# (Source: British Embassy Beijing) China's dam and hydro-energy policy – 2005-12-06

## 1.0 Summary

- 1.1 China is host to a large number of the world's hydro-power plants. While coal is currently the most important source of energy, hydro-power is expected to account for a growing proportion of the energy production. There are several reasons for this. Firstly, an extensive hydro-energy programme will ensure that China maintains a relatively high degree of energy self-sufficiency and that shortages of oil, gas and eventually coal will have a minimal effect on its economic development. Secondly, there is an economic incentive for developing hydro-power as energy can then be sold to neighbouring countries. Finally, hydro-energy is seen as the optimal way of producing clean and renewable energy. This is particularly relevant given that air quality is deteriorating so rapidly that it has attracted the attention of policy makers both in China and abroad. While China is known for its very large hydro-projects (eg Three Gorges and the Nu River) the many small dams that are scattered throughout the country are more important for energy production and for regional development.
- 1.2 Several laws apply to dam construction and the surrounding process. While these laws are reasonably sensible and useful, the extent to which they are actually implemented varies greatly. The State Environmental Protection Agency carries out useful monitoring over the dam environment and can order companies to implement pollution control. However, in reality SEPA has little real power and its recommendations and instructions often go unheeded.
- 1.3 Dams affect the environment in several ways. They contribute to worsening existing pollution and can impact the water quality for several hundreds of kilometres, both upstream and downstream. As the conditions change in the river, there is likely to be a reduction in the number of fish and sometimes a reduction of the number of species. All these factors are relevant in China and many are already becoming apparent in and close to the Three Gorges Project. However, in China dams are generally regarded as an environmentally superior energy alternative. Opposition to dam construction is mainly focussed on dam-related migration and security issues.

## <u>Detail</u>

## 2.0 Hydro-energy overview

2.1 China currently has up to 22 000 large dams<sup>1</sup> as well as a very high number of smaller dams and reservoirs, totalling 46% of the world's hydropower plants. Over

<sup>&</sup>lt;sup>1</sup> http://www.dams.org/kbase/consultations/esea/stats.htm

the past 15 years China has constructed about 300 dams per year.<sup>2</sup> A vast majority of these have been funded privately or by the Chinese government though the World Bank has assisted with some of the major dam construction projects.<sup>3</sup>

2.2 It is estimated that China's potential hydroelectric capacity is as high as 300 gigawatts, and to date only around one-third of this potential has been tapped.<sup>4</sup> China's hydro-power utilisation rate will rise over the next few years as all 26 turbines in the massive Three Gorges project on the Yangtze river are gradually brought into use.



Figure 1: Dams under construction 2005 (>60 m) Source: International Journal of Dams and Hydropower/WWF

2.3 While large projects such as the Three Gorges and Nu River attract much publicity, the most important part of China's hydro-energy programme is small-scale hydroplant installations. These form an increasingly important part of Chinese development strategy, in particular with regards to rural electrification plans such as the Western China Energy Project. On the national level small-scale hydropower accounts for 5% of the energy consumption (9% of energy output) and it is the main source of energy in 1/3 of China's counties.<sup>5</sup> Small-scale hydroplants are primarily located in the Southwest where small-scale hydroplant resources account for 50% of the total national potential hydro capacity. By 2030 it is expected that small scale-hydro power will have a capacity of 100GW and will make up 10% of China's total installed power capacity.<sup>6</sup>

<sup>&</sup>lt;sup>2</sup> Chincold report

<sup>&</sup>lt;sup>3</sup> Chincold report

<sup>&</sup>lt;sup>4</sup> Economist Intelligence Unit, China Country Report, 2005

<sup>&</sup>lt;sup>5</sup> Sector Review of Renewable Energy in China and its potential for CDM Projects", Chinese Renewable Energy Industries Association

<sup>&</sup>lt;sup>6</sup> Sector Review of Renewable Energy in China and its potential for CDM Projects", Chinese Renewable Energy Industries Association

### 3.0 Laws / legislation

- 3.1 According to the National Tenth Five-Year Plan for Environmental Protection (26 December 2001), local governments and departments are requested to "strengthen environmental protection in close relation with the economic restructuring."<sup>7</sup> While this obviously leaves a lot of room for interpretation, clean and renewable hydropower is generally seen as a way of achieving this balance.
- 3.2 There is a host of laws and regulations which are applicable to dam construction, ranging from laws on water and soil conservation to regulations for land requisition. Equally checks and balances have been established to ensure a fair and transparent decision making process. According to a law passed in 2003, an Environment Impact Assessment study must be carried out for large projects. The result of the study should then be made public. The law also stipulates that public hearings must take place to establish a dialogue with the people who will be affected by the construction. So far, however, affected communities have not been consulted prior to any large dam project and the results of the Environmental Impact Assessment for the Nu River Dam Project (see below) were not made public.<sup>8</sup>
- 3.3 For very large projects, such as the Three Gorges, the law calls for the project to be approved by the National People's Congress. Despite the enormous scale of the Nu River Project no such vote has taken place.

## 4.0 Future plans and policy

- 4.1 Hydropower is not explicitly mentioned in the 10<sup>th</sup> Five-year plan for the development of the environment protection industry. However, it is indirectly implicated through several references to prevention and control of air pollution, as well as the preservation of natural resources (especially wood).<sup>9</sup>
- 4.2 Coal currently accounts for 70% of consumed energy in China. However, coal is one of the major causes of air pollution and supplies are also expected to run out within 100 years. Therefore (and to avoid oil dependency), the Chinese government places a very strong emphasis on developing clean and renewable energy. It is expected that renewable energy will account for 12% of the power capacity in 2020 and over 30% in 2040.<sup>10</sup> These figures have been re-confirmed by leading policy makers such Vice-premier Zeng Peiyan and NDRC vice-director Zhang Guobao.<sup>11</sup> According to a

<sup>&</sup>lt;sup>7</sup> www.zhb.gov.cn/english/

<sup>&</sup>lt;sup>8</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=13676

<sup>&</sup>lt;sup>9</sup> The National Tenth Five-year plan for Environmental Protection (Abstract)

<sup>&</sup>lt;sup>10</sup> Sector Review of Renewable Energy in China and its potential for CDM Projects", Chinese Renewable Energy Industries Association

<sup>&</sup>lt;sup>11</sup> The National Tenth Five-year plan for Environmental Protection (Abstract)

senior advisor for the China Development Bank, Zhuang Laiyou, wind and solar power are too expensive for large scale production. Hydro-power will therefore play a large role in achieving this goal.<sup>12</sup>

4.3 Therefore, in the words of the Administrative Centre for China's Agenda 21 (ACCA21), China aims to "vigorously develop hydro-electric power, build large hydro-electric power stations, including the Three Gorges Project and enhance the development and utilisation of our country's water resources." Currently only 9.5% of China's exploitable water resources are being developed and there are ambitious plans to increase this figure. ACCA 21 aims to do this while "adopting effective measure to reduce adverse environmental impacts."<sup>13</sup>

## 4.4 World Commission on Dams (WCD) and the Chinese response

- 4.5 The WDC was established by the World Bank and the World Conservation Bureau with a mandate to carry out a review over the efficiency of large dams in a development context.<sup>14</sup> The surveyed large dams were found to under-perform in nearly all their functions: more than half of the dams generated less power than projected, 70% did not reach their water supply targets and half of them did not meet the expectations regarding irrigation. Furthermore, many had increased susceptibility to floods in the around the dam or in the river area. Especially multi-purpose dams (such as the Three Gorges) performed badly.
- 4.6 The Commission summarised its findings by saying that "in too many cases an unacceptable and often unnecessary price has been paid to secure [benefits], especially in social and environmental terms, by people displaced, by communities downstream, by tax payers and by the natural environment." Equally a "lack of equity in the distribution of benefits" was found to be common.<sup>15</sup>
- 4.7 Following the WCD report the China branch of the International Commission of Large Dams (Chincold) issued a written response supported by two papers from leading Chinese academics. In its response Chincold stressed the importance of hydro-power for rural development and electrification as well as its properties as renewable and clean energy. According to the response, none of the World Bank-funded dams in China have been over budget or had started operations behind schedule. Chincold claims that the report understated the positive effects of dams (particularly Chinese dams) and that there are no realistic alternatives to hydropower in China.

<sup>&</sup>lt;sup>12</sup> Three Gorges to generate 100bn kWh by 2006, Asia Times

<sup>&</sup>lt;sup>13</sup> China's Agenda 21, Chapter 13; the ACCA is affiliated with MOST and the State Development Planning Commission

<sup>&</sup>lt;sup>14</sup> "Dams and development: a new framework for decision making", World Commission on Dams, November 2000

<sup>&</sup>lt;sup>15</sup> International Rivers Network

#### 5.0 Environmental impacts on dams – worldwide and in China

- 5.1 Dams affect the environment in several ways. Perhaps most significantly, the construction of a dam will substantially change the natural habitats in and around the river. More than half of the world's major rivers have already been dammed and as a result fresh water ecosystems have the highest proportion of threatened species.<sup>16</sup> Furthermore, by blocking the flow of sediments dams also divert nutrients away from traditional agricultural areas and contribute to the erosion of coastal river deltas.
- 5.2 Dams can also exacerbate a pre-existing pollution problem by collecting the polluted river water in the reservoir. This leads to a higher concentration of chemicals or pollutants. In addition, the still standing water can also serve as a breeding ground for mosquitoes and other parasites. The reservoir can also produce a large amount of greenhouse gasses (estimates range from 1% to 28% of global emissions) due to rotting flooded vegetation and organic matters from its catchments.<sup>17</sup>
- 5.3 In addition to the environmental impacts the resettlement of large numbers of people and potential increased flood and/or drought risks. The high costs related to dam construction are often controversial. A report by the State Office of Comprehensive Agricultural Development, published in January 2005, suggests that 4 out of 17 inspected World Bank-funded dams in China had safety problems. These dams were Xiaotashan, Shilianghe (both in Jiangsu), Fenshuiling (Anhui) and Gutou (in Shandong).<sup>18</sup>

## 6.0 NGO activity

- 6.1 There are several NGOs which are actively opposing the way dam construction is carried out today in China. Many of these NGOs co-operate under the name of the China Rivers Network. The domestic NGO debate (by Chinese and international NGOs who are active in China) is mainly focussed on how dams affect humans, in particular the procedure, including financial compensation (sometimes the lack thereof), for forced resettlement and the livelihood of nearby and downstream communities. Lack of transparency of the decision making process and the absence of a public dialogue are also often mentioned by domestic NGOs. There is also a substantial international debate regarding dam building on a more general level which concerns itself with water pollutant and species/habitat preservation.
- 6.2 In 2003 protesters from NGOs and civil activists succeeded in blocking a proposal to build a dam in Yangliuhu on the Yangtze river.<sup>19</sup> Chinese civil groups claim that

<sup>&</sup>lt;sup>16</sup> WWF commentary on the Dam Report, http://www.wwf.org.uk/filelibrary/pdf/fr\_dam\_report.pdf

<sup>&</sup>lt;sup>17</sup> www.irn.org/wcd/

<sup>&</sup>lt;sup>18</sup> State Office of Comprehensive Agricultural Development

<sup>&</sup>lt;sup>19</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=8622

the government has imposed a ban on negative media reports about hydro-power plants.  $^{\rm 20}$ 

## 7.0 Three Gorges Project

- 7.1 The aims of the Three Gorges Project are to provide flood control in the middle reaches of the Yangtze; hydropower generation; improved navigation to major ports such as Chongqing; and finally regional economic development in Sichuan and Hubei. When completed it will be the world's largest hydro-energy project. The project is funded privately and by the Chinese government and has not in contrast to many other large dams in China received funds from the World Bank. The cost of the project is estimated to total around US\$ 22 30 billion.<sup>21</sup>
- 7.2 The project will be completed in 2009 (one year ahead of schedule) but the dam was filled to its interim depth already in June 2003. The water level in the reservoir is to fluctuate between 145-175 meters depending on season.
- 7.3 According to Li Yong'an, general manager of the China Yangtze River Three Gorges Project Development Corporation, the dam will have produced 100 billion kWh (this is equal to the double of Beijing's annual power consumption or 10% of the total hydro-energy production in China) of electricity in 2006.<sup>22</sup> Currently there are 12 operating units on the southern bank and a further 14 on the north bank which will become operational in the near future.
- 7.4 The environmental impact of the Three Gorges Project is already becoming clear as the water quality in the reservoir area has reached "worrisome" levels. SEPA is addressing this issue but its measures have had little effect. Almost none of the polluters placed under notice to clean up their operations have done so, 65% of enterprises due to be shut down are still operating and very few have improved pollution control. More than a third of the planned major treatment programmes have yet to be started.<sup>23</sup> However, the World Bank and the China State Development Bank are co-funding a \$500 million project to improve the water environment in Chongqing which will be implemented shortly.<sup>24</sup> With 46 large dams built, under construction or planned, the Yangtze faces a greater environmental threat from dam building than any other river in the world.<sup>25</sup>
- 7.5 Contrary to the Chinese environmental protection law, the decision-making process concerning the project has been classified. According to the environmental law the Three Gorges Project was put to a vote in the National People's Congress in 1992.

<sup>&</sup>lt;sup>20</sup> Dam Opposition swells, Asia Times

<sup>&</sup>lt;sup>21</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=14062

<sup>&</sup>lt;sup>22</sup> Three Gorges to generate 100bn kWh by 2006, Asia Times

<sup>&</sup>lt;sup>23</sup> Water-technology.net

<sup>&</sup>lt;sup>24</sup> Water-technology.net

<sup>&</sup>lt;sup>25</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=13052

In a rare act of defiance, 1/3 of the delegates either abstained from voting or rejected the proposition. While this caused some embarrassment to the government it did not, however, stop them from pushing ahead with the plans.

7.6 In addition to the Three Gorges Project the State Development and Investment Corporation plans to build at least six more hydro-electric power plants in Sichuan, on the upper reaches of the Yangtze. The Government, through the NDRC, has already started approving these plans but so far there is no set timetable for the construction.<sup>26</sup>

## 8.0 Environmental Impacts of the Three Gorges Project

- 8.1 Despite the fact that the dam construction has yet to be fully completed, it is already affecting **fishery** in the region. The dam has interrupted the natural migration patterns of the fish (requests from the Yangtze River Fishery Research Institute for a special fish ladderwere turned down.<sup>27</sup>) The construction has also severely impacted the living environment of the fish. The dam holds back sentiments which contain nutrients which are important for the aquatic life downstream. In addition, it has affected the nitrogen levels in the water for up to 400 km downstream and lowered the water temperature.<sup>28</sup>
- 8.2 The result of these factors are already becoming apparent. There are reports of a significantly lowered amount of fish in the Yangtze River and its tributaries. Some of the species that are affected, especially Chinese sturgeon, are already endangered.<sup>29</sup>
- 8.3 **Water pollution** is also becoming an increasingly urgent problem. Almost all industrial and domestic waste is still going untreated into the Yangtze River. Pollution will also affect the riverbanks, in particular those parts of the banks that become exposed when the water level is lowered before the flood season. Detritus and small cesspools where bacteria and parasites can breed are likely to be left behind in the porous riverbanks. This problem will progressively get worse as pollutants accumulate on the land.<sup>30</sup>
- 8.4 According to one Three Gorges activist, a geological expert has also raised questions regarding the **geological stability** of both the areas used for resettlement and of the structural weaknesses in the river valley that holds the reservoir. Even though the dam is only filled to its interim level these weaknesses have already manifested themselves in frequent mudslides and riverbank collapses in the area.<sup>31</sup>

<sup>&</sup>lt;sup>26</sup> Yangtze river to get more hydroelectric plants, Asia Times Online

 <sup>&</sup>lt;sup>27</sup> Fisheries Scientists Fear Scale of Impact, By Bill Savadove, South China Morning Post, October 6, 2004
<sup>28</sup> www.dams.org

<sup>&</sup>lt;sup>29</sup>http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=13052

<sup>&</sup>lt;sup>30</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=12989

<sup>&</sup>lt;sup>31</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=14062

8.5 In addition to the environmental consequences of the Three Gorges Project, **resettlement** and **corruption** have also been controversial issues. The project will lead to the forced migration of a huge number of people (official figures are 725 000, estimates from NGOs are as high as 2.5 million).<sup>32</sup> Furthermore, the project has been marred by corruption. Last year Beijing announced that 97 officials had been arrested for corruption and embezzlement of funds earmarked for the project (one was executed).<sup>33</sup> While this indicates that the central government is monitoring the project closely it is nevertheless worrying what implications such large-scale corruption will have on the quality of the construction.

#### 9.0 The next big project: the Nu River

- 9.1 The Nu River is one of China's last pristine waterways and it runs through an area which has been designated a World Heritage site by the United Nations. Nine of the thirteen dams proposed are being planned in National Nature Reserves and very near the World Heritage site.<sup>34</sup> Despite the fact that any consequences of a dam project would extend to downstream communities in Thailand and Burma people in these countries have not consulted.
- 9.2 The Nu River dam will produce more energy than the Three Gorges. Tax revenues from the completed full-scale cascade are estimated to reach 2.7 billion rmb/year. Yunnan officials have announced that they plan to sell the energy to neighbouring countries. Pro-government scientist He Zouxui has been quoted as saying that the main objective of the Nu river project is poverty alleviation and that power generation is second to that.<sup>35</sup>
- 9.3 Due to the controversial nature of the project, and the many protests surrounding it, a full Environmental Assessment study was carried out at the orders of Premier Wen Jiabao. However, contrary to the fact that the law clearly proscribes transparency during the assessment procedures, the study was passed directly to the State Council for approval with out any prior public hearings or debate.<sup>36</sup> A project of this size should be approved by the National People's Congress but so far the Congress has not been given a chance to discuss the project.
- 9.4 The project would lead to the relocation of at least 50,000 people, most of whom belong to ethnic minority groups in Yunnan.

<sup>&</sup>lt;sup>32</sup> http://www.threegorgesprobe.org/tgp/index.cfm?DSP=content&ContentID=14062

<sup>&</sup>lt;sup>33</sup> http://news.bbc.co.uk/1/hi/world/asia-pacific/844786.stm

<sup>&</sup>lt;sup>34</sup> http://irn.org/programs/nujiang/

<sup>&</sup>lt;sup>35</sup> Dam Opposition swells, Asia Times

<sup>&</sup>lt;sup>36</sup> Dam Opposition swells, Asia Times

## 10.0 Comment

- 10.1 Dam building is considered the perfect solution to the two often conflicting policy priorities of economic development and environmental clean-up. While the central government in some ways is concerned about the environmental implications of large scale hydro-installations these concerns or the regulations that are a product thereof are sometimes ignored in the provinces. Thus, where regional development in reality often rates higher on the agenda.
- 10.2 Furthermore, there is a very strong emphasis on air quality in the environmental policy and in this context the clean energy generated by a hydro-plant is a very good substitute for coal. Efforts are being made to prevent and clean up water pollution but on the whole hydro-energy is seen as a superior alternative to traditional sources of energy. Hydropower-related pollution receives little attention.
- 10.3 Other environmental and social issues that receive much attention abroad, such as forced migration, habitat/species preservation or protection of natural environments, are not policy priorities. There is little understanding of the need to protect endangered species (especially in the provinces) and the attitude to large-scale migration is that those who are forced to move do so happily knowing that the dam will benefit others.<sup>37</sup>

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