

Closing the knowledge cap in Sediments and Fisheries

*who's right, who's wrong and what to do to close the
knowledge (or understanding) cap*

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Why Sediments and Fisheries?



Strategic priority for Basin Development 4:

Acquire essential knowledge to address uncertainty and minimize risk

Basin Development Strategy 2011

Sediments and fisheries are transboundary issues:

- Sediment trapping by the ongoing and planned construction of large dams may cause a number of consequences, including increases in river bed and bank erosion, changes in the delta shaping processes, and reductions in fertilization of floodplains and coastal waters with nutrients
- High annual fish yields are already under pressure from over-fishing, habitat fragmentation, reduction of flood plains, and blockage of fish migration by dams, weirs and other infrastructure. A significant proportion of the system's river-floodplain fisheries are at risk from ongoing and planned developments

Dealing with these issues requires in-depth knowledge and good understanding of the topics

Factors influencing sediment loads

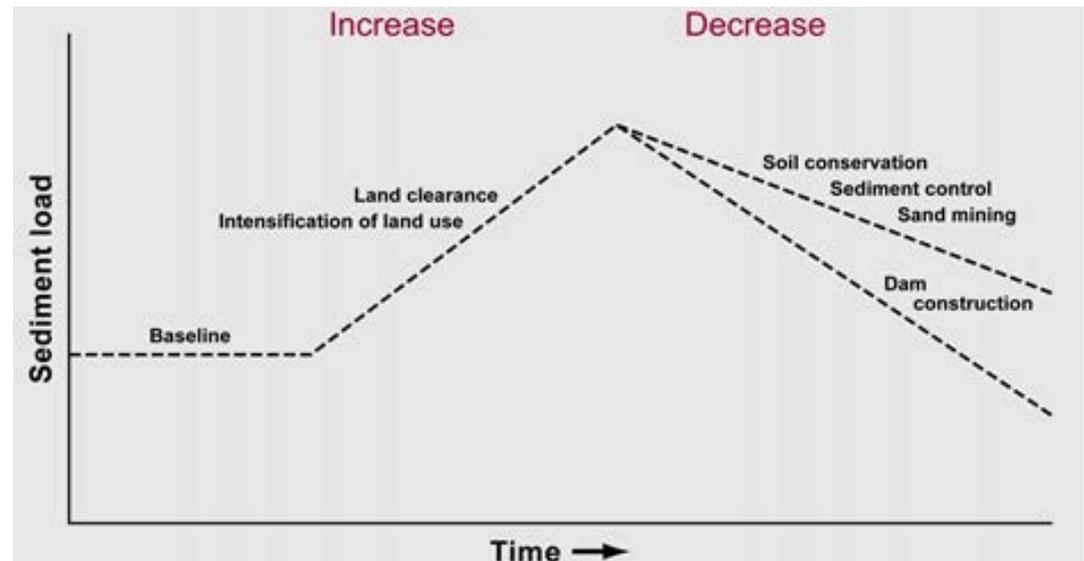
Trends in sediment load of a river are depending on several factors, amongst others the natural erosion rate, accelerated erosion due to land use changes, soil conservation practices, sand mining activities and construction of dams. Some of these factors increase sediment loads, others decrease them



‘Any attempt to investigate trends in the sediment load of the Mekong River will likely be compromised by the lack of long time series of annual loads’ (Walling, 2005)



Walling, 2012



Cheng et al. 2013

Cheng et al. (2013) assessed trends in sediment load of the Lancang-Mekong River for the period 1965–2003:

- Loads increased at Gajiu, Jinghong and Chiang Saen in the period 1985–1992
- After the construction of the Manwan Hydropower dam a clear reduction in sediment load occurred at Gajiu
- That reduction was not observed at Jinghong and the stations further downstream, on the contrary, increases in sediment loads were seen at Mukdahan and Khong Chiam
- The long term average annual sediment load of the Mekong river at its mouth was estimated at about 145 Mt per year



Bravard and Goichot (2014)

Bravard and Goichot (2014) mention an average annual sediment load of 160 Mt/year that may even need to be adjusted upward with 10 to 30 Mt, because sand has been commonly underestimated in the sediment budget because:

- Bedload transport is not included in the sediment balances
- Sand movement near the bed is difficult to measure
- Sampling regimes have insufficiently captured flood events



Walling, 2005 and 2012

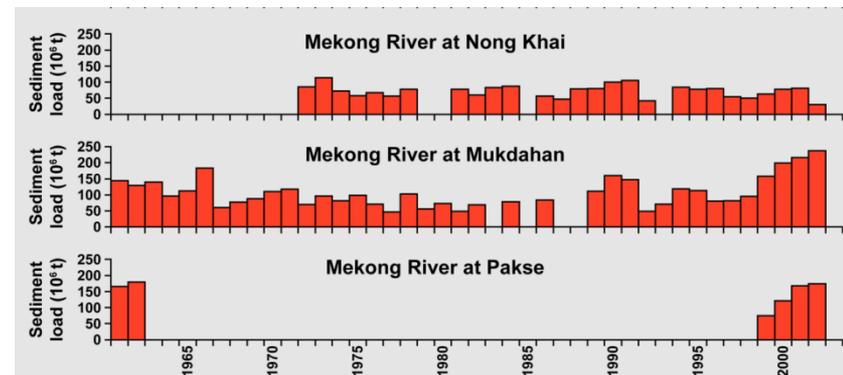
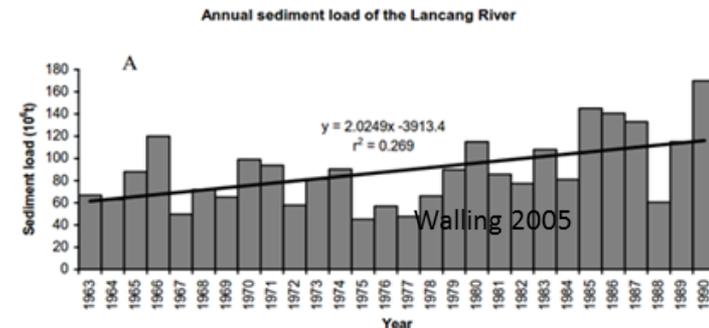
Walling (2005) concluded that sediment loads of the Lancang River increased in the 60s, 70s and 80s. At Jinghong average annual sediment loads increased from 60 Mt/yr (mid 60s) to 115 Mt/yr (late 80s) due to population growth and intensification of the land use in the basin

Further downstream the effect is less pronounced:

- A slight increase in Chiang Saen (70 – 100 Mt/yr)
- Constant in Nong Khai
- Constant at Mukdahan in the 70s and 80s, increase in 90s and early 2000s

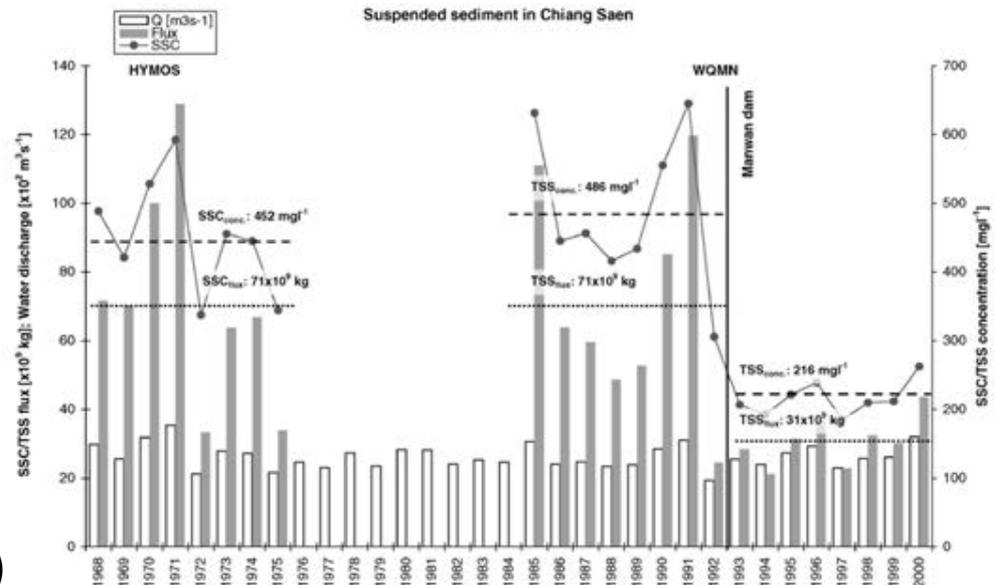
and:

- No reduction in the sediment load of the Mekong River, in response to the construction of the Manwan and Dachaoshan dams



Lu and Siew (2006) and Kummu and Varis (2007)

This view is not shared by Lu and Siew (2006) and Kummu and Varis (2007), who reported a reduction in suspended sediment at Chiang Saen after 1992 from about 70 Mt per year to about 30 Mt per year



Kummu and Varis (2007)

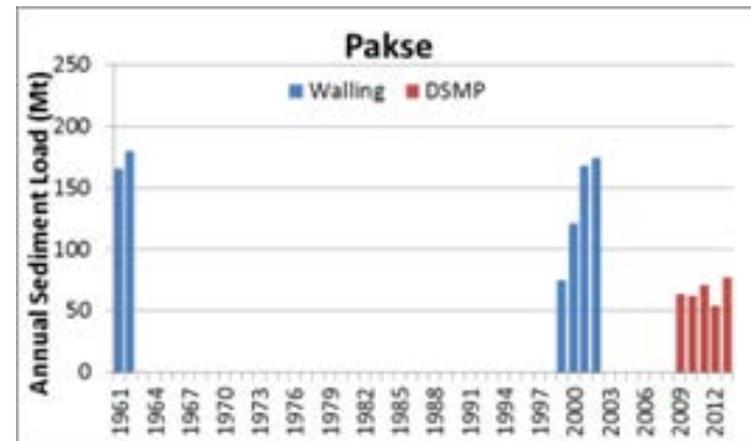
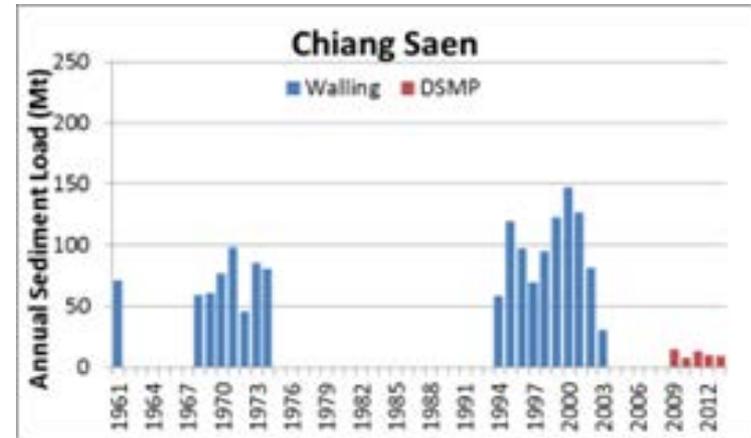
Koehnken (2014)

Results of the recent Discharge Sediment Monitoring Project (DSMP) reported by Koehnken (2014) show a sharp decrease in sediment loads in recent years:

- From 84.7Mt/yr to 10.8 Mt/yr at Chiang Saen.
- From 147 Mt/yr to about 66 Mt/yr at Pakse

Amounts of sediment reaching the mouth of the river are further reduced by extensive sand mining (Bravard et al., 2013):

- > 34 Mm³ (55 Mton) in one year (2011 – 2012), most of which in Cambodia (nearly 21 Mm³), followed by Viet Nam (7.7 Mm³) and Thailand (4.5 Mm³).



Future outlook

- Adamson (2009) came to the conclusion that the combined trapping efficiency of the 5 Mekong mainstream reservoirs proposed in Lao PDR could be as high as 80%.
- Combined with the assumed 90% trapping efficiency of the Yunnan cascade will greatly reduce the sediment loads in the river.
- Besides dams in the 3S basin are expected to trap about 40% of the sediments
- Other factors influencing future sediment loads are:
 - Catchment degradation
 - Soil conservation
 - Sand mining

Discussion points

Recent data indicate a sharp decrease in sediment loads of the Mekong River:

- Can we agree on the actual average annual amount of sediments reaching the delta and leaving the catchment?
- If so, is this decrease caused by the construction of the cascade of hydropower dams in China, or are there other factors influencing the loads?
- What will be the impact of further hydropower development in the basin, including the construction of mainstream dams?
- What are the expected developments in sand mining and its impact on sediment loads?

Inland capture fisheries

Data on commercial inland capture fisheries provided by National Governments and compiled by FAO for the period 1995-2010 show:

- An increase in annual catch in Cambodia
- Relatively stable catches in Thailand, Vietnam and Lao PDR

However, inland capture fisheries are primarily artisanal with a low proportion (<10%) of full-time fishers. Most fish and OAAs are consumed by the households that catch or grow them and so are not recorded in official data

- Estimates for Thailand are limited to large reservoirs and rivers. A recent national survey of fishing households showed that total production could be as high as 1.0 million tons/ year
- In Viet Nam, inland capture fisheries production estimates are for commercial catches only, these represent about 20% of total catches

Country	1995	2000	2005	2010
Capture Fisheries				
Thailand	187	201	199	209
Vietnam	165	210	197	194
Cambodia	n/a	246	324	405
Lao PDR	27	29	27	31
Total	n/a	686	747	839

Aquaculture

Over the same period aquaculture production increased nearly five fold:

- A doubling in Thailand
- Six fold increase in Vietnam
- Still low production in Cambodia and Lao PDR

Country	1995	2000	2005	2010
Aquaculture				
Thailand	201	271	539	432
Vietnam	312	369	882	1,890
Cambodia	9	14	25	58
Lao PDR	13	42	60	82
Total	535	696	1,506	2,462

Future outlook

In Cambodia the growth of the capture fisheries could continue in the short term, whereas production in Lao PDR, Thailand and Viet Nam is thought to stabilize. Aquaculture is likely to expand rapidly in Cambodia and Lao PDR, in response to growing domestic demand

With regard to aquaculture in Thailand, it is anticipated that production levels will steadily rise in the foreseeable future, in Viet Nam, the dramatic rate of increase in aquaculture production in recent years will begin to slow down and further expansion will only take place in response to growing domestic and export market demand

Discussion points

Official statistics provided by National Governments give an underestimation of the total inland capture fisheries production:

- What could be the best estimates of production in the 4 LMB countries?
- Will aquaculture in Cambodia and Lao PDR, and probably Thailand, indeed increase in importance and what could be expected production levels in future?