



Integrating SEA into regional power planning – Results from RETA 7764

Greater Mekong Subregion Strategic Environmental Assessment

Knowledge Sharing Forum | 30 October 2014

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Ensuring sustainability of GMS

Regional power planning – SEA Scope



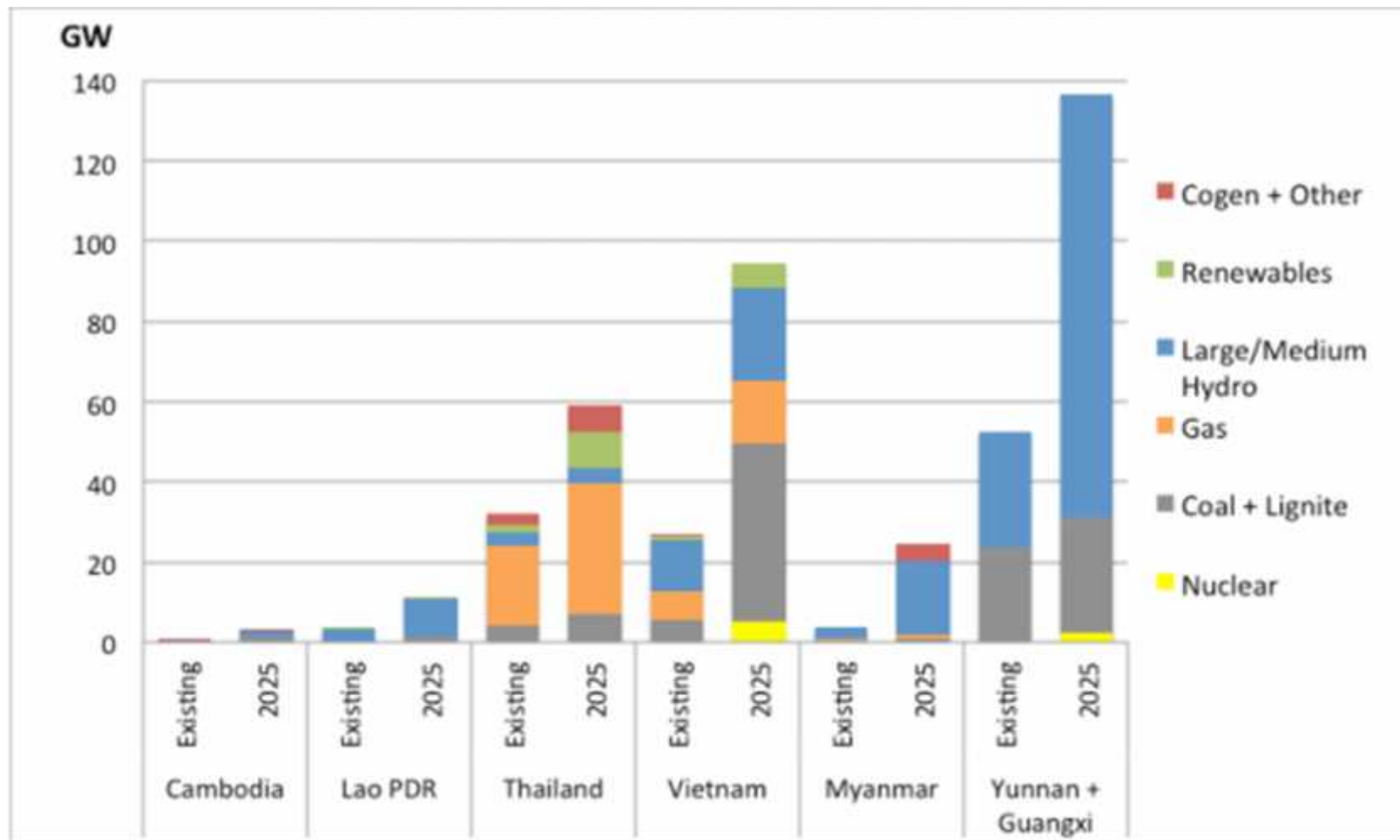
- Considering six GMS countries
- Focus on power trade within GMS region
- Includes all power generation and regional transmission lines
- Greater emphasis on Lower Mekong countries
- Baseyear 2010
- Looking at the proposed power development plans to 2025
- Three scenarios
 - ▣ Current PDP
 - ▣ Increased renewable energy
 - ▣ Increased energy efficiency
- Two scenario options
 - ▣ Global impacts displacement
 - ▣ Regional and local impacts displacement

What is the power plan 2025?

Fuel type	Existing (2012)		Projected (2025)		Increase (2012-25)		
	MW	# plant	MW	# plant	MW	%	# plant
Nuclear	0	0	7,160	4	7,160	--	4
Coal + lignite	34,058	41	84,341	83	50,283	+148%	42
Gas	27,959	39	52,287	54	24,328	+87%	15
Large hydro (a)	49,727	116	160,963	254	111,235	+224%	138
Renewables	3,533	n.c.	16,475	n.c.	12,942	+366%	n.c.
Cogen + others	3,689	16	8,006	6	4,317	+117%	-10
Total	118,967	212	329,232	401	210,265	+177%	189

Changes in numbers of power plants and installed capacity in GMS by 2025

Projected installed capacity by 2025



EXISTING AND PLANNED POWER PLANTS IN GMS COUNTRIES

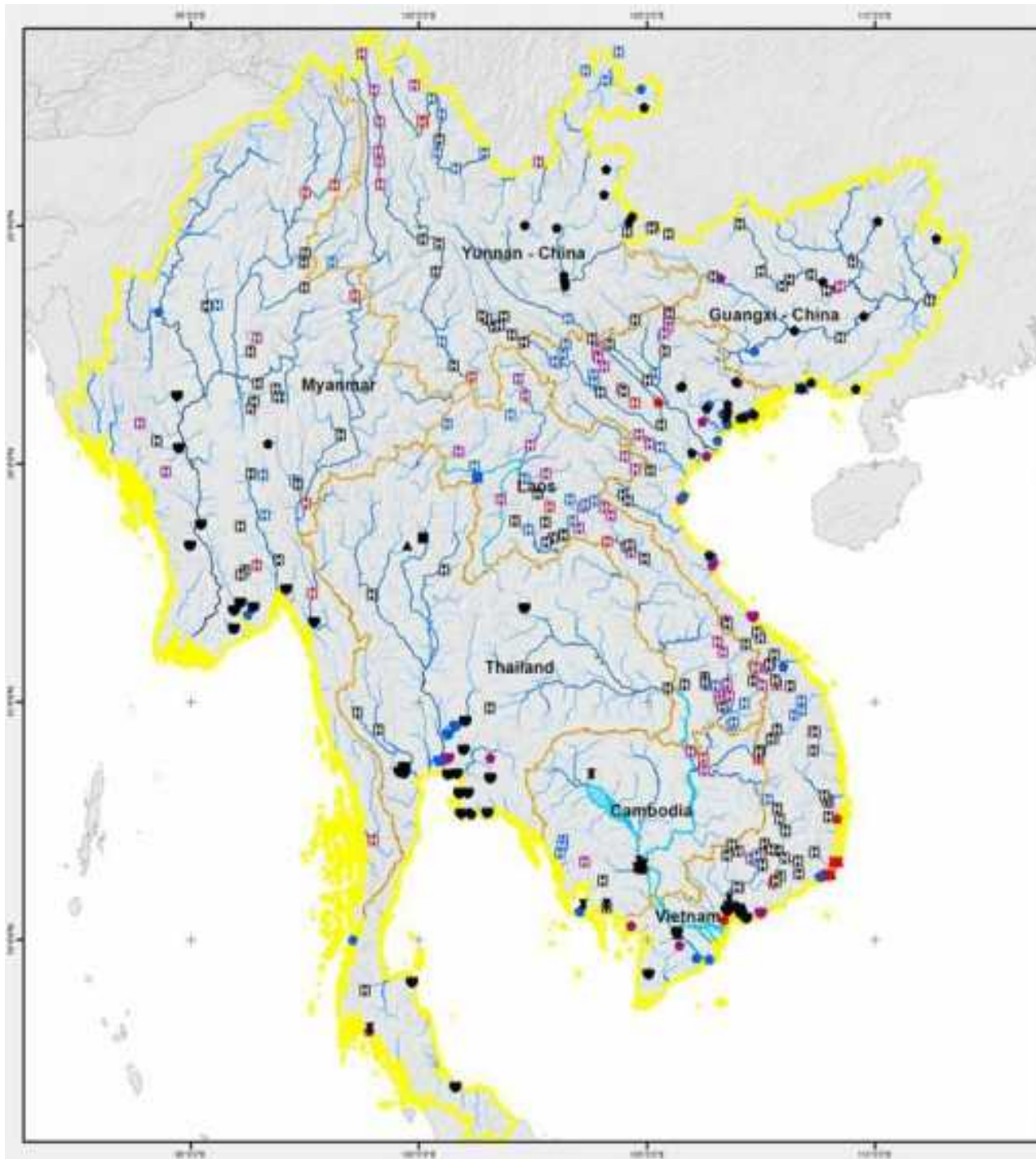
Legend

-  GMS boundary
-  GMS Country Boundary
-  Mekong mainstream

	Existing	2015	2020	2025
Hydro				
Coal				
Lignite				
Diesel				
Gas				
HFO				
Nuclear				



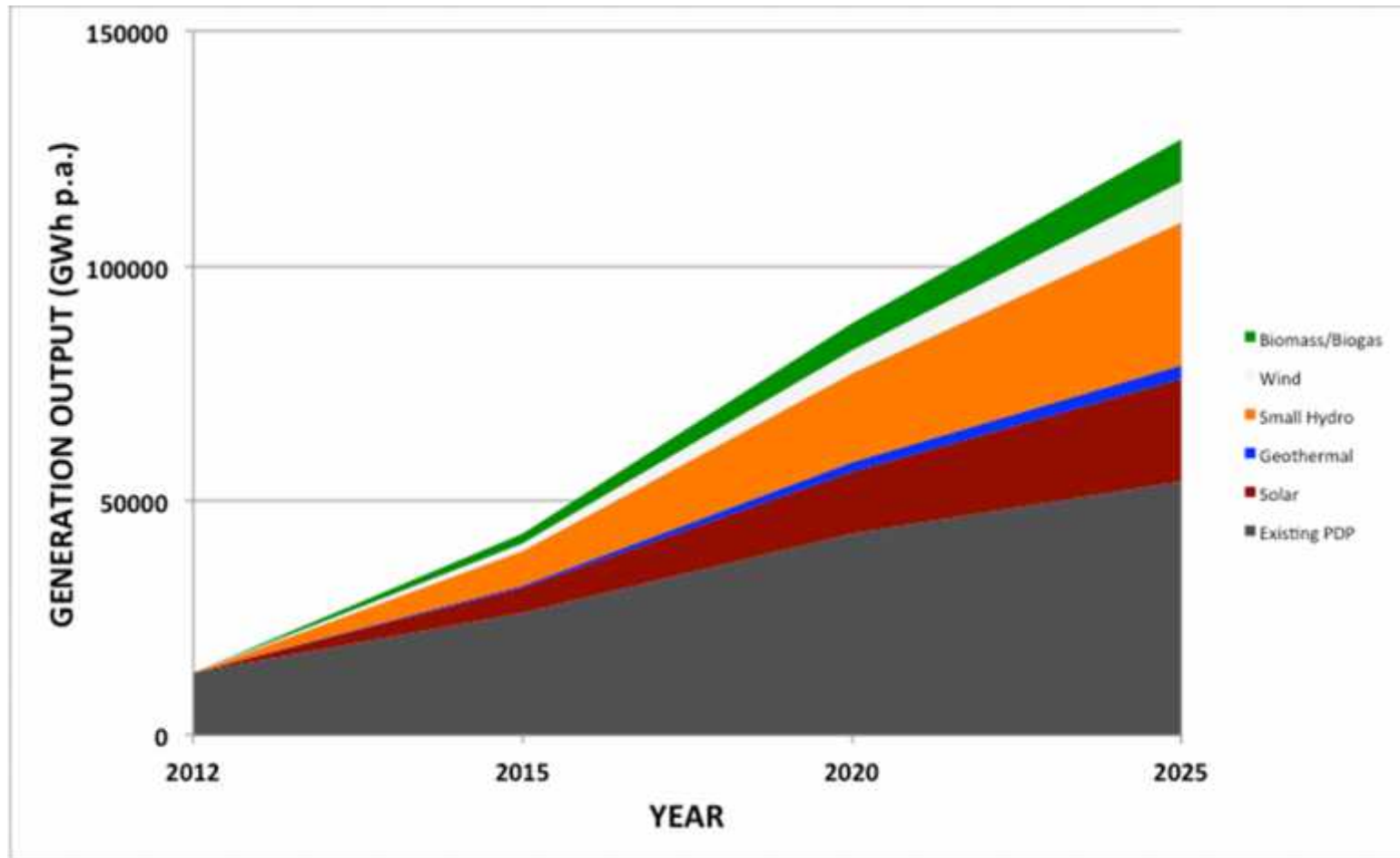
Data source:
 Protected Area - BDC 428 2012
 GMS BDC interactive atlas
 Myanmar Energy Sector Initial Assessment - ADB 2010
 Thailand, Lao PDR, Vietnam PDR
 Cambodia, W. Viet., China - China Southern Grid
 ICM 01 Database - SMS 064 428-7194



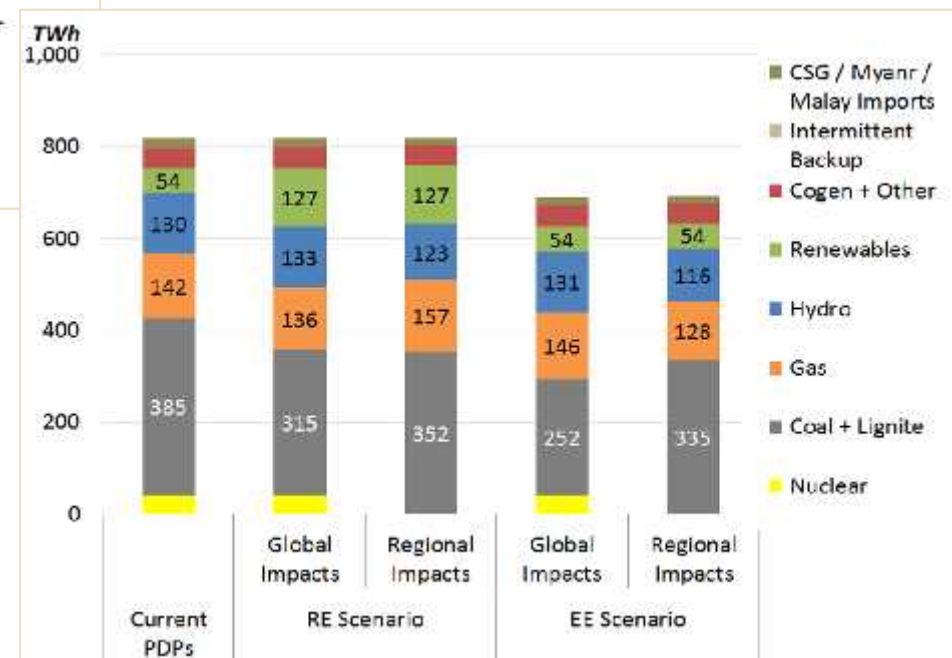
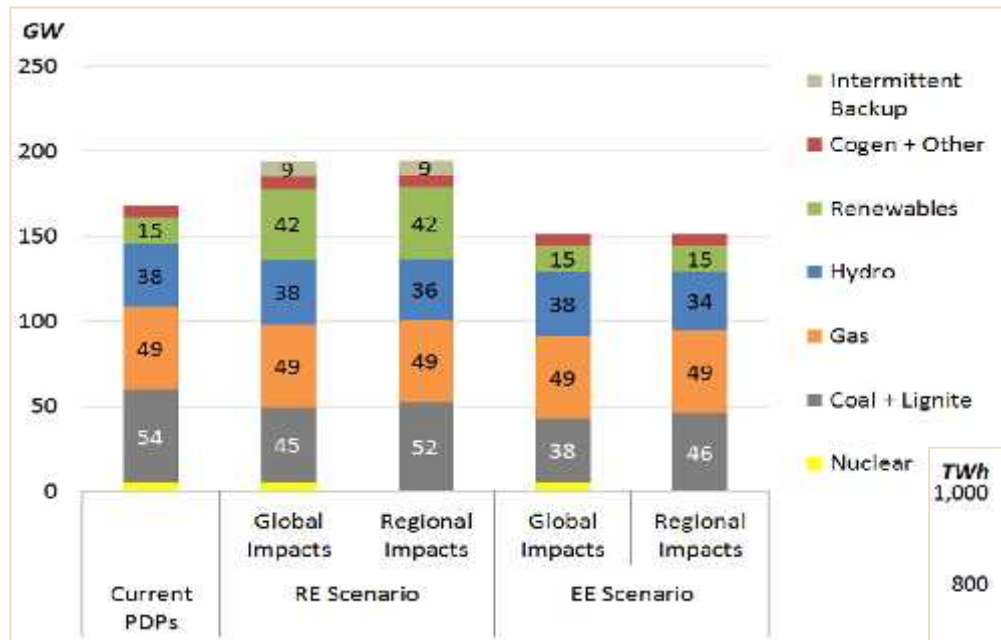
The basis for the comparison

- Analysed each scenario in terms of:
 - ▣ Number of different types of plant by different fuels in each country
 - ▣ Installed capacity of types of plant by different fuels in each country
 - ▣ Annual power production (GWh) by type of plant, fuel and in each country
 - ▣ Lengths and capacities of existing, planned and additional interconnectors between each country
- Plus locations of plants and interconnectors (as far as possible)
- The impacts of each scenario are compared to each other at 2025
- Three time slices are also considered – situation at base year (2012), 2015, 2020 and 2025
- For full GMS, comparison will be between current PDP and Baseyear 2012 in the three time slices
- For comparison between scenarios we use only Lower Mekong countries at 2025

Additional renewables in LMB under Renewable Energy scenario



Projected installed capacity and annual generation by scenario



The comparisons of impacts forms the basis for the Impact Assessment report

- Indicators developed out of national and regional **consultation processes** – highlighting key concerns and issues
- **Eight security aspects**, with sustainability statements and indicators:
 - Ecological security
 - Climate security
 - Food security
 - Social security
 - Health and safety
 - Governance and state security
 - Energy security
 - Economic security

Key Indicators developed

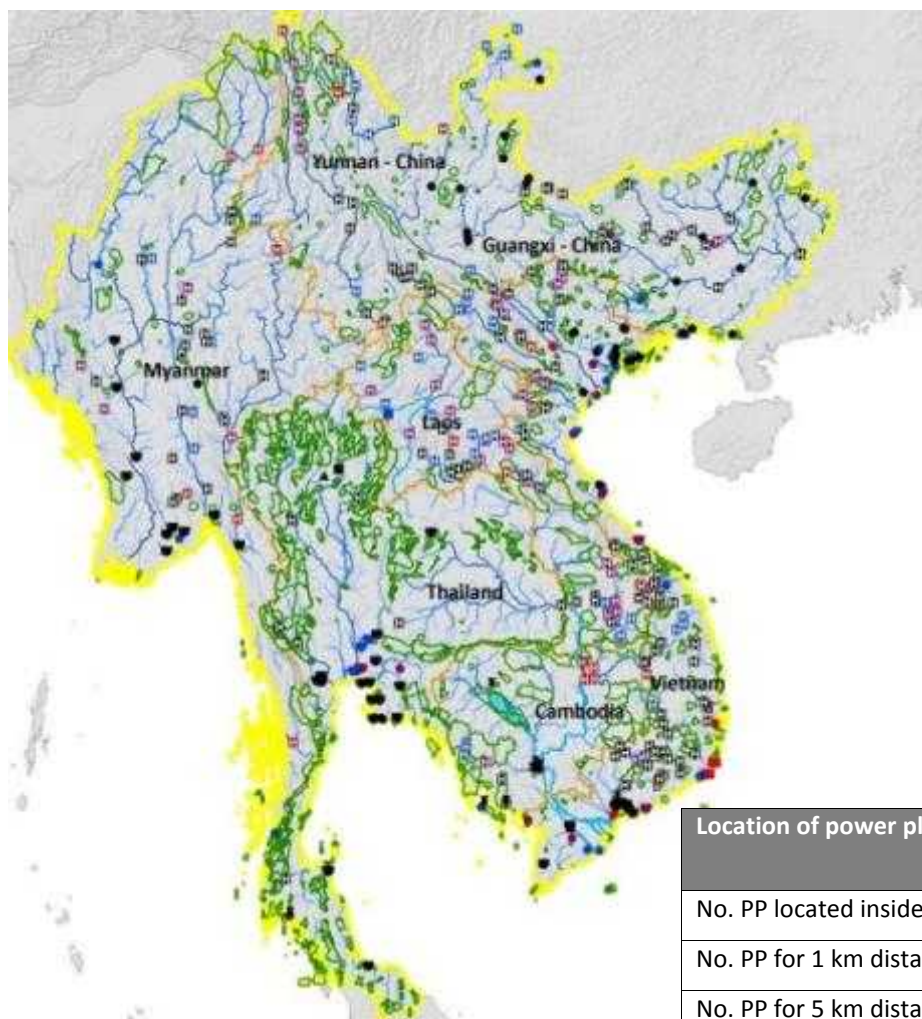


Presented in the Indicator description report

□ ECOLOGICAL SECURITY INDICATORS

- Air pollution from the power sector
- Solid waste production from power sector
- Risks of water pollution from power sector
- Radioactive waste
- Water withdrawal and consumption
- Land take
- Land use change
- Biodiversity
- Ecosystem Connectivity of rivers
- Degree of regulation of rivers (DOR)

Power plants 2025 and protected areas



PROTECTED AREAS WITH EXISTING AND PLANNED POWER PLANTS IN GMS COUNTRIES

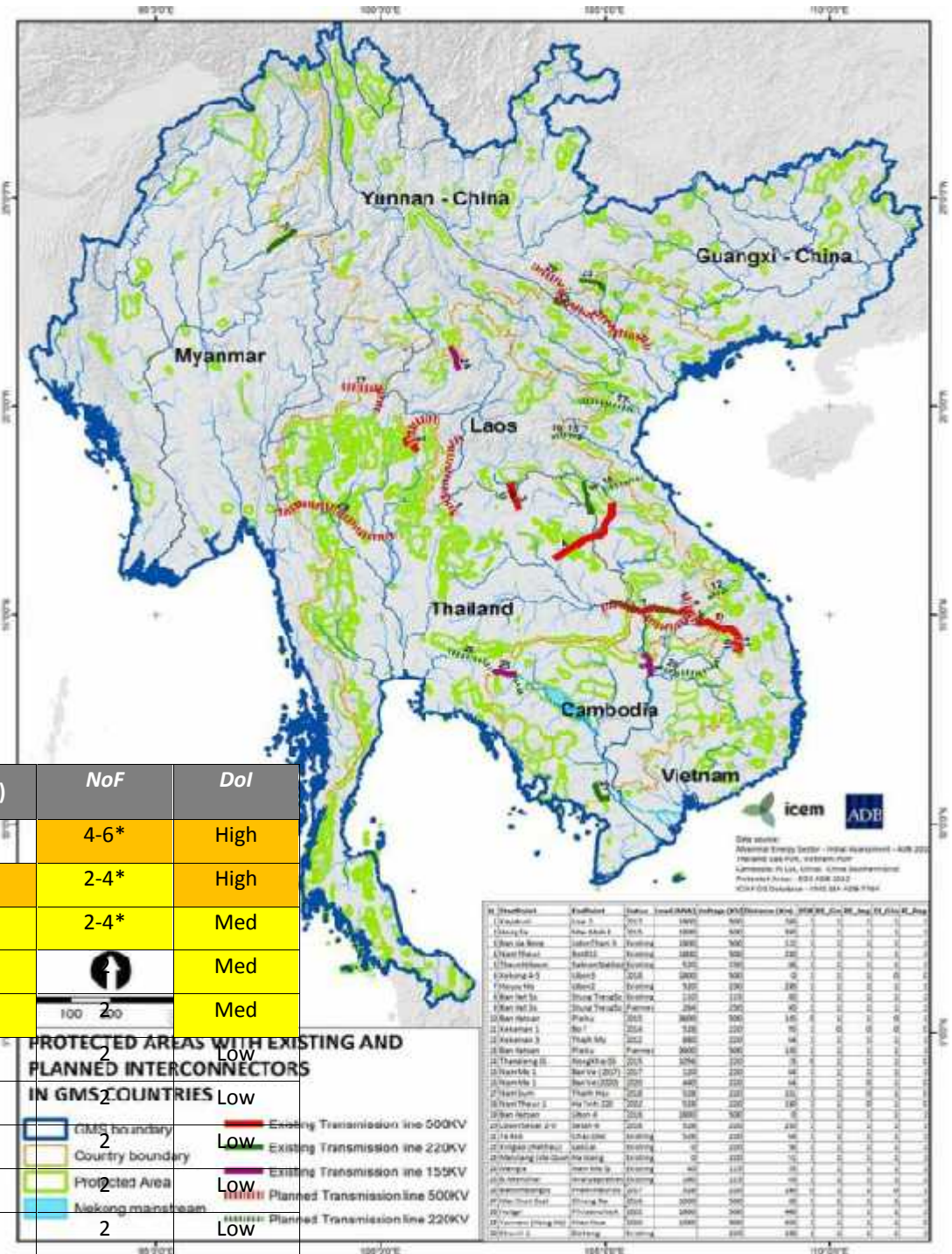
Legend

- GMS boundary
- Country boundary
- Protected Area
- Mekong mainstream

	Existing	2015	2020	2025
Hydro				
Coal				
Lignite				
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Nuclear				

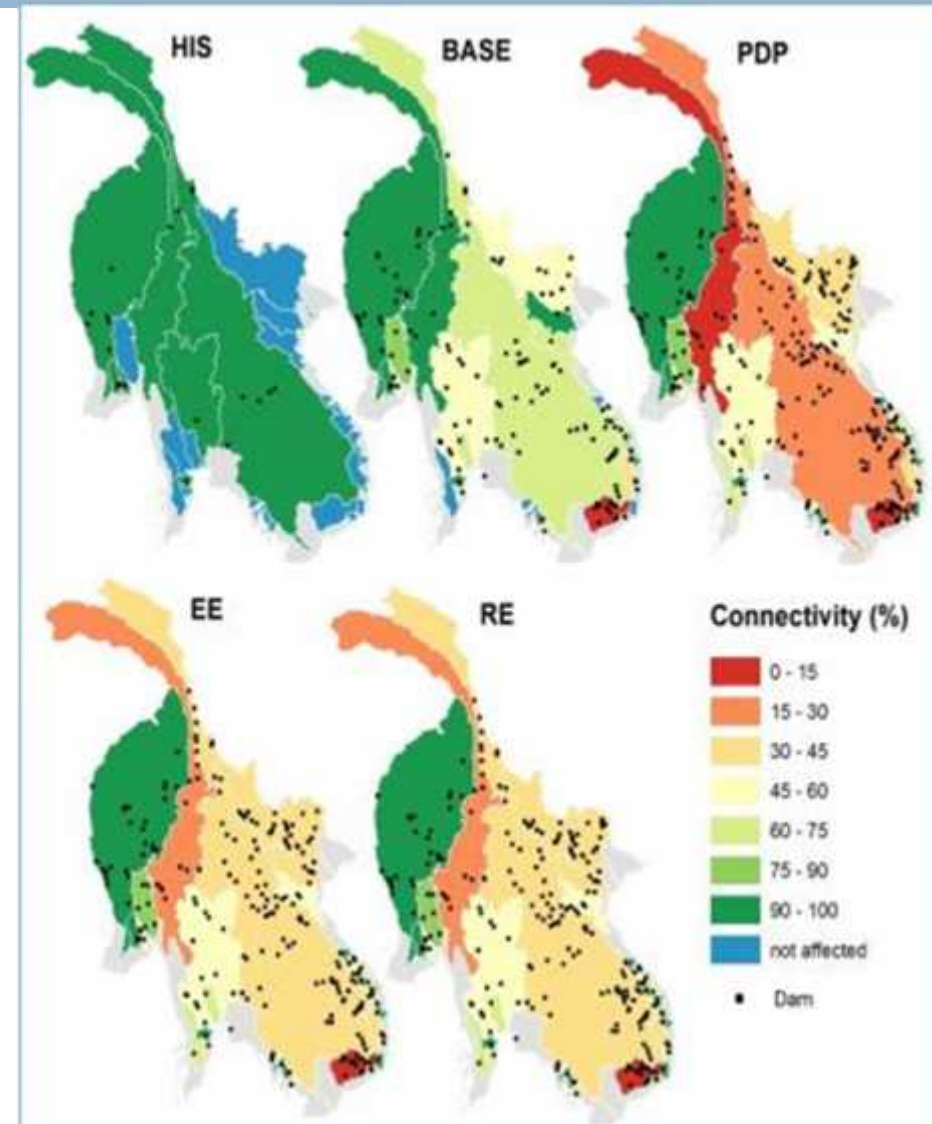
Location of power plants	PDP	RE-Global	RE-Regional	EE-Global	EE-Regional
No. PP located inside PAs*	61	61	56	61	54
No. PP for 1 km distance from PAs	8	8	7	8	7
No. PP for 5 km distance from PAs	74	74	74	74	74
No. PP > 5 km distance from PAs	112	112	118	112	139

Existing and proposed interconnection transmission routes in GMS and Protected Areas



Changes in % connectivity of rivers under different scenarios

Ecosystem connectivity of rivers is important for fish migration, fish species diversity, fish production



Key Indicators developed

CLIMATE SECURITY

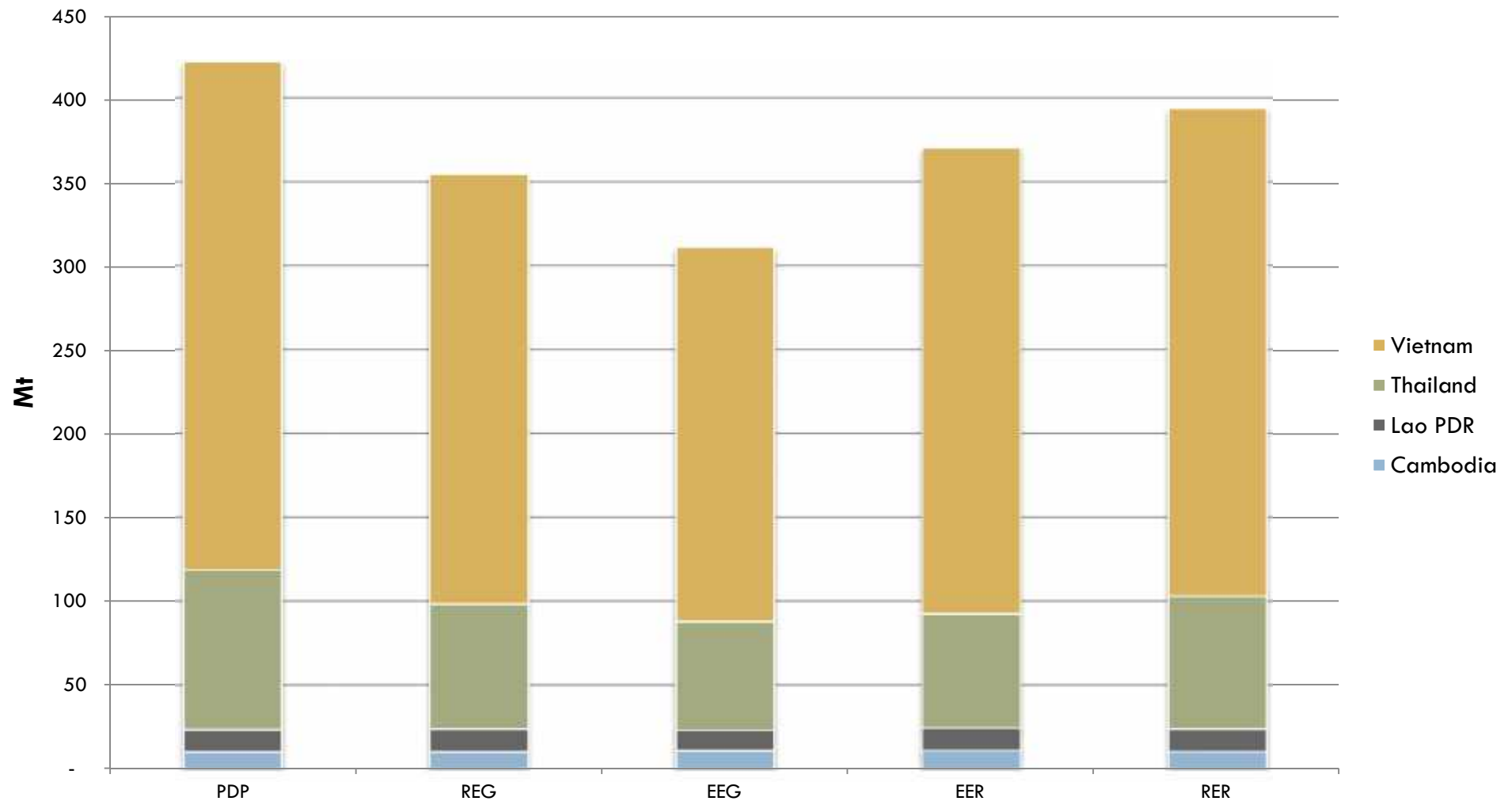
- ▣ GHG emissions from the power sector
- ▣ Climate change risks - historic storm risks

FOOD SECURITY

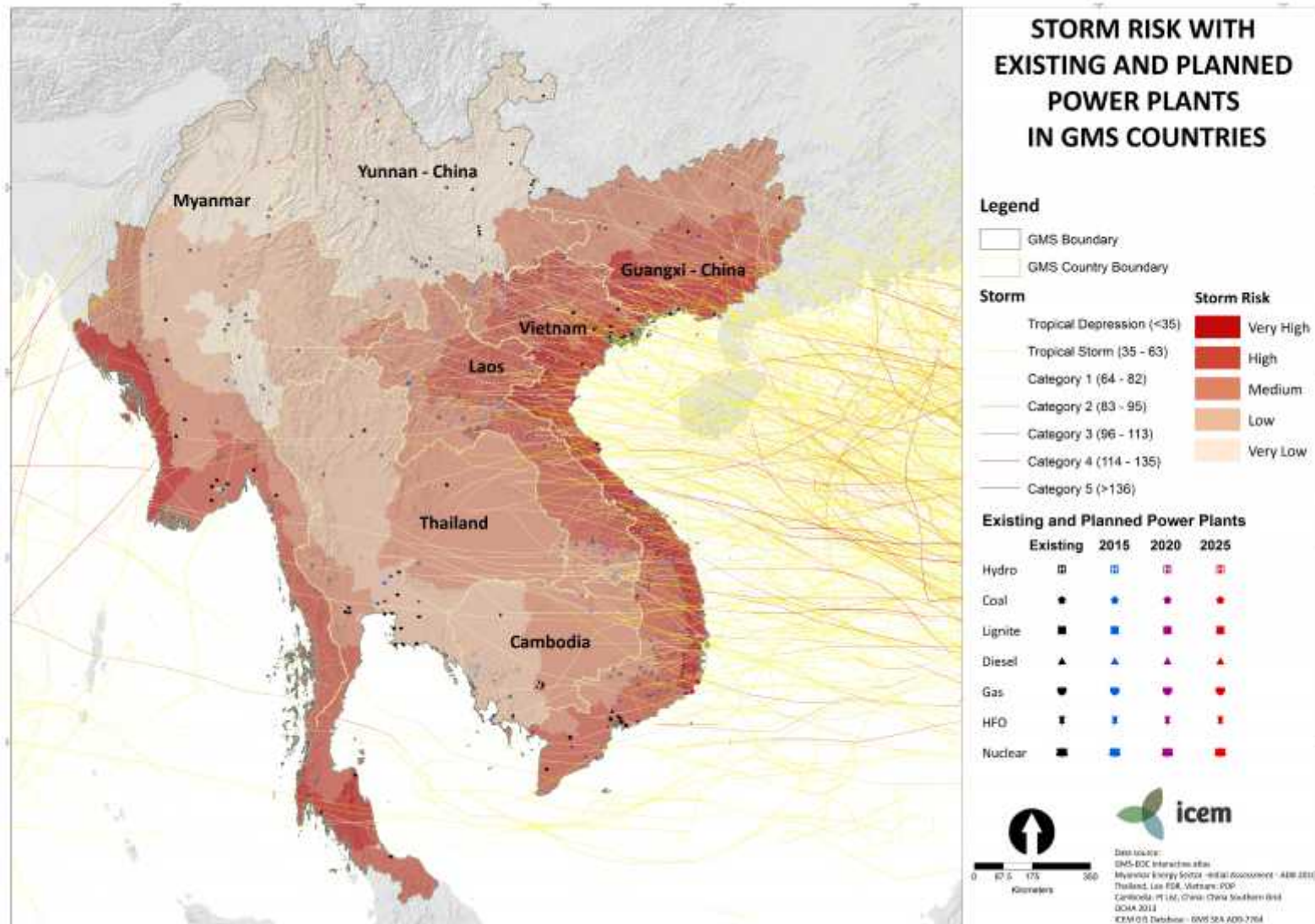
- ▣ Food Production – Agriculture
- ▣ Food production – Riverine capture fisheries
- ▣ Food production – Reservoir Fisheries
- ▣ Nutrition

CO₂e emissions from power sector by scenario

16



Storms and flooding estimating exposure



Key Indicators developed

SOCIAL SECURITY

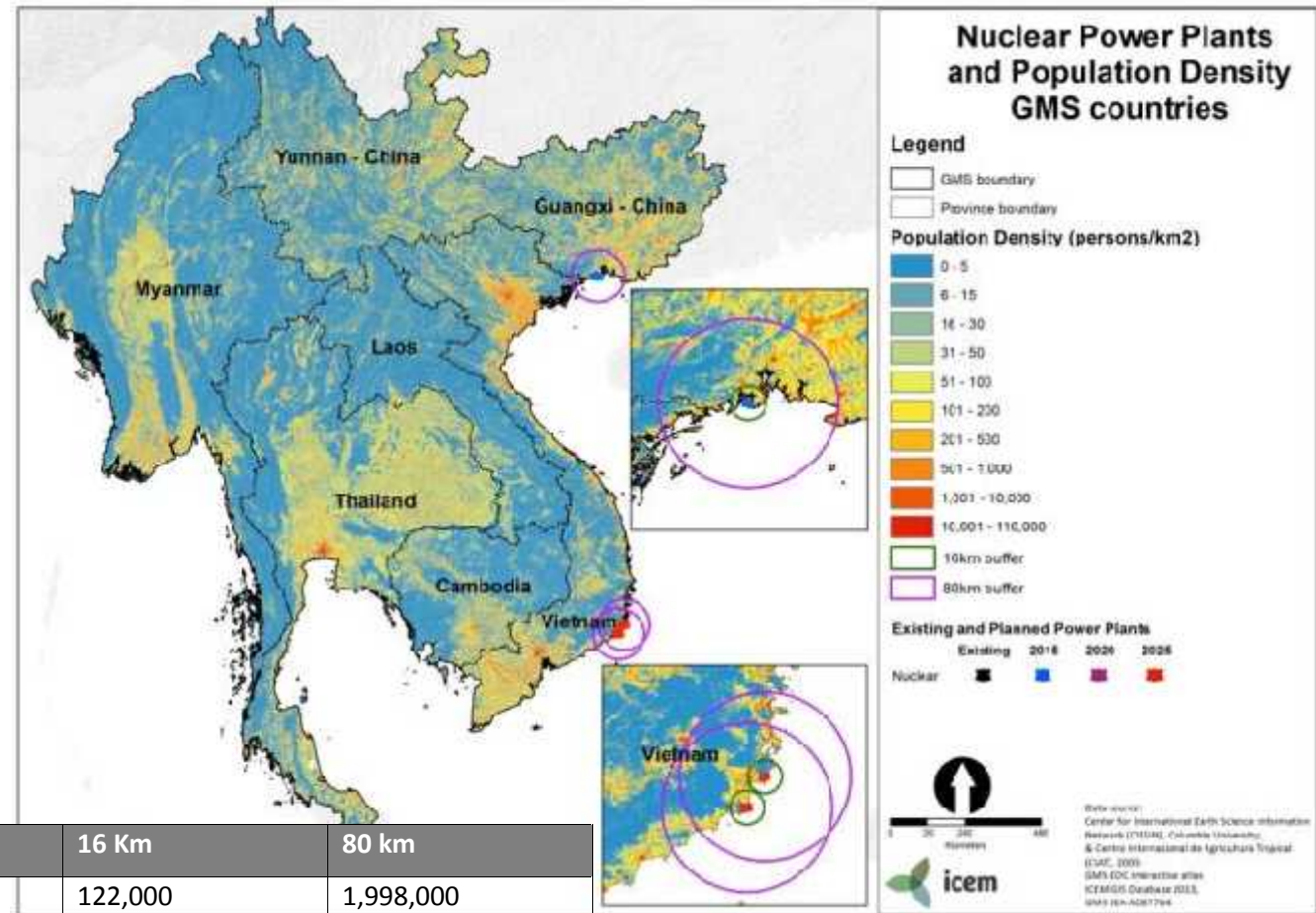
- ▣ Employment in the power sector
- ▣ Access to reliable and affordable electricity
- ▣ Livelihood changes
- ▣ Potential for resettlement
- ▣ Potential impacts on Cultural diversity

HEALTH AND SAFETY SECURITY INDICATORS

- ▣ Health risks from power plants
- ▣ Safety risks
- ▣ Seismic risk
- ▣ Nuclear safety

GOVERNANCE AND STATE SECURITY INDICATORS

Populations adjacent to proposed nuclear power plants



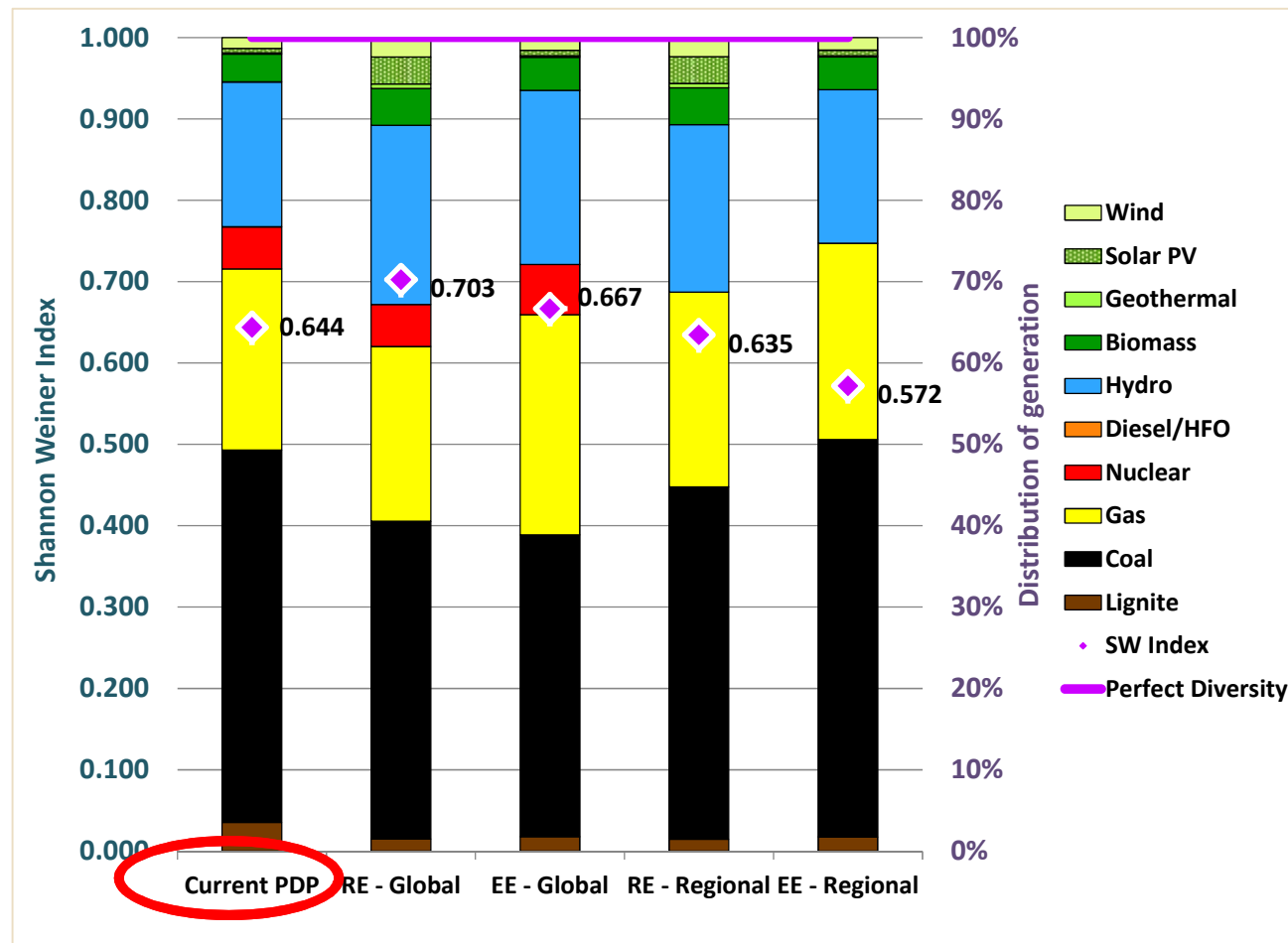
Plant	MWe	16 Km	80 km
Fangcheng-Gang	2,160	122,000	1,998,000
Nuclear 1	2,000	94,000	1,388,000
Nuclear 2	2,000	48,000	1,062,000
Total (cumulative)	7,160	264,000	4,448,000

Key Indicators developed

ENERGY SECURITY INDICATORS

- ▣ Ensuring the availability of energy at all times in various forms
 - Reserves to production ratio
 - Reserves to consumption ratio
 - Shannon-Wiener diversity index
- ▣ Ensuring least cost of electricity supply
 - cost of generation
 - changes in the cost of interconnectors
- ▣ Reducing exposure to price risk - Portfolio-based planning

Shannon Weiner diversity index - comparison of scenarios in LMB

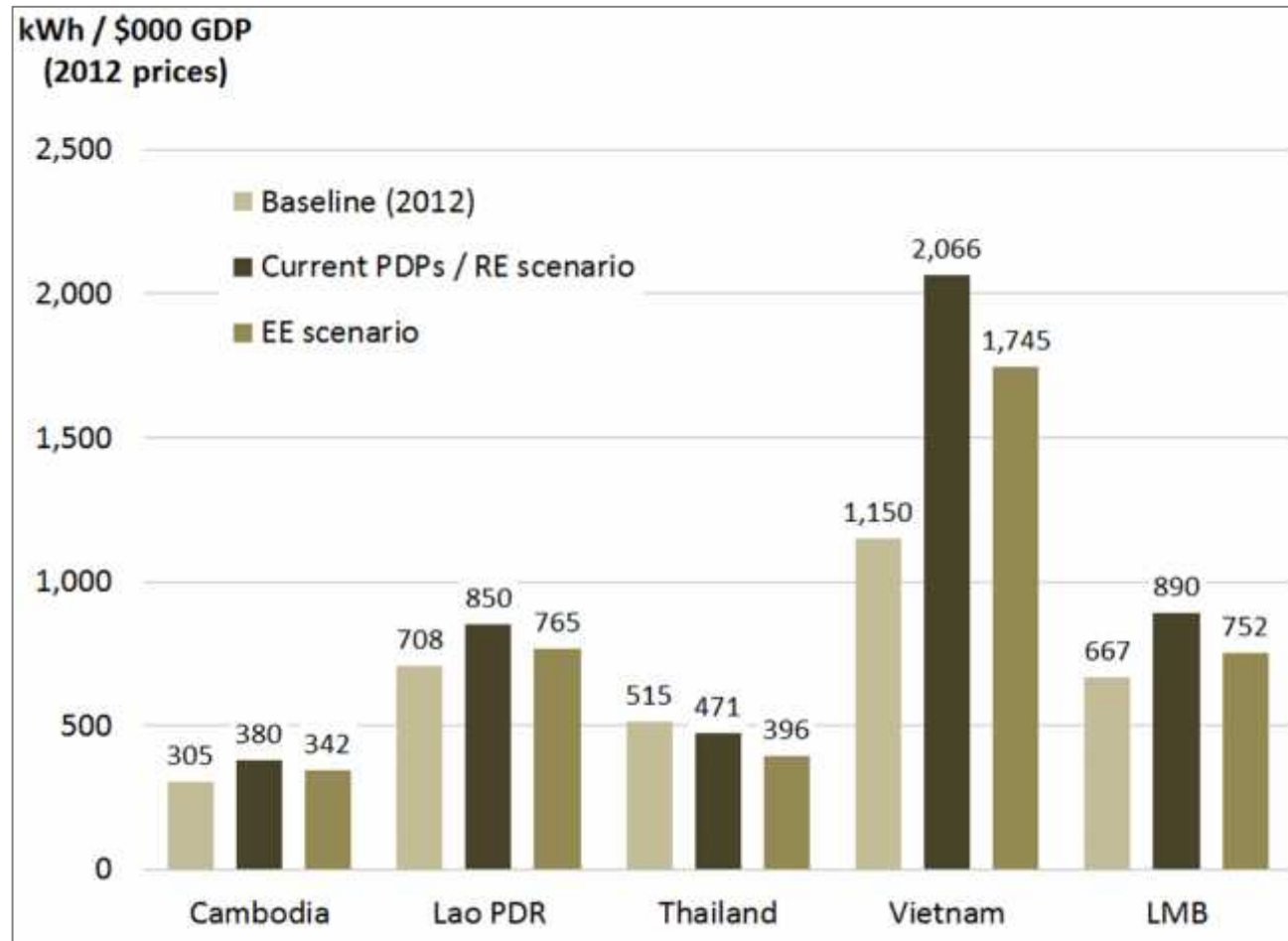


Key Indicators developed

ECONOMIC SECURITY INDICATORS

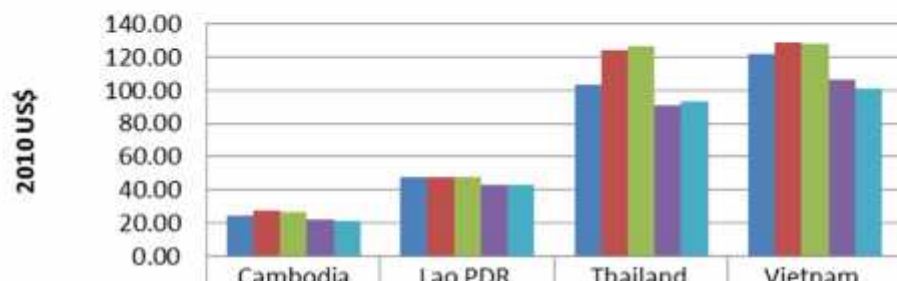
- Maintaining and enhancing contributions to the wealth and economic wellbeing of the *GMS* and its constituent nations
 - Net export revenues
 - Total expenditures of electricity
 - Number of jobs created
 - Investment required as a percentage of GDP
- Encouraging changes in the nature of production and consumption so that they can better satisfy human needs while using fewer raw materials and producing less waste
 - Electricity intensity
- Increasing availability and access to affordable electricity to communities in the *GMS* especially rural and urban poor
 - Proportion of household income spent on electricity

Electricity intensity



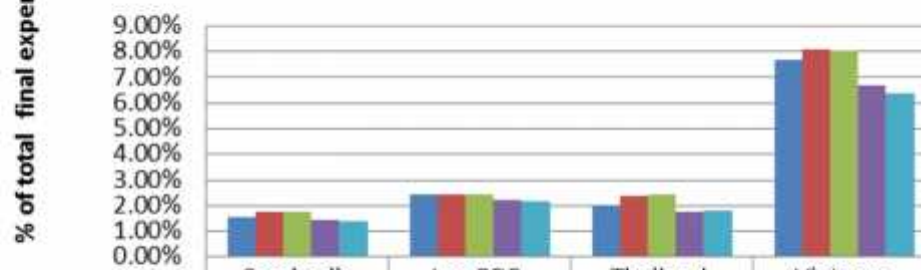
Per capita expenditures on electricity in LMB countries and as % of final household expenditure

Per capita expenditures on electricity



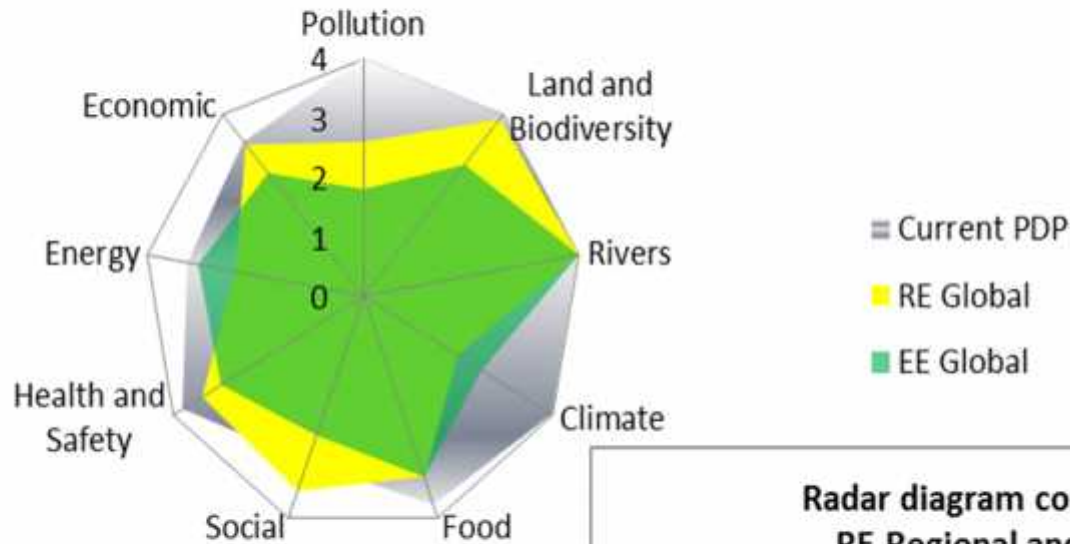
	Cambodia	Lao PDR	Thailand	Vietnam
Current PDPs	24.28	47.94	103.40	121.48
RE-Global	27.16	47.46	124.29	128.50
RE-Regional	27.07	47.44	126.09	127.71
EE-Global	22.06	43.22	90.88	106.02
EE-Regional	21.53	42.98	93.30	101.15

Per capita Electricity expenditures as a percentage of final expenditures



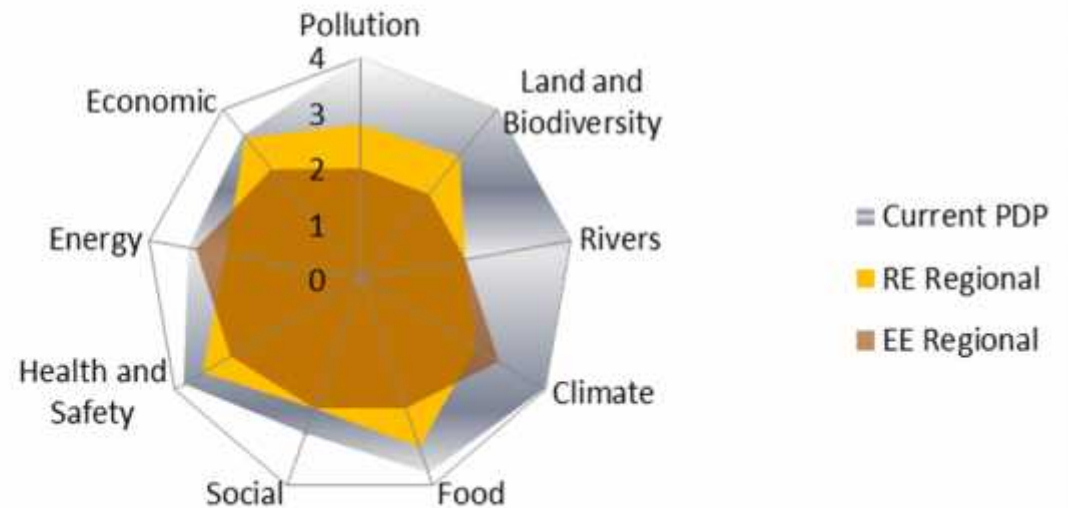
	Cambodia	Lao PDR	Thailand	Vietnam
Current PDPs	1.56%	2.44%	1.99%	7.65%
RE-Global	1.75%	2.42%	2.39%	8.09%
RE-Regional	1.74%	2.41%	2.43%	8.04%
EE-Global	1.42%	2.20%	1.75%	6.68%
EE-Regional	1.39%	2.19%	1.80%	6.37%

Radar diagram comparing Security aspect scores of RE-Global and EE-Global with Current PDP



Qualitative comparisons – Radar diagram method

Radar diagram comparing Security aspect scores of RE-Regional and EE-Regional with Current PDP

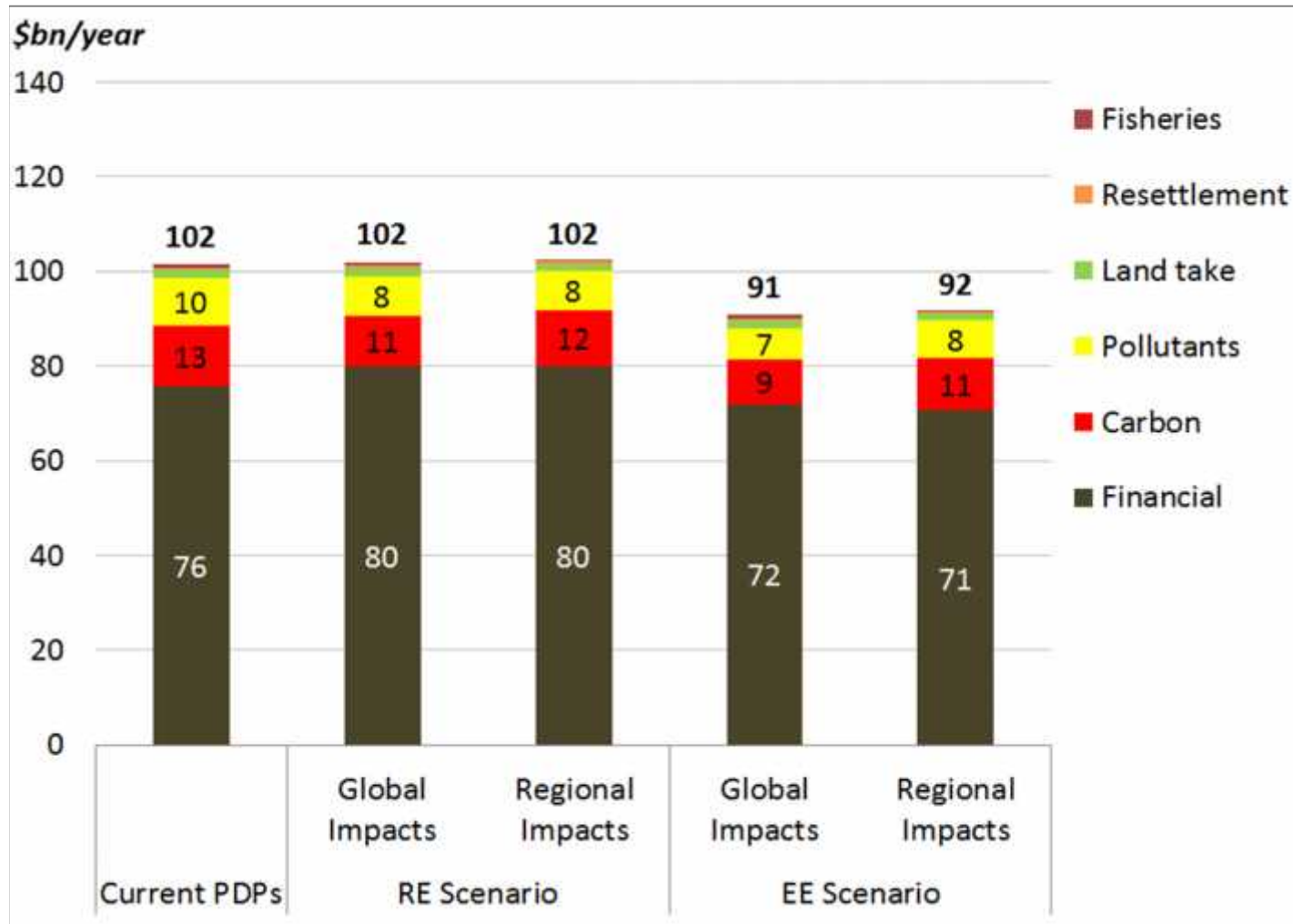


Comparing Current PDP with Renewable Energy and Energy Efficiency scenarios – Global and Regional displacement options

Monetisation / Qualitative comparisons

- Monetisation is used to place a value on the social and environmental impacts of power development, that are not included in financial prices
- Not all indicators are possible to monetise, but may be very important
- Indicators only “capture” part of the importance of the different security aspects
- The SEA tries to show the relative importance of the different indicators for making policy decisions

Total cost of electricity supply in 2025 by scenario



Carbon costs - Base value of 30 US\$/tCO₂

Conclusion 1

- Power sector planning does not take account of wider environmental and social impacts and full costs and benefits of **alternative plans** are not captured in analysis
- **Demand forecasts** within each country may be overestimated and are often not compatible with other countries within the region
- Power sector planning is undertaken on a national, not a regional basis. Consequently, **inconsistencies** emerge and **cross-border impacts** are not fully considered
- The contributions of *GMS* power development to **global environmental issues**, such as green house gas emissions and climate change should not be followed at the expense of **regional and local impacts**.

Conclusion 2

- The effectiveness of **public consultation on power development plans** is mixed, and generally appears to ignore wider environmental and social concerns
- The **rate of development of the power sector** is expected to be very rapid and to **outstrip the capacity** of agencies tasked with environmental regulation, monitoring and enforcement,
- **Pressure from environmental and social impacts** may be expected to increase, especially on **biodiversity**

Recommendations

- Integrate **environmental and social concerns and costs** into the national power planning processes, both national and regional – **SEA is a powerful tool**
- Develop a **common approach to power sector planning** across GMS members and encourage coordination in planning
- Establish minimum protocols for **public consultation** on regional power development plans – **SEA provides a mechanism for this**
- **Strengthen the capacity** of agencies responsible for regulation and enforcement of environmental and social impact management measures to keep pace with power sector development
- Strengthen the **technical knowledge base** for environmental and social impacts management in the power sector

Thank You



Xiaowan dam on Lancang river