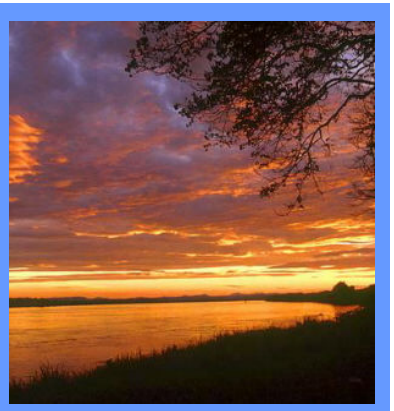






Water management and food issues in SE Asia

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INSAFS, Hyderabad, February 2008

CGIAR Challenge Program on WATER & FOOD

CSIRO

SE Asia issues



- Increasing population - Mekong +13m (18 %) 2015, +58m (80 %) to 2050
- Economic development, increasing energy demands
- Increasing food consumption, changed food demands
- Climate change, IPCC 2001

	2020s	2050s	2080s
Temp change, °C	+1	+2	+3
Rain change, %	+2	+4	+7

Shorter more intense wet season, longer more intense dry season

Sea level rise - saline intrusion in deltas

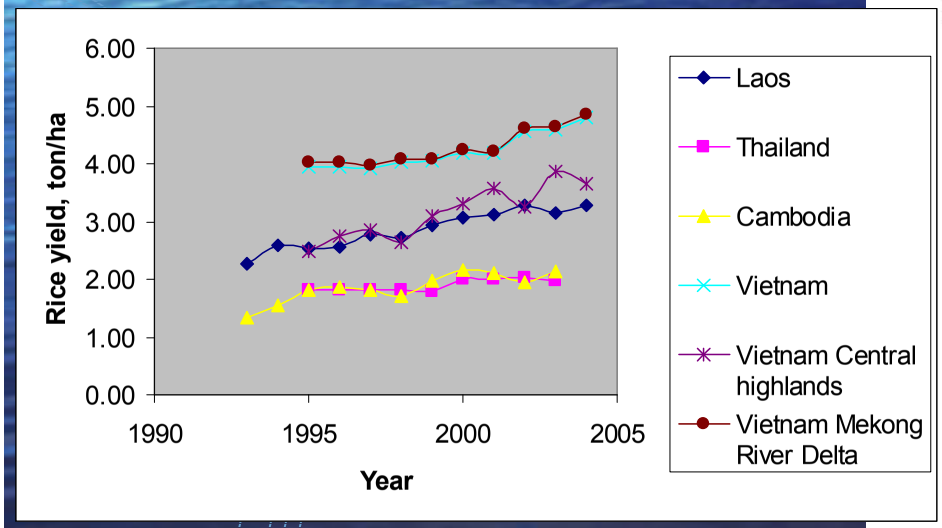
Most systems (food & fibre production, ecosystems, health) vulnerable

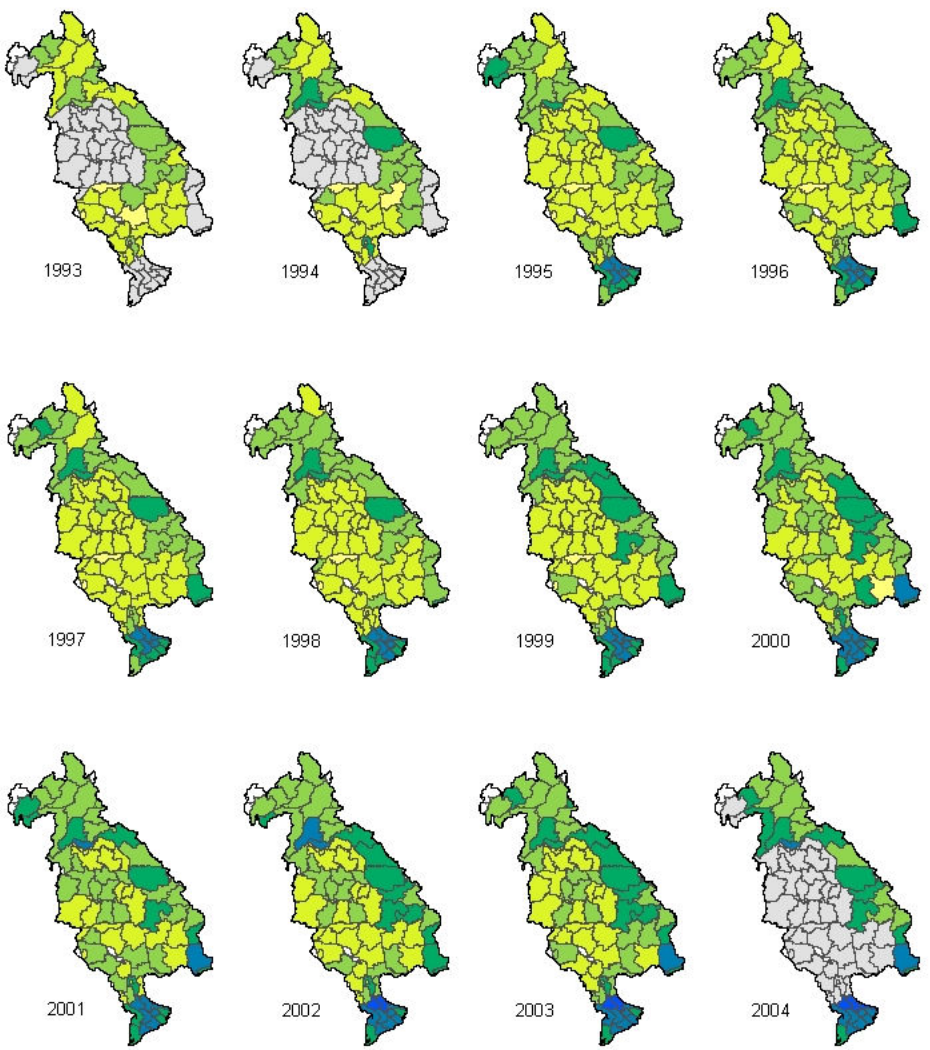
- Capture fisheries fully exploited?



Crop production - rice

- Based on national statistics
- Rice average yield
- Is Thailand low?
- Increases everywhere?

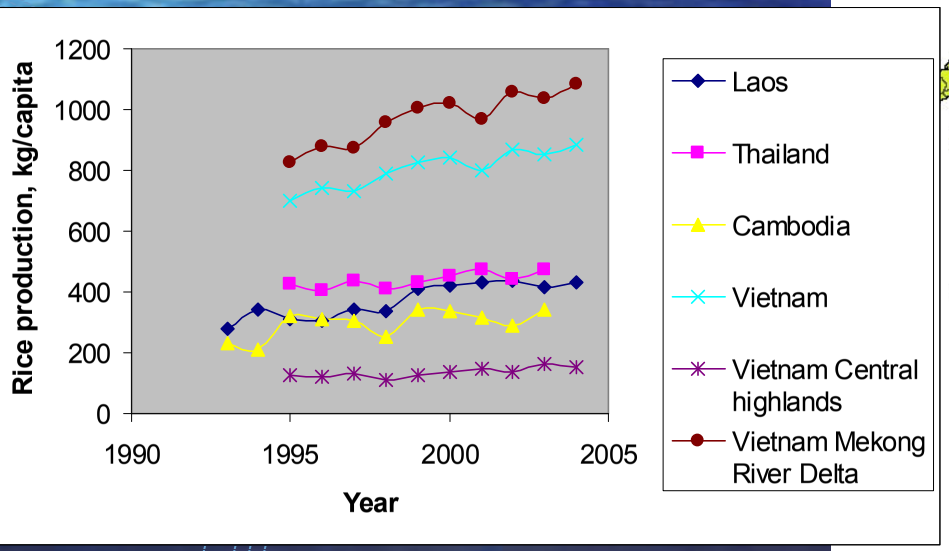


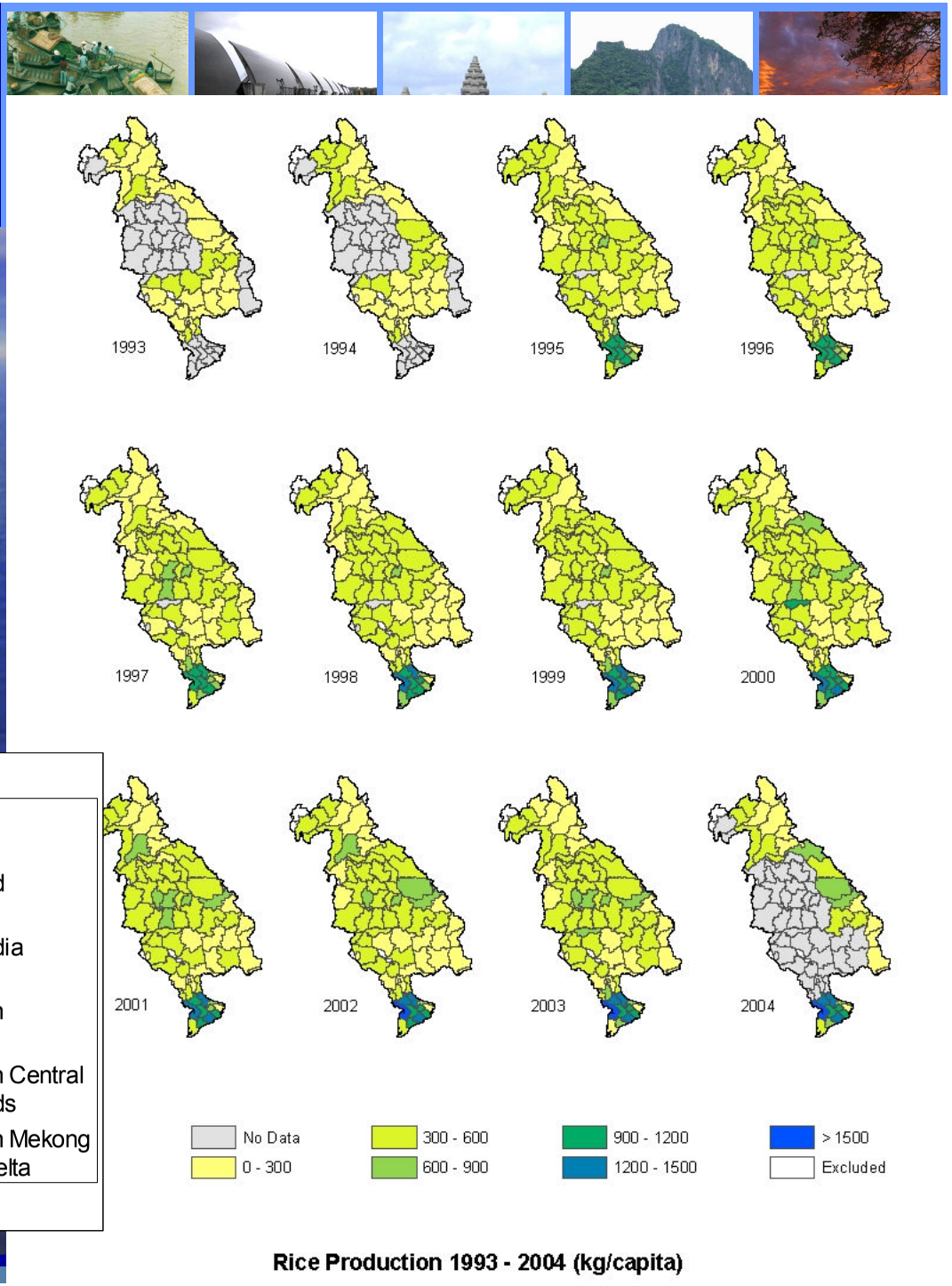


Average Yield of Rice 1993 - 2004 (ton/ha)

Per capita

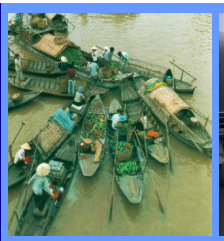
- Based on national statistics for yield and Mekong social atlas for population
- Modest increases





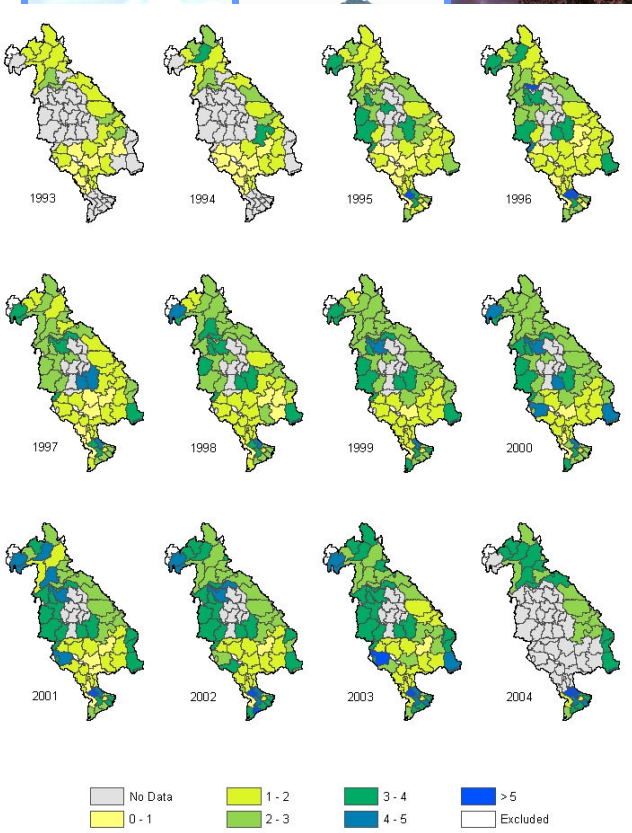
Rice Production 1993 - 2004 (kg/capita)

Other crops

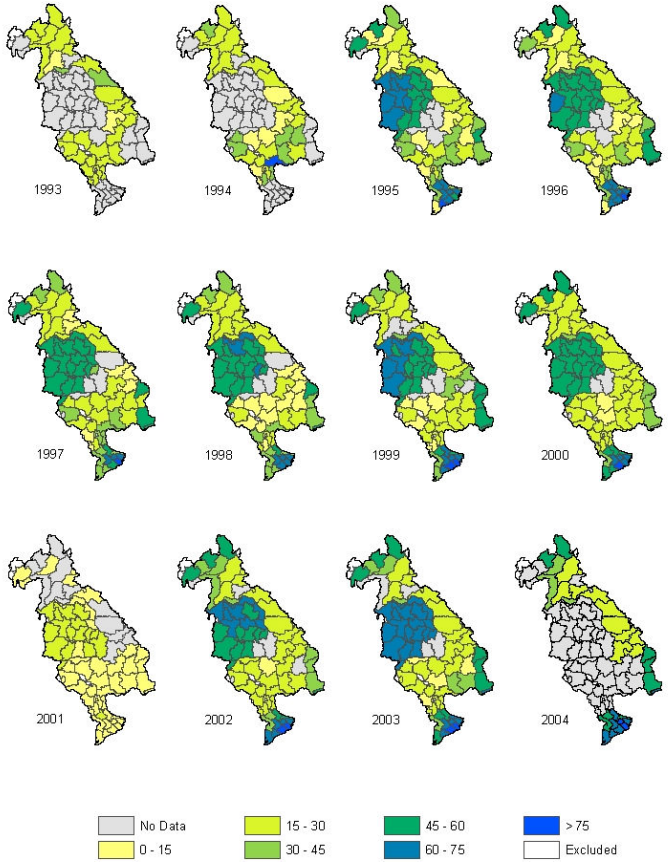




- Sugar and maize
- Sugar - Thailand high?



Average Yield of Maize 1993 - 2004 (ton/ha)

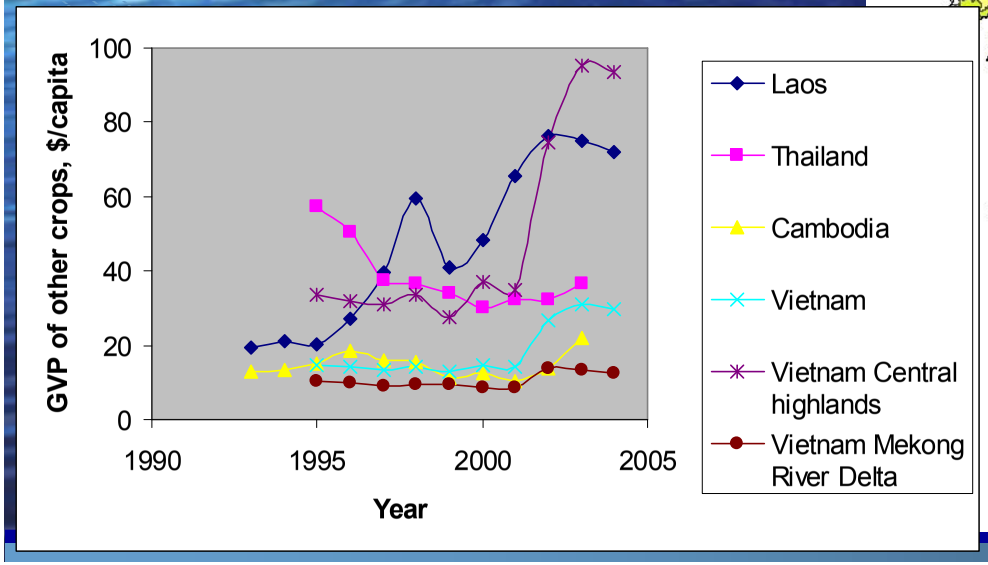


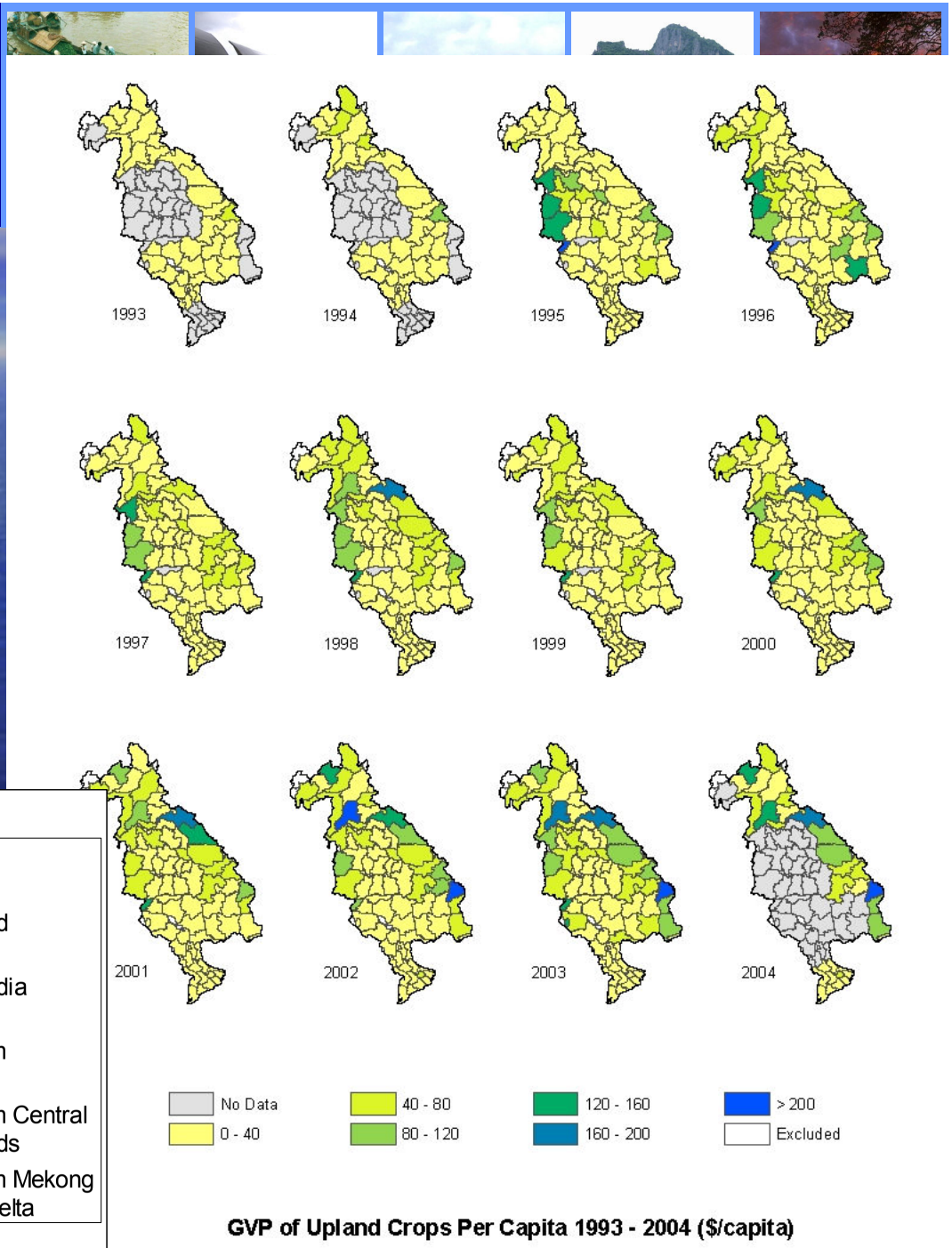
Average Yield of Sugar 1993 - 2004 (ton/ha)

Distortions - Laos sugar for "fresh" trade

Upland crops - per capita GVP

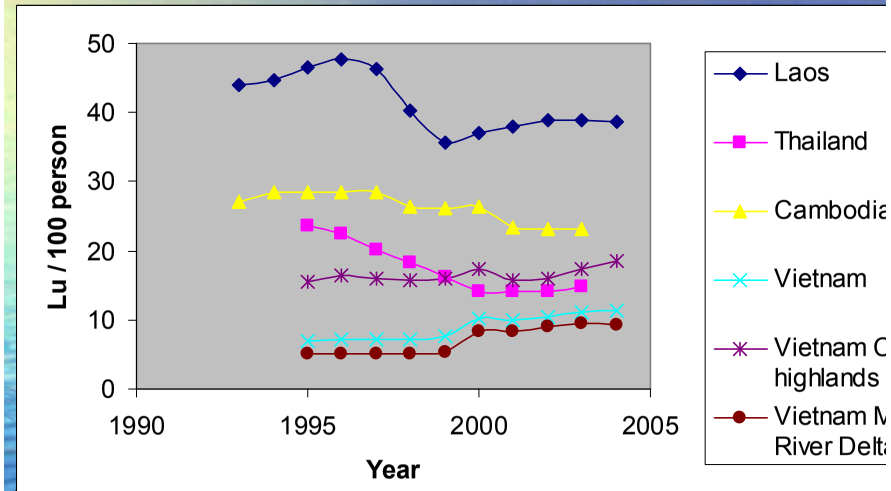
- Idea of income (rice = subsistence, other = market)
- Regional differences

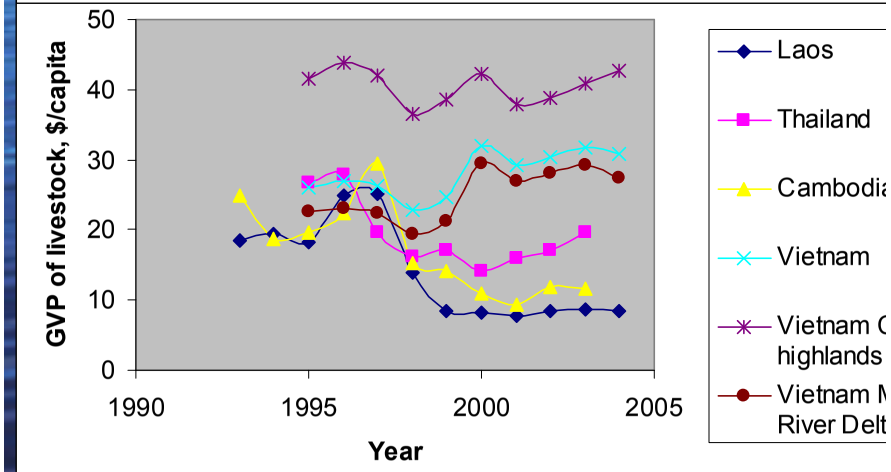


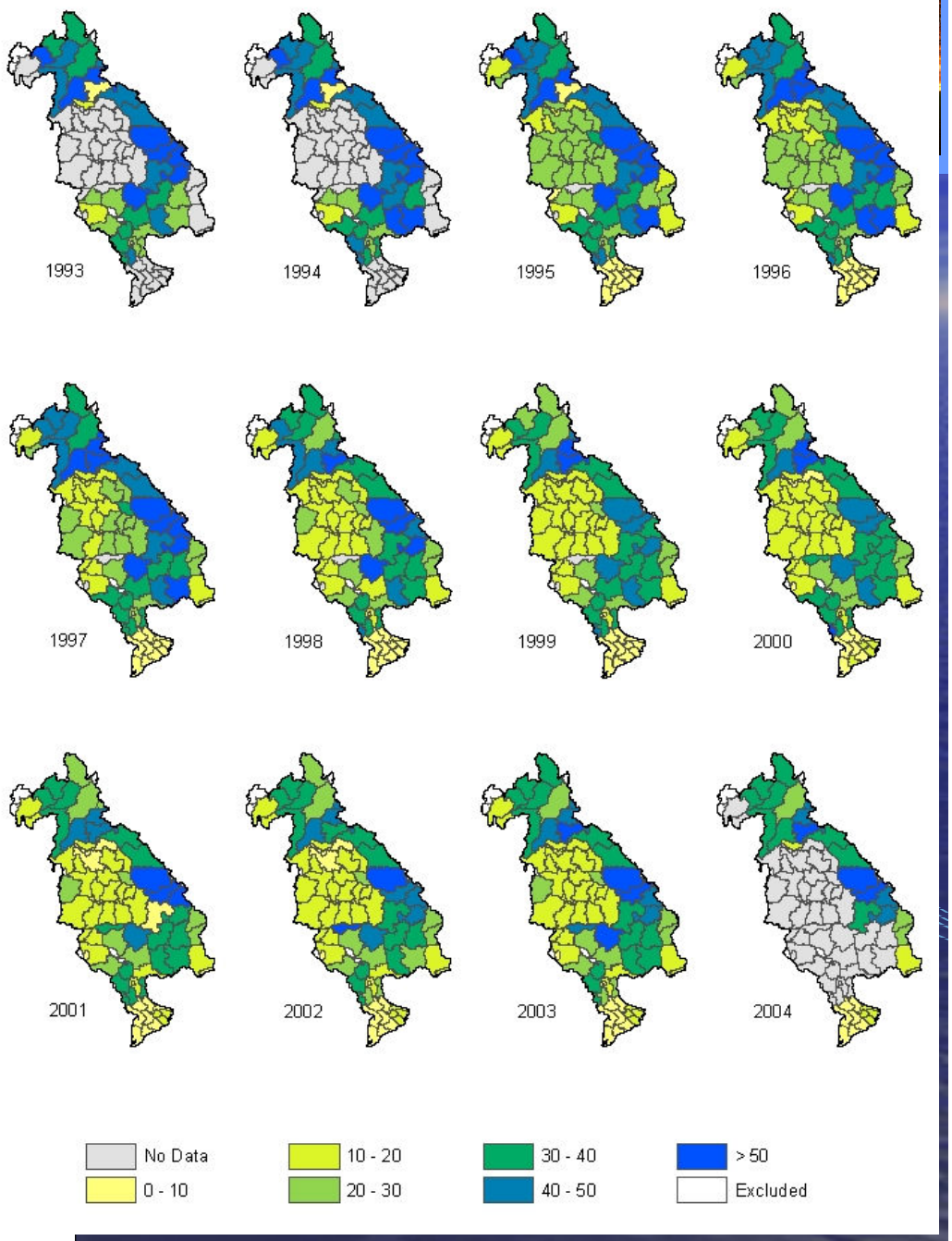


Livestock

- Not increasing per capita







Agriculture - growth prospects



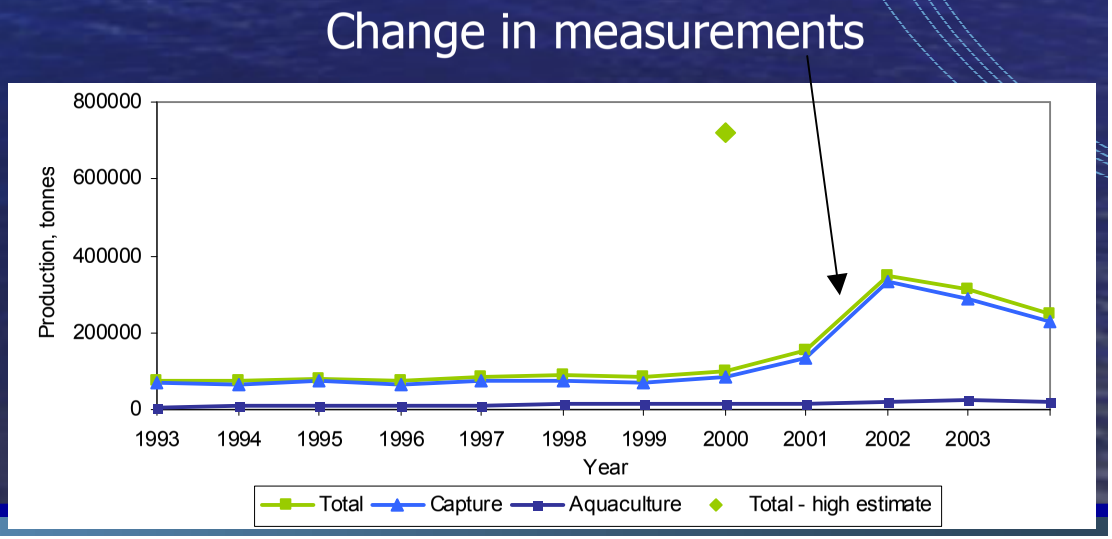
- Agricultural productivity - low in Cambodia (soils, varieties, fertilisation, management)
- Low in Thailand (soils, water, ?fertilisation)
- Improving management and crops in shifting cultivation in Laos (?labou requirements)
- Livestock expected to grow, and will divert other agricultural resources



Fisheries - yield

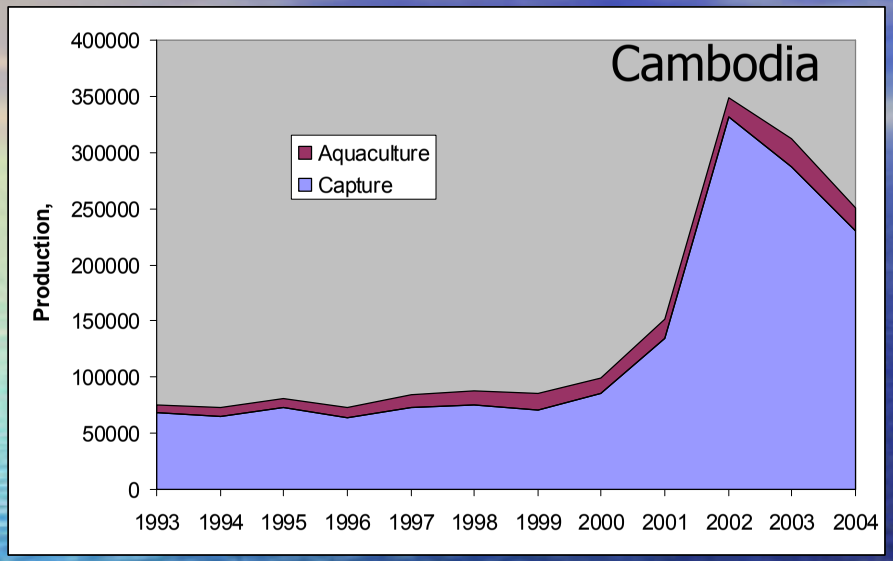


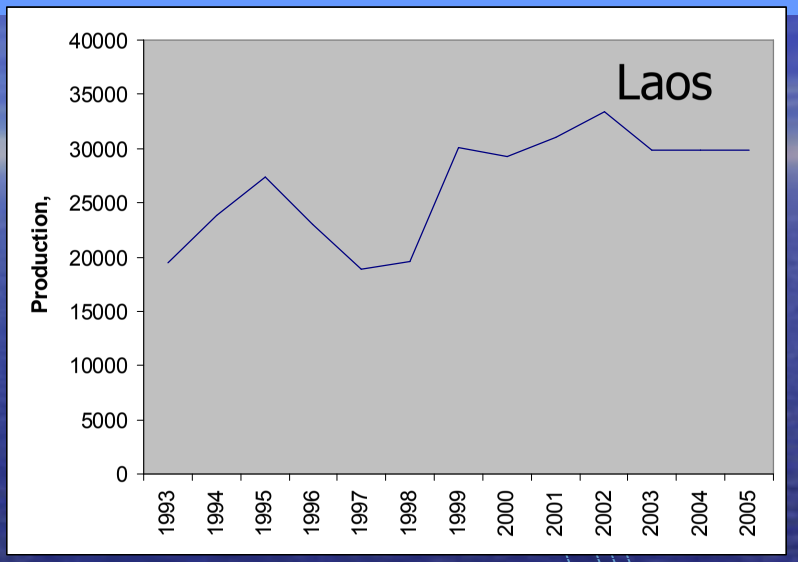
- Very important inland fisheries - especially capture fisheries Tonle Sap and rapidly increasing aquaculture in delta
- Estimates of yield unclear - consumption estimates regarded as more reliable and upper bounds are 2-3 x production estimates.
- However, few trend estimates for consumption.
- Current growth rate unclear (uncertain estimates), but maybe 0.5 m tonnes last ten years, mainly aquaculture

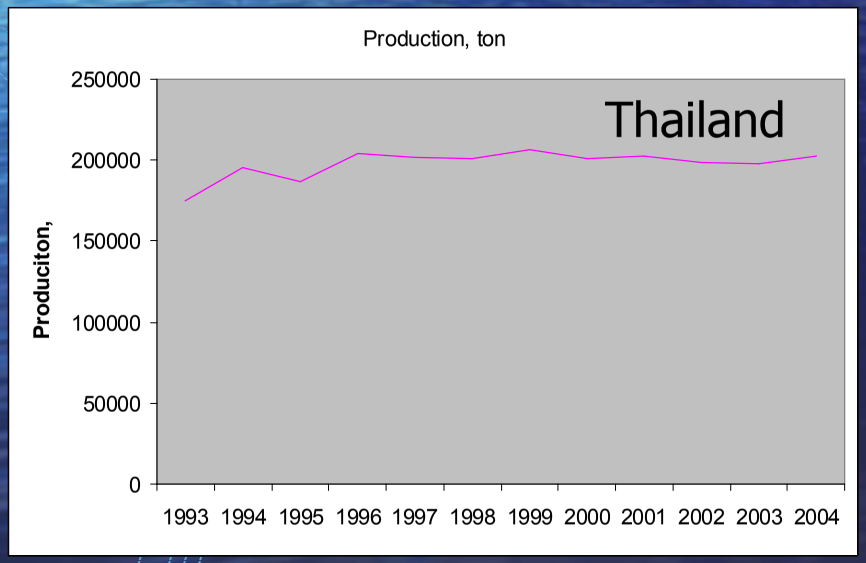


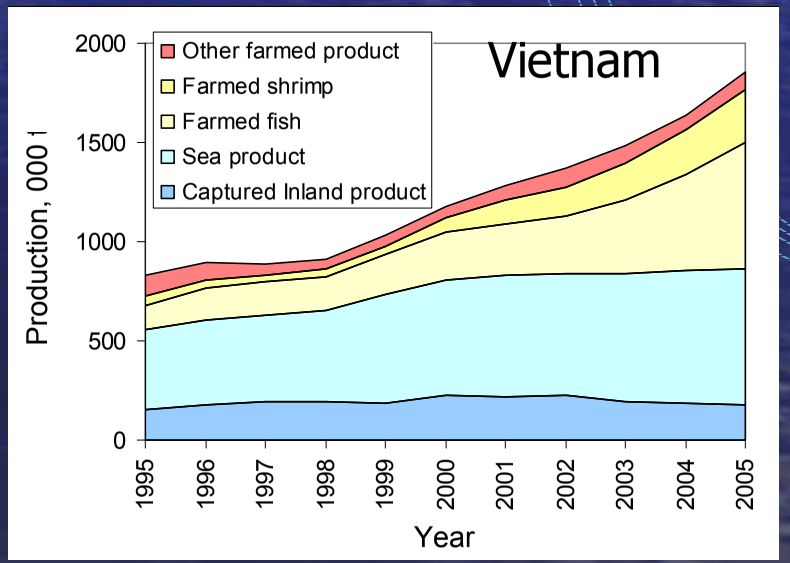
Production estimates









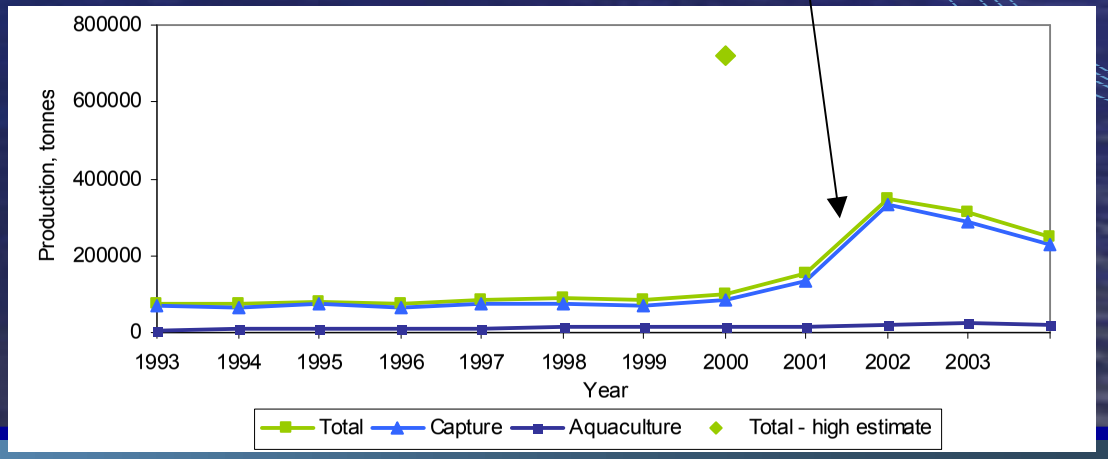


Consumption Cambodia



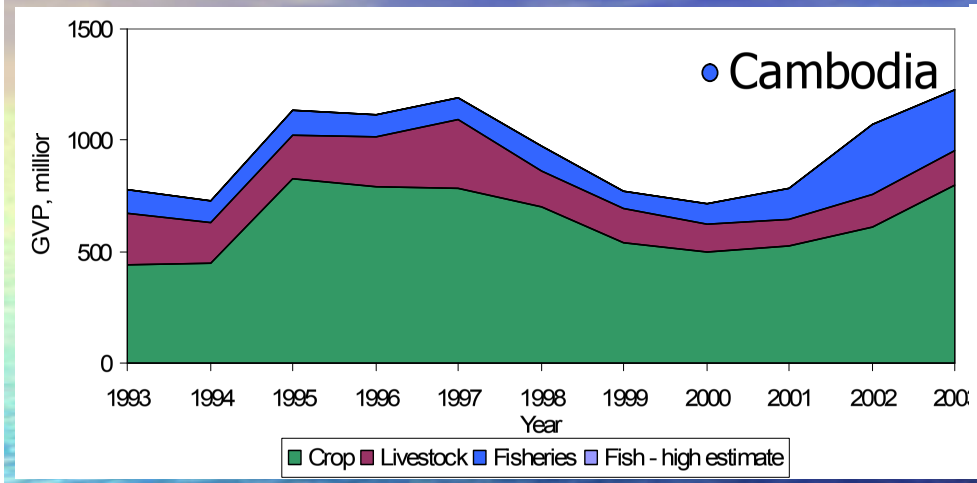
- MRC estimates for Cambodia range from 250,000 to 720,000, and have increased in recent times
- Upper figure is 65 kg/person/year
- Other estimates range from 10 to 49-80 (FAO)
- Other estimates have increased recently
- Is the change in estimates a trend or a change in method or data adequacy? (Much the latter for the MRC?)

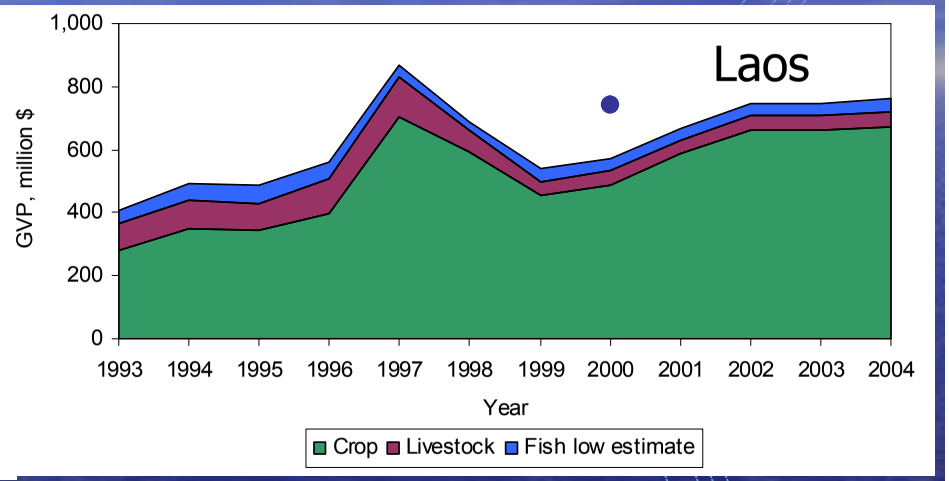
Change in measurements

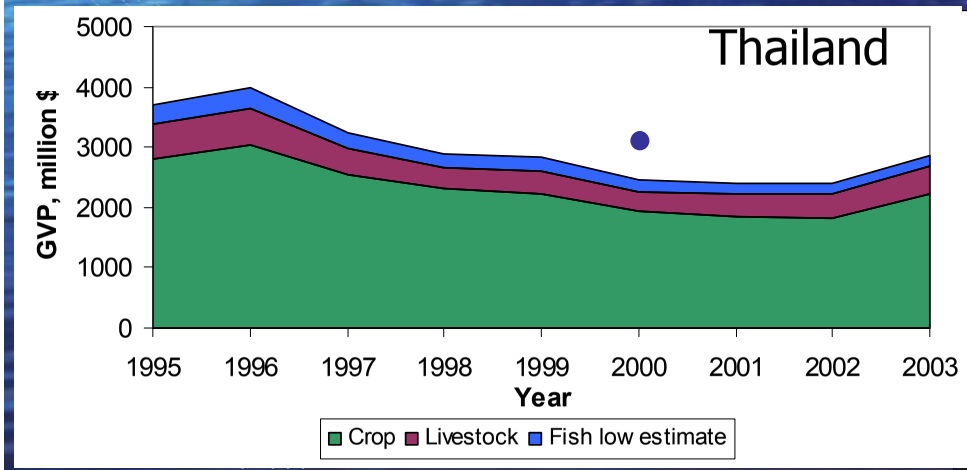


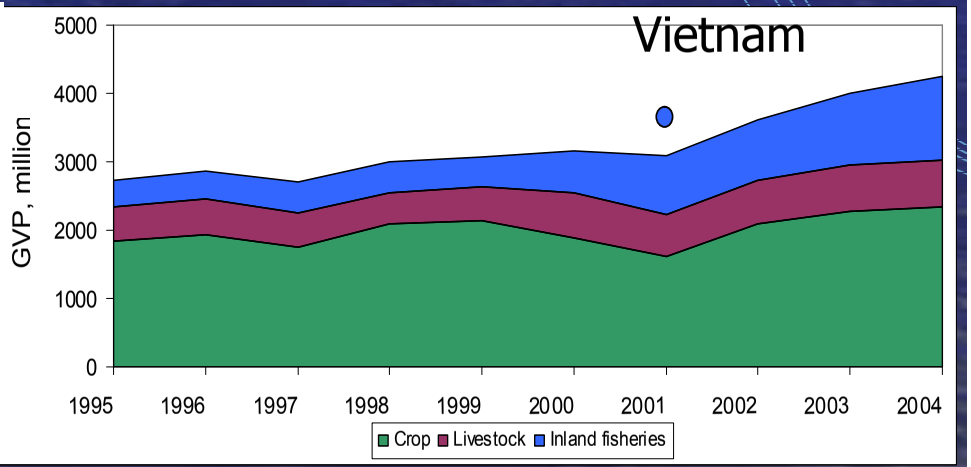
Food - livelihoods







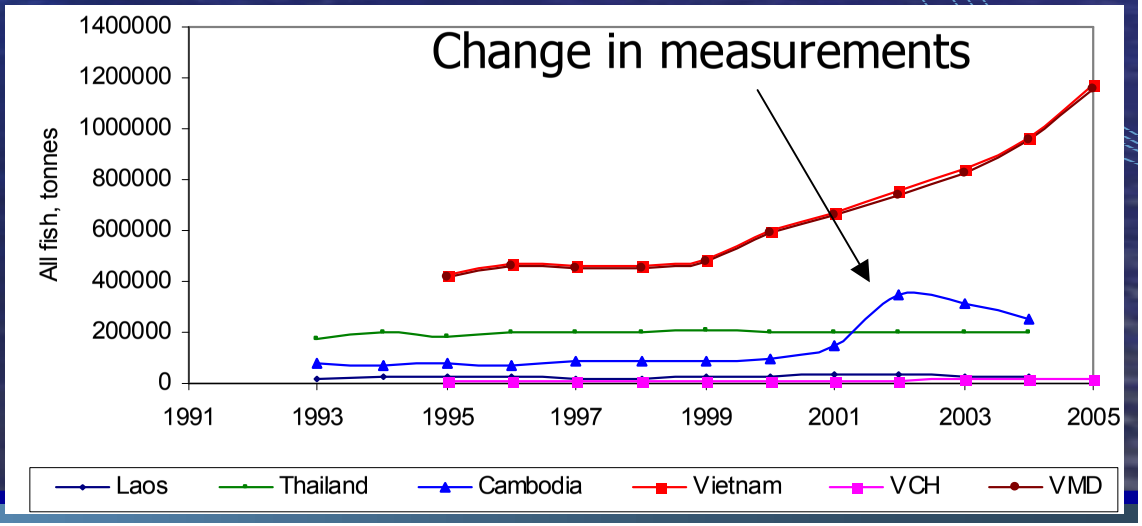




Fisheries growth prospects?



- Demand will increase due to population increase and diet change
- Expected increase ~ 1 m tonnes by 2020, 3.5 m tonnes by 2050
- Current growth rate unclear (uncertain estimates), but maybe 0.5 m tonnes last ten years, mainly aquaculture



Fisheries growth prospects?



- Evidence of overfishing in Tonle Sap and elsewhere - shift in species and fewer large individuals
- Yield maintained by increased effort (classic fishery development trajectory?)
- Capture fishery seems unlikely to expand greatly (except perhaps increased effort before a crash?)
- Aquaculture will expand more in delta - but what about upstream (freshwater)? Rice-fish systems in Laos?

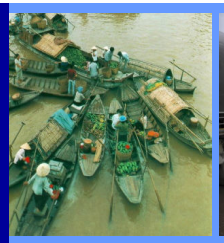


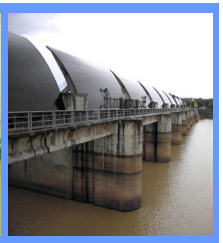
Agriculture and food production - threats



- Climate varies across Mekong - all has wet-dry seasonality, but intensity changes
- Seasonal water shortages, deepest in NE Thailand
- Changes:
  - Land use, hence water use
  - Development - especially dams and diversions
  - Climate change
- Will impact
  - flow reversals / flood storage in Tonle Sap and elsewhere
  - salinity in delta, hence opportunities
  - ecology and fish,

Agriculture and food production - threats

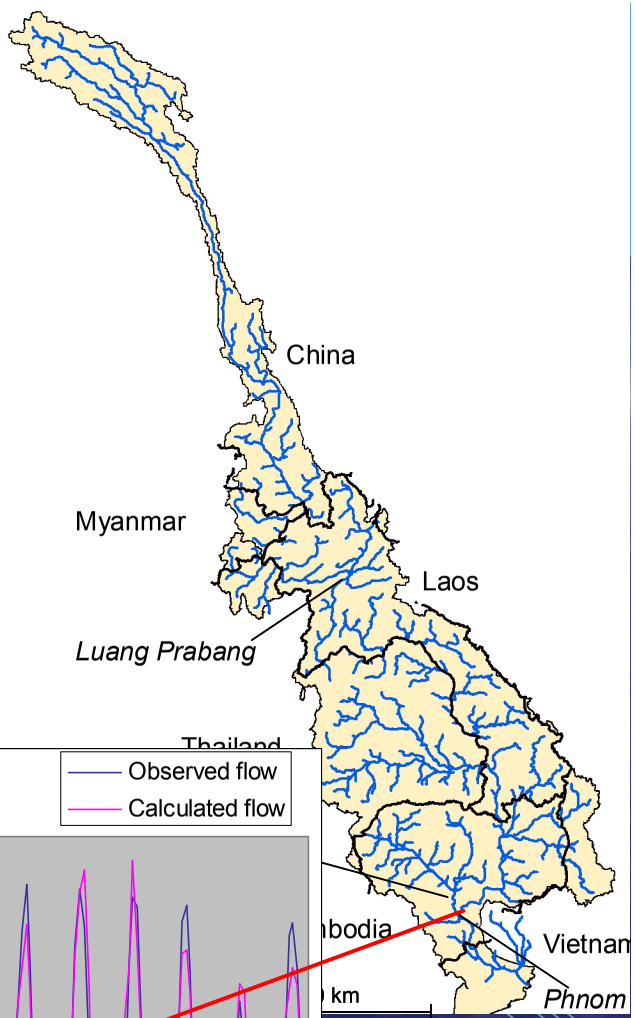


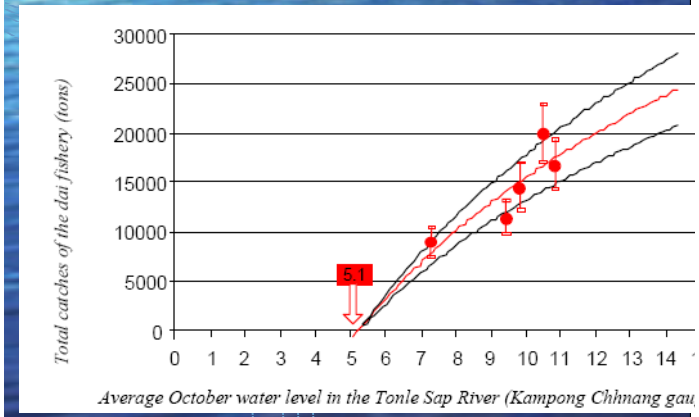


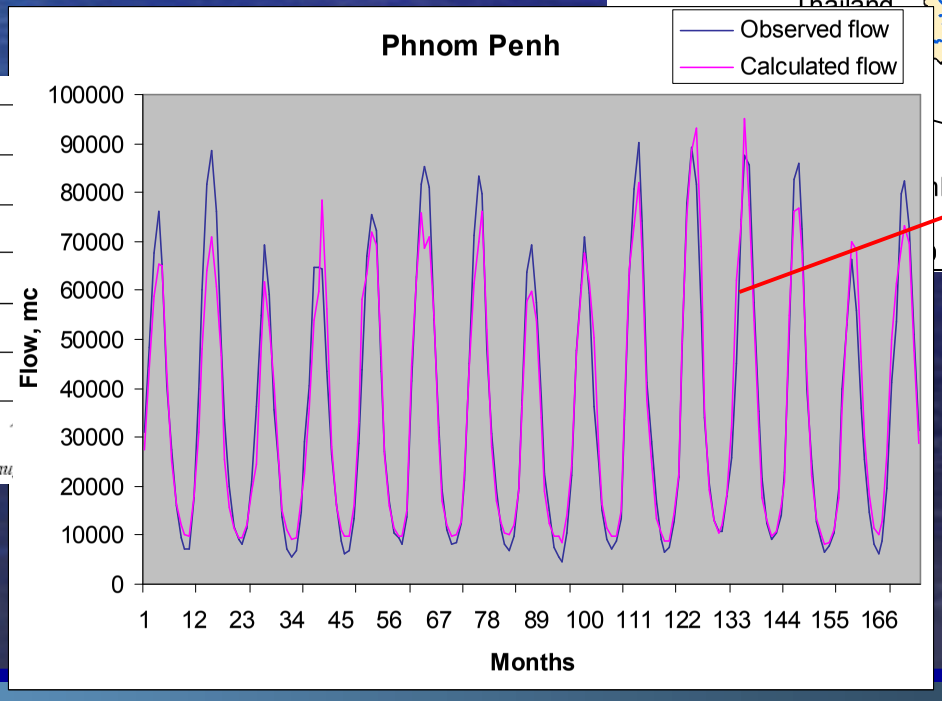
Phnom Penh reach

Increased dam storage for hydropower and increased areas of irrigated agriculture

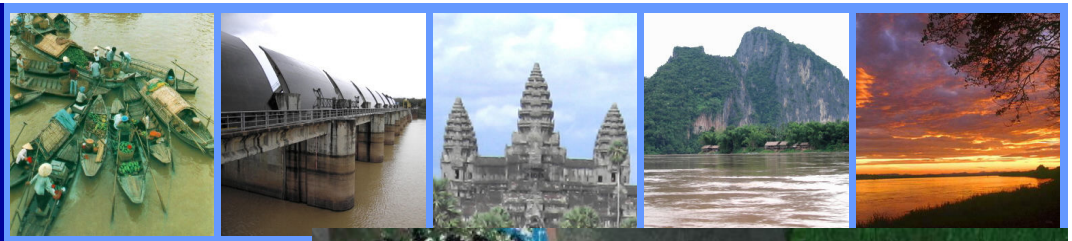
~ 4m Tonnes extra rice plus hydropower vs impact on flood dependent ecosystems and fisheries?







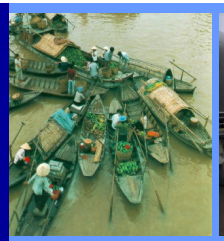
Khone Falls dam - why good information is important

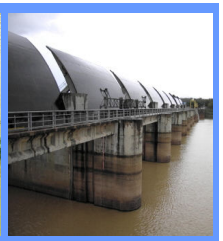


- Planned dam on mainstream fall
- Environmental impact statement suggested little impact on fish
- Scientific studies show that this passage is the major migration passage - 200 species known at Khone falls, many migratory
- Not a good site for a dam



Climate change





Phnom Penh reach

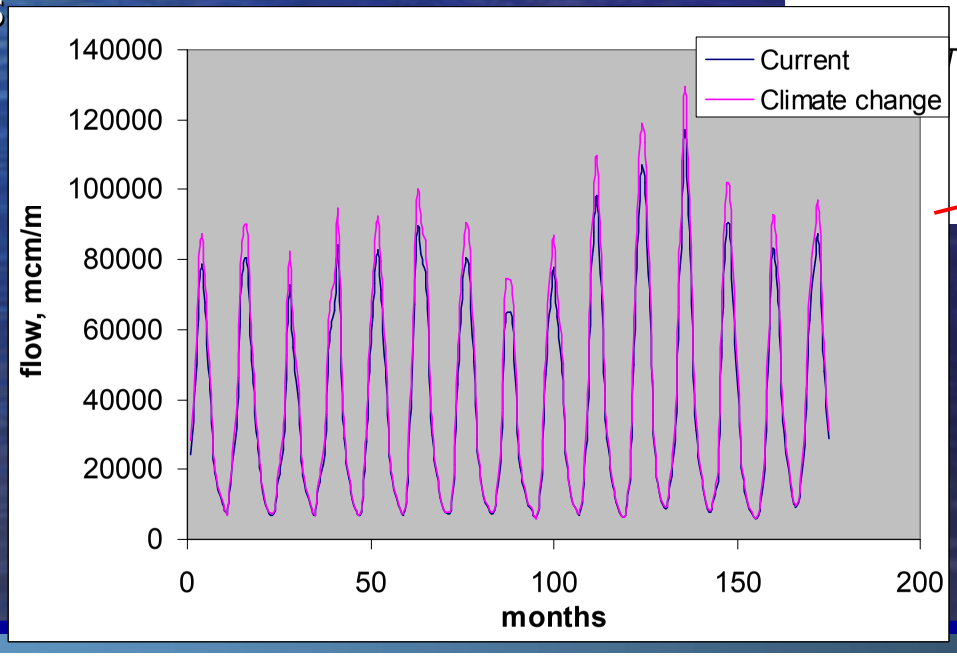
Increased intensity of wet season and dry season

Threaten food production in dry season in water short areas (eg NE Thailand)

Greater flood peaks, more destructive but also may help preserve flood dependent ecosystems and fisheries

Increased salinity and flooding in delta - sea level rise and lower dry season flows





Conclusions: water use



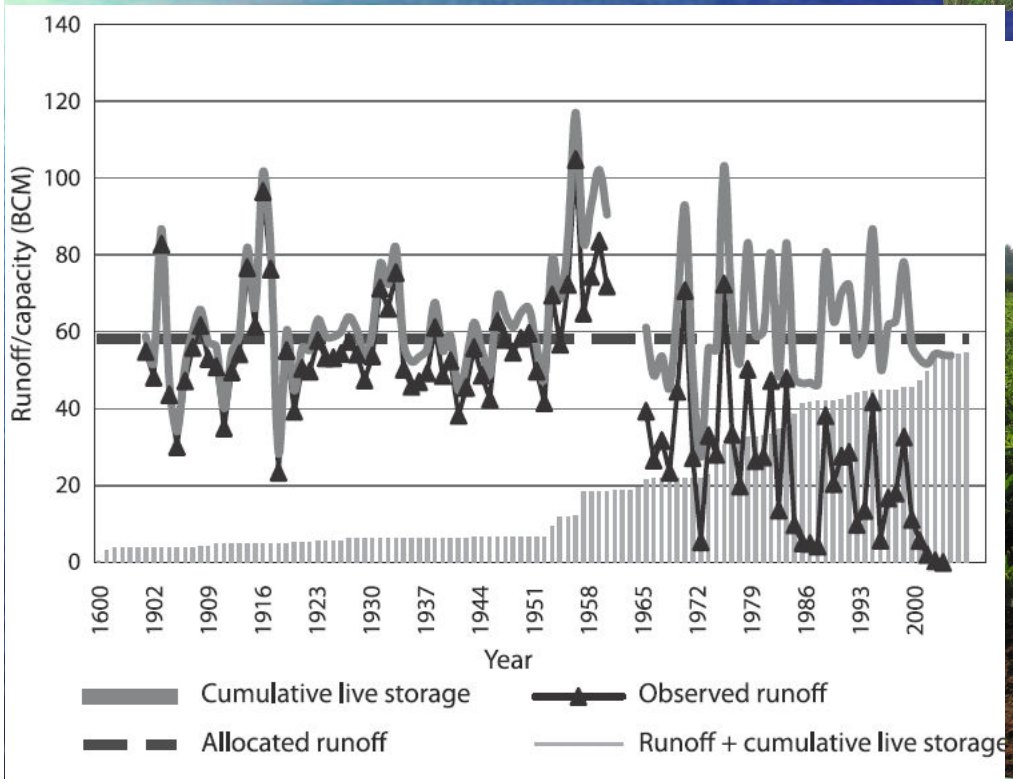
- Demand for increased food production
- Agricultural production varies across region, will low yielding regions (scope for increases)
- Capture fish production at limit? Increases in aquaculture likely
- Threats and opportunities from changes to flow due to development and from climate change
- Need for good governance to cope with upstream-downstream tensions due to demands and threats
- Science has a role to deliver good information to inform policy and planning

Other basins

- Salween, Mekong, relatively undeveloped
- Krishna, Yellow River closing due to upstream diversions and land use change









Conclusions: water use



- Demand for increased food production
- Agricultural production varies, scope for increases
- Capture fish production at limit? Increases in aquaculture likely
- Threats and opportunities from changes to flow due to development and from climate change
- Agricultural planning must consider upstream-downstream
- Need for good governance to cope with upstream-downstream tensions due to demands and threats
- Science has a role to deliver good information to inform policy and planning