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# **THE CANADIAN FEASIBILITY STUDY OF THE THREE GORGES DAM PROPOSED FOR CHINA'S YANGZI RIVER: A GRAVE EMBARRASSMENT TO THE IMPACT ASSESSMENT PROFESSION**

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## ABSTRACT

The Three Gorges Dam proposed for China's Yangzi (Yangtze) River would displace an unprecedented number of people; those from rural areas could not expect to find acceptable livelihoods due to the lack of available land of quality comparable to that of the area to be flooded. In addition to environmental impacts, sites would be lost of irreplaceable cultural value to many people in China.

The Three Gorges project is endorsed by a feasibility study prepared by the CIPM Yangtze Joint Venture (CYJV), a consortium led by Canadian International Project Managers Ltd. (CIPM) and sponsored by the Canadian International Development Agency (CIDA). The report became public through Canada's Access to Information Act, and revealed a series of flaws in the evaluation systematically overstating the dam's benefits and understating its impacts. An analysis of the Canadian feasibility study provides a dramatic illustration of widespread problems in environmental impact assessments of major development proposals throughout the world, and of the procedures for their evaluation. The case of the Three Gorges Dam invites the question of what level of impact would be judged unacceptable if this one is not.

## I.) THE THREE GORGES PROJECT

China's plans for the Three Gorges Dam, a massive hydroelectric project on the Yangzi (Yangtze or Changjiang) River (Figures 1 and 2), have generated much controversy and misunderstanding. The Three Gorges Project would have a wide variety of impacts. The impact that sets this dam apart from all others is resettlement. The official estimate of 1.1 million people for the currently-approved normal pool level (NPL) of 175 m (Zhu Rulan *et al.*, 1992, p. 86) would break all world records by several fold, and a number of omissions in these estimates indicate a displaced population even larger than this. The feasibility study of the Three Gorges Project completed by Canada in 1988 recommended that the dam be built to the same height as the currently-approved design (crest at 185 m above mean sea level), but operated at the lower NPL of 160 m, thereby displacing 727,000 people by the Canadian estimate.

(Figures 1 and 2 here)

Following approval of the Three Gorges Project in 1992 for construction under China's 1990-2000 ten-year plan, virtually anyone in China asked about the dam would voice the opinion that the decision is immutable. It is worth remembering that on at least two occasions in the past--in 1958 and in 1984--the same opinion would have been equally universally expressed. The future in this case is simply unknowable. While many questions merit debate regarding the wisdom of the Three Gorges Project, the present paper is intended to examine the Canadian feasibility study of the proposed dam and the many lessons that this case provides for the impact assessment profession everywhere.

The worst possible outcome is now on the verge of coming about: transshipment of displaced population to settlement areas populated by minorities in the deserts of Western China (*Chicago Tribune*, 11 Dec. 1992). According to a report in the Chinese government's English-language newspaper *China Daily*, Xinjiang Autonomous Region would take 100,000 oustees from Three Gorges in the first phase, followed by additional settlement to a total of 470,000 people (*World Rivers Review*, 1992). This outcome was foreseeable from the lack of unused agricultural land in the area surrounding the Three Gorges and from China's longstanding practice of moving Han settlers into areas dominated by ethnic minorities. In 1988, and again in 1990, I predicted that exactly this would happen to population displaced by the Three Gorges Dam (Fearnside, 1988, 1990). The possibility was never raised in the Canadian feasibility study report, which instead accepted at face value the fiction that all displaced population would be resettled locally. After news of the resettlement plan for the Kashgar area of the Xinjiang Autonomous Region became public in the West, a State Council official was quoted by China's Xinhua News Agency as saying that, although Xinjiang had offered to accommodate some of the emigrants, the central government had decided to resettle them locally instead (*BBC Monitoring Service*, 22 Dec. 1992). However, Chinese Premier Li Peng had said in November 1992 that some of those affected by the dam would be settled "by the whole country" (*BBC Monitoring Service*, 22 Dec. 1992). It is not possible to know how history will unfold in this case, but forced relocation to minority areas in the deserts of western China remains a likely outcome.

## II.) THE CANADIAN FEASIBILITY STUDY

### A.) THE ROLES OF CIDA AND THE WORLD BANK

The Three Gorges Water Control Project Feasibility Study was prepared over the 1986-1988 period by Canada at China's request. It became public in April 1989 as a result of a petition made by Probe International (an environmental group in Toronto) through Canada's Access to Information Act. The 13-volume report, which weighs 17 kilograms, provides an exceptionally well-documented example of the fundamental problems that affect impact assessments throughout the world. The impact assessment profession can learn many valuable lessons from the Three Gorges case, and begin to make the structural changes necessary to break the unhappy pattern that the Canadian feasibility study illustrates.

The feasibility study (CYJV, 1988, hereafter cited only by volume number) was written by the CIPM Yangtze Joint Venture (CYJV)--a consortium headed by Canadian International Project Managers Ltd. (CIPM) and sponsored by the Canadian International Development Agency (CIDA). CIPM is owned by Acres International Ltd. (Toronto) and Lavalin International/SNC Canada Inc. (Montreal). The CIPM Yangtze Joint Venture is a consortium of CIPM plus two state utilities: British Columbia (BC) Hydro International Ltd. (Vancouver) and Hydro-Quebec International (Montreal). The \$14 million feasibility study itself was funded by CIDA (Howard, 1989), not the World Bank as some reports have indicated.

The International Bank for Reconstruction and Development (IBRD), or World Bank, is described in the terms of reference of the feasibility study as to "play a lead role in assisting MWREP [China's Ministry of Water Resources and Electric Power] in coordinating and supervising the [feasibility] study and in reviewing the findings" (MWREP, 1986, p. 3, paragraph 1.5). The Bank appointed the deputy chair of the Three Gorges Project Steering Committee and the deputy chief of the Project Monitoring Group, as well as participating in naming the members of the these groups (MWREP, 1986, p. 13, paragraph 4.2). The Bank also provided funding to finance the expenses of the international experts and Chinese counterparts on the Steering Committee and the Project Monitoring Group (MWREP, 1986, p. 14, paragraph 4.5).

### B.) INTERNATIONAL CONTROVERSY OVER THREE GORGES

The Three Gorges Dam is the subject of great controversy both inside and outside of China. In China the Economic Construction Group of the National Political Consultative Council (1987), an association of scholars, made a 38-day field investigation in the area during which over 40 "forums" were held to hear the opinions of a wide variety of officials, experts and affected groups. They concluded that the Three Gorges Project (TGP) "should not go ahead on the short term," and contested on technical grounds many of the key justifications for the dam, including its effectiveness for flood control. In March 1992 China's National People's Congress approved the project by a vote of 1767 to 177, with 664 abstentions. The number of nay votes

and abstentions (32.2% of the total) is virtually unprecedented in China, where such decisions are usually acclaimed unanimously.

In Canada Probe International's 1990 publication of a book on Three Gorges (since released in a second edition: Barber and Ryder, 1993) led to questioning of the quality and impartiality of the feasibility study (e.g. Farrow, 1990; Teichroeb, 1990). In February 1992 Canada and China were condemned for their roles in the Three Gorges Project by the Second International Water Tribunal. This body, meeting in Amsterdam, The Netherlands, convenes an independent jury whose verdicts carry ethical weight but have no judicial power. In April 1992 CIDA announced that it would put no more money into the Three Gorges Project (Hossie, 1992). The CIDA decision came after that agency had commissioned and received its own reviews of the feasibility study and of the critiques published about it (D. Willmott, personal communication, 1993). CIDA's withdrawal came almost three years after the June 1989 massacre in Tiananmen Square (following which Canada and most other western countries temporarily suspended aid to China); CIDA's 1992 decision therefore represents a vindication of the criticisms of the CYJV feasibility study rather than a consequence of the massacre.

### C.) THE PURPOSE OF THE FEASIBILITY STUDY

The executive summary of the feasibility study describes the mandate of CYJV as "to provide an impartial technical review to the Government of China, to assist it in reaching a decision, and to form the basis for securing funding from international institutions" (Vol. 1, p. 1-4). The content of the report strongly suggests that this description of the mandate is inaccurate. Specifically, it appears that the factions within the Government of China that commissioned the report had already reached the conclusion that they wanted the dam, and that the report was to satisfy the second objective: convincing international institutions to fund the project. This makes its description as "impartial" questionable.

CYJV's terms of reference indicate that one of the justifications for Canadian funding was that it "should enhance the probability of continued Canadian involvement in this important project if the decision is made to proceed (Government of Canada, 1988, Annex D, p. 5, paragraph 2.2). The CYJV report as released to Probe International contains numerous deletions indicated by a rubber stamp specifying the sections of the Access to Information Act under which the information was deleted. The section most frequently referred to is that guarding commercial secrets. Each such deletion represents a confession of a conflict of interest, as the companies that produced the feasibility study were guarding their insider information in order to give them an advantage over competitors when formulating bids for construction contracts. These companies stood to gain a great deal if the report were to result in a Chinese decision to build the dam and in approval of international financing for it. CIPM estimated that Canadian firms could potentially take in \$300-400 million in engineering and managerial fees and \$1.0-1.5 billion in equipment sales (Rusk, 1986). One should therefore not be surprised that the feasibility study found no problems that would impede international approval of financing for the dam.

The CYJV report is remarkable in the way it strains to emphasize positive aspects of the scheme. Most incredible is its listing of resettlement as a benefit: "resettlement construction and development would spur growth in the area bordering the reservoir" (Vol. 1, p. 1-3). Among the benefits ascribed to the Three Gorges Project is to "encourage development of the region with resettlement funds" (Vol. 1, p. 16-8). On the contrary, resettlement is a major negative impact of the project.

### III.) THE CANADIAN ASSESSMENT OF RESETTLEMENT IMPACTS

#### A.) EXPECTED FLOOD LEVELS

The key factor for determining the number of people to be resettled, and the overlapping but not identical set of people for whom compensation will be paid, is the expectation of flood levels and frequencies in the reservoir area (Figure 3). The CYJV Recommended Project sets a "requisition level," below which compensation is paid for farmland, buildings, and the like, corresponding either to the normal pool level (NPL) plus two meters (m) or to the flood level expected once in twenty years (1:20), whichever is higher (Vol. 9, p. 5-1). CYJV recommends that resettlement of people and structures be done up to 12 m above the NPL, or the 1:20 flood level, whichever is higher.

(Figure 3 here)

The Chinese government's Yangzi Valley Planning Office (YVPO) has used a simpler criterion to define the relocation and requisition lines. Only the 1:20 flood probability is used. The CYJV team lists as an issue that "can be raised with regard to the YVPO methodology" the use of the 1:20 flood level as the requisition zone criterion rather than "a standard based on NPL, which would have the effect of extending the requisition zone further upstream" (Vol. 8, Appendix A, p. 5-6). Once "raised," however, the issue is promptly dropped. One factor likely to increase flood levels at the upper end of the reservoir above those used in the feasibility study calculations is the effect of siltation, which will begin at this end of the reservoir and enlarge the area affected in future years (Fang Zongdai and Wang Shouzhong, 1988, p. 86).

CYJV's backwater calculations for the 1:20 flood event were made using the Chinese method, with the reservoir surcharged (*i.e.*, with its water level raised above the flood control level) and  $Q=56,600 \text{ m}^3/\text{second}$ , rather than the international standard of  $72,000 \text{ m}^3/\text{second}$  (Vol. 9, p. 2-8). The  $72,000 \text{ m}^3/\text{second}$  refers to the flood experienced in 1981. Using a lower value in the 1:20 probability calculation means that there may in reality be a greater frequency of floods at the elevations specified.

The 120 km-long backwater on the main river stem is particularly important, since this affects Chongqing (Chungking) --one of the world's largest cities. The report states that "the upstream extension of the reservoir for compensation and requisition is limited to the intersection (+0.5 m) of these two water levels. Consequently, reservoir extension is estimated to be km 472.3 for the NPL 150 and NPL 160 schemes, km 498.6 for the NPL 170 scheme and

km 565.5 for the NPL 180 scheme. In all cases, this results in an arbitrary [emphasis mine] reservoir limit situated well downstream of the city of Chongqing" (Vol. 8, Appendix A, p. 5-6).

Sedimentation expected to occur in the backwater would affect Chongqing. "Although not included in the cost estimate of requisition and compensation for the construction of the Three Gorges Project, the impact of backwater sedimentation was estimated by YVPO" (Vol. 8, Appendix A, p. 5-6). For the NPL 160 m endorsed by CYJV, this estimate shows increases in reservoir 1:5 year flood water levels after 30 years of up to 7.17 m in some places, and at the level of Chongqing of approximately 4 m (Vol. 8, Appendix A, p. 5-8). The calculations inexplicably switch from 1:20 year flood probabilities to 1:5 year flood probabilities for the schemes with NPL of 160 m or more, thereby making the numbers presented appear to represent less additional flooding from sedimentation.

If flood levels at Chongqing were increased by 4 m for floods with a recurrence of once in five years, then the increase for floods recurring once in 20 years would be much more. An indication of the magnitude of the consequences can be gained from the observation that "YVPO has estimated that a 3.0 m increase in the 1:20 year flood level at Chongqing would force the relocation of some 90 000 people" (Vol. 8, Appendix A, p. 5-9). "An FCL [Flood Control Level] greater than 145 m could raise the 100-year flood stage at Chongqing, after about 100 years of TGP operation, to around 200 m" (Vol. 1, Appendix A, p. 2-10); for comparison, the natural water level in Chongqing has an elevation above mean sea level (El) of 158 m (Vol. 8, Appendix A, p. 3-14) (n.b.: the FCL in the design that China's National People's Congress approved in 1992 is 145 m).

Backwater curves have not been developed for the tributaries, nor has any account been taken of the effects of sedimentation at the confluences and within the backwater of each tributary (Vol. 8, Appendix A, p. 5-8). "Tributaries account for one-third of the flooded area at El 160 and this proportion increases at higher elevations" (Vol. 8, Appendix A, p. 5-9). Sedimentation will expand the impact in these tributaries. From the standpoint of resettlement, backwater intrusion into the Jialing River could be especially important. The report states: "the extent of the reservoir could also be significant along tributaries, particularly the Jialing" (Vol. 8, Appendix A, p. 3-14). The Jialing joins the Yangzi at Chongqing, and part of the poorly-quantified additional flooding in the Jialing could affect that sprawling metropolis.

The CYJV report escapes from dealing with the enormous impacts of potential flooding at Chongqing by observing that "backwater levels affected by reservoir and backwater sedimentation were not included in the assessment. Additional compensation and resettlement resulting from higher sediment-caused backwater levels are deferred to operation of the Three Gorges Project rather than to its construction" (Vol. 8, Appendix A, p. 5-3). At the least, the magnitude of these impacts should be quantified to serve as an input for the decision on whether to build the dam.

The operating height of the reservoir is a key determinant of the magnitude of impacts (Table 1). The higher the level, the greater the impacts, especially at Chongqing. The report

observes: "the principal sediment-related consequence of higher operating levels, which include higher FCL, is the shifting of the fluctuating backwater reach further upstream, and the attendant increase in sediment deposition that will increase the flood stage at Chongqing" (Vol. 1, Appendix A, p. 2-10). The CYJV report only endorses scenarios for operation of the dam up to a normal pool level of 160 m. CYJV's concluding statement, however, was careful to leave open the possibility of raising the operating levels in the future: "continuing studies of changing economic factors in China and availability of new data could lead to consideration of slightly modified operating levels" (Vol. 1, Appendix A, p. 5-1). History has moved even faster than one might have expected--the 175 m NPL adopted in 1992 by China's National People's Congress effectively dispensed with the formality of beginning with a dam design that carried international endorsement.

(Table 1 here)

The crest height of the dam--elevation (El) 185 m above mean sea level--is 15 m above the CYJV-recommended NPL of 160 m, which means that flood waters would be captured when river flow exceeds that expected with a frequency of once in 50 years. The "maximum probable flood" (MPF), or check flood level, is calculated to be El 183 m, with a discharge of 116,000 m<sup>3</sup>/second. This is expected to occur approximately once every 1000 years: the 182 m elevation mark is taken as the lower limit for relocation sites in order to meet this criterion.

The calculations of flood probabilities used to set these elevation criteria may well be overly optimistic. The Maximum Flood Control Operating Level (MFL) expected is 181 m, 4 m below the dam's crest at 185 m, and is expected to be reached at a discharge rate of 80,000 m<sup>3</sup>/second. The assumptions for establishing the resettlement elevation cutoffs would place this event at around once in 1000 years (the probability corresponding to 182 m: Vol. 9, preface, p. 5). However, a flood almost this "improbable" was experienced as recently as 1981, when the flow reached 72,000 m<sup>3</sup>/second. In fact, floods in excess of 80,000 m<sup>3</sup>/second have been recorded at Yichang eight times since the year 1153 (Kennedy, 1986). This suggests that even a simple extrapolation of the historical record would produce a frequency much higher than once in 1000 years for 80,000 m<sup>3</sup>/second floods. Flood probabilities, however, have most likely increased dramatically in recent years (and may continue to increase) due to deforestation in the catchment area. The Yangzi catchment basin is the site of a dramatic surge in forest loss (Smil, 1983, p. 228). It is worth noting that the one in 1000 year probability flood was greatly exceeded in 1870, when the historical maximum flow of 110,000 m<sup>3</sup>/second swept away the Zhang Fei Temple (opposite Yunyang) that had been standing since the Three Kingdoms Period (AD 220-265). Much deforestation had taken place by 1870, but the increase since then makes simple calculations from the historical record a poor guide to the future of flood probabilities. The feasibility study's assumption that one flood in 20 years is acceptable for farms and houses, or one in 100 years for large factories (Vol. 9, preface, p. 5), might itself be questioned as expecting the people to accept too much risk. Should the probability calculations be overly optimistic, these risks could be even more daunting.

The CYJV-recommended scheme leaves over half a million people living in the active flood storage area (between El 162 and 182 m) of the reservoir proper, not including the large additional population in the backwater at Chongqing. These people would be flooded periodically during the normal operation of the reservoir when medium and large floods are captured (Williams, 1993, p. 106). Leaving population in the active flood storage area would not be acceptable for dams in Canada (Margaret Barber, personal communication, 1993). In discussing the issue of population in the flood storage area, CYJV stresses that people upstream of the dam living below the equivalent of NPL 162 are exposed to flood risk under natural conditions without the dam, and will benefit by being relocated to safer ground. The report's authors believe that this counterbalances the added risk of flooding when heavy flows are captured in the reservoir. The report asserts that "it has been established that the trade-off between the before and after situations is more or less even" (Vol. 9, p. 2-9).

The criteria used for identifying people worthy of compensation are not so liberal as the report's praise of the Chinese plan might lead one to believe. For example, "the loss of the use of land that is flooded in summer but dry in winter (below the natural 1:20-year flood line) is not included in the compensation criteria" (Vol. 8, Appendix A, p. 3-22). This is a major agricultural resource for the area, representing the most level and fertile land. For NPL 160 m, the Preparatory Office China Three Gorge Project Development Corporation (POCTGPDC), in Yichang, estimated that 31,333 ha of annually flooded farmland would be lost, or more than twice the amount of permanently inundated farmland estimated by that study (POCTGPDC, 1986, p. 44; see Table 1). CYJV's acceptance of the YVPO methodology that denies compensation for use of annually flooded farmland therefore represents a major blow to the riverside farmers, and makes it even less likely that they will achieve the same level of livelihood enjoyed before relocation, as specified in the first of CYJV's 14 resettlement criteria.

## B.) GOVERNMENTS CHANGE THEIR MINDS

The Chinese government could simply alter its water management policies after the currently proposed dam is completed and the limitation imposed by the need to gain approval of international financing is a thing of the past. The same physical structure could be operated with a normal pool level higher than the proposed 160 m: the CYJV group was asked to make resettlement calculations scenarios with normal pool levels as high as El 180 m. It is worth noting that many precedents exist of internationally-financed development infrastructure being used for much more damaging ends than those presented to the financing agencies and considered in environmental impact studies. An example is the Carajás iron ore project in Brazil, completed in September 1984 with financing from the World Bank. Since January 1988, the mine, railway, and port facilities built for export of unprocessed iron ore have been used (after Bank disbursements were completed) as part of a scheme to produce pig iron in smelters along the railway route. The charcoal demanded by the smelters has tremendous potential for speeding deforestation in the eastern Amazon (Fearnside, 1989a). In this case, the potential threat of the pig iron plan had been known before the railway was built (Fearnside and Rankin, 1982), but the World Bank chose not to consider these plans, which were administratively separate from the Bank-financed project. Once smelting began and the danger was apparent to

the world, the Bank had no leverage with which to induce compliance with clauses in the loan agreement committing Brazil to protect the environment along the railway route. The World Bank's internal policies (not any externally-mandated restriction) limit the consequences of non-compliance with loan agreement clauses on the environment, resettlement and similar matters to cutting off the remaining funds for the particular loan in question. Motivation to comply decreases steadily as the loan is paid out, and disappears completely when disbursements have ended.

The lessons for Three Gorges are clear: China can promise to do anything that the Canadian Government or the World Bank might want to hear. Promises can be made, for example, to operate the dam at NPL 160 m and to handsomely compensate all displaced persons. The CYJV report concludes that "resettlement is feasible at NPLs 150 and 160. CYJV is not able to fully confirm the feasibility of the higher NPLs" (Vol. 9, p. 1-1). Once the dam is complete, however, nothing prevents China from changing its mind. No additional construction would be required: the stroke of a pen and the turn of a valve could raise the NPL to 180 m. The additional 465,000 displaced persons (Vol. 9, p. 2-9) might receive little or no assistance, and even the original displaced population of 727,000 could easily find their long-term programs of subsidies and assistance discontinued. It is important to remember that, unlike most of the costs of dam building, there are no economies of scale as the displaced population increases. The report observes: "in fact experience shows that diseconomies are more likely to occur" (Vol. 9, p. 3-4). This is because the better land is used to resettle the first people moved.

China could change its budget allocation to resettlement as the proposed project proceeds. Resettlement comprises approximately one-third of the proposed budget. In the past, gross cost overruns in Chinese dam construction have been the norm: the Gezhouba Dam cost over twice the amount initially expected (Rogers, 1986). Should funds be insufficient to meet overruns, or even to meet the officially expected budget, the first item likely to be cut back is resettlement. Displaced people could be left to fend for themselves without sacrificing the energy and flood control benefits of the dam, but construction activity and equipment procurement must proceed apace if a dam is to result.

The CYJV feasibility study limits approval to lower operating levels because "increments in NPL above 160 m exhibit rates of return of less than 10 percent, due to the additional requirements for human resettlement" (Vol. 1, Appendix A, p. 2-20). Raising the operating level from 160 to 170 m (and the flood control level from 140 to 145 m) would generate an additional 800 MW of firm energy; "however, the value of the power is more than offset by the incremental cost of resettlement (260 000 people)" (Vol. 1, Appendix A, p. 2-17). This assumes that the additional displaced people would receive the relatively expensive benefits package described in the report. The Chinese could easily raise the water level, thereby cashing in on the power benefits while essentially leaving the people to fend for themselves.

A strong possibility that the Chinese government had plans all along to fill the reservoir beyond the CYJV-recommended NPL of 160 m was indicated by the 1987 inundation survey for NPL 175 m "following adoption in China of a project reference scheme that envisages a two-

stage reservoir filling and related resettlement relocation schedule" (Vol. 9, p. 7-7). The previous surveys had included even higher NPLs of 180 and 220 m. The current government plan is to fill in two stages, going first to NPL 156 m, followed by filling to NPL 175 (Zhu Rulan et al., 1992, p. 85). The presently-planned dam's crest height of 185 m leaves the option open to fill the reservoir still further to NPL 180 m, thereby displacing even more population.

Should China decide to raise the water level beyond the limits of the presently proposed structure, the government could subsequently add height to the dam. This is currently under discussion for the nearby Danjiangkou Dam on the Han River (Lampton, 1983; Liu Chiangming and Ma, 1983; see also Vol. 8, Appendix A, p. 6-14).

### C.) DRAFT PLANS

"Draft" resettlement plans have been under preparation since 1985, with the most recent version prepared in 1987 "to accommodate the Chinese NPL 175 scheme" (Vol. 9, p. 7-7). These plans are "still under review by Chinese authorities and are considered working documents" (Vol. 9, p. 7-7). It is important to realize that such plans can quite easily remain in "draft" status while they are in fact carried out and the dam becomes a concrete and steel reality. Considering plans as eternally in "draft" form is a common practice in many countries (such as Brazil), where the preliminary nature of plans can be used to justify secrecy, and to deflect any criticism by alleging that whatever plan is being questioned has changed or is changing. In China there is a long tradition of changing plans as construction proceeds. Despite efforts to curtail the practice, major dams have traditionally been built using the massively inefficient system of san bian (three sides), or the simultaneous surveying, designing, and building of dams (Lampton, 1983, p. 16). In addition to frequent changes in design while building the Dianjiangkou and Gezhouba, both dams had to be halted for two years during construction due to inadequate planning (see Fearnside, 1988). As implementation proceeds on the recommended scheme, it would be quite a normal practice for the plans to evolve along the lines of the more grandiose "draft" proposals, for example, toward a higher NPL or a larger dam.

### D.) BUDGET

There are some indications that the costs are understated in CYJV's budget calculations. The effect of inflation has not been included in any of the calculations, which the CYJV team acknowledges "would seem to be a feature worth incorporating" (Vol. 9, p. 10-8). One wonders, then, why it was not incorporated.

The resettlement cost in the recommended scenario is calculated in Volume 9 as 8.3 billion yuan, but this is rounded to 8.0 billion yuan in the economic and financial analyses in Volumes 1 and 9 (Vol. 1, p. 1-11 and Vol. 9, p. 9-15). The difference is equivalent to US\$ 81 million (US\$ 1 = 3.7 yuan at the official 1987 exchange rate used by CYJV). While this may seem to be small change in a project of this magnitude, the best practice is to maintain more decimal places until the bottom line is reached, and then do any rounding on the final result.

The number of people to be resettled may be understated. In addition to the restrictive criteria applied to defining eligibility for compensation and relocation and the likelihood that flood levels may be higher in reality than those assumed (especially in the backwater and in the tributaries), the growth of the population during construction may be faster than assumed. The calculations have assumed a 1%/year population growth, a migration rate to the cities of 1.5%/year and to the towns of 0.5%/year (Vol. 9, p. 5-10). The report acknowledges that "...higher natural growth and migration rates, and a longer resettlement period (mean that) the CYJV Recommended Scheme population could be increased by an additional 100,000 persons" (Vol. 9, p. 5-16). Only five years after completion of the CYJV study, Pierre Senecal (a Hydro-Quebec official who participated in the resettlement study) stated publicly that population growth has rendered CYJV's endorsement of the 160 m NPL dam "no longer valid." Senecal prefaced his remarks, made in a presentation to the 13th Annual Meeting of the International Association for Impact Assessment (IAIA) held in Shanghai in June 1993, with the caveat that he was speaking for himself rather than for Hydro-Quebec.

#### E.) CHINA'S RECORD OF RESETTLEMENT

Other major resettlements for Chinese dams have been Xinanjiang (280,000), Danjiangkou (380,000), and Sanmenxia (320,000) (Tian Fang and Lin Fatang, 1988, p. 91). Outside China, the record is 100,000 in Egypt and Sudan for the Aswan High Dam. Even at the lowest normal pool level nominally under consideration (NPL 150 m), Three Gorges would produce the world's largest dam-displaced population (Vol. 9, p. 3-4).

The record of resettlement is not good. Tian Fang and Lin Fatang (1988, p. 97), in an article extolling the virtues of the dam and the possibility of "mobilizing the population" to turn the resettlement areas into regions of prosperity, have to admit that previous resettlements have been characterized by "historical mistakes such as uncoordinated management, duplicate development, wasteful use of volunteer labor, and limited funds."

The question of funds is central, and the Danjiangkou case is illuminating. The CYJV report states: "funds were totally inadequate even for the reconstruction of infrastructure, including housing, at the time of removal. Significant funds for development purposes only became available to relocatees in Yunxian county in 1984, over ten years after resettlement had been completed and even these funds may still be inadequate." (Vol. 9, p. 3-3). The historical record speaks louder than the mere announcement of new policies, such as China's new "resettlement with development" policy extolled by the report as "among the best in the world" (Vol. 9, p. 3-2).

That official plans do not necessarily correspond to reality is attested by the continuation of construction activity in the doomed cities below the planned relocation level. Government regulations prohibit construction below NPL 172 (Vol. 9, p. 8-3). That civil construction continues apace in all of the submergence area is obvious to the visitor, and the report observes that this "uncontrolled building" indicates that "while the exercise of 'master planning' is taking place, land use planning controls are not very strong" (Vol. 9, p. 4-21). One might surmise that

the rosy picture foreseen in the master plans for the resettlement areas might similarly not correspond to reality there. The report acknowledges doubts in this regard (Vol. 9, p. 8-3), but these doubts apparently do not affect the overall conclusion endorsing the Chinese government plans as adequate.

#### F.) LAND AVAILABILITY AND QUALITY

The resettlement plan calls for relocating the displaced population within the affected townships (xiangs), plus a few additional townships adjacent to those touched by the reservoir. Within the 600-km-long affected area, much of the displaced rural population would be moved to the eastern end of the area, since the townships there have most of the "claimable land" identified by the survey. Even with the increased number of host townships considered in the resettlement zone as a result of suggestions from the CYJV Steering Committee, the lack of available farmland is apparent. The presently unoccupied "claimable land" is generally unoccupied for a good reason: it is not so good as the land already occupied, including that from which the displaced farmers are coming.

A persistent problem in resettlement schemes for reservoirs in densely populated countries is that land of equivalent quality is simply unavailable. This has been a stumbling block for negotiations between India and the World Bank over financing for dams on the Narmada River (Sardar Sarovar and Narmada Sagar). In this case, the governments of the states of Gujarat and Madhya Pradesh have at least agreed in principle to purchase farmland in order to provide land of equivalent quality (notwithstanding continuing controversy over whether these good intentions will, in fact, be realized). It should be noted that, while Narmada compares favorably with Three Gorges on several counts, the Narmada scheme as a whole is widely viewed as one of the world's great dam-building disasters (e.g. Alvares and Billorey, 1988; Goldsmith and Hildyard, 1984; Morse *et al.*, 1992). In the case of Three Gorges, the idea that equivalent quality land should be offered is not even raised as an issue.

Incredibly, the CYJV analysis assumes that a hectare of inundated land can be replaced by a hectare of reclaimed land--meaning that they are of the same quality. The report states that the "preliminary screening of land replacement potential was conducted assuming a 1:1 ratio of available to inundated land" (Vol. 9, p. 7-19).

Less than half of the total "claimable" land in the resettlement areas is below 800 m elevation, and most of what is below this elevation is in the 400-800 m elevation range (Vol. 9, p. 7-11). In addition, the size of the parcels of available land declines at the more-desirable lower elevations; the average size for the sampled area as a whole is a minuscule 15 mu (1.0 ha) (Vol. 9, p. 7-11).

The tiny average size of available patches of land means that the social structure of the villages dispersed onto these patches will inevitably be pulverized. Point No. 5 of CYJV's 14 resettlement criteria states that "opportunities for resettling people in groups and communities should be provided" (Vol. 9, p. 2-4). It is difficult to imagine how this criterion is to be met. In

countries where villagers threatened by displacement by reservoirs are able to express their views, as in the case of India's Narmada Dams, one of the primary demands is always to prevent fragmentation of village units.

Flooding is considered to be acceptable for orchards if it does not occur with frequency greater than once every five years (Vol. 8, Appendix A, p. 5-2). The citrus orchards that provide the region's major cash crop would have to regrow at an unusual pace indeed if they were to remain profitable under such a flooding regime! For comparison, citrus is presently grown in areas where frost events kill at most some trees once every 25 years (Vol. 9, p. 4-15.).

The 800 m elevation mark is considered to be the upper limit for animal husbandry, apples, pears, apricots, plums and, potentially, mandarins (Vol. 9, p. 7-3). Above 800 m elevation, agricultural use is restricted to potatoes, some cereals, and mulberries for silkworm production (Vol. 9, p. 7-10). Most of what the report calls "confirmed claimable land" is located just below 800 m. It is important to remember that such climatic cutoffs do not occur in an all-or-nothing fashion at a given elevation, but rather are spread over a zone of gradually declining production that undoubtedly includes the upper portion of the zone below each cutoff elevation. These would undoubtedly affect citrus (which is sensitive to cold spells), and so would have a major impact on the viability of the agricultural plans as a whole since citrus orchards are described as "the major component" in Chinese agricultural plans for the resettlement areas (Vol. 9, p. 7-5). The cutoff elevation used for most citrus varieties is 600 m (Vol. 9, p. 7-27).

The CYJV team only examined land below 800 m elevation, but the Chinese proposals include plans for settlement above this mark: "over 50% of the total class 7 [claimable] land is located above El 800" (Vol. 9, p. 7-11). The Chinese expectations for land above 800 m elevation are apparently taken at face value, which seems unwarranted given that the CYJV team found that the Chinese data had an "unclear definition of the distribution and physical characteristics of 'unused slope land', which is the source of all reclaimable land in Chinese resettlement plans" (Vol. 9, p. 7-7). Characteristics such as altitude, slope and soil type are basic to identifying agricultural potential. Within the 185-800 m elevation band examined by the CYJV team, the review found only 68% as much available claimable land as that indicated by the Chinese preliminary results (Vol. 9, p. 7-11). This raises some doubt about the report's conclusion that "the Chinese plans show that sufficient land resources have been identified to satisfy rural resettlement needs for all affected counties" (Vol. 9, p. 7-9).

The CYJV team's finding that only 68% as much claimable land existed in the sample as the Chinese government had indicated (Vol. 9, p. 7-11) conflicts frontally with the report's later conclusion that "taking into account qualitative factors that might increase or decrease the eventual claimable land resource, the [Chinese government's] Three Gorges Project survey results are seen to provide a conservative indication of resource potential" (Vol. 9, p. 7-18). What "qualitative factors" lead to this remarkable conclusion are not specified; the quantitative results pointing in the opposite direction are, to this observer at least, more convincing.

## G.) MINORITY AREAS

Should the plans to farm the steep and relatively high altitude land that makes up most of the "claimable" category, and to intensify production on the already cultivated land, prove less successful or more expensive than expected, the temptation will be strong to look for alternative relocation sites farther afield.

Farmers from the Three Gorges area, who share the Han race and culture with the majority of China's population, may be deported to distant settlement areas where minority groups now dominate, as in the semi-arid western regions near China's border with the Soviet Union. Settlement projects have been underway in border areas such as these, in part in an effort of the central government to populate them with Hans (Gore and Dale, 1980, p. 321; see Fearnside, 1988, p. 619). The possibility of transport to border areas is not mentioned in the CYJV report. Indeed, the expressed purpose of the feasibility report in justifying the Three Gorges Project to international funding agencies (Vol. 1, p. 1-4) made mention of any such relocation plans unlikely. The World Bank policy on tribal peoples (Goodland, 1982) would be violated were such a relocation undertaken in a project funded by the Bank. As mentioned earlier, relocation of part of the displaced population to the area of Kashgar, an area in Western China that is the home of the Uighur minority, has already been announced.

#### H.) NONPERSONS

The feasibility study report mentions that 10-30% of urban dwellers are "not officially registered as resident in urban areas" (Vol. 9, p. 4-10). The Yangzi Valley Planning Office (YVPO) surveys did not count this "floating population" of urban areas (Vol. 9, p. 5-6). The CYJV report fails to mention that the Chinese government apparently has no intention of providing resettlement benefits to these nonpersons (see Fearnside, 1988). The government views provision of benefits to these persons as a reward for illegal behavior (R.J.A. Goodland, personal communication, 1987). In addition to individual illegal migrants to the cities, some whole towns are not officially recognized as "urban areas" (Vol. 9, p. 4-10), meaning that the residents have no rights to rice rations, nor to relocation to industrial jobs. As the report mentions, "those working in rural enterprises are still considered agricultural workers" (Vol. 9, p. 4-20).

Although the floating population is estimated at 10-30% of urban dwellers (Vol. 9, p. 4-10), the calculations assume the most conservative extreme of 10%, amounting to 26,860 people for the CYJV-recommended NPL 160 m scenario (Vol. 9, p. 5-12). It would seem more logical to use 20%, the midpoint of the range, for the floating population, thereby doubling the estimated number of such people.

The CYJV report actually appears to endorse the conversion into nonpersons of rural to urban migrants. For those migrating up to the beginning of construction, "CYJV assumed that migrants would not be entitled to resettlement compensation and hence would be discouraged from the zone to be resettled" (Vol. 9, p. 5-10). The YVPO/CPE defined the affected population as including "the portion of the floating population that has resided in county seats and towns for

more than a year" (Vol. 9, p. 5-7), a criterion that clearly leaves some of the floating population out of the plans.

### I.) RURAL TO URBAN MIGRATION POLICY

There are already too many people utilizing the farmland in the area surrounding the reservoir; 30% are already considered "surplus" due to agricultural modernization and the contract responsibility system (Tian Fang and Lin Fatang, 1988, p. 93). Population growth is an additional source of "surplus" people in the countryside; farmland per capita is only about 1 mu (0.067 ha).

It should be noted that some of this "surplus" population might willingly move into cities if given the chance to do so. As the report mentions, the worldwide tendency for rural-urban migration is especially strong in China where millions of people were forcibly relocated from the cities to the countryside in the 1950s and 1960s. China's restrictions on internal migrations, with people legally tied to their work unit (dan wei), have prevented many rural people from responding to the lure of bright city lights. Were these restrictions lifted, some of the rural resettlement problem would disappear. Resettling farmers is much more difficult than moving city people because farming requires land--a resource that is now essentially fully occupied and that (within the limits of practicality) cannot be created anew regardless of the amount of funds devoted to the purpose. Factories and other urban employment sources can be built if the government is willing to pay the monetary cost required. The problem is that creating factory jobs is about 2-3 times more expensive per capita than is rural resettlement--for example, in the NPL 160 m scenario, CYJV calculates that agricultural jobs on new land will cost 6491 yuan/job while jobs in new factories will cost 16,400 yuan/job (Vol. 9, p. 9-4). The budget allocation to resettlement, already about one-third of the total project cost, might therefore have to be substantially augmented to allow a greater share of urban resettlement. The CYJV-recommended budget calls for 8.3 billion yuan for resettlement out of a total budget of 24.4 billion yuan (Vol. 9, p. 2-6).

Encouraging rural to urban shifts in the host population would relieve some of the pressure from resettling farmers from the reservoir area. The costs of urban jobs for these people would have to be added to the costs based solely on accommodating people from the submergence area. The CYJV report recommends the opposite: that "measures will have to be adopted and enforced to prevent migration to urban areas below the requisition line" (Vol. 9, p. 5-10).

### J.) THE ZERO SUM DILEMMA

Offering development assistance to the resettlement areas, with favorable prices for power to factories in the area, etc., is part of the Chinese "resettlement with development" policy. It is well to remember, however, that from the perspective of China as a whole, this is essentially part of a zero-sum game. The capital and other resources that limit industrial expansion mean that a factory job created in the Three Gorges area signifies one less job

somewhere else in China. The faceless people who sustain this impact elsewhere in China would probably be unaware of any connection of their plight to Three Gorges. They are unlikely to become a focus of international attention. It is only fair to mention, however, that the power from Three Gorges will expand the industrial pie. It is more than justified to reserve a share of the benefits from this expansion for those dislodged by the reservoir.

The prospects for mining development provide a case in point. The official policy is that Three Gorges should receive priority for both mining and industrial investments (Vol. 9, Annex 1, p. 2). The CYJV report, however, states that "all large scale mining projects are controlled entirely by the State, therefore, future development must take into account alternative investments elsewhere in the country. In this regard, the reservoir region is unlikely to receive special attention in the foreseeable future unless special efforts are made to promote these resources" (Vol. 9, p. 4-26). The authors of the report appear to be hinting that the official rhetoric on diverting investments from more promising sites is likely never to be translated into tangible benefits for the displaced population.

The official policy decision of the Central Committee of the Communist Party taken in 1986 is described by the report as "Normal expenditures from other channels should not decrease due to the occurrence of resettlement investment. Instead, funds should be raised from all possible means to bring into being a set of industrial and mining enterprises" (Vol. 9, Annex 1, p. 2). Unfortunately, such official policies cannot make the zero sum problem go away.

#### K.) CONSULTATION OF THE LOCAL POPULATION

Criterion No. 4 of the 14 criteria adopted by the CYJV steering committee is: "the resettlement plans should have broad-based popular acceptance and the affected population should be consulted" (Vol. 9, p. 2-4). The Steering Committee met six times; at the fourth meeting it was decided that "due to data limitations on the question of land availability for resettlement, resettlement feasibility could not be fully demonstrated" (Vol. 9, p. 2-2). At the sixth and final meeting, the steering committee decided that the criteria had been met and that the project is feasible from the point of view of resettlement. Among the doubts that jump to mind, one might question the evidence that Criterion No. 4 had, in fact, been met.

The CYJV report states that "At all the sites visited, the local people were aware of the pending decision concerning the Three Gorges Project" and "the local leaders have been and will continue to be involved in the planning of resettlement within their own communities" (Vol. 9, p. 7-5). The CYJV team visited China for an unspecified length of time during March-April 1988, during which 43 townships (xiangs) were "included in the sample" subjected to "an independent check, using aerial photo interpretation techniques supported by field verification" (Vol. 9, p. 7-11). No indication is given of how many of the 43 townships in the sample received field visits, whether any host townships were visited, nor of how much time was devoted to the field portion of the mission. The reservoir area is made up of 610 townships, 430 of which would receive resettled farmers under the CYJV-recommended El 160 m NPL dam scheme (Vol. 9, p. 7-18). The 43-township sample is described as "representing typical conditions throughout the reservoir

area" (Vol. 9, p. 7-11). It is important to note that, while the sample's representativeness for physical factors can be checked from maps and aerial photos, representativeness from the standpoint of local consultation and support for the project cannot. The tendency of visiting delegations to be shown carefully-selected "success stories" by governments requesting international financing is virtually universal. Nothing is said of what steps might have been taken to avoid this factor in choosing the locations visited and the individuals interviewed at each site. The Canadian team was always accompanied by staff from YVPO (the principal proponent of the dam) during field visits (Zhizhong Si, personal communication, 1993). The "local leaders" alluded to in the CYJV report as involved in the resettlement planning probably refer to Communist Party cadres (ganbus) rather than elected representatives in the sense that might be understood by many Western readers of the document. Dissident voices cannot be expected to make themselves heard. China has no non-governmental organizations that might question official decisions, much less grassroots movements such as the committees of "oustees" threatened by India's planned Narmada Dams. For what it is worth, my own impressions in the reservoir area (eight days during Feb.-Mar. 1987) do not confirm the occurrence of widespread consultation with the local population. Those who were aware of the scheme certainly would not share the view that resettlement "offers an opportunity for planned regional development that can add to the benefits of the Three Gorges Project" (Vol. 1, p. 17-1).

Pierre Senecal (of Hydro-Quebec, but speaking for himself) stated in a presentation to the 13th Annual Meeting of IAIA that the people he had interviewed with CYJV in the cities to be flooded had expressed a wide variety of apprehensions and that they had only heard of the project through the newspapers; the people in the countryside, while less vocal than the urban residents, also expressed concerns, such as the loss of their ancestors' graves. The only quantitative information available was a survey by a Chinese psychologist indicating 10-30% of the rural population in the submergence area opposed to the dam. In light of Senecal's observations, one wonders how the CYJV team could conclude that all 14 resettlement criteria had been met, including consultation and "broad-based" support.

The study's International Panel of Experts lists as a "factor to be considered" that "it is especially important for the success of TGP resettlement program that not only the population to be resettled but also the host population are convinced that they will benefit from the Project" (Vol. 1, Appendix A, p. 2-14). This reminder would seem to stop short of confirming the widespread popular acceptance that the feasibility study asserts has already occurred.

#### L.) IRREVERSIBILITY

The ultimate decision to build the Three Gorges Dam, as well as the decisions to go forward with the many development projects that are linked to it, are treated as faits accomplis in the feasibility study. In China, investments in preparations for dam construction started long before the project was approved by the National People's Congress in March 1992. One account (Tyson, 1991) states that 40,000 people had been moved by July 1991. In addition a highway to the dam site at Sandouping was completed in August 1990. Three apartment blocks to house the dam's engineers had also been completed.

The people already moved, all of whom are rural, are part of an experimental resettlement program. In addition to creating a fait accompli, the experimental program is intended to demonstrate that resettlement can be successful. More support is given to these relocatees than can be expected once the large-scale program gets underway. The experimental resettlement is done within the same districts as the source areas and uses intensification of existing farmland rather than the high altitude sites that would have to be used for bigger flows of population (Zhizhong Si, personal communication, 1993).

The presentation of development plans as "irreversible" is, in fact, often a deliberate strategy to avert fuller discussion of schemes that would be likely to be rejected were the true costs and benefits brought to light. The Balbina Dam, which blocked the Uatumã River in northern Brazil in 1987, provides an example that should not be emulated elsewhere (Fearnside, 1989b). The language of the CYJV feasibility report indicates that the authors accept as foregone conclusions the building of the Three Gorges Dam and many related projects, including the interbasin water transfer schemes. Of these developments the report states flatly: "the Yangtze watershed will be [emphasis mine] subjected to many human interventions over the next several decades" (Vol. 8, Appendix A, p. 6-14). The study team appears not to have fulfilled the role at least theoretically included in its original mandate: to provide input for the decision on whether or not to build the Three Gorges Dam.

#### IV.) THE CONCLUSIONS OF THE CANADIAN STUDY

The CYJV feasibility study of the Three Gorges Project emphasizes positive aspects of the scheme while minimizing the negative consequences. Where negative features are pointed out, the logical conclusions to be drawn from them are usually not reflected in the general conclusions of the study, which ratifies the feasibility of the dam for normal pool levels up to an elevation of 160 m. The resettlement component is illustrative of these problems. A laudable 14-point list of criteria for establishing feasibility of resettlement is presented at the outset of the report. Ironically, however, the more impossible it is to meet any given criterion, the less likely is the criterion to be raised as an obstacle to ratification of the plan. Problems that can be solved by spending more money, as in creating urban employment, lead to recommendations to increase the budget. Problems are ignored when they encounter inherent physical limits, such as replacing inundated land with land of equal quality and refraining from fragmenting village units when the populations are moved. When more politically-sensitive matters are touched upon, as the criterion requiring consultation of the local population and grassroots support for the resettlement plan, the study alleges that the problem has been solved.

The feasibility study has as one of its stated objectives the provision of an impartial review to bolster China's case for obtaining international financing for the dam. The conclusions of the study (although not always the data in the body of the report) serve this end well. The information provided, however, needs to be supplemented if other countries are to judge

adequately whether to fund the proposed scheme. Especially lacking is an assessment of ways that events in the Three Gorges area could (indeed are likely to) unfold in ways different from the official scenario. These include strong indications that China would follow its previously-announced plan for a two-stage filling process up to NPL 175 m, thereby exceeding the maximum of NPL 160 ratified by the CYJV study. As noted earlier, this has already occurred.

Possible budget cuts would be likely to affect the resettlement sector most heavily. Potential financiers should also be aware of doubts about how the population of nonpersons illegally residing in the cities would be treated and of the likelihood of displaced population from Three Gorges being added to ongoing relocation programs to China's border areas where minority groups predominate. In addition to this information needed for the use of multilateral development banks, voters and their representatives in countries funding the banks should be aware of the many ways that bank-financed development projects such as this routinely escape from the best-intentioned loan agreement clauses designed to contain environmental and human impacts. Reform of bank policies would also be needed to make a scenario such as the resettlement plan put forward in the feasibility study reasonably sure of being more than a weighty pile of paper serving to justify another environmental and social disaster.

## V.) LESSONS FOR THE IMPACT ASSESSMENT PROFESSION

### A.) THE QUESTION OF EXPERT PROSTITUTION

Vaclav Smil has characterized the Canadian feasibility study as "expert prostitution" (Teichroeb, 1990). Despite its somewhat abrasive nature, this analogy expresses an important feature of the problem: the implication is that those who write reports like this would, for a fee, suspend any professional or moral qualms they may have and do whatever is asked of them. While holding individuals to account for their actions is fundamental to the functioning of society, it is not sufficient as a strategy to avoid repetition of the problems revealed by the case at hand. The root of the problem is not ethical fragility of the individuals involved, but rather the structure of the situation into which these individuals are placed. It is this structure that the impact assessment profession must take the lead in trying to change.

One common practice illustrated by the CYJV report is the anonymity of its authorship. The names of the authors appear nowhere in the document, let alone on the sections written by each person. The firms making up the CYJV consortium refused to release the names of the individual authors when Probe International requested them to do so. Probe had lodged formal complaints with the professional engineering associations in the three Canadian provinces where the firms were based; the complaints were rejected, the grounds most frequently given for rejection being that the engineering associations only have authority over individuals rather than companies (Barber and Ryder, 1993: 162-167). The CYJV report contrasts sharply with the Probe book, where each chapter carries its author's name. One of the functions of authorship in the academic world is to allow each piece of information to be traced back to its original source. In impact assessments, however, this trail of responsibility is often broken by anonymity; it is also often broken by secrecy.

Impact assessment is primarily done by consultants who work either for private firms such as those that make up CIPM, for government agencies such as CIDA or the state-owned utilities in CYJV, or for multilateral development banks like the World Bank. A lesser amount is done by the regular staff of such agencies. All of these groups are carefully bound by agreements requiring them to maintain a cover of secrecy over what they find. As the terms of reference for the Three Gorges feasibility study illustrate, those who commissioned the report wanted to "demonstrate" that the project is feasible; it should hardly be surprising that a study arriving at that pre-ordained conclusion was duly produced.

One is stricken by the short deadline established for producing the report--a feature of impact assessment efforts in many parts of the world. Proposals for a Three Gorges Dam have been under active study since the 1940s. Why, then, should the feasibility of its most intractable impact--resettlement--be based on a visit to China of less than two months? Important features of the problem were sure to be missed under these circumstances, in this case, some of the most important ones. One might speculate that the short times allocated to tasks such as verifying the consultation with local people could actually have been a means of ensuring that no untoward conclusions would be drawn. Short deadlines contribute to what is, in fact, a common circumstance: the virtually complete isolation of consultants from contact with local people, resulting in reports based on information provided by government officials.

The consultants who collect the information in the field are usually several steps removed from those who write the general conclusions of the study. It is worth noting that individual consultants sometimes profess to have clear consciences, having written frankly of the impacts they foresaw. However, the end effect is often the same as if they had only reported positive aspects of the project: the final conclusions used in decision-making remain the same, such as the executive summary and the public announcement of overall project endorsement of the Three Gorges Project. The oath of secrecy, together with the realization of all consultants that their future prospects for contracts depend on discretion, ensure that any inconsistencies between the detailed findings and the conclusions remain interred.

## B.) AN ADVOCACY STRUCTURE FOR DECISION-MAKING

Perhaps a more advocacy-oriented structure to impact assessment and reporting is needed. As it is now, the reports are theoretically supposed to be unbiased, balancing pro and con information to arrive at an impartial recommendation. The reality, of course, is quite different. It is, perhaps, not realistic to expect that agencies that are specialized in building large dams will produce reports recommending that large dams not be built in favor of other alternatives. Hydro-Quebec and BC Hydro are unlikely to find that the top priorities for cost-effective reduction of China's energy shortage lie in increasing energy efficiency, or even in building smaller dams can begin generating power more quickly and that can be built without massive reliance on foreign contracts. Dam-building specialists are also unlikely to find that flood control benefits from the Three Gorges Dam could be more cheaply achieved by raising and maintaining ring dikes in the flood diversion basins of the middle reaches of the Yangzi and

by restricting industrial development in the diversion basin and beach areas (see Williams, 1993, pp. 113-114).

In situations where the agencies involved have inherent biases, it is often best not to hide these behind a facade of supposed objectivity by merging the functions of impact assessment and overall project evaluation. As a general rule, risks and impacts should be evaluated independent of promotion of the benefits. Misadventures are frequent when the distinction is blurred under a single agency--the simultaneous supervision and promotion of nuclear power in the United States by the now-disbanded Atomic Energy Commission is the best known example. In the case of atomic energy, a long series of safety problems and mishaps were covered up and ignored until the accident at Three Mile Island, after which the safety-related duties of the Atomic Energy Commission were given to the newly-formed Nuclear Regulatory Agency, while the role of promoting nuclear power is separate under the Department of Energy. In this way, the differences are aired publicly, maximizing the probability of a wise decision being taken at a higher level after hearing both sides of the debate.

### C.) AN END TO SECRECY

The Canadian feasibility study as a whole dramatizes the need for public scrutiny and debate about impacts of development projects everywhere. The secrecy that has surrounded both China's drafting of the Three Gorges proposal and Canada's feasibility study of the Chinese plans has deprived these efforts of valuable (and free) input from people from beyond the confines of the institutions entrusted with the studies. Even in Canada, where the CYJV feasibility study report was made available after a lengthy delay, omissions occurred. A total of 2000 pages were deleted (Zhizhong Si, personal communication, 1993). Not only does secrecy result in important factors being overlooked, it also frequently prevents rectification of omissions or distortions before the developments have become "irreversible."

The impact assessment industry generates a vast literature of consultant reports, feasibility studies and other documents that remain hidden from public scrutiny. The benefits of openness are several. One would be the increase in the quality of the studies themselves that could be expected to result from the authors' awareness that their peers would be reading their identified work. A second benefit is ensuring that the information is subjected to the maximum amount of checking for accuracy and consistency, that it is viewed together with the widest variety of other information about the project, and that interpretation is done from the full variety of existing viewpoints. A third benefit is the usefulness of the information to those who face development decisions in other locations, allowing them to capitalize on experience gained elsewhere. The existence of secret studies makes it easy for officials to misrepresent their contents--all doubters can be silenced with statements to the effect that "our confidential studies prove that the project is feasible; since you do not have access to the amount of information that we do, you will have to trust us." The examples that this refrain brings to mind are the many similar statements released by United States military authorities during the Vietnam War.

The International Association for Impact Assessment (IAIA) is a professional organization for the impact assessment profession. IAIA needs a policy on secrecy: this is a first step toward changing the environment in which most members of that profession work. The key to avoiding endless repetition of the CYJV feasibility study's failings is to encourage openness and public scrutiny of all phases of the impact assessment process. All documents must be readily available to the public, such that informed debate can provide the input that can come from no other process.

## VI.) LIST OF ABBREVIATIONS

IAIA	International Association for Impact Assessment
CIDA	Canadian International Development Agency
CIPM	Canadian International Project Managers Ltd.
CYJV	CIPM Yangzi Joint Venture
EI	Elevation (meters above mean sea level)
FCL	Flood Control Level
IBRD	International Bank for Reconstruction and Development (World Bank)
MPF	Maximum Probable Flood
MWREP	Ministry of Water Resources and Electric Power
NPL	Normal Pool Level
POCTGPDC	Preparatory Office China Three Gorge Project Development Corporation
TGP	Three Gorges Project
YVPO	Yangzi Valley Planning Office

## VII.) ACKNOWLEDGMENTS

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## FIGURE LEGENDS

Fig. 1. The Yangzi River and proposed cross-China water transfer routes. (Redrawn from: Fearnside, 1988).

Fig. 2. Sketch map of the reservoir for the Three Gorges Dam at NPL 180 m NPL. The narrow riverine nature of the reservoir is apparent. (Redrawn from: Fearnside, 1988).

Fig. 3. Schematic diagram of dam and reservoir with water levels as recommended by the Canadian feasibility study.

TABLE 1: ESTIMATES OF POTENTIAL FOR CARBON SEQUESTRATION THROUGH VERY LARGE SCALE TROPICAL PLANTATIONS

Proposed area (million hectares)	Assumed average sequestration (t C/ha/yr)	Time period for sequestration effect (years)	Target sequestration rate (GT C/yr)	Target sequestration total (GT C)	Planting costs per ha total (US\$/ha) (a)	Total planting cost (US\$ billion) (a)	Source
500		20-50				200-400	UNEP/Beijer Institute, 1989
500	9.6						Marland, 1988, p. 53
110	6.5		0.7				Postel and Heise, 1988
200	10	30-40	2	60-80		80	Myers and Goreau, 1991
300	10		2.9		398		Myers, 1988 (b)
240							IPCC (c,d)
200-400	5		1-2				Woodwell, 1987 (b)
200	5	20		20-200			United States, OTA, 1991, pp. 217-21
465	6.2	30	2.9	186	395		Sedjo and Solomon, 1988 (e)

(a) Excluding land purchase.

(b) As cited by Lashof and Tirpak (1990, p. V-141); see also Booth (1988).

(c) As cited by Myers and Goreau (1991, p. 222).

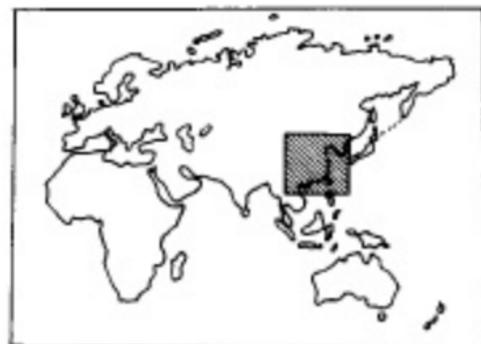
(d) The IPCC Response Options Working Group (WG-3) mentions planting "up to 200 million hectares" over the next 20-50 years, in addition to planting 11-20 million hectares per year over this same period to compensate for deforestation (Kupfer and Karimanzira, 1991, p. 88).

(e) Area and sequestration figures include temperate plantings, which would cost US\$400-1000/ha (excluding land purchase) or US\$372 billion for the temperate zone portion of the proposal.

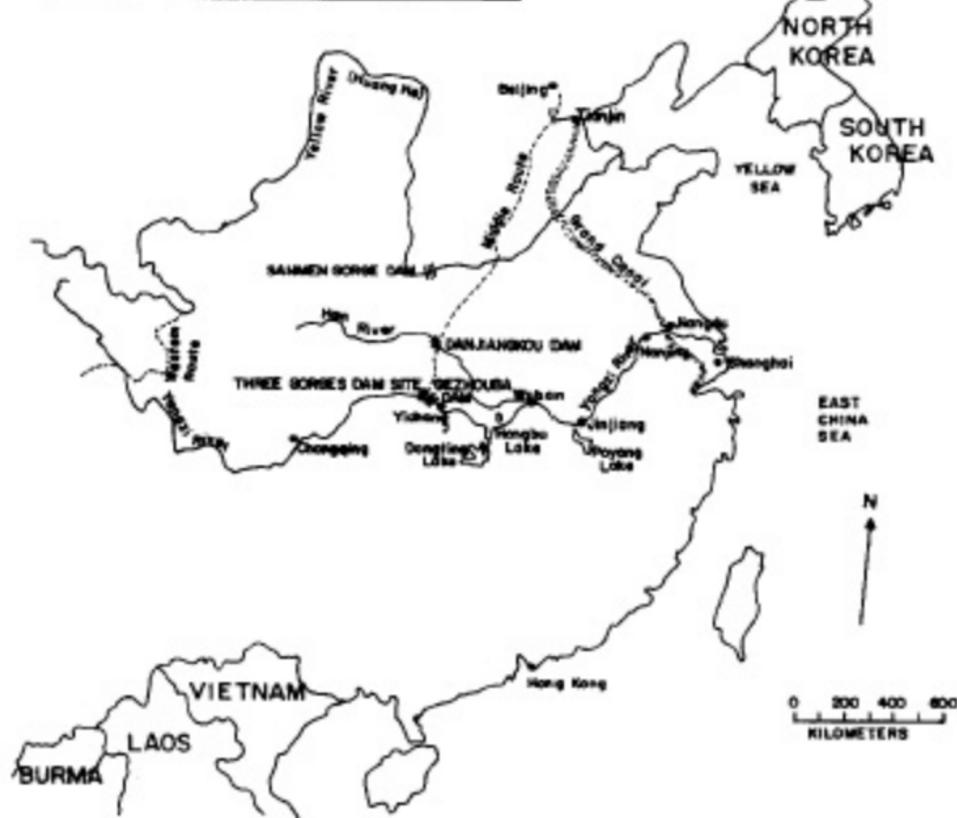


### THREE GORGES RESERVOIR





CHINA



NORTH KOREA

SOUTH KOREA

YELLOW SEA

EAST CHINA SEA

N

0 200 400 600  
KILOMETERS

VIETNAM

LAOS

BURMA

Hong Kong

SAIPAN GORGE DAM

Hei River

THREE GORGES DAM SITE

BEIZHOU DAM

Yuhang

Dongting Lake

Hongbo Lake

Wuyang Lake

Washan

Jinling

Uoyang Lake

Nanjing

Hangzhou

Shanghai

Beijing

Tianjin

Yellow River (Huang He)

Yellow River

Yangtze River

Sichuan Railway

Yellow River

CYJV - RECOMMENDED PROJECT  
Reservoir Operating Levels

