

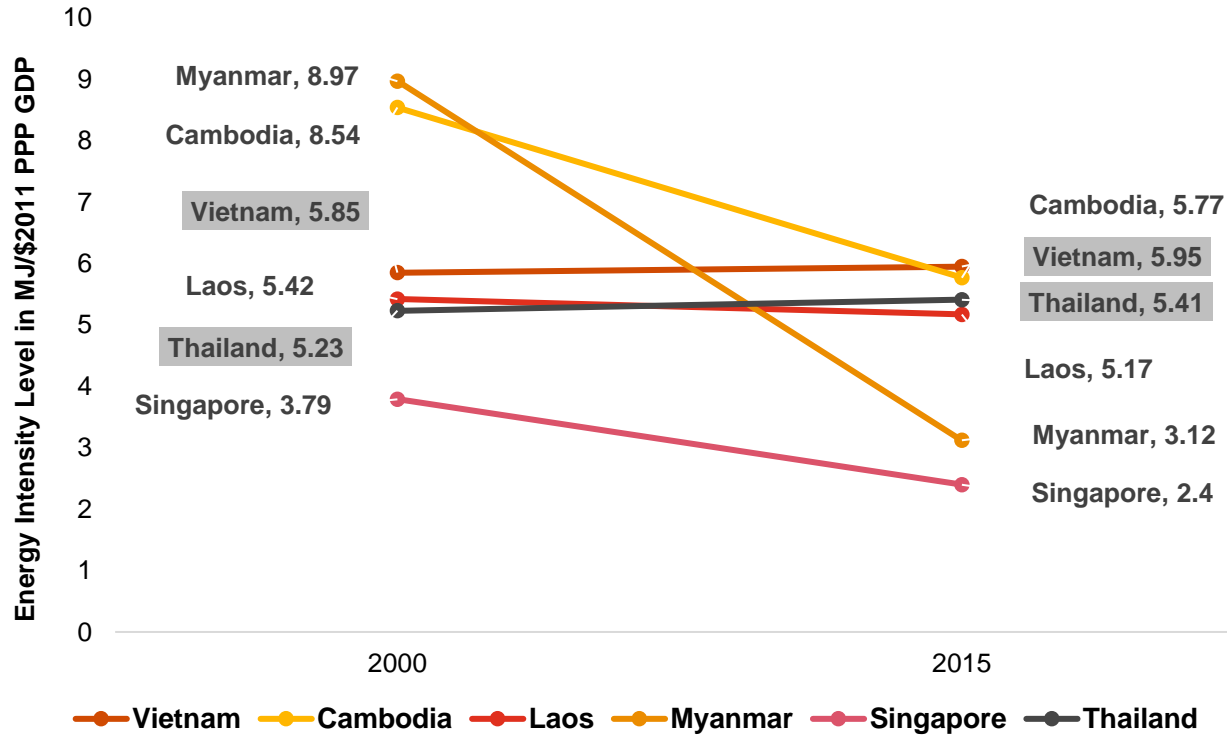
# National Policies and Strategies for Promoting Energy Efficiency in Public Sector Buildings: Experiences from Viet Nam and Cambodia

Rajeev Ralhan  
Asia Clean Energy Summit  
October 2021



# Energy Intensity & EE Policy Status in SEA

## Primary Energy Intensity in SEA



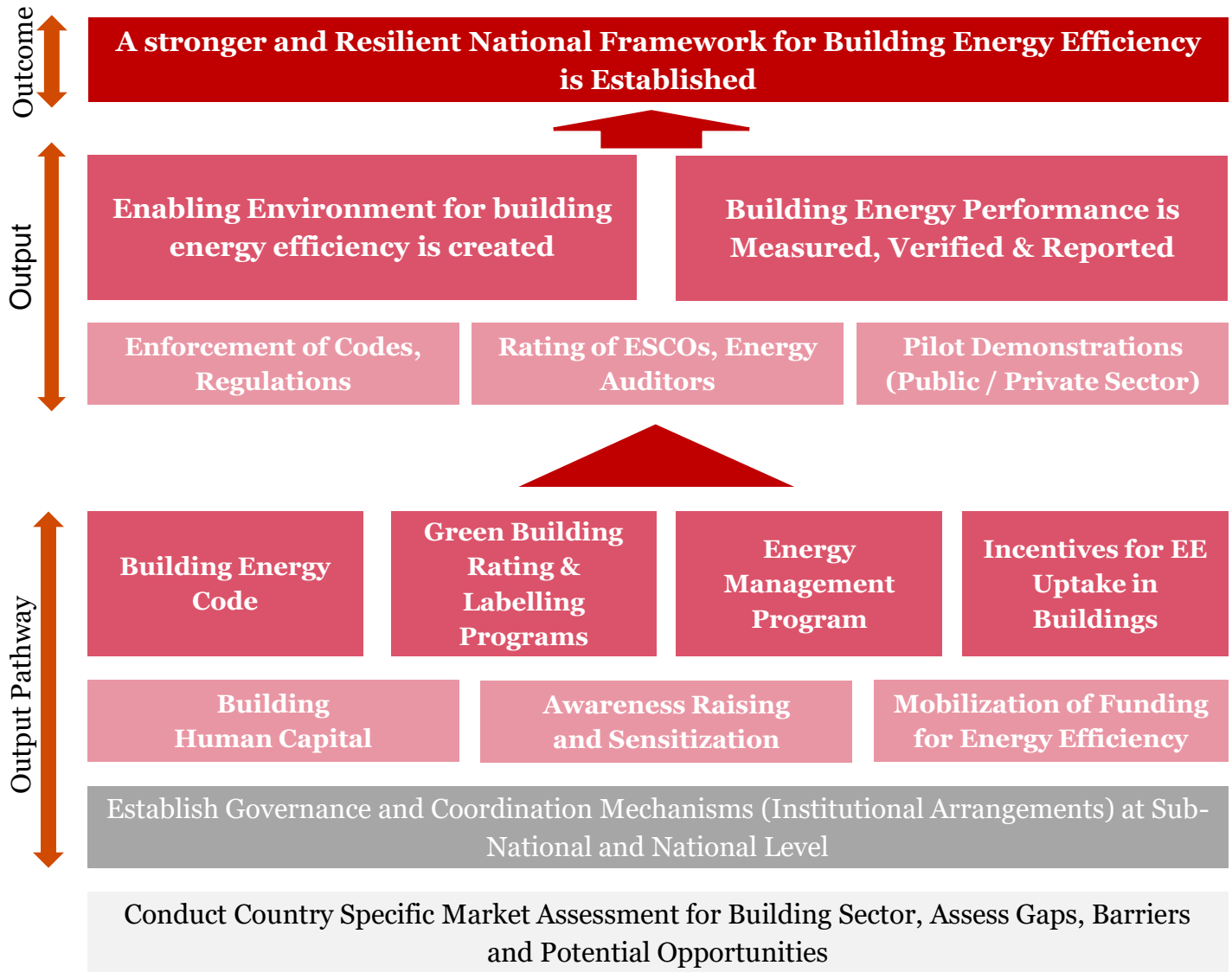
The rapid increase in energy demand can be attributed to:

- Increased **economic activity**
- **Industrial development**
- Rapid **urbanization**
- Increased **transport demand**
- Improved **energy access**
- **Improved standard of living** in SEA regions

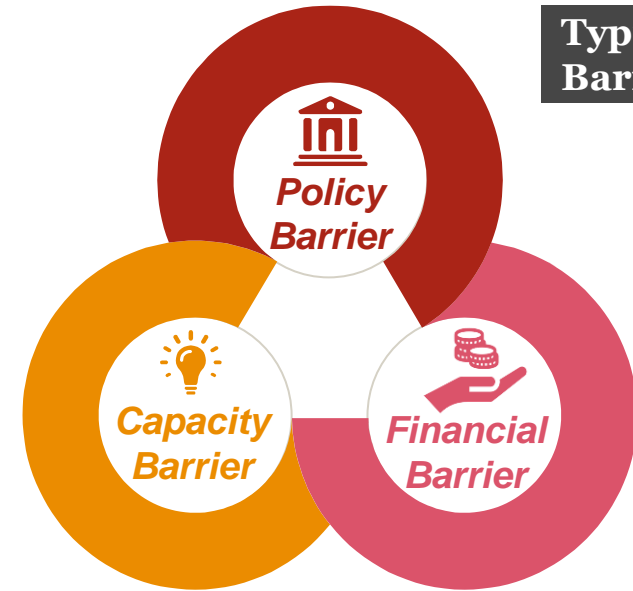
## Building Energy Efficiency Policy Status in SEA

		Policy Instruments			
		EE Code (Buildings)	Energy Management	Appliance S&L	GB Rating System
Singapore		Enforced	Enforced	Enforced	Enforced
Thailand		Enforced	Enforced	Enforced	Under Development
Vietnam		Enforced	Enforced	Enforced	Under Development
Myanmar		Absent	Absent	Enforced	Absent
Cambodia		Under Development	Absent	Under Development	Under Development
Laos		Absent	Absent	Enforced	Absent

**The Demand Side Energy Efficiency is key to addressing the issue of rising energy intensity in these countries**

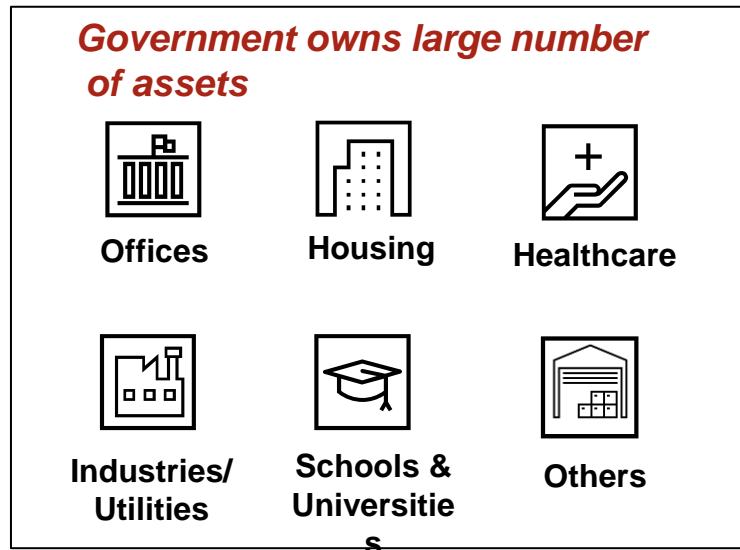


**Typical Market Barriers for EE**

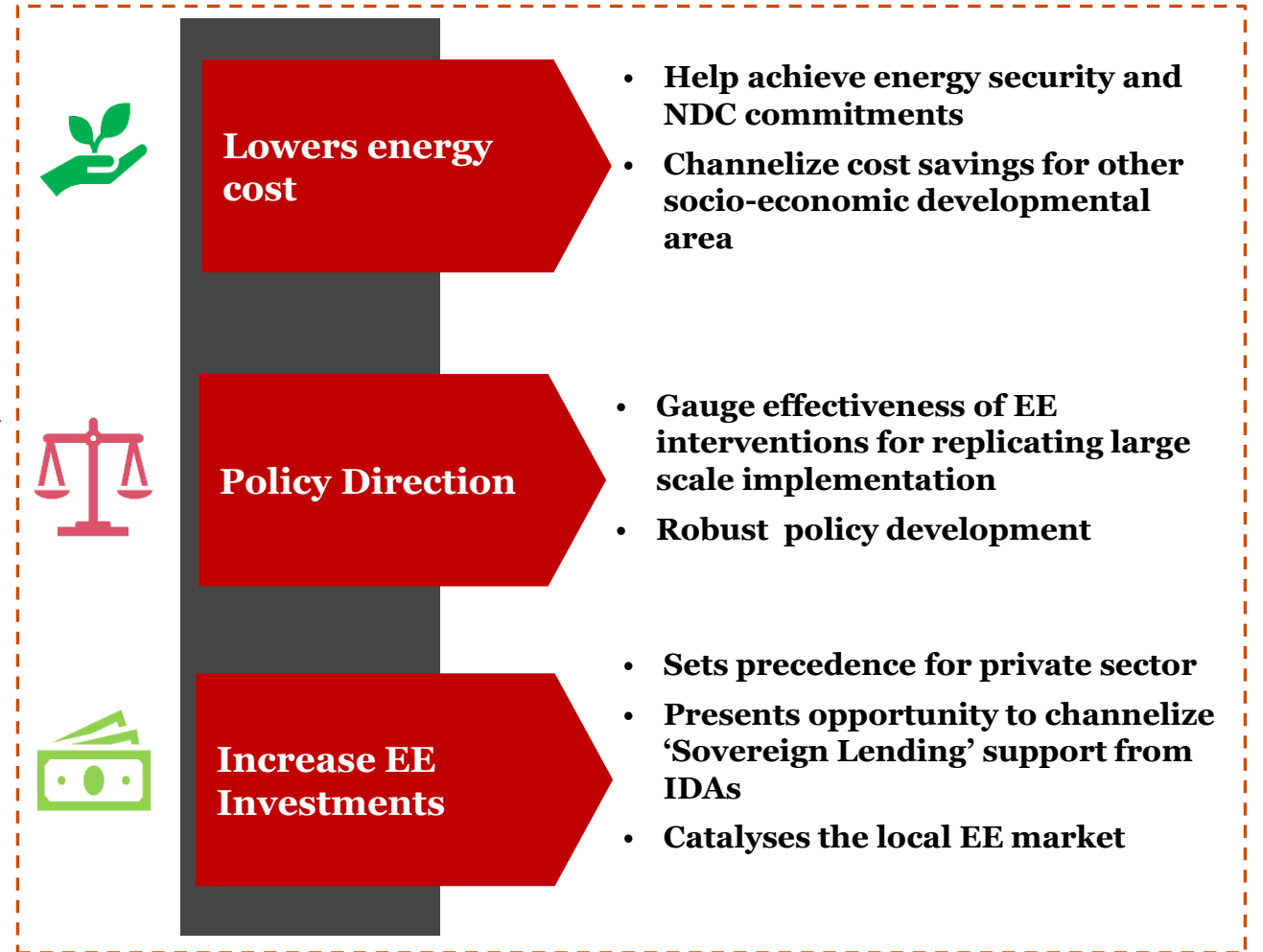
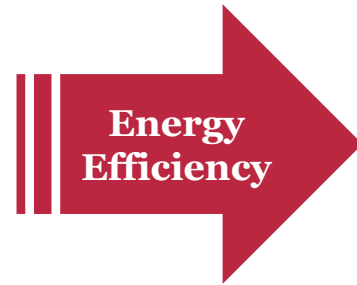


- Policy Barriers**
- Lack of policy guidance and mandates on Building EE
  - Inconsistent standards and technical codes
  - Government's low priority/commitment for Building EE investments
- Capacity Barriers**
- Lack of efficient urban energy planning by Municipal governments
  - Weak stakeholder capacity on building EE
- Financial barriers**
- State budget constraints
  - Limited access to affordable finance
  - Lack of private sector investment

# Why Energy Efficiency in Public Sector Buildings



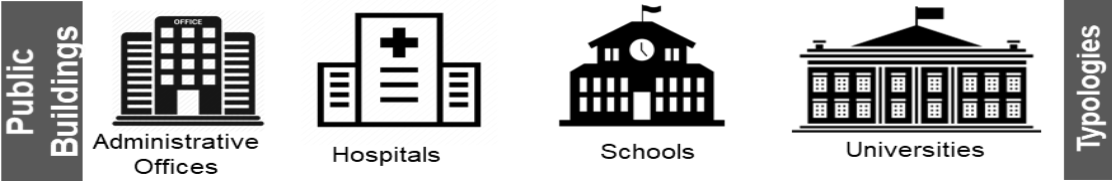
- High energy cost; huge burden on public finance
- Consequently, high carbon emissions



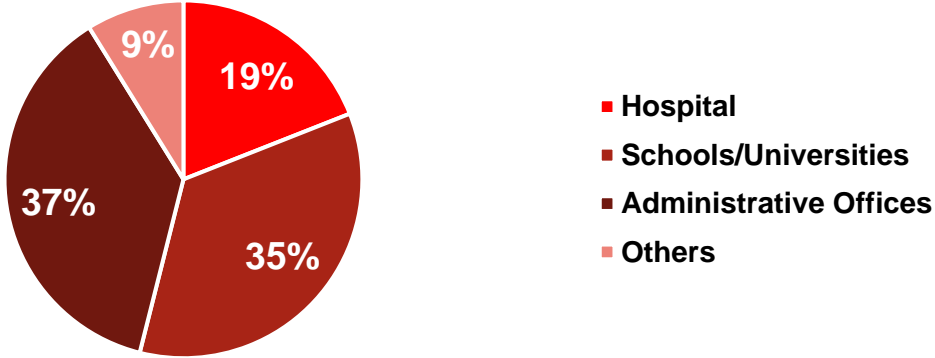
# DSEE Market Assessment in Vietnam: Building Sector

## Project Focus locations and Building typologies

CAN THO    DA NANG    HAI PHONG    LAM DONG    QUANG NAM    QUANG NINH



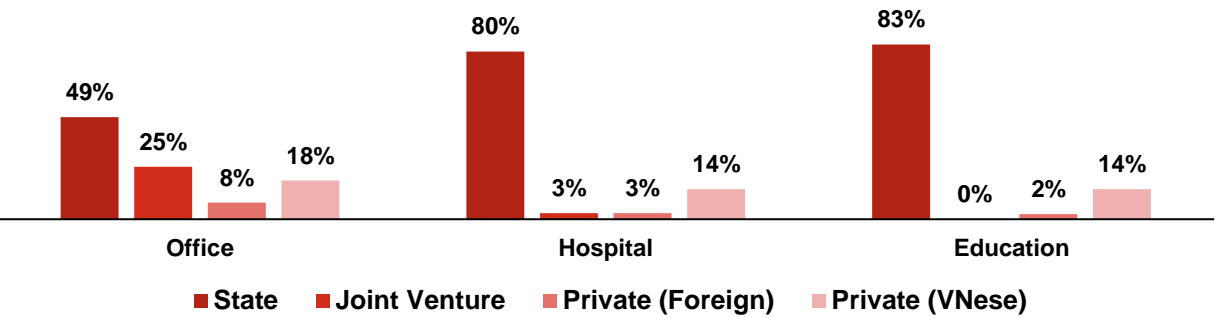
Breakdown of public buildings stock in 6 cities/provinces of Vietnam



Largest number of public building stock comprise of **Administrative offices and schools/universities followed by Hospitals**

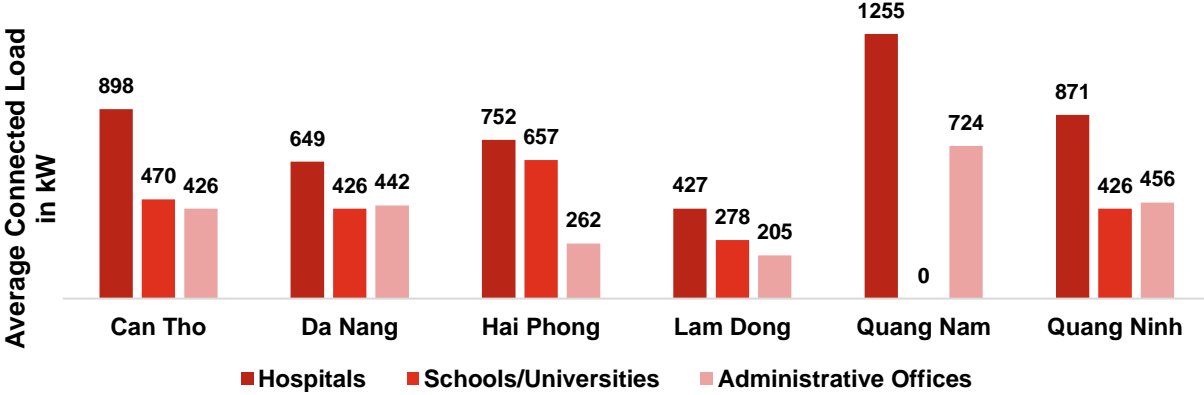
**Hospitals** have the **highest** connected load ranging from **650-1200kW** followed by **offices 260-720kW** and schools/universities **420-650kW**

## Building typology vs ownership



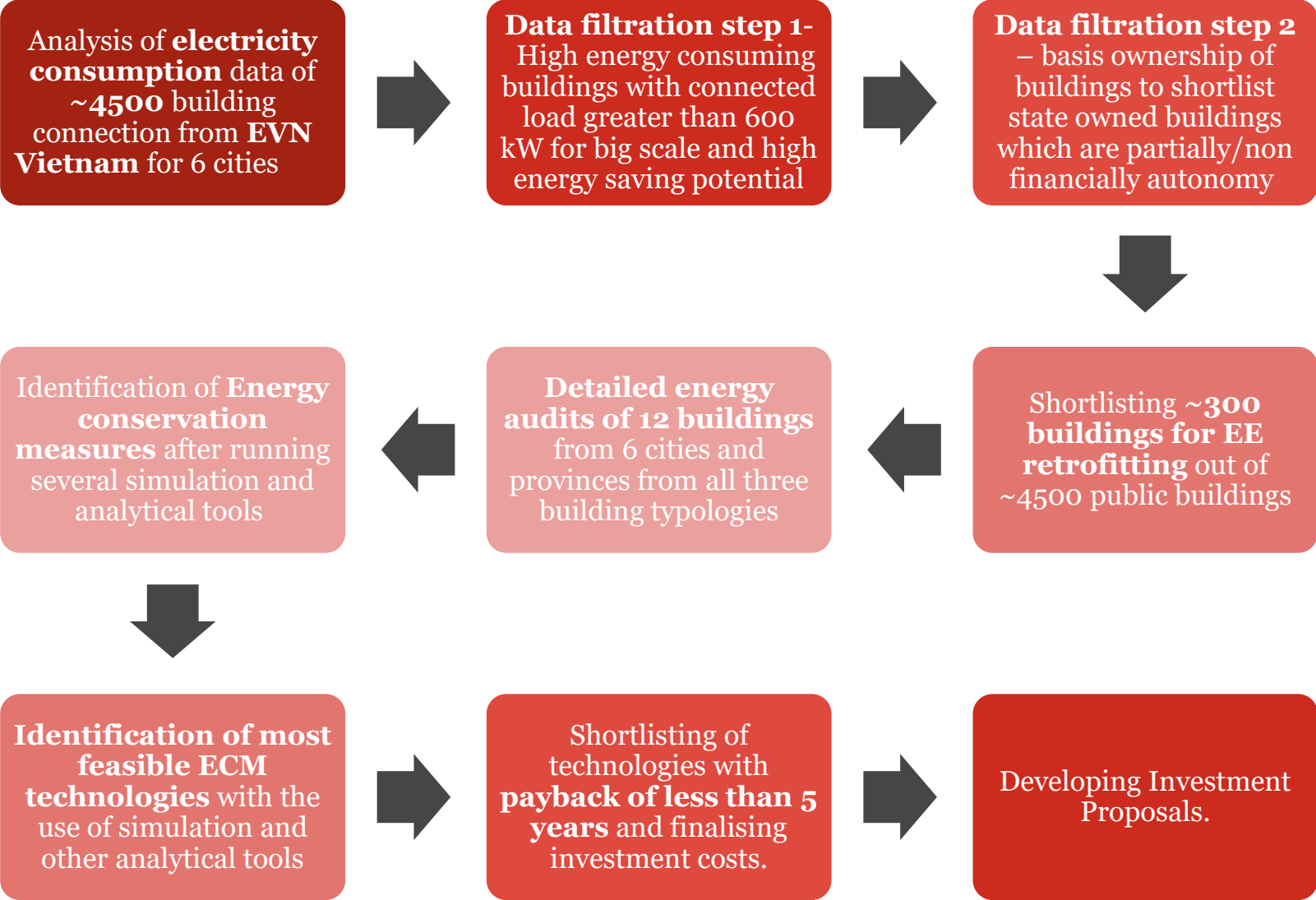
In Vietnam, majority of the public buildings are state owned. Within the State, ownership lies with various departments such as **Dept. of Industry and Trade (DOIT)**, **Dept. of Health (DOH)** and **Dept. of Education and Training**

## Average Connected Load across 6 cities/provinces

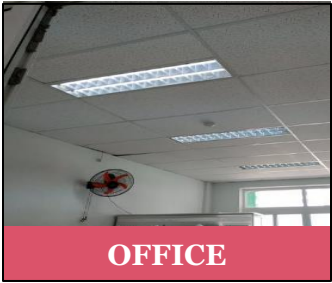


This data is based on information received on electricity consumption from **Vietnam Electricity Corporation (EVN)** of approx. 4500 building connections from the 6 cities and provinces.

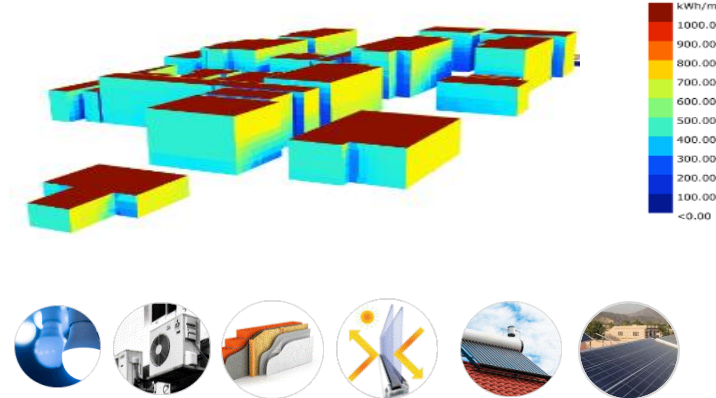
# Steps for Investment Project Preparation in Public Buildings – Vietnam



## Current Status of buildings



## Shortlisting of ECMs'





# Schools of Vietnam

## Key Findings - Schools

- The buildings **does not have an efficient envelope**. High temperature and RH recorded inside class rooms lead to thermal discomfort in school buildings.
- From the energy audit of the facility, it is observed that the **ceiling fans used in the building are inefficient**. Replacement of ceiling fans with efficient ones along with proper positioning can drastically improve the internal comfort conditions of the Classrooms.
- **The schools lack daylighting and do not have efficient lighting systems leading to increased internal and external lighting load.**
- **Lot of space available for Solar PV**



### *Overall Expected Energy Savings*

**19-25%** - Energy Efficiency Saving Potential

**Good** Renewable Energy Offset Potential

# Offices of Vietnam

## Key Findings in Offices

- Majority of air conditioning systems are **Split AC's with medium efficacy** and a number of them **do not comply with the requirements of the code**. Their replacement with more efficient systems will result in reduced energy consumption due to AC
- Majority of the **artificial lighting systems in the offices have inefficient fluorescent lights installed**. Replacement of all those lights with LEDs will lead to a substantial reduction in energy consumption through artificial lighting
- **Building envelope components are not complaint with the requirements of the code & hence are responsible for a significant portion of the cooling loads**



### Overall Expected Energy Savings

**25-35%** - Energy Efficiency Saving Potential

**70%** - Renewable Energy Offset



# Hospitals of Vietnam

## Key Findings in Hospitals

- The buildings **do not have an efficient Roof and Glass** and **does not comply with minimum requirements as per the QCVN standards** leading to increased cooling load of the building
- **The buildings do not have efficient lighting systems** leading to increased lighting load. Replacement of internal and external lighting system with LED's
- **Minimal shading observed leading to heat ingress and glare**
- Majority of air conditioning systems used in the hospitals **are low efficiency and do not comply with the requirements of the code.**



## *Overall Expected Energy Savings*

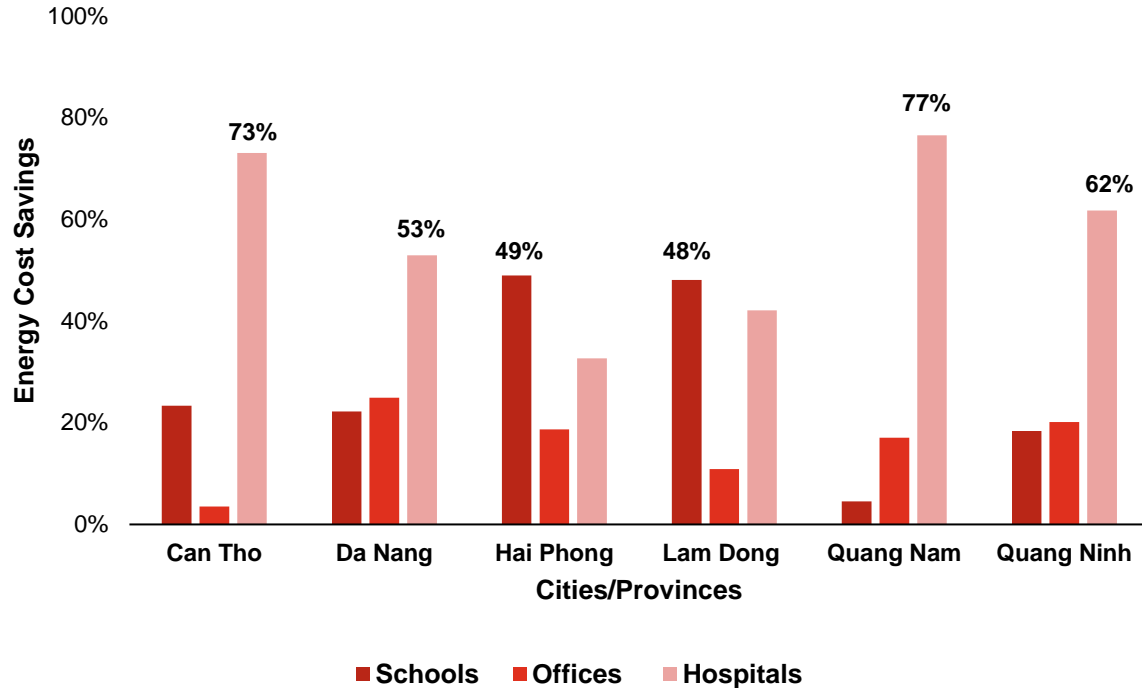
**30-40%** - Energy Efficiency Measures

**60-70%** - Renewable Energy Offset

# DSEE Market Potential in Public Buildings in Vietnam

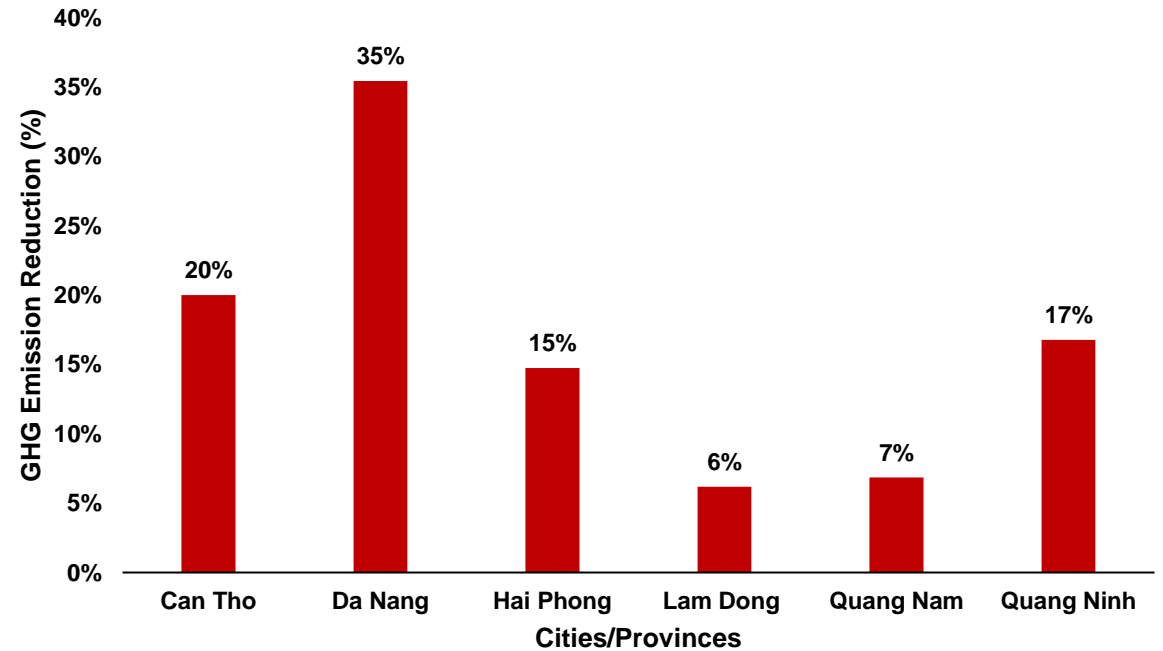
- Total No. of Buildings identified for retrofiting: **305**

ENERGY SAVINGS SHARE (EE+RE) OF DIFFERENT BUILDING TYPOLOGIES IN EACH PROVINCE



**Hospitals** have the highest share in **energy cost savings from EE and RE interventions** in 4 cities & provinces of Vietnam (Can Tho, Da Nang, Quang Nam and Quang Ninh) and **Schools** lead in the other two (Hai Phong and Lam Dong)

GHG EMISSION REDUCTION SHARE AMONG DIFFERENT CITIES/PROVINCES



**Da Nang** will be able to achieve the **highest GHG emission reduction** across Vietnam, followed by Can Tho from SEECIP implementation



Total Energy Savings Potential of **84.90 GWh**



Total Investment of ~ **55mn USD** is required



GHG Emission Reduction Potential of ~ **79 ktCO<sub>2</sub>**

# DSEE Market Assessment in Vietnam: Building Sector Findings

## Findings in Local Context



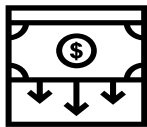
Majority of the public buildings falling under the category of schools, hospitals and offices are state-owned – Important to plan central vs state/province interventions



Hospitals and Offices have high potential of EE intervention as majority use Split ACs and wall hung fans for ventilation. Schools have low daylighting but huge potential for solar PV installation.



Under state owned, various departments are responsible for operation and maintenance for the buildings. DOH is responsible for Hospitals, similarly DOET for schools and DOIT/DOC for offices.



Vietnam has low electricity tariffs which makes the potential for energy efficiency interventions fragile and less attractive.



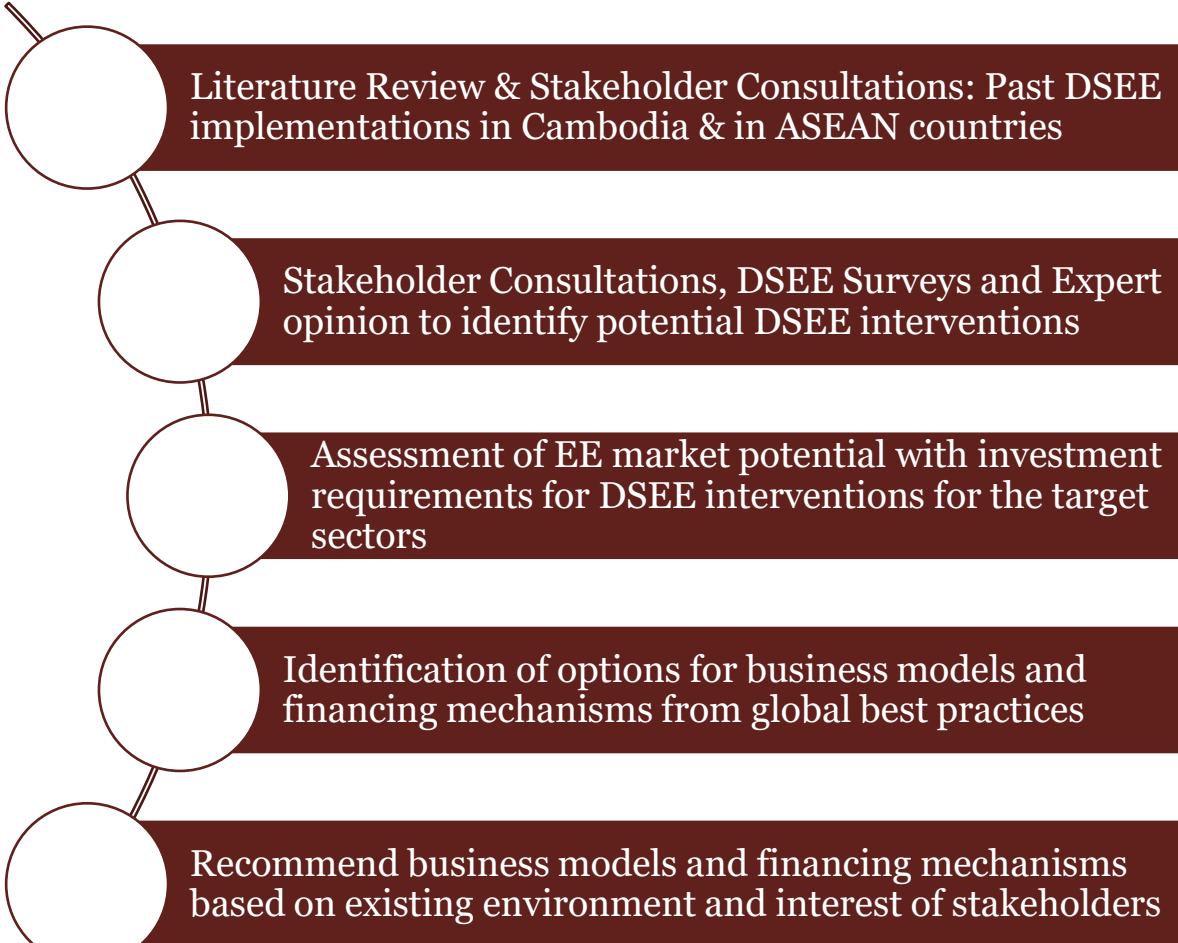
Capacity building and institutional strengthening is the need



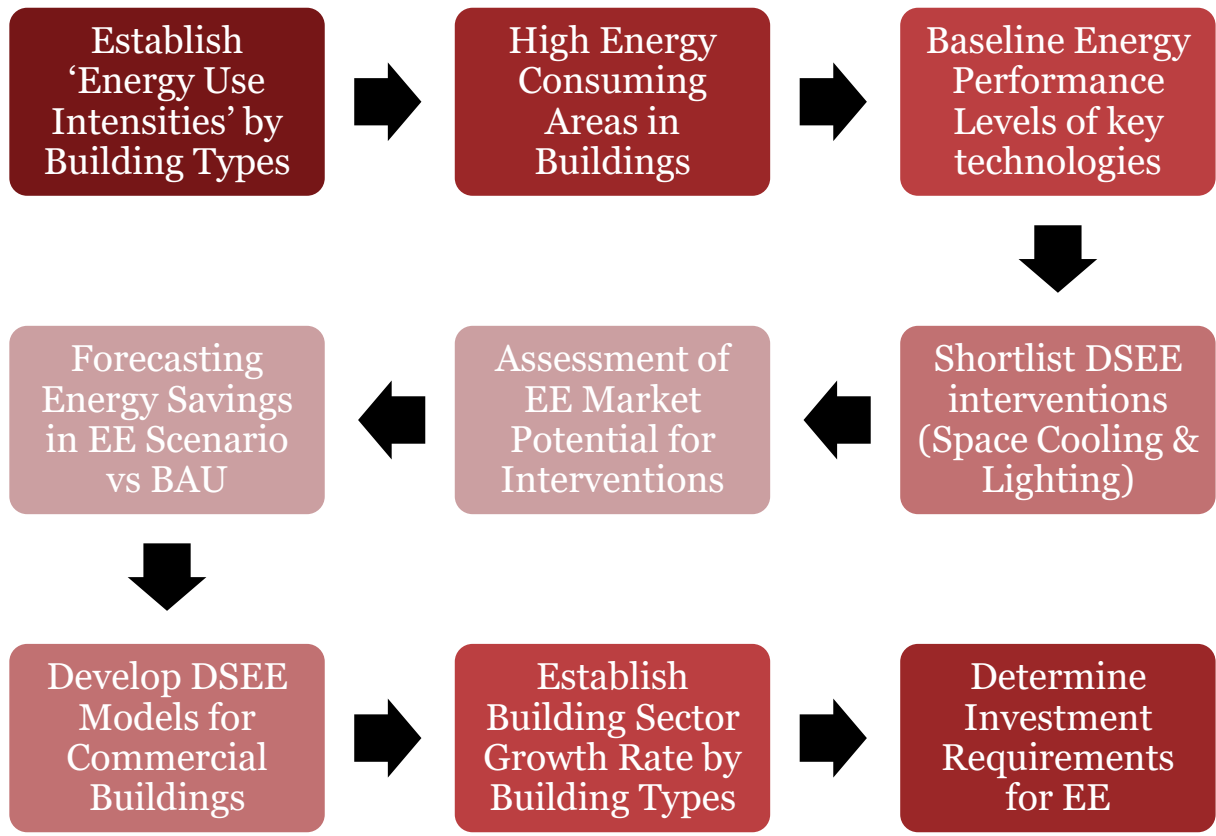
Lack of advanced technologies and bioclimatic design strategies in building code considering majority of buildings are naturally ventilated for major portion of the year.

# DSEE Market Assessment in Cambodia: Building Sector

## About the Study



## Inputs from DSEE Surveys & Data Analysis in Buildings



# DSEE Market Assessment in Cambodia: Building Sector Findings

## Findings in Local Context

**Lack of a Building Energy Code and Energy Management Program** leading to low uptake of energy efficiency measures in Buildings of Cambodia

**Second-hand appliance market for refrigerators, air conditioners** and washing machines was found to be significant in Cambodia,

Major energy consuming applications identified through the commercial building survey included **heating ventilation and air conditioning (HVAC) and lighting**

**Scope for EE interventions in Air-Conditioning:** Low penetration of centralized air conditioners (< 17%) in comparison to packaged and split Acs (~ 90%).

**Scope for EE Interventions in Indoor Lighting:** Higher penetration of CFL and LFL based lighting in Commercial Building puts a strong case for LED retrofits

## Barriers to be Addressed

**Unavailability of Disaggregated Energy Consumption Data at Building Sector Level**



**Absence of Mandate on Energy Efficiency and corresponding targets for Buildings**



**Absent Regulations on Energy Performance of Electrical Appliances, Equipment, Buildings**



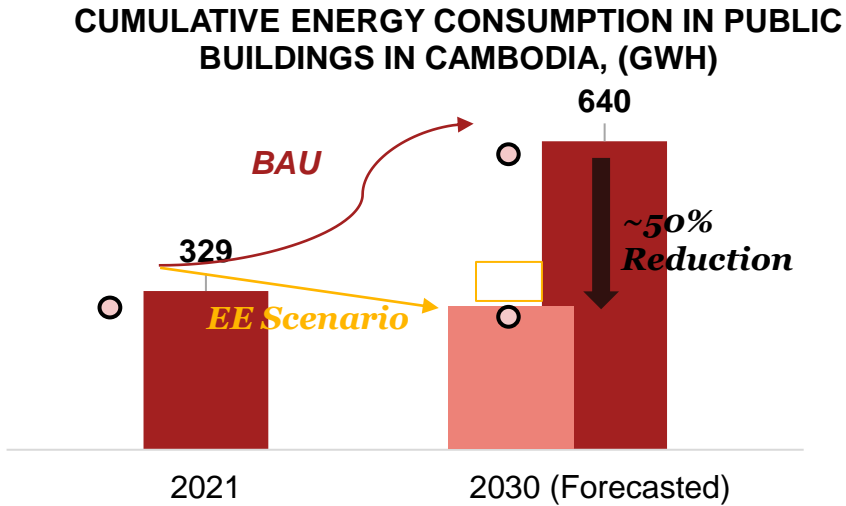
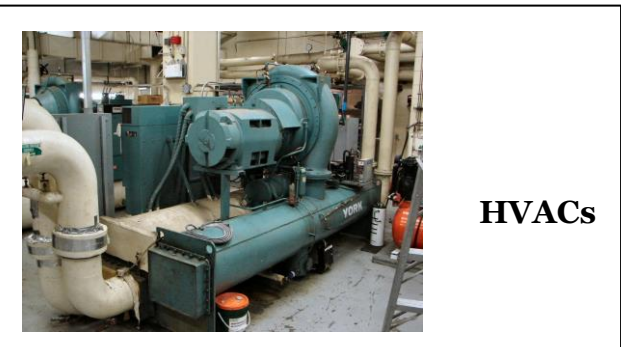
**Low Capacity of Institutions on Energy Efficiency and sub-optimal institutional coordination**

*DSEE Study provided recommendations to address the EE barriers in Cambodia. Project Team is facilitating development of the National Energy Efficiency Policy (NEEP), S&L Sub-decree, S&L for air-conditioners and refrigerators and define targets for EE in addition to suggesting financing mechanisms to achieve the EE market potential across industries, buildings, transport, public services.*

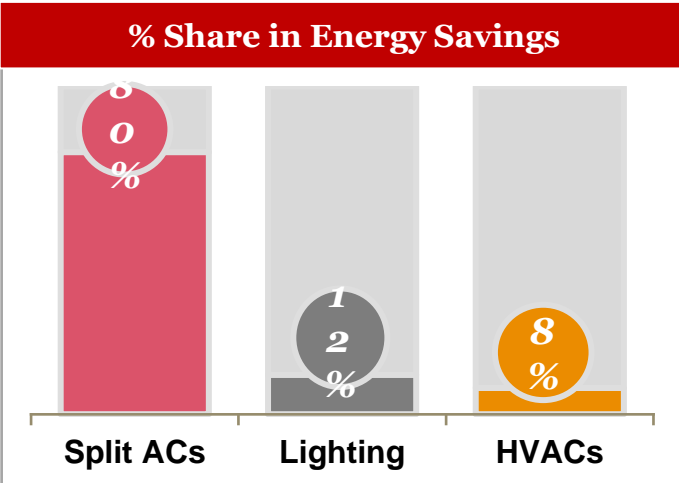


# DSEE Market Potential in Public Buildings in Cambodia (2021-2030)

## EE Appliance Interventions Considered



BAU- Business As Usual; EE Scenario- Uptake of energy efficient appliances



Total Energy Savings Potential of **318 GWh**

Total Investment of ~ **129mn USD** is required

GHG Emission Reduction Potential of ~ **185 ktCO2**

EE Appliance Categories	Investments (Million USD)	Cost Savings (Million USD) @ 0.16 USD/kWh	Pay Back
Split ACs	105	~ 41	~ 3 years
HVACs	13	~ 4	~ 3 years
Lighting	11	~ 5	2 to 3 years

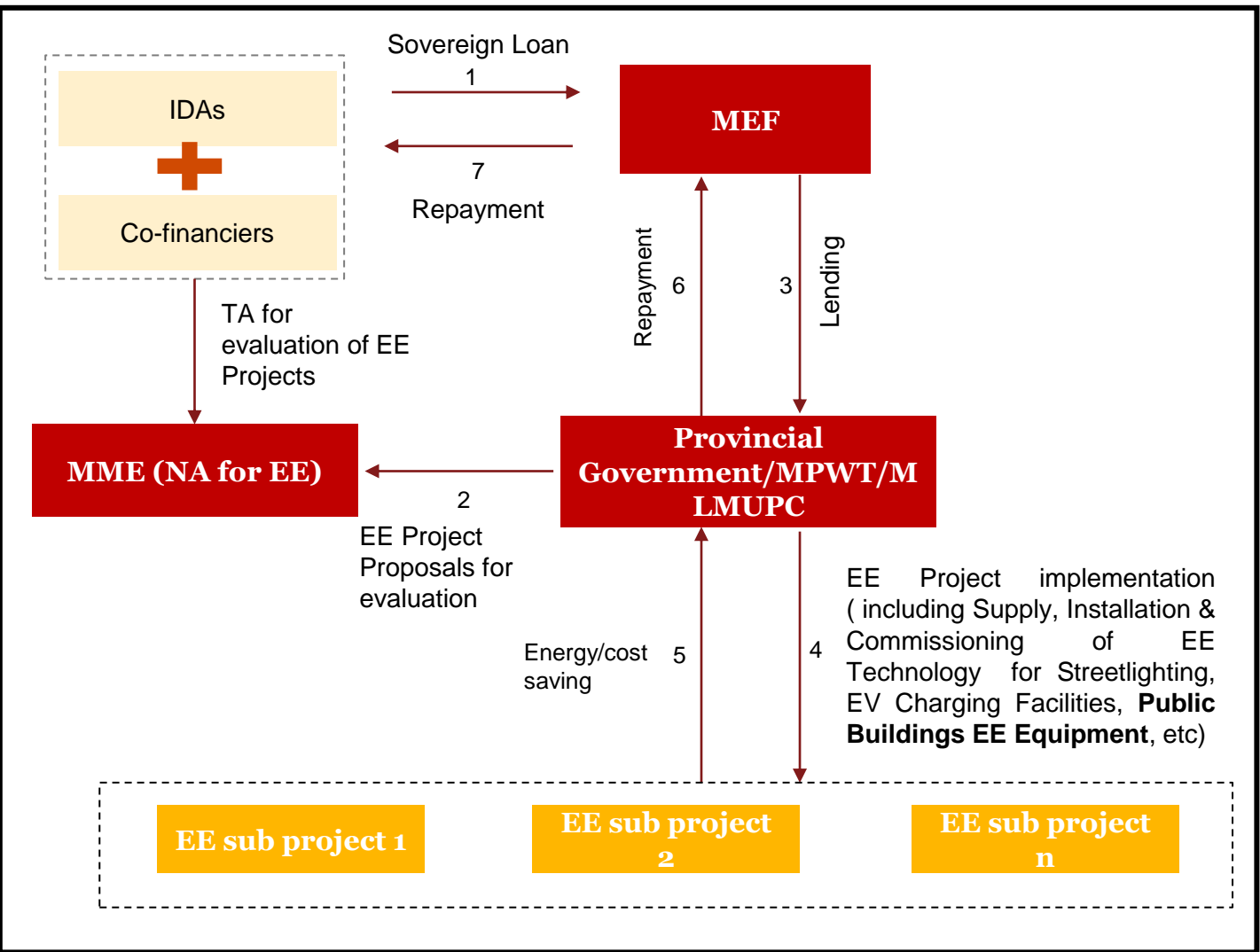
# Examples of Financing Mechanisms for EE in Commercial Buildings

## Few Successful Examples in SEA to promote Energy Efficiency in Building Sector

Mechanisms	Short Description	Success Story Country Case
<b>On Bill Financing</b>	<ul style="list-style-type: none"><li>A model where <b>utility consumers</b> are allowed to procure efficient equipment and pay for the equipment over time through <b>monthly utility bills</b></li></ul>	EESL sold more than <b>20 million LED lamps</b> by extending <b>on-bill loans in India</b> in about <b>15 Indian states</b> ,
<b>Performance Contracting (ESCO Model)</b>	<ul style="list-style-type: none"><li><b>Shared savings model:</b> ESCO invests in the project and cost savings from energy savings are quantified. ESCO receives a share of the savings resulting from project as remuneration.</li><li><b>Guaranteed savings model:</b> ESCO guarantees a level of energy savings and receives remuneration based on actual cost related to the energy savings. Customer is directly financed by an institution and repays the loan.</li></ul>	<b>'Shared Savings Model'</b> has been successfully implemented in Thailand, with lot of opportunities for private sector ESCOs
<b>EE Revolving Fund</b>	<ul style="list-style-type: none"><li>A <b>fixed pool of capital</b> is utilized to fund <b>energy efficiency projects</b></li><li>Repayment happens at <b>lower interest and</b> replenished money is re-lent to new customers.</li><li><b>Lower interest rates and flexible collateral requirements are a key feature</b> of this mechanism and funds are generally managed by government or FIs or at times by non-profit organisations.</li></ul>	EE Revolving Fund was successfully implemented in Thailand where Government Budget was utilized to provide concessional lending was extended to <b>building project developers</b> , factories, ESCOs for EE measures.

# Financial Mechanism: Sovereign Lending for Public EE Projects

## Proposed For EE Technology Uptake in Public Services and Public Buildings in Cambodia

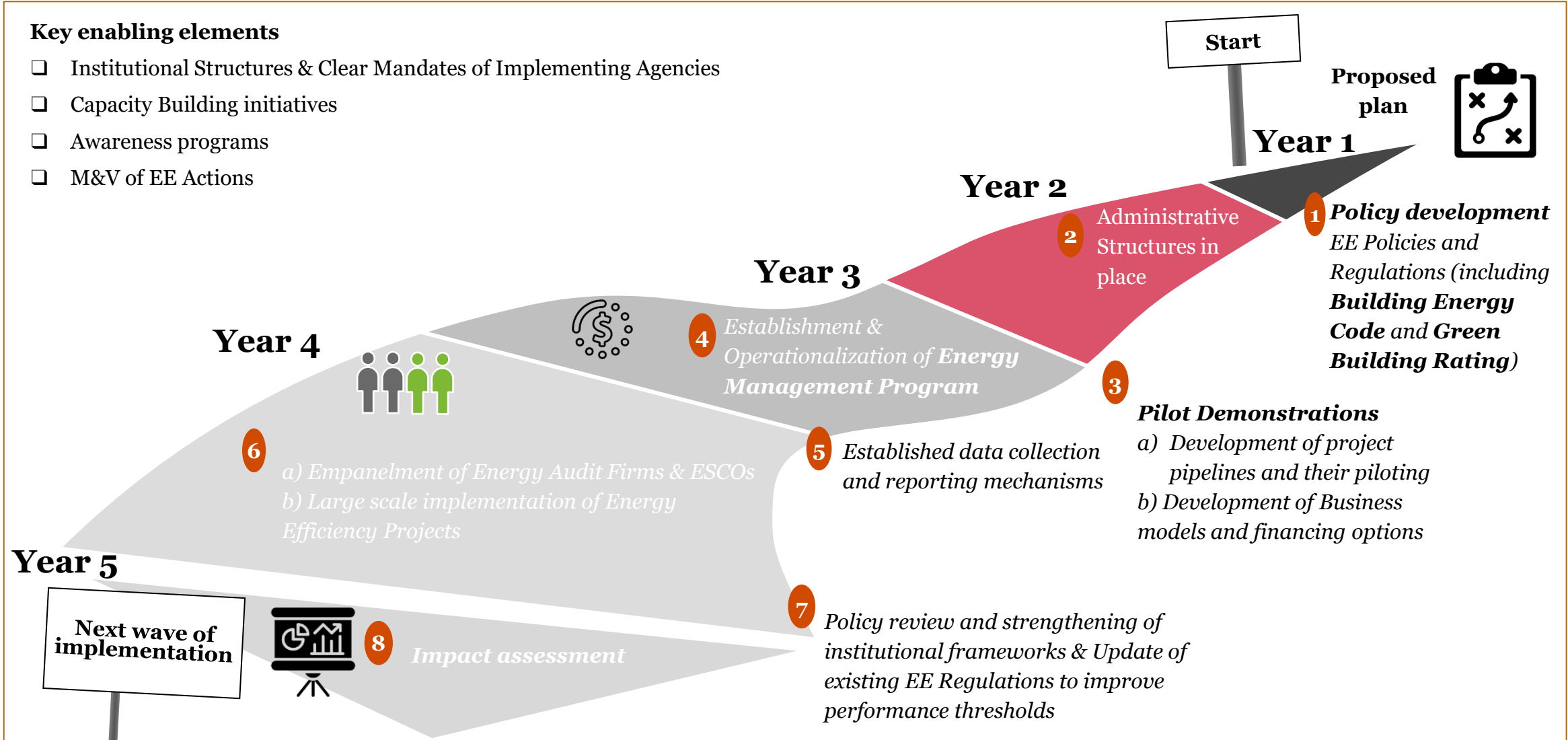


- **Development Institutions** and other co-financiers offer **sovereign lending** to government to finance public EE projects in the country - Public Streetlighting, **Public Buildings**, Municipal Wastewater pumping, EV Charging facilities, etc.
- The **nodal agency for EE appraisal** EE projects of the **provincial governments**
- Upon EE project/sub-project approval **funds are disbursed to provincial government** for procurement of EE Services (tendering for EE procurement, selection of vendors and supervision of EE installation and commissioning).
- **Provincial government shall select the EE Service providers through competitive bidding** for the procurement of EE services.
- Provincial governments **repay the loan based on energy cost savings** which is further repaid to the development institutions and co-financiers.

# Recommended Roadmap for Building Energy Efficiency

## Key enabling elements

- Institutional Structures & Clear Mandates of Implementing Agencies
- Capacity Building initiatives
- Awareness programs
- M&V of EE Actions



# Thank you

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