Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Launch of NCAP Methodology & Regional Capacity Building Workshops For Asia and the Pacific

Wednesday 30 June, 01:00 - 04:00 PM Bangkok Time

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KIGALI COOLING EFFICIENCY PROGRAM

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Workshop Overview

Lily Riahi

Coordinator, Cool Coalition,
UNEP (MC)

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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Agenda

Time	What's on
13:00 ICT	Workshop Overview
13:05 ICT	Welcome Remarks by **Hongpeng Liu, ESCAP and Dechen Tsering, UNEP**
13:15 ICT	Keynote: **Linking NCAP with the Montreal Protocol by Megumi Seki, Ozone Secretariat**
13:20 ICT	Keynote: **India NCAP – Best Practice Experiences by Jigmet Takpa**
13:30 ICT	Presentation: **The NCAP Development Process and Cooling Demand Assessment**
	Presentation: **Access to Cooling in NCAP**
14:00 ICT	Breakout 1: **Sharing Experience on NCAP Development**
	Breakout 2: **Sharing Experiences on NCAP Data Collection and Assessment**
14:50 ICT	Presentation: **Synergizing NCAPs with HFC Phase Out**
15:00 ICT	Presentation: **Mainstreaming National Cooling Plans into National Strategies**
15:10 ICT	Panel: **Scaling up and Financing NCAP Implementation**
15:45 ICT	Q&A
15:55 ICT	Closing

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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Hongpeng Liu

Director
Energy Division
United Nations Economic and Social Commission for Asia and the Pacific

Dechen Tsering

Director
Asia and the Pacific Office
United Nations Environment Programme

Welcome Remarks

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Megumi Seki

Executive Secretary,
Ozone Secretariat

Linking NCAP with the Montreal Protocol

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Jigmet Takpa

Joint Secretary
Ministry of Environment, Forests and Climate Change
India

India NCAP

Best Practice Experiences

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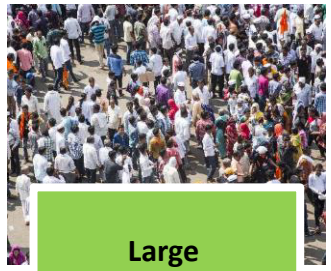
India Cooling Action Plan (ICAP)
Best Practice Experiences

30th June 2021

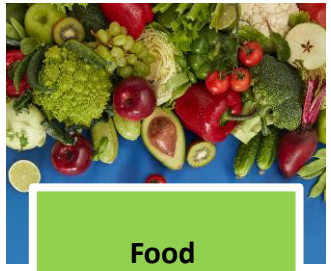
Context: Cooling growth in India



Large Population

Tropical Climate & Rising Temperature

Growing Aspirations



Food Security

Increasing Urbanization & Building Stock

Rising Active Cooling Demand

Greater Penetration of Active Cooling

Rising demand of refrigerant in Cold-Chain

BAU GROWTH WILL RESULT IN SIGNIFICANT SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS: ESCALATING GHG EMISSIONS, INCREASING ENERGY CONSUMPTION & PEAK DEMAND, INCREASING HEAT ISLAND EFFECTS

ICAP - Vision & Approach

- ICAP is a **flagship initiative by MoEF&CC**, Govt. of India - first country in the world to develop a cooling action plan

- A long-term integrated **20 year (2017-18 to 2037-38) outlook across sectors** on India's cooling demand, technology options, refrigerant use and energy consumption

- To develop and formulate a cooling plan that will resonate with multiple stakeholders in the Government, private sector and academia/think tanks and research organizations (**triple-sector approach)**

ICAP Objectives

Assessment of cooling requirements across sectors in next 20 years and the associated refrigerant demand and energy use

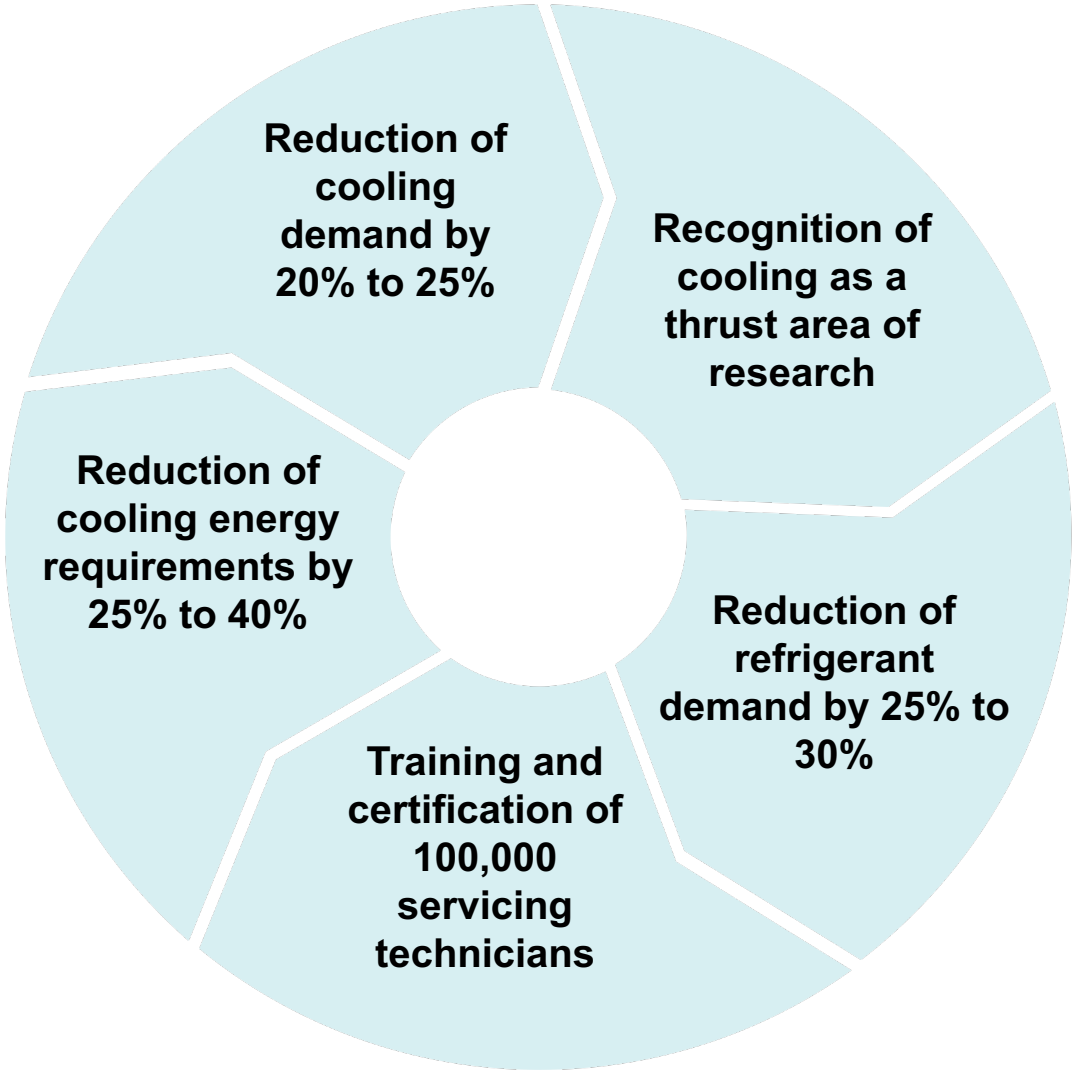
Map the technologies available to cater the cooling requirement including passive interventions, refrigerant-based technologies, and alternative technologies such as not-in-kind technologies

Suggest interventions in each sector to provide for sustainable cooling and thermal comfort for all

Develop an R&D innovation ecosystem for indigenous development of alternative technologies

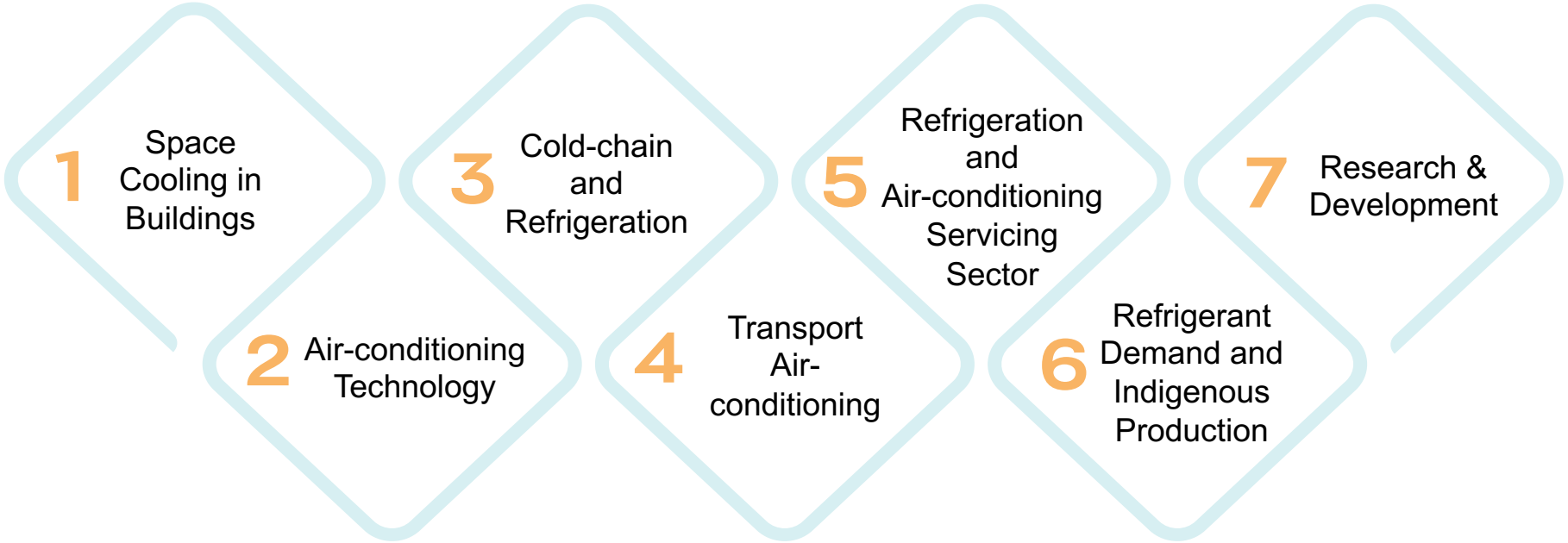
Focus on skilling of RAC service technicians

Broad Goals by 2037-38

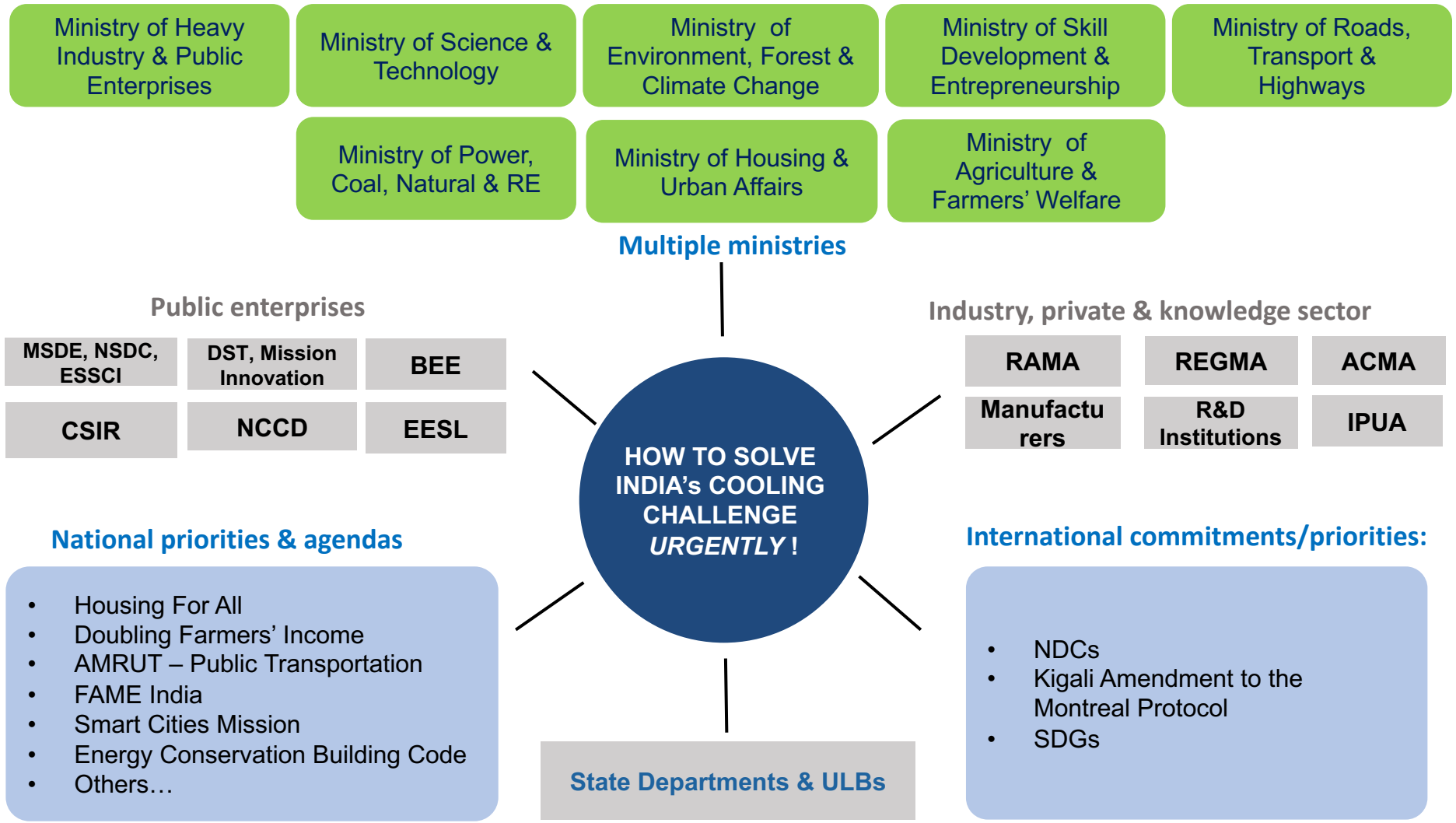


Development Process

- Steering Committee to guide the development of ICAP
- 7 thematic working groups



Multi-stakeholder Development Framework



ICAPs Key Lessons and Takeaways

- Importance of **formulating high-level steering committee**/a nodal entity that owns and provide oversight during the development process
- **Setting up a multiple stakeholder engagement framework** (with triple sector participation) to bring alignment of the diverse interests of stakeholders, right from the start
- Ensuring **inter-ministerial coordination**, buy-in, and cross-sectoral co-ordination
- Data is key, but need not be a show-stopper
- **Instating an implementation framework** that leverages interlinkages with national policies and programmes and international commitments
- Balancing comprehensiveness and timeliness

ICAPs Contributions to NCAP Development Methodology

- NCAP methodology's steps and stages closely follow the ICAP development process; it incorporates lessons from ICAP development

- It will help national governments conduct a holistic assessment of their countries' cooling current and projected cooling demand
  - Especially relevant for emerging economies and climate-vulnerable countries

- India, through its ICAP experiences, has demonstrated South-South cooperation –
  - NCAP development piloted in Cambodia and Indonesia

Cascading Benefits from ICAP

National benefits

- Escalating ‘Thermal comfort for all’ as a national priority
- Broadening the scope of S&L programs to fans & air coolers
- Harmonization of policies that did not intersected before
- Momentum/re-purposing of the India Cooling Coalition

International development & interest

- Supporting development of ‘global’ NCAP methodology
- Signaling political will – India as launch pad for Global Cooling Prize
- Mobilization of resources to support ICAP implementation

THANK YOU

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Dr Satish Kumar

President, Executive Director
Alliance for an Energy
Efficient Economy (AEEE)

Sneha Sachar

Strategic Advisor,
Alliance for an Energy
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The NCAP Development Process and Cooling Demand Assessment

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The NCAP Development Process and Cooling Demand Assessment

30th June 2021

National Cooling Action Plan (NCAP)

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Alliance for an Energy Efficient Economy

In collaboration with

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U4E United for Efficiency

UNIVERSITY OF BIRMINGHAM

UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Developing a holistic NCAP methodology, which can be applied in any country to propose a **comprehensive guiding framework** for NCAP development with pilots it in **Cambodia and Indonesia**

The NCAP Development Methodology

NCAP Methodology: Supporting Cooling Action at a 'National' Level

PURPOSE: A holistic but modular 'guidemap' for the development of National Cooling Action Plans that –

- Drives integrative action across multiple sectors of cooling and considers access to cooling for all
- Sets direction and actionable targets for addressing access to cooling while reducing its environmentally harmful impacts & maximizing the socio-economic benefits

DESIGN: Recognizing the diverse needs and context across countries, the Methodology is:

- Highly customizable to a country's priorities and capacities
- A process that is within the reach of most countries TODAY and can enable immediate and prioritized action towards climate-friendly cooling
  - Not a prescriptive approach; not a modeling framework

Underlying Characteristics of the Methodology

To support its objectives, two foundational characteristics are imbued into every step of the Methodology:

1. Adaptability is critical.

- Methodology provides guidance while affording NCAP development teams high levels of discretion and flexibility to adapt to countries' unique context and needs

2. Simplification and prioritization are important.

- The methodology has to be simple and logical; enabling countries to prioritize (and/or phase out) the steps based on their resource availability/constraints
- Data collection has to be kept simple; excessive data requests can overwhelm the stakeholders and add unnecessary complexity (even resistance!)

Methodology Underscores an Integrated Approach to Addressing Cooling

An Integrated Approach to address cooling should be the norm, and calls for:

- First, reduce the cooling loads to the extent possible
  - Such as, through thermally efficient building design and construction, and passive cooling practices in case of the building sector
- Then, serve the cooling loads efficiently & with low-climate impact
  - Such as, with appropriate and efficient cooling equipment and solutions that use environment-friendly refrigerants to deliver the required amount of cooling with less energy and lower overall emissions
- And, optimize the cooling operations and behaviors
  - Such as, through good O&M practices, user adaptations etc. to ensure that cooling is delivered only to where and when it is needed

Right-size the demand for cooling and optimize the supply of cooling; apply both strategies in conjunction

The NCAP Development Process

STAGE I: CONTEXTUAL ASSESSMENT & PLANNING

* NCAPs Data Collection Framework

STEP 1

COUNTRY-CONTEXT MAPPING

High-level mapping of cooling landscape using existing data & knowledge

STEP 2

NCAP PLANNING AND PRE-WORK

Establishing core guiding components of the development process, such as broad priorities, key stakeholders, and engagement and governance structures

STAGE II: COOLING DEMAND ASSESSMENT

* NCAPs Data Collection Framework

STEP 3

SECTOR-WISE CURRENT AND FUTURE COOLING DEMAND ASSESSMENT

Conducting thorough data-driven assessments of the current and future cooling demand for each of the chosen cooling sectors

STEP 4

SECTOR-SPECIFIC RECOMMENDATIONS & SOLUTIONS

Identifying solutions and future pathways for each of the cooling sectors using the sector-wise analysis

STAGE III: SYNTHESIS & NCAP CREATION

STEP 5

INTEGRATION

Consolidating sector-specific assessments into a cohesive cooling assessment; identifying cross-sectoral synergies

STEP 6

DEVELOPMENT OF NCAP RECOMMENDATIONS

Developing and prioritising NCAP recommendations; mapping the expected impact of NCAP recommendations

STEP 7

NCAP REPORT & IMPLEMENTATION GUIDANCE

Creating an actionable NCAP report, embedded with an implementation and governance framework

MULTI-STAKEHOLDER COLLABORATION

Multi-stakeholder & collaborative development – right from the start

- Mechanisms for effective inter-government and triple-sector engagement
- Importance of a nodal/coordinating entity that owns and drives the process

NCAP development team

Researchers and analysts

Government entities

Private sector & industry

Integrated Approach to Policymaking Essential

Why Integrated policymaking:

- Synergistic dovetailing of ongoing and emergent public policies and programs either laterally through parallel ministries and departments or vertically through different tiers of government[1]
- Helps align objectives, sets in powerful integrative effects — such that whole is greater than the sum of parts
- Includes actors beyond the government—Triple Strength Leadership:
  - The public sector, the private sector, and the academic/non-profit sector will need to work in tandem and with equal enthusiasm if non-trivial challenges such as reaching net-zero GHG emissions by 2050 have to be met. [2]

1 - Meijers, E. and Stead, D., 2004. Policy integration: what does it mean, and how can it be achieved? A multi-disciplinary review. In: Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Interlinkages and Policy Integration. [online] Available at: http://userpage.fu-berlin.de/ffu/akumwelt/bc2004/download/meijers_stead_f.pdf
2 - Lovegrove, N. and Matthew Thomas, M., 2013. Triple-Strength Leadership. Harvard Business Review, [online] Available at https://hbr.org/2013/09/triple-strength-leadership

I. Contextual Assessment & Planning

Data Collection Framework
- Country Context Mapping

STEP 1

COUNTRY-CONTEXT MAPPING

- Socio-economic growth drivers for cooling demand
- International/ national targets and commitments
- Comprehensive view of policies & programs related to Cooling
- Other factors: technology & market trends, manufacturing
- Resources, capabilities and knowledge-base
- Assessing impacts: Electricity and GHG; socio-economic

STEP 2

PLANNING AND PREWORK

- Identifying nodal government entity
- Multi-stakeholder engagement structure/process
- NCAP development team, team-governance & collaboration model, timeline

Intended outcomes:

- *Informs priorities; Highlights potential gaps & opportunities; Catalyzes synergies; Guides next steps*
- *Establishes the board contours and key stakeholders for the country's NCAP development*

II. Cooling Demand Assessment

Data Collection Framework
- Space cooling in buildings
- Food and healthcare cold-chains
- Mobile AC
- Industrial process cooling
- Access to cooling

STEP 3

SECTOR-WISE CURRENT AND FUTURE COOLING DEMAND (BAU & INTERVENTION SCENARIOS)

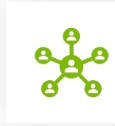
- Setting the baseline: thorough data-driven assessment of the current cooling demand
- Future growth projections: Business-as-usual & Intervention scenarios
- Foundational logic/assumptions behind the key sector-wise recommendations



STEP 4

SECTOR-SPECIFIC RECOMMENDATIONS & SOLUTIONS

- Derive meaningful recommendations to address the cooling growth in the sector
- Prioritize actions: ease of implementation, impacts/benefits
- Consider synergies with existing policies & programs



Intended outcomes:

- *Baseline for the Country's cooling demand (and impacts)*
- *An informed view onto the impacts of the future growth, the 'cost of doing nothing' (BAU growth)*
- *Sector-specific priorities, including quick and high-impact interventions, and the strategic longer-term interventions*

III. Synthesis and NCAP Document

STEP 5

INTEGRATION

- Aggregation of the sector-specific analysis into cohesive country-wide view of cooling
- Identifying cross-sectoral and cross-functional synergies for accelerated action

STEP 6

DEVELOPMENT OF NCAP RECOMMENDATIONS

- Development and strategic prioritization of NCAP recommendations
- Mapping the expected impact of the NCAP recommendations

STEP 7

NCAP REPORT & IMPLEMENTATION GUIDANCE

- Creating a 'live' and actionable NCAP report
- Embedding an implementation and governance framework into the NCAP

Intended outcomes:

- *Alignment among key stakeholders and government entities*
- *'Big' goals of the NCAP*
- *An actionable roadmap that has the 'ownership' and a governance structure for guiding and monitoring future actions*

Cooling Demand Assessment for NCAP Development

(Using Data Assessment Frameworks)

What is cooling demand assessment?

- Data-intensive and analytical step of the NCAP development process
- A thorough data-driven assessment of the current and future
  - Cooling demand (met, unmet, and total cooling demand)
  - Cooling energy consumption
  - Refrigerant consumption
  - Greenhouse gas (GHG) emissions from cooling
- Informs
  - Sector-specific priorities including quick and high-impact interventions in the short-term
  - Strategic interventions in the longer-term

Key definitions

- Met cooling demand: Cooling delivered through mechanical means
- Unmet cooling demand: Cooing demand not served because of lack of access to cooling

NOTE: The reliable quantification of the unmet cooling needs is a challenging task where modelling capabilities are required. Therefore, this cooling demand assessment utilises indicators to assess the lack of access to cooling to help estimate, to the extent possible, the country's unmet cooling demand.

- Total cooling demand: Met cooling demand + unmet cooling demand (estimated to the extend possible)
- Future growth scenarios
  - Business as usual scenario: Projects how the current cooling demand will evolve based at the ongoing level/pace of effort
  - Intervention scenario: Projects how the current cooling demand will evolve based on an accelerated level/pace of effort

Robust data is key but not a show-stopper

- Availability of good quality and enough data is a common challenge
- Leverage government databases, international publications, market reports, etc.
- Close data gaps using logical assumptions and expert interviews
- Periodically revise the cooling demand assessment as new data become available

Cooling demand assessment is Stage II in the NCAP development methodology

STAGE I: CONTEXTUAL ASSESSMENT & PLANNING

STAGE II: COOLING DEMAND ASSESSMENT

STAGE III: SYNTHESIS & NCAP CREATION

* NCAPs Data Assessment Framework

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High-level mapping of cooling landscape using existing data & knowledge

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Establishing core guiding components of the development process, such as broad priorities, key stakeholders, and engagement and governance structures

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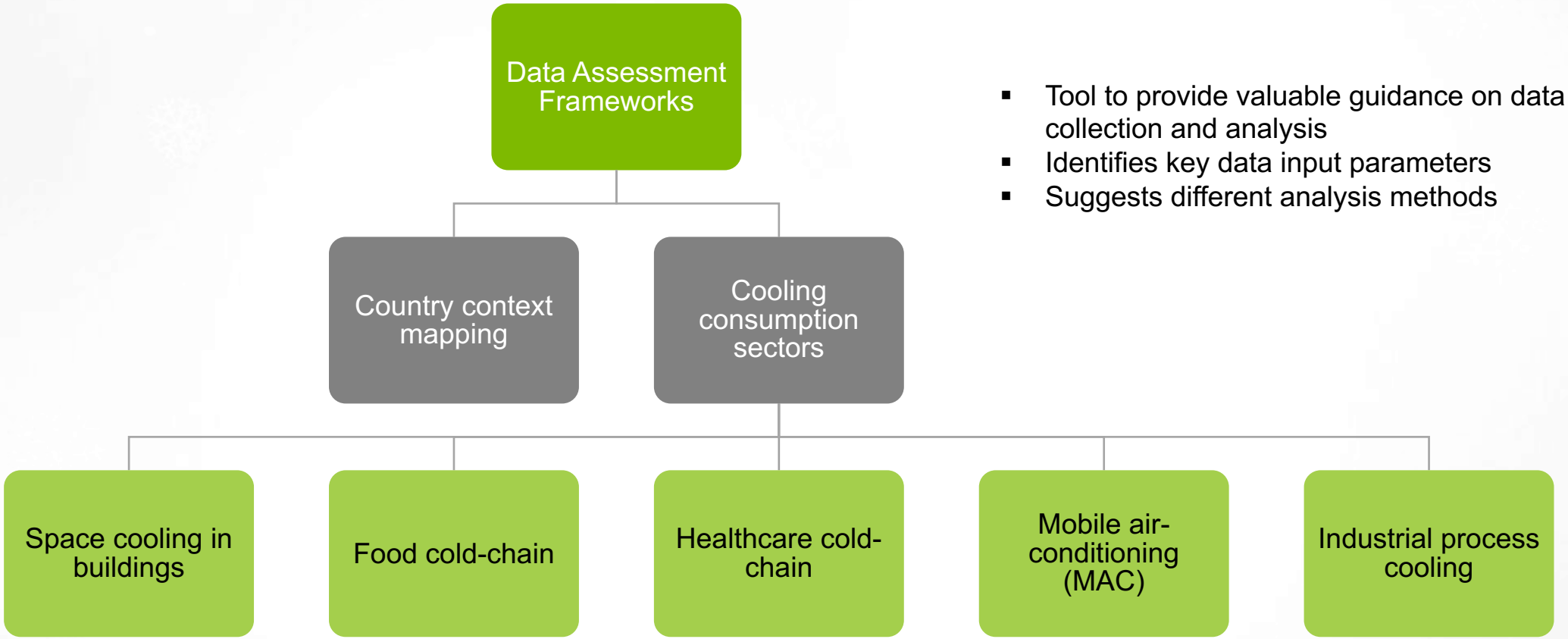
MULTI-STAKEHOLDER COLLABORATION

Introducing Data Assessment Frameworks



- Tool to provide valuable guidance on data collection and analysis
- Identifies key data input parameters
- Suggests different analysis methods

NOTE: Frameworks for space cooling in buildings, food cold-chain, and healthcare cold-chain provide high-level guidance on the unmet cooling demand

How to use the Data Assessment Frameworks

- Frameworks are ‘directional’, not ‘instructional’
  - Include flexible features to suit a country’s capacities, needs, and contexts
- Use them in combination with the detailed steps described in the NCAP Development Methodology
- Not a modelling exercise

Sector-wise current and future cooling demand assessment

Activity 1: Map sector considerations

Main elements

- Identify sector growth drivers
- Map prevalent technologies
- Map current policies and programmes

Activity 2: Select sector objectives

Main elements

- Lay out sector objectives of the data assessment exercise

Activity 3: Decide what to calculate

Main elements

- Select data outcomes

Activity 4: Decide how to calculate

Main elements

- Conduct a broad assessment of the available data, computational resources, and domain expertise available
- Select data analysis pathway/s depending on the above

Activity 5: Identify and collect input data

Main elements

- Identify and collect the input data for the chosen analysis pathway

Activity 6: Estimate the *Baseline*

Main elements

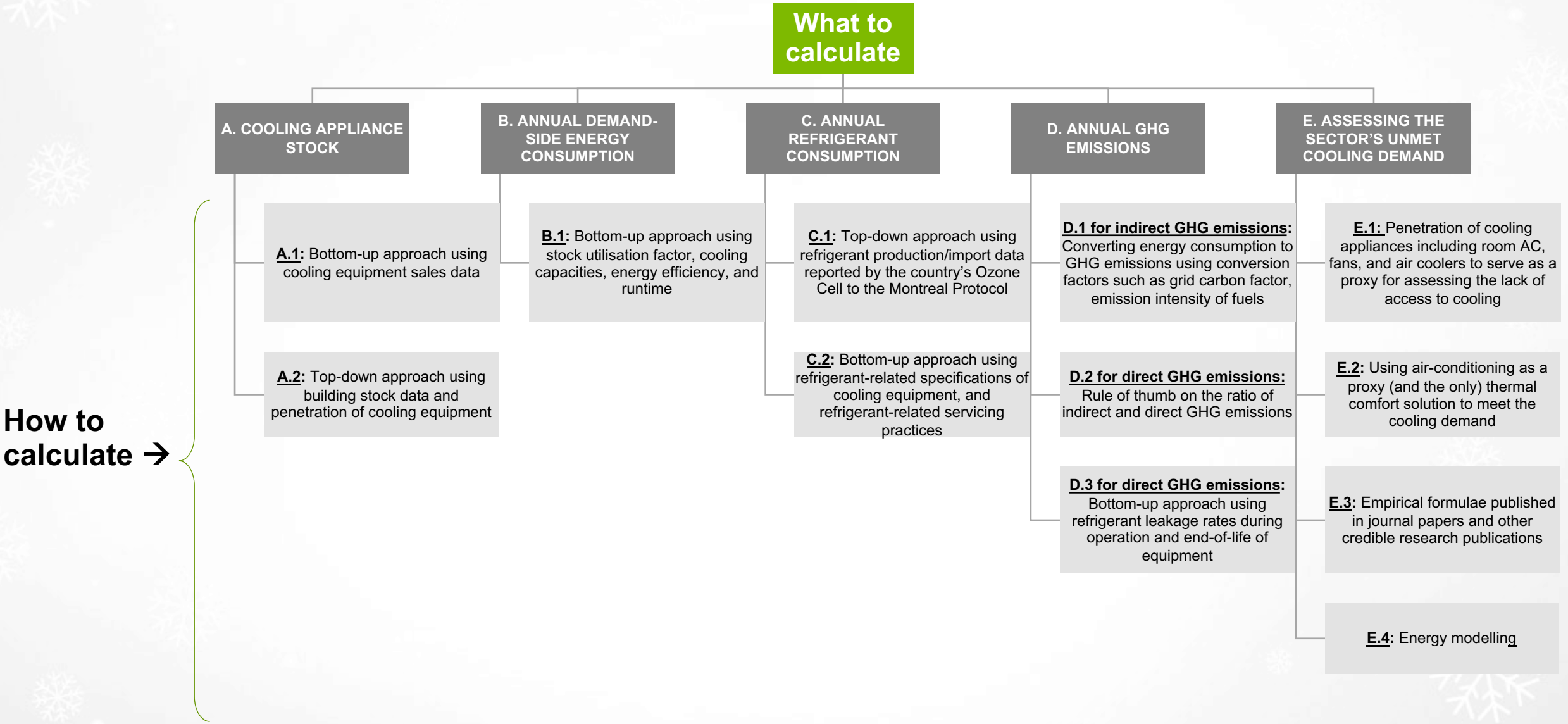
- Estimate the baseline rigorously

Activity 7: Project future growth scenarios

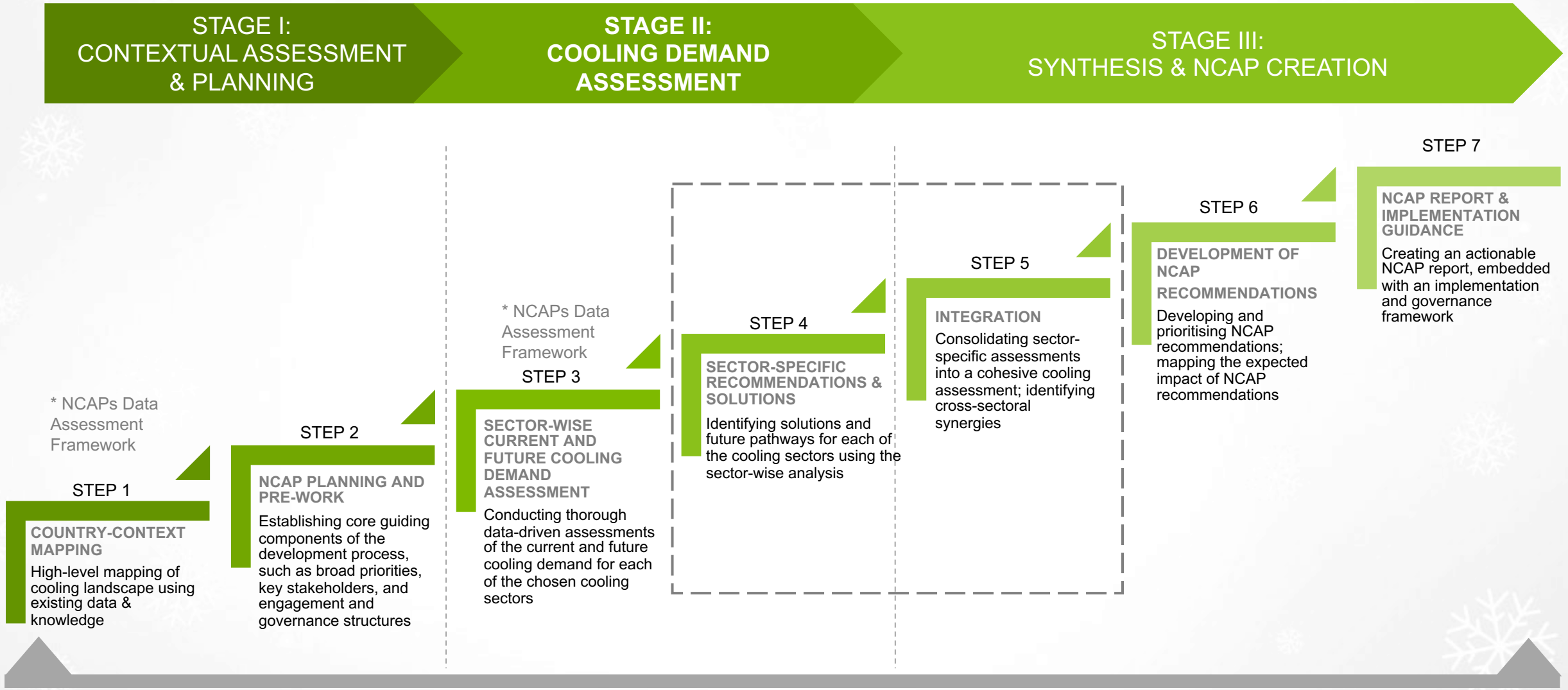
Main elements

- Project at least 2 future growth scenarios
  - 1 business as usual scenario
  - At least 1 intervention scenario

Example: Data Analysis Pathways for Space Cooling in Buildings



Cooling demand assessment is Stage II in the NCAP development methodology



Sector-specific Recommendations & Solutions and their Integration

Main elements

- Synthesize analysis to derive meaningful solutions and future pathways
- Prioritise recommendations based on:
  - Ease of implementation
  - Potential impacts and co-benefits
  - Synergies with existing government policies and programmes

Example: Space Cooling in Buildings

Suggested interventions

- Policy formulation & implementation

  Example: Leverage MEPS & S&L of cooling equipment to influence consumers purchasing decisions

- Market enablers & supporting instruments

  Example: Capacity building and training of HVAC and refrigerant service professionals

- Innovative financial instruments

  Example: Incentive mechanisms to shift the market toward energy efficient, and low-climate impact space cooling

Integration

- Consolidation of sector-specific assessments into an aggregated nationwide cooling assessment
- Relative importance of sectors in terms of demand growth and opportunities for interventions
- Opportunities for cross-sectoral synergistic actions

THANK YOU

Summary of Key Considerations for NCAP Development

	KEY CONSIDERATIONS	TYPICAL CHALLENGES			
		Ownership to drive the agenda	Multi-stakeholder collaboration	Resource-intensive undertaking	Data challenges
	Developing an NCAP would require a nodal government entity that not just 'owns' the development process but also drives effective collaboration and buy-in from multiple relevant government bodies.	X	X		
	Ideally, the stakeholders engaged in the development of the NCAP should include participants from across the triple-sector—that is, the public sector, the private sector, and the knowledge sector (civil society and academia)—who can actively contribute in the form of knowledge sharing as well as data inputs.		X	X	X
	The development process for an NCAP should include a mechanism for effective stakeholder engagement and inputs such that there is an alignment of the diverse interests of stakeholders and the proposed policies and solutions have a broad buy-in. This is a crucial step that primes the stakeholders that are ultimately responsible for on-the-ground implementation of policies and recommendations.	X	X		
	An important consideration is to align the cooling action plan—to the extent possible—with existing national priorities and policies, such as refrigerant transition plans, energy-efficiency targets, and nationally determined contributions. Not only does this encourage inter-ministerial cooperation, it also maximizes potential benefits through synergistic actions.		X		
	Leveraging and building upon existing data-driven research and any government databases and engaging in-country experts – such as from academia, civil society organizations and industry – would be key. Countries should also leverage support and resources from multilateral organizations that have experience in development of NCAPs, as well as leverage any available tools or modelling frameworks.			X	X
	While a comprehensive NCAP would be an ideal aspirational goal if possible, a country should strategically design the NCAP to best balance it's pressing priorities with its resources and capacities, and to minimize the opportunity costs of business-as-usual cooling, while keeping an integrated view of cooling in perspective.			X	X

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Access to Cooling in NCAPs

Alvin Jose

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Cooling Access approach in NCAPs to deliver Energy Efficient and Climate Friendly Solutions

Alvin Jose
Principal Energy Specialist
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SUSTAINABLE ENERGY FOR ALL

COOLING ACCESS | TRENDS IN ASIA THAT WILL INFLUENCE UPTAKE OF ENERGY EFFICIENT AND CLIMATE FRIENDLY COOLING SOLUTIONS

Populations at Risk in Asia that Lack Access to Cooling (from 2018 – 2021)

RURAL POOR

49% of Global Share

18 million

URBAN POOR

61% of Global Share

45 million

LOWER-MIDDLE INCOME

78% of Global Share

67 million

MIDDLE INCOME

84% of Global Share

132 million

FACTORS TO CONSIDER IN NCAPs IN ASIA

- What are the Cooling Needs of the various risk groups and the Solutions they can afford/access ?
- What Solutions and Planning should be considered to address to Cooling Needs of population without access to reliable electricity ?
- What is the Impact on Future Energy and Refrigerant demand based on the cooling needs of the shifting demographic group ?
- What are the enabling policies to ensure that the different risk groups adopt sustainable cooling solutions ?

ACCESS TO COOLING APPROACH | FROM COOLING NEEDS ASSESSMENT TO SOLUTIONS

COOLING SOLUTION APPROACH FOR OPTIMIZATION

THREE COOLING FOR ALL - COOLING NEEDS

COMFORT & SAFETY

FOOD & NUTRITION

HEALTH & CARE

TECHNOLOGY

SERVICES

POLICY

FINANCIAL

FOUR COOLING FOR ALL - COOLING SOLUTION PILLARS

THANK YOU!

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Special thanks to the Cooling for All funders:

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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Breakout 1 Sharing Experience on NCAP Development

Pak Sokharavuth

Deputy Director General
General Directorate of
Environmental Protection
Ministry of Environment, Cambodia

Nguyen Dang Thu Cuc

National Ozone Coordinator
Ministry of Natural Resources and
Environment, Vietnam

Meng Liu

Deputy Chief of Energy Group
China National Institute of
Standardization

Moderator

Lily Riahi

Coordinator, Cool Coalition

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KIGALI COOLING EFFICIENCY PROGRAM

Sharing Experience on NCAP Development in Cambodia

LAUNCH OF NCAP METHODOLOGY AND A SERIES OF REGIONAL CAPACITY BUILDING WORKSHOPS:

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

30 June 2021

By Pak Sokharavuth, Deputy Director General and Ozone Officer
General Directorate of Environmental Protection, Ministry of Environment
and Dr. Keo Piseth, National Consultant NCAP

COOLING ACTION IS A PRIORITY FOR CAMBODIA

- Cambodia's economy has been growing at an average rate of 7%
- By 2030, Cambodia's electricity consumption is forecast to more than triple in comparison to the levels of demand in 2015
- In 2017 the average estimated penetration rate for cooling equipment in Cambodia was about 2% and considering country's steady economic growth and rising income, energy use for space cooling and refrigeration is bound to increase
- At the same time Cambodia's Nationally Determined Contribution, aims at 16% reduction in greenhouse gas emissions from the energy sector in comparison to a business-as-usual scenario by 2030
- The intent of carbon emission reduction is further supported under:
  - National Green Growth Strategic Plan (2013-2030)
  - National Policy, Strategy, and Action Plan on Energy Efficiency (2017)
  - Sub-decree on ODS Management 2005

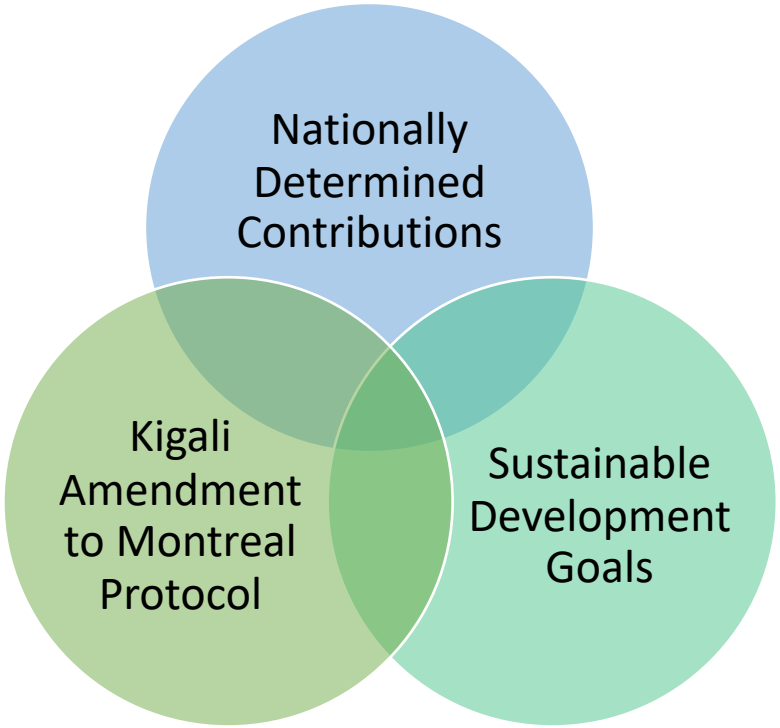
DEVELOPMENT OF NCAP IN CAMBODIA

- Cambodia in collaboration with UNEP and ESCAP started the development of the **National Cooling Action Plan for Cambodia** in the context of Cool Coalition
- The NCAP has identified comprehensive actions to reduce **energy use** and **emissions** from cooling aligned with plans related to emissions from **refrigerants transition**.

- Cambodia: **First country to pilot** the Cool Coalition comprehensive methodology

- NCAP for Cambodia will cover the following important cooling sectors:
  - Space cooling in buildings
  - Cold-chain & refrigeration (food and healthcare)
  - Mobile AC
  - Industrial process cooling

- **Access to cooling** is particularly important for Cambodia, as it is presently quite low across cooling sectors, but is likely to expand driven by economic growth and increasing incomes



COLLABORATION IS KEY FOR NCAP

NCAP National team

ក្រសួងបរិស្ថាន
MINISTRY OF ENVIRONMENT

The National Council for Sustainable Development

- Lead on Montreal Protocol implementation
- Stakeholder engagement for NCAP
- Data collection for NCAP
- Lead on NDC update and inclusion of sustainable cooling
- Drafting the text of the NCAP based on the national assessment prepared by the international team

NCAP International team

Cool Coalition

UN environment programme

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

With technical support by:
Alliance for an Energy Efficient Economy

- Comprehensive methodology for NCAP development
- Technical guidance and support through the NCAP process
- International expertise on sustainable cooling best-practices and solutions
- Large global network of partners and experts

In collaboration with:

Ministry of Land Management Urban Planning and Construction

- Development of Cambodia - NDC Roadmap for Buildings and Construction 2020-2050
- Passive cooling strategies are considered for inclusion into building regulations
- Urban Planning

ក្រសួងរ៉ែ និងថាមពល
Ministry of Mines and Energy

- Development of energy efficiency Minimum Energy Performance Standards and labels
- Regional Harmonisation project with ASEAN Center on Energy

Ministry of Public Works and Transport

- Programmes on reducing GHG emissions from the transport sector
- Refri and Freight transport related to cold-chain

*Multi-stakeholder technical group to support the NCAP development is being formed with participation from the government, private sector and academia

NCAP DEVELOPMENT PROGRESS

Country Mapping and NCAP Planning

- Collect high-level data to set the context and guide the data collection for the sectors
- Determine **the scope** and extent of the NCAP
- Focus to country-specific priority areas
- Understand socio-economic implications

Sept-Oct 2020

Sector Data Collection

- Space cooling in buildings
- Cold-chain & refrigeration (food and healthcare)
- Mobile AC
- Industrial process cooling

Oct 2020-Mar 2021

Sector data Analysis and interventions

- Combining data results and define the met/unmet national demand
- Project how the demand will grow and develop a scenario of ambitious polices to compare
- Identify suitable and impactful policy interventions

Mar-May 2021

NCAP integration and final recommendations

- Develop and prioritise NCAP recommendations
- Map the expected impact of NCAP recommendations
- Validation with Working Group
- Consultations with experts

May-June 2021

NCAP draft and review

- Contextual and methodological chapters
- Policy recommendations chapter
- Reviews by Steering Committee
- Draft revisions and submit for approval

Feb-July 2021

STAGE I: CONTEXTUAL ASSESSMENT & PLANNING

STAGE II: COOLING DEMAND ASSESSMENT

STAGE III: SYNTHESIS & NCAP CREATION

Data collection and survey

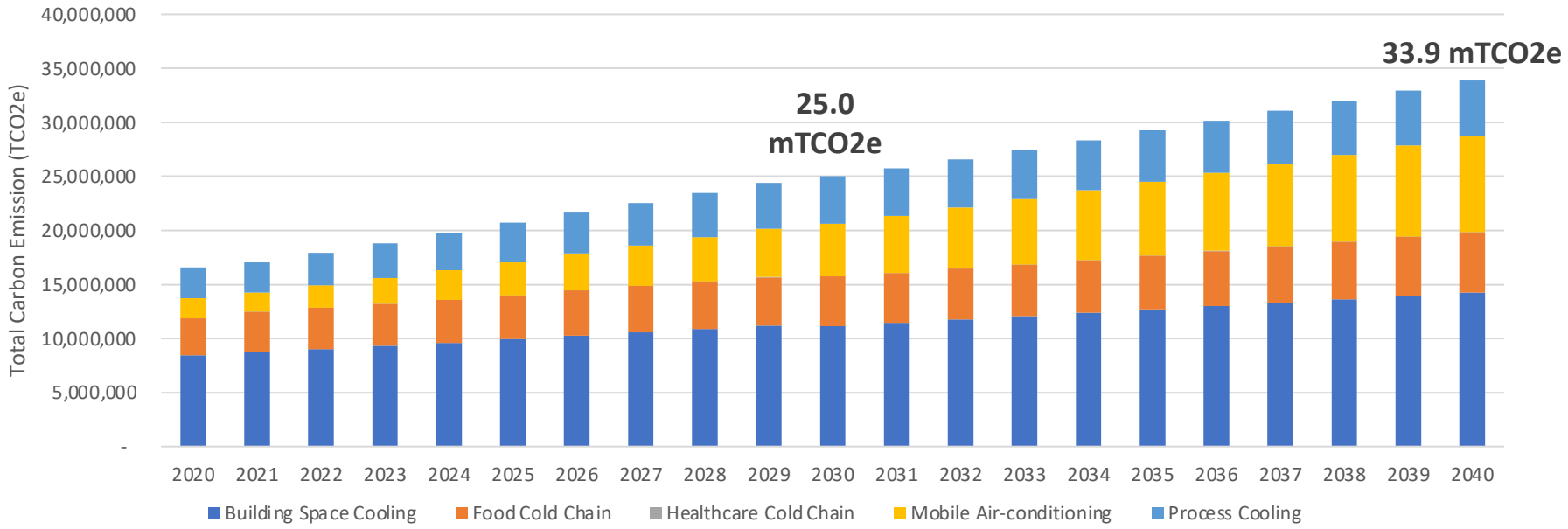
- Carried out by consultant, Cambodia National Ozone Unit in cooperation with local government during September 2020 – February 2021 and rechecking until April 2021
- Target groups
  - Supplier of refrigerants and cooling appliance (importer/distributor)
  - Servicing sectors (workshop/technician)
  - Owner/user of RAC equipment
  - Factory, Ice manufacturing
  - Public Building, Business center, Supper market
  - Hospital, Clinic, school,
  - Hotel, guest house, restaurant, casino, etc.

Observation on survey data

Depend on subjects' motivation, honesty, memory, and ability to respond

- Servicing sector
  - May not be motivated to give accurate answers due to concerns that information could be shared with revenue/tax collectors
- Estimation from household survey
  - Validity and accuracy of estimation on household with or without A/C and no. of A/C and other cooling appliance per household
- Other sectors
  - Long process and need to pass many level to get the data information, sometimes have to revisit

Preliminary Cooling Demand Assessment: Total Carbon Emission (TCO2e)



Observations

- Building Space Cooling constitutes 42% of the total cooling carbon emissions by 2040
- Mobile air-conditioning is the second highest contributor of total carbon emission by 2040 (26% contribution). This is attributed to extended penetration of LDV (76% contribution in MAC carbon emission) in the country (2.7 million LDV for 4.4 million households by 2040)
- The contribution of food cold chain is third highest contributing to 17% of total carbon emissions by 2040. In the year 2020, the penetration of (refrigerators + freezers) in household is 23% and increasing to 55% by 2040

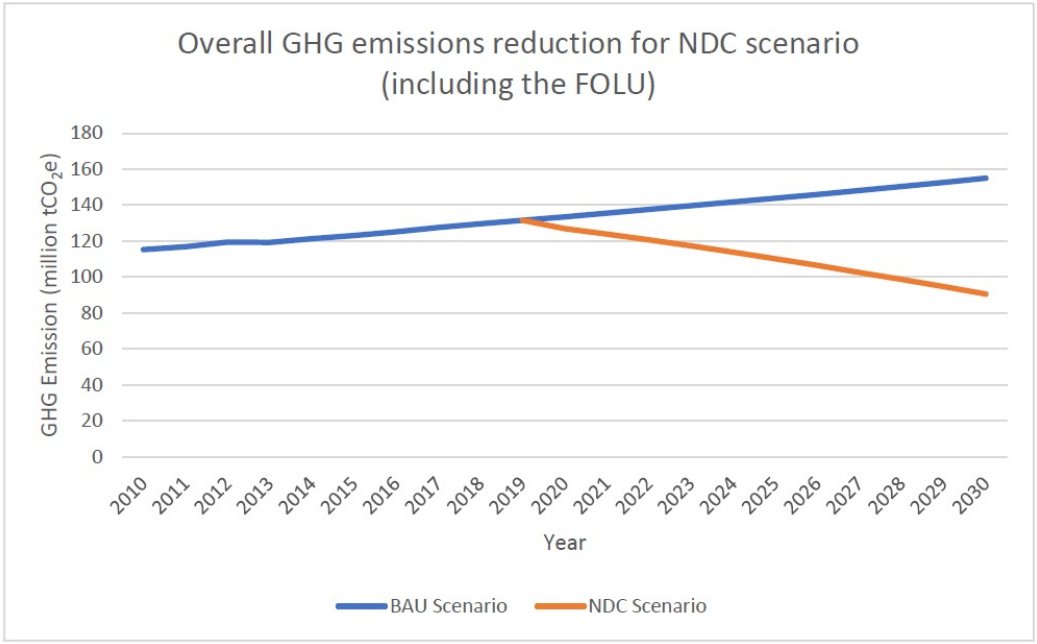
Outline

- Cambodia's National Determined Contribution
- Ten-Year National Cooling Action Plan (2021-2030)
  1. *Background*
  2. *Situation Analysis*
  3. *Existing policies*
  4. NCAP (Vision, Mission, Goals, Interventions, and Cost Estimate)
  5. Implementation Strategies
  6. Financial Mechanism
  7. Monitoring and Evaluation

Linking the NCAP with the NDC

Summary over BAU emissions and NDC emissions reduction

Sector	BAU 2016 emissions ($MtCO_2e$)	BAU 2030 emissions ($MtCO_2e$)	NDC 2030 Scenario ($MtCO_2e$)	NDC 2030 reduction ($MtCO_2e$)	NDC 2030 emission reduction %
FOLU	76.3	76.3	38.2	-38.1	-50%
Energy	15.1	34.4	20.7	-13.7	-40%
Agriculture	21.2	27.1	20.9	-6.2	-23%
Industry (IPPU)	9.9	13.9	8.0	-5.9	-42%
Waste	2.7	3.3	2.7	-0.6	-18%
Total	125.2	155.0	90.5	-64.5	-42%



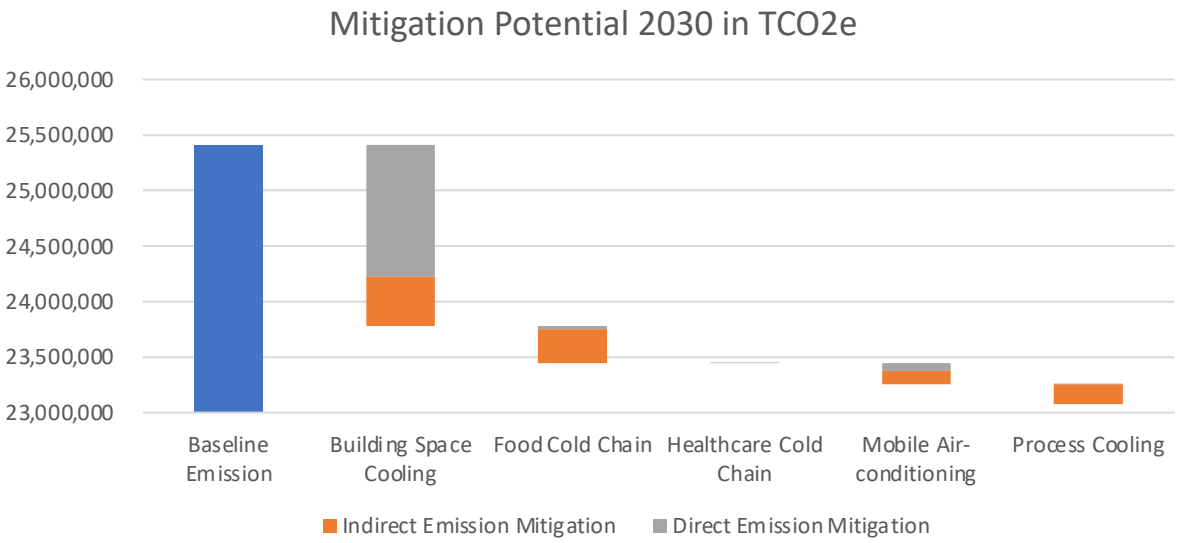
NDC: Mitigation actions for energy efficient and climate-friendly cooling

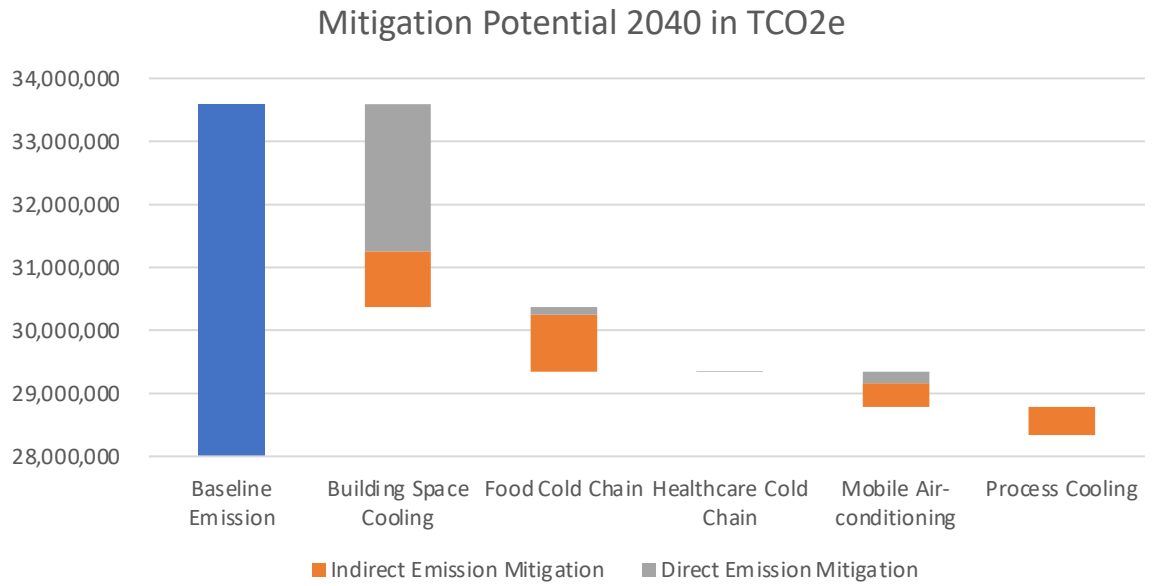
- **Promote implementation of NCAP**
  - Direct emission reduction: F-gas transition in air-conditioning and refrigeration
  - Indirect emission reduction: improved cooling efficiency
  - Inclusion of performance requirements of Passive Cooling Systems in Building Energy Code
  - Implementation of “passive cooling” measures in the cities

NDC: Mitigation actions for energy efficient and climate-friendly cooling

- Implementing electrical equipment labelling
- Enforcing energy-efficient building codes
- Improving cooling system for public sector buildings
- Promoting sustainable energy practices in manufacturing
- Promoting sustainable energy practices in food & beverage industries
- Introducing integrated public transport systems in main cities
- Enhancing system for maintenance and inspection of vehicles

Carbon Emission (tCO2e) Mitigation Potential





Discussion Points

For 2030

- Total mitigation potential 2.33 mTCO2e translating to 9.2 % reduction
- Contribution of indirect emission 1.04 mTCO2e translating to 4.1 % reduction
- Contribution of direct emission 1.29 mTCO2e translating to 5.06% reduction

Discussion Points

For 2040

- Total mitigation potential 5.24 mTCO2e translating to 15.6% reduction
- Contribution of indirect emission 2.61 mTCO2e translating to 7.8 % reduction
- Contribution of direct emission 2.63 mTCO2e translating to 7.8% reduction

NCAP: Interventions

- **Interventions**
  - Immediate interventions (2021-2025)
  - Mid-term interventions (2025-2030)
  - Long-term interventions (2030-2040)

Implementing Mechanism

- Inter-sectoral Working Group for the Implementation of Conventions, Protocols, and International Agreements related to Environmental Protection
  - Implement NCAP
  - Propose policy interventions
  - Coordinate with inter-ministries, development partners, international and national government agencies, private sectors, research institutes, and citizens
  - Strengthen government institution
  - Provide capacity building for stakeholders
  - Raise public awareness and conduct public consultation
  - Conduct research and analysis
  - Conduct monitoring and evaluation
  - Fund mobilisation and technology transfer

Financial Mechanism

- Multilateral Funds
- Bilateral funds
- Private sectors' participation

Monitoring and Evaluation

- Establish data management system for cooling sector monitoring and evaluation
- Continuously collect and update data on cooling systems
- Annually evaluate progress on the implementation of NCAP
- Conduct five-years review

Sample Table for Intervention

No.	Mitigation action	Sector	Ministry	Government priority	GHG mitigation potential	Baseline and targets	Co-benefits(adaptation, environmental, social)	Finance costs (USD)	Finance benefits	Technology availability	Gender	Conditional/ Unconditional	Youth	Private sector	SDGs
24	**Promote sustainable energy practices in manufacturing**	Energy	Ministry of Industry, Science, Technology and Innovation (MISTI)	The National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (MIME 2013), Basic Energy Plan (2019), The National Policy on Green Growth and the National Strategic Plan on Green Growth 2013-2030 and Industrial Development Policy 2015-2025.						Technology transfer in key industrial sub-sectors which are process heat intensive: bricks, food and beverage	Energy efficiency measures cut the production cost and significantly boost competitiveness and productivity of manufacturing, enabling job creation. Women account for 25% of the industry workforce and around 85% of garment workers, Cambodia's largest industrial sector	Conditional	Possibility for youth engagement related to factories, retailers, technology vendors etc.	Private sector involvement through factories, GMAC, retailers, ESCOs and technology vendors	5, 7, 8, 9, 11
	1: Sustainable energy practices in garment Industry				Garments 2.3MtCO_2e, 55% vs BAU by 2030		Improving energy productivity, reducing ambient temperatures through ventilation and cooling optimization and decreasing fugitive heat losses from steam and compressed air delivery systems								
	1.1: Upgrade to efficient boiler				- GHG emission reductions: 0.03 MtCO_2e/year for 26 boilers, approximately			Each efficient boiler is estimated at USD 60,000 cost.	In monetary terms, savings represent USD 13.2 million in avoid wood biomass cost at an average value of USD 40.61/ton.						
	1.2: Sewing machine				GHG emission reduction is estimated at 0.002 MtCO_2e/year for 3,500 new electric machines.			Each efficient sewing machine is estimated at USD 200.	In monetary terms, electricity savings represent USDk 468 in a year, at an average electricity cost USD 0.1475/kWh.						
	1.3: Washing machine				GHG emission reduction is estimated at 0.0002 MtCO_2e/year for 130 new washing machines			Each efficient washing machine is estimated at USD 3,500.	In monetary terms, electricity savings represent USDk 34.8 in a year, at an average electricity cost USD 0.1475/kWh.						
	1.4: Drying machine				GHG emission reduction is estimated at 0.0001 MtCO_2e/year for 65 new drying machines.			Each efficient drying machine is estimated at USD 3,500.	In monetary terms, electricity savings represent USDk 17.4 in a year, at an average electricity cost USD 0.1475/kWh.						

Thank you

VIET NAM'S ACTIONS TO PROMOTE SUSTAINABLE AND SMART COOLING

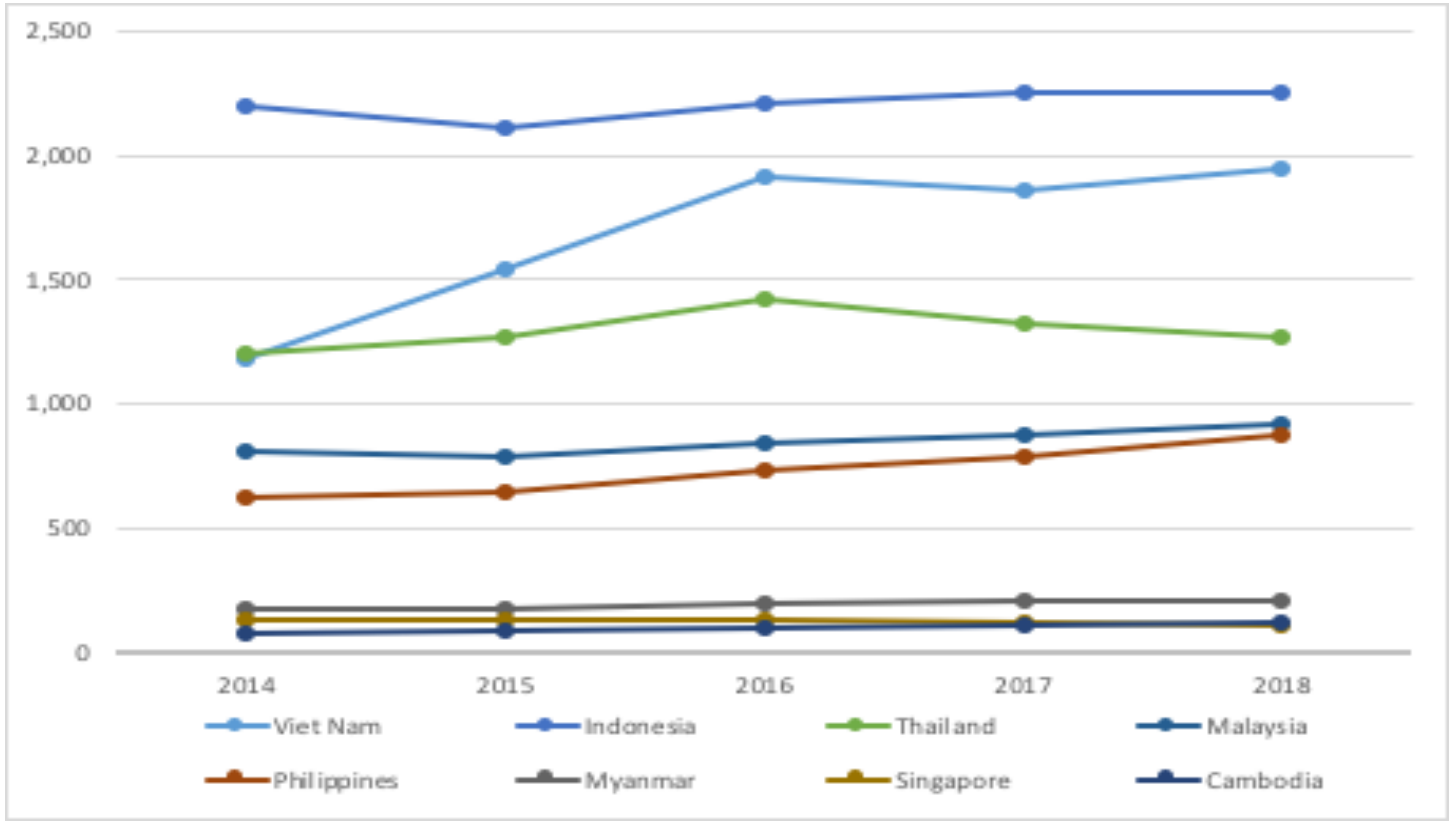
Present at Asia and the Pacific NCAP Workshop

30 June 2021

Contents

Context: Why Sustainable Cooling Matters in Vietnam

- The development and growth of the RAC sector, especially ACs, has been largely driven by Vietnam's rapid development.
- Demand for room AC in Vietnam ranked the second highest among ASEAN countries in 2018 as shown in the figure (in AC units).
- Vietnam's geographic and climatic conditions are also a significant contributor to cooling demand, causing increase GHG emissions.



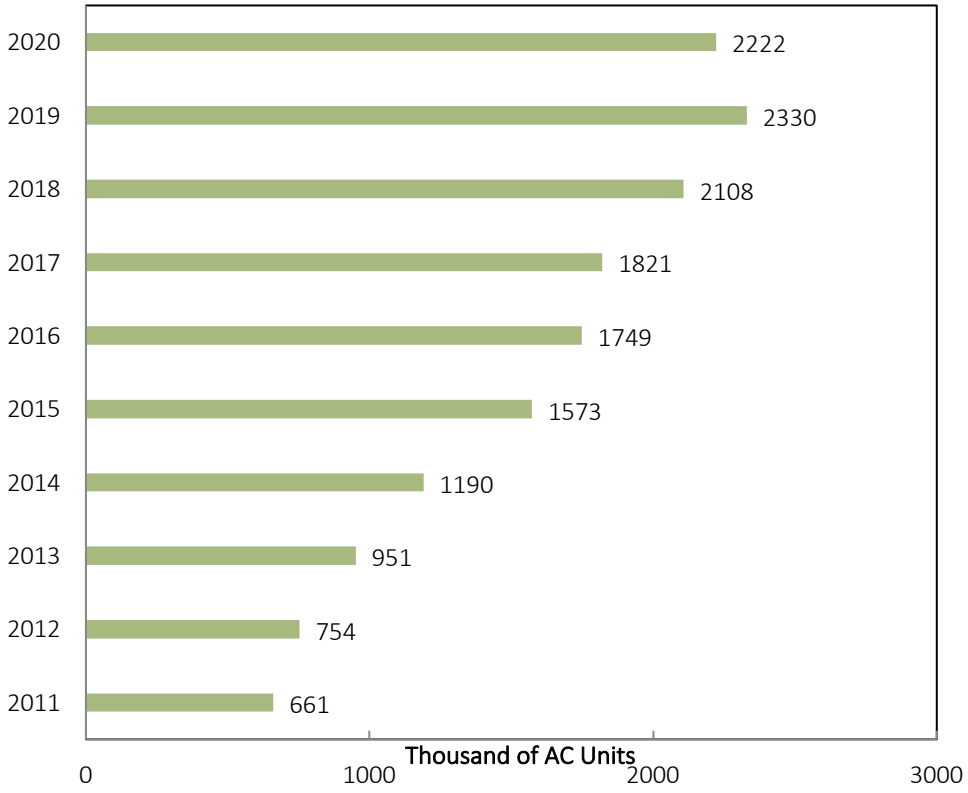
Source: JRAIA, 2019

Key features on the Viet Nam RAC market:

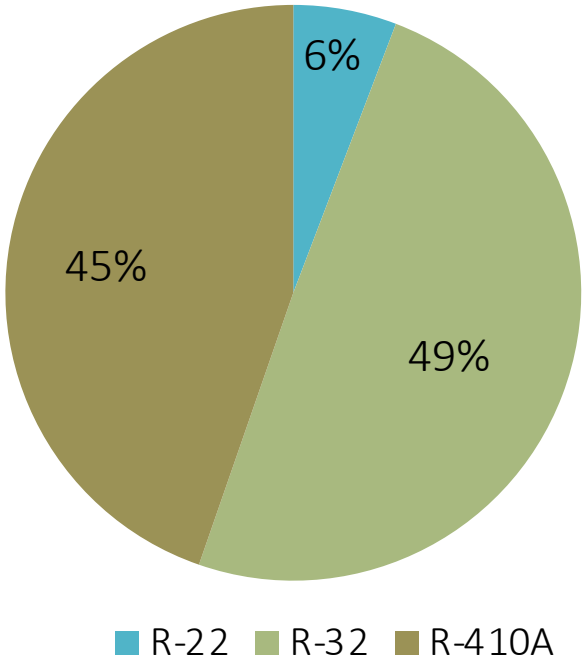
1. The refrigeration and air conditioning market is increasing continuously from 2011-2019 (10-12%/year), except for 2020 due to the impact of Covid-19 pandemic.
2. The majority are air conditioners with small cooling capacity (90%).
3. The use of HFCs is increasing rapidly by:

   - HCFCs are restricted in use

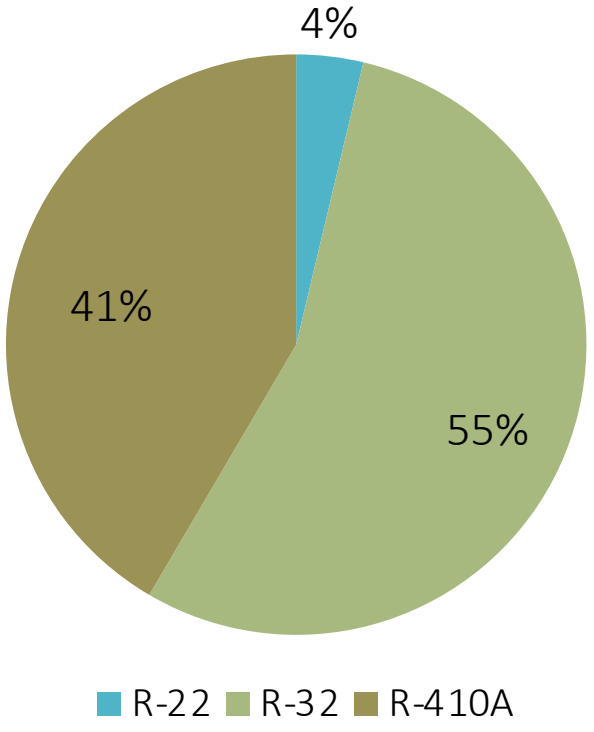
   - Inverter technology in air conditioning increased
4. Market share is dominated by big manufacturers (Daikin, LG, Panasonic, Carrier, Trane, York,...).



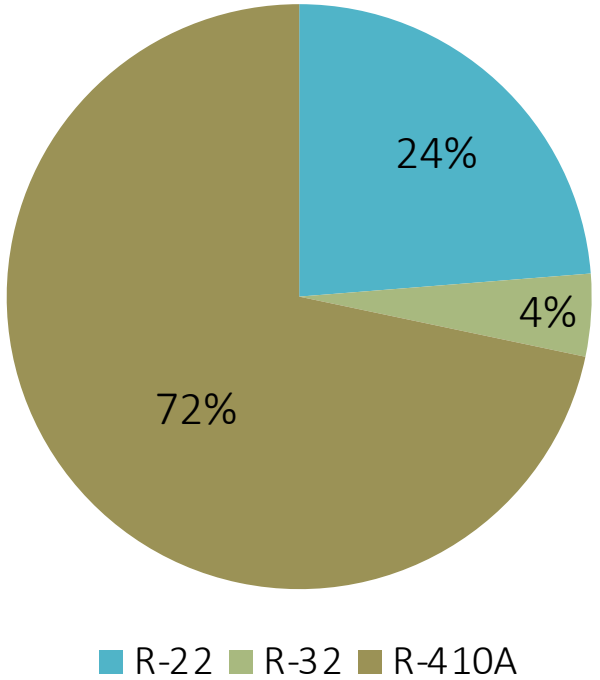
Refrigerants in use for room ACs



All types (N = 4,015)



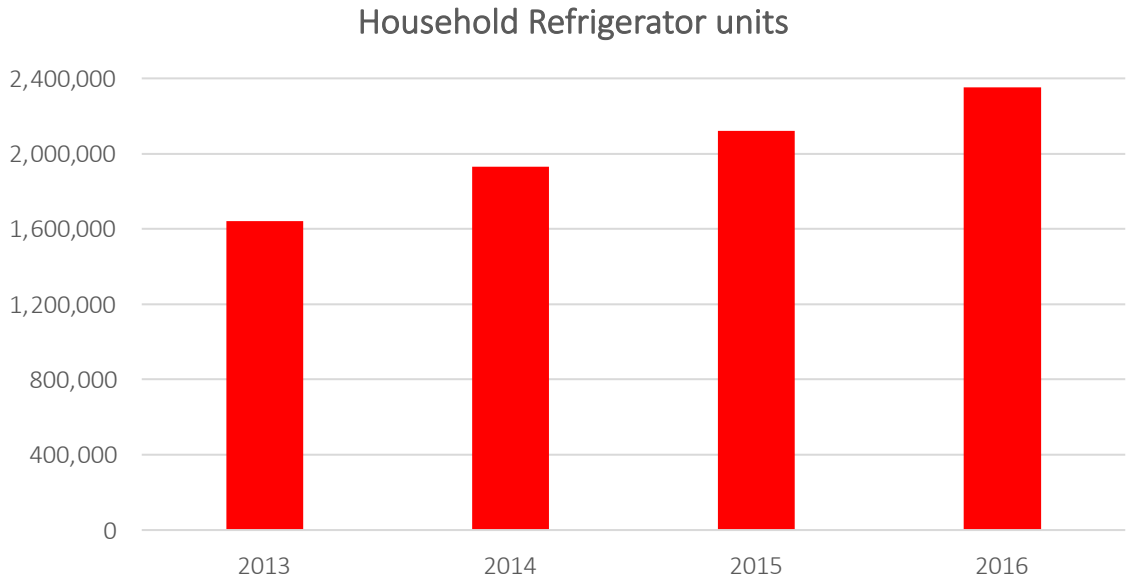
Single split ACs (N = 3,598)

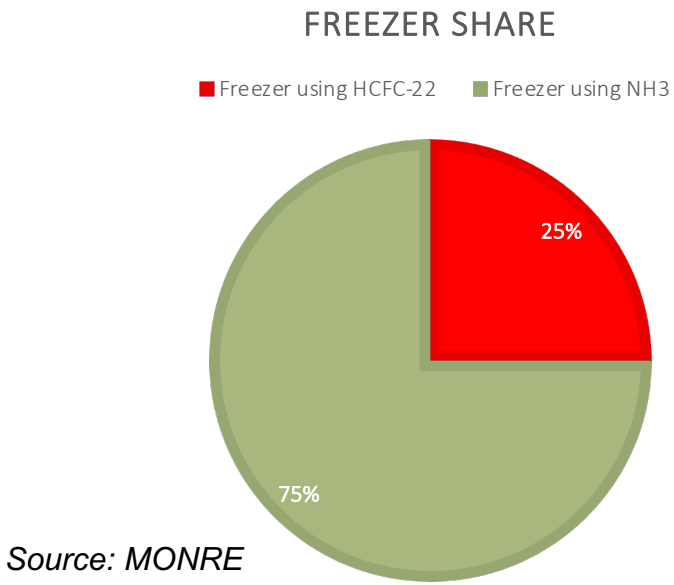


Other types (N = 417)

Refrigerants mainly used in refrigeration sector

1. Household refrigerators are mainly using HFC-134a. **Commercial refrigeration systems are old type, using HCFC-22, HFC-**134A/404A/507a/407A/F.
2. Industrial refrigeration systems are used in many industrial sectors, mainly in seafood processing.
3. About 25% of total freezer systems are using HCFC-22, 75% NH_3. 40% cold storage capacity are operating on HCFC-22 and HFC-404A/507C.





Source: MONRE

Linking Policies to Maximize Benefits of Efficient Climate-Friendly Cooling in Viet Nam

National policies on management of controlled substances under the Montreal protocol

- Viet Nam became a member to Montreal Protocol since 1994;
- Acceded Kigali Amendment in 2019; Join Cool Coalition, Fluorocarbon Initiative in 2020;
- Viet Nam Updated NDC (2014 baseline) adopted by the Gov. in July 2020 indicates intention to reduce 9% of GHG emission and up to 27% of GHG emission with international support, ~ an increase of reduction commitment by 21.2 mil tons of CO2eq compared to iNDC in 2015;
- Viet Nam is implementing HCFC phase-out management plan (Stage 2); preparing for HFC phase-down plan, planned in 2021.
- The Law on Environmental Protection, issued in 2020, stipulates the protection of the ozone layer, under-law documents are underway.
- The national plan for management and elimination of controlled substances to be developed and issued by 31 December 2023, will set up targets to reduce controlled substances (ODS, HFC); categorize controlled ODS and GHG by types, periods and sectors of use; measures to manage, monitor and verify elimination actions of controlled substances; collaborative solutions, information sharing among involving agencies, stakeholders;

Regulatory and policies on energy efficiency

- The legal basis for regulating energy efficiency, and specifically MEPS and labeling schemes, was established and detail in the Law on Economic and Efficient Use of Energy.
- MEPS and labeling schemes are mandatory for a range of products, including air conditioners.
- The government has promulgated regulations on mandatory technical standards for buildings.
- The government also uses its own procurement system to support the high efficiency AC market.
- Vietnam approved the third phase of the Vietnam national energy efficiency program (VNEEP) for the period of 2019-2030.

National Cooling Action Plan (NCAP): Linking Energy Efficiency and Refrigerant Transition:

Lead by Ministry of Industry and Trade
Supported by KCEP
Implementing agency: the World Bank

Report being finalized, data not yet published

Cooling Plan Scope and Objectives

Focus: Room air-conditioning (AC) as part of overall technical assistance (TA) to accelerate AC sector transformation to energy-efficient, “inverter” technology.

Provides context and reasoning for enhanced policy action to complement initiatives to remove or address technical barriers.

Makes the case for action by scenario analysis of various energy performance levels and by incorporating findings on technical barriers while describing cooling policy framework in Vietnam and possible areas to enable fulfilling mandates and priorities of two key cooling government focal points: MONRE and MOIT.

Cooling Plan Development

Review and analyze existing policy, regulatory and institutional framework for room AC on EE and refrigerant management;

Assess room AC market to establish a baseline for estimating impacts of potential policy interventions;

Analyze projections of room AC growth based on expected cooling demand, demographics, economic and market development, and other relevant country data and trends;

Provide analytical underpinning for a proposed new minimum energy performance standard (MEPS);

Set the stage for taking action on the findings and results of associated TA to local AC companies; and

Lay out a strategy for transforming the room AC sector.

Cooling Plan Methodology

Literature and desk review of existing information, rules and regulations, and surveys on the room AC market and policy landscape from Government of Vietnam and international organization;

Gap analysis on legal, institutional, and technical preventing achievement of policy objectives;

Survey conducted in April 2020 to collect commercial and technical parameters and updated data on room AC to provide for detailed analyses. Project database includes 4,015 AC models in total from 38 surveyed stores and manufacturers;

Modeling analysis to project the impact of more ambitious MEPS on the future AC market;

Stakeholder consultations with MOIT, MONRE, the Ministry of Science and Technology (MOST), EE Testing Centers, AC manufacturers, research institutes on heat engineering and refrigeration, and service shops on supplying and repairing cooling equipment.

Vietnam MEPS and Various Targets Compared

Item*	CSPF (W/W)	Btu/h/w	SEER**
ASEAN Shine	3.08	9.9	10.51
Vietnam MEPS 2015	3.1	9.96	10.58
Option 1 – 20% over base case	3.7	11.87	12.61
Option 2 – Ave. CSPF in the market	4.56	14.65	15.56
Option 3– U4E Model Regulation	5.7	18.33	19.47
K-CEP Minimum 20% + SHINE	3.7	11.87	12.61
K-CEP Aspirational for local AC Co.	5.31	17.06	18.12

*For fixed speed, split AC to 15,000 Btu

**Conversion Factors: 1.06206897 and 3.412

Vietnam market characteristics:

- Fixed-speed AC ave. energy efficiency - 3-4.12 W/W
- 2019: 78% are inverter AC
- Dominant refrigerants: R-410A and R32
- Penetration rate only 17%

Kigali phasedown schedule Group 1, A5 Countries

Timeline	Phase-down Schedule
2020-2022	Ave. HFC for 2020-22 + 65% of HCFC baseline
2024	Freeze
2029	10 % reduction
2035	30 % reduction
2040	50 % reduction
2045	80 % reduction

Minimum CSPF recommended by the **2019 U4E model regulation guidelines circulating at the moment**, is 5.7 W/W for the same cooling capacity models for Vietnam. Guidelines also recommend utilizing refrigerants with GWP less than 750 in split (room) AC systems

Climate Benefits of Enhancing EE alongside Kigali Implementation

- EE Improvement Scenarios and the NDC Targets

2030 Emission reductions ($MtCO_2e$)	Direct	Indirect	Total	2030 NDC (contribution to 9% unconditional target)	2030 NDC (contribution to 27% unconditional + conditional target)
Option 1	0.24	1.86	2.10	2.5%	0.8%
Option 2	0.52	5.44	5.97	7.1%	2.4%
Option 3	0.65	7.91	8.56	10.2%	3.4%

- Net Benefits of GHG Emission Reductions

	Option 1 (in VND B)	Option 2 (in VND B)	Option 3 (in VND B)
Net Benefits (Low SVC)	47,440.56	131,705.56	183,812.43
Net Benefits (High SVC)	94,937.57	263,584.51	367,866.72
NPV (Low SVC)	102,980.56	262,210.56	301,799.43
NPV (High SVC)	150,477.57	394,089.51	485,853.72

1 USD = 23,142 VND

SVC = Social Value of Carbon

Proposed Approach to Accelerate AC Sector Transformation

To promote deployment of more climate friendly AC, proposed approach aims to:

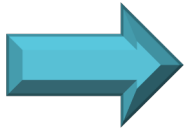
Increase the market share of higher efficient room AC in Vietnam and promote energy savings in the cooling sector to contribute to sustainable development goals and national EE targets;

Directly contribute towards meeting the country's HCFC phase-out and HFC phase-down obligations under the Montreal Protocol and its Kigali Amendment;

Contribute towards achievement of the GHG emission reduction objectives of the NDC and broader green growth objectives; and,

Promote a low carbon lifestyle for consumers and increase capacity of manufacturers and the servicing sector.

To be achieved thru 8 proposed tasks



1. Revise MEPS and Energy Labelling: Raise MEPS and Star Rating Labelling Program for single-split AC.
2. Apply MEPS and Star Labelling to other types of AC.
3. Promote faster transition to more climate-friendly refrigerants.
4. Improve skills, quality and knowledge in servicing and promote an integrated approach thru end-of-life.
5. Promote local AC capacity and consumer awareness towards more EE room AC market.
6. Analyze and recommend incentive mechanisms and business models to scale up adoption of climate-friendly room AC.
7. Strengthen linkages between HFC phasedown and the NDC, including by ensuring that the next NDC update takes into account direct emissions associated thru improved refrigerant management and transition to low GWP alternatives.
8. Assess adequacy and enforcement of building code for enabling real-world cooling performance of AC

THANKYOU FOR YOUR ATTENTION!

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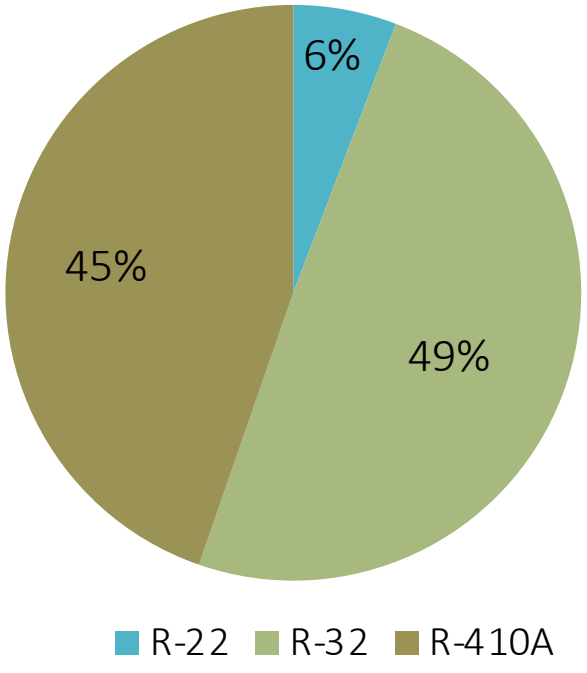
Current status of room AC market

Refrigerant in use



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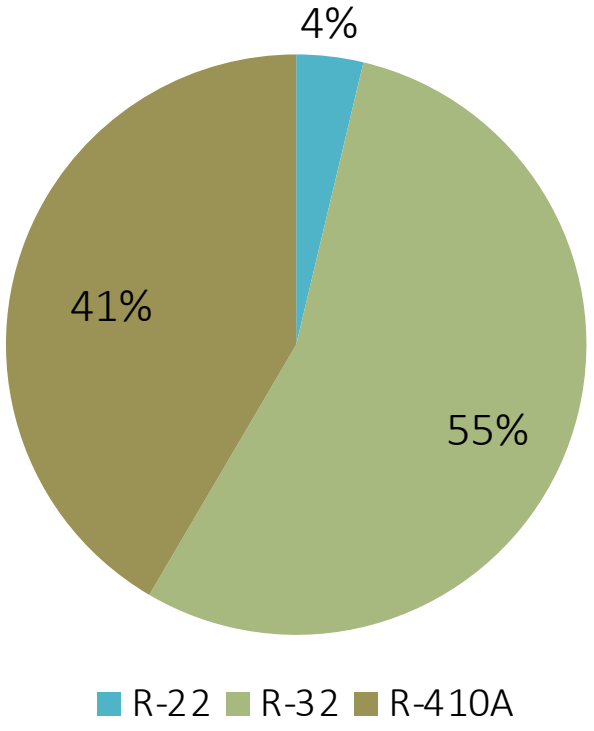

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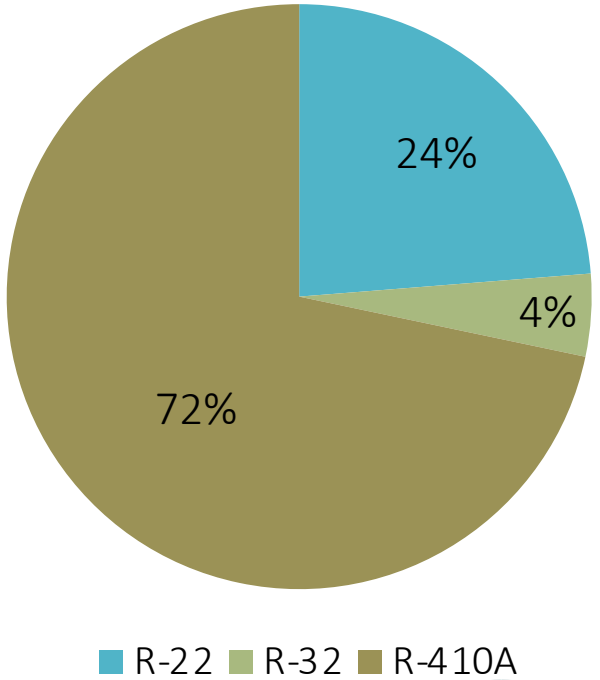
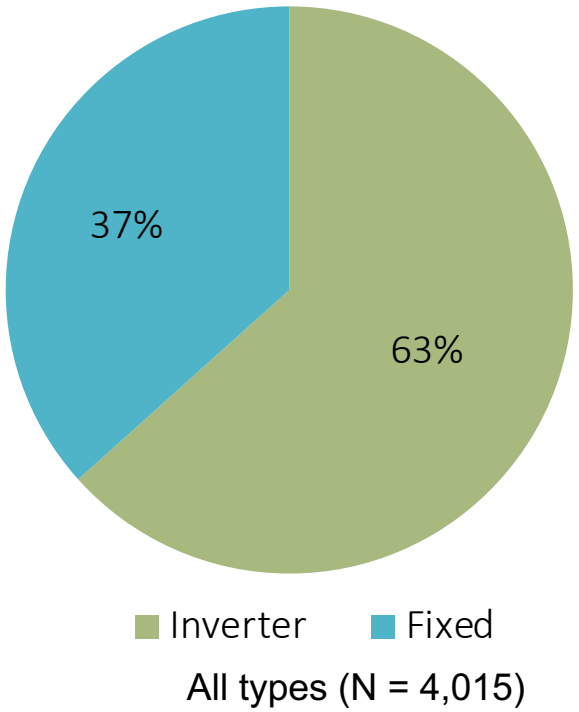


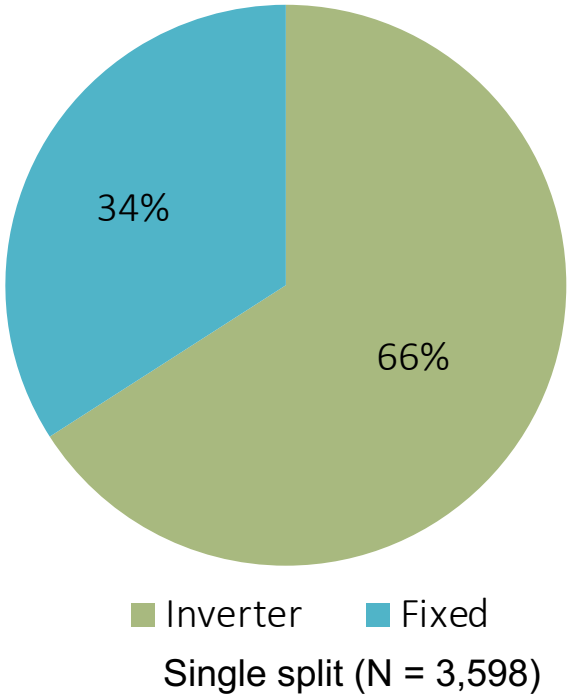
Other types (N = 417)

Current status of room AC market

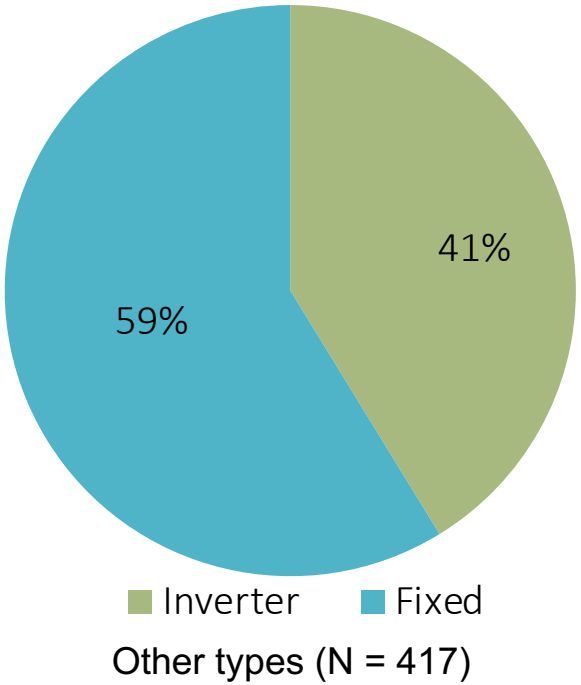
Inverter ACs and Fixed ACs



All types (N = 4,015)



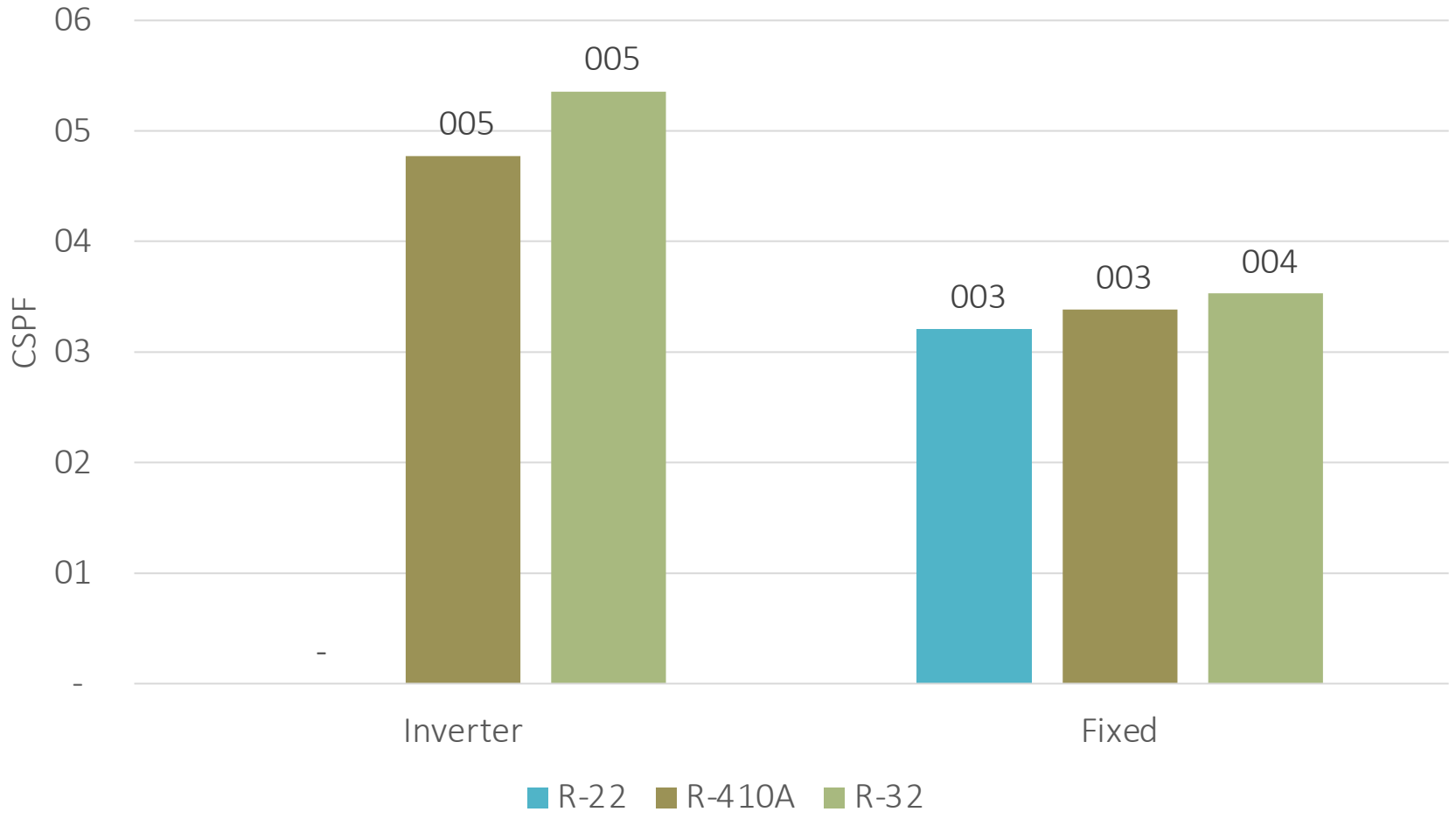
Single split (N = 3,598)



Other types (N = 417)

Current status of room AC market

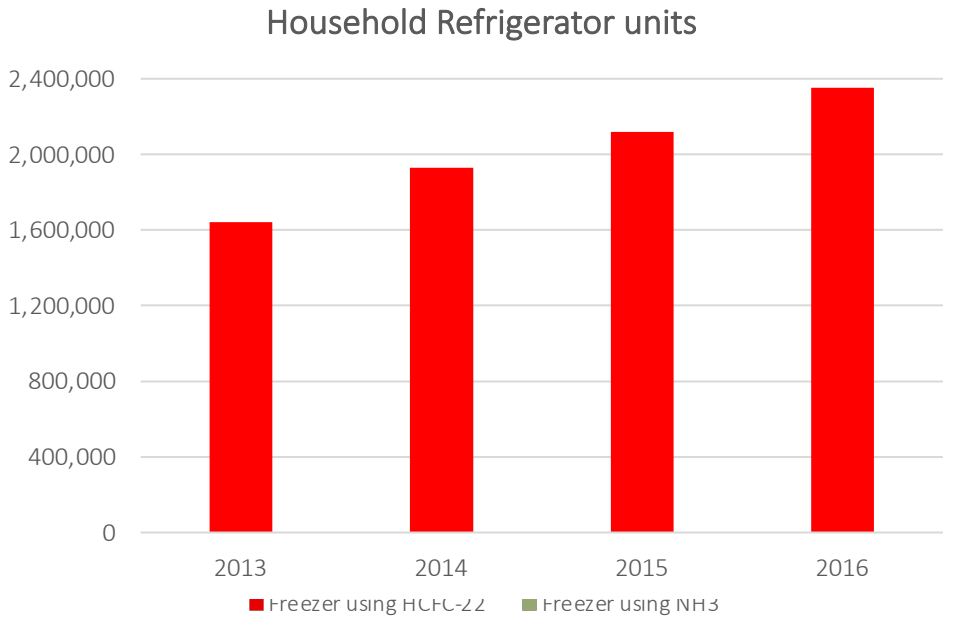
Energy efficiency and type of refrigerants

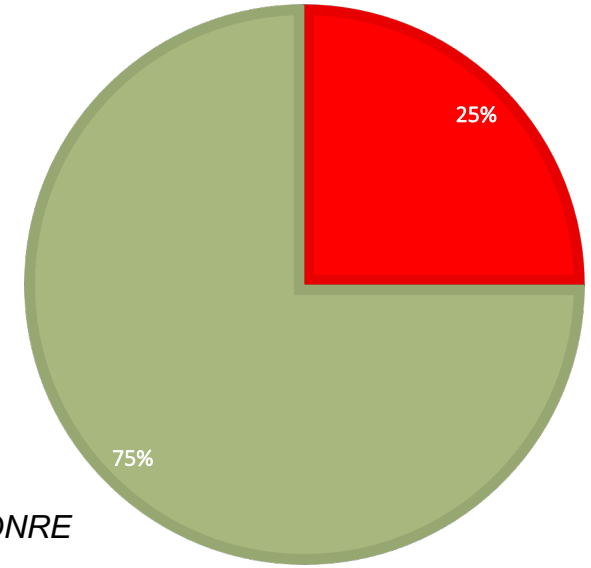


Energy efficiency by refrigerants

Overview of refrigeration market

1. The household refrigerator market has annual growth rate of 10 - 12%.
2. Household refrigerators are mainly using HFC-134a. **Commercial refrigeration systems are old type, using HCFC-22, HFC-**134A/404A/507a/407A/F.
3. Industrial refrigeration systems are used in many industrial sectors, mainly in seafood processing.
4. About 25% of total freezer systems are using HCFC-22, 75% NH_3. 40% cold storage capacity are operating on HCFC-22 and HFC-404A/507C.





Source: MONRE

Regional workshop for Asia and the Pacific on sustainable cooling

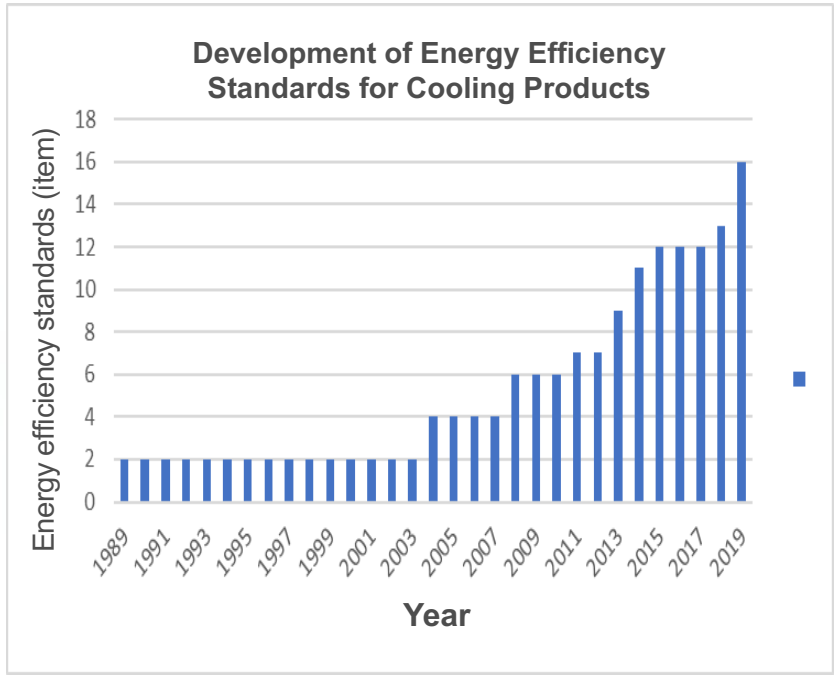
Brief Introduction on China Green Cooling Action Plan

Dr. Meng LIU
China National Institute of Standardization
30 June 2021

1. Background

Development history of energy efficiency standards for cooling products in China

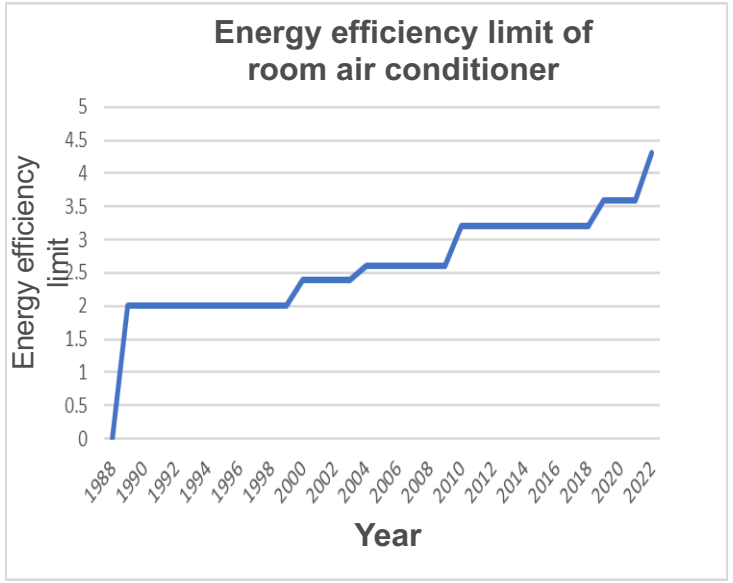
- Energy efficiency standards were first published in 1989
- Energy efficiency standards for 14 categories of cooling products were published by 2019
  - Household
  - Commercial
  - Refrigeration, freezing, etc.



1. Background

Energy efficiency of cooling products has been greatly improved through implementing energy efficiency standards

- The standards newly revised in 2019 will merge EE standards for fix speed and variable speed room AC into one and quickly phase out the fix speed AC, and the newly revised standard is expected to align with the advance international level.



1. Background

On June 13, 2019, seven ministries including NDRC jointly issued the *Green Cooling Action Plan*.

中华人民共和国国家发展和改革委员会
National Development and Reform Commission

关于印发《绿色高效制冷行动方案》的通知

发改环资〔2019〕1054号

各省、自治区、直辖市及计划单列市、新疆生产建设兵团发展改革委、工业和信息化部主管部门、财政厅（局）、生态环境厅（局）、住房和城乡建设厅（局）、市场监管局（厅、委）、机关事务管理部门，各有关单位：

为贯彻落实今年《政府工作报告》、国务院《“十三五”节能减排综合工作方案》和中法《关于共同维护多边主义、完善全球治理的联合声明》等文件要求，加快生态文明建设，促进绿色消费，推动高质量发展，积极参与全球环境治理，我们研究制定了《绿色高效制冷行动方案》，现印送你们，请结合实际认真贯彻执行。

国家发展改革委
工业和信息化部
财　政　部
生 态 环 境 部
住房城乡建设部
市场监管总局
国　管　局
2019年6月13日

International response: During the G20 Summit on June 29, the Foreign Ministers of China, France and the Secretary General of the United Nations held a meeting on climate change and issued a joint press communique to “support the improvement of energy efficiency standards in cooling industry. France and the UN welcome the release of China *Green Cooling Action Plan*. The three parties encouraged all countries to take decisive actions to improve energy efficiency in global cooling industry.”

2. General Idea

(I) Basic principles

- Principles: Market-oriented & government-supported, standard first,, focusing on the efficiency improvement both in the growing market and the existing market..
- Purposes: Improve cooling products efficiency and environment friendliness, expand supply of green products, expand green consumption market, and achieve high-quality and green development of cooling industry.

(II) Goals

- By 2022,
  - ✓ Increase the energy efficiency level in the market of cooling products such as household air conditioner and multi-split air conditioner by more than 30%,
  - ✓ Increase the market share of green efficient cooling products by 20%,
  - ✓ Achieve annual electricity savings of approximately 100 billion TWh.
- By 2030,
  - ✓ Increase the cooling energy efficiency of large public buildings by 30% and the overall cooling energy efficiency by more than 25%,
  - ✓ Increase the market share of green efficient cooling products by more than 40%,
  - ✓ Achieve annual electricity savings of approximately 400 billion TWh.

3. Main Tasks

(I) Standards

Improve energy efficiency of cooling products, with MEPs reaching or exceeding the MEPs in developed countries and Grade One energy efficiency reaches the international leading level

- **Revise standards:** Accelerate the merge of energy efficiency standards for fix speed and variable speed room AC; revise energy efficiency standards for products such as VRF, etc.
- **Develop standards:** Accelerate development of energy efficiency standards for cooling products such as data center, automobile AC and cold storage; phasing out 20%-30% low efficiency products
- **Supporting standards:** Develop and revise supporting national or industrial standards for green design, quality control and others of public buildings and industrial plants. Accelerate developing and revising product and safety standards for environment-friendly cooling agents.

Strengthen implementation of standards

- Use the energy efficiency standards as important technical basis for related policy and regulations such as energy conservation audit and government procurement.

3. Main Tasks

(II) Supply of Green and Efficient Cooling Products

- More policy and fund for the development the green industry; strengthen the connection among green technologies, capital and industries
- R&D on key generic technologies such as VFC, efficient compressor and compact lightweight efficient heat transfer etc.
- Improve the “EE Forerunner” system, establish industry benchmarks and guide enterprises in producing more efficient cooling products
- Accelerate transition to application of low GWP cooling agent in the AC production process, accelerate phasing out HCFCs and limit use of HFCs

3. Main Tasks

(III) Consumption of Green and Efficient Cooling Products

- Improve the government procurement system for energy conservation and environmentally friendly products; expand the scope of government green procurement.
- Strictly implement the statistical survey system for the sales of energy-efficient household appliances.
- Encourage the regular customers to purchase green and efficient cooling products or replace used inefficient products through subsidy or other stimulation measures. Encourage retailers and E-commerce platforms to display and sell green and efficient products.
- Promote the implementation of *Green Procurement Guide for Enterprises (Trial)*, and encourage enterprises to purchase green and efficient cooling products through voluntary commitment to energy conservation and other promotion initiatives.

3. Main Tasks

(IV) Promote Energy Conservation Transformation

Retrofitting projects of central air conditioners

- Promote practices of inefficient products phasing-out and application of energy saving technology of intelligent control, pipeline optimization, energy recovery, energy storage, accumulation of cold, natural cold source, multi-energy complement and natural ventilation in public institutions, large public buildings, subways, airports and other key areas.

Efficiency improvement project of cooling system in data center

- Strengthen optimization and upgrading in equipment layout, cooling architecture, external envelope structure, etc.; encourage the use of efficient cooling technologies such as liquid-cooled server, heat pipe backboard, indirect evaporative cooler, line grade air conditioner, and automatic sprinkling system.

3. Main Tasks

(IV) Promote Energy Conservation Transformation

Retrofitting projects for district cooling system

- Implement retrofitting projects for cooling systems in commercial complex, industrial parks, college campus and leisure resorts etc, introduce EPC and other commercial mode into the management of the cooling system to improve the cost effect.

Retrofitting project for cold-chain

- Improve the cost effect of cold-chain for agricultural products, food, medicine and other areas by replacing the existing inefficient cooling equipment with more efficient refrigerators, refrigerators, commercial freezers, refrigerated trucks, cold storages, etc; establishing energy management center, and introducing new technology such as IoT precise control of temperature (humidity), etc.

3. Main Tasks

(V) International Cooperation

- Promote the implementation of the *United Nations Framework Convention on Climate Change* and its *Paris Agreement* and *Montreal Protocol on Substances that Deplete the Ozone Layer*, so as to improve energy efficiency, reduce greenhouse gas emissions and HFCs.
- Conduct bilateral and multilateral cooperation; share international best practices in green and efficient cooling policies, projects and technologies; actively promote the *Belt and Road Green and Efficient Cooling Action Initiative*.
- Conduct international comparative analysis on cooling energy efficiency standards and test methods, and promote regional and international harmonization and mutual recognition of cooling energy efficiency standards and test methods.

中国标准化研究院
CHINA NATIONAL INSTITUTE OF STANDARDIZATION

Thank you for your attention!!

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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Breakout 2 Sharing Experiences on NCAP Data Collection and Assessment

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Assistant Director, National Ozone Unit, Ministry of Environment and Natural Resources, Sri-Lanka

Pak Supriyadi

Policy Analyst, Directorate of Energy Conservation, Directorate General of Renewable Energy and Energy Conservation, Ministry of Energy and Mineral Resources Republic of Indonesia

Dr Satish Kumar

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Moderator

Ksenia Petrichenko

Economic Affairs Officer
UN ESCAP

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NCAP Data Collection and Assessment in Sri Lanka

Modeeka Tilakaratna

Assistant Director

National Ozone Unit

Sri Lanka

Survey for Data collection

The data for preparing National Cooling Plan (NCP) was collected from primary and secondary sources

- A national kick-off workshop was organized by the Ministry of Environment (MOE) in collaboration with UNDP and UNEP. Relevant stakeholders were participated, and their views and comments were recorded.

- Primary data was gathered through a detailed survey performed using questionnaires, online and field visits

- Secondary data were obtained from statistical outputs of government departments, reviewing previous surveys data, custom data for imported equipment and refrigerants, annual reports of equipment manufacturers and expert opinions.

Challenges encountered

- Difficulties in complete filling out questionnaires due to lack of information
- Visits one place several time to get the needed information
- Collect data on equipment and appliances was difficult, because reluctant to provide inventory of equipment, capacities, and production data.
- Contradicting information was provided in some questionnaires, reducing the confidence level in some results.

For example, information filled in online questionnaire happened to be different when visiting the randomly selected sites (not all)

Thematic areas for the development of Sri Lanka Cooling Action Plan (SLCAP)

After stakeholder consultations following thematic areas were identified.

- Space cooling in Buildings and cooling demand
- Cold –chain and Refrigeration
- Transport refrigeration and Mobile Air Conditioning
- Refrigeration & Air Conditioning Service sector
- Indigenous knowledge and Research

space cooling and cold chain, representing majority of total cooling demand. The largest buildings for space cooling, food & agriculture (fruit& vegetables, dairy, fisheries and meat), commercial (supermarkets and retails), Health services and domestic refrigeration that are offering refrigeration and air-conditioning were surveyed to cover the biggest possible share of the cooling demand in the country.

Data analysis methodology

Data analysis is a complicated process and adapted the following method

- Use of appliances, refrigerant used, refrigeration capacities were listed for each of the sector/subsectors
- The information collected were cross-checked with available inventories/ stocks/ sales information
- Based on above details, estimated values of refrigeration demand and energy consumption were calculated
- Assessed the available improved technologies and their energy efficiency ratios
- The gradual replacement of the stock through replacing with new energy efficient appliances were assessed.
- A Business as Usual (BAU) and Intervention scenarios were developed assuming the use of alternative low-GWP refrigerants as well as energy efficient technologies in future

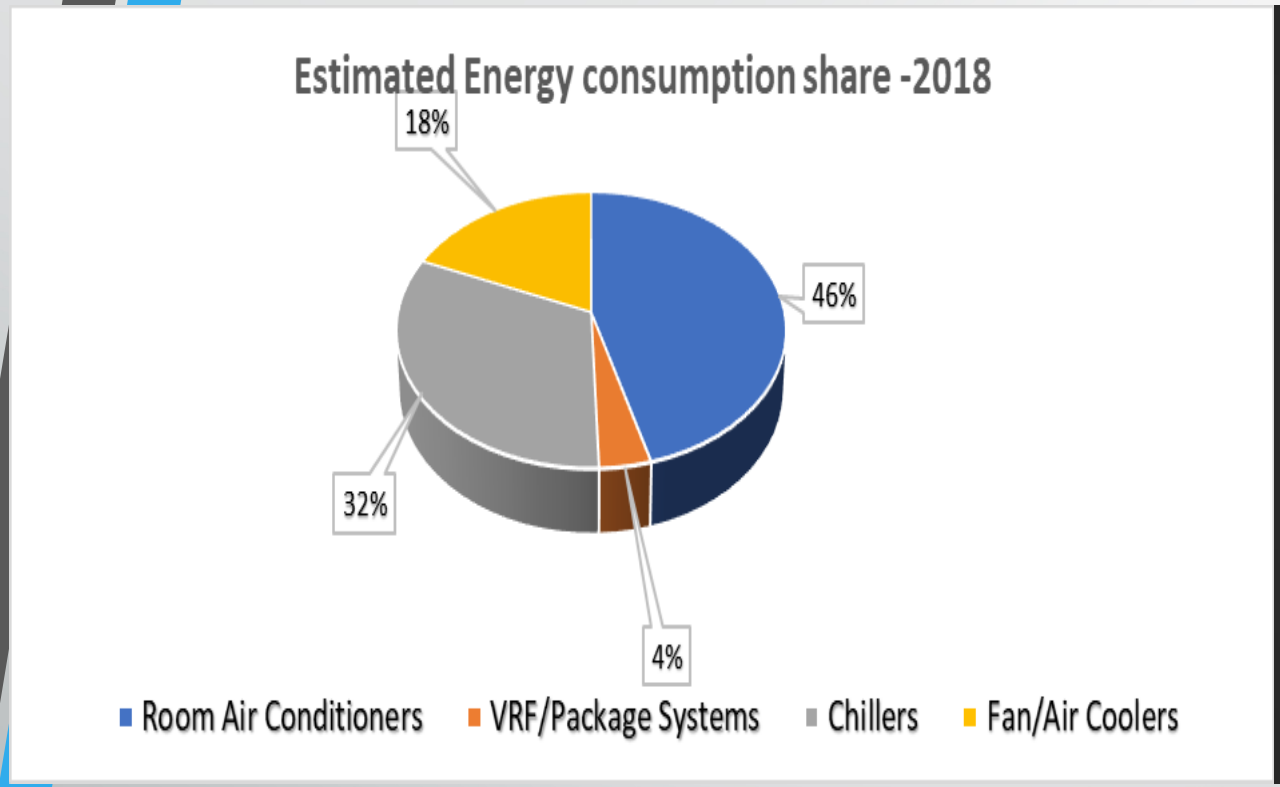
Assessment of future growth of Refrigeration demand and Energy consumption

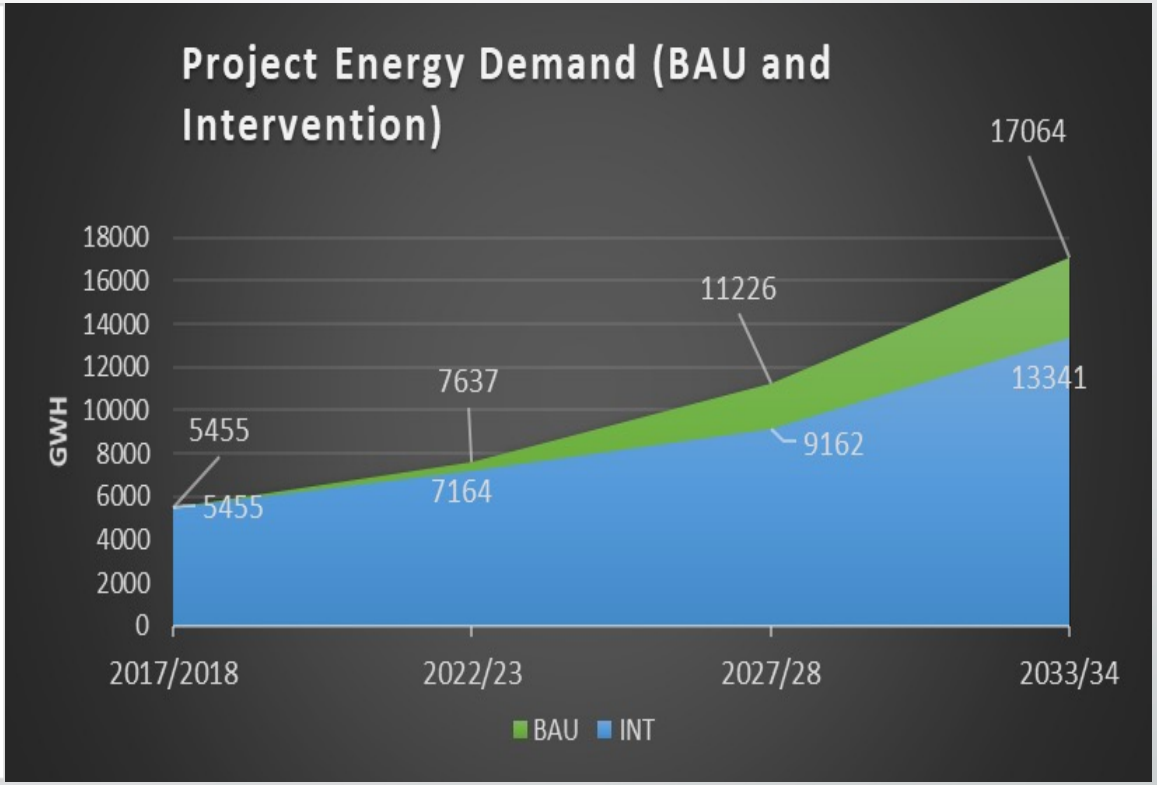
For the evaluation of future growth figures in the RAC sectors, following key drivers of cooling demand were considered.

- Population growth - influences the total number of households as well number of people per household, affecting cooling demand.
- Rates of urbanisation – Urban households usually have a higher probability of owning an AC or refrigeration unit, as well as making greater use of these appliances. Similarly, increasing wealthy households in urban areas will make greater use of AC
- Increase temperatures - increased demand for cooling.
- Economic growth – Increased economic growth will drive demand in the RAC sector as there is increased activity in the economy.
- Food security and demand for quality food – increased production of food and agriculture products and services
- Growth of commercial refrigeration – increased number of Supermarkets and retail outlets which demand refrigeration and air-conditioning

Health security – increasing health facilities

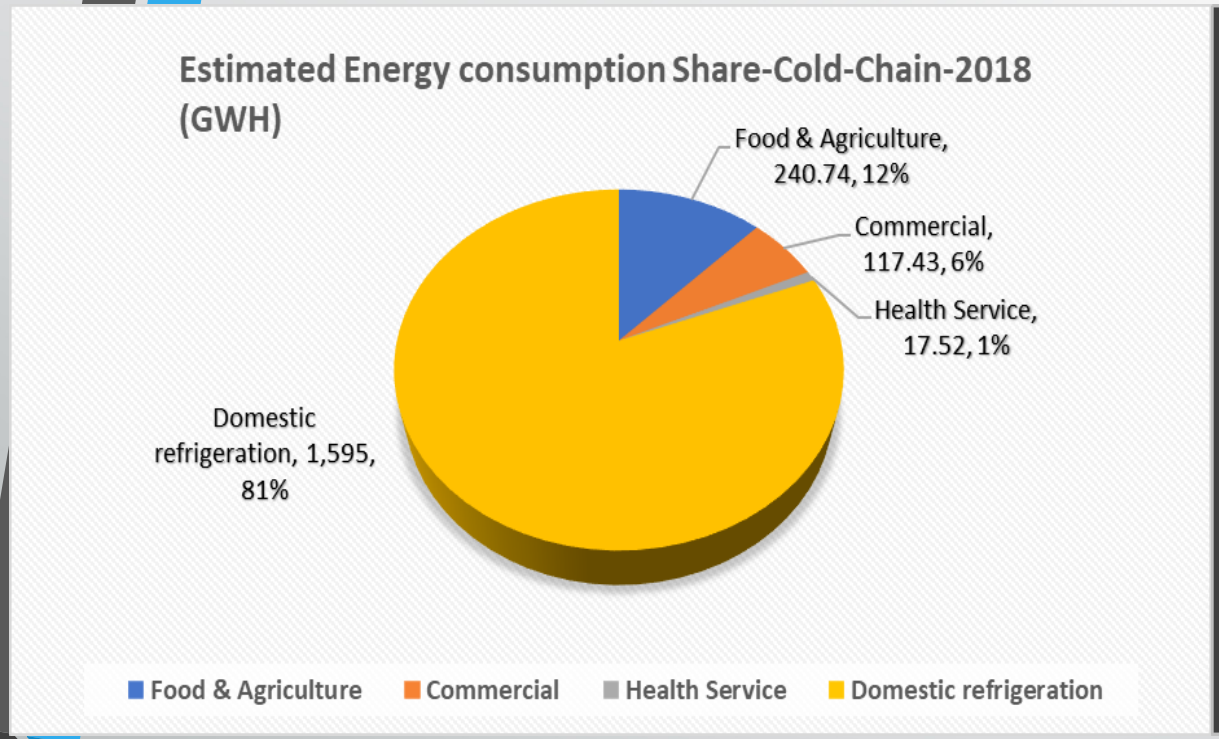
Energy consumption scenarios – Space cooling

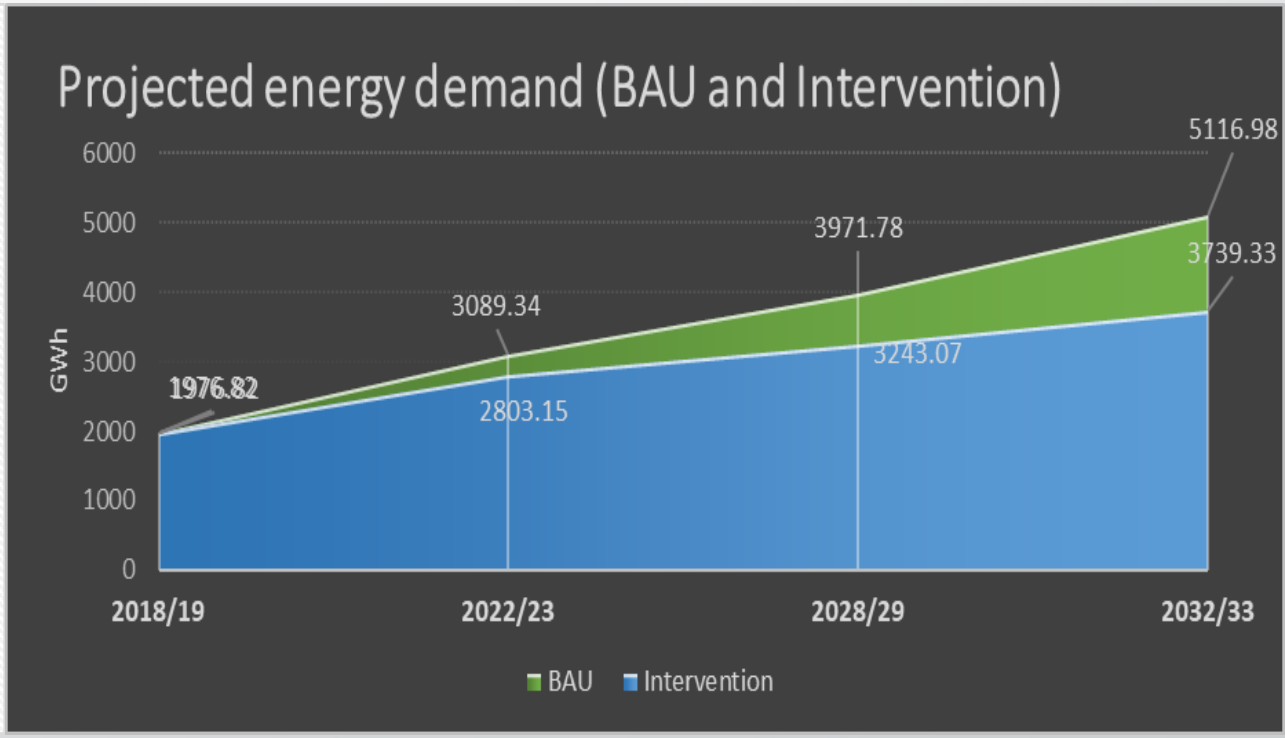




- Note: Assumption was done for Fan/Air coolers

Energy consumption scenarios – Cold-chain





Summary

- Total Annual Electricity Generation (2018) - 15,255.0 GWh (100%)
- Energy demand in Domestic refrigeration - 1,595.0 GWh (10%)
- Energy demand in Cold Chain Sectors - 375.7 GWh (3%)
- Energy demand in Commercial/ Industrial Space Cooling - 5,455.0 GWh (36 %)
- Energy demand in using fans/ Air coolers - 1,263.0 GWh (8%)
- Energy demand in other sector consumption - 6,566.3 GWh (43%

Thank You!

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Shaofeng Hu

Montreal Protocol Regional
Senior Coordinator
ROAP UNEP
OzonAction Compliance
Assistance Programme

Synergizing NCAPs with HFC Phase Out

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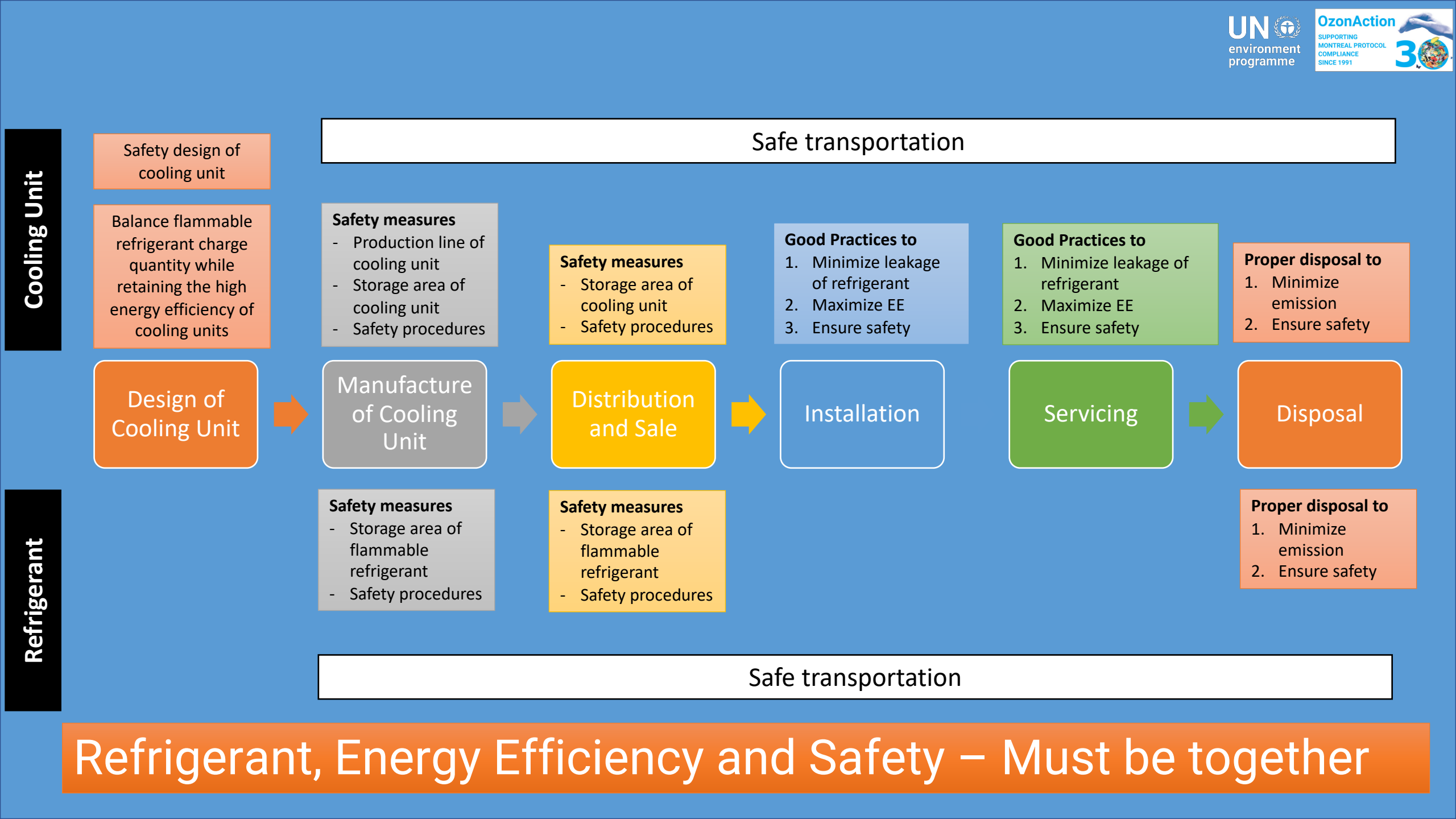
Enhancing Refrigerant Management Approaches Holistically with NCAP

Launch of NCAP Methodology and a Series of Regional Capacity Building Workshops Asia and Pacific

30 June 2021

Refrigerant Management

- Refrigerant management is an integrated part of sector transformation of the cooling sector not only for the phaseout of ODS and phasedown of HFC, but also targets the delivery of energy efficiency cooling.
  - Retaining refrigerant in a ready made cooling system is most critical in order to maintain the designed energy efficiency level of a cooling system
- The new generation of refrigerants being adopted and/or to be adopted, as a result of the implementation of the Montreal Protocol especially its Kigali Amendment, is mostly either flammable, toxic or with higher working pressure, which pose serious potential health related risks that needs to be addressed holistically in the cooling sector.
- The servicing sector faces more challenges with refrigerant management compared to the manufacturing sector in developing countries


Cooling Unit
Refrigerant
Safety design of cooling unit
Balance flammable refrigerant charge quantity while retaining the high energy efficiency of cooling units
Safe transportation
Safety measures
- Production line of cooling unit
- Storage area of cooling unit
- Safety procedures
Safety measures
- Storage area of cooling unit
- Safety procedures
Good Practices to
1. Minimize leakage of refrigerant
2. Maximize EE
3. Ensure safety
Good Practices to
1. Minimize leakage of refrigerant
2. Maximize EE
3. Ensure safety
Proper disposal to
1. Minimize emission
2. Ensure safety
Design of Cooling Unit
Manufacture of Cooling Unit
Distribution and Sale
Installation
Servicing
Disposal
Safety measures
- Storage area of flammable refrigerant
- Safety procedures
Safety measures
- Storage area of flammable refrigerant
- Safety procedures
Proper disposal to
1. Minimize emission
2. Ensure safety
Safe transportation
Refrigerant, Energy Efficiency and Safety – Must be together

Importance of the Servicing Sector in the Cooling Sector

One of the bottlenecks for commercializing of the low GWP alternatives based air conditioner due to the safety related concerns *(China Household Electrical Appliance Association)*

The HVACR Alliance representing the North American heating, ventilation, air conditioning and refrigeration industry state: If not properly installed, HVACR equipment, including cutting-edge energy efficient technologies, will not provide important energy-saving benefits and will undermine our national energy efficiency initiatives *(Letter on Jan 6, 2017 to Vice President-Elect Mike Pence)*

Improper installation could increase household energy use for space heating and cooling on the order of 30 percent over what it should be. *(Piotr Domanski, leading author of Sensitivity Analysis of Installation Faults on Heat Pump Performance, the National Institute of Standards and Technology (NIST) Technical Note 1848, October 2014)*

It estimates that better optimization, monitoring, and maintenance of cooling equipment the potential to save 30Gt of CO2 emissions by 2050. (K-CEP, 2016)

Challenges of Servicing Sector in the Cooling Sector

Technician

- Most are not trained formally, but learn from their masters/ in job;
- Poorly paid;
- Not a favorite job for the younger generation;
- Seasonal workers

Servicing Sector

- Informal excepted those owned by manufacturers;
- Not easily accessible for technical and policy information dissemination;
- A considerable shortage of skilled workers;
- Family business in many countries.

Servicing equipment/tools

- Basic servicing tools and equipment could be relatively expensive fpr many servicing workshops;
- Not widely available in many markets.

Issues/challenges for market transformation to energy efficient and low GWP technologies

Technologies

- The refrigerant charge size and the potential risk with various technical measures
  - The charge size might affect performance, especially on the energy efficiency
  - New technologies to reduce the charge size such as microchannel heat exchangers, cascade technologies etc.
- Supply of reliable and higher efficiency components, such as compressor, motors and heat exchangers with economies of scale
- Technical know-how and manufacturing capacities
- Patents and Intellectual Property Rights on technology transfer: refrigerant and equipment

Policy/regulations

- Safety regulations, standards, building code;
- Government support for marketing: the public procurement policy, etc;
- Unregulated informal refrigeration and air conditioning servicing sector that blocks it to:
  - Access to policy and technology update
  - Acquire capacity building of technicians
  - Equip with proper tools/equipment
- Minimum Energy Performance Standard (MEPS) without consideration of lower GWP refrigerant

Market

- Market competitiveness of equipment：
  - Additional safety device
  - Economy of scale for EE/low GWP technologies products
  - Handling cost in the installation /transportation/storage
  - Constraint on installation requirement – space/occupancy /ventilation device
- Awareness and understanding of the end-users, contractors, architectural designer on EE/low GWP technologies, risk, and social benefit;
- Supply chain: Difficulty to assess spare part and key components for after-sale market
- Misleading/exaggerated media news on risk of new technologies

Efforts made by countries under the Multilateral Fund

- The training to servicing technicians on good practices for reducing the use and emissions of refrigerant has been conducted over the past decades, and training is being extended to cover safety & energy efficiency issues.
- Adopt/develop national safety related standards;
- Work with national Technical and Vocational Education and Training (TVET) authorities to integrate good practices components into their national vocational training and certificate system to sustain the training.
- Conduct specific training for servicing technicians in handling higher EE and very low GWP alternatives such as ammonia, R-290, CO_2, etc
- Outreach programme to support higher EE and low GWP cooling products
- Provide additional funding to support manufacturers to transfer to flammable refrigerants

Policy Options under NCAP

- NCAP needs to reflect the challenge of the refrigerant management and provide a road map to address this issue at the national level:
  - To highlight the interlinkage of energy efficiency and refrigerant management;
  - To address safety challenges, especially in the servicing sector;
  - To integrate the refrigerant management and energy efficiency progamme holistically.
- NCAP could adopt the following options in the context of specific countries:
  - In addition to National Ozone Unit and the national energy efficiency agency, need to engage other authorities to regulate the manufacture, transportation, storage, installation, servicing and disposal process for the sustainable development of the cooling sector;
  - To enact safety regulations, standards, product standards, building code to promote and manage the adoption of EE and low GWP technologies i.e. to remove marketing barriers, and to set up procedures, conditions, requirements to minimize potential safety and health risks;
  - To formalize the refrigeration servicing sector: minimum competency requirement for the servicing technicians; servicing workshop registration;
  - To prioritize the trade of refrigeration servicing technicians in its national technical vocational education training system;
  - To favor EE and low GWP products through a public procurement policy, product labeling and/or other fiscal measures;
  - To establish banned/controlled list of higher GWP technologies;
  - To support R&D on all pending EE and low GWP technical challenges;
  - To raise awareness and training of servicing technicians, contractors, etc.

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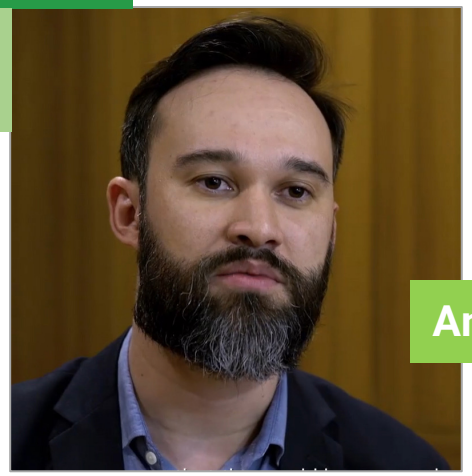
Thank you for your attention!

Mr. Shaofeng Hu,
Senior Montreal Protocol Regional Coordinator
OzonAction, Asia & Pacific
UN Environment Programme

Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Mainstreaming National Cooling Plans into National Strategies



Anderson Alves

Regional Coordinator for Asia-Pacific
United Nations Development Programme

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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Mainstreaming the National Cooling Plans into National Strategies

30 June 2021

Anderson Moreira do Vale Alves
Regional Coordinator, Asia-Pacific
Montreal Protocol Unit, Chemicals & Waste
United Nations Development Programme (UNDP)

The United Nations Development Programme

UNDP advocates for the regeneration of the ozone layer and thus the protection of human health, but also aiming to achieve significant reductions in greenhouse gas emissions, industry innovation, job creation, and more-efficient use of energy, while reaching the Sustainable Development Goals.

UNDP has partnered with KCEP to support the following countries to develop their NCAPs:

- Chile, Colombia, Costa Rica, Cuba, Mexico, Panama, Trinidad & Tobago, Uruguay.
- Ghana, Lebanon, Nigeria
- Bangladesh, Philippines, Sri Lanka

Cooling Sector: a multitude of purposes, essential to our daily lifes…

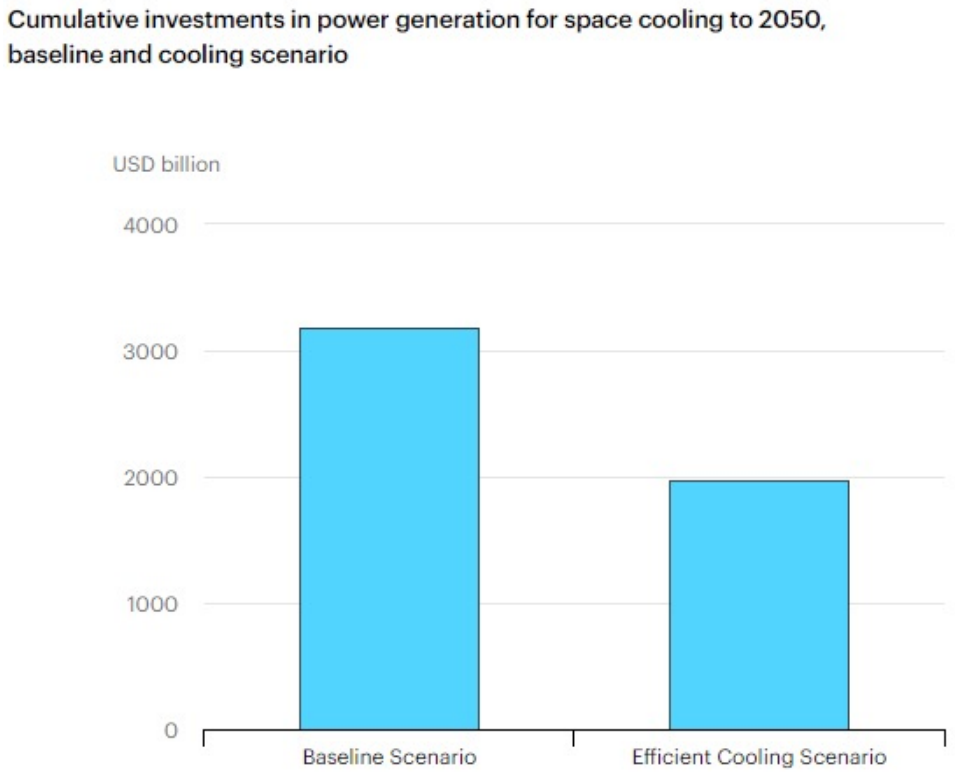
Source: JRAIA.org

Cooling Sector : energy perspectives

IEA´s "Future of Cooling" Report:

- By 2050, around 2/3 of the world's households could have an air conditioner.
- Without action to address energy efficiency, energy demand for space cooling will more than triple by 2050.
- Cooling will drive peak electricity demand, especially in hot countries.

The Efficient Cooling Scenario reduces investment and running costs by USD 3 trillion between now and 2050



Policy Framework

National Frameworks

National Energy Plans

National Action Plans (Mitigation/Adaptation to Climate Change

Under the Paris Agreement

Nationally Determined Contributions (NDCs)

Under the Montreal Protocol

HCFCs Phase-out Management Plans (2011-2030)

HFCs Phase-down Management Plans (2024-)

National Cooling Action Plans

Policy Framework in Action

Trinidad & Tobago:

- Stand alone document, National Policy level.
- Approved in 2019, under implementation (Phase 1) aligning MP activities with a GEF project on energy efficiency.

Lebanon:

- Stand alone document, Guidance to Policy Makers
- Approved in 2021, raise ambition in energy performance for AC and Refrigeration applications, look into a long-term alignment with EU standards (revisions every 3 or 5 years).

Panama:

- Sub-set of the National Energy Plan (2015-2050), approved in 2021;
- Identifies specific challenges and opportunities for energy efficiency actions under the Cooling Sector, aligning the National Energy Plan to the Montreal Protocol´s Management Plans.

Thank you!

Nature, Climate and Energy Group (NCE)
Global Policy Network (GPN)
Bureau of Programme and Policy Support (BPPS)
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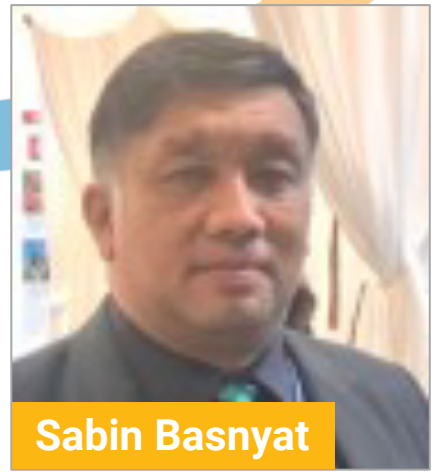
Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

Scaling up and Financing NCAP Implementation

Moderator



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Delivering Energy Efficient and Climate Friendly Cooling through National Cooling Action Plans

QUESTIONS & ANSWERS

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THANK YOU

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