



ĐẠI HỌC
BÁCH KHOA HÀ NỘI
HANOI UNIVERSITY
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Sustainable Cooling for Net Zero Target in Viet Nam

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ONE LOVE. ONE FUTURE.



SUSTAINABLE COOLING IN A WARMING WORLD

In a warming world, access to cooling is not a luxury

Extreme heat is **#1**  killer of climate impacts

1B  people will be exposed to lethal heat waves (at 2°C) by 2050

But the more we cool, the more we heat the planet

- We can't condition our way out of this crisis: 20% of the world's electricity is used for refrigeration and air conditioning.
- Left unchecked, emissions from cooling are expected to double by 2030 and triple by 2100.

Sustainable cooling has a big GHG reduction potential

Phase-down of HFCs by 2100 can achieve 0.4°C of avoided warming, integrating efficiency could **double the benefits**.

→ Over 4 decades **avoid equivalent to roughly 4-8 years of global GHG**, based on 2018 levels

Sustainable cooling supports the Sustainable Development Goals... ..the Kigali Amendment and Paris Agreement Goals



- Zero hunger
- Health and Well-Being
- Affordable Clean Energy
- Decent Work & Economic Growth
- Climate Action
- Sustainable Cities and Communities
- Poverty alleviation....



LAW ON ENVIRONMENT PROTECTION 2020



Law on Environmental Protection

dated November 17, 2020

- **Article 91: Reduction of GHG emissions**
- **Article 92: Ozone layer protection**
- **Article 139: Carbon credit market**

- **Decree 06/2022/ND-CP** of the Government dated January 7, 2022 on greenhouse gas emissions reduction and ozone layer protection.
- **Decree 45/2022/ND-CP** of the Government dated July 7, 2022 on sanctioning of administrative violations in environmental protection.



Circular 01/2022/TT-BTNMT on reduction GHG emission reduction and ozone layer protection and details of some articles of the Law on Environmental Protection.

List of Substances (Refrigerants)

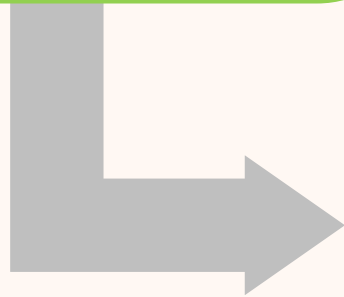
LAW ON ECONOMICAL AND EFFICIENT USE OF ENERGY (2010)



Law on economical and efficient use of energy

dated June 17, 2010

- **Article 37 of the Law defines the management measures for EE in equipment and vehicles, including cooling appliances**



Decree No.21/2011/ND-CP dated from 15 May 2011 detailing the Law on Economical and Efficient Use of Energy and measures for its implementation.



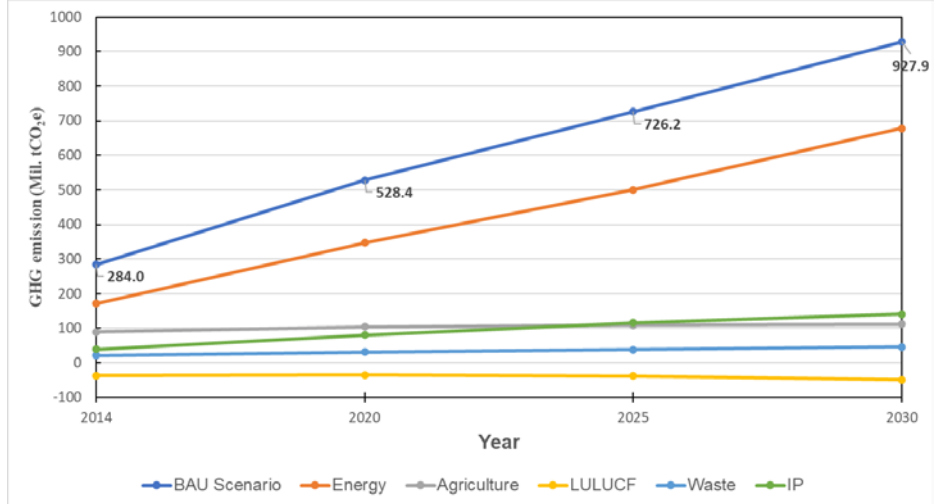
Decision No.04/2017/QĐ-TTg dated 25 April 2017 on the list of equipment and appliances to which the mandatory energy labeling and MEPS are applied, and the roadmap for implementation



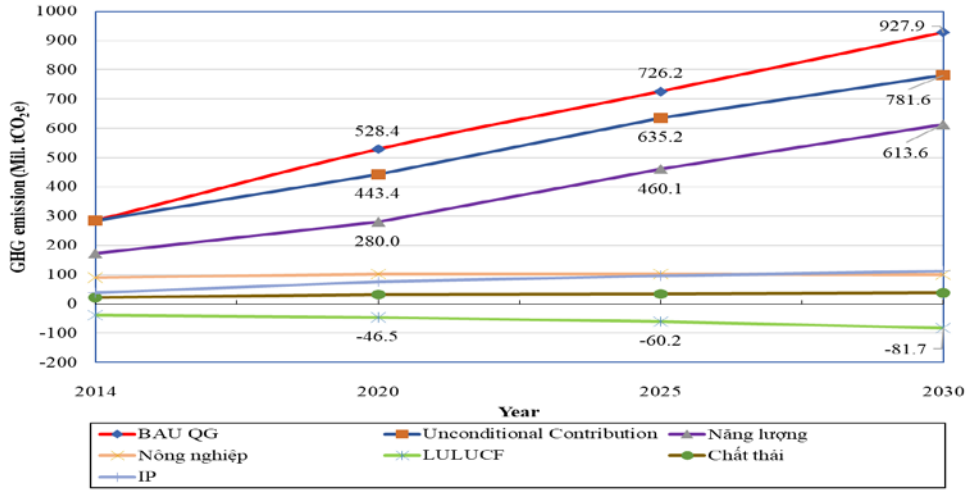


NATIONALLY DETERMINED CONTRIBUTION (NDC) 2022 IN VIET NAM

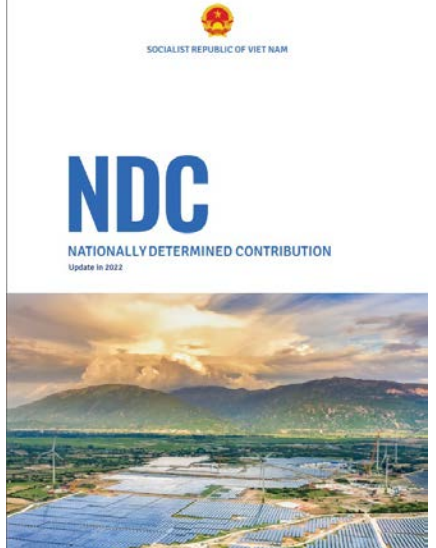
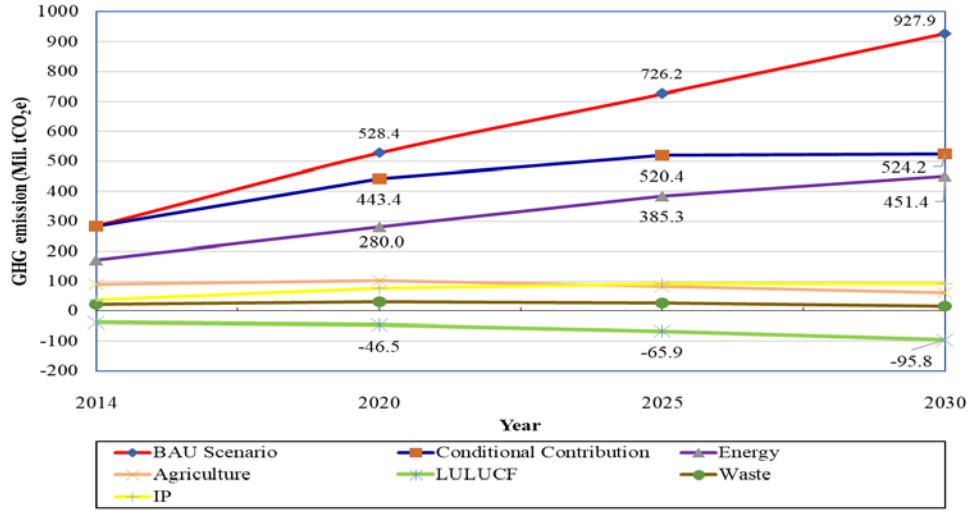
National GHG emissions by sectors under the Unconditional Contribution



GHG emissions under the BAU Scenario



National GHG emissions by sectors under the Conditional Contribution



- Increases its unconditional **GHG emissions reduction target to 15.8% by 2030** relative to a BAU scenario.
- Conditionally to international support and financing, through bilateral and multilateral cooperation, Vietnam has set an **emissions reduction target of 43.5% by 2030**.
- Sustainable cooling solutions and refrigerant life-cycle management integrated into NDC 2022**

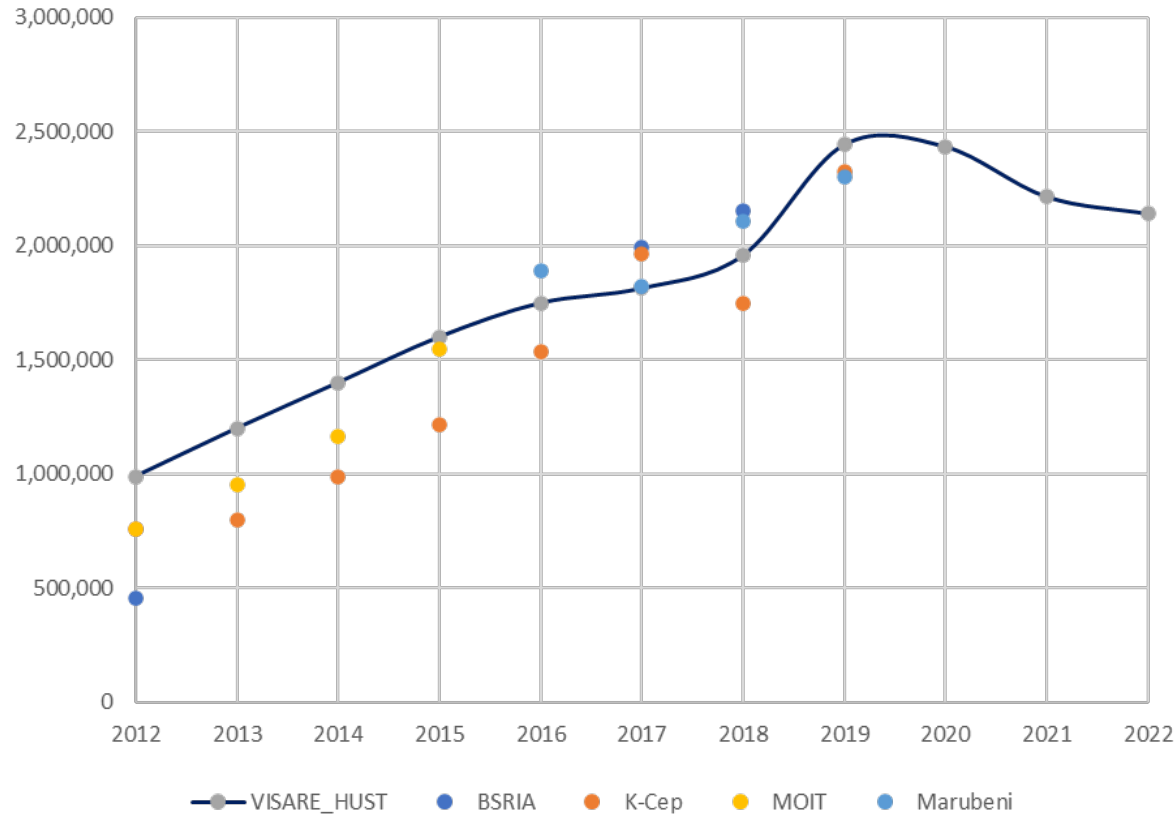


SOLUTIONS IN NDC 2022

1. Development of renewable energy such as small hydroelectricity, wind energy, solar energy; development of biomass thermal power, incineration and landfill waste power, and biogas power;
2. **Use of high-efficiency air conditioning and refrigeration equipment in commercial and residential services;**
3. **Use of measures to improve energy efficiency in industries; use of high-performance electrical equipment high efficiency refrigerating equipment in services, commerce and trade;**
4. Limitation of fuel consumption for motor vehicles; conversion of modes of transportation of passengers and goods;
5. **Promotion of climate-friendly refrigerants, and recovery, recycle, reclamation and destruction of controlled substances (HCFCs and HFCs).**



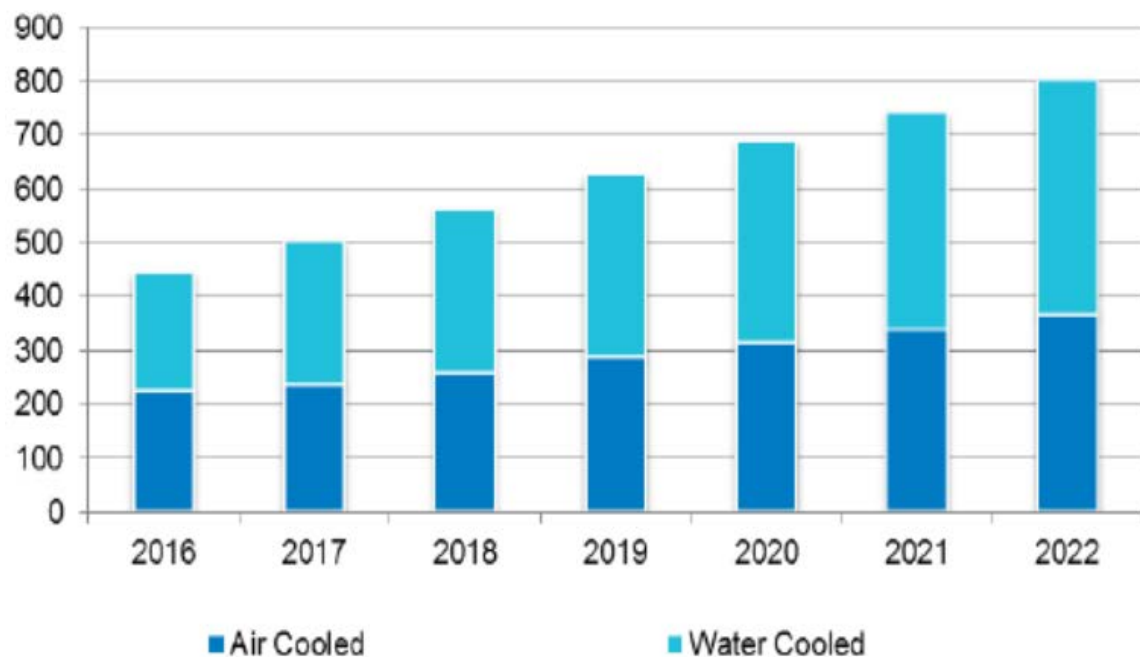
AIR CONDITIONING MARKET



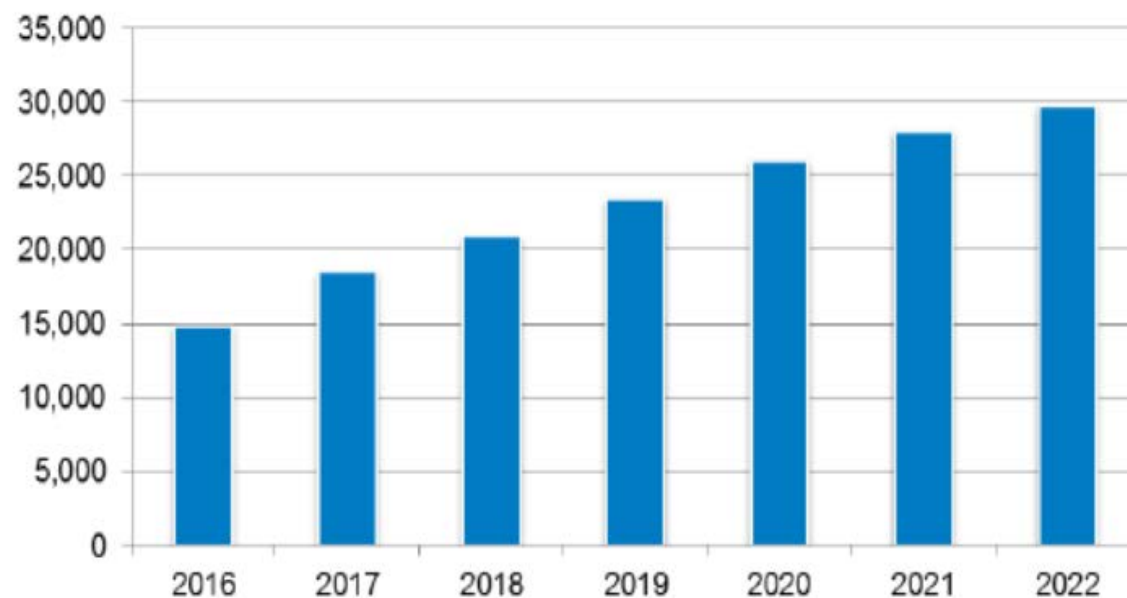
- ❑ The air conditioner market has an average growth rate of 10-12% (2.5 million units). The majority is imported.
- ❑ More than 90% room air conditioners with a cooling capacity of less than 20,000 BTU/h.

AIR CONDITIONING MARKET

Chiller sales by unit volume, 2016-2022F

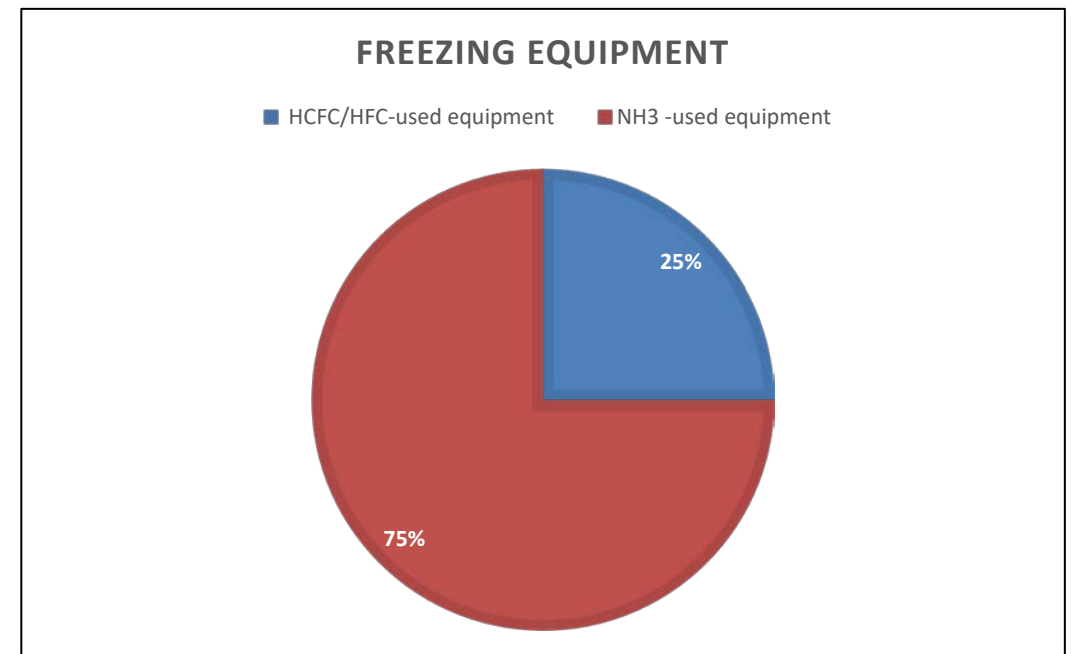
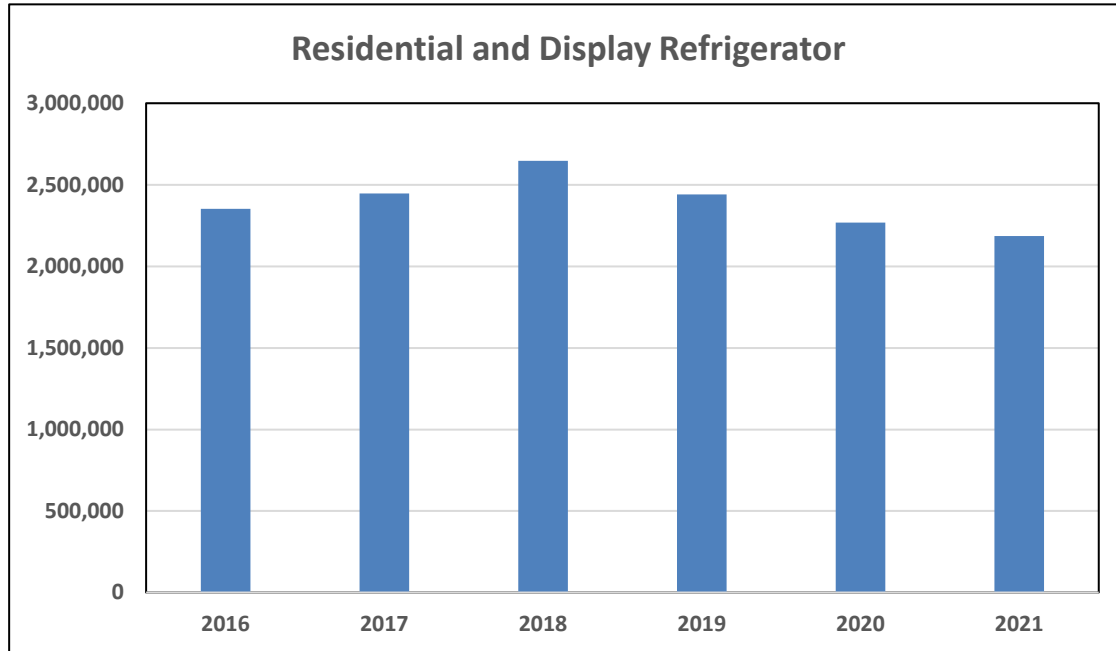


VRF sales by unit volume, 2016-2022F



Source: BSRIA -JRAIA

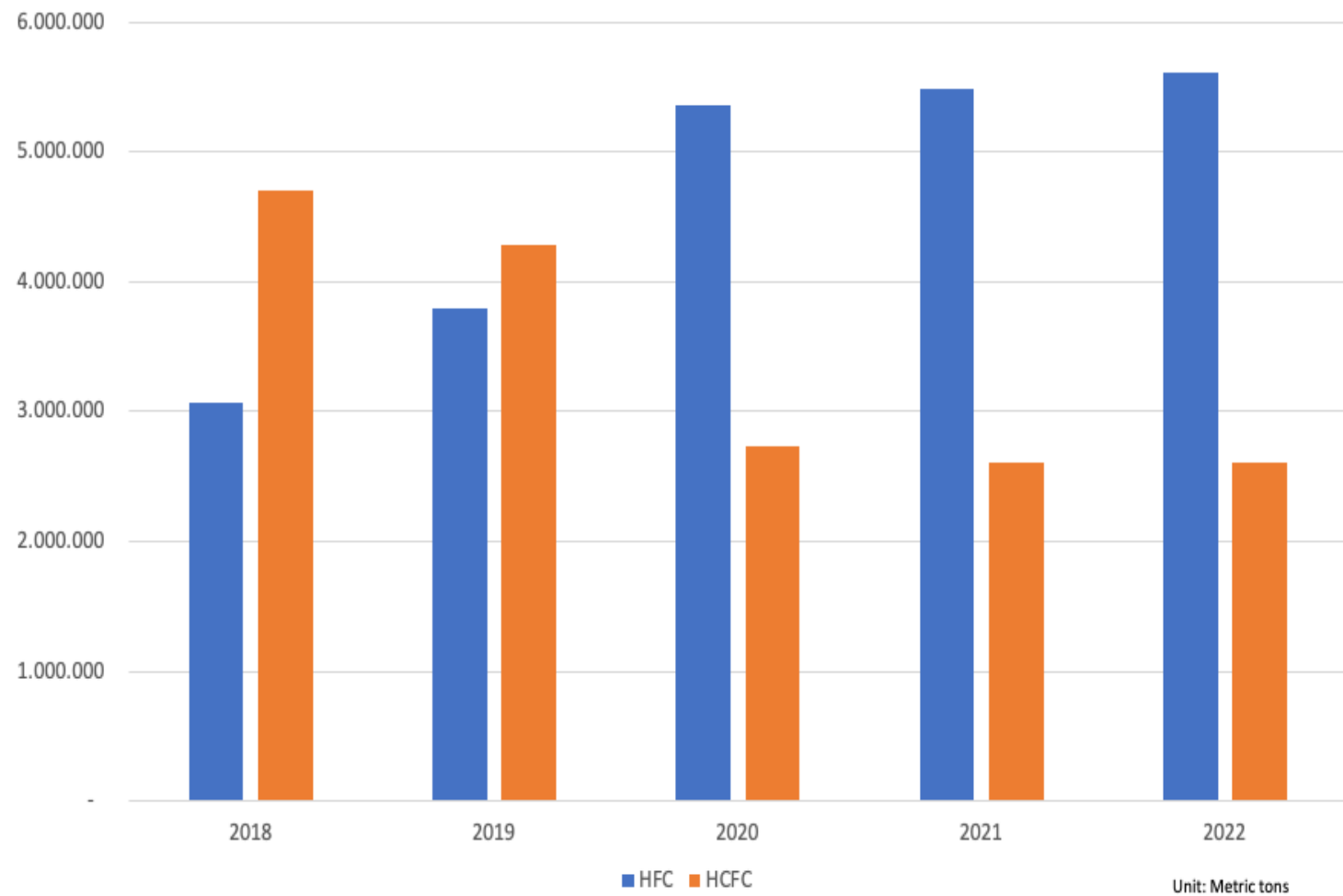
REFRIGERATION MARKET



- ❑ The household refrigerator market has over 2 million units per year (R134a and R600a).
- ❑ Commercial refrigeration systems use R22 and R134a/407C/404A/507A, R-90
- ❑ Industrial refrigeration systems are mainly used in the seafood and beer/beverage production sectors. Total capacity 20,000 MT/day, storage capacity 800,000 MT/day.
- ❑ Approx. 75% of freezing systems use NH₃, and 25% use HFC/HCFC.



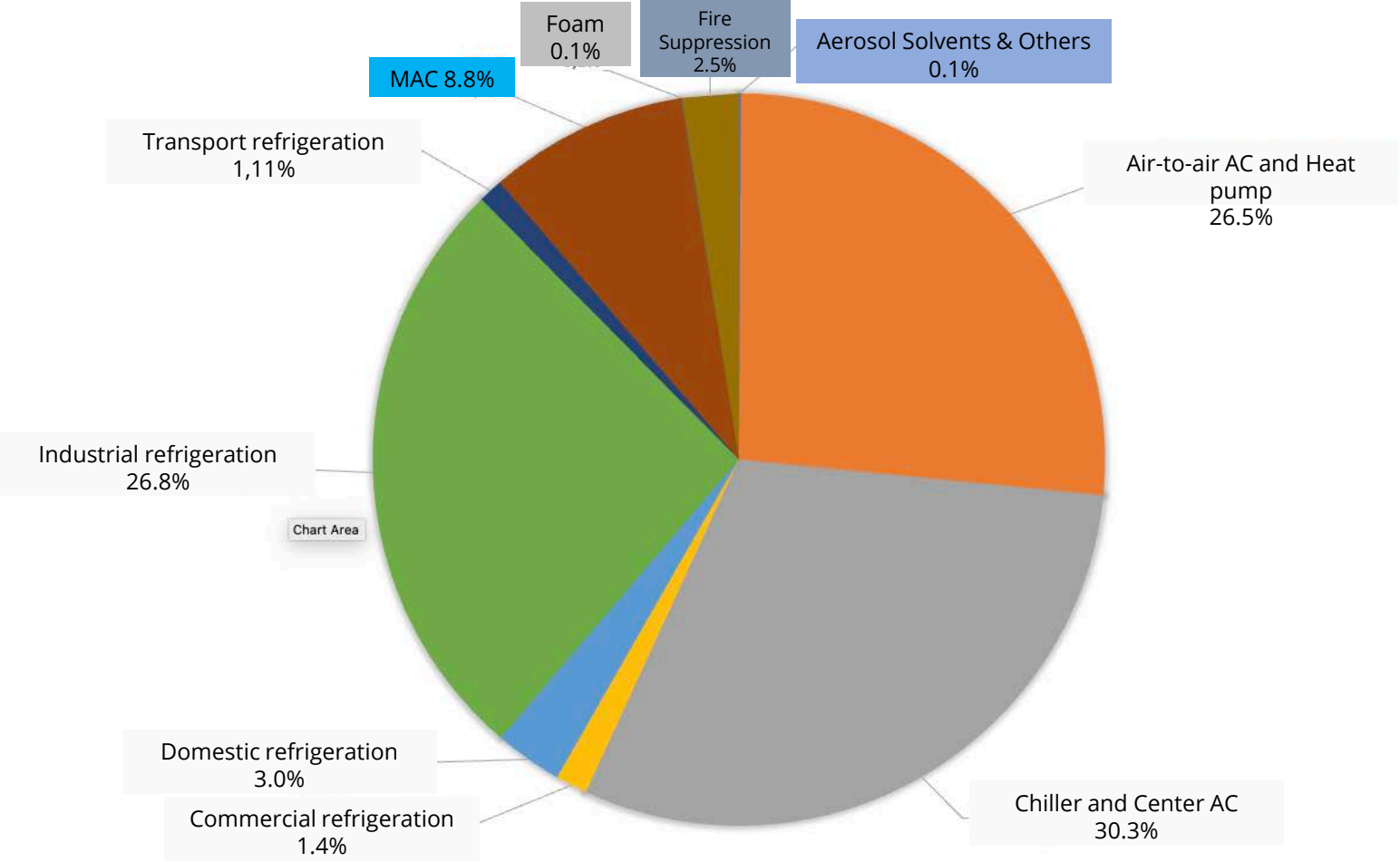
HCFCs & HFCs CONSUMPTION (2018-2022) IN VIET NAM (KIP)



Average HFC Consumption (2020-2022)	9,910,795 tCO2
65% HCFC Consumption (2009-2010)	3,786,844 tCO2
HFC Consumption Baseline (Kigali Amendment approach)	13,697,639 tCO2



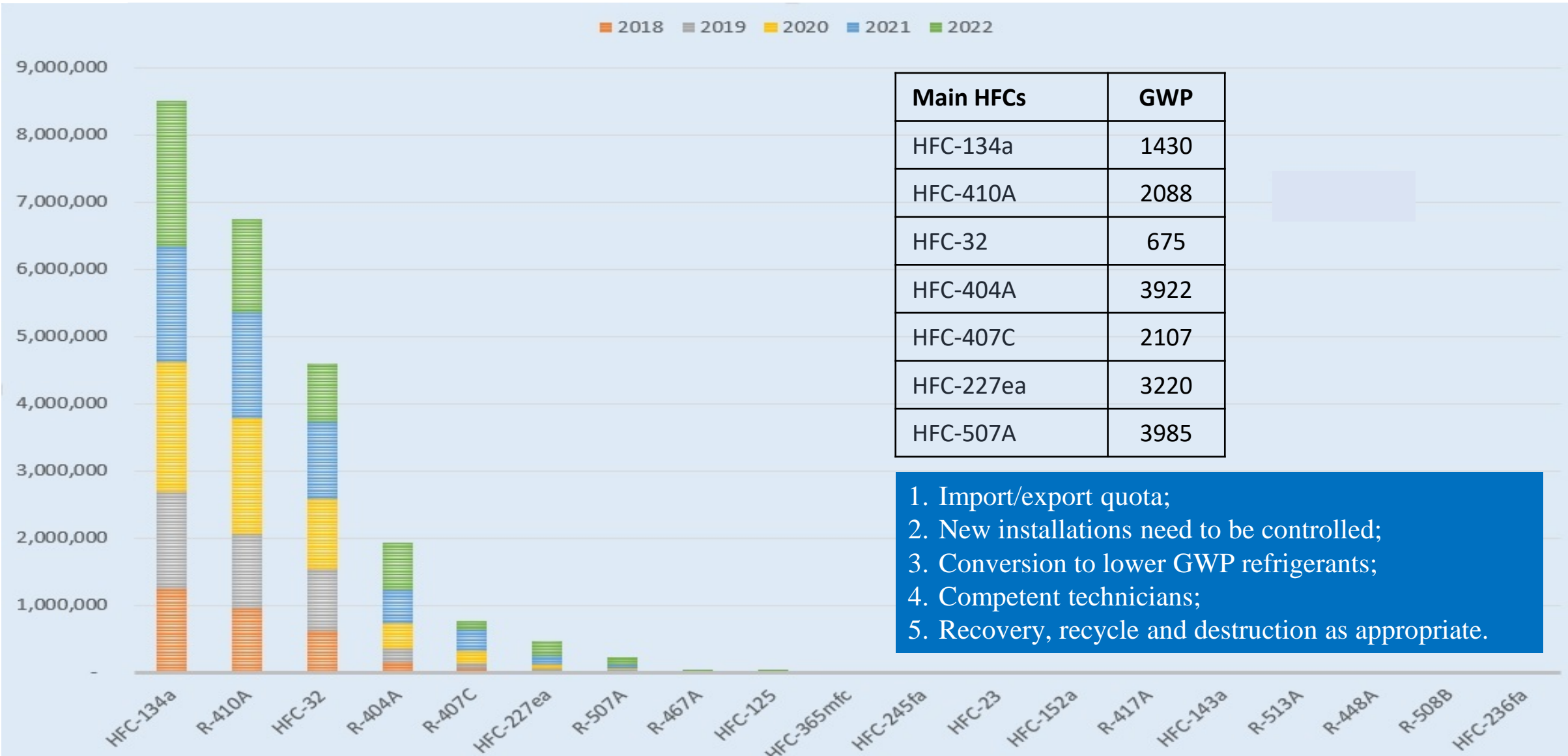
HFCs CONSUMPTION BY SECTORS



Share of HFC average consumption (2020-2022) by sectors



HFCs CONSUMPTION BY SUBTANCES (2018-2022)



Main HFCs	GWP
HFC-134a	1430
HFC-410A	2088
HFC-32	675
HFC-404A	3922
HFC-407C	2107
HFC-227ea	3220
HFC-507A	3985

1. Import/export quota;
2. New installations need to be controlled;
3. Conversion to lower GWP refrigerants;
4. Competent technicians;
5. Recovery, recycle and destruction as appropriate.



POLICY AND LEGAL DOCUMENTS IN PREPARATION

National plan for management of controlled substances (2024)

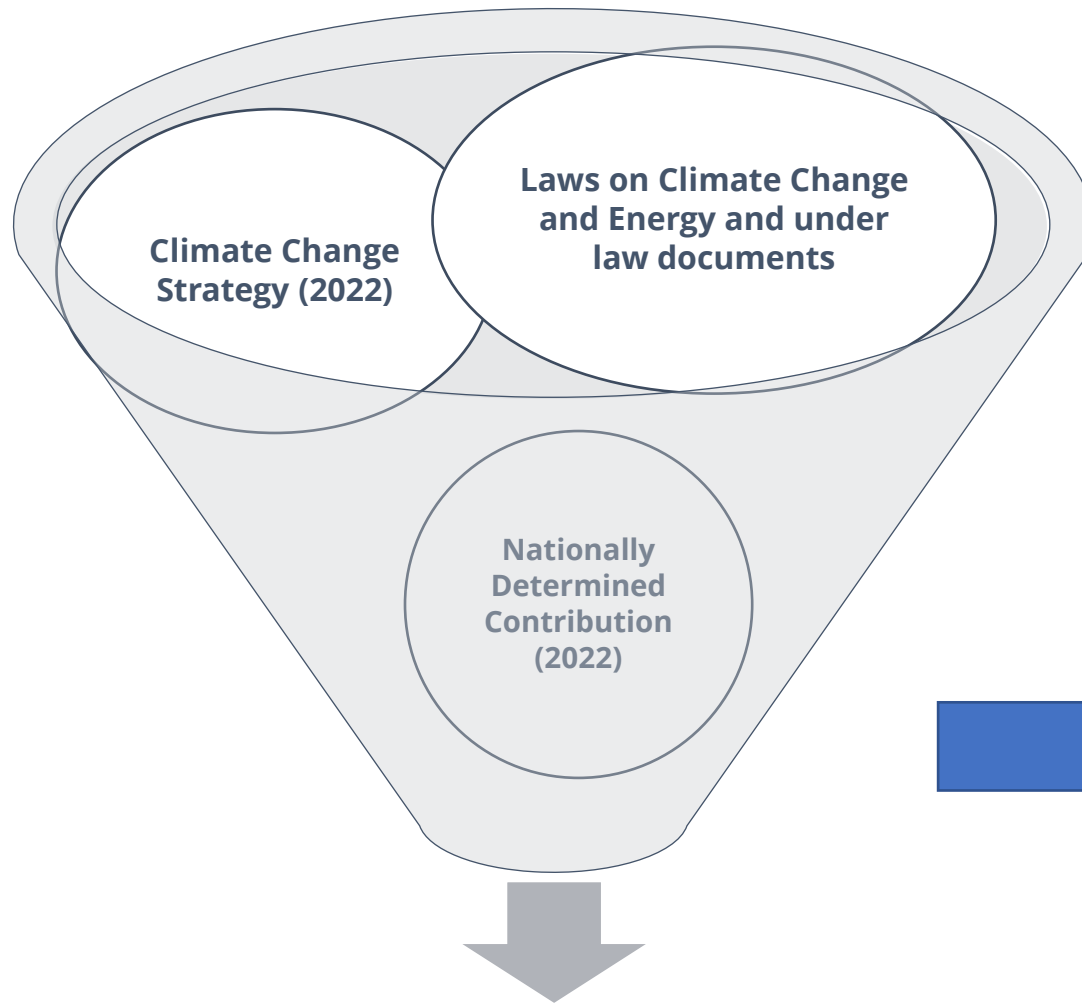
- ❖ Assessment of current usage by refrigerants and sector, consumption and projection;
- ❖ Develop different scenarios and interventions needed to ensure compliance (2045);
- ❖ Measures for management (registration, monitoring, reporting); phasing down and phasing out of the controlled ODSs and GHGs;
- ❖ Responsibilities of organizations, individuals and relevant units in implementing the plan.
- ❖ Integrate sustainable cooling into the national plan (commitment of Global Cooling Pledge in COP28)

National technical regulation (2023)

Collect, transport, storage, recycle, reclaim and destruction of controlled substances RAC equipment following the list of the refrigerants is shown in Circular 01/2022/TT-BTNMT:

- ❖ Collecting, transport, storage of refrigerants
- ❖ Identification of refrigerants after recovery
- ❖ Recycling of refrigerants
- ❖ Reclaiming of refrigerants
- ❖ Handling of controlled substances





Net zero target by 2050
COP26 implementation plan;
Action plan on methane emission reduction;
Emerging issues in cooling sector.

- Inventory of HFCs bank
- MRV of GHG emission
- Leakage reduction
- Energy efficiency of cooling appliances
- Life cycle management (refrigerants, equipment)
- Linkage to carbon credit and other incentives.

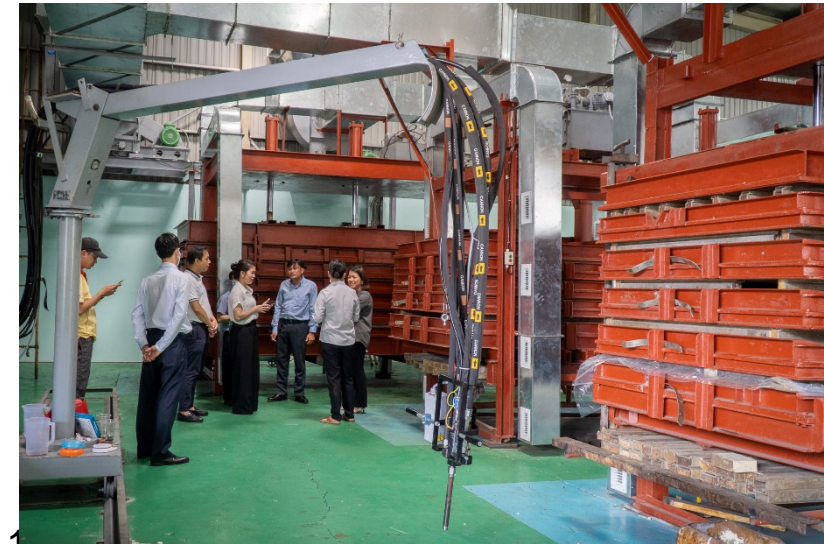
Other climate change commitments and national policies, legal framework



OTHER ACTIONS ON SUSTAINABLE COOLING IN VIET NAM

	Sustainable Urban Cooling in Viet Nam's cities (UCAP)	National Green Cooling Programme (NGCP)	National Cooling Action Plan (NCAP)
Objectives	<ul style="list-style-type: none"> Enhance regulatory framework for sustainable urban cooling; Increase capacity of cities, on urban cooling; Increase green investment and innovative financing mechanism. 	<ul style="list-style-type: none"> Assess the current state including the technology available, market status, and international/national policies of the cooling sector in Vietnam; Promote conversion to high EE and low carbon technologies and increase energy savings in the cooling sector. 	<ul style="list-style-type: none"> Pilot the Cool Coalition methodology to develop a more comprehensive NCAP; Build upon prior efforts supported by the World Bank and expand NCAP covering space cooling and urban planning.
Targets	<ul style="list-style-type: none"> 02 pilot cities (Can Tho and Tam Ky, Quang Nam province); 01 learning city (Dong Hoi, Quang Binh province). 	<ul style="list-style-type: none"> Refrigeration (domestic ref.; commercial ref.; industrial ref. and transport ref.); AC (residential ACs; Central ACs; MAC). 	<ul style="list-style-type: none"> Space cooling (including passive cooling strategies); Urban planning.
Activities	<ul style="list-style-type: none"> Local policy enhancement and urban cooling action plans; Prefeasibility and Design of Cooling Fund; Integrating Urban Cooling in relevant national policies. 	<ul style="list-style-type: none"> Inception report; Stakeholder workshop; National data survey and analysis; Projections of growth in cooling sector; Sector/subsector review and gap analysis; Develop NGCP and roadmap; Analysis of financing approaches; Consultation workshop; Final report 	<ul style="list-style-type: none"> Collect data and information on the baseline status and development trajectories of urban planning and passive cooling; Establish parameters and define assumptions for various future development scenarios Integrate urban cooling strategy and passive cooling into comprehensive NGCP report.

HCFC PHASE OUT MANAGEMENT PLAN STAGE II (HPMP II)



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THANK YOU

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