

Building a case for Energy Efficiency in GMS Energy Transition

Greater Mekong Sub region, 29th Regional Power Trade
Coordination Committee (RPTCC-29) Discussions
July 2022





Energy Efficiency is the First
Fuel for Energy Transition

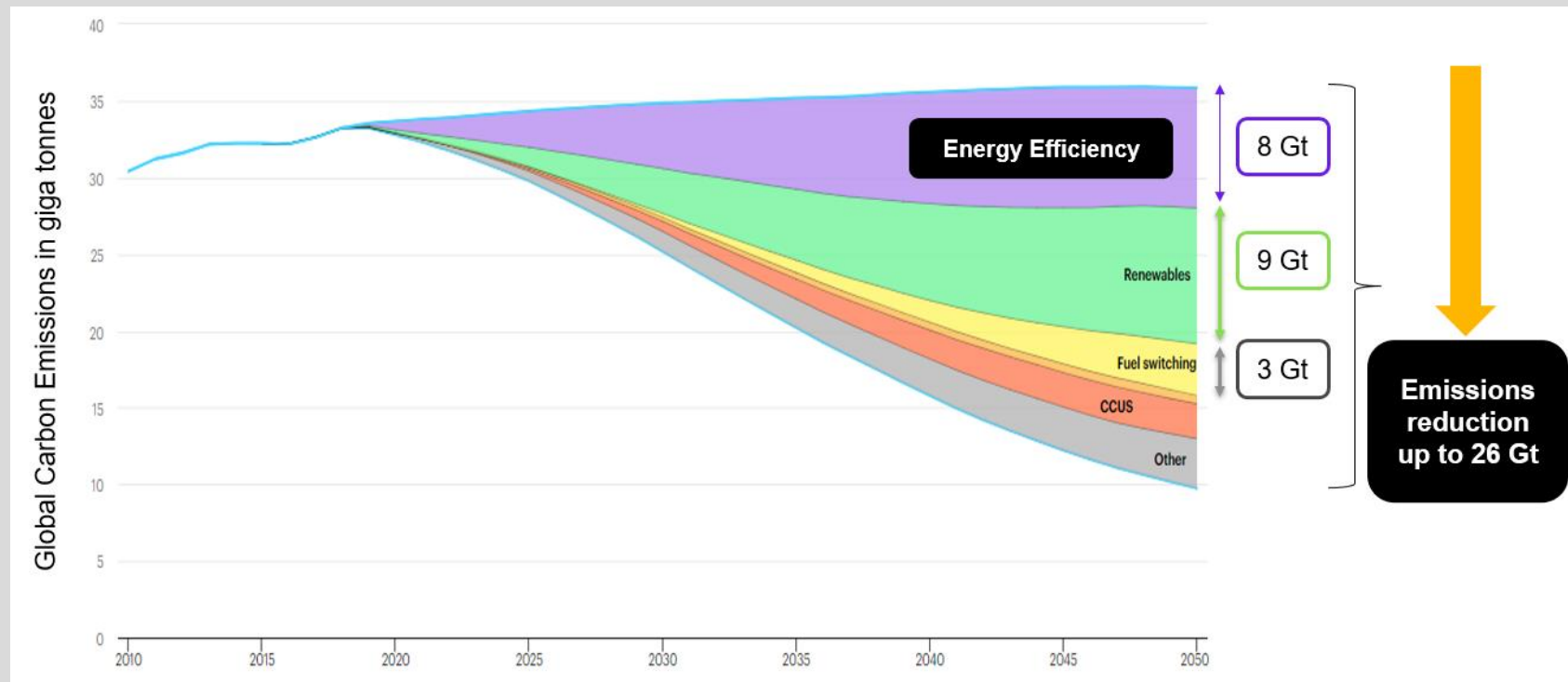
Climate Change: Is it relevant ?

Increasing awareness, expectations and requirements of **stakeholders** with different priorities has made Climate Change a highly relevant topic with a substantial impact on businesses and their **stakeholders**.



“Man-made carbon dioxide emissions need to fall by about **45% by 2030**, from 2010 levels, and **reach “Net Zero” by 2050** to give the world a good chance of limiting warming to 1.5°C.”
- **United Nations Climate Panel, 2021**

Energy efficiency's role in emission reduction



56 Gt
rise in CO₂
Emissions by
2030

31 Gt
required
reduction to meet
1.5°C target by
2030

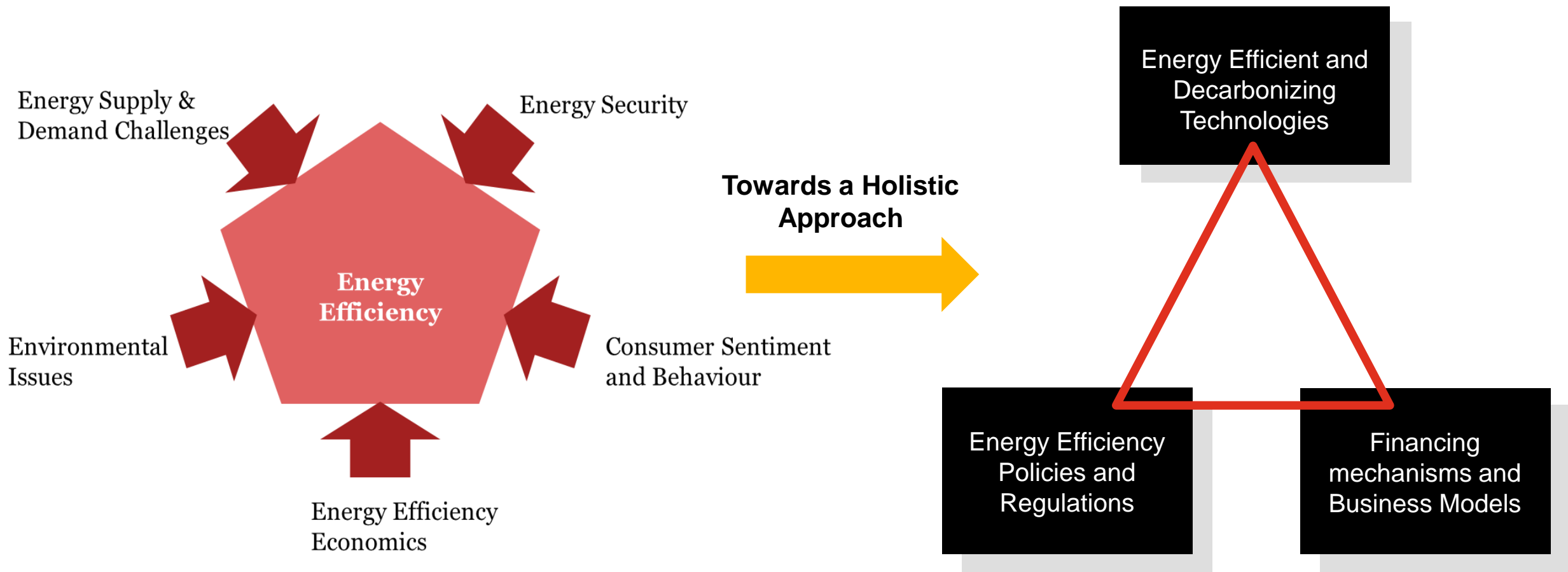
As the same time, the world today faces formidable challenges in sustainably and economically meeting its energy needs

A large portion of emission reduction has to come from Energy Efficiency

Source: IEA (2020), Clean Energy Transitions Programme 2019, IEA, Paris <https://www.iea.org/reports/clean-energy-transitions-programme-2019>

Source: UN Emissions Gap Report 2019

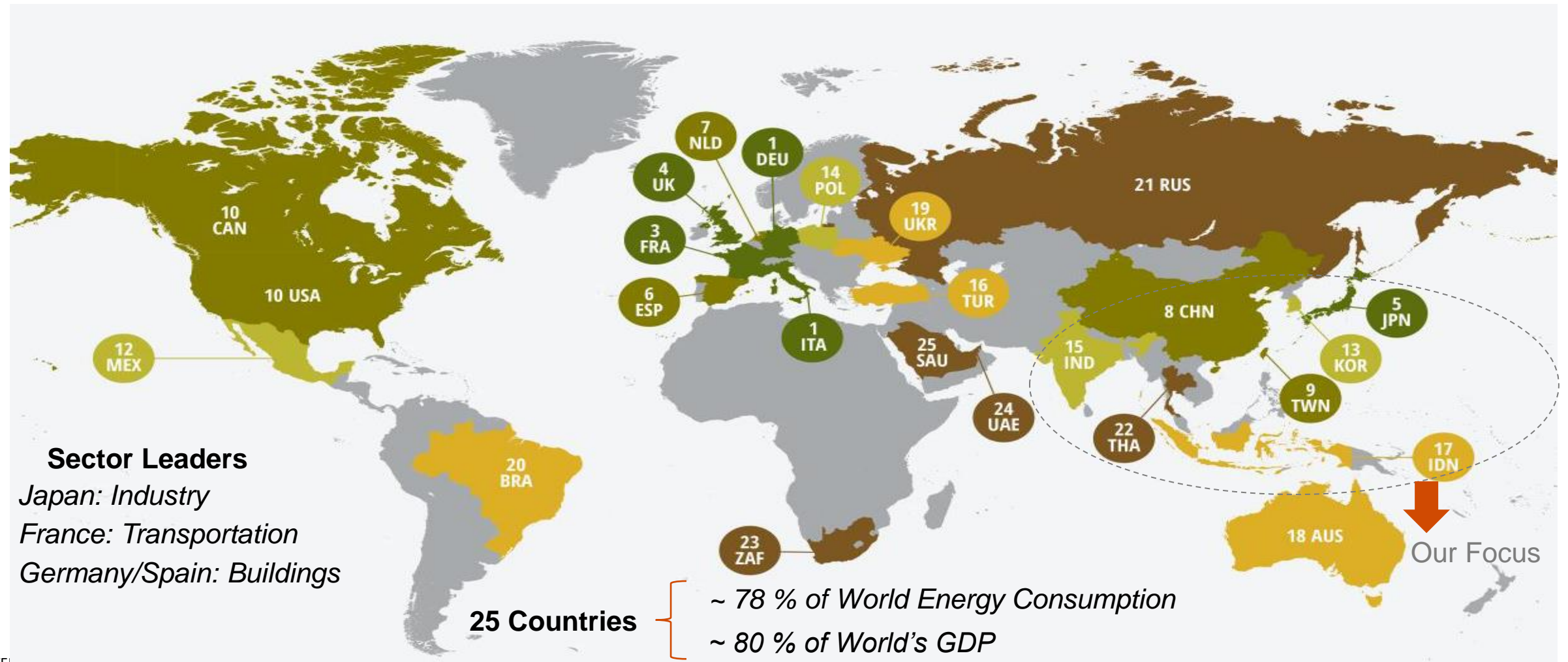
Energy Efficiency as the first fuel of the sustainable global energy system is today at the forefront of global political and corporate agenda.....



US\$ 1.3 trillion Estimated annual investments in the Energy Efficiency to meet the Paris Agreement (IEA)

Results of 2018 International Energy Efficiency Scorecard by ACEEE

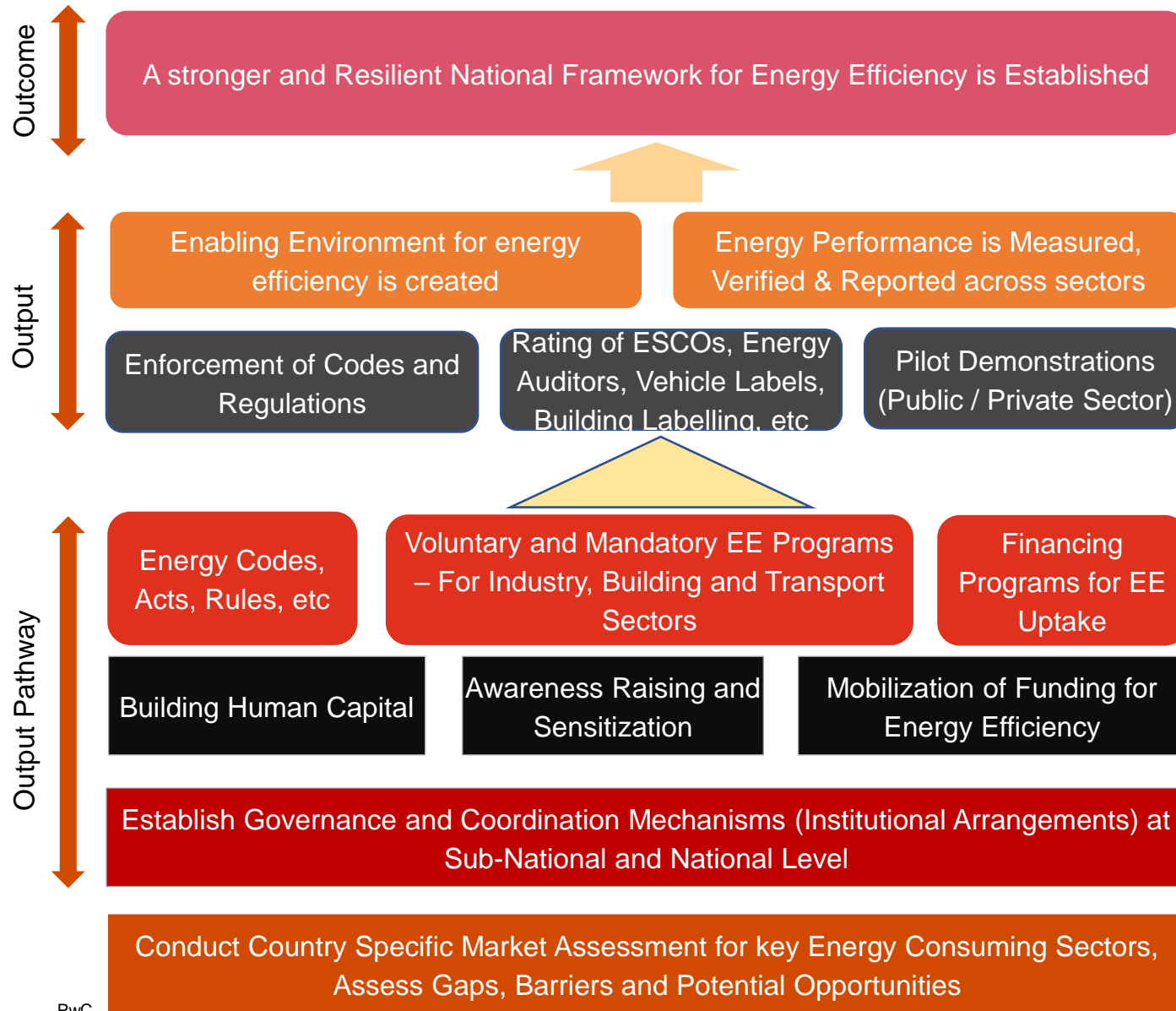
International scorecard on EE prepared by ACEEE for 25 High Energy Consuming countries of the world. In the study, EE indicators (performance) were analysed across building, industry and transport sectors to provide a ranking.



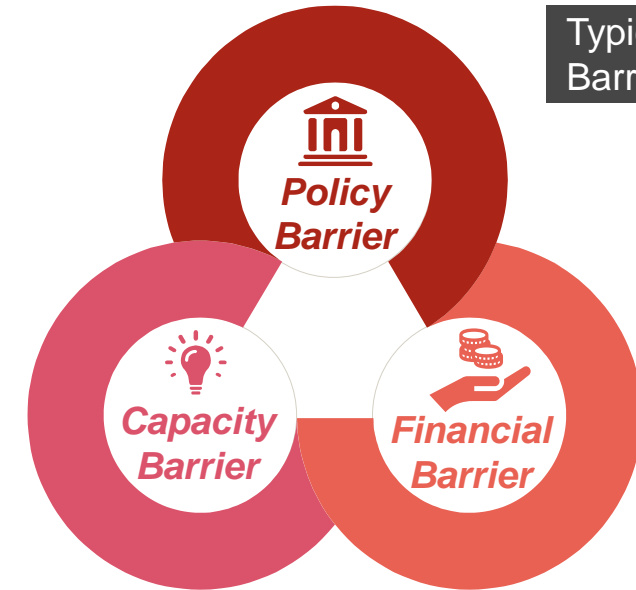
EE Highlights from Regional Countries

Highlights	Japan	China	India	Thailand	Vietnam
EE Law / Regulation / Act (Year)	✓ (1979)	✓ (1998)	✓ (2001)	✓ (1992)	✓ (2010)
Appliance Categories with S&L implementation (No. of appliance/product categories)	✓ (23)	✓ (20)	✓ (26)	✓ (5)	✓ (22)
EE in designated industries & Energy Audits	✓ (Des. Consumers)	✓ (Des. Consumers)	✓ (Des. Consumers)	✓ (Des. Consumers)	✓ (Des. Consumers)
BEC Adoption & Building Retrofit Policies (Low compliance rate < 20% is marked as low and > as high)	High	High	Low	Low	Low
Govt. push in the form of law, act or regulation was required to kick off EE	✓	✓	✓	✓	✓
Incentive and penalty mechanism in place for exceeding and under achieving EE targets	✓	✓	✓	✓	✓
EE implementation responsibility delegated across partner ministries / agencies	✓	✓	✓	✓	✓
Countries' National Targets (base year / target yr.) in terms of GHG Reduction, CO2 Intensity, Energy Intensity	Abs. GHG 25.4% (2005 / 2030)	CO2 Intensity 60% (2005 / 2030)	Emission Intensity by 45% (2005 / 2030)	Energy Intensity by 20-25% (2005 / 2030)	Emissions by 9%-27% (2014 /2030)

Policy Framework To Address Typical Barriers to Energy Efficiency



Typical Market Barriers for EE



Policy Barrier

- Lack of policy guidance and mandates on EE
- Inconsistent standards and technical codes
- Government's low priority for EE investments







Financial Barrier

- State budget constraints
- Limited access to affordable finance
- Lack of private sector investment

Capacity Barrier

- Lack of efficient urban energy planning by Municipal governments
- Weak stakeholder capacity on EE

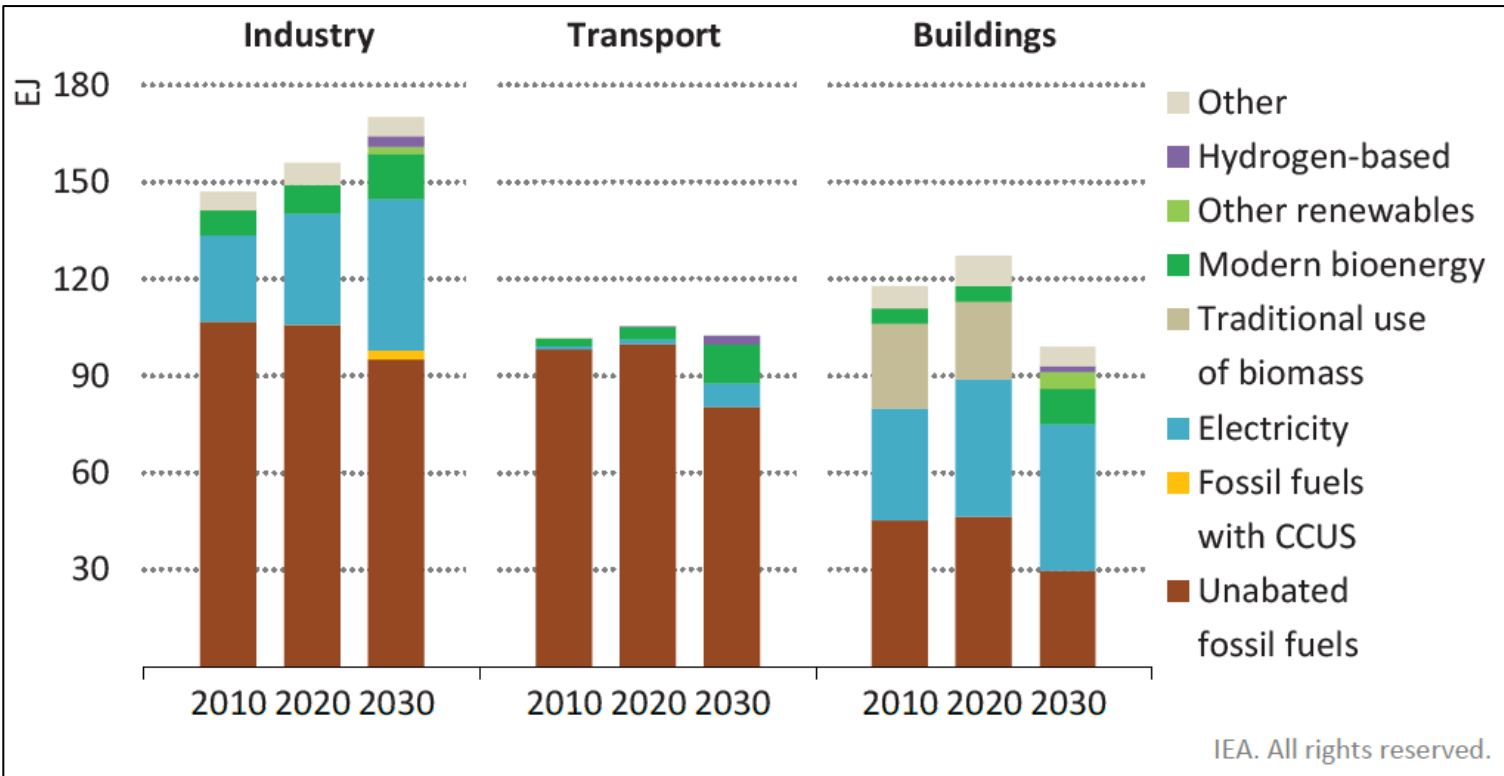
Energy Efficiency Policy Status in SEA

		EE Policy & Regulatory Mechanisms					
		EE Policy / EE Act	Mandatory Energy Audits for DECs	Appliance S&L	Building Energy Code	EA / ESCO Certification	Developed ESCO Market
Singapore		Enforced	Enforced	Enforced	Enforced	Enforced	Enforced
Thailand		Enforced	Enforced	Enforced	Drafted	Drafted	Drafted
Vietnam		Enforced	Enforced	Enforced	Absent	Absent	Absent
Myanmar		Drafted	Under Development	Absent	Under Development	Under Development	Under Development
Cambodia		Absent	Under Development	Absent	Drafted	Under Development	Under Development
Laos		Drafted	Under Development	Absent	Under Development	Under Development	Under Development
		Absent	Under Development	Drafted	Enforced		

The rapid increase in demand for energy is attributed to increased **economic** activity, **industrial development**, rapid **urbanization**, increased **transport demand**, improved **energy access** and **improved standard of living** in SEA regions.

“Demand Side Energy Efficiency is key to addressing the issue of rising energy demand trends in GMS countries”

Global Energy Consumption Breakup by Source & Sectors and Forecast in “NZE by 2050 Scenario”



Transport has the **highest level of reliance** on **fossil fuels** of any sector and **accounts for 37% of CO2 emissions** from end-use sectors (7.1 Gt in 2020)

In NetZero, electricity share in TFECE rises from 20% to 26% by 2030 implying massive **growth in sales of EVs and appliances.**

Universal **access to clean cooking** solutions is realized in 2030 in NZE, eliminating traditional use of biomass

Share of modern bioenergy more than **doubles by 2030** and its growth is significant in long-distance transport. Demand for coal and oil declines the most in NZE scenario.

Between 2020 and 2030, the **energy intensity** of global economy decreases by **4.2% per year** in NZE

Reference: Final Energy Consumption in exajoules by Source and Sector to 2030 in the NetZero Emissions by 2050 Scenario, IEA 2021

2

Possible Strategies
for Energy Transition
- Building Sector

Transition of Services in Building Sector

Existing Areas

	Government bodies	Private & Corporates	Financial Institutions	Academia & Think Tanks
EE Codes Development & Implementation	Primary	Secondary	Primary	
EE, Sustainability, RE & Green building roadmaps		Primary	Secondary	Secondary
Advisory & Implementation on Energy Supply	Primary	Primary	Secondary	
Energy Performance Contracting		Primary	Primary	
Energy audits, Post occupancy evaluations	Secondary	Primary	Primary	
EE Retrofit advisory, EMS support	Secondary	Primary	Primary	



Emerging Areas

	Government bodies	Private & Corporates	Financial Institutions	Academia & Think Tanks
Net Zero Energy & Smart Readiness Guidelines	Primary	Secondary	Primary	
Data-Drive & User-Centric Design		Primary	Secondary	Primary
Occupant Health & Wellbeing advisory		Primary		Primary
Smart, Low energy & Phase Change Materials	Primary		Secondary	Primary
High tech, Low Carbon Cooling consultation	Secondary	Primary		Primary
Grid interactive buildings, Smart grid	Primary		Primary	Secondary
District Energy Systems, Cooling as service	Primary	Primary		
IOT-enabled BMS		Primary		Primary

Primary

Secondary

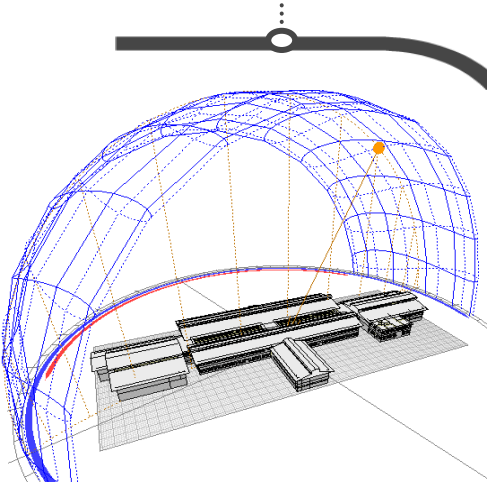
Road to Resource Efficient Buildings – New Buildings

Green Building Design Considerations shall be embedded in the National Building Codes

Baselining, benchmarking and optimizing at each step and going beyond to achieve carbon neutrality at an optimum investment. Every step to be evaluated considering its environmental impact, and local market conditions

Bio-climatic design elements

Form and massing, orientation, solar shading, microclimate



Passive design features

Resource Efficient Building Materials, daylight and visual comfort, External Shading, etc.

High efficiency envelope

High performance walls and roof, efficient glass, local, sustainable and low embodied energy materials

Smart Energy Management System

IoT-enabled smart building energy management systems, predictive building operations, IAQ Sensors and Centralized Controls for Ventilation Operation

Efficient and sustainable cooling

Enhanced thermal comfort and process cooling through high efficiency conventional cooling to meet Healthcare Ventilation Standards

Load optimization

Super-efficient and smart lighting system, efficient process equipment, hybrid of natural and artificial lighting

On-site renewable energy

Rooftop and on-site solar PV, Waste-to-energy options

Clean energy alternatives

Utility-scale clean energy options, Renewable Energy Certificates

Resource efficiency

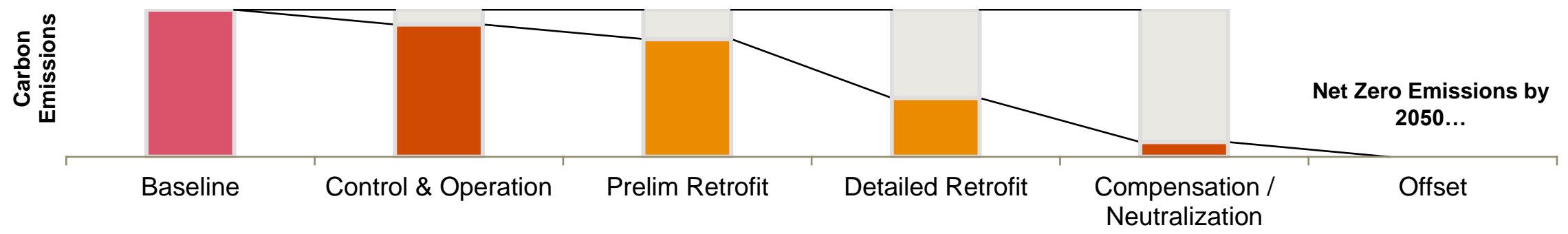
Efficient water use and water conservation leading to Net Zero Water usage, zero waste diversion



Road to Resource Efficient Buildings – Existing Buildings

Decarbonization roadmap based on realistic year on year targets shall be formulated for high Energy Consuming Buildings

- 1. **Baseline Development**
To result in preparing the baseline data on Energy & GHG emissions across Designated / High Energy Consuming Buildings
- 3. **Optimize Energy Demand / Prelim Retrofit**
Consider building energy simulation backed calculations to simulate impact of various EE measures (technology retrofits, operations control, etc)
- 5. **Compensation / Neutralization**
Consider feasibility of using RECs, Carbon credits, other similar options as compensatory measures



- 2. **Optimise Control & Operations**
Assess decarbonization strategies for implementation across building operation & end use. Establish mechanisms for IT based monitoring & reporting. Implement strategies in phase wise fashion in line with targets.
- 4. **Transition to Clean Energy**
Consider a) RE Purchase through PPAs or power trading, b) Shift to low GWP refrigerants, c) Reducing fossil consumption in phases in line with targets
- Undertake Cost-Benefit Analysis for each of the decarbonization recommendations in line with 'Targets'**
Estimate investment requirements, cost saving potential, pay-back period and present findings to management for their acceptance

S&L as a Policy Measure to Drive Energy Efficiency in Buildings

Market Transformation

- Drives out inefficient technologies from the market
- Creates a conducive environment for innovation in Energy Efficiency domain and thus enables job creation

Consumer Benefits

- Reduced energy bills
- Assurance of superior quality products thereby lower maintenance costs
- Averted urban/regional pollution

Socio-Economic Benefits

- Increase income of consumer with reduced energy bills
- Avoided investment on generation capacity addition to cater increasing demand
- Free-up existing generation capacity thereby increase energy access
- Reduced carbon emission thereby aiding in achieving NDC commitments
- Reduced energy imports thus moving towards achieving energy security

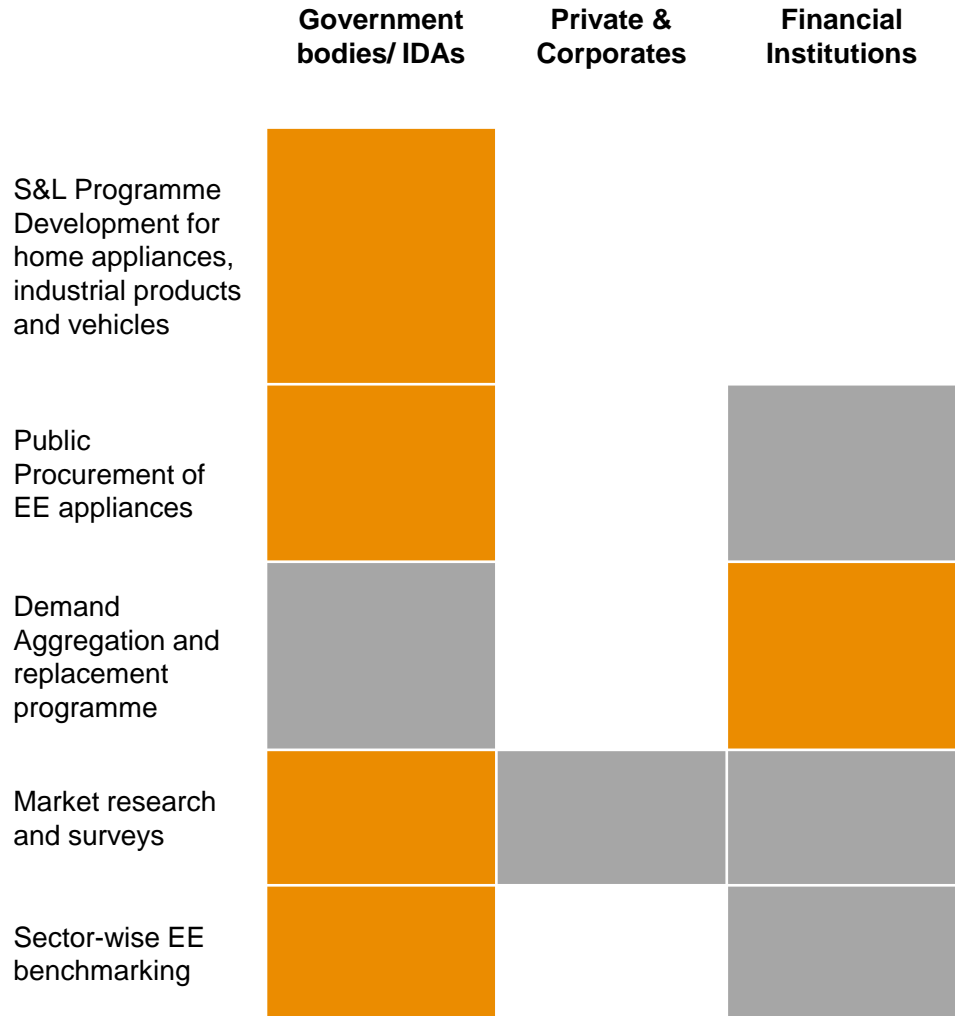
For high-consuming appliances, the difference between average appliances in use and efficient new appliances is substantial



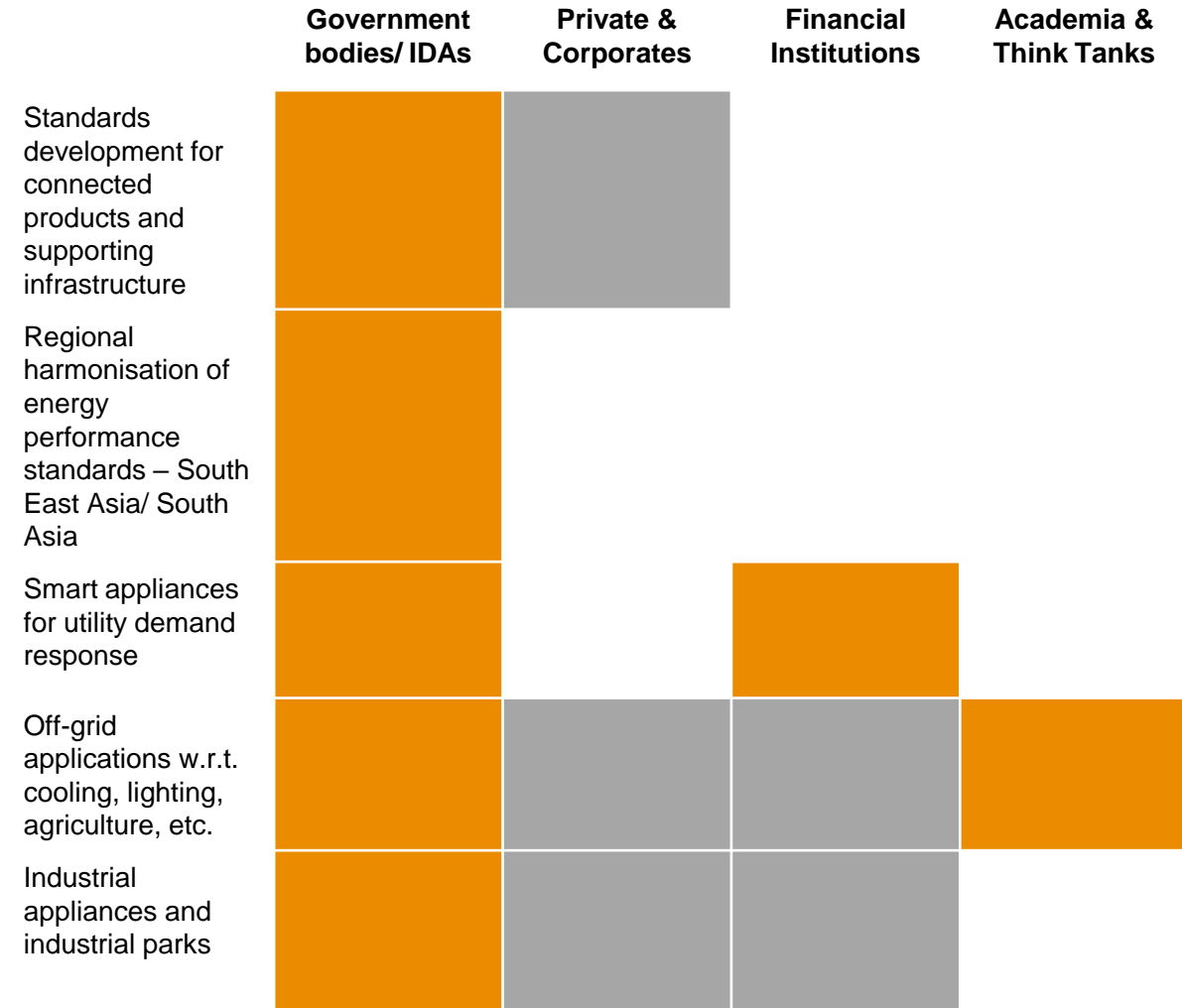
	Typical Appliance in Use (GMS HH)	Efficient new Appliance HH	Ø Savings Potential per annum
Air Conditioners	1802 kWh/yr	1180 kWh/yr	622 kWh, 35%
Refrigerators	342 kWh/yr	129 kWh/yr	213 kWh, 62%
TV	184 kWh/yr	92 kWh/yr	92 kWh, 50%
Fan	168 kWh/yr	84 kWh/yr	84 kWh, 50%
Washing Machine	159 kWh/yr	139 kWh/yr	20 kWh, 13%
PC	64 kWh/yr	29 kWh/yr	35 kWh, 55%
Light	16 kWh/yr	8.4 kWh/yr	7.6 kWh, 48%

Transition of Services – S&L

Existing Areas



Emerging Areas



Aspects of S&L

Promote efficient & sustainable products

Influence consumer behaviour

Promote healthy competition amongst importers/ manufacturers

Award / recognize best in class products



Improve technology / market standards

Market monitoring

Phase out inefficient products

Regulate energy intensive products



Improve compliance and enforcement

Build test laboratory capacity

Measurement and verification



Monitor and improve outcomes

Impact assessment of the labelling scheme

Compliance with international commitments (Montreal / Kigali etc.)

3

Possible Strategies
for Energy Transition
- Industrial Sector

Approaches for Industrial Energy Efficiency

Approaches towards energy efficiency

Voluntary

- Industry see's scope to reduce energy cost by improving efficiency
- Gets detailed energy audit conducted through experts
- Implements recommendations for improving energy efficiency

Mandatory

- Government schemes
- Example: PAT (Perform Achieve and Trade) in India
- Example: Mandatory energy audits are also part of schemes in Australia, Thailand, Taiwan, etc.

Approaches towards energy efficiency in SME's

Saturation

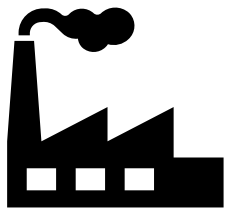
- Aims at reaching large number in shorter time
- Energy saving measures involve no/low to medium investments
- Do not address process modifications
- Leads to smaller energy savings with bundling of a number of ECMs

Innovative

- Focuses on major energy consumption areas
- Requires design modifications through R&D efforts, resource pooling...
- Require more time but provides holistic solutions
- Leads to major energy saving, need for long time engagement at cluster level

Common DSEE Interventions Across Industrial Sectors

Industries



Sub-Sectors Considered*



Brick



Argo-processing



Cement



Textile, Footwear & Garments



Paper & Pulp



Iron & Steel

**The sub-sectors selection varies for different countries based on their value to respective GDP and energy consumption.*

EE Technologies*



Variable Speed Drives



EE Compressors



Pumps & Motors



LED Lamp & Luminaire



HVAC Systems

- Waste Heat Recovery Systems
- Boilers
- Use of alternative fuels such as diesel to LPG in dryers in Rubber factories

**Only few cross-sectoral technologies are provided here. The complete technologies and their applicability within industries are given in country specific slides in the annexures.*

Infusing Energy Efficiency in industries...

Systematic path to transition industries with low carbon technologies and promote energy efficiency and conservation.

What?

Diagnostic Phase:

- Field visit and initial assessment of energy saving potential and identification of troubled areas
- Instrumented measurements and analysis for all major equipment within plant boundary for thermal and electrical consumption

01



Solutioning Phase:

- Identification and prioritization of energy conservation measures and classification based on investment (no cost, low cost, medium & high-cost).
- Implementation support for no and low-cost measures.
- Capacity building of plant personnel

02



Implementation Roadmap:

- Action plan for implementation with financing options for medium and high-cost measures
- Implementation support for medium and high-cost measures

03



How?



Assessment of timeseries data & instrumented audit



Identify innovative solutions & implementation plan



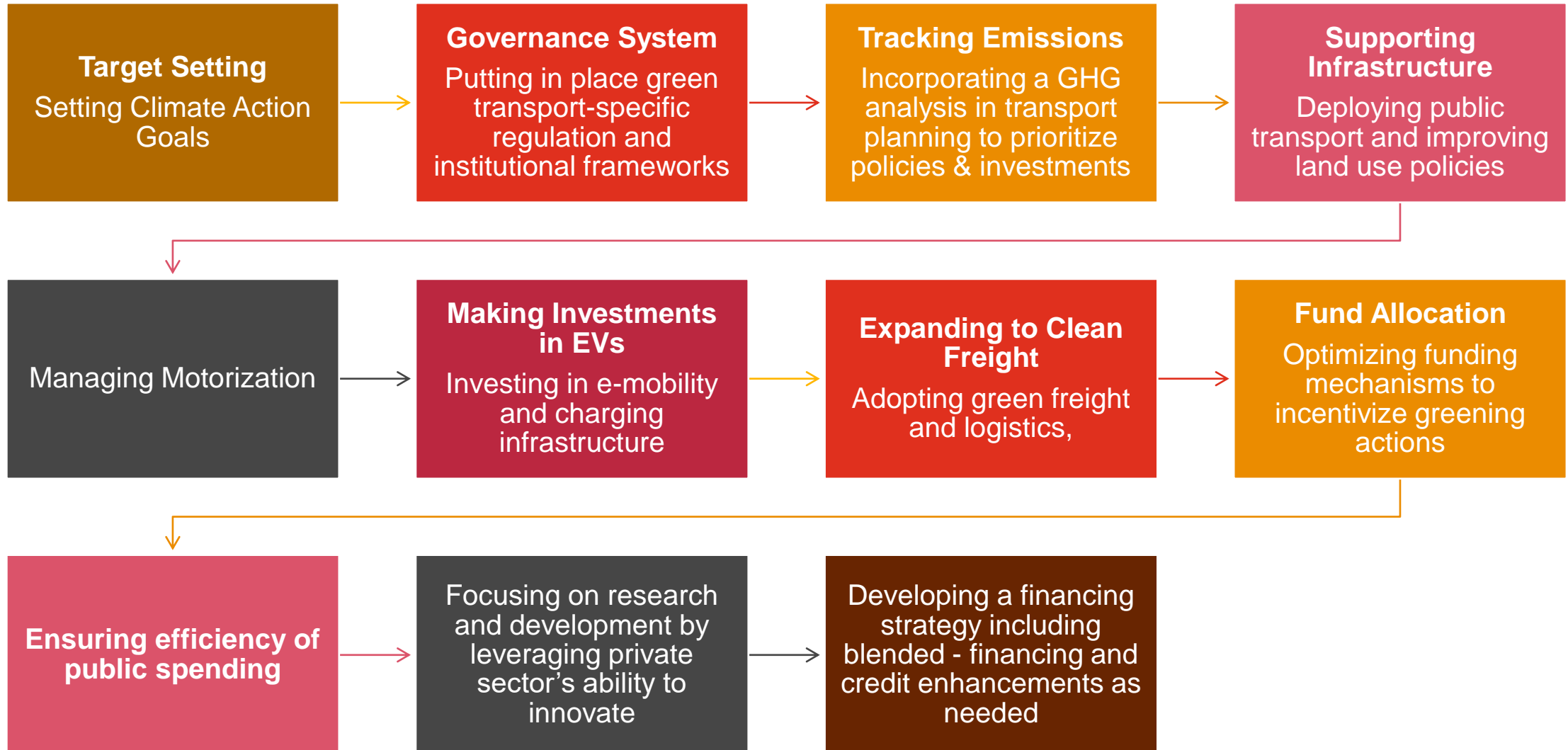
Develop EE skillsets with future outlook



4

Possible Strategies
for Energy Transition
- Transport Sector

Road to Transport Sector Decarbonization



Possible Decarbonization Measures Administered by Governments

Supply Side Interventions / Aimed at Suppliers

01 Fuel Efficiency (FE) Norms

Gains in energy efficiency across all modes of transport on account of FE targets set as per **Corporate Average Fuel Economy** or Fleet level mandates set as long-term targets.

02 ETS for Fuel Suppliers

Emission Trading Scheme works on the principle of **'Cap & Trade'** where credits can be awarded to operators of Renewable Electricity run EV charging stations for **credit trading among fuel suppliers**. Scope of the scheme could be expanded to biofuel mix offered by fuel suppliers. **Gradually fuel supplier obligations could be introduced in terms of RE in fuel mix.**

03 Emission Standards

Tail pipe emissions from vehicles are regulated in several countries. Countries such as EU, India, Singapore, China and more have taken a lead in adopting emission standards equivalent to **Euro VI**. Emission **limits are set on CO, Total Hydrocarbons, NOx, PM and Particle Number (PN)**

04 S&L for Vehicles, Tyres, etc.

Vehicle Fuel Efficiency Labeling (VFEL) is used by numerous countries worldwide to improve the fuel efficiency of their transport fleets. Labels indicate tested fuel economy **CO2 emitted/km**. Fuel efficiency is further driven as a result of **MEPS mandate**. Thailand, Vietnam, Singapore, China, Japan, Korea and others have mandated VFEL.

Demand Side Interventions / Aimed at Buyers

05 Green Freight Program

It involves deployment of technologies and practices to improve efficiency of freight sector to cut costs and carbon emissions and **provide a means to track and benchmark performance**. **Either targets are set for the freight operators or recognition is provided based on comparative performance.**

06 Feebate Program

A feebate program **levies a fee on inefficient vehicles and offers a rebate on efficient vehicles**. The funds generated from the imposed fees on inefficient vehicles are used for awarding rebates for efficient vehicles. The benchmark or pivot point should be revised periodically to ensure that fees are in line with rebates for program sustainability.

07 Vehicle Scrappage

Scrappage schemes for old vehicles can reduce inefficient vehicles from on-road transport. Old IC engine vehicles are not in line with the latest standards and are bound to emit more pollutants than recent cars. Levying taxes on old in-efficient cars encourages car owners to replace them

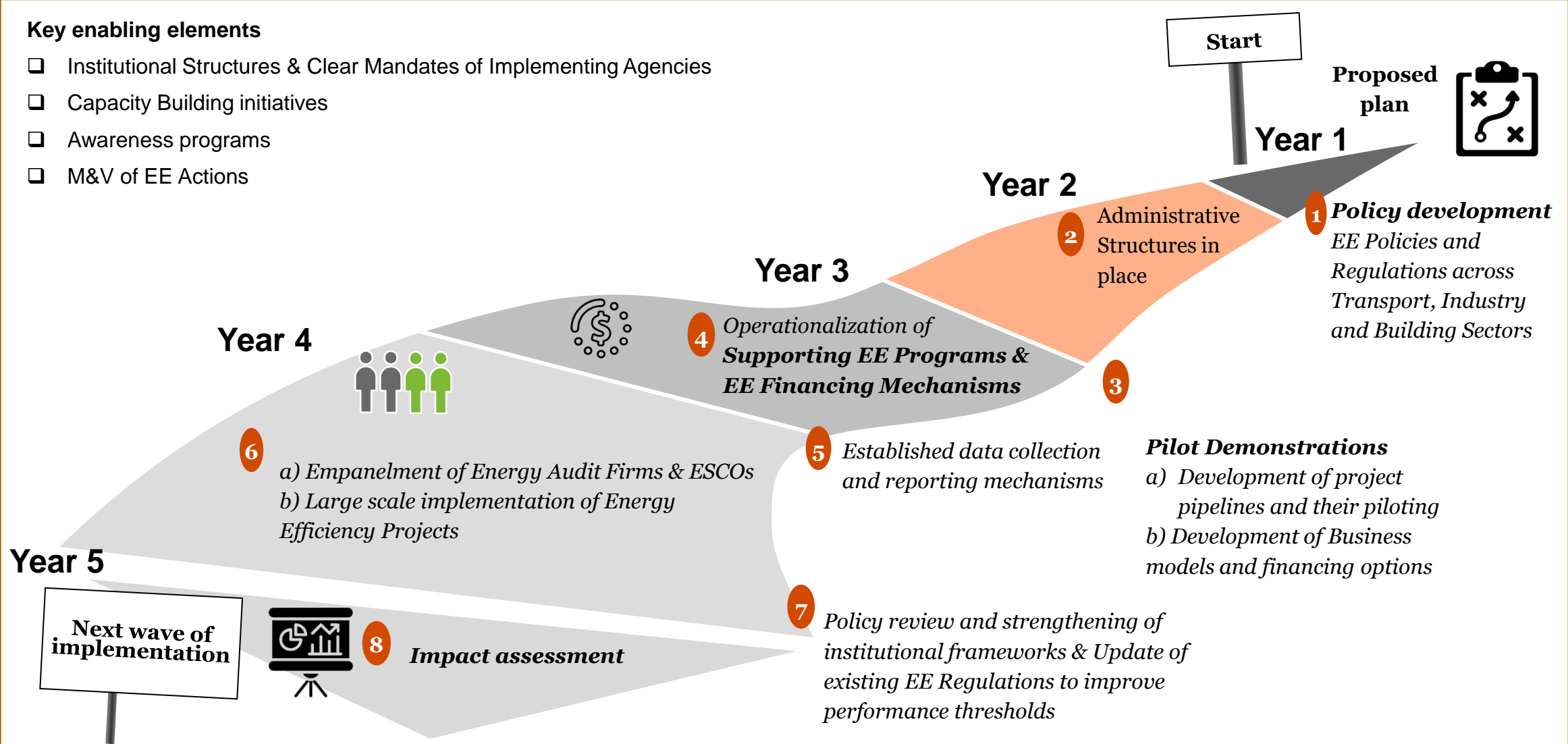
08 Road Congestion Pricing

Charges are levied for the use of roads **during peak demand hours** in urban cities for areas experiencing traffic congestion. This has been successful in Singapore, London. Charges can be levied based on time of the day with use of Satellite systems and cellular network.

5

Possible Roadmap
for Energy Transition

High Level Roadmap for Energy Efficiency Transition in GMS Countries



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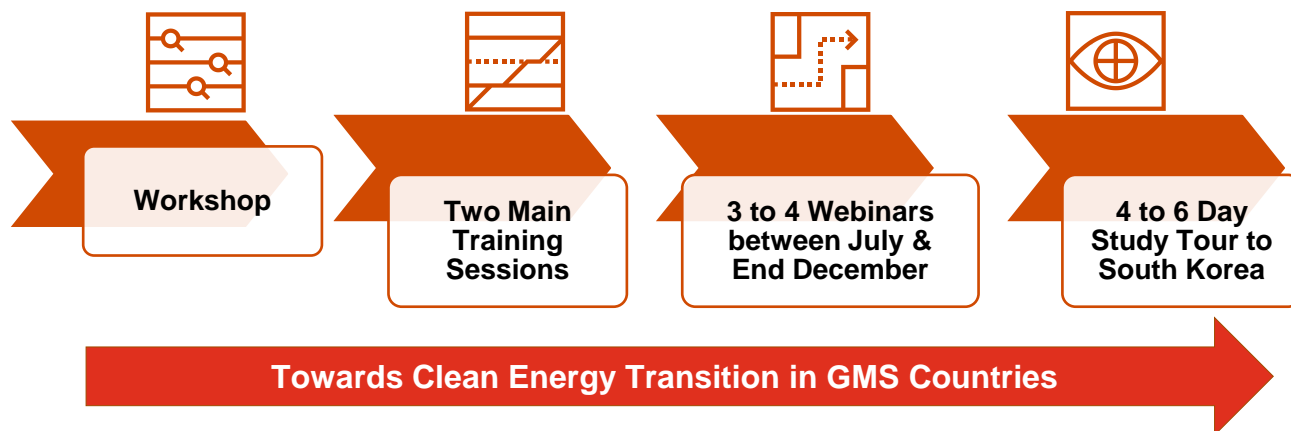
Program Highlights –
Clean Energy
Transition

Objectives & Training Workstream Outline

Project Objectives

- Provide an understanding of issues and challenges related to energy transition in the GMS and how energy efficiency can play a major role in the decarbonizing the energy sector
- Support the GMS Energy Transition Task Force with trainings on energy efficiency
- Showcase how green and sustainable finance can support this energy transition by factoring in socioeconomic factors of job creation, livelihoods and productivity

Proposed Structure



Training Outline

Training Course 1

- Introduction to benefits of Energy Efficiency in decarbonizing economy/sectors.
- Enablers to take forward Energy Transition Agenda in GMS and plan future agenda covering the major energy consuming sectors.
- Presentations by GMS countries on EE policies/programs followed with open Discussions on Country Scenario to explore how ADB can assist in accelerating EE programs.

Training Course 2

- Country presentations on need and requirements in terms of capacity building, policy support and need for a common EE transition agenda in GMS countries.
- To identify TA requirements for GMS countries in the context of Energy Transition
- Knowledge sharing around success stories and roadmaps from around the world.
- Best practices on EE from region and around the world



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Thank You

