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Business Case for
Natural Refrigerants

04/09/2018 – Singapore



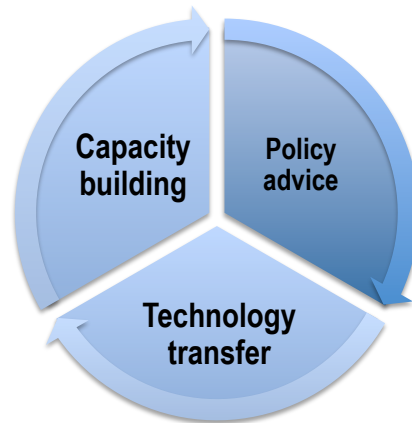
**Market introduction of hydrocarbon split Air Conditioners in Asia
Challenges and Opportunities**

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GIZ Proklima

Promoting energy efficient cooling using natural refrigerants

- GHG emissions monitoring in the RAC sector
- Training and certification of technicians on safe handling of natRef



- GHG inventories
- Technology needs assessments
- Adoption of performance (MEPS) and safety standards

- Conversion of local production lines
- Technology demonstration



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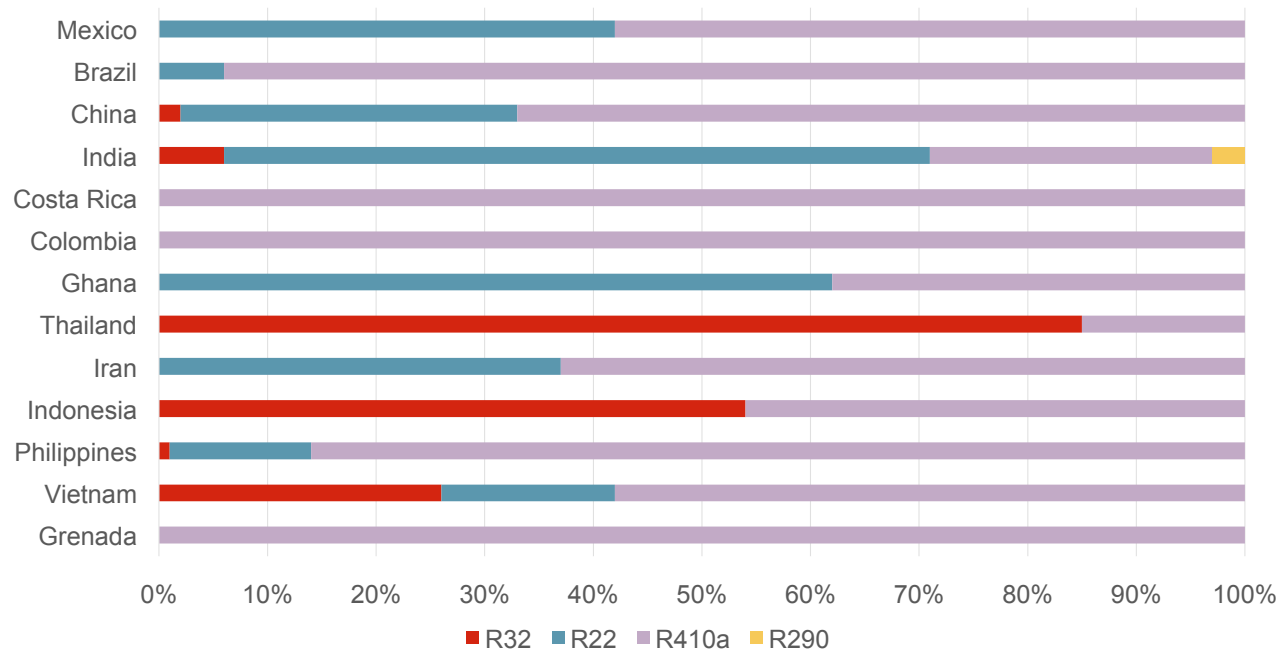
Characteristics of mini split Air Conditioners in Asia

- Mass consumer product (Indonesia approx. 2,8m, China approx. 40m sales in 2016)
- Split ACs are responsible for the largest share of energy and refrigerant-related emissions in the RAC sector in many countries
- Large variety in terms of price, energy efficiency, technical features (inverter, wifi-control etc.)
- Large variety in terms of life cycle Impact:
 - Costs (from approx. 2.000 up to 16.000 USD)
 - Energy and refrigerant use and related GHG emissions (TEWI) from 6 - 77 t CO₂eq per appliance
- Except in the Indian market, mini split ACs use HCFC or HFC refrigerants (R22, R410a and R32), which are subject to the internationally regulated HFC phase-down



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Distribution of refrigerants in mini split ACs



Source: GIZ Proklima, Cost, Climate and Energy Performance of split AC markets, 2018

Barriers and solutions to hydrocarbons market uptake in Asia

Barriers	Solutions
Lack of certified and skilled technicians to produce, install and maintain hydrocarbon refrigeration and air conditioning systems	<ul style="list-style-type: none"> • Development of certification schemes • Roll-out of training programs for RAC technicians on the safe handling of hydrocarbons in cooperation with vocational training schools
Current national standards stick to charge size thresholds that are too small for flammable refrigerants (underlying assumptions lack basis in evidence based research)	Adopt national standards within national standard committees by increasing charge size and introducing risk mitigation measures, referring to evidence research-based model addendums
Hydrocarbon RAC component often not available, oligopoly on HC split AC compressors	Promote local manufacturing and assembly of components and appliances
Hydrocarbon RAC equipment still more expensive than conventional HFC-based systems due to negligible market scales.	Introduce tax incentives and / or public procurement programs to ease market uptake
Little awareness about actual risk and risk mitigation measures related to use of hydrocarbons in RAC systems	Target-oriented awareness-raising campaigns that inform about safe use of HC RAC equipment, making use of evidence-based results

Conversion of Godrej & Boyce split AC production

- Technical Assistance in converting HCFC-22 based split AC production to HC-290
- Training on safe handling of flammable refrigerants during HC-290 split AC manufacturing, installation, servicing and repair
- So far, Godrej sold approx. 600.000 pcs in the market with a capacity of 1 TR (3,37 kW) and 1,5 TR (5 kW)
- Establishment of a training, certification and registration network to fully capture and control the installation, servicing and repair of R290 split ACs.
- Current inverter HC-290 models are top in efficiency in their capacity category



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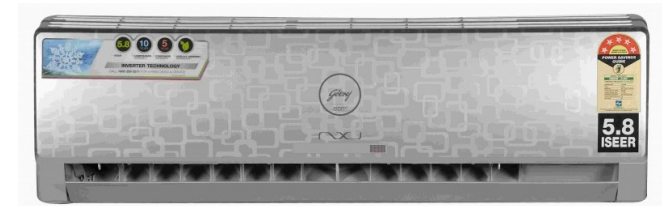


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India: Top ten split AC models (1TR capacity)

Models	Model	CC (kW)	ISEER	Refrigerant
Daikin	TKM35SRV16	3,6	5,6	R32
Godrej	GSC 12 FIXH 7 GGPG	3,5	5,8	R290
Hitachi	RAU512AWEA	3,6	5,7	R410A
Daikin	JTKM50SRV16	5,0	5,2	R32
Mitsubishi	MSY-GK24VA	6,7	4,8	R410A

Source: LBNL database, initial assessment most efficient units (2017)



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What do R290 Split AC manufacturer and suppliers need to do?

Establish proper manufacturing, servicing and repair infrastructure

- Establish or link with qualification bodies (in-house or partnering institutions)
- Ensure standardized qualification through certification
- Use technician registration systems to allow control of process

Develop safe product

- Ensure adequate system tightness
- Avoid potential sources of ignition
- Enhance dispersion of refrigerant leak

Transparency in communication on product features

- Documentation: High quality of installation and user manuals
- Refrigerant and flammable gas stickers at in- and outdoor units
- Comprehensive and fact-based campaigning

How can the Government support?

Enable proper qualification, certification and registration of technicians

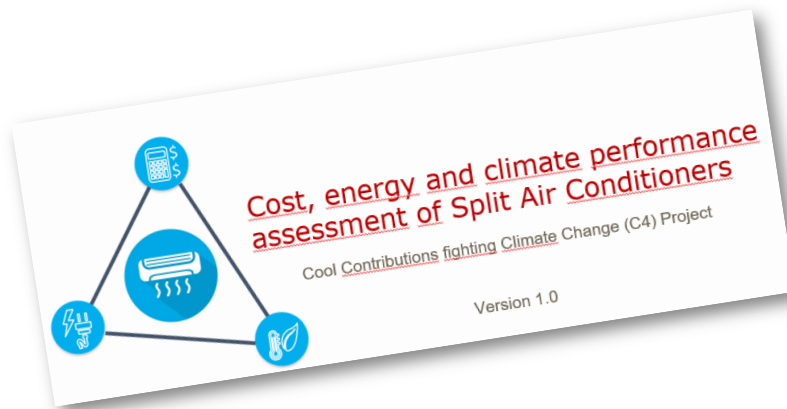
- Initiate assessment of competency levels and review resp. adopt training materials
- Build capacity of certification bodies and enforce certification standard and process
- Partner with registration body and establish registration scheme

Ease access to Green technology

- Assist manufacturers in accessing financial and technical support to transition to R290 split AC manufacturing
- Create incentives for R290 production and supply
- Tax incentives on energy efficient and low GWP refrigerant appliance components (e.g. compressors)

Act as informing front runner

- Carry out Green AC procurment programs
- Implement broad and target-oriented awareness campaigns



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Find more information about projects and publications at:

GIZ Proklima:
<https://www.giz.de/expertise/html/3372.html>

Green Cooling Initiative:
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Thank you for listening!

