

# When a river is dammed in the Mekong a tree falls in Brazil

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## HYDROWORLD.com Sept 2010

- World Bank report supports hydropower development, integrated water resources management

WASHINGTON, D.C., U.S. 9/1/10 (PennWell) -- A newly-released report on the World Bank Group's water strategy calls for support for hydropower in developing countries, while urging a more integrated approach to water resources management. ... Specifically, the report, endorsed by the World Bank Board's Committee on Development Effectiveness (CODE), directs the Bank Group to: ...

- Scale-up support for hydropower, as the largest source of renewable and low-carbon energy, including high-risk, high-reward infrastructure projects ...

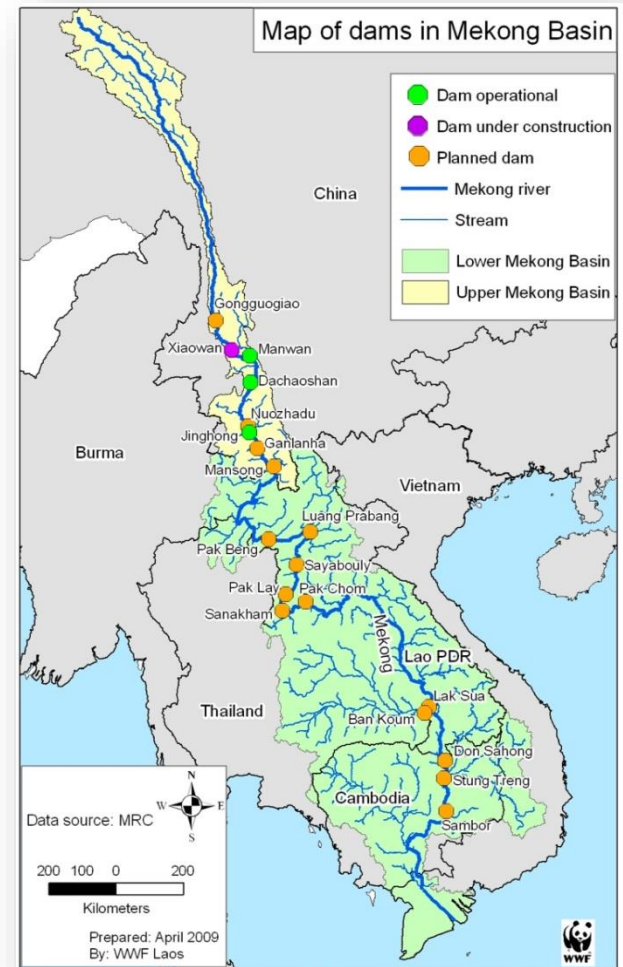
- China to boost hydropower capacity by 50 percent by 2015

BEIJING, China 9/1/10 (PennWell) -- China plans to boost its installed hydroelectric power capacity to 300 million kW by 2015 from the current 200 million in an effort to cut carbon dioxide emissions ... Government officials told media outlets that such an expansion is needed for China's goal to reduce its carbon dioxide emissions per unit of gross domestic product (GDP) by 40 to 45 percent by 2020. China promised at the Copenhagen Conference on global climate change last year that it would generate 15 percent of its power from non-fossil sources by 2020, up from the current 7.8 percent.

...

# Scenario for Mekong basin dams

- Strategic Environmental Assessment data (ICEM 2010)
- 88 basin dams by 2030
- Include 10% reservoir fisheries gains
- Replacement of the net loss in fish protein of -23.4 to -37.8%



# Four options to replace lost fish protein

1. Import protein

2. Divert aquaculture & marine fish exports

3. Expand livestock production (Orr et al. 2012)

4. Expand protein-rich crop production

# Example of livestock consumption data for Cambodia (FAO 2011)

	Livestock and milk products	Quantity '000 t/yr			
		Production	Import	Export	“Food”
Cambodia	Beef and buffalo meat	73	0	0	73
	Eggs primary	22	0	0	22
	Milk	23	16	0	39
	Pig meat	117	0	0	117
	Poultry meat	28	0	0	28
	Sheep and goat meat	0	0	0	0
	Total	263	16	0	263

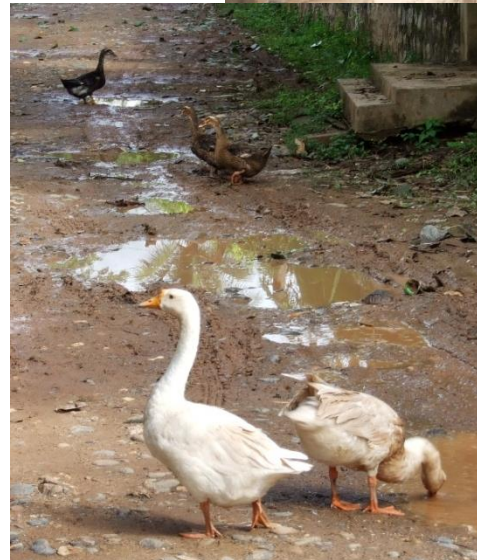
# Livestock resource requirements

## Requiring new pasture



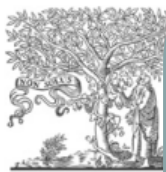
Mekong livestock. © B. Pittock.

## Scavenging livestock



# Previous research:

Orr, S., Pittock, J., Chapagain, A., & Dumaresq, D. (2012). Dams on the Mekong River: Lost fish protein and the implications for land and water resources. *Global Environmental Change*, 22(4), 925-932. doi: 10.1016/j.gloenvcha.2012.06.002



ELSEVIER

Dams on  
and water

Stuart Orr

<sup>a</sup> WWF International

<sup>b</sup> Crawford School

<sup>c</sup> WWF UK, Panda

<sup>d</sup> Fenner School of

- Very conservative snapshot in time, no:
- Non-barrier impacts of dams on fish
- Resource requirements for scavenging animals
- Population increases of people
- Dietary change with wealth
- Climate and other global change impacts

New  
research:  
not all  
proteins  
are equal  
... lysine

Source: FAO

Food stuff	Protein g/100g	Protein index: fish = 100	Lysine mg/100 g	Lysine index: fish = 100
Soy	38	202	2653	155
Ground nuts	25.6	136	1876	110
<b>Fish</b>	<b>18.8</b>	<b>100</b>	<b>1713</b>	<b>100</b>
Legumes/pulses	22.5	120	1683	98
Chicken	20	106	1590	93
Beef	17.7	94	1573	92
Pork	11.9	63	961	56
Offals	16	85	917	54
Eggs	12.4	66	863	50
Molluscs etc.	10	53	797	47
Seeds	18.1	96	585	34
Oil Crops	12.6	67	500	29
Wheat	12.2	65	374	22
<b>Rice</b>	<b>7.5</b>	<b>40</b>	<b>299</b>	<b>17</b>
Maize	9.5	51	254	15
Milk	3.5	19	248	14
Other veg	2.03	11	100	6
Fruit	0.98	5	52	3

# Lysine sources in the Lower Mekong

Lysine Supply	Cambodia %	Laos %	Thailand %	Vietnam %
<b>Total</b>				
<b>Vegetable</b>	46	53	36	42
<b>Animal</b>	53	46	63	57
<b>Vegetable Lysine</b>				
<b>Rice</b>	41	47	39	33
<b>Maize</b>	4	4	0	2
<b>Oil Crops</b>	9	13	8	7
<b>Soy</b>	29	27	27	24
<b>Pulses &amp; Beans</b>	13	2	11	18
<b>Other veg</b>	1	9	1	1
<b>Ground Nuts</b>	0	0	5	15
<b>Fruit</b>	0	0	1	0
<b>Wheat</b>	0	0	8	0
<b>Seeds</b>	3	0	0	0
<b>Total</b>	100	98	98	100
<b>Animal Lysine</b>				
<b>Fish</b>	56	38	31	24
<b>Molluscs etc</b>	2	0	1	6
<b>Pork</b>	15	22	14	37
<b>Beef</b>	12	19	6	5
<b>Chicken</b>	4	8	24	11
<b>Offals</b>	4	6	0	7
<b>Eggs</b>	2	4	14	3
<b>Milk</b>	3	1	8	4
<b>Total</b>	99	99	98	98

Source: FAO

# Maximum land required for lysine replacement (% change)

<b>Lysine source</b>	<b>Cambodia</b>	<b>Laos</b>	<b>Thailand</b>	<b>Vietnam</b>
<b>Vegetable sources</b>	59	22	11	6
<b>Animal sources</b>	155	47	10	7
<b>Crop &amp; animal sources</b>	43	15	5	3
(km <sup>2</sup> )	(24,090)	(3,580)	(10,840)	(3,260)

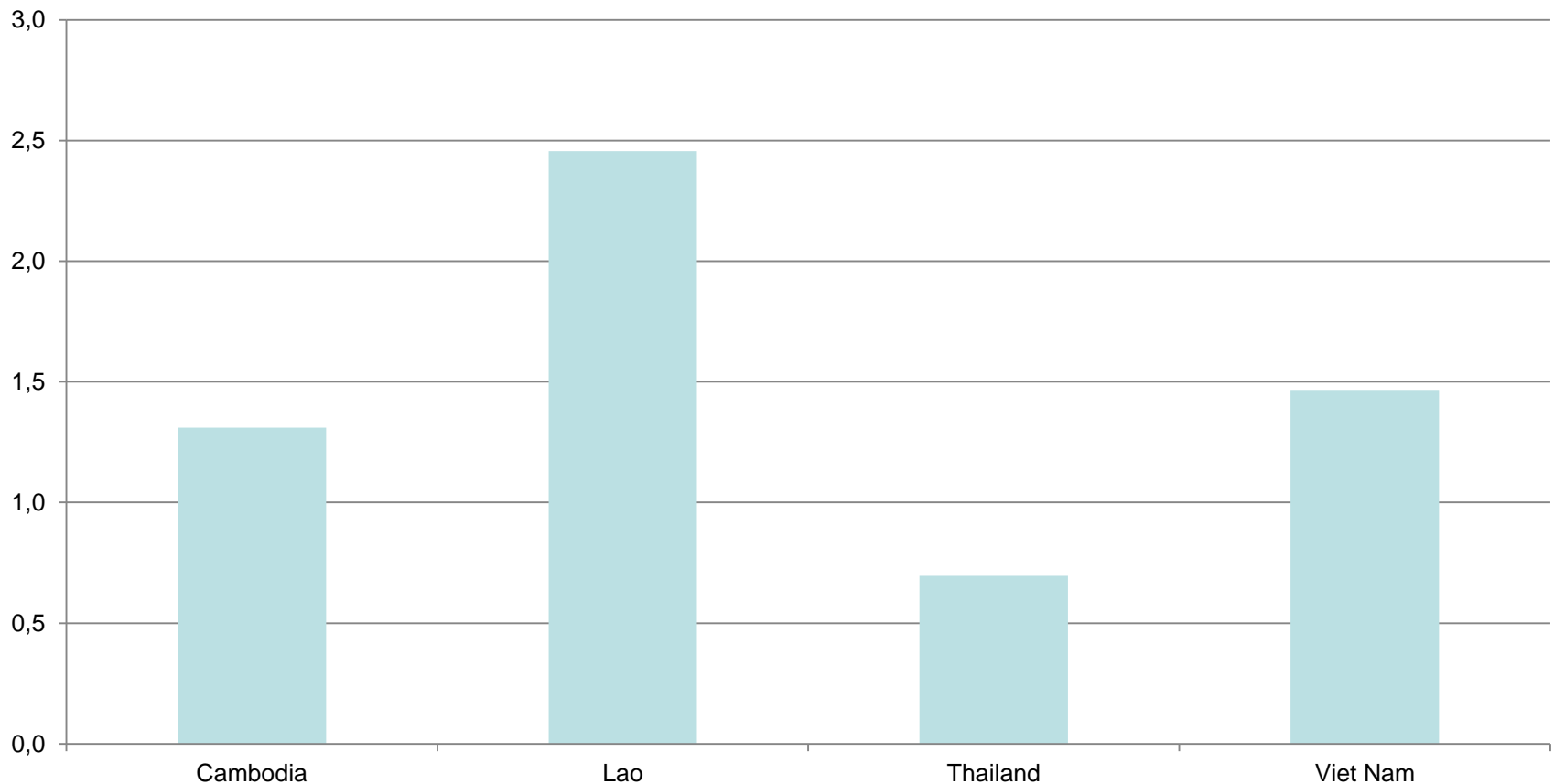
# Comparison of land use change area:

- East Timor = 14,874 km<sup>2</sup>
- Brunei = 5,765 km<sup>2</sup>



# Average annual increase in agricultural land use 2002-2011

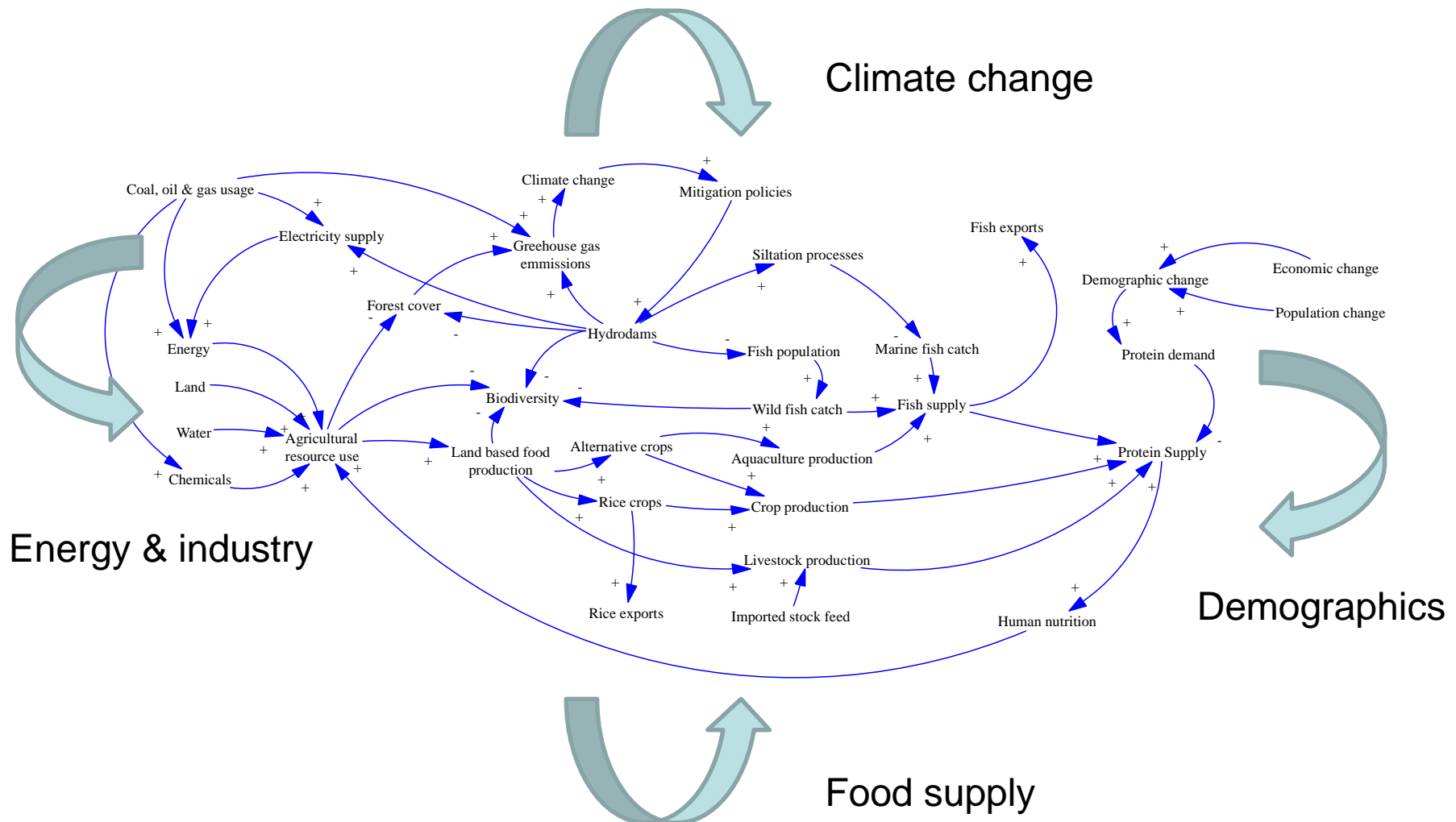
Source: FAO (2011)



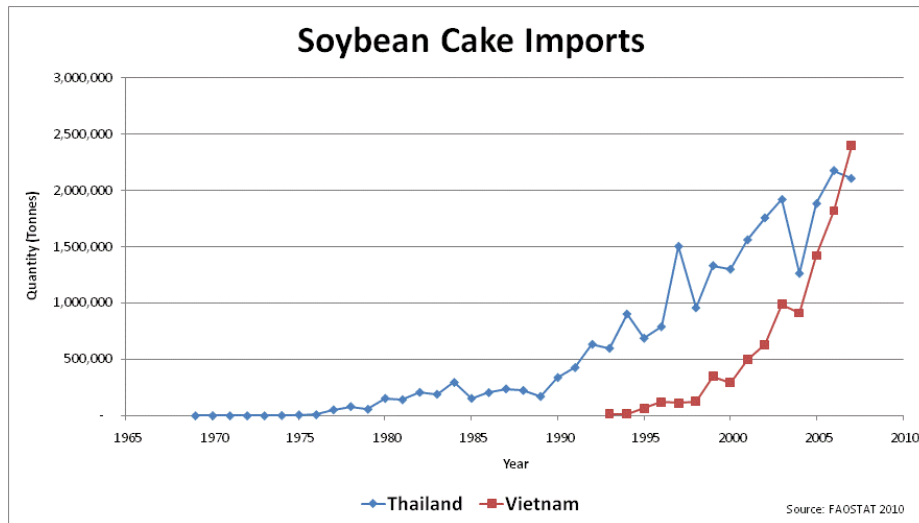
# Power – lysine trade-off summary

<b>Hydropower</b>	50,000 - 64,750 MW feasible (LMB) 14,697 MW, or 23 - 28% on the mainstem
<b>Wild fish</b>	-23.4 to -37.8% net reduction
<b>Aquaculture / marine fish</b>	-31% TH fish exports -51% VN fish exports
<b>Livestock</b>	+7 - 155% pasture land
<b>Crops</b>	+6 - 59% crop land

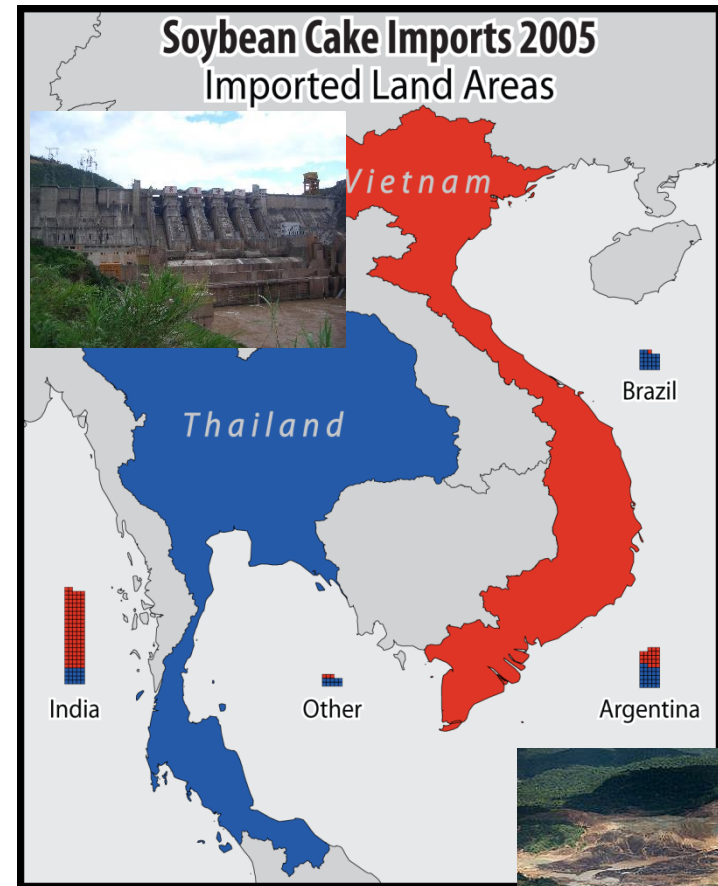
# Complex system reinforcing development



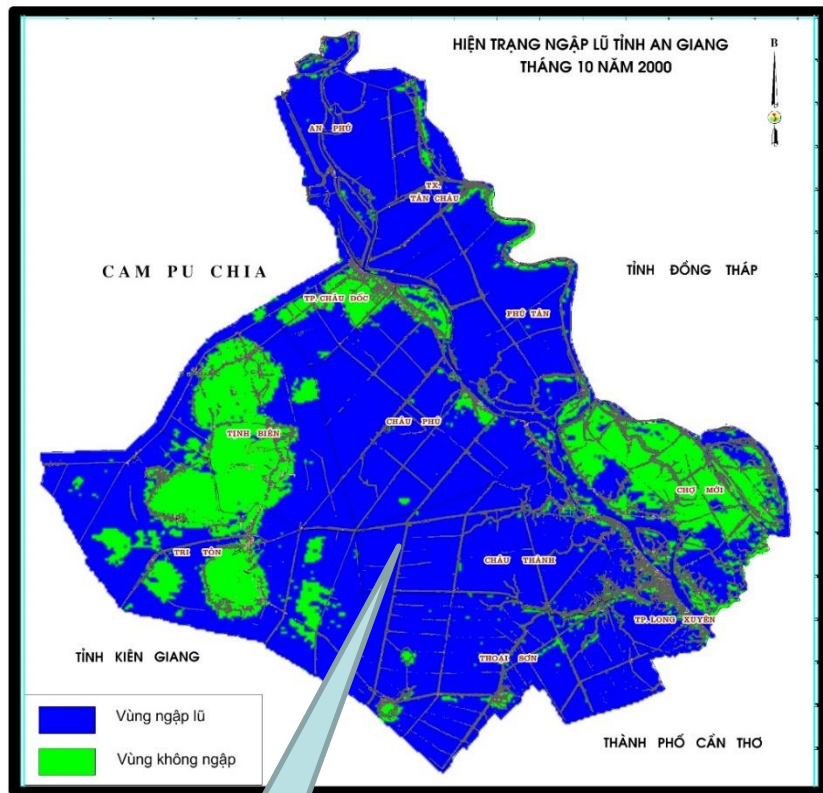
# Feedstock imports: soybean cake



Produced on a land area  
of 19,895 km<sup>2</sup>

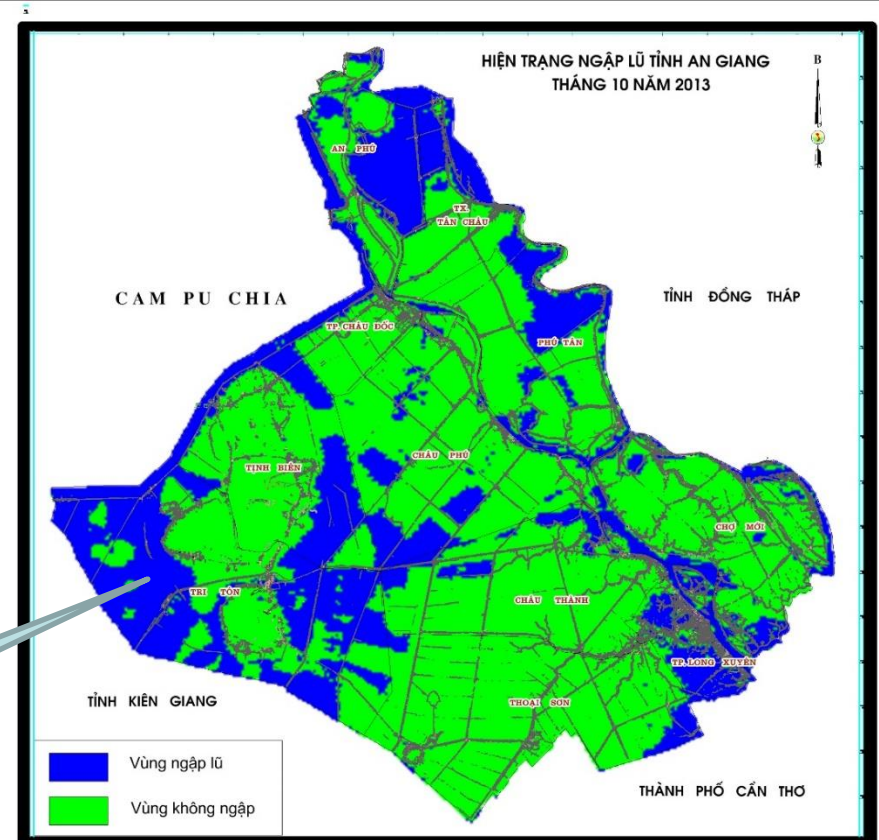


# Areas covered by high dikes in An Giang between 2000 and 2013, Mekong delta, Vietnam



Flooded  
areas in  
2000

Flooded  
areas in  
2013



## Food prices and poverty (ADB 2008)

Country	Population (million)	% in poverty	Vulnerability to 10% increase in food prices (%)	Vulnerability to 10% increase in food prices (people)
<b>Cambodia</b>	14.5	35	4.4	610,000
<b>Laos</b>	6.8	31	5.1	280,000
<b>Thailand</b>	65.9	10	0	0
<b>Viet Nam</b>	87.0	15	2.4	1,980,000
<b>Total</b>	174.2			2,870,000

# Summary for Vietnam

- Pasture land increase of 3% to 8%
- Increase in imports
- Import / export and opportunity costs - aquaculture
- Higher protein prices impact poor (2.4 M)
- Fewer replacement options than Thailand



Mekong River, Vietnam. © B. Pittock.

- Investments in dams
- UN Watercourses Convention

# Summary for Cambodia

- Pasture land increase of 3,750 to 19,350 km<sup>2</sup> (25% to 129%), plus land inundated
- Import / export and opportunity costs
- Higher protein prices impact poor (4.4 M)
- Very few affordable replacement options



Ankor Wat. © B. Pittock.

- UN Watercourses Convention

# Water – energy – food nexus conclusions:

1. Hydropower will improve energy security but at the cost of food supply
2. A lot of land and water is required for replacement of food sources globally
3. The poor will be impacted
4. Governments need to explain how food security will be enhanced



Fishers, Mekong delta, Vietnam.  
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