



# STATE of KNOWLEDGE

## China's Influence on Hydropower Development in the Lancang River and Lower Mekong River Basin

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### Why is China developing hydropower on the Lancang River and in the Lower Mekong River Basin?

China is the world leader in hydropower construction. In its 12th Five Year Plan (2011-2015), China announced its intention to further expand its hydropower capacity by developing eight hydropower zones with over 60 large-scale hydropower projects, bringing the total installed capacity of hydropower within the country to 284 GW (GEV 2011).

An important component of China's domestic hydropower development and its energy strategy is the construction of the Lancang cascade, located in Yunnan Province. The Lancang River<sup>1</sup>, known as the Mekong River south of the Chinese border, has a hydropower potential of 30,000 MW. To harness this potential, the Chinese government has plans to develop a cascade of eight mainstream dams on the Lancang, with five currently in operation. Once completed, these dams will be able to produce 15,720 MW or 52.4% of the Lancang's hydropower potential (Grumbine, Dore and Xu, 2012). Another 20 dams are either planned or under construction on Lancang tributaries (Kummu and Varis 2007).

Through the provision of cheap electricity, hydropower development along the Lancang provides opportunities for economic development in China's industrial cities such as Kunming and Guangzhou. Hydropower is one of the five pillars of Yunnan's economy. It is perceived as a clean energy source and an important component in reducing China's heavy reliance on fossil fuels and its CO<sub>2</sub> emissions, which are currently the world's highest. According to the Fast Statistics of the National Electric Power Industry, China's

installed hydropower capacity in 2010 accounted for 22.18% of its total energy supply.

China's hydropower influence, however, is not limited to the Lancang. China is also a major player in Lower Mekong Basin (LMB) hydropower development. Through companies such as the China International Water and Electric Corporation, Hydro Lancang and Sinohydro, China is active in dozens of dams in the Lower Basin including the recently announced Lower Sesan 2 (400 MW) dam in Cambodia. These dams provide an opportunity for China to export expertise, increase its political influence, develop trade links, and boost profits for its state-owned enterprises (SOEs). For the host countries, these projects offer large financial injections into their national economies, while also providing infrastructure and electricity. These dams are thus framed as 'win-win' projects by Chinese developers.

**Conclusion:** *The Lancang cascade is an important component of China's plans to develop cheap, renewable, low carbon energy to supply its growing domestic electricity demands. Lower Basin hydropower development offers opportunities for China to increase its political and economic influence in the basin and for SOEs to raise their profits and export their hydropower expertise.*

### History of Lancang Hydropower Development

Hydropower development on the Lancang was considered as early as 1956, when HydroChina Kunming Engineering Corporation (HCKEC) began site investigations. From 1957-58, HCKEC identified 21 potential hydropower sites along the river, and carried out the primary planning for the

1 - Lancang will be used to denote Lancang River for the remainder of the text.

Xiaowan Dam site. Due to the political and economic instability brought about by the Great Leap Forward and the Cultural Revolution, further hydropower planning was suspended until the late 1960s.

After extensive study, in 1988, construction began on the Manwan Dam, the first mainstream dam on the Lancang-Mekong River, without formal notification to downstream nations. Throughout the 1990s and 2000s, China's hydropower development along the Lancang advanced rapidly, and by 2008, four mainstream dams were operational: the Manwan (1,550 MW) began operation in 1992; the Dachaoshan (1,350 MW) in 2003, the Jinghong (1,750 MW) in 2008 and the Xiaowan (4200 MW) in 2010. As of June 2013, the Nuozhadu (5,850 MW) is operational, although not all turbines are running yet, and the Gongguoqiao (750 MW) is under construction.

The rapid development of the Lancang since 2000 coincides with the formation of the Yunnan Lancang Hydropower Development Corporation (YLHDC) in 2001. Prior to 2001, the responsibility for the development of the Lancang was shared amongst the Yunnan Provincial Lancang Integrated Development Planning Commission, the Ministry of Energy (MoE) and the China Energy Investment Corporation. In 2001 the YLHDC was given overall responsibility for developing the Lancang cascade. In 2002, YLHDC was renamed the Huaneng Lancang River Hydropower Corporation (HLHC).

HLHC is a shareholder corporation of China Huaneng Group (CHG), Hongta Group (HG) and Yunnan Investment Corporation (YIC). CHG is a state-owned corporation under the jurisdiction of the Chinese Central Government, and one of the five largest corporations in the hydropower sector. HG is a state-owned corporation aligned with China Tobacco. HG controls some of Yunnan's largest cigarette brands and has an increasingly wide portfolio that includes energy, construction, securities, paper production, pharmaceuticals, light chemicals, and hospitality. In China's 2010 Strongest Enterprises Report, HG ranked first in Yunnan and 104th nationwide (ETMOC 2010). YIC is an investment corporation of the Yunnan Provincial Government.

**Conclusion:** *The rapid development of the Lancang cascade since 2000 coincides with a shift in responsibility from the Yunnan Provincial Lancang Integrated Development Planning Commission, the Ministry of Energy (MoE) and the China Energy Investment Corporation to Huaneng Lancang River Hydropower Corporation (HLHC). HLHC is a powerful state-owned corporation with a diverse portfolio.*

## What are the downstream political, economic and environmental implications of Lancang hydropower?

Despite China's political, economic and environmental links with the Lower Basin, all of the existing dams on the Lancang were completed unilaterally without downstream consultation. This has spurred protest from downstream countries. These protests climaxed in the dry season<sup>2</sup> in 2010, when significantly reduced river levels on the Mekong mainstream below China coincided with the filling of the Lancang dams (Hirsch 2010). China blamed the low water levels on unusually dry weather patterns and not on the dams, but did agree to increased data sharing regarding water flows and releases, and improved dialogue with lower riparian countries.

Goh (2009) posits that China's development of the Lancang cascade has political and ecological consequences for downstream communities. China maintains, however, that "whatever action [it] takes to exploit the Mekong's potential is purely an internal matter" (Dupont 2001:129).

Nevertheless, the downstream protests that emerged in 2010 have prompted China to officially state that any hydropower developments on its stretch of the river will carefully consider downstream impacts (China Daily 2012). It has further stated that the benefits of dams will include flood control and improvements to water use and drought management downstream by storing water during the rainy season and releasing it during the dry season (China Daily 2012). China has extensive laws regulating hydropower development, including the Environmental Protection Law, the Environmental Impact Assessment Law, the Water Law of the People's Republic of China (PRC), the Law of the PRC on Water and Soil Conservation and the Regulations of the PRC on Natural Resources. These laws, however, include few or no provisions that account for the transboundary impacts of hydropower dams.

Nevertheless, a number of studies have shown that China's cascade of dams will reduce water levels by as much as 30% as far as Vientiane City in the Lao PDR, increase saline intrusion into the delta and impede vital sediment flows, which would have far reaching impacts on fisheries, agriculture and livelihoods throughout the Lower Basin (Kummu and Varis 2007; Räsänen et al. 2012; etc.).

The Lancang sub-basin is a major source of sediment for the Mekong River Basin. Almost half of the Mekong River's length passes through China. It contributes to 35% of the dry season flow and over 55% of the sediment load, and is thus vital to ecosystems throughout the entire basin (Kummu and Varis 2007; CPWF SOK Mekong Sediment Basics 2013). The Mekong's hydrology is characterised by a significant flood-pulse that propels nutrient rich sediments through the system during the rainy season from June to October. These nutrients support the region's ecosystem services and agricultural production upon which the majority of the livelihoods in the region rely (Kummu and Varis,

2 - The dry season in Thailand usually runs from November to May.

2007). It is estimated that the cascade of eight dams has a theoretical sediment trapping capacity of 94% (Kummu and Varis, 2007).

Sedimentation is also an important consideration for dam planners as it reduces the lifespan and operational capacity of dams by impacting their storage capacity. Erosion rates in the Lancang catchment have always been very high, which has implications for the lifespan of China's dams along this reach. Sediment loads at Manwan are impressively high, quoted at 1.21 kg/m<sup>3</sup> (Plinston and Damming, 1999:238). Without intervention, the Manwan reservoir's 'dead' storage would have been filled within 15-20 years, but the construction of the Xiaowan upstream has extended the dam's lifespan because of the Xiaowan's own sediment trapping efficiency (ibid).

Sedimentation can also damage hydropower turbines, which are costly and time-consuming to repair. Sediment flushing gates can be installed to move sediments downstream of dams, but these must be incorporated in the early construction phase. They are also costly and can reduce the hydropower potential of the project. (For further information on sedimentation and its impacts within the Mekong Basin see CPWF SOK Mekong Sediment Basics).

Politically, the Lancang cascade allows China to control the quantity of water reaching the Lower Basin. This is extremely important to the livelihoods, food security and economies of Laos, Cambodia and Vietnam. Räsänen et al. (2012) found that the Lancang cascade increased the dry season discharge by 34-155% and decreased the wet season discharge by 29-36%, thereby altering the timing and amplitude of the river's flood pulse characteristics. The impact that the current dams are having on fisheries and hydrology, both in the basin and the delta, is still not fully understood, but will undoubtedly be closely watched by downstream nations over the coming years.

No formal agreements exist between China and downstream governments on the management of the Basin. China has 'dialogue status' with the Mekong River Commission (MRC), the main river basin organisation (RBO) in the region, with which it shares hydrological data from the Lancang, but it has so far declined the invitation to become a member. Notwithstanding China's stance that the Lancang cascade is a national issue that it has generally been unwilling to discuss, it has continued to engage in hydropower development policy with downstream nations.

The downstream governments have been reluctant to engage with China on the Lancang cascade's impacts due to China's relative military and political power and the country's large investments and aid in the Lower Basin.

**Conclusion:** *China frames its hydropower development as*

*a win-win for both itself and the Lower Mekong Basin countries. The Lancang cascade impedes sediment transfer throughout the Basin and allows China to control the dry season flow. This has potentially significant political, economic and ecological implications for downstream countries. China has increased its transparency and data sharing with downstream countries, but no formal agreements exist on the management of the basin.*

### **What is China's hydropower influence in the Lower Mekong Basin?**

China's role as a financier and developer of dams in the LMB has increased dramatically over the past decade. The main drivers of China's recent boom in hydropower development include closer international relations with its neighbours, expanding markets for burgeoning SOEs, energy security, greenhouse gas emission reduction targets, and the rising cost of domestic environmental and social problems. Since 2000, Beijing has been working to increase its influence in the region through policies that encourage overseas investment.

China is actively trying to improve and strengthen its relationship with Southeast Asia as a whole, and especially in the LMB due to shared land borders. Improved relations will help China to consolidate its power close to home for both national security and economic reasons. After a conflict with Vietnam in 1979, the cessation of relations with Lao PDR from 1979 to 1999, and supporting the Khmer Rouge in Cambodia, China has a lot of work to do to earn back the trust of its regional neighbours. China's relations with Cambodia and Lao PDR were normalized in 2000, when former president Jiang Zemin became the first Chinese president to visit the two nations (Thayer 2001).

However, the transition from foe to friend has been remarkable and timely, mostly due to Beijing's political and economic initiatives over the past decade. Some of the most notable political changes have been:

- China's decision not to devalue the Renminbi during the chaos of the Asian financial crisis and instead offering financial assistance, (Thailand alone received over USD 1 billion; Halloran 1998).
- China's 'Going Out Policy', which was initiated in the 10th Five Year Plan (2001-2005) and set the basis for Chinese overseas direct investment.
- China, Cambodia, Lao PDR, Thailand and Vietnam have all been accepted into the World Trade Organization.
- The drafting and signing of the China ASEAN Free Trade Agreement (CAFTA) creating the third largest free trade region in the world on January 1, 2010 (Tong 2010).
- The Chiang Mai Initiative, which focuses on currency security in the region, was also spearheaded by China in the early 2000's.
- The Asian Development Bank's Greater Mekong Sub region program has also promoted closer ties through



massive networks of infrastructure projects in the area (Cronin 2012).

These policies reflect a transition in Beijing towards regional cooperation and demonstrate its ambitions to open markets, counter Western influence in the region, and establish itself as a leader both in Southeast Asia and globally. The policies have been effective in delivering these goals, and also in offering the LMB nations an alternative to Western – and often highly conditional - investment.

Beijing's political initiatives in the LMB have been in tandem with the momentum of China's roaring economy. China is the largest trading partner of Myanmar, Vietnam, and Lao PDR; it is Thailand's second largest, and Cambodia's third (Gronholt-Pederson 2013; Chen Y.W. 2012; Heng 2012). On a country-by-country basis, the value of trade with China in 2010 came to USD 46.0 billion for Thailand, USD 27.3 billion for Vietnam, USD 4.7 billion for Myanmar, USD 1.3 billion for Cambodia, and USD 1 billion for Laos. China has also built much of Cambodia's infrastructure and is its largest aid donor and foreign investor. China's aid programs to Lao PDR, Cambodia, and Myanmar are currently greater than those of the U.S. (Kurlantzick 2007). To get an accurate understanding of China's influence in LMB trade, aid and investment must be viewed as a package, rather than separate initiatives. Urban et al. (2013:312) describe how these elements are packaged together in deals in the LMB:

The Chinese practice is hence often to bundle aid, trade and investment by providing, for example, both investments and concessional loans for dam building and linking this to the export of electricity coupled with the import of Chinese manufactured goods and trade deals for Chinese firms.

China's hydropower developments in the LMB offer more benefits to energy security when compared to dam building projects abroad. One of the crucial differences between Chinese hydropower development in the LMB and projects in Africa or South America is connectivity to China's electricity grid. The close proximity of the LMB allows electricity to be imported into China's rapidly growing urban centres (Urban et al. 2013). Energy security is a major concern for Chinese decision-makers, who have set a goal of 15% per cent of the energy portfolio coming from non-fossil fuels by 2015, of which half is planned to come from hydropower (CEP 2012). These aggressive energy goals outlined in the 12th Five Year Plan (2011-2015) have spurred a flurry of large dam construction and cascade projects. The LMB is currently experiencing a huge surge in large dam projects, with more than 50 on-going large dams (over 50 MW) from Chinese companies alone, and with many more still in the proposal phase (Urban et al. 2013).

The distribution of large-scale Chinese dams in the region

is as follows: Myanmar 30, Lao PDR 13, Cambodia 7, Vietnam 3, and Thailand with some Chinese dam projects, but none over 50 MW (Urban et al. 2013). These projects are financed, developed, constructed, and contracted out primarily to Chinese SOEs. Sinohydro plays at least one of these roles in 30% of the large dam projects in the LMB, and handles the financing, developing, and building 5 of the 13 large Chinese dams in the Lao PDR (Urban et al. 2013). SOEs like Sinohydro often have higher capacity, scalability, greater political backing, more experience gained from domestic construction projects, and can usually build dams at a lower price than their competitors (McDonald et al. 2009). These large-scale projects usually require approval from the highest levels of government in both Beijing and in the LMB nations, and thus connections with the state serve as an asset. In the LMB, almost every major dam project has SOE involvement from well-known global giants, but Myanmar shows some contrast with much smaller and less well-known companies operating there (Urban et al. 2013).

**Conclusion:** *The immense scale of the Chinese dam projects in the LMB is a result of political, economic, energy security, and greenhouse gas emission reduction goals. All signs point towards an increase in dam building and 'bundled' economic cooperation through large SOEs in the years to come. An important question will be how Chinese SOEs manage the problematic social and environmental impacts of their projects in the LMB.*

### What are China's external environmental and social policies related to hydropower?

China has repeatedly stated that it follows the laws and policies of the countries where it invests and develops projects. This includes a policy of non-interference in domestic affairs that has drawn criticism from civil society for its lack of environmental and social protection (See WWF 2008 and International Rivers 2012). In 2012, perhaps in response to these criticisms and China's concerns over its reputation, the China Banking Regulatory Commission revised the Green Credit Guidelines that regulate Chinese banks' environmental performance. These guidelines now state that banks must improve the environmental and social risk management of overseas projects and follow international norms.

A further step in environmental management was realised when in February 2013, the Ministries of Commerce and Environmental Protection released the Guidelines on Environmental Protection in Foreign Investment and Cooperation. These guidelines encourage Chinese companies to "identify and pre-empt environmental risks in a timely manner, lead our companies to actively fulfil their social responsibility in environmental protection, build a good foreign image of Chinese companies and support the sustainable development of host countries." (For further information on Chinese

Corporate Social Responsibility (CSR) see CPWF SOK: Corporate Social Responsibility in Mekong Hydropower Development).

In 2011, Sinohydro developed a Policy Framework for Sustainable Development that sets out environmental, social and security standards, in line with international standards including obtaining the free prior and informed consent of impacted peoples. To what degree these policies and standards will be implemented in the Mekong Basin is yet to be seen; they represent, however, a promising, albeit belated step for China's sustainable hydropower development.

***Conclusion:** Initially China followed a policy of non-interference, limited engagement with actors and environmental and social protection measures that were limited to the laws and policies in the country in which it was operating. Recently, China has been engaging in improved dialogues with actors across the Mekong and strengthening its social and environmental protection laws and Corporate Social Responsibility policies for international projects.*

### **Overall Conclusion**

China has significant strategic and economic interests in the Lancang and the Lower Basin, of which hydropower is a key component. China's hydropower development in the Mekong Basin has been cautiously welcomed by states as they seek investment in their water resources and the associated economic development that accompanies strong relations with the Chinese state and its SOEs. These investments, however, have been criticised by many civil society organisations and academics for their lack of environmental and social safeguards. Despite an historical absence of engagement with civil society, academics, and the wider international and regional community in the past, China and its SOEs appear to be increasingly concerned with their reputational risk and the potential social and environmental impacts associated with large-scale water infrastructure projects. As a result of these concerns, China and its SOEs have been progressively involved in dialogue with downstream countries through the MRC, ASEAN, NGOs and forums such as the Challenge Program on Water and Food's (CPWF) Mekong Forum on Water, Food and Energy held in Phnom Penh in 2011, and in Hanoi in 2012. For example, HLHC has experimented with the Hydropower Sustainability Assessment Protocol on the Jinghong dam and gave a presentation about its experience at the CPWF's Mekong Forum on Water, Food and Energy. China's continued and increasing engagement with a wide range of actors and its ability to hold its SOEs to the standards and guidelines it has set out will be a litmus test for its promises to promote sustainable 'win-win' development.

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## What is the State of Knowledge (SOK) Series?

The SOK series sets out to evaluate the state of knowledge on subjects related to the impact, management and development of hydropower on the Mekong, including its tributaries. Publications in the series are issued by the CGIAR Challenge Program on Water and Food – Mekong Programme. The series papers draw on both regional and international experience. Papers seek to gauge what is known about a specific subject and where there are gaps in our knowledge and understanding. All SOK papers are reviewed by experts in the field. Each section in a SOK papers ends with a conclusion about the state of knowledge on that topic. This may reflect high levels of certainty, intermediate levels, or low certainty.

The SOK series is available for download from the CPWF Mekong website at <http://mekong.waterandfood.org/>

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In the Mekong, the CPWF works to to reduce poverty and foster development by optimizing the use of water in reservoirs. If it is successful, reservoirs in the Mekong will be: (a) managed in ways that are fairer and more equitable to all water users; (b) managed and coordinated across cascades to optimize benefits for all; (c) planned and managed to account for environmental and social needs; (d) used for multiple purposes besides hydropower alone; (e) better governed and the benefits better shared. More information can be found at [www.mekong.waterandfood.org](http://www.mekong.waterandfood.org).

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