Modeling Carbon Neutral Pathways in Thailand and Bangkok

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U.S. DEPARTMENT OF ENERGY BATTELLE

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Strong US-Thai Collaboration: Partnering with Policy Makers and University Experts

U.S. Department of State

US-ASEAN Smart Cities Partnership

Modeling & Analysis

Pacific Northwest NATIONAL LABORATORY

Thammasat University

Stakeholder engagement

Bangkok Metropolitan Authority

Energy Policy and Planning Office
MINISTRY OF ENERGY

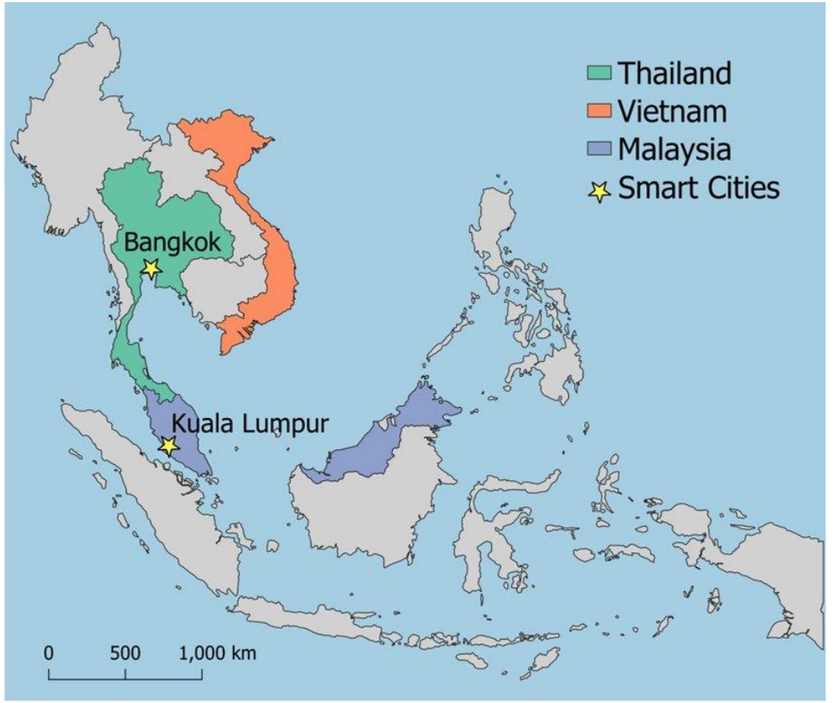
Electricity Generating Authority of Thailand

Office of Natural Resources and Environmental Policy and Planning

PNNL team visit to Thailand (Jan 2023)

Integrated Multi-sector/Multi-scale Modeling in Smart Cities

- Cities play an important role in decarbonization, and through meaningful stakeholder engagement and capacity building, this project helps enable smart city development in a net-zero context.
- Using a global integrated model (GCAM) used by IPCC in all its reports and analysis:
  - Earth systems (temperature, precipitation, yields etc.)
  - Human systems (population, income, prices and preferences)
  - Policies (mitigation, subsidies, taxes and building codes)
- Helps identify the most beneficial decarbonization pathways at the city and national level



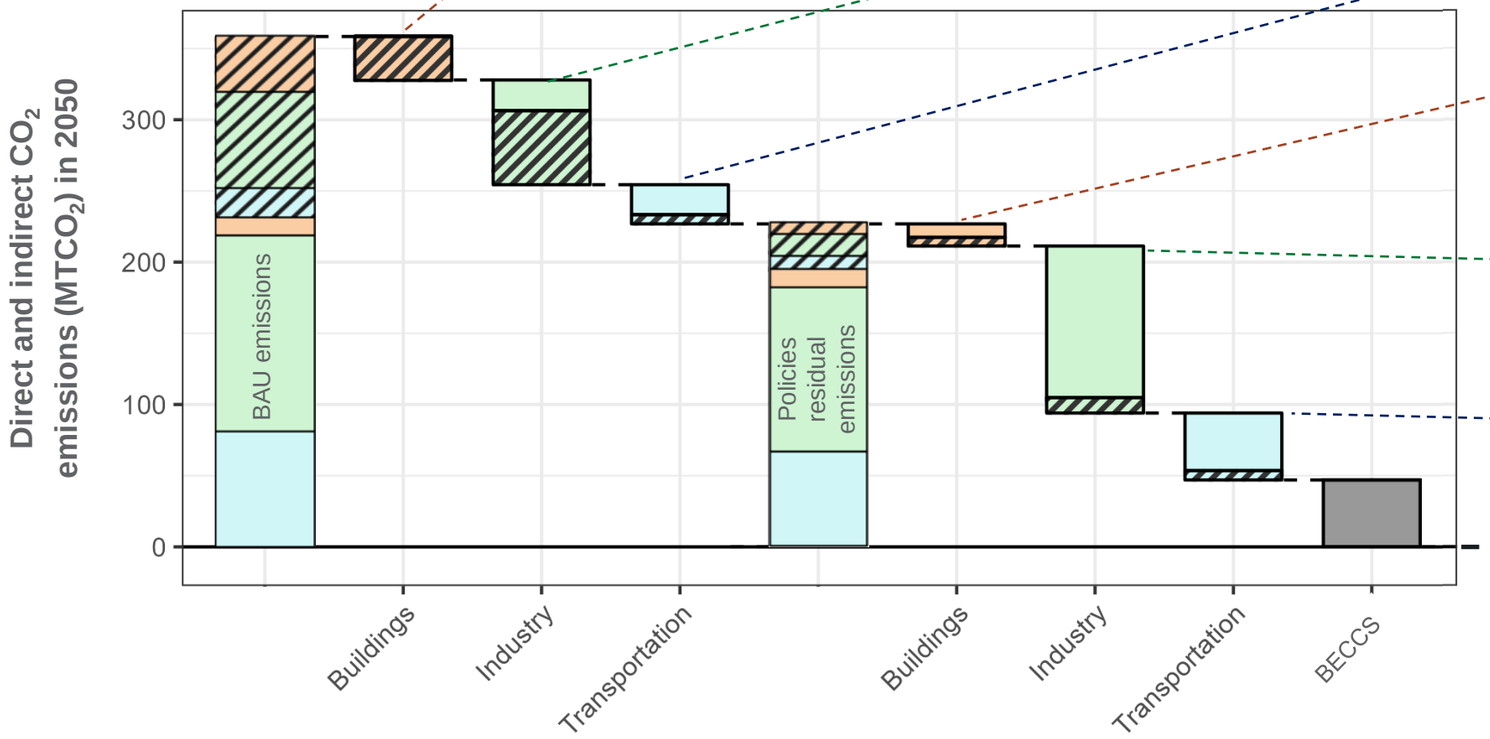
A map showing the location of the Smart Cities included in this pilot project.

Thailand - Carbon Neutrality in 2050

Buildings
- Air conditioner efficiency
- Building envelope efficiency
- Phase-out of non-LED lighting

Industry
- Industrial energy efficiency improvement
- Hydrogen fuels

Transportation
- Electric vehicle cost reduction
- Internal combustion engine vehicle phase-out



Buildings
- Cooking electrification

Industry
- Electrification
- Increased use of hydrogen

Transportation
- Further electrification

Direct emissions

Indirect emissions from electricity consumption

Power
- Solar, wind, and biomass development
- Coal phase-out
- CCS with gas

Bangkok's share of Thailand's total 2050 emissions (grey) and share of emissions mitigation (colored)

BAU	Buildings	Industry	Transport	Policies	Buildings	Industry	Transport
10%	29%	8%	5%	6%	26%	4%	2%

BECCS = Bioenergy carbon capture and storage

Key Insights

Electrification across sectors, accompanied by **decarbonization of the power sector**, will be key drivers for reaching carbon neutrality by 2050

Energy efficiency and demand-side measures will play a crucial role in decarbonization at the city and national levels

Hard-to-mitigate sectors will require **carbon capture and storage (CCS);** some emissions in these sectors will need to be offset using bioenergy with carbon capture and storage (BECCS) or other carbon sequestration technologies.

The **Bangkok metropolitan area** will play a key role in reaching national decarbonization targets

The extent of carbon sequestration achieved in the **land use change (LUC) sector** will have major implications for mitigation efforts needed in other sectors

https://jgcri.github.io/seasia

Thank you

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