

MEKONG UPDATE & DIALOGUE



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The Australian Mekong Resource Centre was established at the University of Sydney in 1997 to promote research, discussion and debate on development and environment issues in the Mekong Region. The AMRC is a focal point for information, dialogue and activities in support of an equitable and sustainable development path for the Mekong Region.

The *Mekong Update & Dialogue* provides:

- lead article on the key topic of the issue
- responses to the lead article
- news of current developments in the region
- news from the AMRC
- information on Mekong-related conferences and events in Australia

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READER CONTRIBUTIONS

The Mekong Update & Dialogue welcomes the comments of its readers on issues raised in the Feature article and in the Responses to the Feature. If you do wish to make comment please email us at mekong@mail.usyd.edu.au. Comments should be sent by early November and should be limited to 1-2 paragraphs.

EDITORIAL - Lancang Hydropower and Optimal Development

Large scale planning, for economists and engineers alike, is often based on the principle of optimization. The “big picture” is supposed to provide a basis for allocating the resources of a country, a company or a river basin in such a way that overall benefits are maximized relative to costs, for example so that factor allocation is Pareto optimal. With the benefit of such an overview, local opposition to projects deemed to have wider societal benefit can be portrayed as parochial, or more commonly as “NIMBYism” – not in my backyard, please.

Lancang hydropower poses some interesting challenges for national planners in lower Mekong countries, who in turn commonly find their own “optimal” plans challenged by those affected by dams and other interventions that have severe local livelihood impacts. He Daming and Chen Lihui suggest that, despite the known – and unknown – risks of large scale hydroelectric development of the upper Mekong (Lancang, as the river is known in China), the social and environmental costs per megawatt are significantly lower than the costs that would be incurred by downstream dams on the Mekong mainstem. So, on the assumption that some tradeoffs are going to be necessary to satisfy growing regional power demand, the argument goes that it is more optimal for China to make the (relatively small) social and environmental sacrifices and export its surplus power to downstream countries.

Of course this logic begs a number of questions: should China be seen as making the sacrifices, or instead as monopolizing the benefits of power export within the wider Mekong River Basin context? Can we see the impacts as contained within China when it is known that there are significant downstream hydrological, geomorphological and ecological impacts, all with livelihood implications for river basin communities? These impacts are acknowledged by He and Chen, and further explained by Melissa Neave in her response in this issue of Mekong Update and Dialogue.

While the Lancang dams bring such questions into sharp macro-scale perspective, unequal sharing of costs and benefits of hydropower in the Mekong tributary basins transcend borders at a smaller scale, for example in the Se San River Basin. In this case, ethnic minority farmers and fishers in Ratanakiri and Stung Treng Provinces in north-eastern Cambodia have been bearing the brunt of impacts from hydropower development in Vietnam’s Central Highlands. These impacts have gone uncompensated, in part due to their transboundary nature.

Yet the inequalities and problems associated with optimization are not limited to international impacts. As experience with numerous dams in Thailand has shown, the principles of compensation dissolve into the reality of roughshod over-riding of local rights, particularly where impacts continue to be marked by uncertainties. The very scale of the Lancang dams goes to remind us of the limited recourse that downstream and weaker players – whether they be countries, fishers or farmers – have in response to large scale development on the Mekong.

FEATURE

The Impact of Hydropower Cascade Development in the Lancang-Mekong Basin, Yunnan

by He Daming and Chen Lihui

The Lancang-Mekong, with a total basin area of about 810,000 km² and an annual average volume of flow of 475,000 m³, is a major international river. In Yunnan river gorges are steep; slopes range from 1.5‰ in the upper part of the Lancang to between 0.8‰ and 1.0‰ in the middle and lower parts. Potential hydropower is unevenly distributed, mainly concentrated on the mainstream of the Lancang in China and the tributaries of the lower Mekong. The supply capacity of electricity among most of the riparian countries can't meet the power needs. Data provided by the State Power Corporation of China shows that the total installed capacity of the cascade dams would be over 15,000MW, yielding over 7,000MW of firm power and annual energy production of about 70,000 GWh.

Both the upstream and downstream governments in the Lancang-Mekong Basin began investigation and planning of hydropower projects nearly half a century ago. Since the founding of the Mekong Committee in 1957, hydropower

development has been the predominant focus of water resources utilization with three important reviews being done in 1970, 1988 and 1994 for the planning of cascade development on the mainstream. Nevertheless, due to various restrictions only the tributaries are being exploited in terms of hydropower development, though in one sense it is fortunate that no large dams have been built on the mainstream of the lower Mekong River.

The exploitation of the Lancang River Basin in Yunnan for electric power commenced 50 years ago. The Tianshengqiao Hydropower Station, with an installed capacity of 400 KW, was completed in 1946. It is situated on the Xier River, a tributary of the Lancang. Since the 1980s, Lancang hydropower development has taken place on the mainstream with a cascade development of eight dams planned (Fig.1). Manwan hydropower station, with an installed capacity of 1500 MW, was completed in 1996 and is in operation. Dachaoshan hydropower station, with an installed capacity of 1350 MW, will be completed soon. Xiaowan hydropower station, with an installed capacity of 4200 MW, is under construction. Two others, Jinghong hydropower station, with an installed capacity of 1500 MW, and Nuzadu hydropower station, with an installed capacity of 5500MW, are at the feasibility study stage and will begin construction in 2006 and 2005 respectively. A Thai company is jointly involved in the feasibility study of Jinghong.

Power transmission between cascade components is expected to be up-graded to provide for future growth in the energy export to both Thailand and Laos. In November 1998, the governments of Thailand and China signed a memorandum of understanding on the export of electricity to Thailand from China. As part of the national hydropower energy base in the Great West China Development Strategy, hydropower cascade development in the Lancang mainstream has proceeded rapidly in recent years. Its impact on basin ecology has caused wide concern within society.

Runoff change

The Mekong River Commission estimates that approximately 16% of the total Mekong River flow has its origin in China. This is supported by data from China (MOWR, 1992). The impacts of cascade development on the lower Mekong are concentrated on the flow change and flooding control upstream of Vientiane. The significant change in the flow is the annual average flow to the lower Mekong.

Water resources utilization in the Lancang River is limited by the mountainous terrain. Only about 3% of the water available is consumed. The major object of the Lancang cascade development is hydropower generation. The annual average water flow into the lower Mekong will not be reduced. Therefore upstream development of hydropower will not exacerbate conflict over competing uses.

But as dam construction in the Lancang River proceeds, the flow regime is changing. Because of their small storage capacity, the impact of Manwan and Dachaoshan dams on the average monthly flow is insignificant. Major changes to downstream flow will occur only after 2010 when Xiaowan is scheduled to be completed. The monthly flow at the border between China and Burma will be increased in the dry season, and decreased during the flooding season (Fig.2), which will provide benefits downstream for the development of irrigation, navigation,



Fig.1 Hydropower Dams on the Lancang River

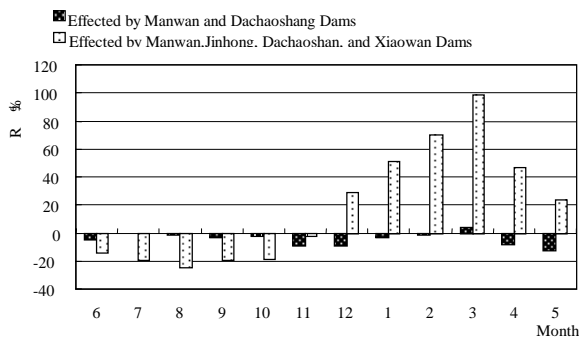


Fig.2 The Change Rates (R) of monthly runoff caused by cascade at the border of Lancang River into the lower Mekong River

hydropower transmission and for flood control because of flow regulation by the cascade reservoirs. The floods in the lower Mekong derive primarily from heavy storms in the Mekong tributaries in Laos; this means that the cascade development is limited in its ability to mitigate flood flows below Vientiane.

Impacts on fish ecosystems

Water projects for either irrigation or power generation purposes substantially transform the river and block the migration pathways of fish between the upper and lower reaches of the river, interrupting their growth, spawning, and multiplication. The consequent decrease in reserves will result in changes to the composition of the fish community. Even channel rectification will alter hydrological conditions, by speeding up the river flow, leaving behind less foodstuff, and destroying watergrass and sheltered rearing habitats of fishes. In the end, indigenous fishes will become extinct.

Around the world 60% of all rivers have been dammed causing blockage to the migration of certain fishes. It is especially the case in the construction of cascade dams, which fragment the habitats of fishes, and divide the complex river ecosystem into various reservoir ecosystems with simple and similar habitats. With blockage by the dam, the exchange of fish species between the two sides of the dam wall is broken and the modification or extirpation of certain species will speed up.

The Lancang-Mekong Basin is rich in aquatic biodiversity, especially in its downstream section. There are 1200 species of fish in the Mekong. As for freshwater fish in particular, there are 153 species in Yunnan, 650 species in Thailand and 850 species in Cambodia (Mekong River Commission, 1997). Fish species are greatest in number in the estuarine areas of the Mekong.

Some 400 fish species are considered of local economic importance and 30-50 species of national economic importance. Fish is the major source of low-cost and high quality animal protein for 40-80% of people in the Mekong River Basin. It is estimated that annual average production of fish is from 624,000 to 887,000 tons in the lower Mekong, 90% of which are freshwater (Secretary of Mekong Committee, 1992). If all the Mekong mainstream dams planned by the Mekong River Commission in 1995 were built, about 2,000 km of the river would be impounded as reservoirs, causing serious harm to the fish ecosystem. A series of dams planned on branches of the Mekong in Laos will also cause serious harm to fish species (Hill, 1994).

In recent years more attention has been paid to the possible

effects of cascade damming on fish ecosystems. Since 1994, when the Manwan Dam was completed, the mainstream ecosystem below the dam has been suffering from fragmentation and the consequent changes in fish distribution. Owing to lack of research, few migratory fish species from the lower Mekong have been discovered in the Lancang River. Nam An, Nam Na and Luosuojiang rivers - three major branches of the Lancang - have high fish biodiversity. The impact of hydropower cascade development in the Lancang mainstream could be greatly reduced if the three rivers were to be set up as migratory fish reserves. According to an investigation by Yunnan University (1996-2000), traditional fishery grounds have been inundated by the dam building and native species are diminishing. While fish species have increased in the reservoir, cultivated fisheries could decrease indigenous fisheries in the future.

Soil erosion

Surface soil erosion is the main source of sedimentation in the Lancang-Mekong. Annual total sediment loads, derived from the data collected at the mainstream hydrological stations of Jiuzhou, Gajiu and Jinghong from 1965 to 1987, show that the contribution from the lower area is substantially greater than from the upper and middle areas of the Lancang River in Yunnan, and this increased markedly after 1980 (You Lianyuan, 1998). It is related to deforestation and agricultural development in the lower Lancang (Zhang Peifang et al, 1999). The ADB estimates 50% of the 150-170 million tons/year sediment load in the lower Mekong derives from the Lancang River in China. However, the sediment of the lower Mekong mainly comes from northern Laos and not from the Lancang River (Liu Heng, 1998). Once the Lancang cascade development is completed, sediment entering the lower Mekong will be greatly decreased because of the storage effect of the reservoirs, although we still do not know exactly what the impacts will be on the lower Mekong.

The impact of cascade damming on local environments

A comparison of the Lancang mainstream cascade dams with cascade dams proposed for the lower Mekong, shows that the former have much higher economic benefit and lower impact on local ecosystems than the latter (He Daming, 1995). For example, the total installed capacity of the cascade in the Lancang mainstream is 105.5 % of the cascade in the lower Mekong River, but the total cost of the former is only 33.53% of the latter. The cost per kW for hydropower development in Lancang is US\$ 503, but it is as much as US\$1,584 in the lower Mekong, which is about 313% of the former investment. So, if the hydraulic resources in the Lancang were jointly developed and the hydropower exported to the lower Mekong riparian countries, great savings would be likely. Moreover, the amount of land inundated by the nine cascade dams on the lower Mekong mainstream amounts to 13.57 ha/MW, compared with 0.62 ha/MW for the eight cascade dams on the Lancang mainstream, indicating the former is as much as 2,189% of the latter. So, if the cascade project on the Lancang mainstream in Yunnan goes ahead and the proposed cascade dams on the lower Mekong are cancelled, the amount of resettlement and land inundated could be reduced, and wetlands and biodiversity (especially aquatic ecosystems) could be conserved in the lower Mekong River Basin.

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Professor He Daming is Director of the Asian International River Centre at Yunnan University. Since 1988 his research has focussed on transboundary water resources and sustainable development in relation to international rivers in Asia. He has organized over 35 projects to do with international rivers and has published 14 books.

Chen Lihui is Vice-professor at the College of Resources, Environments and Earth Sciences, Yunnan University. Since 1995 she has been studying the integrated development and management of the Lancang-Mekong River Basin. She has published a book and over 15 papers.

RESPONSES TO FEATURE

Potential Physical and Environmental Impacts of Dam Building in the Lancang-Mekong Basin, Yunnan

by Melissa Neave

The comments made by He and Chen on potential hydropower cascade development in the Lancang-Mekong basin address several pertinent issues. However, a more thorough investigation into the impacts of dams on the physical environment is likely to prove useful.

Dams are constructed to fulfill a variety of human needs, the most common of which are power generation, water supply and flood control. While these needs are generally met upon the completion of the structure the environmental and social costs are often undervalued during the design and planning phase. Cost-benefit analyses tend to over-represent the design benefits of proposed dam(s) while virtually ignoring or dismissing potential negative impacts to the non-human environment. However, even the most innocuous structure will cause systematic changes to the hydrologic, morphologic and ecologic functioning of a river. Indeed, long-term observations of both large and small dams have led most western nations to re-

evaluate their dam building policies and many of these countries currently emphasise dam removal rather than emplacement.

One of the most obvious consequences of dam construction is the disruption of riverine ecosystems. He and Chen acknowledge that the Lancang-Mekong basin contains a high diversity of economically important fish species, at both the local and national levels. However, they fail to relate the likely collapse of these fisheries to hydropower cascade development in the basin.

Numerous studies of aquatic environments have shown that native fish are highly vulnerable to even slight changes in their habitat. Most obviously, dams impede the upstream and downstream migration of fish, which may restrict access to both breeding grounds and feeding areas. But dams also alter flow regimes, which can affect fish populations in a variety of ways. One of the goals of cascade development along the Lancang-Mekong River is to control the magnitude and timing of flow. This is done primarily to ensure that river discharges are more evenly distributed throughout the year – making water available in dry seasons and reducing floods in wet months. However, indigenous fish communities have adapted to the natural flow regimes and are likely to be heavily impacted by changes in the timing and magnitude of peak flow events. Ecologic diversity requires flow diversity and simply altering the magnitude and distribution of flows in the Lancang-Mekong system is likely to accelerate the loss of native species.

In addition, the impoundment of water behind the cascade dams may change the temperature and oxygen content of the river. Stagnant water is generally low in dissolved oxygen and, depending upon its depth, often considerably colder than natural streamflow. Biological organisms are generally adapted to narrow temperature ranges and are obviously dependant upon oxygen for their survival. Thus, aquatic species in general and fish in particular will be vulnerable to disruption following dam construction.

Unfortunately, it is unlikely that those who will be most affected by the loss of fish in the Lancang-Mekong basin will be recompensed in any way through increased power generation. To most local communities the presence of consumable fish is likely to be far more important than the generation of power.

One of the more pervasive physical impacts of dams is the alteration of natural sediment patterns within the fluvial system. This results in two major consequences. Firstly, the capacity of dams is routinely reduced due to the impoundment of sediment behind the structure. The accumulation of this sediment gradually fills in the reservoir and may require dredging to maintain the design goals of the dam. This generates often unforeseen and ongoing costs.

Perhaps more importantly, however, the release of sediment-deprived water from a dam can result in significant incision and bed lowering in the downstream direction. This causes an adjustment to the slope of the channel, which instigates a complex series of geomorphic responses. These may include changes to channel widths and alterations to lateral migration patterns. Roads, bridges and streamside settlements are vulnerable to damage from these changes in stream behaviour.

He and Chen recognize that sediment loads in the lower Mekong will be greatly reduced as cascade development proceeds. However, they assert that the consequences of this

reduction are unknown. This points to an obvious lack in the preliminary assessment of the environmental impacts of this project. How can dam construction be approved when the consequences have not been investigated to even a relatively basic level? It appears that the economic benefit of the power generation is being valued far and above the possible socio-economic costs to local communities and the overall health of the river.

The benefits of the proposed cascade development in the Lancang-Mekong basin may eventually outweigh the potential negative impacts, however it behoves planners to give environmental issues due consideration. The reality is that any alteration to the system will affect a physical response and that, although it may be difficult to predict the precise nature of that response, the pre-emptive identification of specific problems may reduce the overall cost of the project. Perhaps most telling is the fact that, despite the large costs of dam construction and the potentially larger costs associated with remediation and dam removal, relatively little money is expended on preliminary research and on-going monitoring of the environmental impacts of dams.

Melissa Neave is a lecturer in Geography in the School of Geosciences, University of Sydney. Her main area of interest is in the field of fluvial geomorphology with a focus on arid/semiarid hillslope processes. She has worked on the biogeomorphic influences of small mammals in a Chihuahuan desert ecosystem in the American southwest and is currently interested in using rainfall simulation to model the effect of surface crust formation on runoff and sediment generation.

It is anticipated that a response by Professor Le Quang Minh will be available from the copy of MU&D 5.3 on the AMRC website (www.mekong.es.usyd.edu.au) in the near future.

NEWS FROM THE REGION

Se San River dams

In March a new report was published on the downstream effects of the controversial Yali Falls Dam in Vietnam. This report complements an earlier report (May 2000) and update (July 2001) on the effects of the dam in Cambodia's Ratanikiri Province. The vast majority of some 30,000 villagers along the Se San, Sre Pok and Sekong Rivers in Stung Treng Province, northeast Cambodia, have experienced serious negative impacts from the dam. The long-term consequences - severe damage to the aquatic ecosystem, river hydrology and water quality - could be even more serious. A coalition of villagers, called the Se San Protection Network Project, has been formed to investigate the dam's impact and to challenge the politics of hydropower.

In June this year construction started on another dam, the Se San 3 Dam, on the Se San River twenty kilometres downstream from the Yali Falls Dam. This dam, costing \$US 273 million, will greatly add to the negative impacts upon downstream villagers in Cambodia.

Bainbridge, B. 2002 "Cambodian villagers battle Viet dams", Phnom Penh Post, 5-18 July 2002
-- 2002 "Villagers voice outrage over plans to build Sesan 3", Press Release from CEPA, 10 July 2002

Working conditions in Cambodia and Vietnam

An ILO monitoring project has led to an improvement in working conditions in some 30 Cambodian garment factories producing for export. The factories concerned employ around 21,000 workers, approximately 19,000 of whom are women. Cambodia has some 200 garment factories employing 200,000 workers. Recent monitoring found no evidence of child labour or sexual harassment in the factories. The report found improvements in freedom of association, payment of wages and overtime conditions. ILO reports influence purchasing decisions of foreign buyers.

By contrast, surveys show that female workers in Vietnam are suffering from long working hours as well as sub-standard health and safety conditions. Over 50% of Vietnam's workforce



Workers at a fish market in Ha Long Bay, Vietnam. (Source: Andrew Wyatt)

is female. More than 60% of workers in fisheries, garment, textile, leather and footwear firms, which demand many extra working hours, are female. Women undertaking night shift work are also in danger of rape and robbery when returning to living quarters far from their industrial workplaces.

-- 2002 "ILO finds "encouraging signs of improvement" in working conditions in Cambodian garment factories", Press Release from ILO, 1 July 2002
-- 2002 "Female workers need better care", Financial Times Information, 23 July 2002

AUSTRALIAN MEKONG NEWS

Update on the Dialogue

The **Dialogue on River Basin Development and Civil Society in the Mekong Region** which the AMRC, in cooperation with key civil society partners in the Mekong Region, is organising, began late August. The Australian component started with a two-day briefing session in Sydney for invited participants from the Mekong Region. This was immediately followed by a four-



Participants at the Dialogue briefing session held at Sydney University 26-27 August.

day study tour visiting the Murray-Darling Basin Commission (MDBC) in Canberra and various sites around Echuca on the NSW-Victorian border. The one-day workshop in Brisbane was held on Monday 2 September in conjunction with the annual *Riversymposium*. Participants included members of the four National Mekong Committees, CEOs of the MDBC and the MRC (Mekong River Commission), civil servants from the region, representatives from Mekong and Australian NGOs, and academics. A half-day workshop was also held the following day in Brisbane for invited NGO, government and academic participants in order to provide an opportunity for them to

engage in greater depth with each other and with Australian speakers from the previous day.

Full details of the Brisbane workshop program are available from our website www.mekong.es.usyd.edu.au. Preparations are now well underway for the Thai component of the Dialogue to be held in Ubon, northeast Thailand, in early November. Information will be posted to the website as it becomes available.

NEWS FROM THE CENTRE

Stop Press

As we go to press, we have just heard that our application for support from the Australian Research Council has been successful. Phil Hirsch and Andrew Wyatt will be working on a 3 year project on *Political Ecology of Risk in River Basin Development*. More in the Mekong Update 5.4.

River basin development: a negotiated approach

In June, Phil Hirsch participated in a 4-day workshop in Cochabamba, Bolivia that aimed to set common directions for a multi-site program on alternative approaches to river basin development. The program is funded by the Netherlands government through the NGO BothEnds and involves case studies of grassroots initiatives that involve upscaling from local action to broader level river basin development and management. AMRC is working with partners in Cambodia (Se San River Basin) and Thailand (Nan River Basin) for the Mekong component of this initiative. The Cochabamba meeting included the other case holders, from Bangladesh, Bolivia, India, Peru and South Africa. The workshop program involved a field visit with irrigators affected by the neo-liberal water reform agenda, that led to the infamous "water war" in Cochabamba in 2000. Further information can be found on the website of BothEnds (www.bothends.org), which coordinates the program together with its Indian partner organization Gomukh.

First AMRC intern

Commencing this year the AMRC is offering at least one person each year the opportunity for professional and academic development through on-the-job experience and exposure to issues relating to the development of the Mekong Region. In August I-Ling Chia became the first intern to join us. I-Ling is investigating hydropower development in the Se San Watershed in Vietnam and Cambodia, with the purpose of creating a case study on the AMRC website. I-Ling has an honours degree in communications studies from Singapore's Nanyang Technological University. She worked for Singapore's broadcasting media company, MediaCorp Radio, as a radio producer-presenter and journalist for three years, producing current affairs programs, news reports, and hosting radio shows. She is currently undertaking a Masters course in international relations at the University of New South Wales.

UPCOMING EVENTS

Conference on Economic Recovery and Reform

28-29 October 2002, Bangkok, Thailand

Contact: Ms Wannah Vejbrahm
Email: intconf@econ.tu.ac.th
fax: 66 2224 9428

International Conference "From Conflict to Co-operation in International Water Resources Management: Challenges and Opportunities"

20-22 November 2002, UNESCO-IHE Delft, Netherlands

Contact: Janos Bogardi, Programme 'PCtoCP: Water for Peace', Division of Water Sciences, UNESCO

Vietnam Update 2002 Conference: 'Local Government and Authority in Vietnam'

28-29 November 2002, Australian National University (ANU), Canberra, Australia

Contact: Beverley Fraser, Administrator, Dept of Political and Social Change RSPAS, ANU, Canberra, ACT 0200, Australia
Phone: (612) 6125 4790
Fax: (612) 6125 5523
Email: beverley.fraser@anu.edu.au
<http://rspas.anu.edu.au/polsoc/Vietnam/index.htm>

4th International Hani/Akha Culture Studies Conference

1-10 December 2002, Honghe Prefecture, China

Contact: The Honghe Research Institute of Nationalities, Jianshui, 654300, Yunnan, China.
Tel: 0873-7613015
Fax: 0873-7616545
Email: hnhnxh@yahoo.com.cn
<http://www.hani-akha.org/international/4th.html>

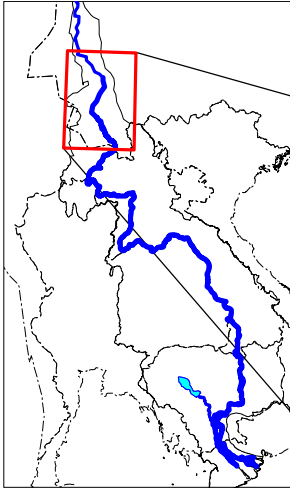
The Second International Symposium on the Management of Large Rivers for Fisheries: Sustainable Livelihoods and Biodiversity in the New Millennium

11-14 February 2003, Phnom Penh, Cambodia

Contact: Chris Barlow, LARS2 Coordinator, Mekong River Commission, PO Box 1112, Phnom Penh, Cambodia
Email: barlow@mrcmekong.org
<http://www.lars2.org/>

The events listed above are changed with each issue of Mekong Update & Dialogue. For a complete list of upcoming events please go to our website at www.mekong.es.usyd.edu.au. For submission of new events please contact the AMRC Administrator at mekong@mail.usyd.edu.au

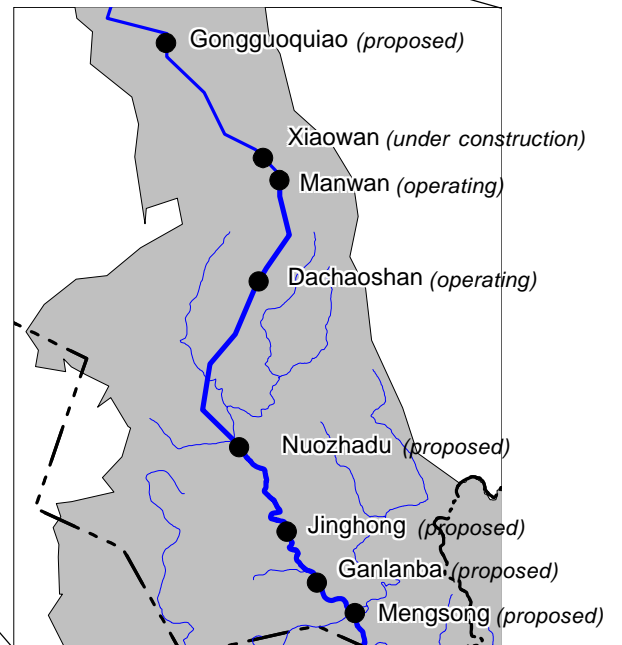
MEKONG MAPS: Lancang Hydropower



Manwan Dam

Location of existing and proposed Lancang River dams

(Source: Gavan McCormack)



Dachaoshan Dam

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