

Power Integration between China and Myanmar: Case of Salween River

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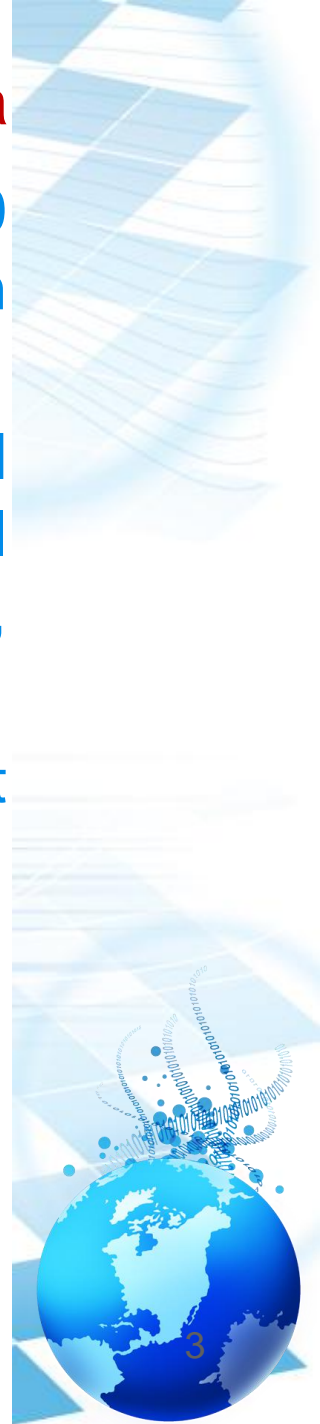
Contents

1. **Background**
2. China in Salween river
3. Chinese Motivation
4. Conclusion



Chinese Investments of hydroelectric in Southeast Asia

- Chinese state-owned firms are building at least 30 dams in Myanmar, 14 in Laos, 7 in Cambodia and 3 in Vietnam (Nathanial M, 2013).
- Chinese investors (Export-Import Bank of China and China Development Bank) financed 46% of all hydroelectricity capacity additions in Cambodia, Laos, and Myanmar (EIA, 2013).
- In 2013, six hydropower projects have been built along Burma's Salween River
 - Kunlong Dam (1,400 MW), Shan
 - Nong Pha Dam (1,000 MW) , Shan
 - Mai Tong Dam also known as Tasang Dam(7,110 MW), Shan
 - Manntaung on a tributary of the Salween (200 MW), Shan
 - Ywathit Dam (4,000 MW), Kayah (Karenni)
 - Hat Gyi Dam. Source: Salween Watch, 2014

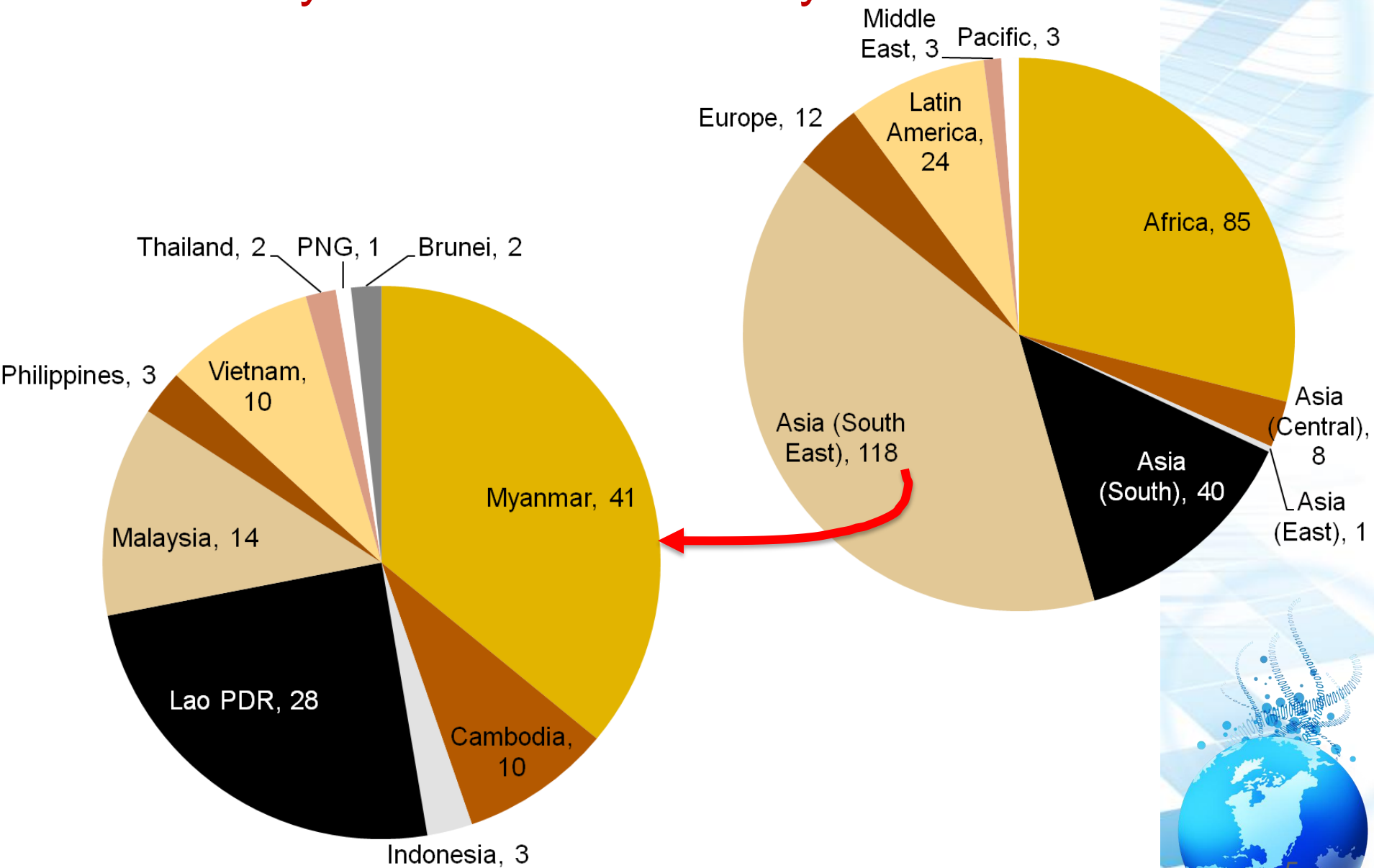


Chinese Investments of hydroelectric in Southeast Asia

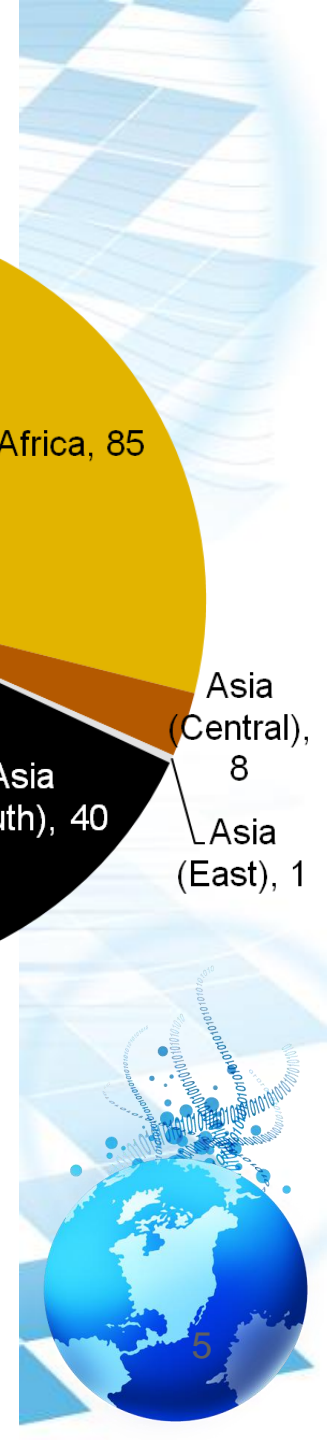
- **Cambodia** plans to build 10 dams between 2010 and 2019, adding 2,045 MW of capacity. Chinese entities are providing financing for six of these dams (EIA, 2013).
- In 2011, **Laos** exported almost 678 million kwh, or nearly 32% of its total generation, and electricity exports accounted for about one third of its total exports (EIA, 2013).
- China's investment in **Myanmar's** hydroelectric generating capacity is the 6,000 MW Myistone facility. Estimated to cost \$3.6 billion, once of the largest hydroelectric plants ever built (EIA, 2013).
- China is the leading investor in Cambodia and Laos, while for Vietnam, its largest trading partner-China is most significant. **Vietnam** is itself emerging as an investor in natural resources in Cambodia and Laos (IISD, 2008)



Chinese Hydro-investment in Myanmar



Source: International Rivers (2012)



Contents

1. Background
2. **China in Salween river**
3. Chinese Motivation
4. Conclusion



Upper Salween (怒江)



•Total planned 13 plants sum up capacity is 21,320MW, 103 billion kWh/Year. (China energy org, Aug 2014)

•Announced on 23th of January 2013, the Energy 12th Five-Year Plan (2010-2015) pointed out that Songta, Maji, Yabiluo, Liuku, Saige were being listed on the development plan.

•Among those plants, Songta is a key construction project, and other projects are to be started by orders. (The Observer, Feb 2015)





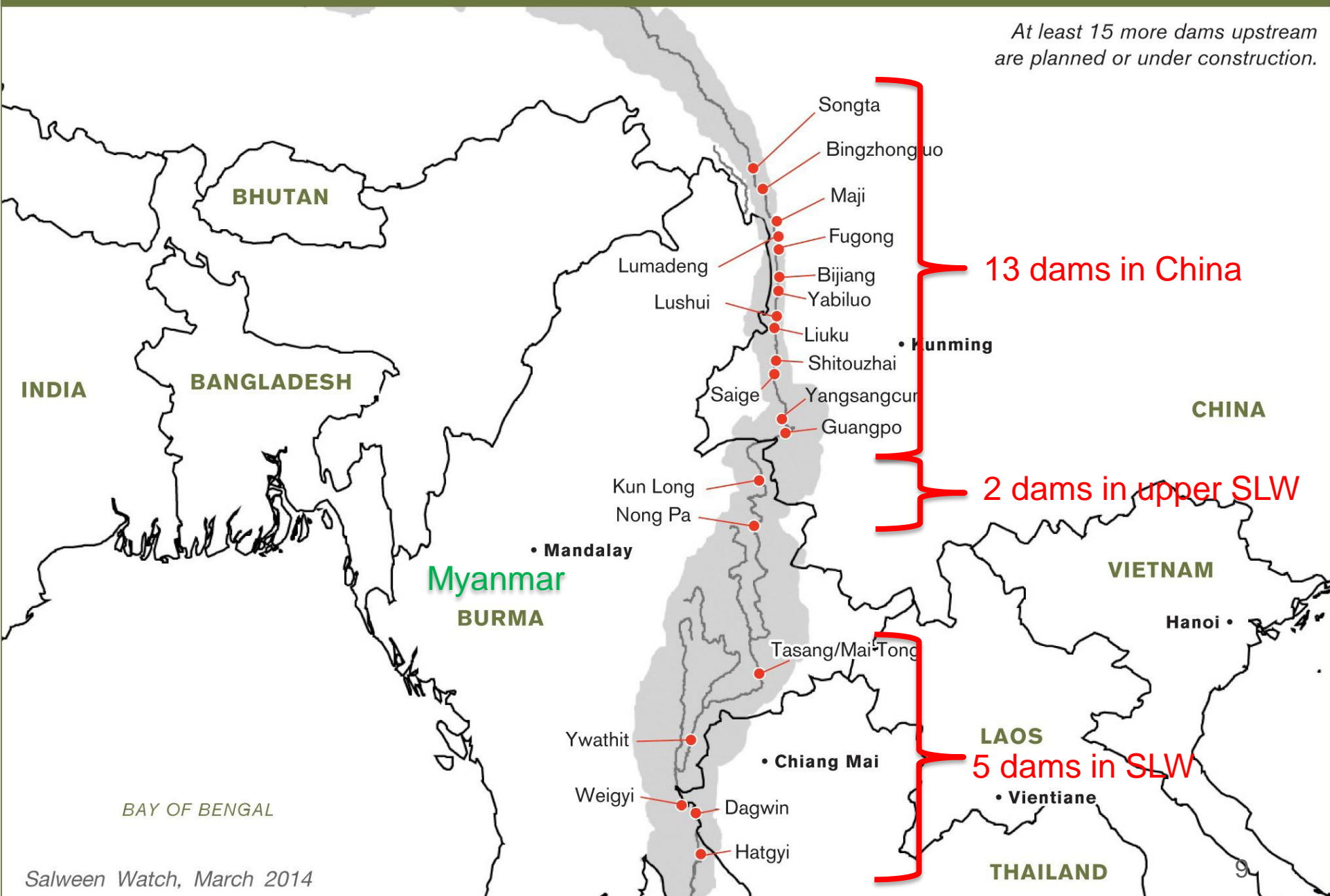
Upper Salween Hydro

Project	Capacity (MW)	Cross border	State	Developer	Builder	Status
Song Ta (ซ่งถ้ำ)	3,600	China Myanmar	Yunnan	Beijing Survey and Design Institute (designed)	Longtan Hydropower Development Co., Ltd. (中国大唐集团公司)	Under construction (important project)
Ma Ji (หม่าจี)	4,200	China Myanmar	Yunnan	Yunnan Huadian Nu river Hydropower Development Group		Construction by orders
Ya BiLuo (หย่าปี่หลั่ว)	1,800	China Myanmar	Yunnan	YaBiLuo hydro preparation office		Construction by orders
LiuKu (ลิ่วคู)	180	China Myanmar	Yunnan	LiuKu hydro preparation office		Construction by orders
Saige (ไส้เก้อ)	1,000	China Myanmar	Yunnan	Saige hydro preparation office		Construction by orders



PROPOSED DAMS IN THE SALWEEN BASIN

At least 15 more dams upstream are planned or under construction.



Hydro in Thanlwin (ตาลวิน)



Project	Capacity (MW)	Cross border	State	Developer	Builder	Status
Kun Long (กุ่มโหลง)	1,400	China	Shan		Hanergy, Goldwater	Proposed
Nong Pa (หนองป่า)	1,000	China	Shan	HydroChina, MEP	HydroChina	Proposed
Tasang (Mai Tong) (ท่าซาง)	7,110	Thailand	Shan	Ratchaburi, Sinohydro, Three Gorges	Sinohydro, Three Gorges	Under Construction
Ywathit (ยวาทิต)	4,000	Thailand	Kayah	Datang, Shwetaung		Proposed
Weigyi (Mae Saring1) (เว่ยจี)	4,540	Thailand	Karen			Susepended
Dagwin (Mae Saring2) (ดากวิน)	800	Thailand	Karen			Suspended
Hatgyi (ฮัตจี)	1,360	Thailand	Karen	EGATi, Sinohydro, Goldwater	Sinohydro	Proposed



Key Stakeholders

			Developer									Builder					
		Dams	Beijing Survey and Design Institute (designed)	Yunnan Huadian Nu river Hydropower Development Group	Hydro Preparation Office Yabiluo	Hydro Preparation Office Liuku	Hydro Preparation Office Saige	Hydro China, MEP	Ratchaburi, Sinohydro, Three Gorges	Datang, Shwetaung	EGATI, Sinohydro, GoldWater	Longtan Hydropower Development Group	Hanergy, Goldwater	HydroChina	Sinohydro	Three Gorges	
Salween River	Nu River 怒江 (中国)	Song Ta 松塔水电	✓									✓					
		Ma Ji 马吉水电		✓													
		Ya BiLuo 亚碧罗水电			✓												
		LiuKu 六库水电				✓											
		Saige 赛格水电					✓										
	Thanlwin (Myanmar)	Kun Long												✓			
		Nong Pa							✓						✓		
		Tasang (Mai Tong)								✓						✓	✓
		Ywathit									✓						
		Weigyi (Mae Saring1)															
		Dagwin (Mae Saring2)															
		Hatgyi										✓				✓	

Contents

1. Background
2. China in Salween river
3. **Chinese Motivation**
4. Conclusion



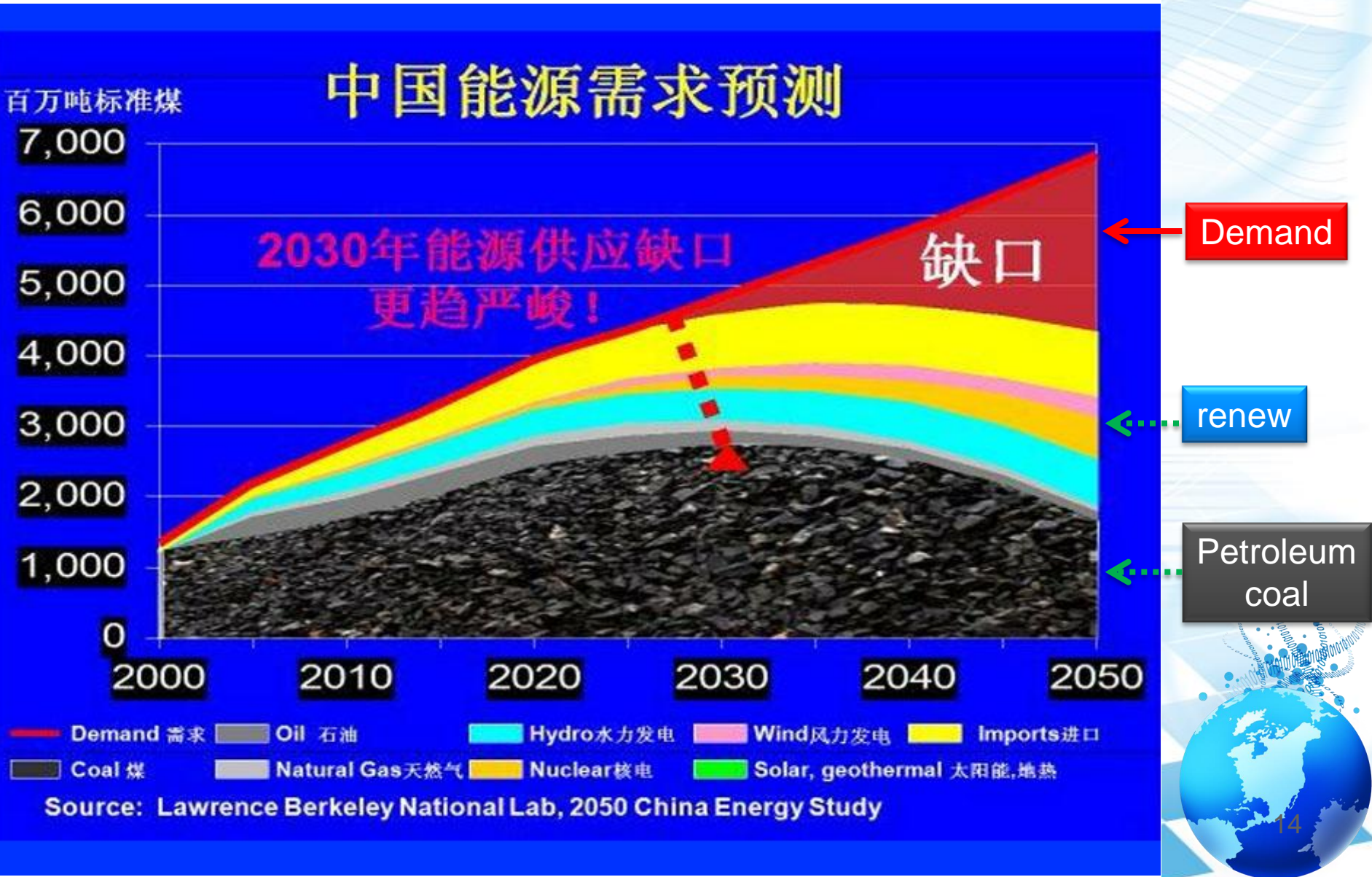
Main Motivation Behind...

Growing Energy Dependence...

1. Geopolitical Importance of Myanmar
2. The Great Western Development Strategy
 - South-North Water Transfer Project
3. Five Year Plans
 - The West - East Electricity Transfer Project



Chinese Power Mix Forecast



Geopolitical Importance



- China's strategic interest in access to the Bay of Bengal in the context of Beijing's objective to develop a naval presence in the Indian Ocean. (Uppsala, 2013)
- Bilateral talk for infrastructure development in Myanmar.



The Great Western Development Strategy

The western half of China, however, lagged behind severely. In order to help the **western half** of China **catch up** with the **eastern half**, a Leadership Group for Western China Development was created by the State Council in January 2000, led by former Premier Zhu Rongji.

South-North Water Transfer Project

- Due to strong urbanization and industrialization, water has become scarce and the situation has reached a crisis level in the East part of the country (Uppsala, 2013)

- Diverting water from the upstream sections of six rivers in southwestern China, including the Mekong, the Yarlung Tsangpo and the Salween, to the dry areas of northern China (Craig Simons, 2006)



South-North Water Transfer Project, 2050

Five-year plan: key indicators of the directions and changes in development philosophy at the highest levels of Chinese leadership

- The People's Republic of China began implementing five-year plans in 1953 in order to align the economy with top policy goals and to communicate this directive throughout the government bureaucracy. Five year plans are designed to be roadmaps for regulators and provincial officials, who are responsible for their implementation.
- **10th Five Year Plan (2000-2005)**

The West - East **Electricity Transfer** Project, initiated in the Tenth Five-Year Plan (2000-2005), was designed to bring investment and development to China's lagging west while satisfying the growing electricity needs of the country's eastern provinces. (Wilson center, 2012)

- **11th Five Year Plan (2006-2010)**

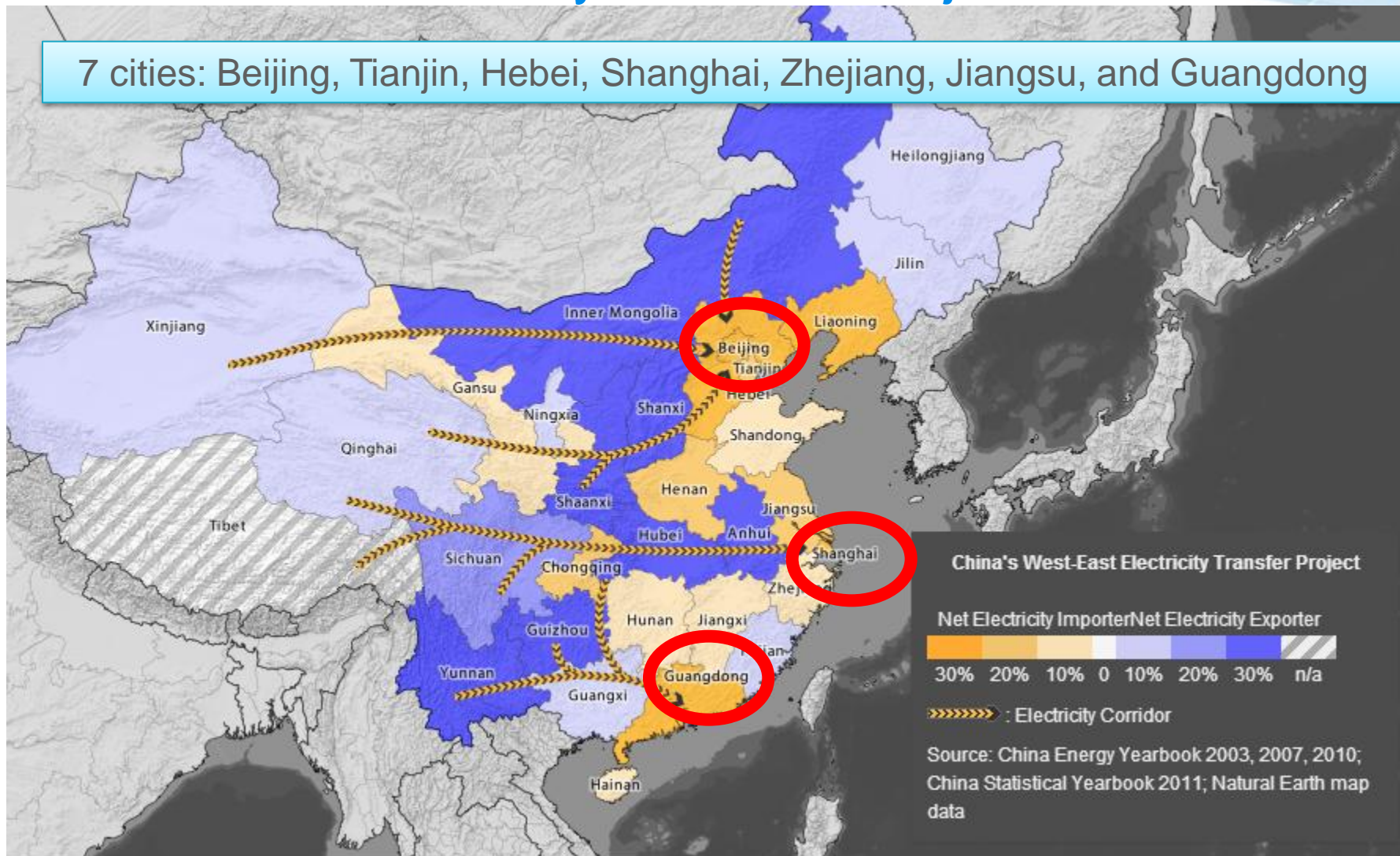
During the "11th Five-Year Plan" period, the **Yunnan state** started the development of the Liuku and Sai-ge Hydropower Stations on the Nu River.

Until 2010, China's **renewable energy** aimed to reach **10%** of the national energy consumption, and the amount of renewable energy will reach 300 million tons of standard coal.



West - East Electricity Transfer Project

7 cities: Beijing, Tianjin, Hebei, Shanghai, Zhejiang, Jiangsu, and Guangdong



12th Five Year Plan (2011-2015)

- China is already the world's largest emitter of CO₂, approximately 78% of the country's electricity demand is made by coal burning, and the International Energy Agency predicts that the country will account for 40% of the growth of global annual CO₂ emission over the next 25 years (Philip H, 2008)
- An alternative source of electricity-hydropower produces far fewer emissions, and China already derives more of its electricity from hydropower than virtually any other country.
- It is clearly said that 'Nu river hydropower project' is on the main list of development for during the 12th Five-Year Plan (2011-2015).
- In the 12th Five-Year Plan paper, obviously listed large hydropower base development projects: Nu River Songta plant, Nu River Ganliu sixth dam: Maji, Yabiluo, Saige and other projects.



Contents

1. Background
2. China in Salween river
3. Chinese Motivation
4. **Conclusion**



Recognized Barriers(1): Environmental Impact

Environmental Impact

- ① Land resources loss due to reservoir inundation (水库淹没导致的土地资源损失) (Zhao, Zheng, Wang 2006)
- ② Landscape influence (Zhao, Zheng, Wang 2006)
 - Main natural and cultural attractions affected (UNESCO heritage sites)
- ③ Terricolous plants/ Aquicolous species and animals (Zhao,Zheng,Wang 2006)
 - 37 kinds of fish in the middle and lower reaches of the Nu river
- ④ Greenhouse gas emissions from reservoir (Zhao, Zheng, Wang 2006)
- ⑤ Environmental protection measures and costs (Zhao, Zheng, Wang 2006)
- ⑥ Natural hazards: Earthquakes - Nu river is located on an active fracture zone of China (Hudongbaike, 2013)
- ⑦ Debris flow: there are 762 Nujiang Prefecture landslides, mudslides point (Hudongbaike,2013)





Recognized Barriers(2): Societal Impact

Societal Impact

- ① Barriers for migrants from the dam sites (Yang,Ou,Luo 2010)
 - Local ethnic minorities have strong regionalism about their hometown, Psychological fear about living in a new environment
 - From primary industry (agriculture based) change into secondary or tertiary industry is a big challenge for local ethnic
 - Immigrants high expectations for compensation (Increase awareness of the rights of migrants, more migrants required a long-term compensation rather than cash and in-kind compensation)
 - Per capita arable land area is not enough for whole migrants since 98%of the Nu river area is consist of mountains, cannot meet the production needs of immigrants
 - Poor migrants status, although most of the migrants life standard is improved but for less competitive immigrants are even poorer than their previous life
 - Fair distribution issues of immigration interests, exist personal feelings and corruptions lead unfair distribution and delaying. This will stimulate group events.
- ② Lost local migrants' culture diversity (Yang,Ou,Luo 2010)
 - Nu river area consists of several minorities such as Lisu, Bai, Nu, Pumi, Dulong,Tibet ethnic. Variety ethnic customs and traditional cultural heritage(food, clothing, crafts, houses, music, dance)will be affected after migration
- ③ Local ethnic immigration and relocation of facilities (Zhao,Zheng,Wang 2006)
 - Waste pollution (三废污染) : Solid, liquid and gas wastes

Barrier Removal: Hints from Chinese Literature



- 1) **Reduce the number of cascade hydropower stations** (Fu,Sun,Liu,Wang,Yang 2011)
 - Not divide Nu river into an artificial 13 Lakes but leave several segments of the river in sufficient length to preserve ecosystem. Maji,Yabiluo,Saige and Liuku are feasible for cascade development, others are need to be considered carefully.
- 2) **Carefully select on dam site, prevent further geological disasters** (Fu,Sun,Liu,Wang,Yang 2011)
 - Some of the Nu river are located on active zone
- 3) **Make clear list about prohibit development river** (Fu,Sun,Liu,Wang,Yang 2011)
 - Avoid habitat diversity, rare species focusing area, environment protection, world heritage areas for development
- 4) **Establish technologies for detect the whole basin** (Fu,Sun,Liu,Wang,Yang 2011)
 - Biomonitoring Network System is needed combine with ecological survey for detection
- 5) **Implementation of fish protection technology** (Fu,Sun,Liu,Wang,Yang 2011)
 - Construction of fish proliferation station/ Artificial reproduction and releasing facilities
- 6) **To set local integration of migrants as a priority, if for relocation immigration then will consider fellow-based migrants together** (Yang,Ou,Luo 2010)
- 7) **Provide workforce training to achieve full employment of labor migrants into different industries** (Yang,Ou,Luo 2010)
- 8) **Establish a harmonious immigrant communities, to educate local people accept different minorities as one community before new migrants arrived** (Yang,Ou,Luo 2010)
- 9) **Focus on tourism development at new place after migration, provide work opportunities for migrants and increase their living standard from earnings** (Yang,Ou,Luo 2010)
- 10) **Establish a strict supervision to achieve a fair and equitable distribution of benefits** (Yang,Ou,Luo 2010)

Way Forward

- Yunnan Province is an important base for China's "West - East Electricity Transfer Project". Hydropower development, especially upper/lower Salween have a huge potential for power supply in the China's future energy.
- On the other hand, socio-environmental negative impact and migrant issue are currently well recognized by the Chinese investors as well as government.
- The solution should be in accordance with global standard, which requires some funding resources. In this regard, currently, it is suggested that investors should set up a fund for compensation for social and environmental impact.



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Thank you for your attention

