



**CLIMATE &
CLEAN AIR
COALITION**
TO REDUCE SHORT-LIVED
CLIMATE POLLUTANTS

shecco
Base



RESIDENTIAL AND LIGHT COMMERCIAL AC

Sustainable Technologies for AC Workshop

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GLOBAL TRENDS

Globally, the **need for AC is set to increase** = rising temperatures + growing middle class

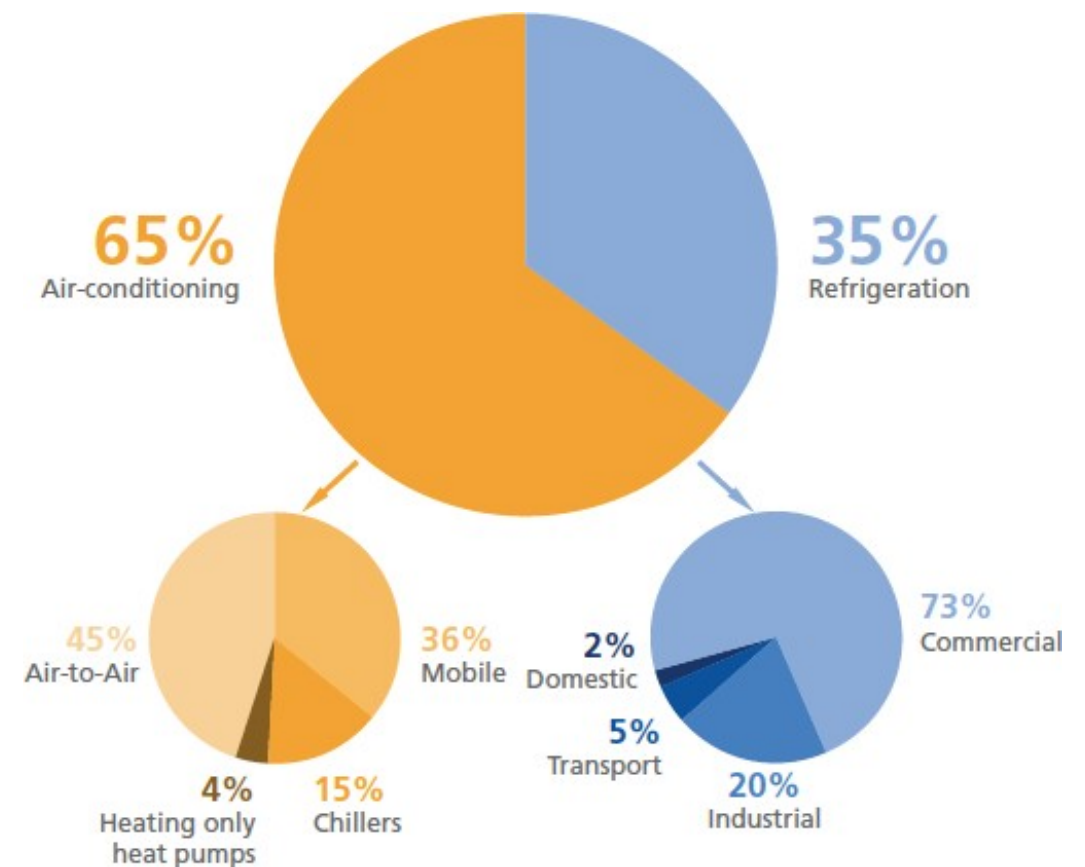
UNEP estimates **global stock will reach over \$1.5billion by 2030**, with AC already representing 20% of household energy consumption in warm climates

United4Efficiency report - consumers could achieve \$56billion in energy savings by 2030 by “improving air conditioner energy efficiency policies now”

Main options:

- R32 - GWP of 650
- R290 - GWP of 3.3

UNEP: 65% of HFC use comes from AC



TRANSITION TO HFC-FREE REFRIGERANTS

Pace and timing of transition away from HFCs /HCFCs depend on a number of factors and vary for each sector and region.

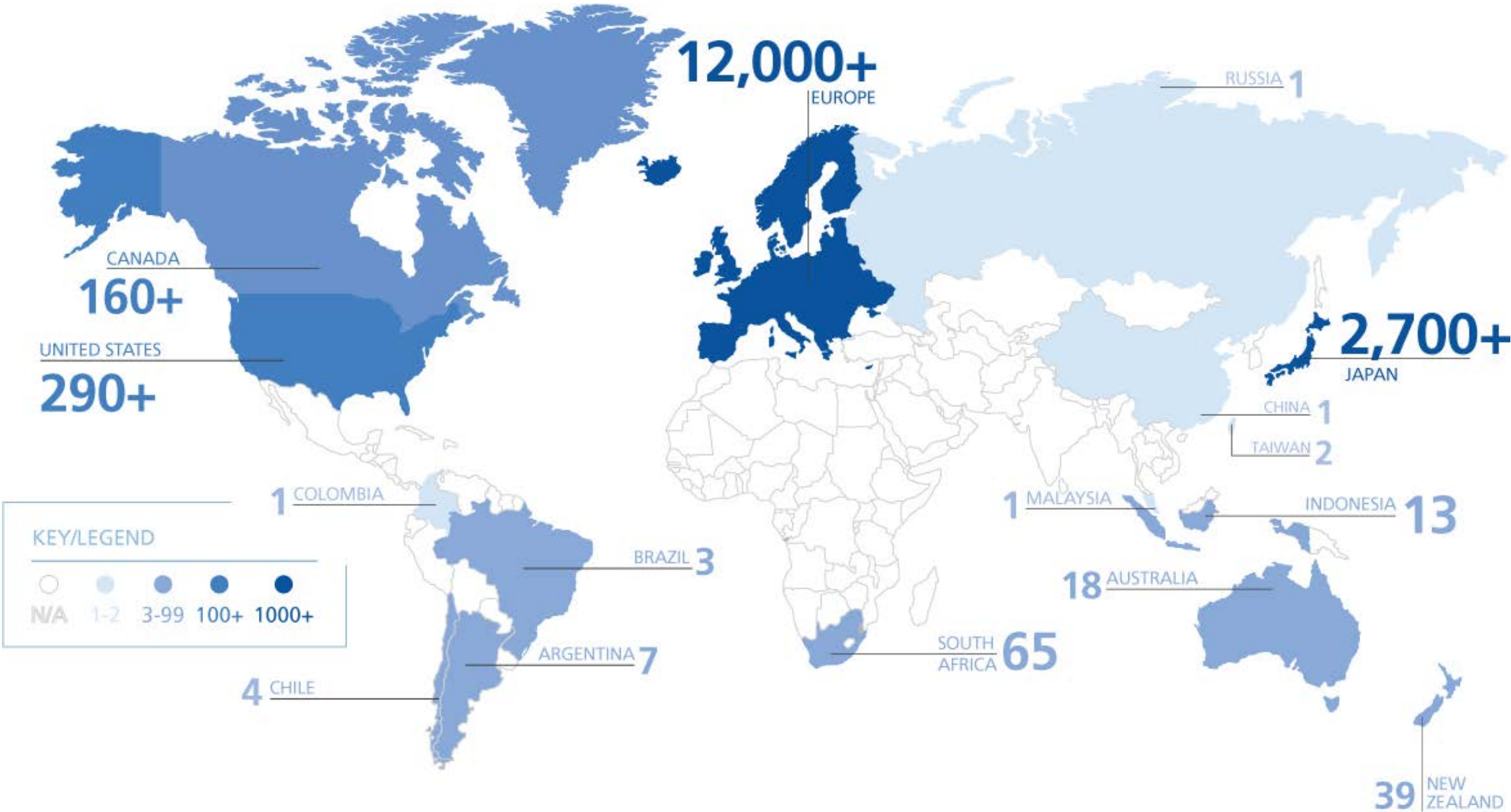
The example of **commercial refrigeration shows** a strong trend towards natural refrigerants as a result of:

- **voluntary commitments** (Consumer Goods Forum, individual pledges of large multinationals)
- **legislative pressure** (HFC bans in EU F-Gas Regulation, SNAP Programme, etc.
- clear signal to move away from fluorinated refrigerants)

increased availability of HFC-free equipment /competition between NR technologies = decreasing costs

technological advancements for warmer regions (ejectors, parallel compression, etc.)

CO₂ TC STORES GROWING GLOBALLY (SEPT 2017)



CO₂ TC MAJOR MARKETS: GROWTH TRENDS



	2015	2017	Growth
Europe	5.500	12.000	118%
USA	52	290	458%
Canada	139	160	15%
Japan	1.500	2.700	80%

Other regional markets also emerging as a result of **individual food retailers' efforts**

AIR CONDITIONING

01

RESIDENTIAL AC - MARKET TRENDS

Supply of split and window RAC units comes **predominantly from Asia** with main manufacturers being either Chinese or Japanese.

China - world's biggest manufacturer of RAC with **market share of 85%**, **100 million AC units / year**

China and India established production of R290 RAC, BUT market uptake is slow

= **active policy support, update of safety regulations, and stronger industry commitment** are needed to **unlock full R290 RAC market potential**



INDIA MOVING TOWARDS R290 RAC

Split AC represents 80% of total AC units sold in India

India showing strong trend towards R290 RAC

- Currently **400,000+** units installed in the market

Major leader: **Godrej Appliances**

- Replaced CFC, HFC and HCFC as early as 2002
- Efficient and green ACs using R290; first in the world
- India's first ACs with 7-star performance
- Earliest brand to opt for voluntary energy labelling of its refrigerators



CHINA: R290 RAC PRODUCTION

Chinese market showing an interest towards R290 RAC

- established production capacity with **potential to make 1.8 million R290 RAC units per year**
- **1,300+** units installed already
- Major players: Midea, Gree, Haier

Midea case study:

- Nanyang Vocational and Technical College in Jiaxing, (the country's northern Zhejiang province).
- **1,060 R290 based ACs** in the dormitories
- Installed in November 2016, no problems in operation so far
- Completed additional projects in warm ambient regions, including Seychelles University in the Seychelles.
- Demonstration projects funded from the Multilateral Fund for the Implementation of the Montreal Protocol.



EUROPE: PORTABLE IS MAKING HEADWAY

Europe has been moving towards **R290 in portable AC**

- 2 key manufacturers - Midea Germany, Delonghi
- EU F-Gas Regulation bans the use of HFCs with GWP > 150 in portable AC as of 2020

BUT, the move to R290 in split AC has not happened yet in Europe:

- **Midea, Haier** developed and certified R290 RAC units for the European market (TUV), not marketed yet
- **Barriers:** lack of market demand, lack of ambitious legislation, standards, high initial costs, lack of training, etc.

Concerted effort of industry, consumers and legislators needed to move the market



HC BASED HEAT PUMP & WATER CHILLERS

- **Triple Aqua's efficient heat pump using hydrocarbons** is running in two offices and a supermarket in the Netherlands
- **can save up to 50% in heating and cooling costs** in commercial buildings compared to traditional heat pumps, with a COP (coefficient of performance) between 4 to 10
- The system employs propaene (R443A), a mixture of the hydrocarbons propane (R290) and propene (R1270), with a **global warming potential (GWP) of 3** and a charge of **< 5 kg**



Source: http://hydrocarbons21.com/articles/7250/tripleaqua_s_dutch_debut

HC BASED HEAT PUMP & WATER CHILLERS

- HC based water chillers introduced by several companies targeting **commercial air-conditioning** and **process cooling applications**
- RSA Cooling - water chiller for outdoor installations, and are available with **cooling capacity from 3,0 to 15,0 kW**
- HC water chillers in Australia, **reliable performance at 45C** days this summer



Japanese Government (METI) & New Energy Development Organisation (NEDO)

- 4 companies participated in the research projects to develop technologies for high energy efficiency low-GWP based small and mid-size air-conditioning systems
- DENSO - development of **CO₂ (R744) AC system with high efficiency ejector**
- MITSUBISHI ELECTRIC - development of **HC based room air-conditioning system**
- project finished in September 2017, report on the outcome expected in 2018

高効率低**GWP**冷媒を使用した中小型空調機器技術の開発

三菱電機株式会社	自然冷媒を適用したルームエアコンの研究
株式会社デンソー	高効率エジェクタを使用したCO ₂ 冷媒空調システムの開発

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THANK YOU!