# NTS ALERT

July 01/09 Issue

CONSORTIUM OF NON-TRADITIONAL SECURITY STUDIES

A FORTNIGHTLY BULLETIN OF CURRENT NTS ISSUES CONFRONTING ASIA

Compiled, Published and Distributed by

NTS-ASIA Secretariat,
Centre for NTS-Studies,
S. Rajaratnam School of International Studies,
Nanyang Technological University


## WATER WOES AND FOOD SECURITY


***Abstract:** This NTS-Alert examines the nexus between water management and food security in Asia and how climate change exacerbates the adverse impacts that result from poor water management. It then highlights the case of the Mekong River as an example of the dilemma of states and communities in utilising the river as a source of food, water and energy.*


**CONTENTS**


PAGE 2

FOOD AND WATER SECURITY: CHALLENGE OF CLIMATE CHANGE

PAGE 4

THE STATE OF WATER MANAGEMENT IN THE MEKONG REGION

PAGES 5

IMPACT OF DAM PROJECTS AND CLIMATE CHANGE ON FOOD SECURITY

PROBLEMS WITH CURRENT INITIATIVES

PAGE 6

MOVING FORWARD


### Introduction

The international focus on the global food crisis that was looming in the first half of 2008 has been overshadowed by the current global economic downturn that began towards the end of 2008. However, the food crisis has not disappeared with the recession.

Although global food prices might have fallen, it remains at high levels in many poor countries.

The 2008 OECD-FAO Agricultural Outlook even projected that food prices, on average, will be higher over the next 10 years, compared to that of the past decade.

Moreover, the recession has brought down income and purchasing power, increased unemployment, and made investment difficult for farmers.

People are also opting for cheaper food which may lead to undernourishment.

Globally, approximately 1.02 billion people are unable to exercise their right to food, and consequently another 200 million people have been pushed into absolute poverty.

It is estimated that the Asia-Pacific is home to 642 million hungry people, the largest number when compared to other regions.

The existing food security crisis will be exacerbated by climate change related pressures such as floods, drought, water scarcity, rainfall variation, heat waves, sea level rise and poor crop yields.

According to the United Nations Development Programme, by 2080 the impact from climate change may cause another 600 million people to be malnourished and increase the number of people facing water scarcity by 1.8 billion.

Water is vital for agriculture. In Asia, the agriculture sector is the backbone of food security, especially for poor rural communities. Therefore, it is imperative to understand how food security is affected by climate change and water.

© Oxfam International

**"Solving the food crisis is about helping farmers in poor countries stay afloat." - Oxfam International.**


*NTS Alert Team*

*Mely Caballero-Anthony, Irene Kuntjoro and Sofiah Jamil.*

*Please click here to visit our websites*

*(1) Consortium of NTS Studies in Asia*
*(2) Centre for NTS Studies*

*Contact us at NTS_Centre@ntu.edu.sg*

**Food and Water Security and the Challenge of Climate Change**

To meet the demand for food by the existing large number of Asia's poor as well as projected growing populations, agriculture production is expected to increase substantially. In Asia, rice is a culturally and economically significant staple food. It is also a water-sensitive crop. The importance of water to the agricultural sector in Asia can be seen from the figures in *Table 1*. Countries in Asia use 75 per cent of water on average for agriculture. Therefore, equitable access to water is a major challenge to food security in the existing water-stressed region.

Climate change will aggravate the existing pressure on agriculture and water management. The rise in mean global temperature will have various impacts on agricultural production. In mid to high latitude areas, temperature rise might create small benefits for growing crops. However, in equatorial areas, where many developing Asian countries are located, a moderate rise of temperature can create a negative impact on crop yields.

*Table 1 Percentage of water use by agriculture sector in selected Northeast and Southeast Asian countries*

| Country | Water use by agriculture |
|---|---|
| Cambodia | 56% |
| Indonesia | 91% |
| Lao PDR | 90% |
| Malaysia | 62% |
| Myanmar | 98% |
| The Philippines | 88% |
| Thailand | 95% |
| Vietnam | 68% |
| Republic of Korea | 48% |
| Japan | 62% |
| China | 68% |

*Source:* Water Environment Partnership in Asia (2009) Outlook of Water Environmental Management Strategies in Asia, Japan: Ministry of the Environment and Institute for Global Environmental Strategies (IGES).

Increases in mean global temperature will affect precipitation and increase evapotranspiration - which in turn will affect soil temperature and soil moisture conditions that are suitable for crop growth. Increased pests and disease vectors influenced by climate change may further reduce crop yields. Moreover, increased global temperature will induce a sea-level rise, which will increase the salinity of soil that in turn will reduce arable land for agriculture. Extreme weather events such as floods and droughts may also increase in frequency and cause fatal damage to crops. Examples of the dominant extreme weather events in Southeast Asian countries can be found in *Table 2* on page 4.

There are two types of agriculture systems, namely rain-fed agriculture and irrigated agriculture. Rain-fed agriculture is mainly practiced by and becomes the livelihood of small-holder farmers in developing countries in the northern latitude. It produces 60 per cent of global food crops and covers 80 per cent of global agricultural land. Rain-fed agriculture is most vulnerable to changes in precipitation. Increased evaporation and evapotranspiration with associated soil-moisture deficits will also substantially impact this type of agriculture.

Irrigated agriculture accounts for 40 per cent of global crops and almost 70 per cent of world water withdrawal. In Asia, irrigation is important due to high population densities and a tradition of rice cultivation. Existing irrigation and drainage systems and infrastructure are not ready to handle extreme climate variations as they are designed for stable climate conditions. With changes in the pattern of precipitation, poor water management in the irrigation system could also reduce agricultural productivity.

Overuse of groundwater and increased salinity in the soil due to improper water drainage systems could damage irrigated land. Poor water management can also be found in intensive irrigation water use that is caused by the growing demands of industrial agriculture. It could result in the contamination and degradation of soil and water from pesticide and fertiliser runoffs, which in turn will affect agricultural productivity and environmental sustainability in the long run.

In addition to sustaining agriculture, there is an increasing water demand in livestock, fisheries and aquaculture sectors. For the fishing communities living in coastal areas, apart from extreme weather disasters, the threat to their food security comes from climate change impact on oceans and seas. Changes in sea surface temperature and increased frequency of storms will have an impact on the supply of fish, both for the purpose of direct consumption and/or income generation. While for inland water fishing communities and aquaculturists, it is higher inland water temperature, changes in precipitation and water availability, which very likely will reduce supply.

Even without extreme weather events, climate change will already have an adverse impact on the lives of communities of farmers and fishers in rural

areas who are mostly poor, vulnerable and food insecure. In the face of climate change, communities in rural areas, particularly those living in resource stressed environments with minimum capacity to adapt and mostly lacking infrastructure, face an immediate and increased risk of crop failure, loss of livestock and reduced availability of fish stocks, as well as aquaculture.

The negative consequences of climate change on agricultural production will in turn affect the availability, access, stability and utilisation of food. Disruption to food availability will result in people having less or undermines their access to food, as will damaged infrastructure due to extreme weather events. With fluctuations in climatic conditions, the stability of food availability is at risk.

Moreover, climate change may also lead to the spread of infectious diseases. It will exacerbate health concerns of those who are already undernourished and hungry as they will be more susceptible to diseases.

**"The negative consequences of climate change on agricultural production will in turn affect the availability, access, stability and utilisation of food. Disruption to food availability will result in people having less or undermines their access to food, as will damaged infrastructure due to extreme weather events."**

**Climate Change Adaptation as Part of the Solution to Address Food and Water Security**

When agriculture is a primary source of income for a large percentage of the poor, adaptation strategies should be implemented to create community resilience and reduce vulnerability to climate pressures. Eva Ludi from the Overseas Development Institute proposed that policy attention to address food and water insecurity issues that will not increase vulnerability to climate change in the long run is needed in the following areas:

- Developing long-term water policies and related strategies. These have to take into account country-specific legal, institutional, economic, social, physical and environmental conditions. These will also need to integrate the different sectors dependent on water. Water policies need to address such issues as upstream-downstream competition over water resources and equitable allocation of water across regions and generations;
- Increasing water productivity by promoting efficient irrigation and drainage systems;
- Improved watershed and resource management, integrating the different natural resources through, for example, the promotion of Integrated Water Resources Management (IWRM) processes;
- Enhancing water availability through better use of groundwater storage, enhancing groundwater recharge where feasible, and increasing surface water storage. Given the current economic situation of many water-stressed countries, however, managing demand is equally important: Reducing water consumption and improving water use efficiency;
- Institutional and governance reforms that balance demand and supply across sectors, and to mainstream climate change adaptation;
- Enhancing stakeholder participation in water development and climate change adaptation;
- Improve information and early warning systems to provide land and water users with timely, adequate information and knowledge about availability and suitability of resources to promote sustainable agriculture and prevent further environmental degradation. Information exchange and dialogue between communities is important, not only at national levels but also at the trans-boundary river basin level;
- Human resource, capacity and skills development of policy makers and end-users to help them deal with new challenges; and
- Increase investments in agriculture and rural development.

**Case Study: Water Management and Food Security along the Mekong River**

In mid-June 2009, over 11,000 citizens in the region signed the 'Save the Mekong' petition in a bid to urge governments in the Mekong region – namely Cambodia, Laos, Thailand and Viet Nam – to keep the river flowing freely and to pursue more sustainable options of meeting energy demands rather than building dams. The petition, which included signatures of fishermen and farmers living along the river's main streams and tributaries, signals the critical importance of the Mekong River. The river

*Table 2 Climate hazard hotspots and dominant hazards*

| Climate hazard hotspots | Dominant hazards |
|---|---|
| Northwestern Vietnam | Droughts |
| Eastern coastal areas of Vietnam | Cyclones, droughts |
| Mekong region of Vietnam | Sea level rise |
| Bangkok & its surrounding area in Thailand | Sea level rise, floods |
| Southern regions of Thailand | Droughts, floods |
| The Philippines | Cyclones, landslides, floods, droughts |
| Sabah state in Malaysia | Droughts |
| Western and eastern area of Java Island, Indonesia | Droughts, floods, landslides, sea level rise |

*Source:* Arief Anshory Yusuf & Herminia Francisco (2009), *Climate Change Vulnerability Mapping for Southeast Asia*, Singapore: Economy & Environment Program for Southeast Asia (EEPSEA), p. 6.

is the lifeline for about 60 million people and has increasingly been the focus of various hydro-electric dam development projects.

While governments have suggested that such dams would provide better development opportunities, construction of the dams have for the most part been scrutinised as being detrimental to the lives of communities living by the river. This section will examine the issues faced in managing water resources in the Mekong region for sustaining livelihoods and food security amidst pressures of climate change and globalisation.

**The State of Water Management in the Mekong Region**

There are several reasons contributing to the building of dams and related water management systems along the Mekong River. Firstly, there is the need to meet increasing water demands. For China, this means addressing its water scarcity situation in the north by transporting water upstream from its Yunnan province.

Secondly, the increasing population and food demand (due to rising incomes and changing diets in urban areas) requires more land to be devoted to food production.

According to the United Nations' 2006 statistics, the population along the Mekong is expected to increase from the current 60 million to more than 90 million by 2050, with the proportion of urban dwellers growing from about 20 to 40 per cent.

Consequently, Mekong countries have sought to build dams to irrigate land to increase their food production – much of which has been exported.

Thirdly, as countries industrialise, more sources of energy are required. The Mekong River is seen to be a large potential source of hydropower to meet this demand in energy. This is especially so in China, Laos and the central highlands of Viet Nam.

Poorer Mekong countries like Laos also view hydro-electric dams as a source of revenue, by selling hydro-electric power to industrialising neighbours like Thailand.

News reports have noted that Laos has begun to build 23 dams on the lower Mekong River and its estuaries; work is scheduled to finish in 2010. China has already built three of a planned nine cascade of dams in the upper stretches of the Mekong.

The demand for such forms of energy has also increased over the years, as renewable energy sources are a means of mitigating climate change.

**Impact of Dam Projects and Climate Change on Food Security**

However, the development of such dams has had adverse effects on the region's fisheries and agriculture, posing a threat to local communities' food security. Existing dams have been constructed, both on the main Mekong river channel and on selected tributaries.

Dams on the former, however, have had a relatively greater impact on food security than those dams on tributary channels. These threats to food security include:

- Changes to the timing and magnitude of water flows would affect the production of fisheries;
- Blocking of fish migration that account for up to 70 per cent of the river's commercial fish catch; and

- Destruction of spawning grounds and dry-season fish refuges, as a result of the removal of rapids and siltation.

Several existing hydro-electric projects have already caused concerned amongst local communities. An example is China's dam construction on the upper Mekong main river, which has resulted in declining fish stocks, riverbank erosion and hazardous water level fluctuations in downstream Myanmar, northern Thailand and northern Laos.

Recent reports also suggest the possibility of conflict arising in areas such as the southern Viet Nam delta, should water and food resources deplete dramatically in the future.

The effects of climate change only serve to exacerbate the dire situation of these fisheries and agricultural land. For fisheries, changes in the quantity, quality and timing of water available for sensitive habitats would affect the conducive conditions of spawning grounds for various marine species. As for the effects on rice production, it is predicted that:

**"The effects of climate change only serve to exacerbate the dire situation of these fisheries and agricultural land. For fisheries, changes in the quantity, quality and timing of water available for sensitive habitats would affect the conducive conditions of spawning grounds for various marine species..."**

- More intense dry seasons in northeast Thailand would exacerbate water shortages and increase crop water requirements;
- More intense wet seasons would result in increase flooding would further increase saline intrusion into the delta and limit rice production; and
- Sea-level rise would also increase the likelihood of saltwater intrusion

**Problems with Current Initiatives**

There have been several efforts to address the situation, though these have often faced obstacles.

*Limitations of Integrated Water Resources Management (IWRM)*

Given the limited amount of resources available in the Mekong, there have been initiatives to integrate various resource management systems, hence giving birth to the concept of IWRM. For example, the integration of rice and fisheries systems offers good prospects in improving production and livelihoods.

However, this must be managed carefully to ensure that rice farming and pesticide use do not affect fish production.

In addition, IWRM has of late been scrutinised as being a set of best practices which have not been able to be effectively implemented in local scenarios.

While IWRM may be referenced in policies and law, actual implementation requires redistributing power, capacity building and a change in mindsets.

*Lack of effective local participation*

Linked to this is the lack of effective attempts by government officials to involve local farmers or water-user groups in the management of large-scale irrigation schemes. This is further complicated by the fact that many of these farmers do not have any control over the way in which water is distributed and allocated at higher levels in the system.

Concepts of participation would also need to take into account the strong sense of hierarchy which pervades in various Southeast Asian countries such as Laos – thereby delaying progress on the issue.

*Focus on benefits rather than cost-benefit ratios*

At the regional level, the Mekong Region Commission (MRC) – a regional organisation comprising Thailand, Laos, Viet Nam and Cambodia, with China and Myanmar as dialogue partners – formulated the Greater Mekong Sub-region Economic Cooperation Program to strengthen transport, trade and tourism links, boost competitiveness, improve access to social services, increase energy access and security, and protect the environment in member countries.

However, there has been little faith amongst civil society on such regional action, which has failed to materialise at state and local levels. Moreover, since its establishment, the MRC for the most part has been geared towards economic development rather than a holistic understanding of the social and environmental factors surrounding the Mekong.

According to a policy brief by the International Water Management Institute in Sri Lanka, dam projects have predominantly focussed on benefits rather than weighing it with the costs of implementing such a project. This is exacerbated by the lack of thorough cost-benefit analyses and environmental impact assessments. As such, the real costs of such projects

– the brunt of which are felt by local rural communities – are not known or, rather, ignored.

*The China factor*

Another point of contention in these regional conversations is China's power in muscling its way through negotiations. China is not a core member of the MRC and as such, poorer downstream states – whose funding depends heavily on international banks and donors – often do not have much bargaining power if China decides to go ahead with its dam projects, as it has very little to lose from doing so.

**Moving Forward**

Yet, while the MRC continues to discuss how best to go forward with their hydro-electric dam projects, it would be useful for China to reflect on its domestic situation with its Three Gorges Dam. While this dam may be a major part of western China's development boom, it has not come without dire costs.

To date, the government has ordered some 1.2 million people living in towns clustered on the banks of the Yangtze River to be evacuated to other areas before construction with little compensation. In addition to this, decades after its construction, the environmental costs are enormous.

While the Three Gorges Dam does embody a rather bleak scenario, similarities are already present in the Mekong experience – dryer seasons, reduced sources of economic livelihood and the lack of effective governmental assistance to local communities.

For the sake of the Mekong people and the regions around it, China would do best to reflect on past mistakes to avoid further catastrophes. The MRC must also work towards ensuring that their ultimate goal is not just the optimal well-being of their economies, but also the well-being of their people.

The Mekong case thus demonstrates the complexities in managing a transnational watershed in the face of increasing global demands for food produce, as well as environmental and resource pressures.

States must therefore revise their current resource management frameworks to ensure the security needs of their people amidst economic development. The implementation of resource management should also effectively involve relevant stakeholders, and must be able to sustain climate change adaptation and mitigation measures.

**References**


'1.02 billion people hungry. One sixth of humanity undernourished – more than ever before', *FAO Newsroom*, 19 June 2009. Available at http://www.fao.org/news/story/en/item/20568/icode/.

'Food prices "endanger millions in Southeast Asia" ', *OneWorld.net*, 21 February 2009. Available at http://uk.oneworld.net/article/view/162291/1/.

'Food prices remain high in developing countries – Despite improved global cereal supplies food emergencies continue in 32 countries', *FAO newsroom*, 23 April 2009. Available at http://www.fao.org/news/story/en/item/12660/icode/.

'Global food crisis "may deteriorate" ', *OneWorld.net*, 30 March 2009. Available at http://uk.oneworld.net/article/view/162559/1/5847.

'The next food crisis – is it unavoidable?' Remarks by Angel Gurría, OECD Secretary-General, Davos, 30 January 2009. Available at http://www.oecd.org/document/43/0,3343,en_2649_37401_42091499_1_1_1_1,00.html.

'The Threat to Fisheries and Aquaculture From Climate Change', Worldfish Center Policy Brief, 2007.

'Water and Food Security', *FAO Fact Sheet*, 2008.

Darwin, Roy, 'Climate change and food security', *USDA Agriculture Information Bulletin*, Number 765-8, June 2001.

Facon, Thierry, 'Water management in rice in Asia: Some issues for the future', in Papademetriou, Minas K., Frank J. Dent and Edward M. Herath (eds), *Bridging the Rice Yield Gap in the Asia-Pacific Region*, Bangkok: FAO, 2000.

Food and Agriculture Organization of the United Nations, 'More people than ever are victims of hunger', 2009. Available at http://www.fao.org/fileadmin/user_upload/newsroom/docs/Press%20release%20june-en.pdf.

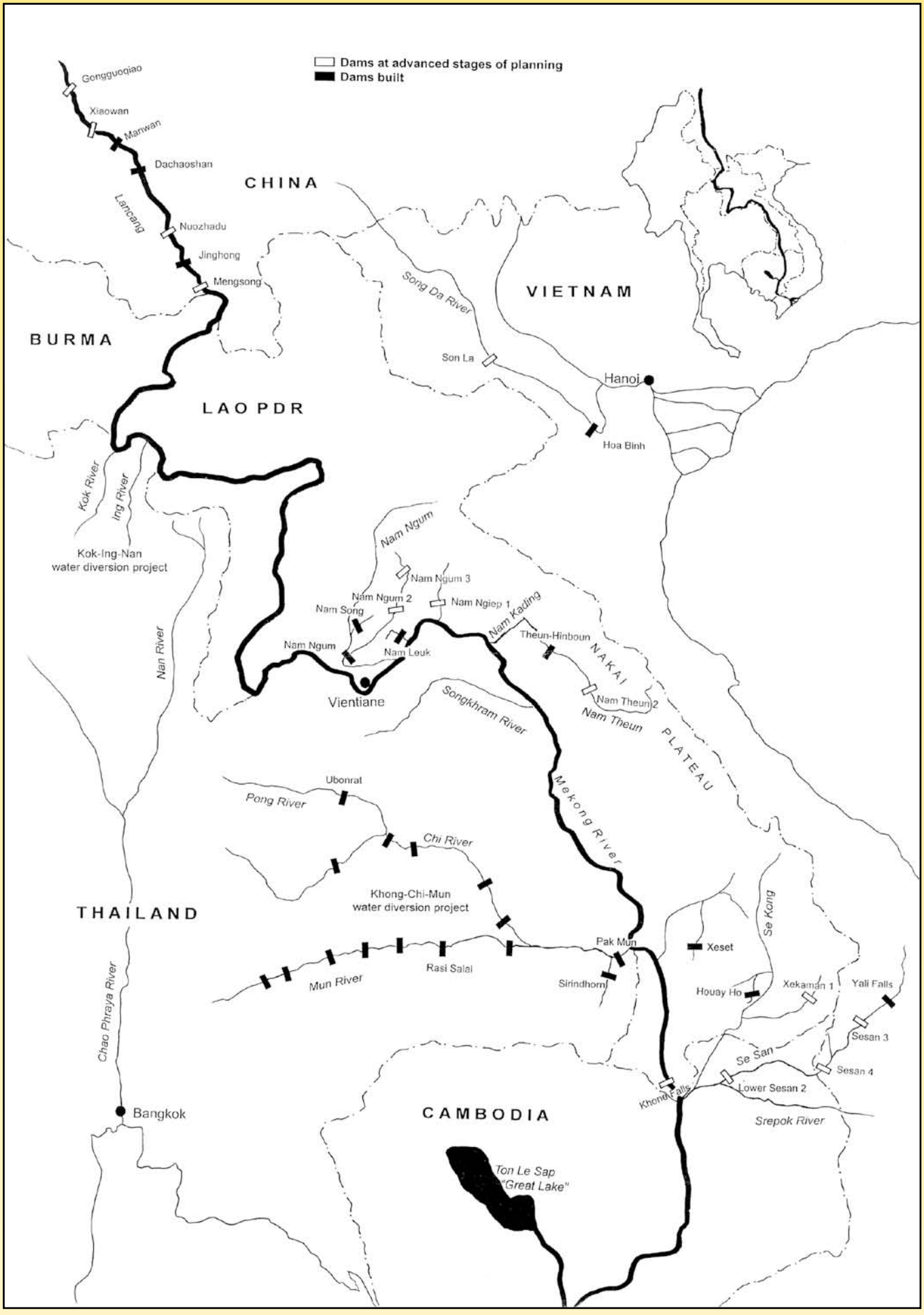
Friend, R., 'Securing sustainable livelihoods through wise use of wetland resources: Reflections on the experience of the Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP)', *MWBP*, Vientiane, Lao PDR, 2007.

Hirsh, P., 'Water governance reform and catchment management in the Mekong region', *The Journal of Environment and Development*, vol. 15, no. 2, 2006, pp. 184 – 201.

Hvistendahl, M., 'China's Three Gorges Dam: An environmental catastrophe?' *Scientific American*, 25

*Source* World Rivers Review (June 2007)

Proposed development of hydro-dam projects along the Mekong River






**Compiled, Published and Distributed by NTS-Asia Secretariat, RSIS Centre for NTS Studies, NTU**

March 2008. Available at http://www.scientificamerican.com/article.cfm?id=chinas-three-gorges-dam-disaster.

'Integrated Solutions to the Water, Agriculture and Climate Crises', *IATP Fact Sheets*, March 2009.

Ban Ki-Moon and Rodriguez Zapatero, 'Food security: Our forgotten crisis', *International Herald Tribune (France)*, 25 January 2009. Available at http://www.un.org/sg/articleFull.asp?TID=90&Type=Op-Ed.

Kirby, M. and M. Mainuddin, 'Water and agricultural productivity in the Lower Mekong Basin: Trends and future prospects', *Water International,* vol. 34, no. 1, 2009, pp. 134 – 143.

Ludi, Eva, 'Climate change, water and food security', *Overseas Development Institute Background Note*, March 2009.

Macan-Markar, M., 'Asia: Dams Across the Mekong Could Trigger a "Water War" ', 25 June 2009. Available at http://ipsnews.net/news.asp?idnews=47367.

'Mekong nations reviewing regional cooperation plan', *Saigon Giai Phong Daily*, 18 June 2009.

Mekong River to be thirsty for fresh water, *Look At Vietnam*, 27 May 2009. Available at http://www.lookatvietnam.com/2009/05/mekong-river-to-be-thirsty-for-fresh-water.html.

Thapan, A., 'A 2020 Vision for the Mekong's subregion', *The Nation,* 16 June 2009.

Varghese, Shiney, 'Food, Water and Climate Challenges', *IATP Commentary*, May 2008.

'Water governance in the Mekong Region: The need for more informed policy-making', *IWMI Sri Lanka Water Policy Briefing* 22, November 2006.

Watson, Robert, 'Climate Change, Food Security and the Role of Agricultural Science and Technology', *Tyndall Briefing Note* 35, April 2009.

'World joins Mekong citizens in battle to stop dam building', *AsiaOne News*, 21 June 2009.

Yusuf, Arief Anshory and Herminia Francisco, *Climate Change Vulnerability Mapping for Southeast Asia,* Singapore: Economy & Environment Program for Southeast Asia (EEPSEA), 2009.