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Background Paper on:

Asia Low Carbon Buildings Transition (ALCBT) Project | An initiative by International Climate Initiative (IKI)

Acknowledgement

This background paper has been prepared by the Global Green Growth Institute (GGGI) for the Asia Low Carbons Buildings Transition (ALCBT) Project, under the initiative of the Government of Germany through the International Climate Initiative (IKI). The Asia Low Carbon Building Transition (ALCBT) Project is a five-year multi-stakeholder project that aims to facilitate the nationwide transition towards Low Carbon Buildings in five Asian countries namely, Cambodia, India, Indonesia, Thailand, and Vietnam.

The project is jointly being implemented by GGGI with Energy Efficiency Services Limited (EESL), HEAT International and ASEAN Centre for Energy (ACE).

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List of Abbreviations

ALCBT	Asia Low Carbon Buildings Transition
ACE	ASEAN Centre for Energy
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APAEC	ASEAN Plan of Action for Energy Cooperation
ASEAN	Association of Southeast Asian Nations
BAU	Business as usual scenario
BEE	Bureau of Energy Efficiency
BEEP	Building Energy Efficiency Program
BMKW	Federal Ministry of Economic Affairs and Climate Action
BU	Billion Units
CO_2	Carbon dioxide
EC	Energy Conservation Act
ECBC	Energy Conservation Building Code
ECBC +	ECBC Plus
EE	Energy Efficiency
EESL	Energy Efficiency Services Ltd.
EMC	Energy Manangement Centre
ESCO	Energy Servicing Companies
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GHG	Green house gases
HAREDA	Haryana Renewable Energy Development Agency
HEAT	HEAT International Gmbh
ICAP	India's Cooling Action Plan
IEA	International Energy Agency
IGBC	Indian Green building Council
IKI	International Climate Initiative
Ind	Indicator
JV	Joint Ventures
kVA	Kilo volt amps
kW	Kilo watt
LCB	Low Carbon Buildings
LCBT	Low Carbon Building Tools
LCT	Low Carbon Tools
MoEF	Ministry of Environment and Forest
MoHUA	Ministry of Housing and Urban Affairs
MoP	Minnistry of Power
MRV	Monitoring Reporting Verification
NAPCC	National Action Plan for Climate Change
NMEEE	National Mission for Enhanced Energy Efficiency
NZE	Net Zero Energy
NZEB	Net-Zero Energy Buildings
OSS	One stop solution
PSC	Project Steering Committee
PWD	Public Works Department
SDA	State Development Authority
TA	Technical Assistance
TAC	Technical Advisory Committee
TCO_2eq	Tons of CO_2 equivalent
TWh	Tera watt hour
WP	Work Package

1 Building Energy Efficiency Program: Initiatives in India

1.1 Introduction

Energy is one of the key indicators that reflect the growth of a nation. The efficient use of this important resource is the cornerstone of sustainable development. For a nation that has a substantial population, with a tremendous appetite for energy being necessary to improve living standards, wherein one is constrained both by resource limitation and usage liberty, energy efficiency comes as the first fuel. In its bid to combat increasing energy consumption and related carbon emissions, the National Action Plan for Climate Change (**NAPCC**) has provided pathways for sustainable development of the country by promoting low-carbon and high resilience development. Under the action plan, the National Mission for Enhanced Energy Efficiency (**NMEEE**) focussed primarily on enhancing the energy efficiency of large energy intensive sectors by helping accelerated adoption of low-carbon technologies, appliances, and equipment through innovative measures for market transformation enabled by appropriate financial instruments.

1.2 Energy Consumption and Growth Projections in Building Sector

The building sector is very important for energy conservation in India. Buildings are being constructed in India at a rapid pace and still majority of the building stock remains yet to be constructed. If buildings are constructed with built-in efficiencies, then these inefficiencies will be locked in for at least the next 50 years. Even for existing buildings, the potential for energy savings is more than 30-40%. Hence it is very important to frame policies for residential and commercial Buildings.

As per BEE, for the Low Carbon Strategies for inclusive Growth in building sector, the estimated commercial floor space in 2005 has been estimated as 425 million square meters[1] with the electricity consumption being 35.965 billion units[2]. Taking the figures of 2005 as the baseline, and assuming a growth rate of 8% for office & retail spaces and 10% for hospitality sectors, the electricity consumption is expected to increase (BAU scenario) for residential sector to about 707 BU in 2030 from 247 BU in 2015. In case of commercial buildings, electricity consumption seems to increase to 162 BU in 2030 from 93 BU in 2015. Together these sectors will consume about 850 BU by 2030. With implementation of policies like 24x7 and power for all, this consumption may increase further.

1.3 Energy Conservation Building Code (ECBC)

The Energy Conservation Building Code (ECBC) was launched in May 2007 by the Bureau of Energy Efficiency (BEE), Ministry of Power. Its main objective is to establish minimum requirements for energy efficient design and construction of buildings. BEE has launched a new version of code ECBC 2017 on 19th June 2017. The newly developed code is futuristic, pragmatic, and easy to implement. The new version of Code is geared to encourage public and private sectors to not only meet the basic ECBC criteria, but to exceed them as well. Long-term success of the ECBC will depend heavily on the collaborative roles that various stakeholders would play towards the development, adoption, and implementation of building code. The ECBC sets minimum energy standards for new commercial buildings having a connected load of 100 kW or contract demand of 120 kVA or more. The effective implementation of code provides comfort to occupants by adopting passive design strategies & day light Integration. It is technologically neutral, promotes renewable energy and also emphasises on the life cycle cost of building.

ECBC 2017 is one of the first building energy codes to recognize beyond code performance. One of the major updates to the code is inclusion of incremental, voluntary energy efficiency performance levels. There are three levels of energy performance standards in the Energy Conservation Building Code (ECBC) i.e., ECBC, ECBC Plus, Super ECBC. In ascending order of efficiency, an ECBC compliant building has approx. 25% savings, the ECBC+

[1] Roshanee (beeindia.gov.in)
[2] Based on data from the Central Electricity Authority (CEA), GoI

building approx. 35% savings and compliance with Super ECBC building performance standards will result in energy savings of 50% or more in comparison to conventional buildings.

BEE has targeted the following initiatives aligning with ECBC in new commercial and new residential buildings by 2030:

New Commercial Buildings:

- ECBC Code to be updated to include building-integrated renewable and incorporate technological advancements to achieve Nearly Zero Energy Buildings.
- Notification of ECBC Rules under Central notification.
- Standardize procedures for notification of ECBC in states as well as implementation procedures.
- All States to mandate ECBC with the objective that 75% of all new commercial buildings are ECBC compliant.
- Mandate States to adopt ECBC in their building byelaws to avail benefits under Government National Missions such as Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart Cities Mission, etc.
- BEE will provide support to States for training and capacity building of State Departments for adoption and enforcement of the code.
- BEE to develop website for compliance of ECBC by states on both modes i.e., Prescriptive and Whole Building Simulation methods.
- Establishment of ECBC Cells in State Urban Development Departments / PWDs to support and monitor progress.
- Super ECBC building will be supported in 5 states with necessary financial support to develop Super ECBC compliant building which will be equivalent to near zero energy building.

New Existing Buildings:

- Extend the coverage of ECBC to the multi-storey residential sector as well, with amendments to the Energy Conservation (EC) Act.
- Amendment of the EC Act to extend the coverage of ECBC to the residential sector.
- Labelling programme for Residential Buildings
- Model designs for energy efficient houses for early adoption.

1.4 Vision for Net-Zero Buildings

Net zero energy (NZE) describes buildings whose energy consumption and emissions are fully offset by energy generation on site. The buildings would generate as much clean energy as they consume. Once considered as far-reaching, expensive goal only available to the technically advanced, net zero buildings are now well within the realm of possibility. The Net Zero Energy Buildings concept into commercial retrofits will improve the energy efficiency levels in existing buildings, exploring the possibilities of involving renewable energy sources to reduce their dependence on external energy sources. Ministry of Power has directed to make all administrative buildings of Ministry, sub-ordinate offices, attached offices and CPSUs including subsidiaries and Joint Ventures (JV's) as Net-Zero Buildings. It is estimated that adopting NZEB will help occupants enjoy 90% of comfort level with a 50% reduction in energy consumption and meeting the energy needs 100% through renewable sources[3]. In India although the concept is in its nascent stage, it has been successfully applied in Indira Paryavaran Bhawan, Ministry of Environment and Forest (MoEF), AkshayUrja Bhawan, HAREDA, Panchkula etc.

Table 1: Actionable Points in the Building Sector

Few Actionable Points- Buildings Sector	
Energy Conservation Building Code	*Strengthening states institutions to operationalize Commercial and Residential Building Codes*

[3] Roshanee (beeindia.gov.in)

Buildings under Perform Achieve & Trade (PAT) Scheme	*Improving energy performance index of buildings through mandatory targets*
Energy Efficiency label	*Develop energy efficiency labels for buildings*
Financing incentives under buildings	*Promoting Energy Efficiency in buildings through financial incentives*
Efficient Buildings	*Synergizing of upcoming concepts such as net zero buildings, passive house, building aspects in smart cities, etc.*
Low-Carbon Building Material	*To promote energy efficient building materials*
Sample Standard design	*Creating replicable model design for code compliance*
Thermal Comfort	*Initiate and disseminate studies on thermal comfort*
Demand Response	*Study on building demand response with internet of things (IOT) and artificial intelligence (AI)*
Comprehensive Database	*Preparing comprehensive database on building materials, technologies, devices, processes, expert manpower, etc., and making them available in public domain*

1.5 Building Energy Efficiency Program (BEEP) in India by EESL

Considering enough opportunities of energy saving the building sector, Energy Efficiency Services Ltd. (EESL), an entity under Ministry of Power (MoP), Govt. of India has tried to address the same through innovative business models in various building categories. EESL's building programme enables the building owners to overcome technical & financial barriers to promote energy efficiency implementation in the buildings. Since 2017, EESL has retrofitted energy efficient appliances in over 10400 buildings This has resulted an estimated saving of about 360 million units per annum – around 32% reduction from baseline consumption. EESL invested around $50 Mn in this program[4].

Figure 2: Physical achievements of the EESL Building Energy Efficiency Program (BEEP)

However, the interventions are only for existing public buildings.

[4] EESL

2 Asia Low Carbon Buildings Transition (ALCBT)

2.1 Project Background

Considering the high energy consumption in the **building sector** and its opportunity for decarbonization, the Global Green Growth Institute (**GGGI**) developed a concept note post due consultation with the relevant stakeholders in the Southeast Asia region during 2020. This concept note was primarily made to develop a full-scale proposal to seek technical assistance (TA) funding from the Federal Ministry of Economic Affairs and Climate Action (**BMKW**) under their call for proposal in the International Climate Initiative (**IKI**). Accordingly, GGGI developed the full-scale proposal on ***Asia Low Carbon Buildings Transition*** (ALCBT) project focusing on 5 countries in South and Southeast Asia, namely **Cambodia, India, Indonesia, Thailand and Vietnam.** These countries represent over 70% of the future business-as-usual (BAU) building related GHG emissions in Asia outside China.

In the Asian region, buildings, particularly space cooling, are the main drivers for the growing future electricity demand and rising GHG emissions. For example, the building related electricity demand for space cooling in India will grow more than 4 times to 585 TWh and in ASEAN more than 3.5 times to 350 TWh by 2040 from current levels (IEA WEO 2018,2019). GHG emissions from the building sector arise from the building construction, material production (25% of the lifetime carbon footprint of a building), electricity consumption by appliances and systems (with cooling accounting for about 50% of the life-time carbon footprint and 25% by other appliances such as water heating, elevator, lighting). The current building stock often utilizes inefficient insulation, shading, appliances, and systems. Low carbon buildings integrating better insulation, tighter building shells, improved designs, more efficient appliances for heating & cooling and a transition to natural refrigerants can reduce GHG by about 3 GT CO_2 by 2050 in the selected project countries.

While the project countries are taking steps towards addressing the energy intensity of new buildings by establishing building codes which are partly mandatory in some of the project countries for larger buildings, they are still inadequately enforced (India, Indonesia, Thailand, Vietnam)[5]. These codes do not comprehensively cover the carbon footprint of buildings (no comprehensive inclusion of the carbon footprint of building materials, no consideration of refrigerant-related emissions from cooling appliances). The building codes and energy management initiatives do not effectively cover the retrofit of existing buildings.

Larger buildings in Asia are debt-financed. However, the financial sector has not systematically started to link the financing of buildings with their carbon performance. This results in a financing gap for developers proposing low carbon buildings. The EU Taxonomy addresses this gap and is increasingly being referenced and adopted beyond the EU.

In **India**, the building sector is one of the energy intensive sectors. The uneven implementation of building energy efficiency standards across the country could see a sevenfold increase in CO_2 emissions by 2050[6]. Globally, India accounts for the largest increase in peak electricity load, mostly due to the cooling demand[7]. Keeping this in mind, the Government of India's Cooling Action Plan (ICAP) was designed with an integrated vision, targeting a reduction in cooling demand, refrigerant transition and enhancing energy efficiency by 2038. The highest potential for substantial carbon savings is in buildings that are yet to be built, which will account for 70% of the country 's urban infrastructure in 2030[8].

The government has set a target of reducing the emissions intensity of its GDP by 45% by 2030 from 2005 levels. The building energy efficiency and energy management sectors have thus been prioritized for action. The Energy

[5] In **India**, the Energy Conservation Act (2001) is a national strategy to lower energy intensity while the Energy Conservation Building Code (ECBC) prescribes performance requirements for building elements. Still, India still faces substantial challenges in enforcing residential and commercial building codes. The government of **Indonesia** has issued regulations on buildings. Jakarta and Bandung have adopted mandatory green building codes, but only 5% of buildings in Indonesia are subjected to mandatory energy performance. In **Vietnam**, Laws and Technical Regulations6 on energy performance of buildings exist but have limited impact due to enforcement limitations.

[6] https://rmi.org/indias-buildings-sector-moonshot-corporate-climate-commitments-can-forge-the-path/
[7] https://documents1.worldbank.org/curated/en/131281601358070522/pdf/Primer-for-Space-Cooling.pdf
[8] https://rmi.org/indias-buildings-sector-moonshot-corporate-climate-commitments-can-forge-the-path/

Conservation Building Code (ECBC) will be made mandatory across all states to promote construction of (near-zero) energy-efficient buildings. There is also increasing focus on ensuring that the ECBC for residential buildings is implemented. Complementary initiatives include GIZ's project with MoHUA on Climate Resilient Buildings, promoting low carbon materials and the recently concluded MAITREE project focusing on sustainable cooling. The ALCBT complements these efforts with the building MRV tool, which assesses the embodied and operation carbon and cooling efficiency.

Besides India, the other project countries are also directly or indirectly adopting the transition to low carbon buildings in their NDCs. However, a comprehensive approach for tracking progress and meeting NDC targets has not been systematically implemented. Regional approaches have been introduced for MEPS and labels for appliances in ASEAN but not for buildings across the region. ASEAN countries have committed to harmonized energy standards and regional collaboration in reducing energy intensity across the region. This is applied for appliances but not yet for buildings.

Existing barriers and gaps are holding back the strategic ambition of moving to low carbon targets. The ALCBT overcomes barriers including patchy and complex building codes, lack of access to financing, lack of frameworks for financing industry to valorise low carbon building benefits, lack of technical capacity of the essential stakeholders (government, industry, environmental /energy agencies.) The project will have a major impact on overcoming these barriers and realising the identified mitigation potential. The project partners are deeply anchored in the project countries and hold a strong network of regional and local partners to ensure the full and successful implementation of the project. The ALCBT supports the national policies and aspirations for low carbon buildings, and the APAEC strategy. It also aligns with the recommended actions for *new and existing buildings* and other areas in the GlobalABC Regional Roadmap for Asia.

Keeping the above factors in view, GGGI intends to intervene in the building sector in 5 Asian countries through a programmatic approach with due support from IKI. This project, which is expected to kick off from July 2023, will address varieties of issues like low-emission analytical tools, capacity building, the ESCO model and innovative financing mechanisms by June 2028. The proposal has been approved in principle by BMKW and other formalities are in progress. The brief description of the project is explained below.

2.2 Target group:

As said above, the ALCBT project will involve various target groups as the beneficiaries. The following are the broad target groups within the project countries:

I. **National and state/city governments** for establishing and implementing a comprehensive framework for low carbon buildings and institutionalizing the MRV tool and Building Registry.
II. **Developers, building owners, suppliers, engineers and architects** to provide industry insights and engagement to realise the transition of new and existing buildings to low carbon standards.
III. **Financial services institutions** (including ESCOs and banks) will be sensitized to apply the MRV tool as part of the taxonomy for the financing of low carbon buildings.
IV. **Academia and training institutes** to integrate low carbon buildings and sustainable cooling into tertiary education and professional training.

Therefore, this project shall include techno-financial and policy aspects encompassing the building sector.

GGGI will implement this project under the guidance of Ministry of Housing and Urban Affairs (**MoHUA**), Govt. of India through a consortium comprising of Energy Efficiency Services Limited (**EESL**) from India, the **HEAT** International from Germany, and the ASEAN Centre for Energy (**ACE**) from Indonesia. The consortium partners will cooperate with the national actors of the project countries to transfer knowledge and embed project approach within national institutions. **GGGI** as an international organization has strong relations to the relevant government partners in all partner countries. **HEAT** will provide technical guidance and methodology development to be applied in the project. **EESL** is a public company established for the enhancement of building and building related energy efficiency standards in India and beyond. **ACE** as intergovernmental organisation mandated to support ASEAN countries in transiting to a low carbon energy economy maintains strong links to all ASEAN energy ministries.

In India, the project will have state partners like **Energy Management Centre (Kerala), Dept. of Environment & Forest (Uttar Pradesh)** and **Haryana Renewable Energy Development Agency (HAREDA).**

2.3 Programme objectives, results, and structure

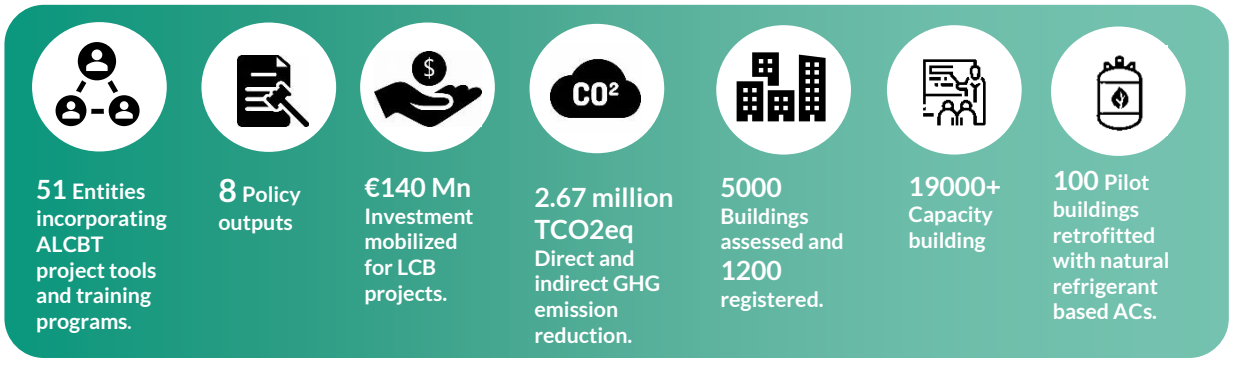
The project seeks to catalyse a nationwide sectoral transition towards low carbon buildings in *Cambodia*, *India*, *Indonesia*, *Vietnam* and *Thailand* with the innovative approach addressing new and renovated buildings. Through this project, technical, planning and institutional tools for low carbon buildings implemented by key public and private sector stakeholders in the project countries. These tools and technical capacities will further be mainstreamed in public and private institutions by the end of 2028.

Figure 2: ALCBT Results Framework structure

<table>
<tr><td colspan="4">Impact (s)
Nationwide transition towards low carbon buildings in Asian countries, substantially reducing GHG emissions from the sector.</td></tr>
<tr><td colspan="4">Outcome (s)
Technical, planning, and institutional tools for low carbon buildings have been successfully implemented by key public and private sector stakeholders in Cambodia, India, Indonesia, Thailand, and Vietnam by 2028, resulting in direct emissions reduction. Tools and technical capacities for low carbon buildings mainstreamed in public and private institutions.</td></tr>
<tr><td colspan="2">Ind. 0.1
Number and description of private and public sector entities in project countries that incorporated ALCBT project tools and training programs to mainstream low carbon buildings by Q2/2028.</td><td colspan="2">Ind. 0.2
Number and description of policy recommendations for enhancing energy efficiency and promoting low carbon buildings that have been adopted by partner governments, including NDC enhancement by Q2/2028.</td></tr>
<tr><td colspan="2">Ind. 0.3
Amount of financing mobilized for low carbon building projects through the use of taxonomy, MRV or (super) ESCO pilots by Q2/2028.</td><td colspan="2">Ind. 0.4
Amount of GHG emissions reduced directly or indirectly by various measures of ALCBT through use of low-carbon materials and analytical tools by professionals of building industry by Q2/2028</td></tr>
<tr><td>Output I:
Technical and Institutional Tools
Standardized tools and systems for managing carbon emissions from building sector developed and piloted.</td><td>Output II:
Technical Capacity
Key industry stakeholders in project countries have enhanced capacity to deliver low carbon buildings.</td><td>Output III:
Financing
Financial pathways established to facilitate financing for occupants, owners, and developers of low carbon buildings.</td><td>Output IV:
Replication and Scale-up
Project knowledge documented and shared to facilitate replication and scaling up.</td></tr>
</table>

2.3.1 Expected Project Outcomes and Outputs:

Regional Project Outcomes for 5 countries:



India Specific Outcomes and Outputs:

- ✓ **20** private and public sector entities incorporated ALCBT project tools and training programs.
- ✓ **2** Policy recommendation outputs adopted by the government.
- ✓ **€78 million** investment mobilized for LCB projects.
- ✓ **1.2 million TCO_2eq** direct and indirect GHG emission reduction.

Output I: Standardized tools and systems for managing carbon emissions from building sector developed and piloted.

- ✓ **600** new buildings assessed with LCT and included in building registry to track carbon reductions in buildings.
- ✓ **1,000** existing buildings assessed with LCT and categorized.
- ✓ **30** key public and private sector stakeholders (individuals and entities) engaged in developing project recommendations.
- ✓ **200** public procurers, technical personnel, energy managers, building developers, professionals, policy makers and practitioners have access to the technical guidelines to encourage the adoption of green procurement for efficient and sustainable cooling in the building sector.

Output II: Key industry stakeholders in project countries have enhanced capacity to deliver low carbon buildings.

- ✓ **35** public officials trained to integrate carbon assessments into National plans and strategies.
- ✓ **2120** industry professionals trained, and capacity built.
- ✓ **3** universities incorporate sustainable cooling and low carbon building principles with syllabus development support from ALCBT.
- ✓ **22** entities offering novel EE products and services on sustainable cooling through capacity transfer from the ALCBT.

Output III: Financial pathways established to facilitate financing for occupants, owners, and developers of low carbon buildings.

- ✓ **6** banks, ESCOs and investment companies apply ALCBT taxonomy, MRV, OSS database, etc. to assess low carbon building/sustainable cooling investments.
- ✓ **4** public authorities (national or subnational) applying the low carbon building standard and the MRV tool for green public procurement.
- ✓ **60** buildings with description of contracting model retrofitted with efficient cooling appliance.
- ✓ **100** new buildings constructed according to the EE standards of the project (*combined for all project countries)*
- ✓ **4** buildings having 50% or more workforce as female obtaining favorable credits for pilot implementation of EE or LC technologies.

Output IV: By 2026, project tools propagated at national level in four project countries and replicated in at least two countries.

- ✓ **600** people who have increased their knowledge of LCBT tools and related knowledge.
- ✓ At least **1** non-pilot site that has expressed interest in adopting LCBT approaches.
- ✓ **4000** participants at (in-person and virtual) public events on LCB and sustainable cooling who rate increase in awareness after the event. (*combined for all project countries)*
- ✓ **20** regional knowledge sharing products developed and disseminated. (*combined for all project countries)*

2.4 Involving local partners

Local partners will be involved in knowledge generation together with Consortium Partners, during which knowledge transfer is planned. National partners for this project will be drawn from Govt, think-tanks, expert consultants, academia, researchers, industry associations etc.

2.5 Project Governance Structure (Proposed)

The project will be governed by a country-specific **project steering committee (PSC)** comprising of senior stakeholders and experts from the sector and industry, the project consortium, and the German government (**ZUG**). The committee will be responsible for overseeing the project and making strategic decisions based on the annual project progress and will be chaired by senior representatives from the aligned ministries in the respective

project countries. The **consortium** led by GGGI will handle the overall project implementation in the project countries. A **technical advisory committee (TAC)** comprising of representatives from leading research and technical organizations will ensure that the scientific methods followed during project implementation are best suited for the respective project countries. The above committees will be formed for the duration of the project and will be dissolved on successful project completion. *Figure 3* shows the project governance structure.

Figure 3: Governance structure for the ALCBT project (Proposed)

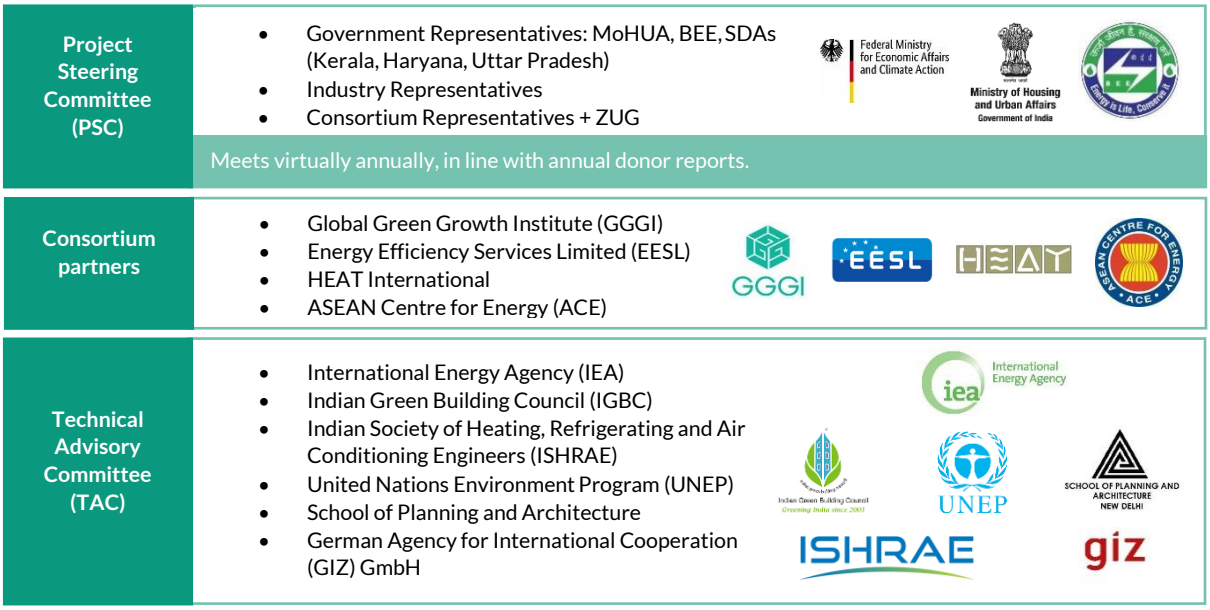


Table 2 provides an overview of the project activities in India.

*Table 2: Overview of project activities and implementation in India**

*Blue highlighted rows indicate implementation by national partners

Outputs / Country	**India**
Establishing performance metric	X
MRV: database and registry for low carbon buildings	X
Policy Recommendations for enhancing standards.	X
Pilot MRV and auditor certification	3 states
Online tools and digital processes	-
Green Procurement	-
Regional building registry	-
Professional training	X
Industry engagement	X
Universities	X
Establishing the taxonomy	X
Green Finance Network	X
Low carbon building investment pipeline	X
Pilot new business models	-
Bulk Procurement pilot ACs/chillers	X
Bulk Procurement/ESCO capacity development	X
Project countries	X
ASEAN replication and sharing	
Global replication and sharing	

It may be noted that Cambodia, India, Indonesia, and Vietnam are the main implementation countries, as major economies in South and Southeast Asia. Cambodia is a template country for replication in other smaller ASEAN countries. Thailand is a more mature country and the project focus here is demonstrating its approach on sub-sectoral basis, i.e., the hotel sector, which during the pandemic was heavily affected and has a strong green recovery potential.

2.6 Results framework

*Lightly coloured text is used to represent activities that are not carried out in India

Impact(s)

Nationwide transition of building sector towards low carbon buildings in Asian countries, including India, resulting in substantial and sustained reduction of GHG emissions from the sector.

*Estimated **0.89 MTCO$_2$eq savings** from project pilot, further assessments on GHG reductions will be conducted during Preparatory Phase.*

Outcome

Technical, planning and institutional tools implemented, and capacity enhanced in project countries in order to deliver low carbon buildings and increased market demand in at least 1 city each (3 states in India - Haryana, Uttar Pradesh and Kerala)

Activities/ Inputs

Output I: Tool development.	**Output II: Technical Capacity**	**Output III: Financing**	**Output IV: Replication and Scaling**
Technical and Institutional Tools Standardized tools and systems for managing carbon emissions from building sector developed and piloted.	Key industry stakeholders in project countries have enhanced capacity to deliver low carbon buildings.	Financial pathways established to facilitate financing for occupants, owners, and developers of low carbon buildings.	Project knowledge documented and shared to facilitate replication and scaling up.
Work package (WP I-1): *Country-specific institutional tools for managing building carbon.* --- **a. Develop and validate Building Carbon Assessment tool.** **b. Customise tool to make it country specific.** c. Establish **database** with building assessment for building digital tool. --- **d. Prepare subnational government for pilot.** e. Implement **3-year Building Carbon Assessment tool and building registry subnational pilot**. --- **f. Conduct policy review and institution mapping.** **g. Collect data and model scenarios based on the national and regional building sector, low-carbon pathways, climate targets and policies.** h. Engage **key stakeholders to develop policy recommendations** for net zero	**Work package (WP II):** *Capacity development for low carbon buildings* --- a. Develop **professional training program**, translate to local language if required. b. **Train trainers** at partner institutions. c. **Roll out training** for public and private sector representatives. --- d. Jointly **develop core syllabus.** e. **Customise** to country context. f. Engage **universities** to integrate syllabus. --- g. Market engagements and assessment in each country to **determine EE market gaps**. h. **Training of AC distributors and installers** on natural refrigerants.	**Work package (WP III):** *Finance tools and mechanisms for low carbon buildings* --- a. Develop framework for **Green Finance Network engagement** – regular meetings, scope, membership, etc. b. Establish regular meetings with interested **institutions** to link ALCBT tools to **address barriers**. --- c. Development of **basic taxonomy framework** for buildings. d. **Localization of framework** with existing/planned targets and regulations. e. Enhance **Green Public Procurement (GPP)** based on enhanced carbon performance standards by **developing guidelines, roadmaps and providing online training**. --- f. **Sensitize building developers and architects** to Building Carbon Performance tool and finalized taxonomy.	**Work package (WP IV):** *Finance tools and mechanisms for low carbon buildings* --- a. Establish **project webpages** featuring "partners only" document sharing and closed discussion platform and open access pages for public sharing of project tools and publications. b. Reach out to **subnational governments** to promote results and lessons from project pilots. **Replicate** pilots at subnational levels through **technical workshops** for city officials. c. Showcase **project achievements at local, regional and global events**, to raise awareness. --- d. Optimize implementation results by providing **technical assistance, an online resource sharing platform**, and **regular (virtual) knowledge exchange** between ASEAN Member States to share results and lessons.

carbon in the building industry, including proposals for integrating MRV, updated NDC and LEDS targets. **Work package (WP I-2):** *Digital tools for ASEAN (ACE)* --- a. **Online tools development and validation.** b. **Standardisation of project information** c. **Financial of EE project analysis** d. **Webpage development.** e. **Investor matchmaking** f. **Awareness raising of online tools** and support ACE to operate the ASEAN's OSS platform. --- g. **Compile data on available cooling technologies.** h. **Develop green procurement guidance, also introducing LCA GHG assessment and thresholds. Assessment will include upfront embedded carbon in building and solutions for the use and end-of life phase of buildings including cooling appliances and systems and their refrigerants.** i. **Formation of ASEAN procurement alliance** committed to green procurement for efficient cooling products.		g. **Assess potential projects** for carbon performance. h. Pitch low carbon building projects to **potential investors**. i. Complete project assessment for **fit to investor portfolio.** --- j. Conduct in-depth study of existing and future **On-Bill and ESCO market** in the buildings sector of Thailand, Indonesia and Vietnam. k. **Validate** study findings. --- l. Building a **pipeline of EE investment pilot projects** (non-financial barriers) m. **Technical assistance and capacity building** for FIs and ESCOs (financial barriers) --- n. Market engagement and **business model** design. o. **Building identification** and **assessment**. p. **Procurement** and **retrofit**.	e. Regional knowledge sharing through annual **workshop/ webinar** inviting international/ regional partners from FIs, governments, and building developers and **promoting investment opportunities and attracting investors** in the development of low-carbon building projects in ASEAN. --- f. **Replication and scale-up of retrofits** in other states and increasing buildings through ESCO and FI ecosystem. g. **Outreach**

Key assumptions about causal links and context

1. National and city governments in Asia are supportive of reducing energy demand and carbon footprint of buildings but lack the specific tools to enforce regulations.
2. Through introducing technical tools and building human capacity the project can catalyse sector-wide implementation of EE and low carbon practices for buildings.
3. Initial financing is a major obstacle in the adoption of EE appliances and low carbon materials, despite low payback period. By mobilizing financing programs, this project helps overcome adoption challenges from the perspective of building owners and developers.
4. By stimulating market demand and strengthening government and industry capacity to deliver, nationwide transition to low carbon buildings can eventuate

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