefits of this project in terms of power generation and navigation.
 - Since 1954, Chinese and foreign scientists and engineers have devoted themselves to the planning, design and consulting work on the project.
 - In April 1992, the National People's Congress approved the construction of the Three Gorges dam on the Yangtze River.
- The Yangtze River:
 - The Yangtze River runs thru the heart of China. Its waters start in the Himalayan Mountains and run 3900 miles to the East China Sea. It is the third longest river in the world next to the Amazon and the Nile. It is also the third largest river in terms of annual water runoff, next to the Nile and Congo Rivers. The Yangtze River watershed is inhabited by about 400 million people, greater than the population of the United States and about 1/3 the population of China. The river

has a drainage area of 1.8 million square kilometers (km), accounting for 18.8 percent of China's territory. It is one of the most sediment-filled rivers on earth.

- Each year, the waters from the glacial now melt from the high mountains South West of Chongqing, flow swiftly thru the 200 km stretch of the beautiful three gorges. They gather strength from the hundreds of tributaries that rush down from the mountains to meet the Yangtze as it flows thru the narrow and towering limestone canyons.
- The Three Gorges include the Qutang Gorge, the Wu Gorge, and the Xiling Gorge. The Gorges are some of the most beautiful scenery on the River and one of the 10 most famous scenic spots and historical sites in China.
- The Yangtze River also known as Chang Jiang (Long River) was critical to the cultural origins of China. Human activity has been found in the Three Gorges area from tens of thousands of years ago. The river has served as a main transmission belt for products and people, with 3,600 rivers open for navigation in its mainstream and its branches for 44,000 miles.
- It's a place of ancient civilization and for thousands of years trackers have pulled boats upstream in the turbulent waters of the Yangtze and up thru the gorges.
- For centuries, the magnificent Three Gorges area has inspired literary men and women, poets and artists. Their work has been handed down from generation to generation.
- The fertile Yangtze basin, including the great delta region formed by the sediment from the Yangtze River, produces 40 percent of China's grain, 33 percent of its cotton, 48 percent of its freshwater fish, and 40 percent of the total industrial output of the country.
- Along the banks of the Yangtze are situated some of China's major industrial cities, Chongqing, Wuhan, Nanjing, and Shanghai.

So why build a dam on the Yangtze River? Why build a dam in the midst of the beautiful three gorges?

Government Perspective:

- **Flood Control**
 - The primary reason for the construction of the TGD Dam is for flood control.
 - From the beginning of recorded time, the Yangtze River has been the cause of great destruction and loss of life. During the summer, flood waters rush down from the mountains in the west, through the gorges, overrunning the fields and plains and towns on the middle and lower

reaches, and wreaking havoc in the lives of the millions of people inhabiting the region.

- During the 2,200 years, from the beginning of the Han Dynasty to the end of the Qing Dynasty in 1911, there have been 214 floods, an average of one every 10 years.
 - In the last century, there were five severe floods. The great flood in 1931, took the lives of 145,000 people, inundated an area the size of New York State, submerged more than 3 million hectares of farmland, and destroyed 108 million houses.
 - A flood in 1935 killed 142,000 people.
 - A 1954 flood inundated 48 million hectares of farmland, affected 18 million people, and claimed 30,000 lives. An additional 19 million people suffered from flood damage.
 - After the construction of the dam was approved in 1992, a major flood in 1996 was followed by an even greater one in 1998, which led to over 4,000 fatalities. In that flood, there were more than 5 million houses destroyed and 21.8 million hectares of farmland submerged. The total economic cost of the 1998 flood for China was \$30 billion.
 - Ironically, as the Yangtze basin continues its rapid development, the potential loss of life and property increases.

 - As the bulk of the floodwaters accumulate in the upper reaches of the Yangtze, which usually accounts for 60 to 80 percent of the total volume of the river upstream of Yichang, controlling the flow of the Yangtze in the gorges would significantly reduce the danger of flooding in the lower plains region.
- Power
 - The second key reason to build the Dam is Power. Clean Power.
 - China's is probably the country in the world with the greatest hydropower potential, and estimated 378 GW. Only about 10% of this potential has been developed.
 - The dam will generate power to help keep pace with China's economic growth. It is estimated that China's 1990 power capacity of 130 mw will grow to 580 mw by the year 2015.
 - From a pollution point of view, the Three Gorges Dam's annual power output is equivalent to burning 50 million tons of coal or burning 25 million tons of crude oil.
 - This will effectively cut
 - 100 million tons of carbon dioxide,
 - up to 2 million tons of sulfur dioxide,
 - 10,000 tons of carbon monoxide,
 - 370,000 tons of nitrogen oxide
 - 150,000 tons of dust from the atmosphere

- So, not only will it generate power to support the economic growth, it will do it in a way that will reduce pollution in a country with already severe pollution issues.
- **Navigation**
 - Another important benefit of building the dam is improved navigation on the Yangtze River. The 660 km long stretch of waterway from Yi Chang to Chongqing will be greatly improved with the TGD reservoir.
 - Before the dam, ships had to navigate in areas of rapids and treacherous twists and turns as well as low water levels during dry seasons. The dam will allow vessels up to 10,000 tons to travel 1,500 miles from Shanghai to Chongqing, opening up markets in the Central China Yangtze watershed.
 - The annual one way navigation capacity will increase from 10 million tons to 50 million tons and decrease navigation cost by about 35%. This will bring great industrial development to Central and Western China, increasing both employment and standard of living.
- **Respect**
 - Last but not least, comes the issue of “Respect”. The Three Gorges Dam has become a symbol of unity and strength for the ruling communist party of the Peoples Republic of China.
 - “the damming of the Yangtse River is of great political and economic significance ... It proves to the whole world the Chinese people’s ability in building the world’s first rate hydroelectric project.” says Li Peng,
 - Many high ranking Chinese officials expect the dam to become a potent symbol of their nation's vitality in the 21st century and the new millennium.

Talk from Power Point: The Dam

Issues Associated with the Dam:

The day after the exciting and educational day at the Three Gorges Dam, my good friend, Yu Quan and I, headed up into the mountains for some white water rafting. It was about 1.5 hours of the most beautiful and treacherous white water rafting I have ever done. And the company who owned and managed the rafting activities was The Three Gorges Project Corporation. The same group that manages the dam.

Later, as I reflected on the day and the excitement of riding the rapids, I realized a sort of contradiction in time and space. The river, rapids the scenery was absolutely exciting and amazing. I had a great time. But quite frankly, I also felt lucky to be

alive and as well offended by the way things were managed. The Three Gorges Project Corporation had taken an amazing rafting river opportunity and sent people down this river without the right equipment, without proper training, and with little regard to the safety of the people on the river or protection of the environment around it. This operation would never have functioned in such a way anywhere else in the world.

Did this contradiction regarding the beauty of the rafting and the total disregard for safety and environment at all parallel the amazing construction of the dam with its social, economic and environmental impacts? As one looks beyond the concrete, what can be seen?

I'd like to provide a little deeper analysis of this project.

Project not universally supported in China:

When the dam was approved the National People's Congress (NPC) in 1992, almost one-third of the normally compliant NPC delegates, in what was an unprecedented display of legislative dissent, either abstained or cast opposition votes. The decision making process on the dam project has been criticized by people who have dared speak out against the Chinese government, by exiled Chinese, and by international organizations. The process had been far from democratic, and the opposition had not been able to present its views.

Dai Qing, a very outspoken opponent of the project, was jailed for 10 months for her views of the dam. If not for the fact that her father was a respected military general, her fate might have been different.

Dai Qing call the dam "the most environmentally and socially destructive project in the world." She had also called for a halt to the construction and supported the idea of a series of smaller, less disruptive dams on the tributaries of the Yangtze River. But the dam project moved forward.

Resettlement of People:

One of the key areas of opposition was the resettlement of people. To support the building of the dam and reservoir, many people had to be relocated and resettled. Estimates range from 1.4 – 1.9 million people.

People were often moved from very rich farmland along the river basin to often unknown and inhospitable territory with lower living standards and where local people resent them.

There are so many reports of corruption where government officials seized on the opportunity to take funds designated for the relocation process to fill their own

pockets leaving the people in need with little resources to pay for new homes. Many people who protested such corruption reportedly were beaten up.

As an example of people being hurt in the process, a recent report talks about several hundred families who had lost their home to the Three Gorges Dam who are now faced with losing their newly completed residences. The problem being corrupt builders and the ineptitude of local officials.

In December 2009, six hundred immigrant families jointly purchased four 12 story buildings that were already under construction and would have 30,000 SM of living space. On August 18, 2010, the local township government issued a public notice that the buildings, which are now close to completion, were illegally constructed and will be confiscated and torn down. And, all the incurred expenses and damages are to be paid for by these immigrant families alone.

But the relocations are also not complete. In July, the head of the Yangtze River Water Resources Commission cautioned the public that the dam cannot store its maximum capacity at 175 meters because 28,470 people still live on the reservoir's edge, below that level.

Additionally, it was recently reported by the China Daily that 300,000 more people will be relocated to help prevent pollution from adjacent communities contaminating the reservoir and protecting residents from seismic dangers that were not anticipated when the dam was built.

I have seen other reports that predict the total relocation will be 4 – 6 million people by the time things settle out.

Power Generation:

The dam has an installed capacity of 18,200 MW and soon to be 22,500 MW. But the dam will only achieve that output for a short period of time during the year. For about 5 months of the year, most of the 32 generators will remain idle with maybe 5 – 8 of the generators operating with a total output of around 5,000 MW, which is less than $\frac{1}{4}$ of its rated capacity.

The reason for this has to do with water flow. During the periods of high water flow in July, August, and September, the average river water flow is between 25,000 – 30,000 CMS (cubic meters per second). This is more than the requirements to power the existing 26 generators, which require a total 24,000CFM.

But in the seasons of very low water flow which include December – April, the average water flow is only about 5,000 CMS. This is only enough to power 8 of the 32 generators, and that is if the dam is filled to its maximum capacity of 175 meters creating the maximum hydraulic head. Otherwise, the number of operational generators could be reduced to as little as 5 depending on the water level.

In 2008, the dam only produced about 47% of its potential output. Based on annual water flow tables and dam specifications, I can calculate that it is only possible to achieve 65% of its potential output under the best of conditions which will likely never happen.

This is not new to the Three Gorges Dam people. They are of course fully aware of this. But as we compare the size, cost and installed power capacity and benefits of this dam to other global project or energy alternatives, this fact needs to be taken into consideration. While the installed capacity looks very impressive, it is also a little misleading.

Flood Control:

In the last six weeks, the Three Gorges Dam underwent a major test withstanding the flow of 3 major flood peaks. On August 25, the water flow hit 55,000 CMS. The dam was able to discharge water at 25,000 CMS and hold back 31,000 CMS. Holding back the water is designed to ease the downstream flood pressure.

On July 20, the flow was even greater flowing in at 70,000 CMS. This was more than the flow during the 1998 flood that killed over 4,000 people. At this time it was discharging at 40,000CMS and holding back 30,000CMS. If you remember the Yangtze River flow rate table at the dam site, the highest average month was around 30,000 CMS. So this discharge rate is even higher.

The good news is that the dam held up the pressure of significant water flow and there was no major flooding downstream like in 1998. But at the same time, it had to discharge a lot of water downstream and for some reason, did not hold back more water in the reservoir. The dam water level did not exceed about 160 meters, which is well below the maximum design level of 175 meters. As I read thru articles and news reports, some interesting things become apparent.

First, due to the floodwater released from the Dam and coupled with torrential rains, the water level in the downstream Yangtze River in Hubei Province rose above the flood alert level along 628 miles of dikes on July 22, as reported in the Wuhan Morning Post on July 23.

According the late Huang Wanli, a professor in the Hydraulics Engineering Dept. of Tsinghua University, he long predicted that the dam would regulate water in a "reverse way". By sluicing water out the reservoir during the rainy season when it is suppose to store water, and storing water during the dry season, when it is suppose to release water.

In order to generate the maximum power during the dry season (season of low water flow), the water in the reservoir needs to be collected and stored at its

maximum height of 175 meters. By doing so, this reduces the downstream water flow when it needs it the most. Likewise, if you are discharging large amounts of water during the rainy season, it only compounds the downstream problems of battling floods due the high river flow coupled with their own local torrential rains. Should be collected in the reservoir and not sent downstream during the rainy season. Well lets take a closer look at why the water level may have been kept at 160 meters and not raised to 175 meters.

The officially stated reason for not raising the water level to 175 meters is to allow reservoir capacity for future floods. But according to other reports, the officials had not mentioned that holding floodwaters behind the dam actually increases flooding. To achieve the dam's official gross flood control capacity of 22.1 billion cubic meters, the reservoir level would need to be raised to 175 meters, which in times of high water flow would cause flooding in Chongqing 400 miles upstream at the end of the reservoir.

By some reports, initially when officials calculated the dams ability to prevent floods, it basically assumed the reservoir was flat and drew a strait line at 175 meters between the dam and Chongqing at the other end of the reservoir. This would be true if it were a lake. But as it is really a flowing river, it has what is called a hydraulic slope. A number of scientists say the reservoir would have a hydraulic slope with a gradient of .007% meaning the water would be 7 meters higher for every 100 km. (By the way, drawing a flat line would also keep resettlement figures down).

Also, according to experts, the reservoir has never been flat since the day they started filling it in 2003. Recent data indicated that when the reservoir level at the dam was 140 meters, the difference in height in Chongqing was 40 meters.

In an interview on August 19 with the general manager of the Three Gorges group the following dialog transpired.

Reporter: On July 19, Chongqing experienced the largest flooding this year, resulting in the flooding of the Chaotianmen port. There have been allegations that this flooding was associated with the Three Gorges Reservoir? What do you think about this?

Cao Guangjing: When the water level was 185 meter at Cantun (a port 40 km downstream of Chongqing) on July 19, the water level at the Three Gorges was about 150 meters. I have to say that holding water in the Three Gorges reservoir had no impact on the flood in Chongqing.....

This statement would be accurate if you assume no hydraulic slope. But if you consider a hydraulic slope of .007% as the experts indicate, then the water level at Cuntan would calculate to be 189 meters. Within the margin of error of the 185 meters he indicated. Therefore, the dam could very well have contributed to the

flooding. So, raising the water level to 175 meters could possibly flood Chongqing during the rainy season as has been suggested.

So, here is a possible dilemma. During the rainy season in order to prevent floods, we keep the reservoir level lower than it's capacity so not to flood Chongqing upstream and in order to do this we release a lot of water downstream increasing the treat of floods??

Water Shortage Downstream:

All right, enough on the flood control issues for now. Because it seems that the dam is also causing an opposite problem, water drought.

In January, it was reported that the Yangtze River had reached its lowest level in 142 years, stranding dozens of ships along the waterway in Hubei and Jaingxi provinces. The water resources commission blamed climate change, even as they acknowledged that the dam had reduced the flow volume of the river by 50 percent. (Probably to maximize Power Generation).

With less water, the mouth of the Yangtze near Shanghai experienced water shortages and the decreased flow of fresh water also means that the saltwater from the East China Sea now creeps farther upstream. This in turn seems to be causing a rise in the number of jelly fish, which compete with the river fish for food and consume their eggs and larvae, thereby threatening native populations that are already dwindling as a result of overfishing.

Navigation:

Of course, creating a reservoir between the dam and Chongqing greatly increases the capacity to transport goods. A couple of items for consideration.

1. When I was at the dam, the ship locks were shut down for at least one day because the water flow thru the dam and waterway was not safe for boats. It had been shut down for the same reason for several says in the last two months.
2. The greater water surface area in the reservoir is also causing much greater fog compared to the already foggy conditions making navigation riskier.
3. The ship lift is years being schedule. Its usefulness is questioned.
4. There were serious concerns this summer of trash washed down by torrential rains that could jam the gages on the ship locks.

Siltation and Sedimentation:

This is a double-edged problem and has consequence both upstream and downstream of the dam.

Upstream:

Five hundred & thirty million tons of sand, pebbles and silt wash down thru the gorges each year and much of that will settle in the reservoir and at the base of the dam. This will have the effect of reducing the reservoir storage capacity. It was reported in the South China Morning Post on Sept 1, 2010, that due to sedimentation in the reservoir, the flood control capacity will be reduced from 22.1 billion cubic meters to 18.7 cubic meters or a 15% reduction. Other estimates are much higher based on past experiences with other dams.

At the headwaters of the reservoir in Chongqing, the river will dump silt where the river presently sweeps it away. The harbor made deeper by flooding, will swiftly become shallow because of the new silt making it difficult for shipping.

Downstream:

Some critics say that while the dam can handle water surges, it may actually contribute to downstream flooding for other reasons. As the water passes thru the narrow gorges and enters Central China broad plains, the river traditionally slows and for centuries sediments have raised the riverbed above the surrounding countryside and is held back by dikes. As the silt now settles in the reservoir behind the dam, the water released by the dam is lightened of its muddy load, and flows with more force. So instead of depositing silt from the muddy water to strengthen the dikes, it threatens to gouge out the dikes with its faster flow.

Also, in water with little sediment, sunlight reaches deeper and nourishes the photosynthetic algae, which also feeds on sewage and fertilizer runoff. This is also becoming a problem.

As much of the silt from the Yangtze's upper and middle reaches are deposited in the reservoir, it is having a profound effect on the river delta. Up to 4 square kilometers of coastal wetlands are now eroded every year and as the delta subsides, seawater is intruding up the river affecting agriculture and drinking water suppliers near Shanghai.

Pollution:

Silt and sedimentation act as natural fertilizers to the Yangtze River Valley. The dam reservoir will trap much of the sediments and more chemical fertilizers will need to be used to compensate for the loss of natural fertilizers.

Upstream, many of the cities do not have adequate sewer systems. It is estimated that billions of tons of sewage flow into the reservoir each year including human waste and industrial waste. The dam will slow the water flow robbing the river of its natural self-cleaning mechanism that now flushes sewage into the East Chin Sea.

In a Sept. 1, 2010 article, it was stated by an environmental scientist of his concern of worsening water quality in the reservoir. Phosphorous and Nitrogen levels from industrial and fertilizer runoff have risen 10 times above the levels of a decade ago. The reservoir sewage levels are increasing as well as admitted by the Three Gorges Project Construction committee.

Trash:

When visiting the dam last month, I noticed from the top of the dam several boats in the process of cleaning trash from the reservoir next to the dam. Apparently thousands of tons of trash washed down by the recent torrential rains. The China daily reported that 3,000 tons of trash a day was being collected and that the large amount of trash threatened to jam the gates on the locks. Probably the good news is that the trash is being collected at the dam and not ending up in the East China Sea and Pacific Ocean.

Wildlife:

The White Dolphin, also known as the Baiji, is China's rarest and most endangered water mammal species with approximately 300 in existence. It is found only in the Yangtze River. It was feared that the dam would severely degrade what little remained of the dolphins habitat. In a news article of December 2006, three years after the initial filling of the dam, the baiji.org Foundation announced the extinction of the Baiji after an international expedition failed to find a rare white dolphin on the Yangtze River. The head of the foundation, August Pfluger, said, "There is no concrete evidence to prove that the extinction is related to the Three Gorges dam. However, this is not to say that the two are not related. The water level in the Yangtze River downstream of the dam was lowered by 2 meters after its completion. The decrease in water levels significantly reduced the quality of the river environment for the white-fin dolphin.

I'm sure there were other factors that contributed to the extinction of this animal, which has been in existence for over 20 million years until this last decade.

Storing water at the Three Gorges reservoir has also put off the reproductive period of the wild Chinese sturgeon for about a month and may further reduce the number of the already rare species according to a leading expert.

Earthquakes:

There are two issues here.

First, the three gorges dam is situated near six seismic fault lines, one as close as 10 miles away. The Zigui-Badong fault line, 50 miles upstream, is considered likely to

produce earth quakes that could affect the dam. After the dam started filling in 2003, it registered a quake of magnitude 3.4. It has hit as high as 6 in the past. It is believed that the weight of the reservoir could produce earthquakes of higher magnitude than what has been recorded in the past. What would happen in the event of a major breach due to an earthquake? A rupture of the dam would create a lethal tidal wave, wipe out Wuhan and Shanghai, kill millions of people and cripple China for decades. The dam is said to be designed to survive an earthquake of magnitude of 7.

Secondly, is the weight of the reservoir the cause of earthquakes? In the wake of the very deadly Sichuan earthquake two years ago, some observers are questioning if the dam could have played a role in triggering it. Though no one has directly fingered the dam and reservoir, and would be impossible to prove anyway, many have raised this as a possibility.

According to Chongqing Municipality statistics, seismic activity has increased since the reservoir began filling in 2003. In 2008, when attempts were made to fill the reservoir, at least 14 earthquakes were reported in the Fengjie area.

Landslides:

Landslides have been directly linked to the filling of the reservoir. As the reservoir level rises, the water penetrates fissures and seeps into the loose soil at the base of the area's rock cliffs. This destabilizes the land making it prone to landslides. The Three Gorges has a base of limestone, but are also layered in places with sandstone, shale and mudstone which are softer materials and more likely to collapse. The soaking and huge pressure changes weaken the banks. To compound the problem further, the water level fluctuates as engineers balance the water level to optimize either power generation or flood control. The abrupt change in water pressure further disturbs the land.

In one example after the reservoir started filling in 2003, 700 million cubic feet of rock slid into a Yangtze River tributary just 2 miles from where it flows into the Yangtze. It created a 65 foot wave and killed 14 people.

Since 2006 when the water level was raised further, numerous other landslides have occurred and cracks are appearing in roadways, buildings and land. In one year, there were 97 significant landslides.

I just read an interesting story about a High School located more than 100 meters above the reservoir water level. There are huge cracks in the land and in most of the school facilities including cracks that cut off entire staircases. Inspectors have not been invited to the school for fear that they would have to close and would have to relocate 3000 students and teachers which they can't afford to do. The students continue to live in unsafe geological conditions.

Lost Archeological Treasures:

The Yangtze River is one of the great sources of the origins of Chinese Civilization. But when the dam was being evaluated prior to its construction, no archeologist or cultural anthropologies were among the 412 experts to evaluate the dam.

There are thousands of important archeological site in the reservoir area. Although some of these sites have been rescued prior to filling, many of them have been submerged. It is estimated that 1,300 excavated sites and 8,000 non excavated sites will be inundated by the reservoir.

Other Issues:

I wanted to give you a very brief overview of some of the key issues associated with the dam. There are also many other concerns about the dam that will need to be saved for another day.

The Three Gorges Dam Project is said to be the largest water project ever built in the history of the world. And as you can see, it has also been extremely controversial due to its massive environmental, economic, and social impact.

Did the project give China the respect it was seeking? It seems over time and as problems are exposed, that political support in China for the project has eroded. Top government officials now distance themselves from the project.

The benefits of such a project seem to be easier to define and the government is pretty good in its calculations in terms of quantifying flood control benefits, power output, pollution advantages and improved navigation vital for the development of Central China.

But to identify and quantify the cost is a lot more difficult. It can only be done over a long period of time and in very difficult, complex and controversial ways. One can calculate the cost of concrete and steel, but how does one even put a value on the hardships of the people who are displaced, or the extinction of wild life, or earthquakes and landslide, and the many other negative economic, social, and environmental consequences and risks of such a project. Is the benefit worth the cost? It's hard to say when the benefits are clear but the costs are not. It's probably just easier to hide or ignore the real costs.

As for this project, as of 2010, the water is over the dam so to speak. The best that can be done now is for a comprehensive and honest evaluation of both the benefits and the costs, so that this experience can be useful in the consideration of other major dams or significant projects worldwide. And if you can believe it, I just heard about a potential new dam being considered in Tibet, which would be 1.5 times larger than the Three Gorges Dam.

What will China have learned from this amazing project on the Yangtze River?

Thank You