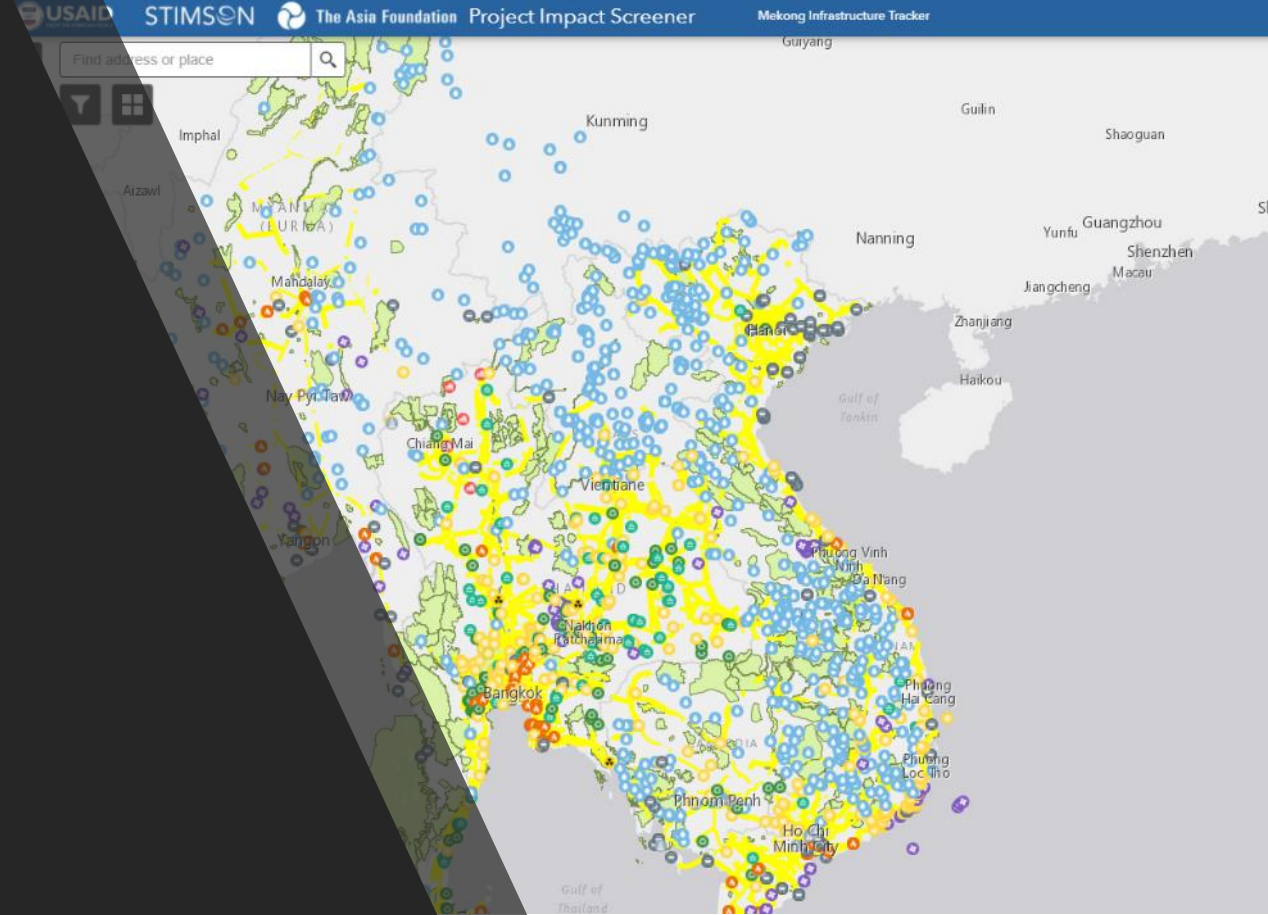


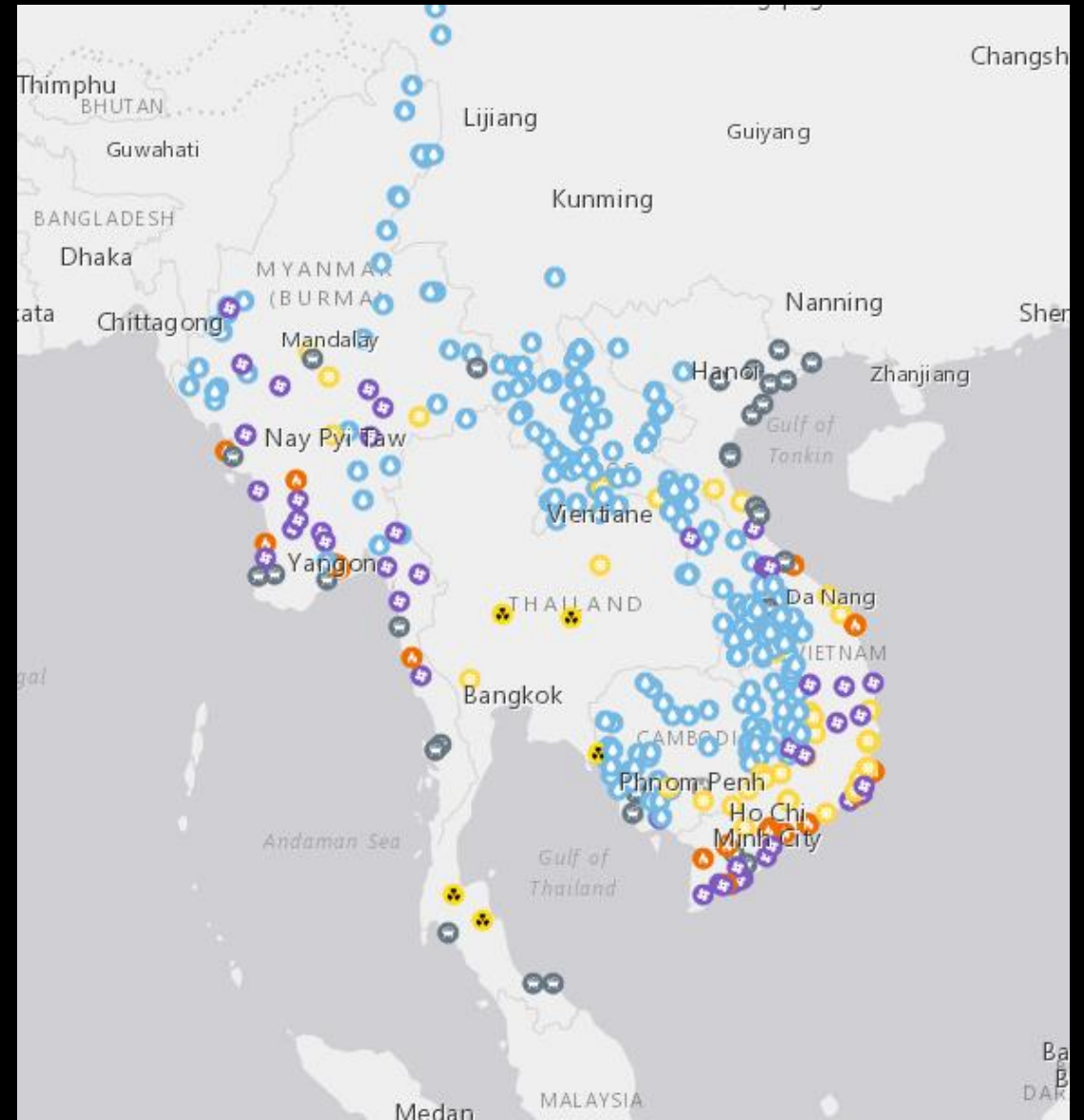
# Spatial Multi-Criteria Analysis in the Mekong Basin

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ACEF Side Event  
June 16, 2021



# Planned Project Map Represents Multiple Futures

- All countries in the Mekong Basin face rising electricity demand
- Project-by-project approach can be problematic
- Tradeoffs are inevitable
- Many scenarios can meet energy sector needs and there are opportunities to strategically choose and optimize outcomes



Map of all proposed power generation projects in the Mekong River Basin. Taken June 2021 from the Stimson Mekong Infrastructure Tracker, supported by USAID and The Asia Foundation at <https://www.stimson.org/2020/mekong-infrastructure-tracker-tool/>.

# Case Study: Energy Developments in the 3S Basin

- 3S Basin is located near demand centers in Vietnam and Cambodia
- Most projects currently planned are hydropower projects, along with two coal projects, and a series of solar projects in Vietnam
- The Sekong is last major free-flowing tributary to the lower Mekong and is critically important for fisheries
- Development to date has been slow due to lack of supporting infrastructure, but is anticipated to increase through the 2020s
- There are four general scenarios for how energy development might play out, based on current power sector trends, existing project proposals, and potential policy decisions in each of the CLV countries

## Planned Dams in the 3S Basin

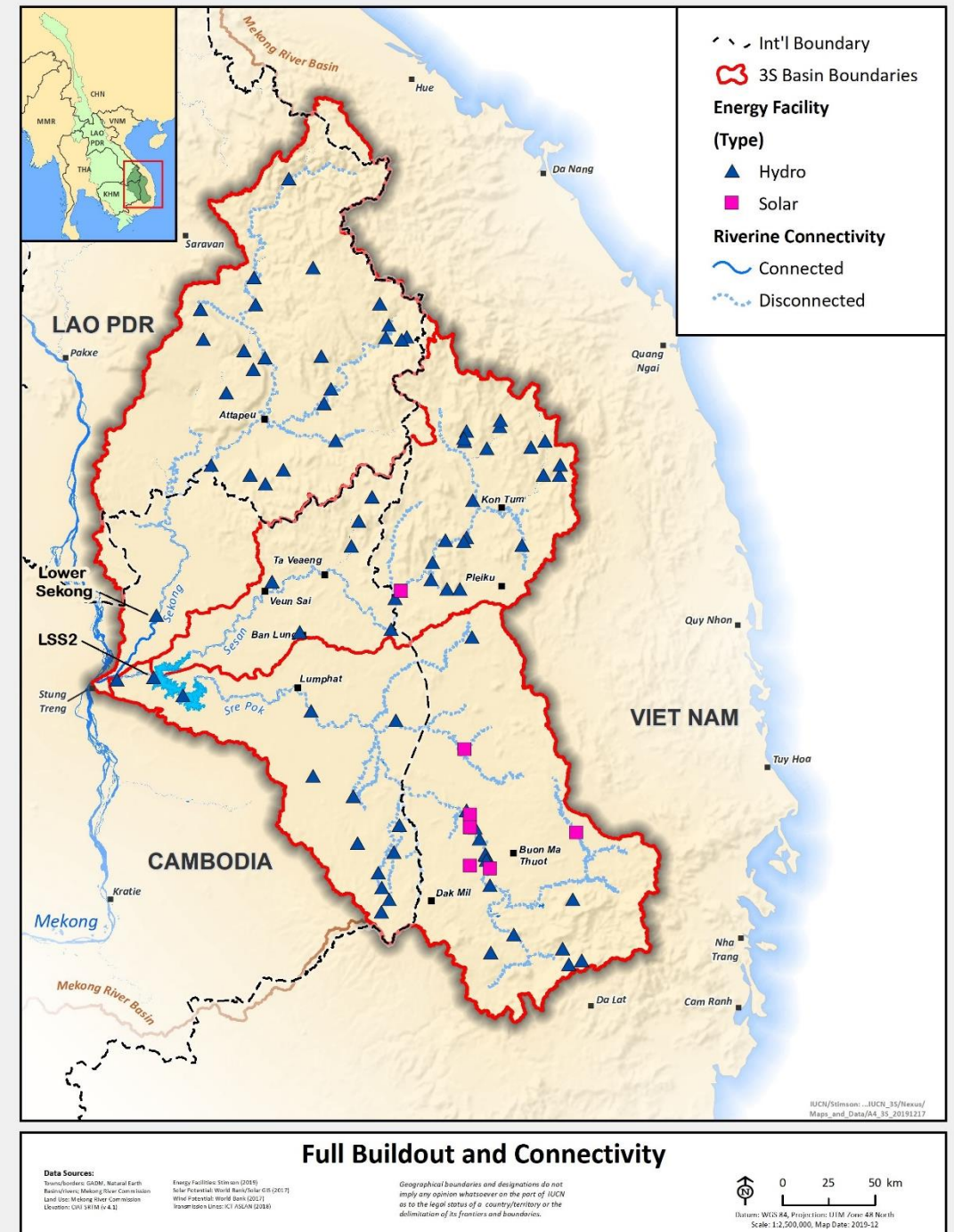
Status	By Country			By Sub-basin		
	Laos	Cambodia	Vietnam	Sekong	Sesan	Srepok
Operational	12	3	37	13	23	16
Under Construction	6	0	0	6	0	0
Inventory/Proposed Pipeline	58	21	1	59	8	13
<b>Total</b>	<b>76</b>	<b>24</b>	<b>38</b>	<b>78</b>	<b>31</b>	<b>29</b>
Dams <15 MW	41	13	18	41	16	15

*This table shows all the planned dams in the 3S basin, by country and by sub-basin.*

Source: Stimson Mekong Infrastructure Tracker, supported by USAID and The Asia Foundation, January 20, 2021 • Created with Datawrapper

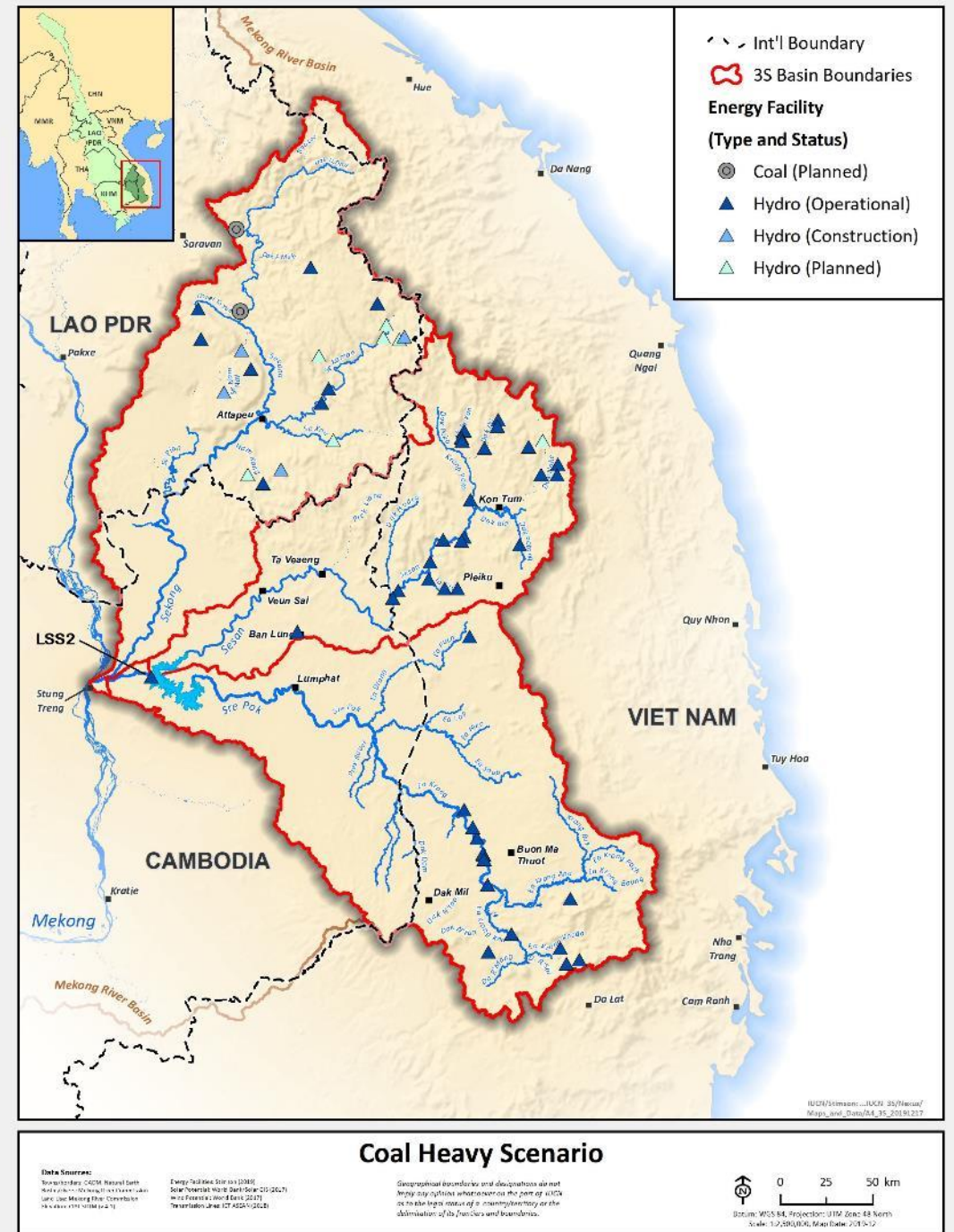
# Scenario 1: Full build-out

- Assumes that countries continue to prioritize existing projects over new technologies or new proposals
- National planning processes remain independent and uncoordinated



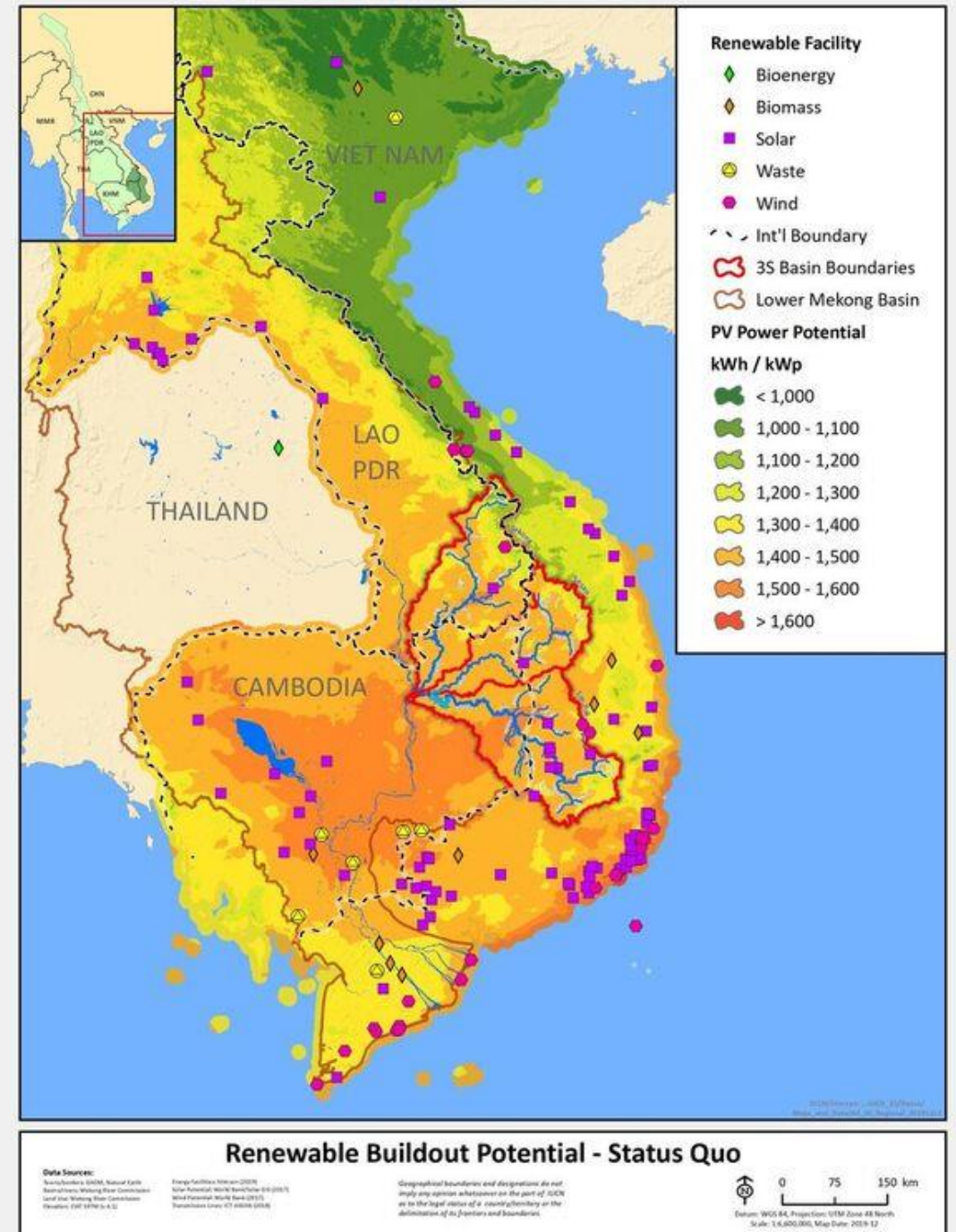
# Scenario 2: Coal-heavy buildout

- Concerns over unreliability of hydropower due to drought push Cambodia to avoid expansion of domestic hydropower and diversify
- Cambodia imports 2,400 MW of coal from Laos plus Don Sahong Dam
- Vietnam will purchase power from Laos, but negotiates to avoid mainstream Sekong dams



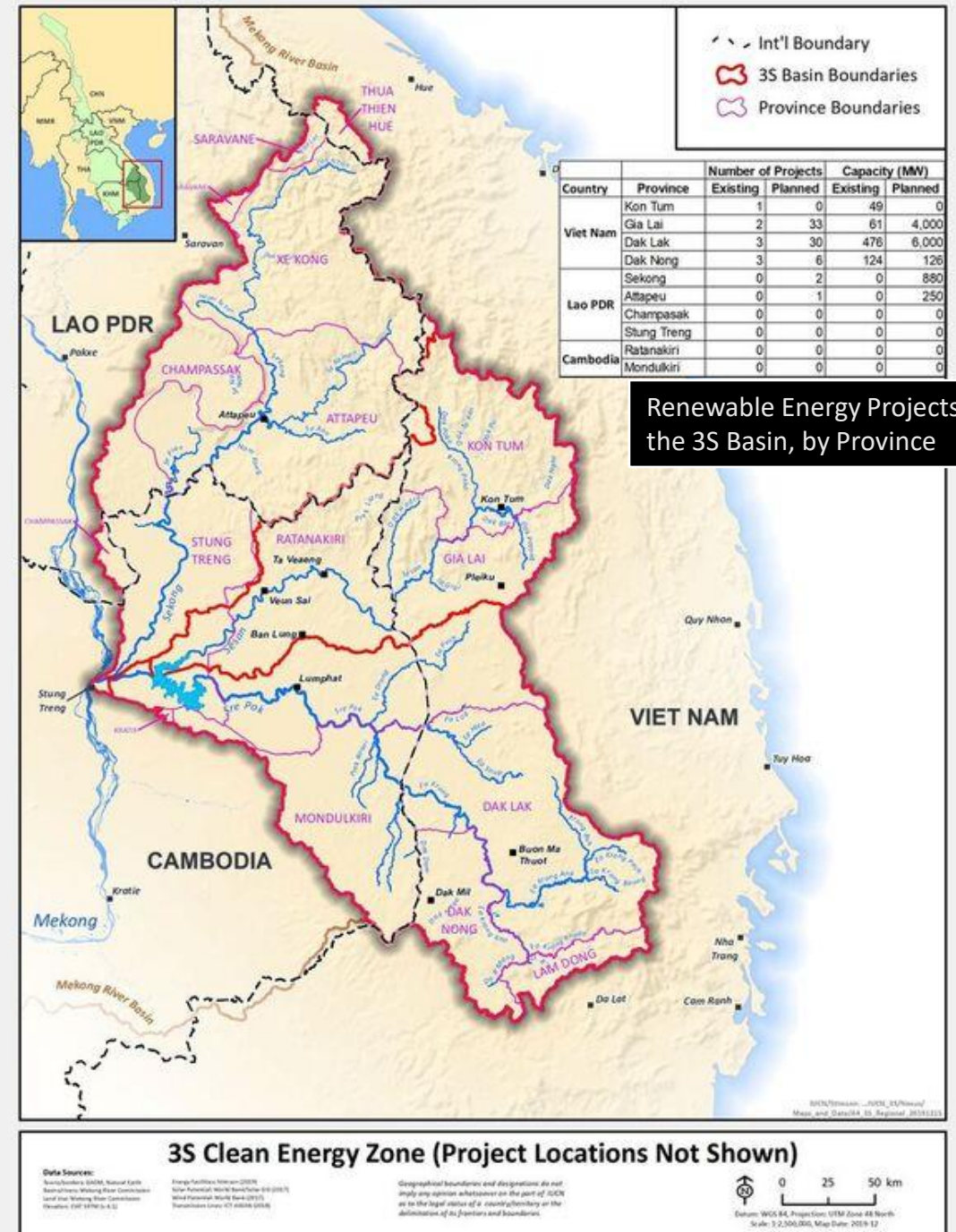
# Scenario 3: Renewable energy buildout

- Renewable energy transition drives investments towards solar/wind, but projects move forward on case-by-case economic basis
- Renewables replace most of the Cambodian dams in the 3S Basin and reduce Vietnam's interest in importing hydropower from Laos
- But there is no regional coordination



# Scenario 4: 3S Clean Energy Zone

- Renewable energy transition drives investments towards solar/wind
- All three countries decide to coordinate on energy development and electricity trade
- Some hydropower moves ahead, but it is strategically sited
- Status-quo river connectivity between the Sekong River and Tonle Sap/Mekong Delta is largely maintained



Scenario	# New Projects	New Installed Power Generation	Connectivity Losses	Impacts
Full Buildout (Everything Proposed)	45 hydropower dams; 3 coal plants; 9 solar projects*; 2 wind projects*	6,230 MW hydropower; 3,100 MW coal; at least 3,856 MW of solar,* and at least 436 MW wind*	43% reduction of connectivity (more than 1,870 km)	<ul style="list-style-type: none"> <li>Severe reduction of migratory routes for fish</li> <li>Severe reduction of sediment flow to the Mekong</li> </ul>
Coal-Heavy	13+ hydropower dams; 2 coal plants; 1+ solar projects*	1,150+ MW hydropower, 2,400 MW of coal, 44+ MW of solar*, ? MW wind*	Up to 26% loss in connectivity, depending on which dams move ahead	<ul style="list-style-type: none"> <li>Mainstream of the Sekong River is left connected, but many tributaries to the Sekong are blocked</li> <li>Blocks fish migration to tributaries</li> <li>Some sediment flow impact</li> </ul>
Renewable	Up to 19 dams, many new solar projects around Cambodia, Laos, and Vietnam	Less than 3,400 MW of hydropower in Laos; 400 MW of hydropower in Cambodia; tens of thousands of MW of solar and wind around Laos, Cambodia, & Vietnam	Up to 41% reduction in connectivity (1,760 km)	<ul style="list-style-type: none"> <li>Severe reduction of migratory routes for fish</li> <li>Severe reduction in sediment flow to the Mekong</li> </ul>
3S Clean Energy Zone	? dams, 1+ wind project*, 72+ solar projects*	Up to 1,536 MW of dams in Cambodia, up to 1,500 MW of dams in Laos, 600+ MW of wind*, 11,256+ MW of solar*	Maintains status quo—all new dams built upstream of existing projects	<ul style="list-style-type: none"> <li>No further impact on fish migration routes between Tonle Sap &amp; 3S</li> <li>Likely impacts above Lower Sesan 2 and existing dams in Sekong tributaries</li> <li>Some impact on sediment flow</li> </ul>

\*Projections for solar and wind are based only on already identified projects within the 3S Basin. This is likely to significantly increase in the future given solar and wind potential.

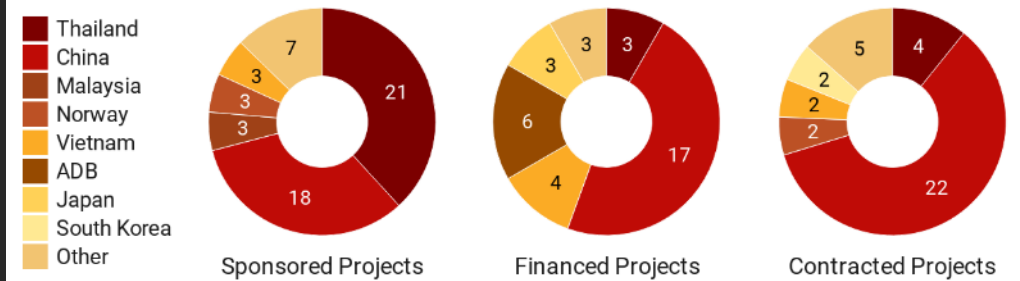


# Thailand Power Development Scenarios

- Thailand's PDP 2018 anticipates adding 56,000 MW of installed capacity through 2037 to meet national demand projections and replace aging plants
- Imports are a major part of this, and Thailand has an MOU to import up to 9,000 MW from Laos
  - Thailand is the major off-taker for Lao-produced hydroelectricity
  - PPAs already signed for approximately 5,500 MW
- Domestically available solar, wind, and biomass are increasingly attractive investments
- Thailand's power purchase agreements will have major influence on the financial viability of key projects in Laos, including controversial dams on the mainstream of the Mekong River

## Country Involvement in Operational Power Plants in Lao PDR

This chart shows the top five foreign investors in operational power plants in Laos by number of involved projects and across different types of project involvement.

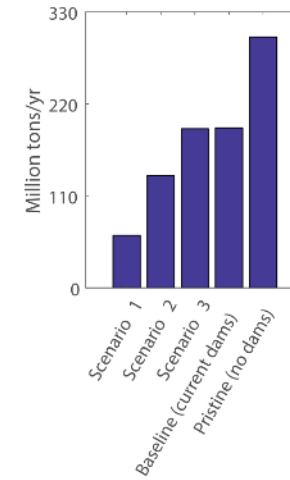


Source: Stimson Mekong Infrastructure Tracker, supported by USAID and The Asia Foundation; December 30, 2020 • Created with Datawrapper

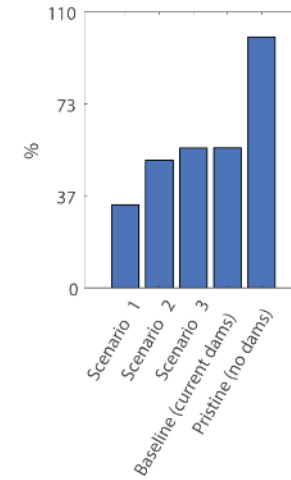
# Scenarios & Analysis

- Phase 1 study in 2019 considered three separate scenarios with different amounts of imported power from Thailand's neighbors
  - High Import
  - PDP 2018 Scenario
  - Renewable Energy Scenario

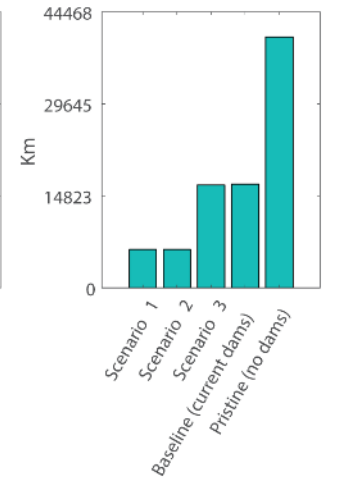
Total sediment flux to the Ocean



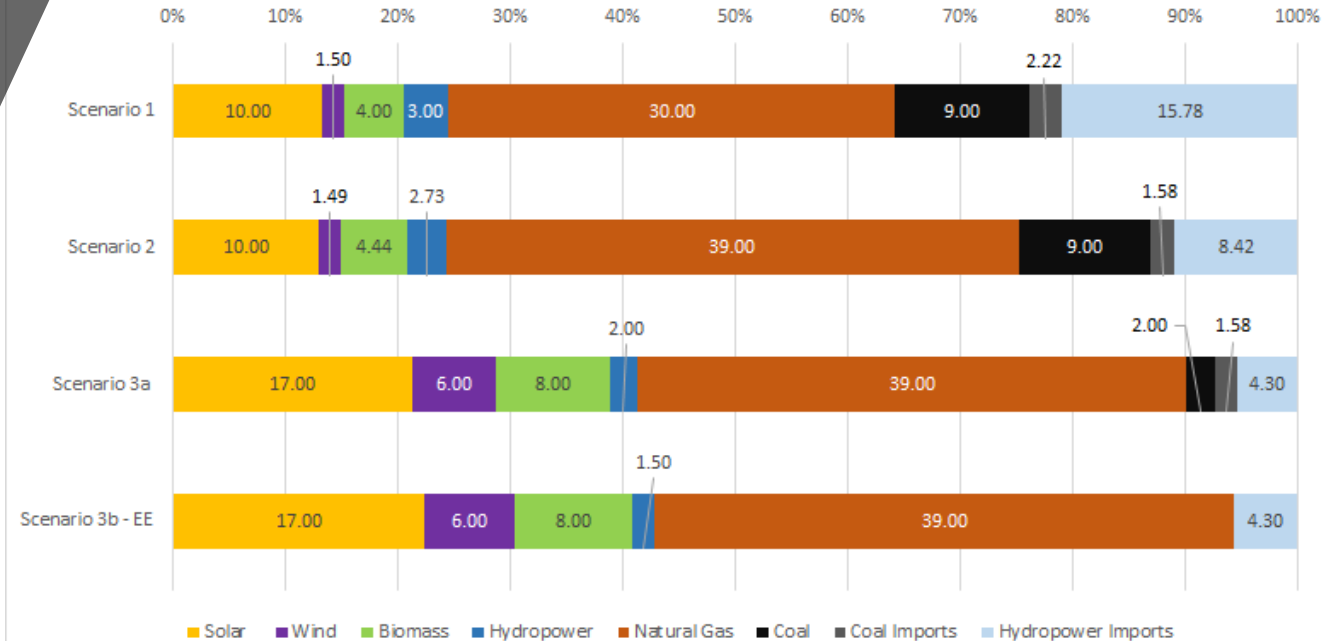
Connectivity



River kilometers connected to ocean

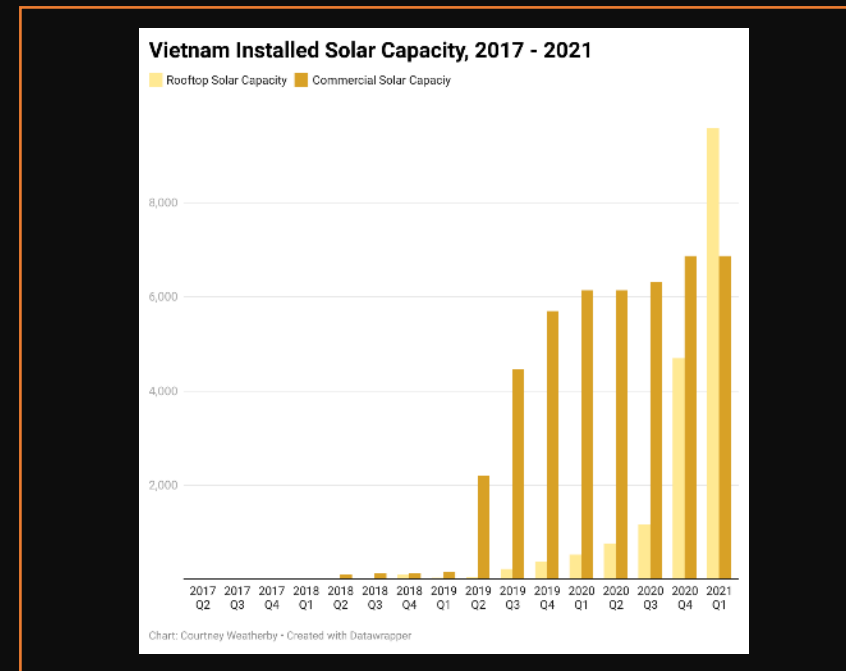


Comparison of Energy Mixes in 2037 (in MW)



# Scenarios & Analysis

- Feedback led to a Phase 2 study which is ongoing, involves greater discussion of new trends and baseline assumptions with Thai stakeholders, and which is exploring four updated scenarios
- Shocks and trends which need further analysis:
  - High amount of excess electricity
  - COVID-19 Impacts on energy market
  - Carbon neutrality targets
  - Boom in rooftop solar
  - Battery storage and EVs



A scenic view of a town with a river and mountains under a cloudy sky with a rainbow. The foreground shows a wooden balcony railing. The middle ground features a street with buildings, including a large multi-story building and a smaller building with a green roof. The background shows a wide river and distant mountains.

# Thank You!

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