Natural Refrigerants around the World
- Current market trends -

Proklima International
Agenda

The Green Cooling Approach
The Technology Cycle
Relevance of the RAC Sector
Market Trends of Residential AC
GIZ Proklima's Approach
Green Cooling and Climate protection
The „Green Cooling“ Approach

Focus not only on the ozone hole but also on the climate protection!

Cooling and air conditioning with natural refrigerants and equal or better energy efficiency
Technology cycle and areas of intervention

**Basic research**
- R&D-Policy for climate-friendly technologies

**Applied Research & Development**
- Strategy development (nat. refs)
- Incentives, subsidies
  - e.g. red. import duties, taxes, fees

**Technology Demonstration**
- Policy advise and development

**Market Introduction**
- Environmental standards
  - Techn. Standards, Norms, Quality management
- Technology advise and information

**Market penetration**
- Finanzierungsoptionen
- (PPP-)measures for innovative technologies
  - Implem. plans, local adapt. of technologies
  - Dissemination strat. and measures

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**Macro-economic Level**
- Policy advise and development

**Meso-economic Level**
- Environmental standards
  - Techn. Standards, Norms, Quality management
  - Technology advise and information

**Micro-economic Level**
- (PPP-)measures for innovative technologies
  - Implem. plans, local adapt. of technologies
  - Dissemination strat. and measures
Relevance of the RAC Sector

- The number of air-conditioning systems worldwide is expected to rise from 660 million to more than 1.5 billion by 2030.
- The stock of refrigerators in emerging and developing countries is expected to double to around 2 billion by 2030.
The RAC sector is one of the fastest growing markets in developing and emerging countries.

The largest growth in production and sales in the RAC sector takes place in Asia.
The success story of domestic refrigeration

- Global market share of R600 based domestic refrigerators today ranges around 70% of annual production
- HC-600a fridge compressors today are more energy efficient and come at less cost than HFC-134a compressors
Relevance of Room Air Conditioning on HFC emissions

- 65% of HFC (R410a, R32) use comes from AC
- Split AC accounts for more than 30% of global HFC emissions
- Responsible for 20-40% of energy consumption in many households around the world
- Choice of refrigerant:

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>GWP</th>
<th>HCFC Phase-Out</th>
<th>HFC Phase-Down</th>
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<tbody>
<tr>
<td>R22</td>
<td>1810</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R410A</td>
<td>2088</td>
<td><strong>Up</strong></td>
<td></td>
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<tr>
<td>R32</td>
<td>675</td>
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<td><strong>Up</strong></td>
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<td>R290</td>
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</tbody>
</table>

Source: shecco
08.11.2018

Source, UNEP
Market Trends of low GWP split AC

Supply of split AC units comes predominantly from Asia

**China**: Market share of 85%
- **20 RAC production lines converted** to R290 - potential to make 6 million R290 RAC units per year
- **< 10,000 units** installed
  = active policy support, update of safety regulations, and stronger industry commitment are needed to unlock full R290 RAC market potential

**India**: Split AC represents 80% of total AC units sold in India
- Currently **>600,000 R290 units** installed in the market
- **>4,500 trained technicians** across the country
- **Export** to other countries: Maldives, Nepal, Grenada, Bhutan, Philippines, Costa Rica, Thailand

Source: shecco
Conversion of Godrej & Boyce split AC production in India

- 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

- Godrej sold approx. 600,000 units in the Indian 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
## India: Top efficient split AC models

<table>
<thead>
<tr>
<th>Models</th>
<th>Model</th>
<th>CC (kW)</th>
<th>ISEER</th>
<th>Refrigerant</th>
<th>Unit Price (USD)</th>
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<tbody>
<tr>
<td>Daikin</td>
<td>TKM35SRV16</td>
<td>3.6</td>
<td>5.6</td>
<td>R32</td>
<td>718</td>
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<tr>
<td>Godrej</td>
<td>GSC 12 FIXH 7 GGPGb</td>
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<td>5.8</td>
<td>R290</td>
<td>905</td>
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<tr>
<td>Hitachi</td>
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<tr>
<td>Mitsubishi</td>
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<td>4.8</td>
<td>R410A</td>
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</tr>
</tbody>
</table>
Market trends of residential AC

Europe: moving towards **R290 in portable AC**
- EU F-Gas Regulation bans the use of HFCs with GWP > 150 in portable AC as of 2020
- At least 8 manufacturers
- Approx. **200,000 portable AC units**
- All new products are expected to use R290 within the next 2 years
- The use of R290 split AC in residential applications is widely untapped in Europe, although internationally there is progress
GIZ Proklima’s Approach

Supports around 40 partner countries in integrated ozone and climate protection through the use of natural refrigerants and energy-efficient applications in the refrigeration and air-conditioning sector since 1995.