



**ក្រសួងបរិស្ថាន**  
MINISTRY OF ENVIRONMENT



**ESCAP**  
Economic and Social Commission  
for Asia and the Pacific

**UN**   
environment  
programme

# Passive Cooling Strategies for Sustainable Development in Cambodia

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Presented to the GlobalABC & Cool Coalition Passive Cooling  
Working Group

*05 December 2024*



## Cambodia's Space Cooling Context

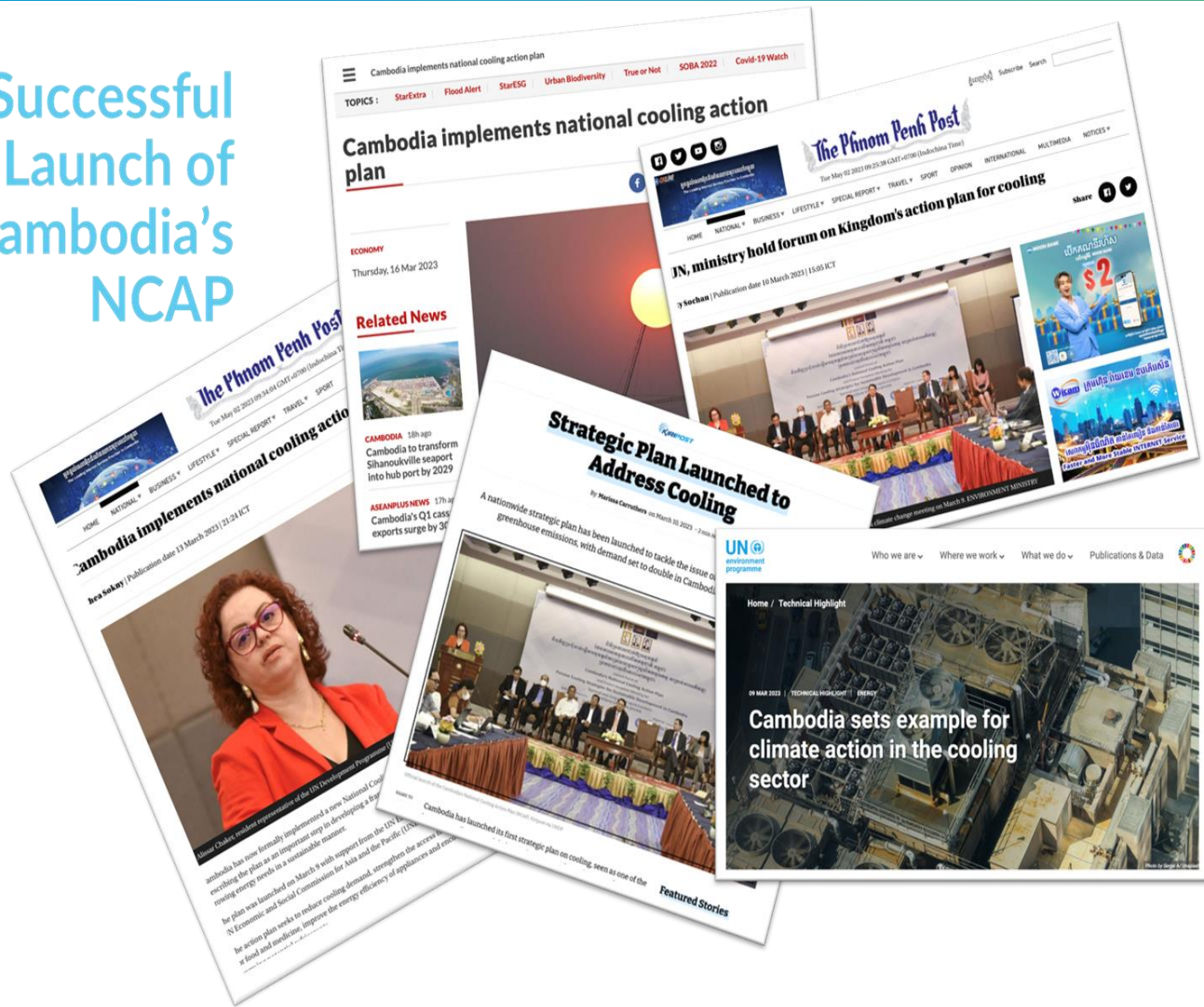
- ③ **At least 45% of electricity consumed in Cambodia is for cooling, of which 80% is for space cooling in buildings**
- ③ **The majority of households do not have air conditioners, but temperatures are rising and uptake is increasing rapidly**
- ③ **Rising demand for cooling has significant implications for energy demand and greenhouse gas emissions.**





# NCAP and implementing PCS recommendations

Successful Launch of Cambodia's NCAP



Ministry of Land Management Urban Planning and Construction

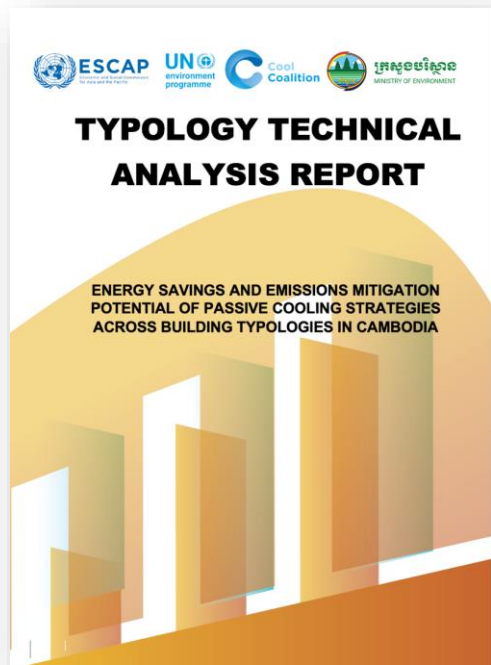


Global Alliance for Buildings and Construction



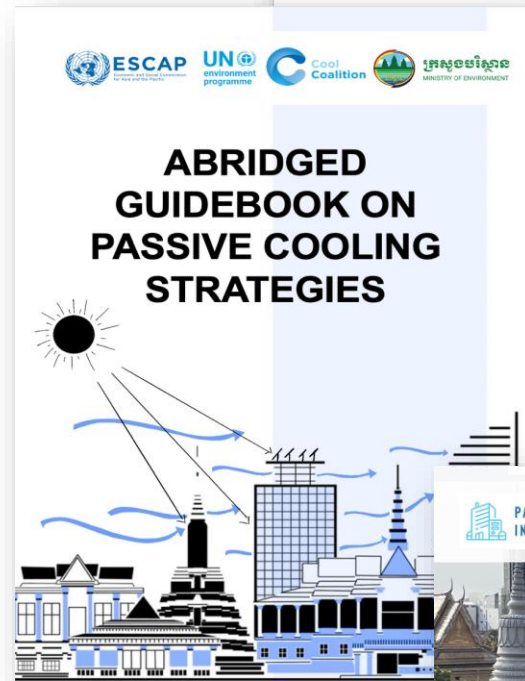
# Local Knowledge Creation

# Knowledge and Tools



1

Support decision-makers with in-depth analysis of passive cooling's potential to lower energy and emissions



2

Provide guidelines and tools for practitioners to enable scale-up



What is "Passive Cooling" and why is it important?

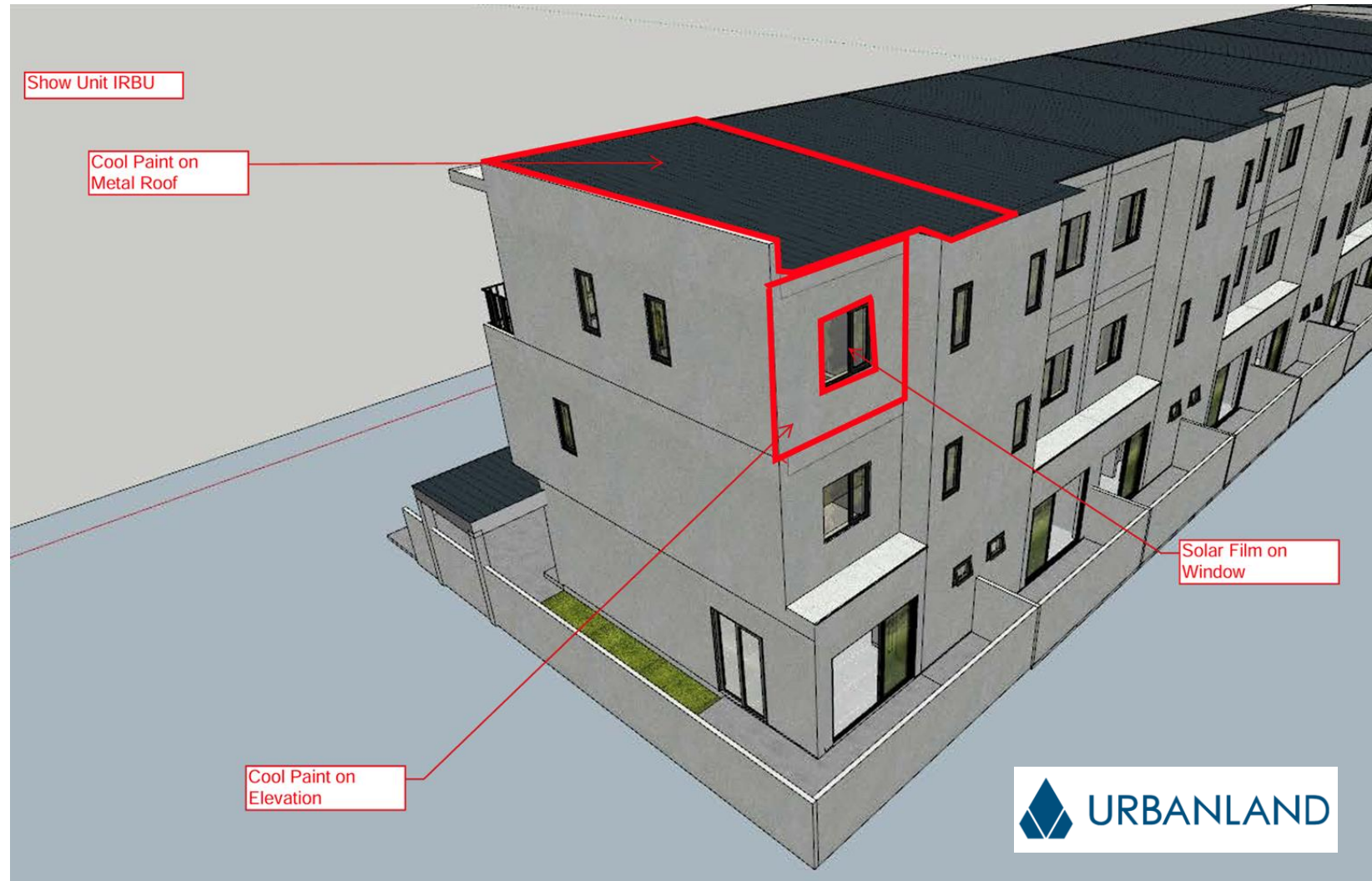


# Pilot project

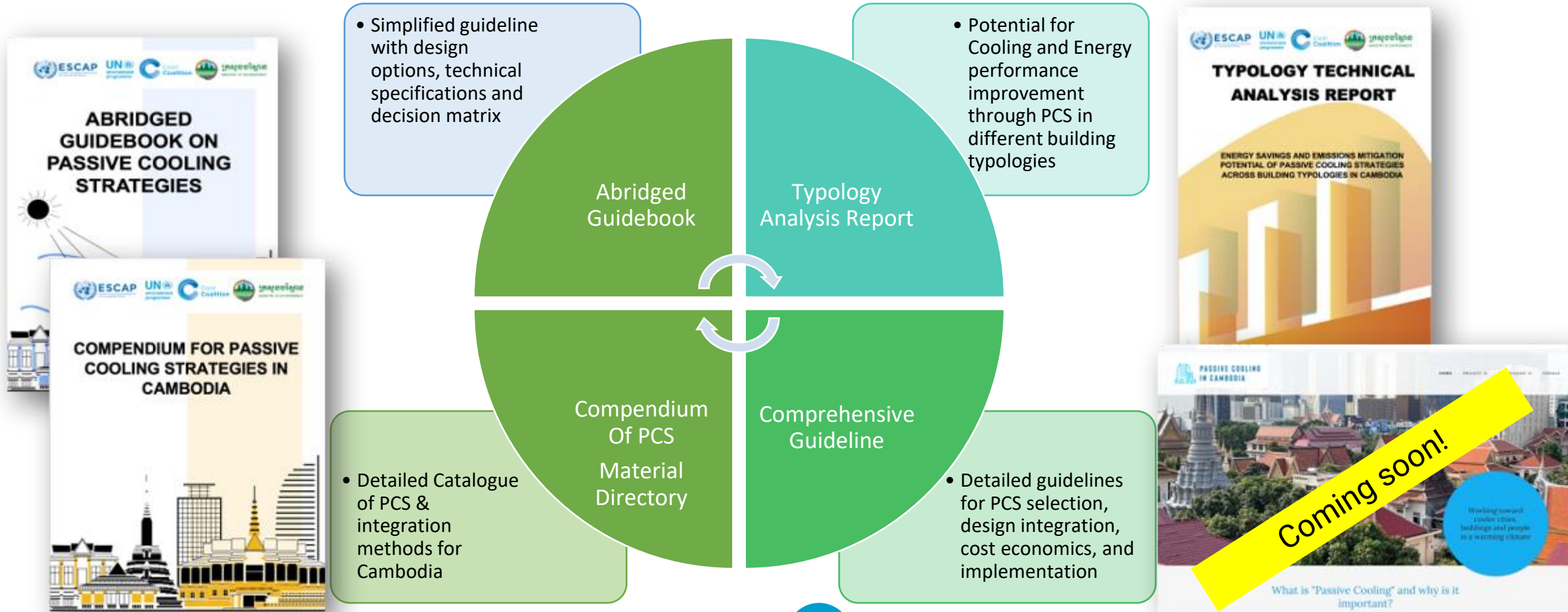


3

Demonstrate passive cooling strategies' application, costs, benefits



# Knowledge Products

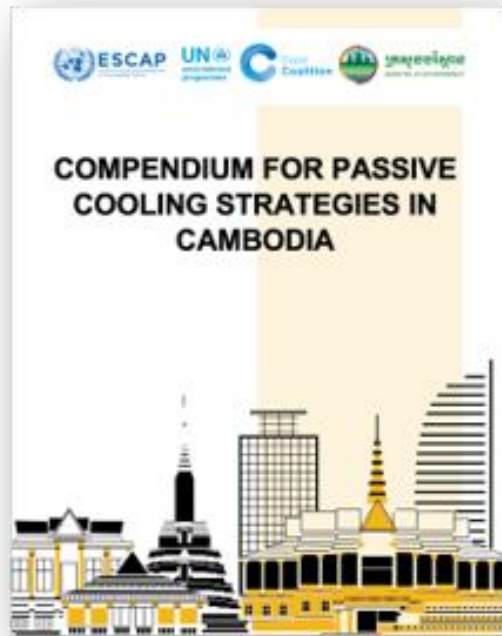


**1** Support decision-makers with in-depth analysis of passive cooling's potential to lower energy and emissions

**2** Provide guidelines and tools for practitioners to enable scale-up

# Intent of the Compendium

The compendium serves as a comprehensive guide for stakeholders involved in building projects, providing a catalogue of passive cooling strategies applicable at various stages of the project lifecycle.



## Building Physics

Discusses fundamentals of building physics like thermal comfort, mode of heat transfer, heat gain and loss etc

## Site-Oriented Passive Cooling Strategies

Refer at concept stage to optimize for comfort and efficiency. Early implementation maximizes effectiveness in heat mitigation and energy efficiency.

## Design-Oriented Passive Cooling Strategies

Refer at design stage to optimize layout, materials, and ventilation. Early integration ensures effective heat mitigation and sustainable design.

## Materials-Oriented Passive Cooling Strategies

Refer at construction stage to select materials and technologies for optimal performance. Early consideration ensures effective integration and building performance.

## Passive Cooling Strategies Matrix

Presents the effectiveness of PCS on building typologies.



# Compendium – Contents

Building  
Physics

Outdoor  
Vegetation

Water Features

Pavements

Form and  
Orientation

Massing and  
Zoning

Ventilation

Night Cooling

Window-to-  
Wall-Ratio

Self and Mutual  
Shading

Walls

Shading

Fenestration

Roofs

**Description > Strategy Application > Analysis Tool > Implementation Case Studies**

# Abridged Guidebook on PCS

PCS Level STRATEGY Abridged Guidebook

The strategy name

States what level of PCS – Site or Building or Component Level

## STRATEGY

Title

Image to have a visual understanding about the Passive Cooling Strategy

This section helps you understand the structure of how this document is designed. Each section and its explanation are explained clearly.

Cost	Max	Min
Installation	Tough	Easy
Solution Availability	Tough	Easy
Energy Saving	Min	Max
Thermal Comfort	Min	Max

**BENEFITS**

This section highlights six benefits of the strategy as a PCS, showcasing its effectiveness in saving energy, improving comfort, and supporting sustainability efforts.

**APPLICATION**

This section details the construction process or application methods for the primary passive cooling solution, providing practical guidance on implementation.

**SPECIFICATIONS**

This section provides specifications for the material or solution, offering brief on its composition, dimensions, and performance criteria.

**RESOURCES**

This section offers resources, and additional reading materials for further exploration.

**IN CAMBODIA**

Design Guidelines: [Compendium](#)

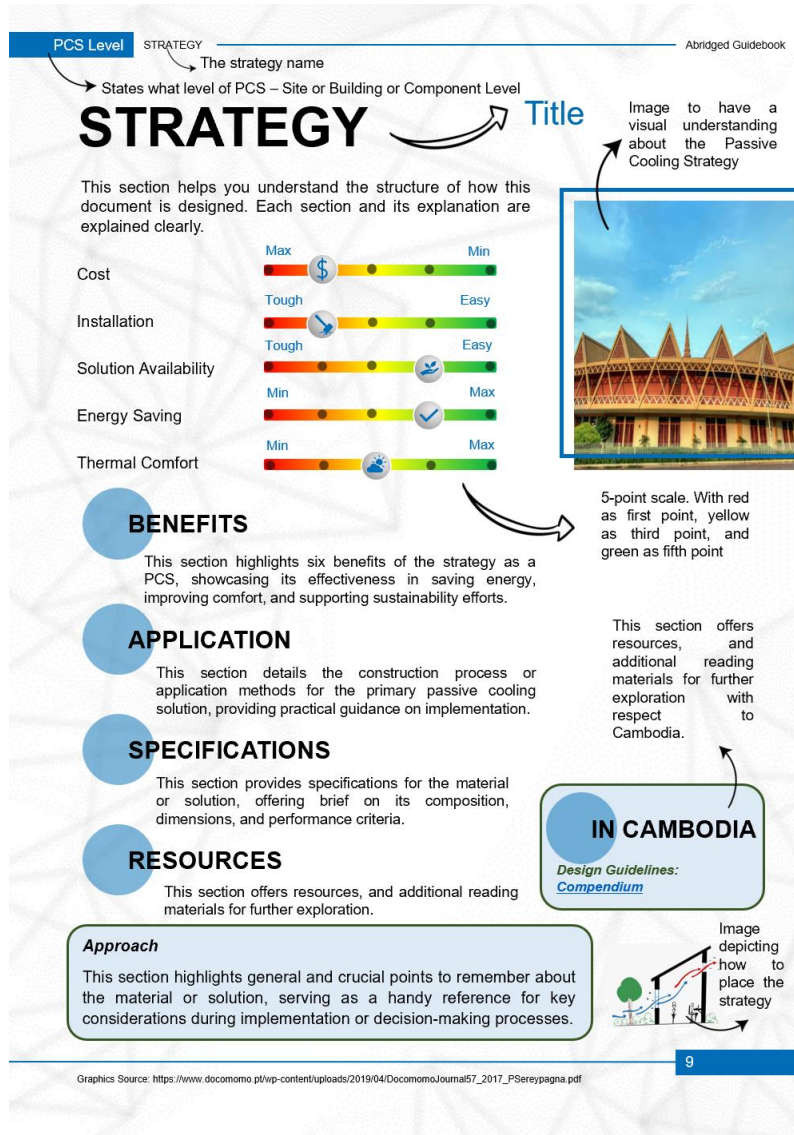
**Approach**

This section highlights general and crucial points to remember about the material or solution, serving as a handy reference for key considerations during implementation or decision-making processes.

5-point scale. With red as first point, yellow as third point, and green as fifth point

This section offers resources, and additional reading materials for further exploration with respect to Cambodia.

Image depicting how to place the strategy



The abridged guidebook offers practical guidelines for implementing PCS in Cambodia.

The guidebook serves as a decision-making tool, helping users select appropriate PCS through a tailored decision matrix.

Each strategy is accompanied by concise specifications, applications, and benefits, with an emphasis on long-term energy savings.



# DEMONSTRATION PROJECT AND TECHNICAL OUTPUTS



# Demonstration Project

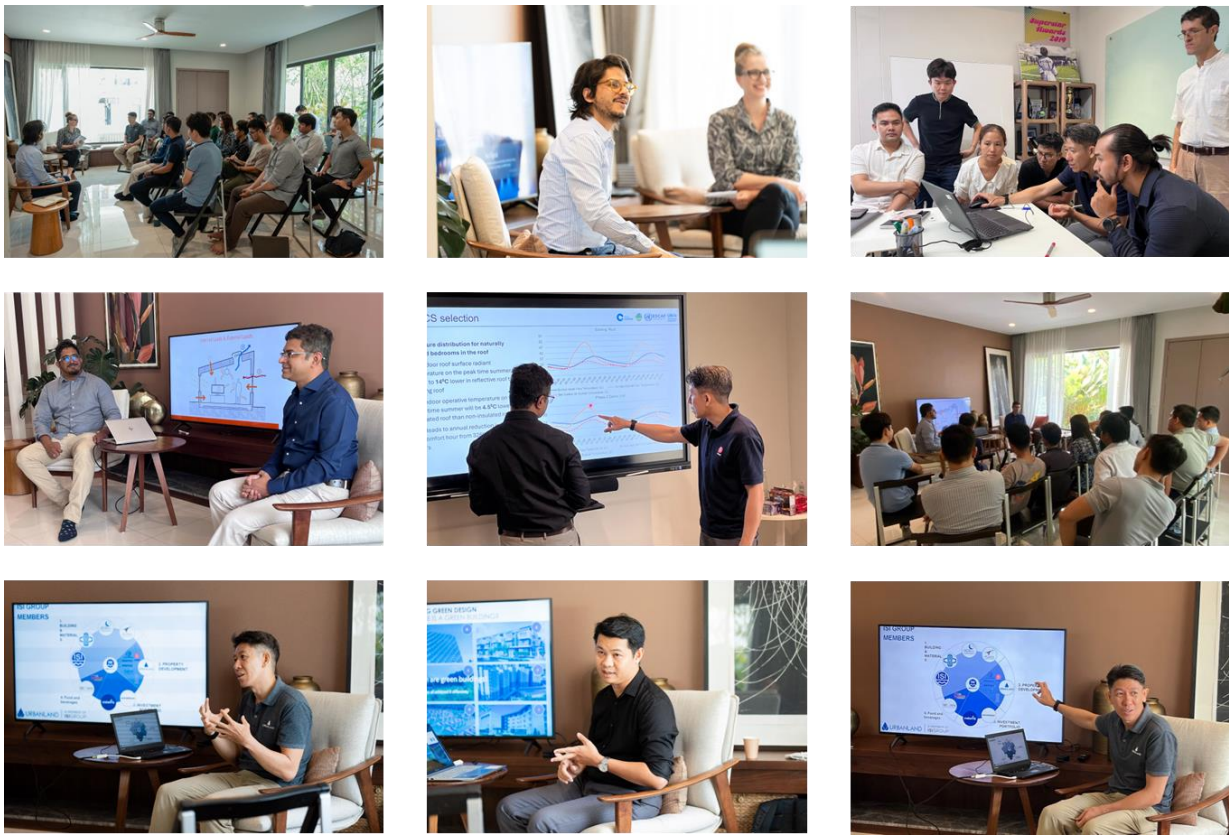


For the Demonstration Project, two buildings from Borey Chankiri were selected—one as the baseline unit and the other as the PCS-integrated unit. A list of PCS were identified and implemented in the PCS-integrated case and are being monitored to estimate the thermal performance improvements





# Design Charette for PCS identification



## List of PCS Approved

- Cool Coatings on Concrete Roofs
- Cool coatings on Metal Roofs
- Cool coatings on Elevations
- Outdoor roller blinds
- Solar film on glazing
- Low-emissivity indoor paints

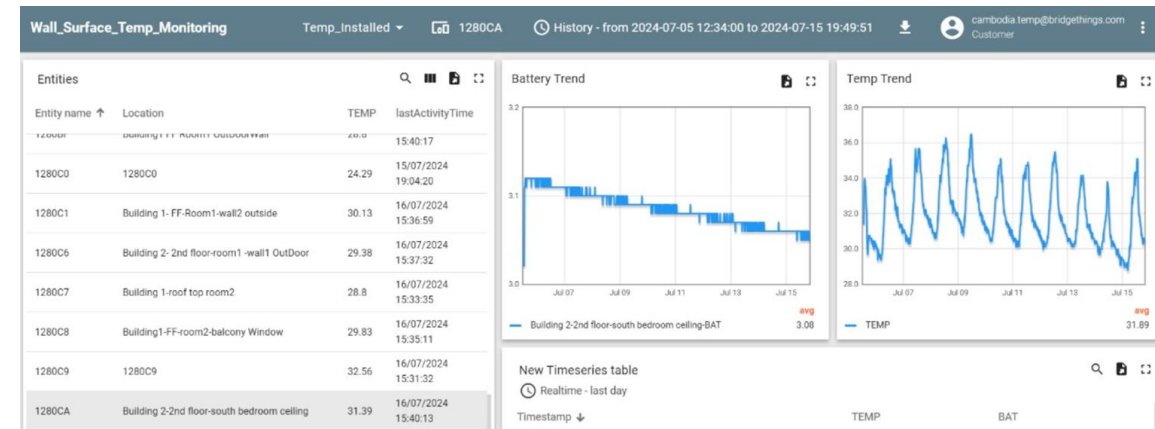


# Data Monitoring Setup



Window, Wall and Ceiling Surface Temperature Monitoring

AC Energy Monitoring



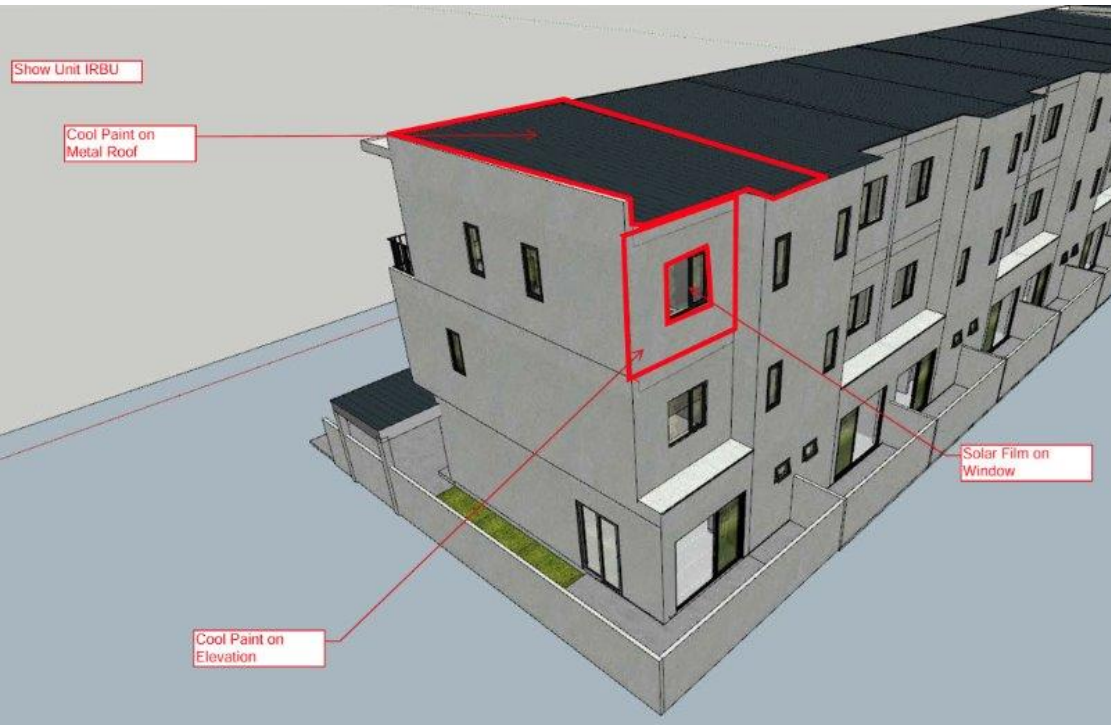
Roof Surface Temperature Monitoring

Weather Station

The live data from the sensors are continuously monitored through a dashboard created by the team to detect anomalies and analyze patterns. This real-time data collection will be instrumental in creating an accurate base case, reflecting actual



# PCS Pilot Implementation



PCS Pilot Options



Cool Roof on Baseline Unit



Cool Roof on PCS Integrated Unit



# INFLUENCE ON POLICY AND PRACTICE IN CAMBODIA

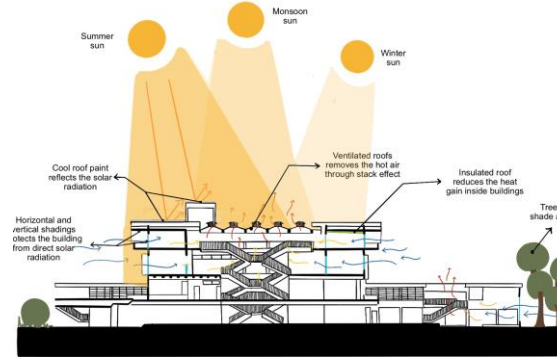
# Applying project research results to Cambodia's building - energy codes

## Knowledge products

- Abridged Guidebook**: Simplified guideline with design options, technical specifications and decision matrix
- Typology Analysis Report**: Potential for Cooling and Energy performance improvement through PCS in different building typologies
- Compendium Of PCS Material Directory**: Detailed Catalogue of PCS & integration methods for Cambodia
- Comprehensive Guideline**: Detailed guidelines for PCS selection, design integration, cost economics, and implementation

**Coming soon!**

## Data from Demonstration



## Cambodia codes

1	Building Codes...
2	Navigating the Code...
3	Occupancy Classification and Use...
4	Special Technical Requirements Based on Occupancy and Use...
5	Building Heights and Areas...
6	Types of Construction...
7	Fire-Resistive Construction...
8	Interior Finishes...
9	Fire Protection Systems...
10	Means of Egress...
11	Accessibility...
12	Interior Environments...
13	Energy Efficiency (International Energy Conservation Code)...
14	External Walls...
15	Roof Trusses and Roofing Structures...
16	Structural Protection...
17	Special Inspections and Tests...
18	Soils and Foundations...
19	Building Materials and Systems...
20	Plumbing Systems...
21	Elevators and Conveying Systems...
22	Special Construction...
23	Existing Structures (International Existing Building Code)...
	Bibliography...
	Index...

## Informing Cambodia Policy with PCS Project Insights

### The Minimum & The Maximum:

- Integrating a regulatory minimum: **Quality** and efficiency baselines



**Pragmatic** with minimum performance (to allow effective implementation)

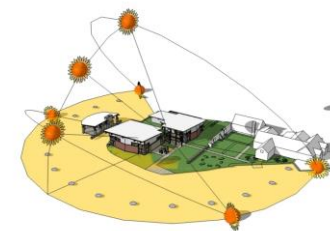


- Supporting ambitious voluntary directions: Market trend, Incentives, Green frontrunners ..

**Drive the market** transformation & support minimum standards to **progress** over the time

### Translating PCS into regulation:

Turning PCS & Sustainable design efforts into a **Measurable** Index



**Building energy performance index**  
Practical way, backed by science, measurement of PCS performance  
**Rewarding** energy efficient building





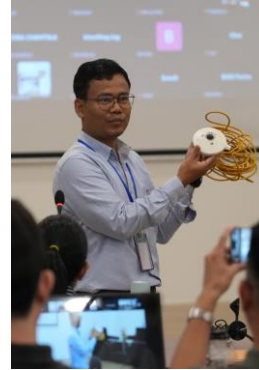
# Supporting Passive cooling in policy, to meet international commitments

National Energy Efficiency Policy 2022 & NCAP	Cambodia's 2020 NDC	Global Cooling Pledge Declaration de Chaillot
<ul style="list-style-type: none"> <li>• Reduce energy consumption in the residential sector by 34% and 25% in commercial and public buildings</li> <li>• Adoption of a 'Building Energy Code' for residential and commercial buildings</li> <li>• Deployment of Passive Cooling Solutions a key strategy to provide thermal comfort and reduce cooling demand in buildings</li> </ul>	<ul style="list-style-type: none"> <li>• Building codes and enforcement/ certification</li> <li>• Inclusion of performance requirements of passive cooling systems in the Building Energy Code</li> <li>• Passive cooling in public and commercial buildings</li> <li>• Climate change response measures in building design and construction</li> </ul>	<ul style="list-style-type: none"> <li>• Commit to establish national model building energy codes that incorporate market appropriate measures such as passive cooling and energy efficiency strategies at the latest by 2030 for new and refurbished buildings</li> <li>• Commit to spur the decarbonisation and resilience of the buildings sector including passive cooling.</li> </ul>

**Implementation of national roadmaps (NCAP, Buildings Roadmap) is a key to achieving thermal comfort and climate-friendly cooling access in Cambodia**

# Building Capacity and a Community of Practice

- Engage stakeholders across the building sector to share knowledge, learn, discuss challenges and identify solutions



## Passive Cooling Strategies

- Explain the objectives
- Detail the concept & ground it with local demonstrator
- Share knowledge on relevant strategies (Compendium)
- Learn hands-on practice with energy simulation tools

## CoP Ecosystem

- Private firms
  - Universities
  - Public Institutions
  - Development Orgs
- Architects
  - Engineers
  - Energy auditor
  - Teachers
  - MEP specialists
  - Policy consultants
  - ...





# LOOKING FORWARD



# LEVERAGING DATA AND LESSONS LEARNED

## POLICY

- Supporting building regulation development
- Inputs to NDC update
- Informing ASEAN regional guidelines

## PRACTICE

- Raising awareness
- Developing a “business case” for passive cooling in Cambodia
- Identifying supply chain and market interventions



**Thank you.**

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