Fisheries Action Coalition Team (FACT)

The Impacts of Upstream Development on Wetland and Biodiversity Resources in Tonle Sap

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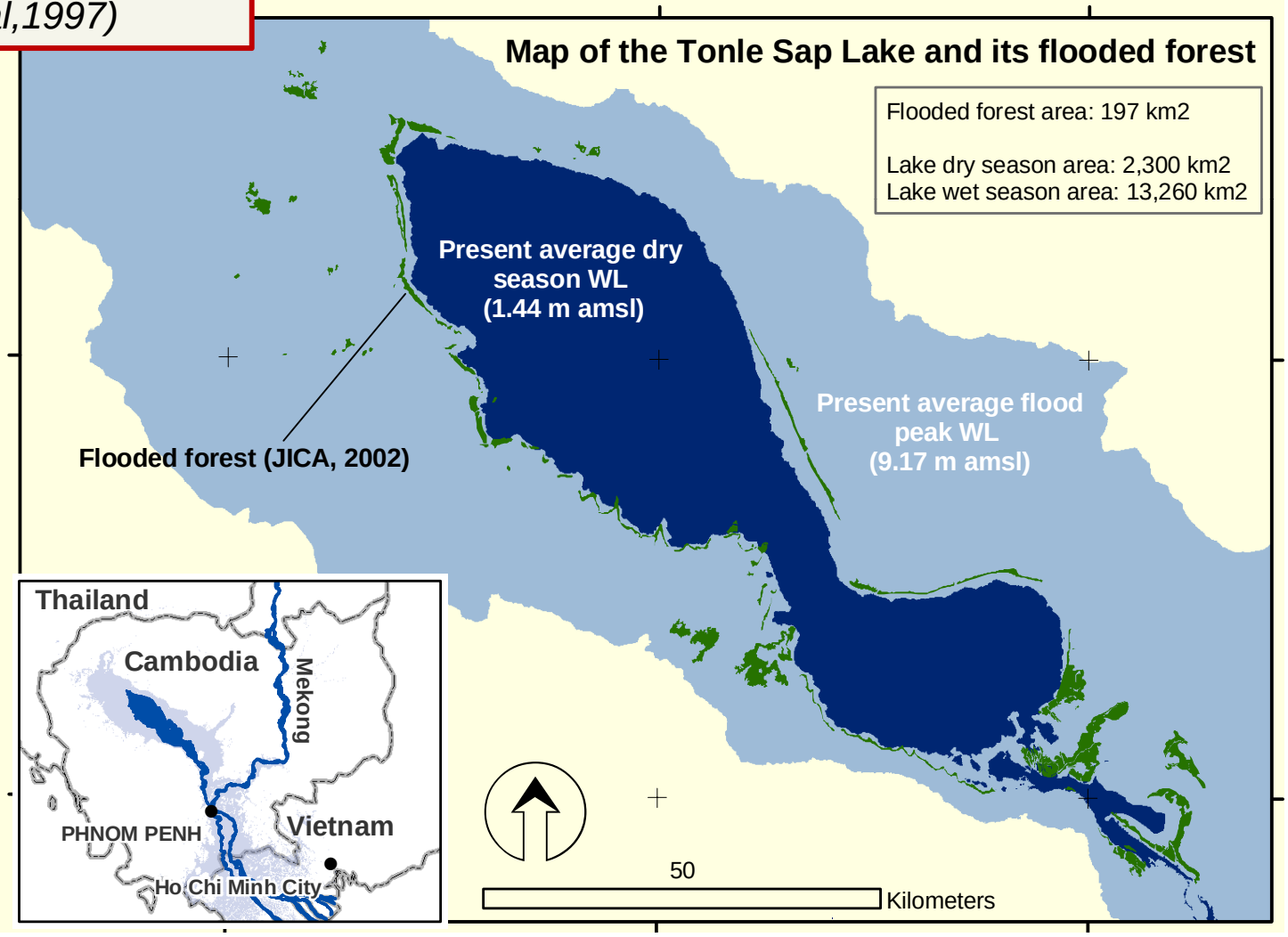
Tonle Sap Lake

'Flooded forest'
tall gallery stands of trees on the banks of lake and river
(McDonald et al,1997)



Hydrology

- 1–2 m asl in the dry season
- 8–11 m asl in the wet season
- 20% of the Mekong River's floodwaters are absorbed by the Tonle Sap.
- 62% of the Tonle Sap's water originates from the Mekong River.
- 38% of the Tonle Sap's water originates from the Tonle Sap basin.
- The Tonle Sap is connected to the Mekong River by the 100-120 kilometer long Tonle Sap River, which reverses its flow seasonally (ADB, 2005; CNMC, 2004; WUP-FIN, 2003).

“Flood pulse” in Tonle Sap

- In Tonle Sap Lake:
  - flooding submerges the Tonle Sap floodplain and riparian forests during the wet season and
  - floods recede from the floodplain during the dry season. This is the “flood pulse” in Tonle Sap.
- Ecosystems that experience fluctuation between terrestrial and aquatic conditions are called pulsing ecosystems (*Kummu et al.,* 2008)

Dams and Hydropower Dams in the Mekong

- Since the 1950s:
  - nearly 6,000 large and small dams have been built in the Lower Mekong (FACT, 2001).
  - dams are mainly hydropower and irrigation.

Major water resource development projects in the Mekong basin

Year	No. of Projects	Power characteristic		Irrigation potential (ha)		Active storage (mcm)
		MW	GWh/year	Wet season	Dry season	
1965-1975	***9***	***257***	***1,266***	***209000***	***189000***	***10012***
1975-1995	***6***	***1681***	***8330***	***53000***	***35000***	***1058***
1996-2005	***8***	***3240***	***17597***	***0***	***0***	***4148***
Grant Total 1965-2005	**23**	**5178**	**27,193**	**275,000**	**227,000**	**15,328**
Source: CNMC & NEDECO, 1998						

Impacts of Hydropower Dams

- The dams will have two main impacts on Mekong and Tonle Sap:
  - There will be below normal wet season flows to the Tonle Sap
  - There will be increased dry season flows in the Mekong slowing flood recession from the Tonle Sap

The Decrease in the Wet Season Flow

Impacts on flood *(after ADB, 2004)*:

Duration:	**-5%**	(264→250 d)
Flood volume:	**-16%**	(60→52 km^3)
Floodplain area:	**-16%**	(11,000→9,200 km^2)
Min WL	**+0.6 m**	(1.44→2.04 m)
Max WL:	**-0.6 m**	(9.17→8.57 m)

(*Kummu et al.*, 2008).

Increase in the Dry Season Flow

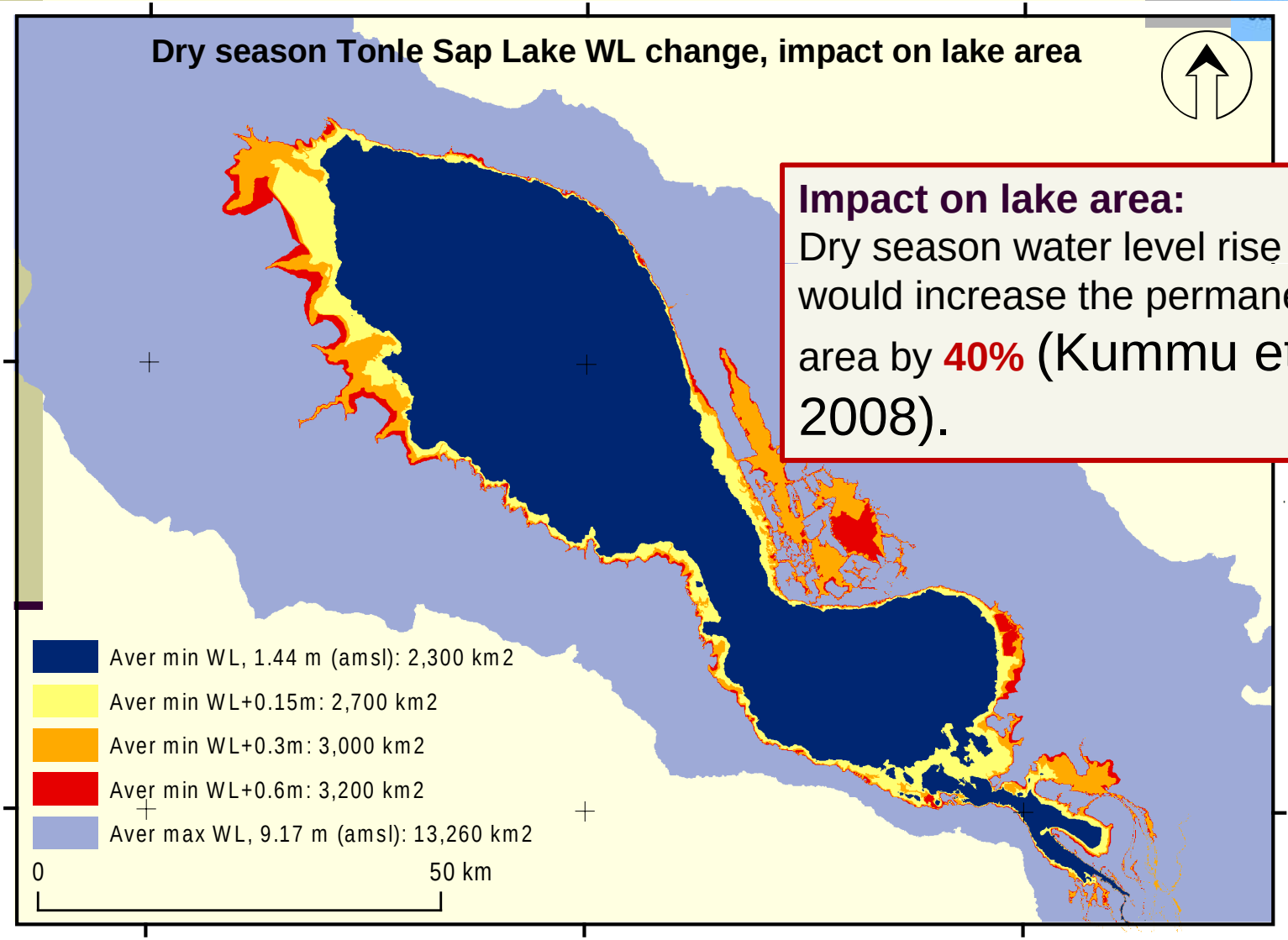
Results of the CIAs on low WL:

MRC:	**+0.15 m**
Adamson (2001):	**+0.30 m**
ADB (2004):	**+0.60 m**

- Recent Cumulative Impact Assessment (CIA) studies made by
  - MRC under the IBFM (Integrated Basin Flow Management) project
  - ADB (2004): Cumulative Impact Analysis and Nam Theun 2 Contributions (prepared by Norplan and EcoLao)
  - Adamson (2001), and WL analysis of Garsdal (2004)

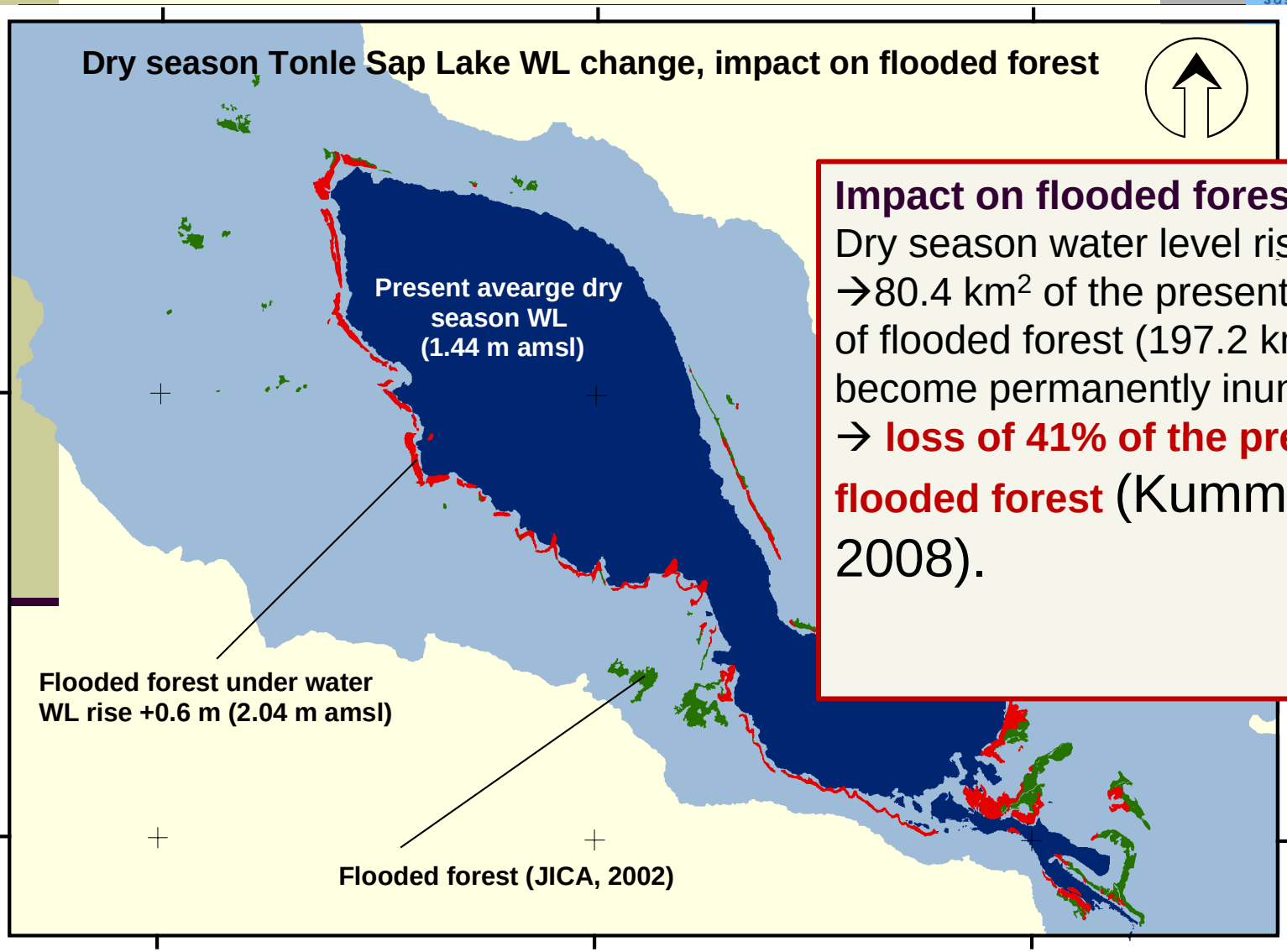
are used to understand possible upstream development impacts.

Dry season WL rise:impact on lake area



Impact on lake area:
Dry season water level rise of 0.6 m would increase the permanent lake area by **40%** (Kummu et al., 2008).

Dry season Water Level rise after ADB (2004): impact on flooded forest



Impact on flooded forest:
Dry season water level rise of 0.6 m →80.4 km^2 of the present total area of flooded forest (197.2 km^2) would become permanently inundated → **loss of 41% of the present flooded forest** (Kummu et al., 2008).

Impacts on Fisheries

- The dams will block fish migration. The decrease in the wet season flow will reduce the floodplain area.
- A smaller floodplain area will result in lower fish production leading to a reduced catch.

Relationship between *dai* catch and maximum flood discharge of Tonle Sap River

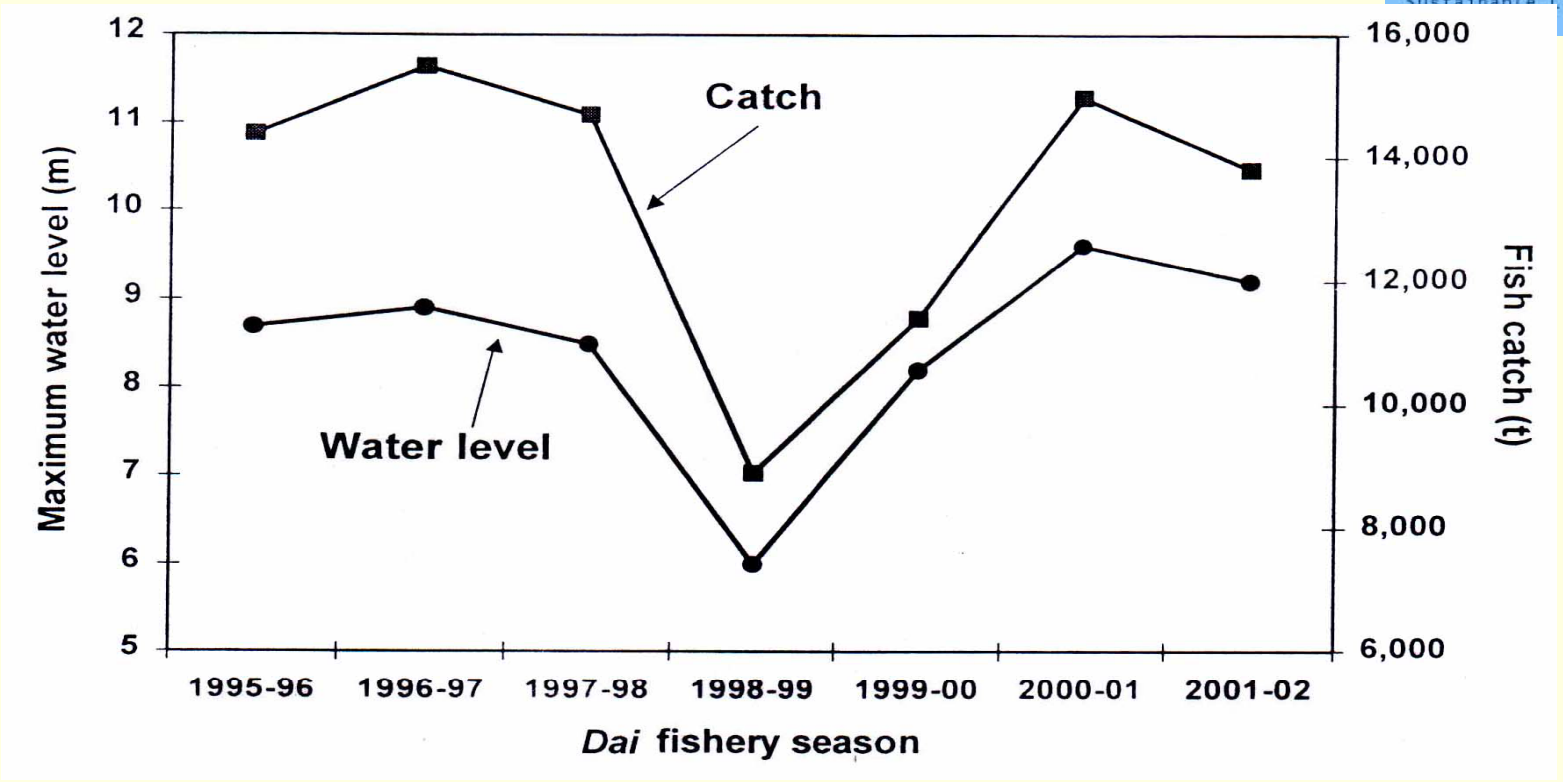


Fig 5.54 Relationship between *dai* catch and maximum flood discharge of Tonle Sap River (MRC, 2003)

Concluding Comments

Any upstream Mekong hydro development will alter the essential hydro-ecological processes upon which the Tonle Sap fishery depends. This fishery is critical to the livelihoods of over a million people in over 140 communities. The *cumulative* impacts of both mainstream and tributary dams could potentially disrupt one of the world's great inland fisheries and threaten the food security of the fishers of Cambodia.

Thank You