

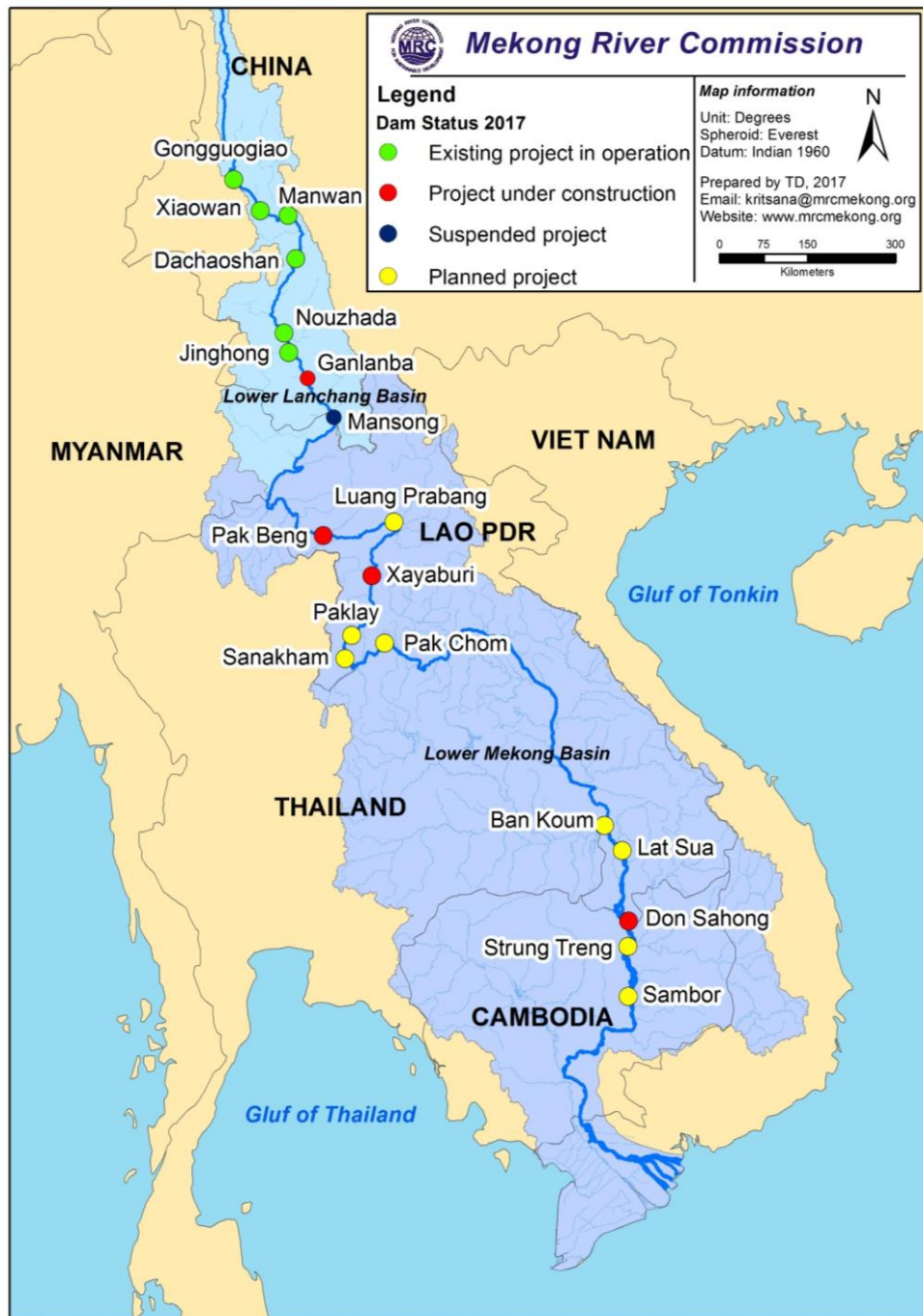
The LMB Sustainable Hydropower Development Strategy



Regional Power Trade Coordination Committee 24

Nay Pyi Taw, 20 June 2018

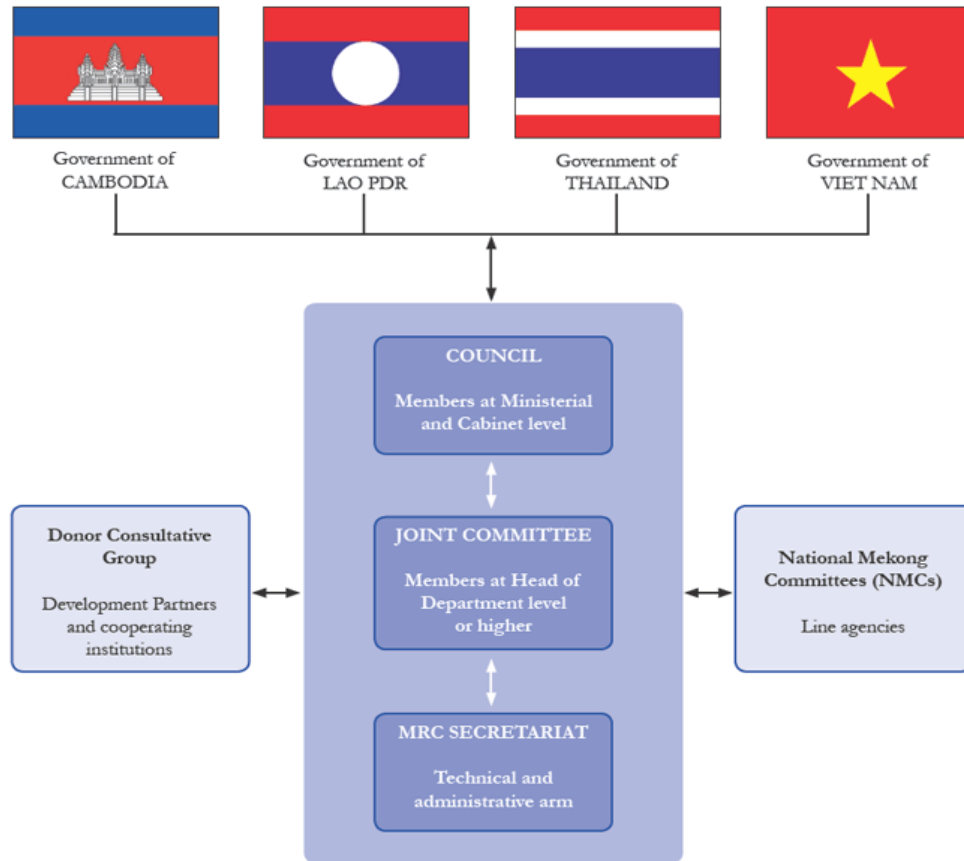




The Lower Mekong Basin

- Most of Cambodia
- Most of Lao PDR
- North-East Thailand
- Mekong Delta in Vietnam

Introducing the Mekong River Commission



Our Dialogue Partners



China



Republic of the Union of Myanmar

Mekong Agreement 1995 (MA95)

- **Article 1. Areas of Cooperation**

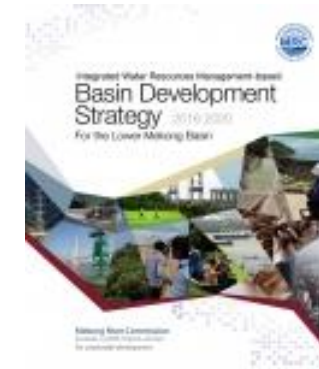
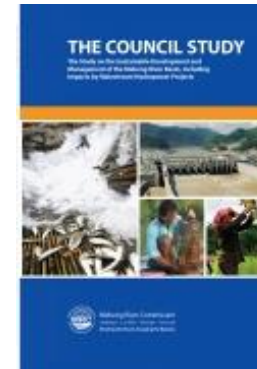
To cooperate in all fields of sustainable development, utilization, management and conservation of the...the Mekong River Basin including...irrigation, **hydro-power**, navigation, flood control, fisheries...in a manner to optimize the multiple-use and mutual benefits of all riparians and to minimize the harmful effects that might result...

- **Article 2. Projects, Programs and Planning**

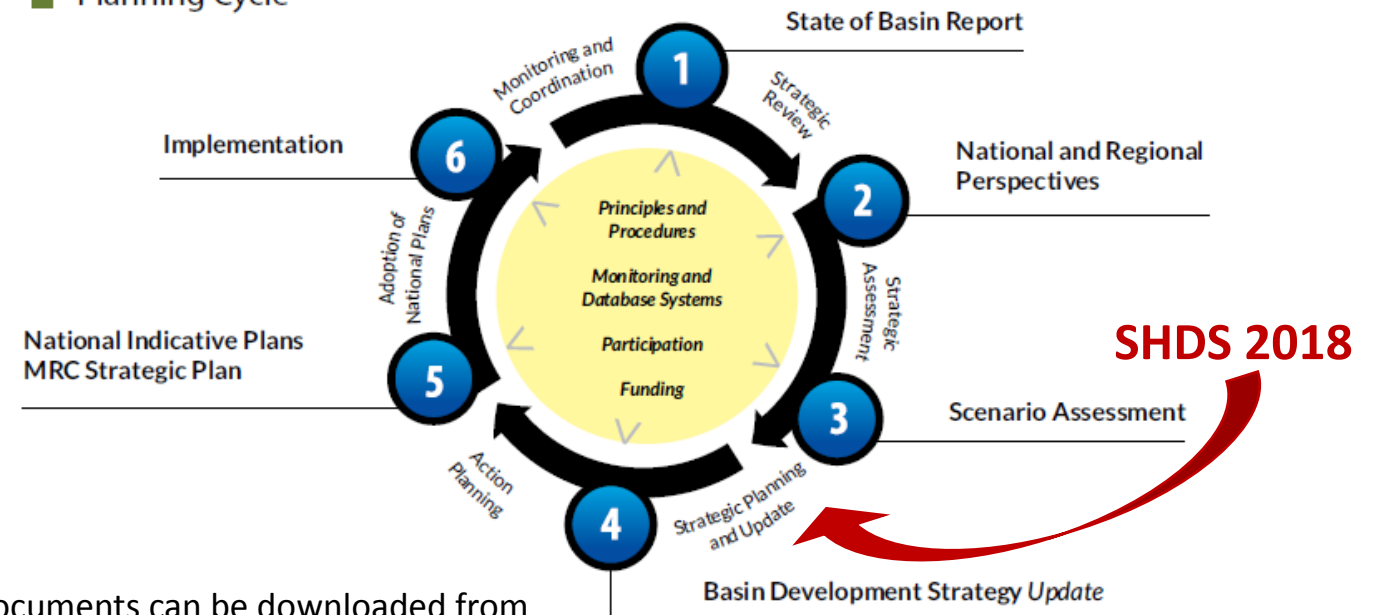
To promote, support, cooperate and coordinate in the development...with emphasis and preference on joint and/or basin-wide development projects...through the formulation of a **basin development plan**, that would be used to identify, categorize and prioritize the projects and programs...

Role of Sustainable Hydropower Development Strategy 2018

- Builds on existing basin-wide analysis by MRC
- Investigates potential hydropower pathways in more detail
- An input to the *Basin Development Strategy 2021-25* which will
 - prioritise **development opportunities** for the LMB
 - define **strategic priorities** supporting these opportunities
 - identify **implementing actions** by MRC and governments



Refreshed MRC Strategic Planning Cycle



All documents can be downloaded from <http://www.mrcmekong.org/publications/>

Objective and Outputs of SHDS 2018

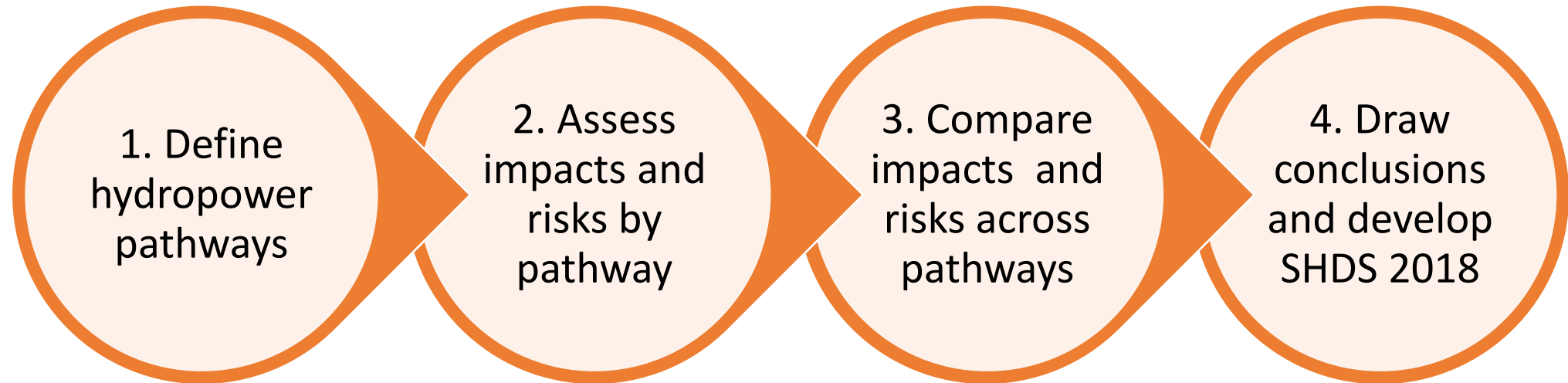
OBJECTIVE

Alternative hydropower development pathways are to be proposed, explored and discussed in order to formulate a sustainable hydropower development strategy that **enhances benefits** beyond national borders and **minimises adverse transboundary impacts**, while **supporting water, food and energy security** and taking full account of uncertainties and risks.

EXPECTED OUTPUTS

- Identification of hydropower development pathway/s that maximise **net** transboundary benefits
- Definition of transboundary benefit and cost-sharing mechanisms for LMB hydropower
- Proposals for strategic initiatives supporting the pathway/s and transboundary mechanisms
- Recommendations on short-term implementation actions for MRC and national governments

Steps in developing SHDS 2018



Process and timetable for SHDS 2018



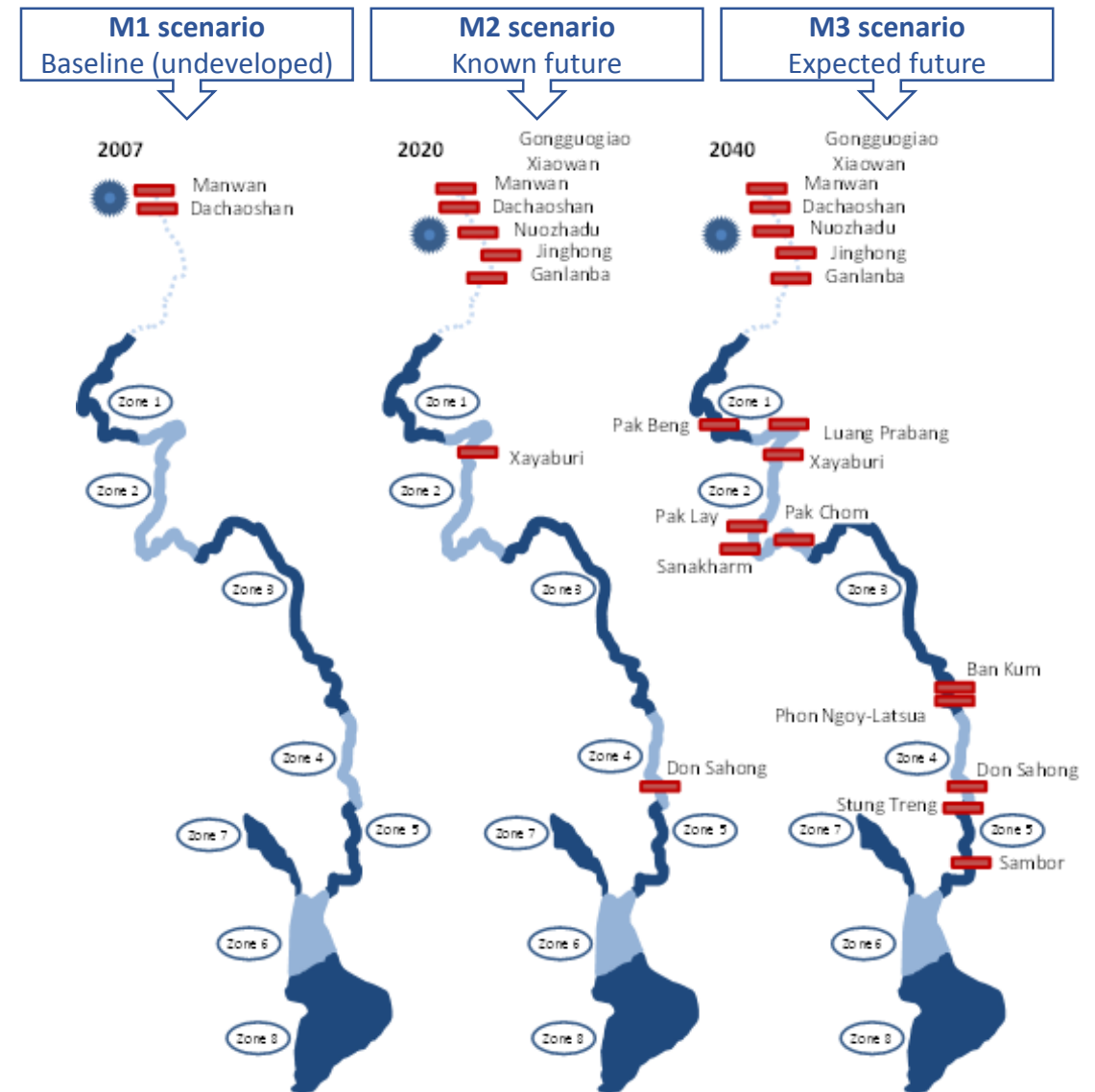
LMB hydropower development (Council Study scenarios)

Mainstream dams

- 11 by 2040 with 2 commissioned by 2020
 - 6 in upper Lao PDR, including Xayaburi (under construction), Pak Beng and Pak Lay (both notified)
 - 3 in lower Lao PDR, including Don Sahong (under construction)
 - 2 in Cambodia

Tributary dams

- 129 by 2040 with 87 commissioned by 2020
 - 98 in Lao PDR, 14 in Vietnam, 11 in Cambodia, 6 in Thailand



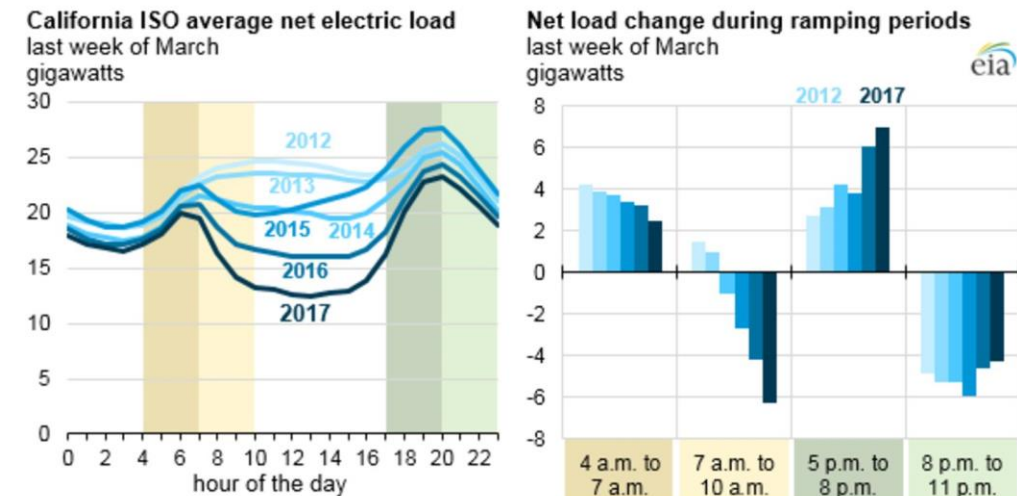
Current hydropower benefits

	Baseload energy	Peak energy	CO ₂ emissions reduction
Service	Constant output over time	Only during peak hours	Depends on generation profile
Displaced supply	Coal / Gas CCGT	Gas CCGT / Gas GT	<i>Depends on time of operation</i>
Cost savings	Avoided fuel cost Avoided capacity cost (<i>'dry' year firm capacity</i>)	Avoided fuel cost Avoided capacity cost (<i>'dry' year firm capacity</i>)	No financial benefit but there is a social benefit
Comments	<ul style="list-style-type: none"> All LMB hydro can provide Service may become less valuable over time 	<ul style="list-style-type: none"> Provided by storage hydro Peak period pricing needed to realise full benefits Fluctuating water flows have negative impacts 	<ul style="list-style-type: none"> Not currently remunerated Need to net off methane emissions from flooded biomass

Potential to enhance hydropower benefits?

- Increasing penetration of variable and intermittent solar and wind generation
- Opportunity for **LMB storage hydro** to provide additional services
 - **'Firming'** – replacing decline in solar energy during evening peak hours
 - **Balancing** – rapid response to fluctuating wind and solar output
- Requires synchronisation with importing electricity systems

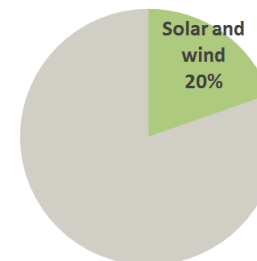
Increasing solar penetration leads to requirements for rapid changes in output in mornings and evenings. Thermal capacity is not well-suited to provide these changes



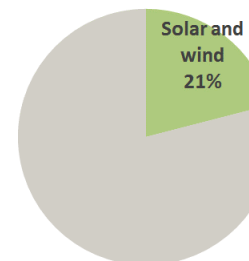
Source: U.S. Energy Information Administration, based on [ABB Energy Velocity](#)

Solar and wind share of installed capacity

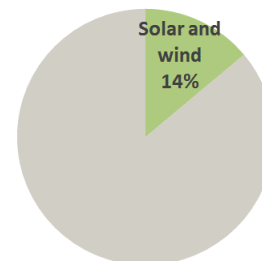
California 2016



Thailand 2036



Vietnam 2030



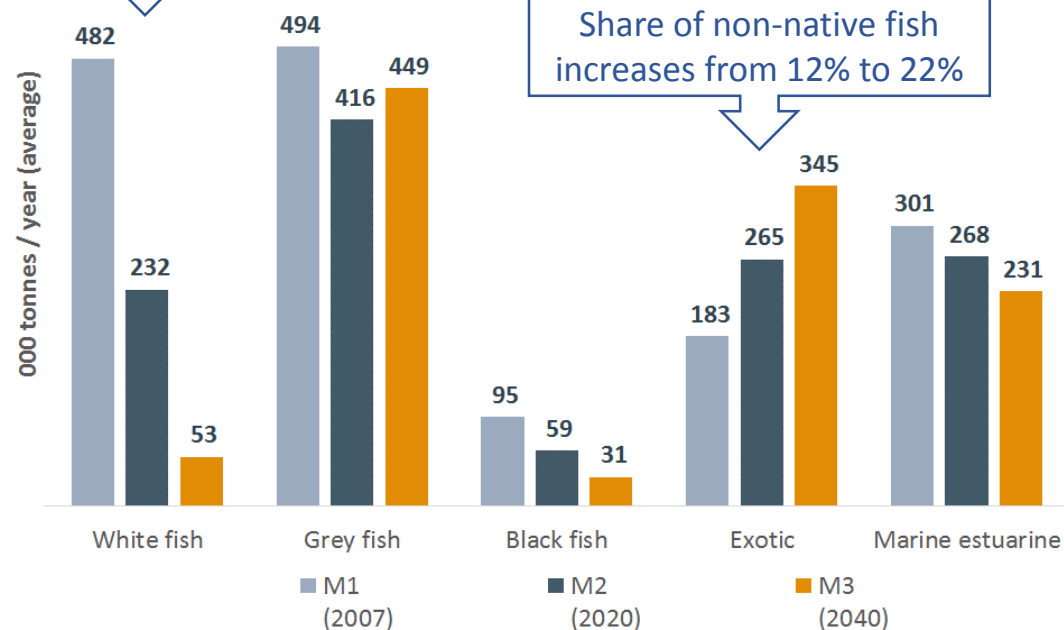
Impacts of hydropower development on LMB fisheries

PROJECTED IMPACTS (Council Study)

Reduction in average fish catch of 447,000 tonnes per year or by 29% between M1 and M3 scenarios

White fish (upstream migratory) reduced by 90%

Share of non-native fish increases from 12% to 22%



CAUSES

- Blockage of migration routes
- Changes in seasonal flood patterns
- Loss of breeding and feeding habitats

POTENTIAL MITIGATION MEASURES

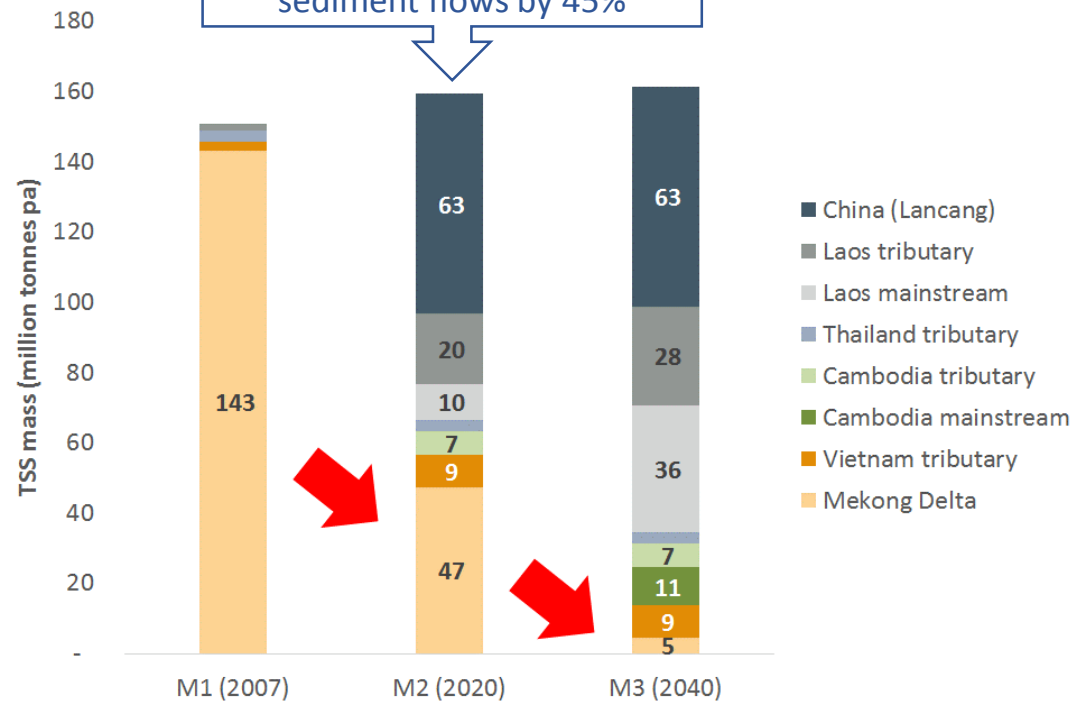
- Improved fish passages for migration
- Redesign dams to reduce fish loss and improve sediment flow (low head dams, vertical turbines, rising gates, leaving side-channels clear)
- Increased aquaculture in reservoirs and the Mekong Delta

Impacts of hydropower development on LMB sediment flows

PROJECTED IMPACTS (Council Study)

Reduction in sediment flows reaching Mekong Delta by 97% between M1 and M3 scenarios

Chinese dams alone reduce sediment flows by 45%



CAUSES

- Trapping of sediment in reservoirs behind dams

IMPACTS ON LMB AGRICULTURE

- Reduction in rice production of 552,500 tonnes pa in Mekong Delta (~10%) and 203,000 tonnes pa (~7%) in Cambodia floodplains (Mekong Delta Study)

POTENTIAL MITIGATION MEASURES

- Redesign dams to improve sediment flow
- Flushing of dams (opening gates for 3-month periods)

Other major negative impacts of LMB hydropower development

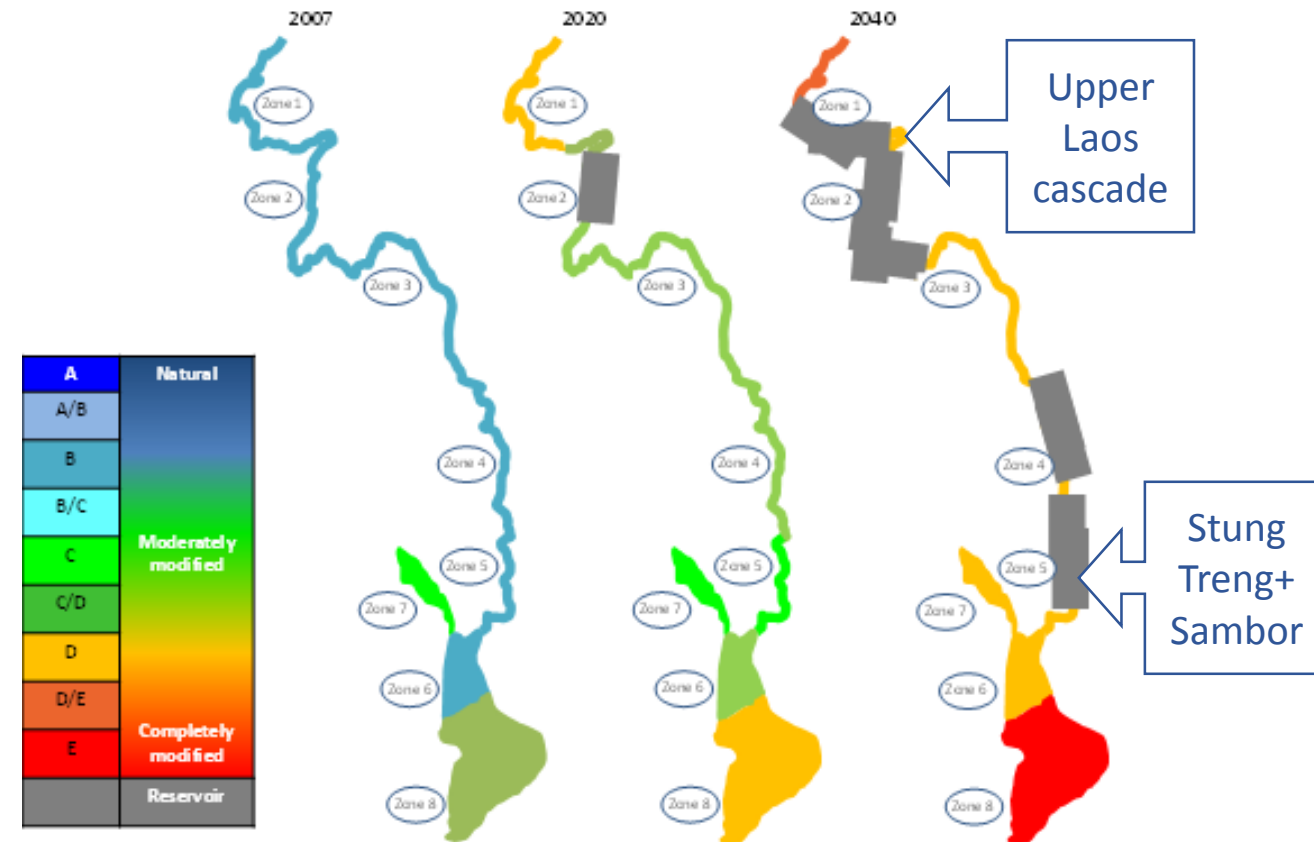
Social

- Resettlement of communities (~150,000 people in total?)
- Loss of livelihoods from fishing and riverside gardens

Environmental

- Flooding of environmental 'hotspots'
- Loss of wetlands (30-45% reduction from M1 to M3)
- Loss of native algal, invertebrate and fish communities

CHANGES IN RIVER CONDITION (Council Study)



Potential positive impacts from LMB hydropower development

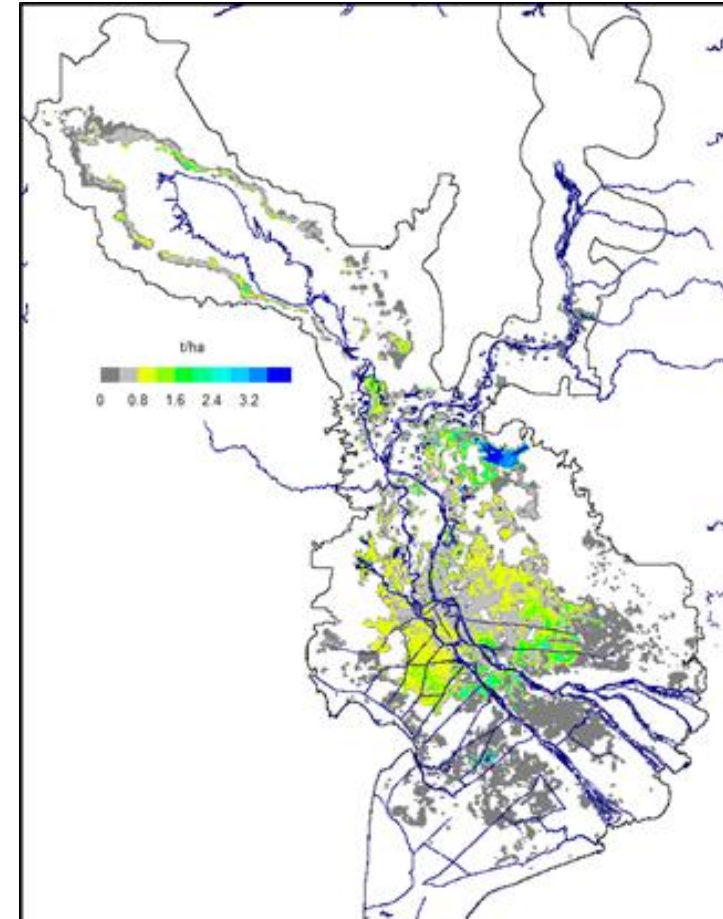
Social

- Employment opportunities from dam construction

Agricultural

- Irrigation from multi-purpose projects
- Reduced salinity in the Mekong Delta
- Reducing flooding of wet-season rice

CHANGES IN RICE YIELDS FROM REDUCED FLOODING (Council Study)



The proposed hydropower development pathways

1. CURRENT PLANS

Build all hydropower projects included in the Council Study by 2040

Provides a baseline for comparison with other development pathways

2. DESIGN MITIGATION

Apply design and siting changes to reduce negative impacts (eg, multiple low head dams)

Examines trade-off between lower benefits (higher costs) and reduced negative impacts

3. PRIORITISATION

Only build the 'best' projects up to a predetermined limit (eg, 50% of current plans)

Examines whether most benefits can be realised but with much reduced negative impacts

4. CONSERVATION

Only build projects on already-developed rivers and away from environmental 'hotspots'

Examines how benefits change if increased emphasis on reducing negative impacts

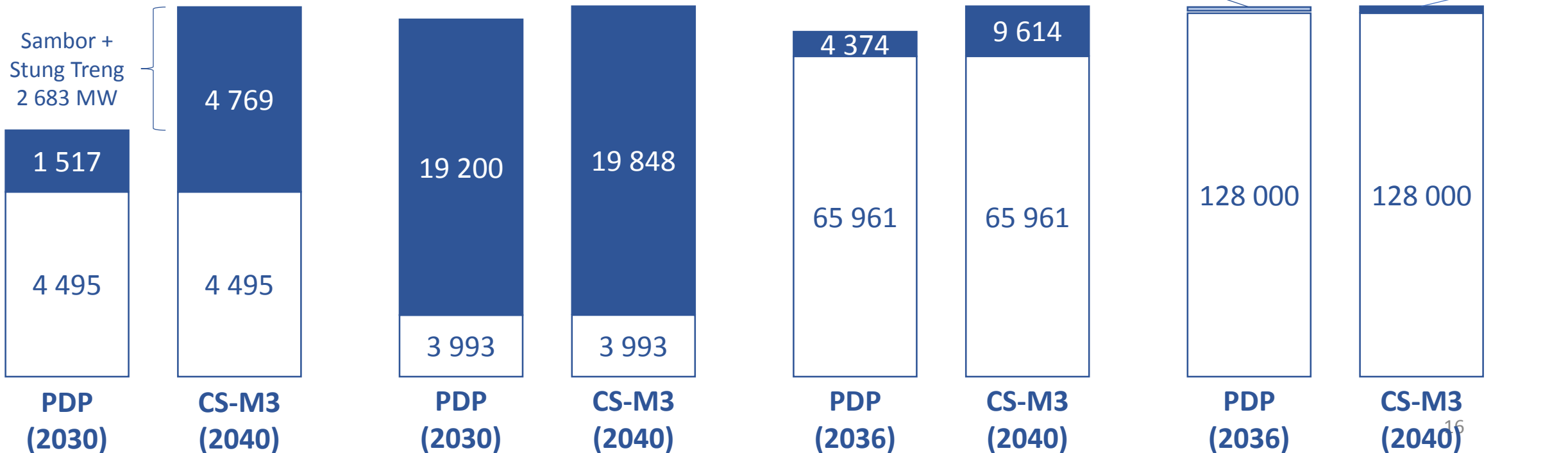
How to reconcile national PDPs and the Council Study?

Cambodia: CS assumes 4,769 MW of LMB hydro capacity by 2040. PDP2015 (draft) plans 1,517 MW by 2030

Lao PDR: Current plans assume that all LMB hydro capacity shown in CS is commissioned by 2030

Thailand: CS assumes 9,614 MW of LMB hydro imports by 2040. PDP2015 plans 4,375 MW by 2036

Vietnam: CS assumes 2,261 MW of LMB hydro imports by 2040. PMP VII plans 1,500 MW total imports by 2030



Potential approaches to reconciliation

- Scale-down LMB hydropower development to match national PDPs
Which projects to remove from the Council Study list of hydropower projects?
- Assume that many LMB hydropower export projects are deferred until after end of Vietnam national PDP in 2030 and Thailand PDP in 2036
Potential inconsistency with assumptions underlying Laos development plans
- Remove thermal capacity from national PDPs to make 'space' for LMB hydropower projects
Implies that the SHDS is assuming a different development pathway to national PDPs

Our current proposal. This assumes that national PDPs are adjusted to take advantage of lower-cost hydropower imports

Questions for RPTCC members

- Can we be provided with the most recent Power Development Plans for each LMB country?

[Current PDPs: Cambodia – 2015 (draft) / Lao PDR – project status at June 2018 / Thailand – 2015 / Vietnam – PMP VII revised (2016)]

- How should we reconcile the Council Study assumptions on LMB hydropower development and the national Power Development Plans?
- What are the views of RPTCC members on the potential to use LMB hydropower to provide regional firming, balancing and other ancillary services?

We would like to arrange meetings with RPTCC members during the forthcoming national consultations in early-August 2018, to follow-up on these questions through National Mekong Committee (NMC)



Schedule of National Consultation on SHDS

- **Lao PDR: 3 August 2018**
- **Viet Nam: 6 August 2018**
- **Cambodia: 8 August 2018**
- **Thailand: 9 August 2018**

Thank you



<https://goo.glsuzxhV>

For more information, please visit:
www.mrcmekong.org/about-mrc/programmes/initiative-on-sustainable-hydropower/