How to successfully implement Green Cooling:

Sound strategies, qualified RAC workforce, best-available technology

OEWG42 Side Event, 16 July 2020
5:00-6:00 pm (EAT Nairobi)
Facilitators: Janna Breitfeld, Julia Schabel

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
Federal Ministry for Economic Cooperation and Development

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

PROKLIMA NATURALLY COOL

Instructions

Please leave your microphone and camera switched off.

Write your questions in the chat.

If there is not enough time to answer all questions,
we will send an e-mail with the answers.

This event will be recorded and published.
With your participation you agree to this.

Objective

How to use the RAC sector's savings potential to achieve climate and development targets?

- **Overview of possible fields of action for ozone, climate and energy policy**
- With your active participation you can shape the following online events!

Agenda

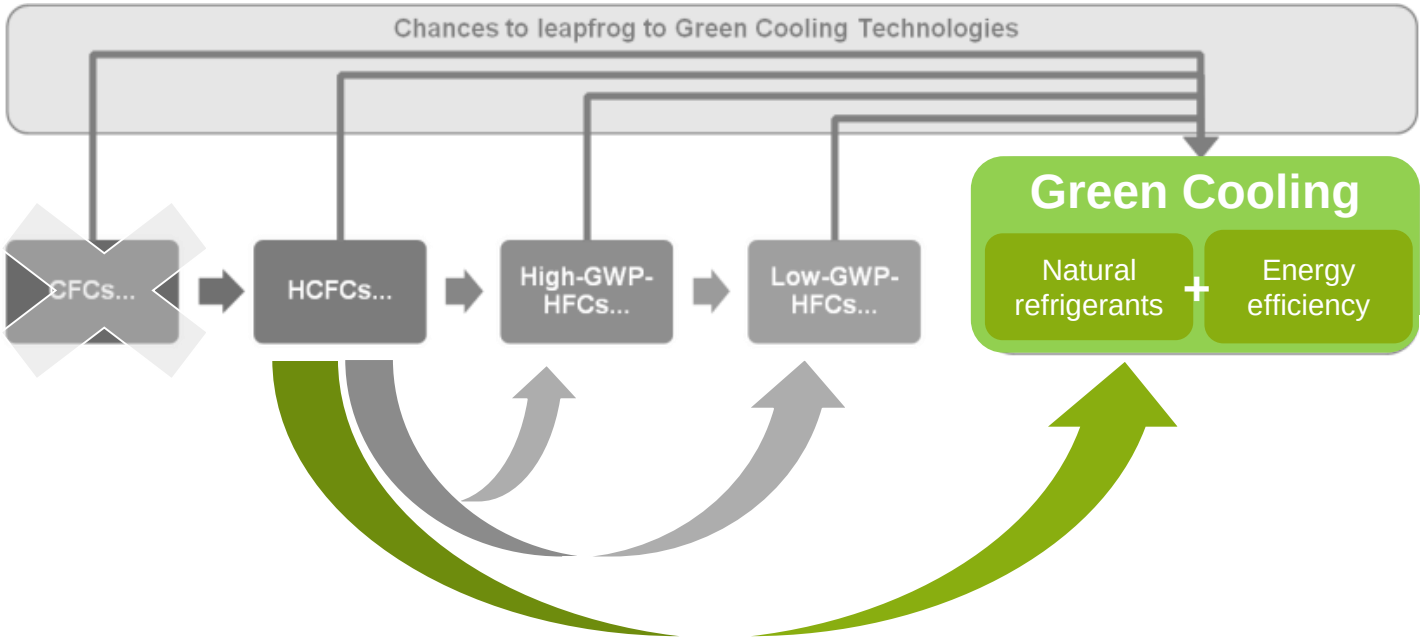
Proklima – Naturally Cool!	Janna Breitfeld, GIZ Proklima
Benefits and components of RAC inventories & cooling strategies	Christopher Jäger & Birgit Mayer, GIZ Proklima
What is "Fit for Green Cooling"? Benefits of a sound scheme to qualify, certify and register RAC technicians as part of a successful cooling strategy	Lara Teutsch, GIZ Proklima
R290 split AC as an example for best-available technology	Philipp Munzinger, GIZ Proklima
Questions and Answers	All
Closing	Bernhard Siegele, GIZ Proklima

Proklima – Naturally Cool!

Janna Breitfeld, GIZ Proklima

By 2030, the cooling sector will account for 13% of global greenhouse gas emissions.

Switch to Green Cooling in one single step



- **Appliances with natural refrigerants with same or better energy efficiency**

Proklima

- Programme established in 1995 in the context of implementing technical projects under the Montreal Protocol
- Promoting and introducing **natural refrigerants and energy-efficient appliances** in the **refrigeration and air-conditioning and foam (RAC&F) sector**
- Supporting around 40 partner countries in the field of **integrated ozone and climate protection**

On behalf of

Federal Ministry
for Economic Cooperation
and Development

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany

Green Cooling in action – what are we doing?

Policy Advice

Supporting
evidence-based decision making for
sustainable sector strategies

Example: Advancing NDCs (= nationally determined contributions)
through climate-friendly cooling

Capacity Building

Training of >35.000 technicians
within the HPMPs

Training of >150 cooling technicians, lecturers and political decision-makers within the Cool Training

Technology Transfer

Cooperation with the industry
(e.g. production and distribution of climate-friendly ACs)

Example: JetWing Hotel Group in Sri Lanka

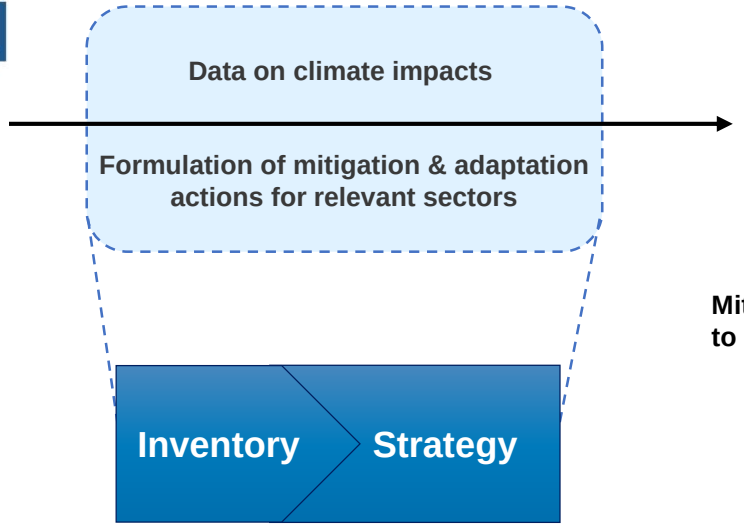
Benefits and components of RAC inventories & cooling strategies

Christopher Jäger & Birgit Mayer, GIZ Proklima

Montreal Protocol & Climate Regime

Montreal Protocol on Substances that Deplete the Ozone Layer

- **Control of ODS**
- **Kigali Amendment: control of HFCs with GWP**



Mitigation & Adaptation actions to limit global temperature rise

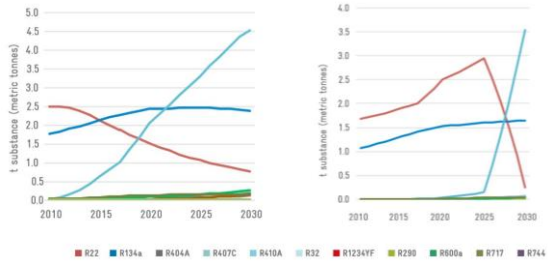
Source (MP Logo): https://ozone.unep.org/sites/default/files/Handbooks/MP-Handbook-2020-English.pdf
Source (UNFCCC Logo): https://c2.staticflickr.com/6/5450/9917212873_04a14c8e35.jpg

RAC&F Sector Inventories

- **About**
  provide context-specific overview of RAC sector equipment, emissions & ODS banks (status-quo & projected development)

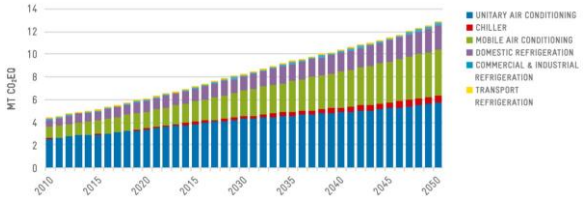
- **Components & Data**
  Sales and stock per subsector as well as growth rates per subsector
  Technical information on refrigerants used, energy efficiency, leakage rates, lifetime,…
  Core components:

ODS banks
on unit basis
Total sector banks
Projection of future banks for recovery & recycling



Source: GIZ 2020

GHG emissions
on unit basis
Total sector emissions (direct & indirect)
Projection of future emissions



Source: GIZ 2018

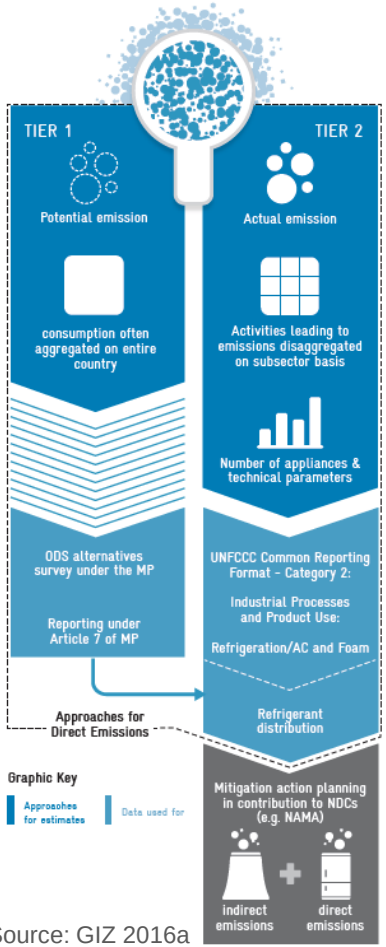
RAC&F Sector Inventories

- **Data & Methodology**
  equipment based emissions & ODS data -> IPCC Tier 2 methodology

  requires comprehensive data collection
  - relevant authorities (NOU, energy, industry, tourism, infrastructur)
  - customs (imports / exports)
  - Manufacturers
  - Distributors
  - Servicing firms
  - End users

- ***Measurement, Reporting & Verification (MRV) System***
  institutionalised data collection and analysis

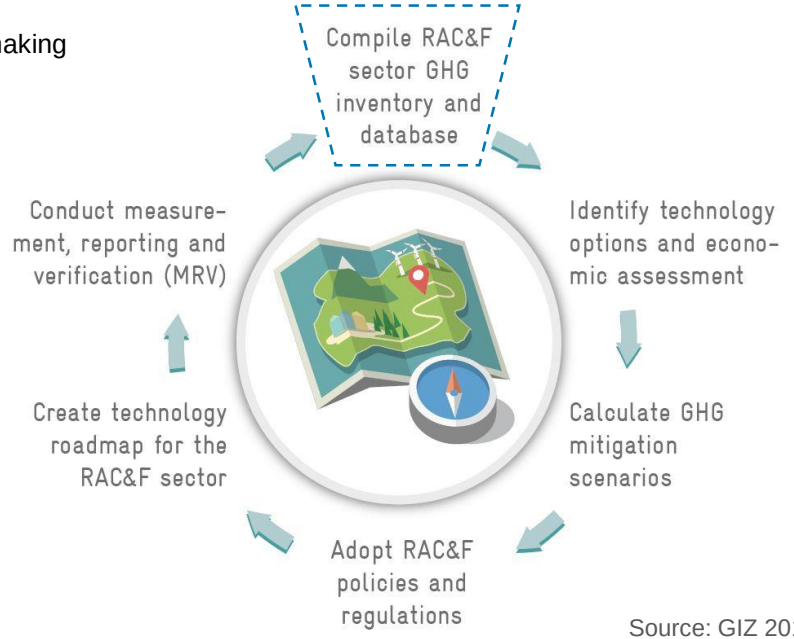
  simplification of reporting of sector data



Source: GIZ 2016a

RAC&F Sector Inventories

- **Benefits**
  serve as a starting point for GHG & ODS emission reduction activities
  - ➢ support identification of sector priorities
  - ➢ support evidence-based decision-making

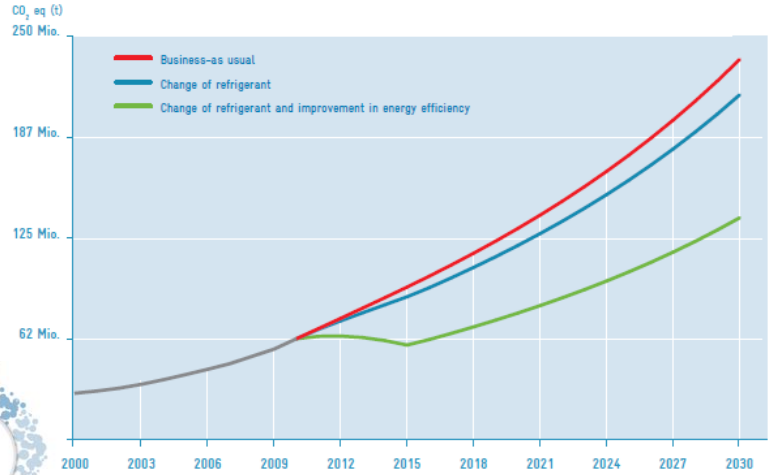


Source: GIZ 2016b

Cooling Strategies

- **About**
  - Roadmap for countries to show GHG mitigation potential of the RAC sector and how to achieve it
  - Based on inventory with robust country data – data is interpreted and appropriate mitigation actions are identified in the cooling strategy
  - Each cooling strategy is different: national specifics and opportunities are assessed
  - Comparability between countries by overall structure

- **Components**
  - Policy Analysis as link to overall country policy framework
  - Assessment mitigation potential & mitigation scenarios
  - Barrier Analysis
  - Analysis of options how to achieve mitigation potential
    - ➢ Strategies
  - Analysis of financing options



Source: GIZ 2016a

Strategies
To increase Energy Efficiency
To facilitate the transition to natural refrigerants
To standardise the qualification & certification scheme for RAC technicians: “Fit for Green Cooling”
To establish MRV systems
To manage ODS & HFC banks
Country specific strategy
Country specific strategy
…
…

Source: GIZ (n.d.)

Cooling Strategies

- **Benefits**
  - ✓ Increased visibility for RAC sector and facilitated integration in national policy landscape
  - ✓ Tool to understand RAC sector emissions relative to national GHG emissions
  - ✓ Support for data comprehensiveness of national GHG inventories
  - ✓ Support for evidence-based policy decision-making & priority setting:
    Illustration of long-term pathways for policymakers
  - ✓ Tool to support ambition enhancement in NDCs
    - RAC sector not considered in many NDCs yet
    - RAC sector GHG mitigation belongs to the most costs effective actions

giz

Source: GIZ 2016a, GIZ 2016b

What is “Fit for Green Cooling”?

Benefits of a sound scheme to qualify, certify and register RAC products and services as part of a successful cooling strategy

Lara Teutsch, GIZ Proklima

Background

- **100** countries have ratified the Kigali Amendement and have commited themself to phase-down HFCs

- Increasing number of countries mentioning a sustainable transition of the RAC Sector within their NDCs

The question is no longer **whether** countries will switch to climate-friendly refrigerants, but **how** they will.

- In order to maintain environmental protection and society/personal healthcare and safety, the trading and handling of refrigerants should be permitted only for qualified, certificated, registered companies and employees.

A quality infrastructure is needed

The need for a quality infrastructure

New Alternatives require extra training

The introduction of new alternative refrigerants such as NH_3, CO_2 or HCs is associated with a number of challenges, because these require handling of:

- Flammability
- Toxicity
- High Pressure Systems

Reduce Environmental Impact, Increase Energy Efficiency and Safety

Improper installation and maintenance of cooling units can lead to:

- Less energy-efficiency
- Higher leakage rates of refrigerants
- Breakdowns
- Premature end of life of the systems

→ Greater direct and indirect emissions and higher costs

Reasons to set up a QCR scheme

Proper **qualification** of RAC technicians minimises environmental and health-related risks, increases energy-efficiency and ensures the creation of a future-oriented workforce

Certification makes the level of knowledge of technicians measurable

Registration gives countries an overview of trained workers and certification status

Our services

(1) Qualification

- We provide a guideline with 14 theoretical and practical modules in accordance to international standards (EN 13313 and draft ISO/DIS 22712)
- We support national training institutes to integrate the modules into pre-existing curricula.
- We conduct “Trainings of the Trainers” and assist with the implementation.

(2) Certification

- We develop examination procedures.
- We build capacity of Certification Bodies.
- We develop materials, tools and instruments for certification processes.
- We assist with labelling, reporting and monitoring.

(3) Registration

- We identify registration needs of people, companies, products.
- We develop an R-scheme and investigate enforcement requirements.
- We assist with the development of materials, tools and instruments.
- We assist with reporting and monitoring.

Fit for Green Cooling - Module Overview

Module A	Safe application of hydrocarbon refrigerants
Module B	Refrigerant circuit joining technologies
Module C	Safe application of carbon dioxide refrigerant
Module D	Safe application of ammonia refrigerant
Module E	Basic refrigeration, refrigerants & lubricants
Module F	Energy efficiency
Module G	Environmental protection
Module H	Electrical basics for refrigeration installations and safety
Module I	Design and testing of appliances and extensive systems
Module J	Refrigerant recovery, recycling, reclaim
Module K	Installation and commissioning
Module L	Operations & maintenance
Module M	Placing and mounting of RAC circuit components
Module N	Hermetisation (sealed system design)

Hydrocarbon Training Manuals: Thailand and Iran

- ✓ Practical and theoretical training sessions
- ✓ Trainer manual
- ✓ Chapter Material incl. Handbook & Handouts
- ✓ PPT Presentations
- ✓ Skills to assess
- ✓ Assessment Questions

Category		I (BA)		II (WK)		III (FO)		IV (LE)	
Requirements		Semi-Skilled Worker No Formal VETC training		System Operator Formal VETC training		Craftsman Formal VETC training Refrigerant Handling		Engineers / Operations Manager Refrigerant Handling	
		1 year professional field practice		2 years of professional field practice		4 years of professional field practice		Mechanical Engineering Studies or FO plus min. 4 years field practice	
Sector		Domestic and Commercial RACHP		RACHP		RACHP		All Sectors	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Modules	1. Placing and Mounting of RAC Circuit Components	X	X						
	2. Brazers Competences	X	X			X	X	X	X
	3. Professionals Module								
	3.1 Environmental Protection			X		X		X	
	3.2 Refrigerants and lubricants			(X)		X		X	
	3.3 Safety & Energy Efficiency Standards			X		X		X	
	3.4 Hermetisation (sealed system design)			(X)		X	X	X	X
	3.5 Design and Testing of Appliances and Extensive Systems							X	
	3.6 Installation and Commissioning			(X)		X	X	X	X
	3.7 Operations & Maintenance			X	X	X	X	X	X
	3.8 Refrigerant recovery, recycling, reclamation			(X)		X	X	X	X
	3.9 Safe application of NatRef – HC / CO_2 / NH_3			(X)		X	X	X	X
	3.10 Electrical parts, installations, safety			X	X	X	X	X	X
	4. Chiller								
	4.1 Planning and Installation			(X)		X	X	X	X
	4.2 Commissioning			(X)		X	X	X	X
	4.3 Operations & Maintenance			X	X	X	X	X	X
	5. Re-evaluation and Renewal of Training Certificate (after several years of certificate holding)			X		X	X	X	X
	6. Optional Module Extensions								
	6.1 Basic Knowledge in Thermodynamics → M3 (in case not already available with II, III, IV)			X		X		X	
	6.2 System/failure evaluation/trouble-shooting →M3			X	(X)	X	X	X	X
	6.3 Solar driven RAC / Application of solar cooling systems							X	
Assessment		A		B		C		D	
Certificate		Cat I		Cat II		Cat III		Cat IV	

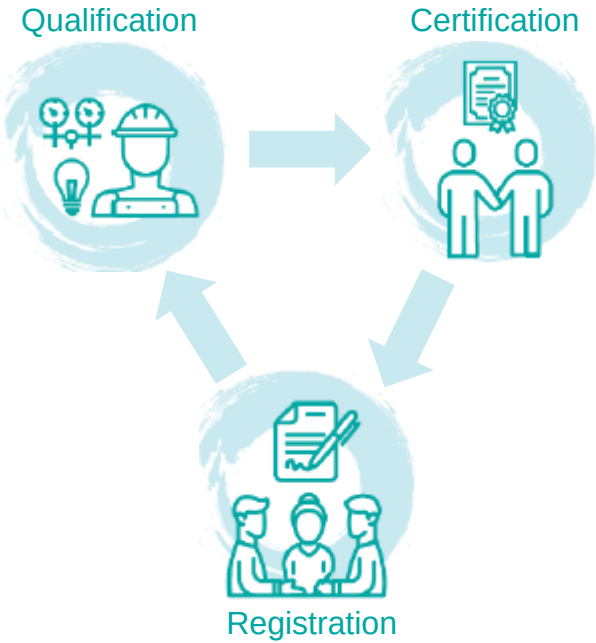
Fit for Green Cooling Modules

Certification Levels according to EN 13313 Annex A

giz

Characteristics and advantages of Fit for Green Cooling

- Holistic approach
- Modular structure of the training courses
- Compliance with international standards:
  - industry standards such as EN378, ISO 5149 and EN13313
  - makes the concept internationally viable and comparable
- High adaptability:
  - Can be integrated in existing, country-specific structures and curricula



Still curious?

Be part of our full Webinar next Thursday on Fit for Green Cooling with live expert discussion

Registration link in the Chat

23rd of July 3:30 – 5:00 p.m. (CET)

Fit for Green Cooling

Qualification, Certification and Registration of RAC technicians

R290 split AC as an example for best-available technology

Philipp Munzinger, GIZ Proklima

Why do we need Green ACs?

- Split-type ACs are currently the most commonly used appliances for space cooling worldwide
- Most split ACs operate with average to low energy efficiency levels and use highly climate damaging refrigerants (HCFC-22, HFC-410A, HFC-32) and account for around 10% of total electricity demand worldwide in 2016 (IEA, 2018)
- Demand for split ACs is growing rapidly due to climate change, economic growth and demographic factors, especially in developing countries
- Future scenarios propose an increase to 3.7 billion split ACs by 2050 in comparison to around 850 Mio. split ACs today (IEA, 2018)

Energy-efficient R290 split ACs as sustainable solution for space cooling

- Conventional split ACs
  - Use highly ozone depleting HCFC (R22) or high-GWP HFCs (R410A and R32)
  - Wide use of average to low energy-efficient appliances

- R290 split ACs
  - Use climate-friendly refrigerant with negligible GWP of 3
  - Optimized system design and favourable thermodynamic properties of propane allow for high energy efficiency levels
  - lower operational costs and lower amount of indirect emissions and negligible direct emissions

- **Energy-efficient split ACs using climate-friendly HC refrigerant (R290) present a cost-efficient and sustainable solution for climate protection in the RAC sector**

Barriers

- General awareness and technical know-how
- Insufficient qualification and certification of AC technicians
- Profit-making and greenwashing of HFC-410A and HFC-32 refrigerants
- Risk perceptions associated with the flammability of R290 refrigerant
- International safety standards
- Availability of R290-specific appliances and components

➢ Time frame from to date until first reduction steps in 2028 leaves enough room for massive lock-in of HFC-based inefficient split AC technologies!

Proklima supports R290 split AC market development

- **Production line conversion** of R22 split ACs to R290 split ACs for Godrej in India and GREE in China
- Global **demonstration** of safe and energy-efficient use of R290 split ACs
  - Pilot projects in 7 countries around the world
  - Energy performance monitoring
  - Trainings with manufacturer, suppliers and local technicians
- Technician **trainings** on safe handling of flammable refrigerant
  - QCR Development
  - Training of Trainers and technicians
  - Cooperation with training institutions and certification bodies
  - State of the art equipment for training centres
- **Studies**, policy publications and technical documents
  - National RAC GHG Inventories
  - Standard papers
  - Technical manuals
- Extension of **Project Pipeline** to upscale business cases through market incentives and global supply chain support

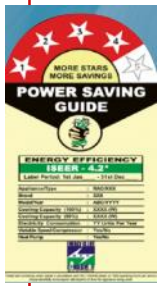
Selected country cases

Costa Rica - Implementation through demonstration and training

- Frontrunner in transitioning to climate-friendly technologies
- RAC sector responsible for 12% of countries GHG emissions
- Installation of R290 split ACs for demonstration and trainings

India - Holistic approach

- Godrej: Production line conversion of R22 to R290 split ACs in 2012
- Godrej followed charge limits of European standards and has established QCR System for R290 split ACs
- Introduction of Indian SEER in 2015 taking into account local climate conditions
- Mandatory energy labelling for room ACs (5 Stars: ISEER of 5.8 and use of R290)



Ghana - Market introduction of green ACs

- Including RAC sector in its NDCs
- Leapfrogging from R22 and R410A to R290 in the AC market
- Introduction of 380 R290 split ACs to the market
- Midea and GIZ jointly conducted trainings

→ Mitigation potential of 7.86 Mt CO_2

Philippines – Train-the-trainer

- train-the-trainer sessions for 32 RAC training professionals on the use of R290 split ACs
- RAC trainers will cascade knowledge to students of TESDA training center throughout the archipelagpo

Green Cooling Project

Objective: Accelerating the transition to climate-friendly and energy-efficient split-type air conditioners (Green AC) in front-running countries

Outputs:

Support on Green AC policy instruments (MEPS, eco-labels and GWP limits)	Green AC rebate programme	AC technicians qualification and certification	End-of-Life Management of replaced ACs

Project countries: Costa Rica, Ghana in first phase, additional countries in second phase

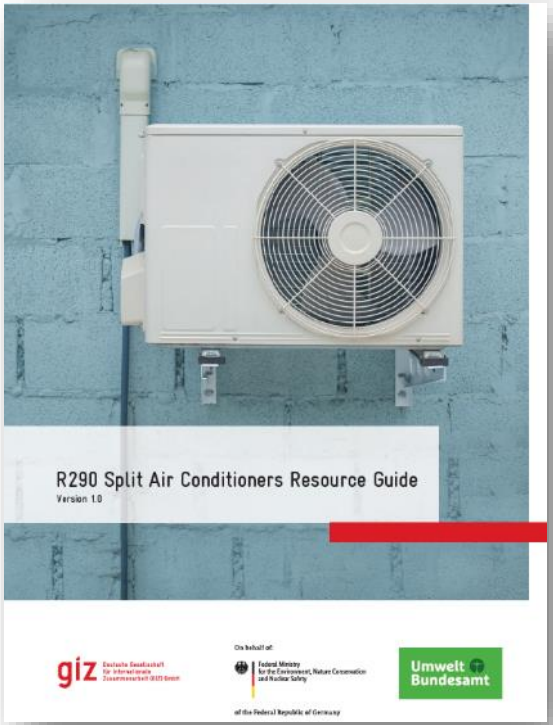
Status: Funding proposal under preparation

R290 Split AC Resource Guide

- Builds on **practical experience** gained in GIZ Proklima and partner projects
- **Inform relevant stakeholders** about the relevant factors influencing a successful market transition to energy efficient R290 split ACs
- **Address knowledge gaps** and concerns that hinder the transformation towards R290 split ACs
- Provide an overall understanding of R290 split ACs, exhibiting their **advantages in comparison to conventional split ACs**
- Inform about the required **specific setup of ACs** and the **specific set of skills of technicians**
- **Encourage policy makers** to facilitate the market uptake of split ACs using R290

The guide addresses:

- **Political decision makers**
- **National standardisation, custom and certification bodies**
- **Split AC industry**



Download

The stage is yours!

Feel free to write your questions & remarks into the chat!

Closing

Bernhard Siegele, GIZ Proklima

Contact

Bernhard Siegele
Programme Manager

bernhard.siegele@giz.de

Birgit Mayer
Advisor

birgit.mayer@giz.de

Christopher Jäger
Advisor

christopher.jaeger@giz.de

Contact

Lara Teutsch
Junior Advisor

lara.teutsch@giz.de

Philipp Munzinger
Advisor

philipp.munzinger@giz.de

Julia Schabel
Junior Advisor

julia.schabel@giz.de

Janna Breitfeld
Advisor

janna.breitfeld@giz.de

Dig deeper:

twitter.com/GCIGreenCooling

www.green-cooling-initiative.org

Thank you!

Credits & Sources

GIZ. (2016a). Advancing nationally determined contributions (NDCs) through climate-friendly refrigeration and air conditioning - Guidance for policymakers. Retrieved from: https://mia.giz.de/qlink/ID=245498000 or https://www.green-cooling-initiative.org/news-media/publications

GIZ. (2016b). Key pieces for climate-friendly and energy-efficient cooling.

GIZ. (2018). Ghana's Greenhouse Gas Inventory and Technology Gap Analysis for the Refrigeration and Air Conditioning Sector. Retrieved from: https://www.green-cooling-initiative.org/fileadmin/Publications/2018_GCI_Inventory_Report_Ghana.pdf

GIZ. (2020). Greenhouse Gas Inventory of the Refrigeration and Air Conditioning Sector in Grenada. Retrieved from: https://www.green-cooling-initiative.org/fileadmin/Publications/2020-Inventory-C4-Grenada.pdf

GIZ. (n.d.). Proklima – naturally cool! Green Cooling – for the protection of the climate and the ozone layer. Retrieved from: https://www.green-cooling-initiative.org/news-media/publications

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Germany
T +49 228 44 60 - 0
F +49 228 44 60 - 17 66

Dag-Hammarskjöld-Weg 1 - 5
65760 Eschborn, Germany
T +49 61 96 79 - 0
F +49 61 96 79 - 11 15

E info@giz.de
I www.giz.de

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH