



Technology Cooperation in the Refrigeration, Air-conditioning & Foam Sectors

November 12th, 2013, Warsaw

GIZ – Proklima

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On behalf of

BMZ



Federal Ministry
for Economic Cooperation
and Development

On behalf of



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany



GIZ worldwide

- GIZ's purpose is to promote international cooperation for sustainable development.
- GIZ is a 100% federally owned, public-benefit enterprise.
- GIZ operates in more than 130 countries worldwide with an annual turnover of approx. 2 billion EUR (in 2011)
- GIZ employs approximately 17,000 staff members worldwide
- GIZ is active in a variety of sectors, including e.g. education; health care; infrastructure; environment; climate (adaptation, mitigation)



On behalf of

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and Development

PROKLIMA

- 18 years worldwide initiatives
- > 240 projects
- > 40 Partner countries
- > 10.000 ODP tons reduced
- ~ 100 Mio tons CO₂eq. reduced

On behalf of



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Focus on natural refrigerants with low-GWP and energy-efficient applications



Introduction GIZ Proklima

- **Policy Advice:** Support governments of partner countries on drafting regulations and setting policies that comply with international environmental agreements
- **Technology Cooperation/Transfer:** Support of ozone layer & climate friendly technologies in RAC and Foam sectors
- **Emission Reduction:** Reducing the consumption of industrial gases with negative climate impact in RAC and Foam sectors
- Operationalizing strategies across diverse **conventions and realizing synergies** with other multilateral environmental agreements



Global relevance

- Ca. 15% of global energy consumption for cooling (7% growth/year until 2050)
- Ca. 15% of global GHG-emissions through cooling, air-conditioning and foam
- HFCs are highly climate effective substances (GWP approx. 1.000-10.000)
- Approx. 40% of energy consumption in urban areas (like Mumbai) are used for refrigeration and air conditioning
- In developing countries 400 Million tons/year (= 25%) of the foodstuffs is lost due to a lack of refrigeration.



→ Natural refrigerants, ammonia, CO₂ and hydrocarbons are freely available and offer an immediate solution for almost all applications

	CFC/ HCFC	HFC	HFC/ HFO	NH ₃	CO ₂	HC
Ozone Depletion	Red	Green	Green	Green	Green	Green
High GWP	Red	Red	Green	Green	Green	Green
Persistent wastes	Red	Red	Red	Green	Green	Green
Depletable Resources	Red	Red	Red	Green	Green	Green
Recycling	Red	Red	Red	Green	Green	Green
Safety issues	Green	Green/Red	Red	Red	Green	Red
Energy efficiency	Green	Green	Green	Green	Green/Red	Green
Costs	Green	Green	Red	Red	Red	Green
Local production	Red	Red	Red	Green	Green	Green



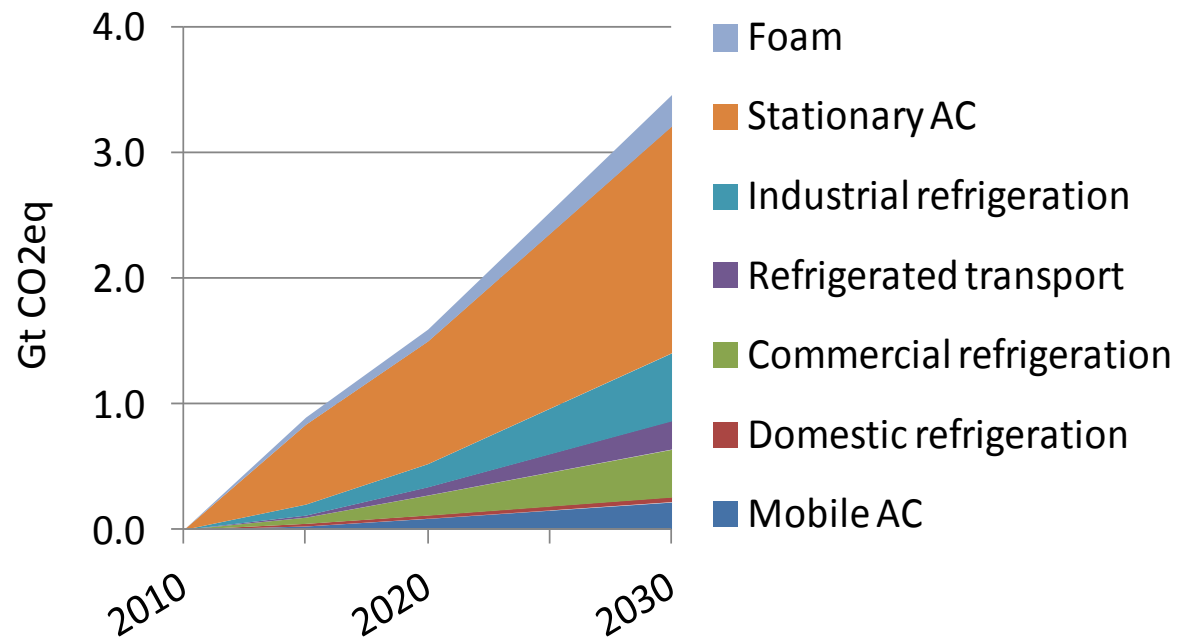
Mitigation of Direct Emissions: Stationary AC has most significant potential



Split AC (Indoor)



Window AC



Fields of cooperation in the technology cycle

GIZ activities – Multi-level approach

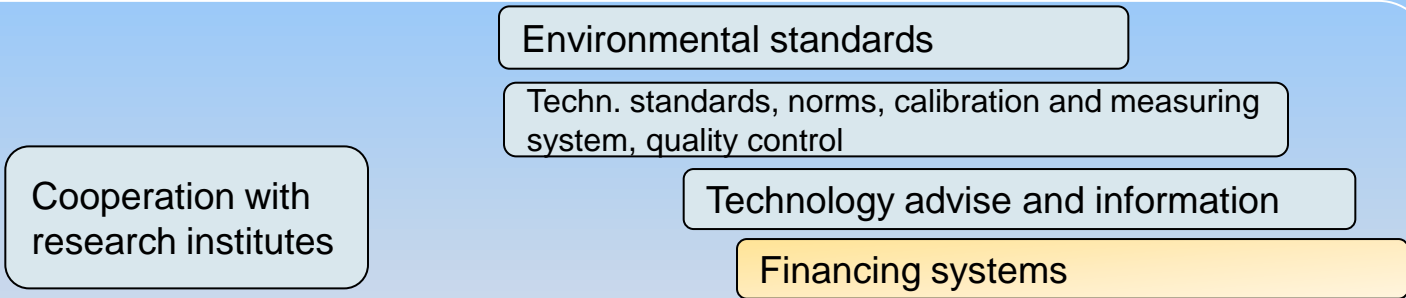
Technology



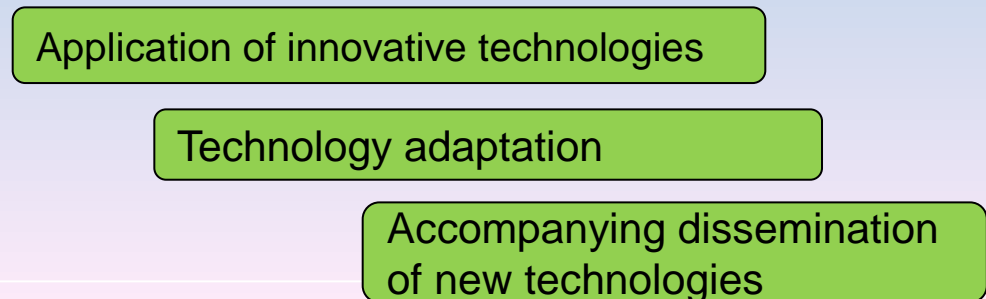
Macro



Meso







Micro





Proklima – Case Studies

Production + R&D	Split AC China & India			<ul style="list-style-type: none">• Key Subsector• Low GWP natural refrigerant• Improved energy efficiency
Production + R&D	HC/ Solar Refrigeration Swaziland			<ul style="list-style-type: none">• Production + capacity building in Africa• Natural refrigerants• Renewable energy (solar)
Use	Supermarkets South Africa			<ul style="list-style-type: none">• Transform end-user sector• Low GWP natural refrigerant• Improved energy efficiency
Post-Use	Refrigeration Recycling Brazil			<ul style="list-style-type: none">• Sustainable end-of-life treatment• Collection of old appliances• Recovery of CFCs, HCFCs, HFCs• Destruction



Case I: Production conversion in China & India

Unitary AC Gree, China & Godrej, India



Use of natural refrigerants



• GWP 1810



• No IPR
• GWP 3

- **Cooperation** with the countries' largest manufacturer of Split-ACs for the **FIRST production** of ACs with R290 instead of F-Gases
- Joint development of "safe" product and service standards
- Improved energy efficiency +15%
- Suitable for high ambient temperature regions (>52 °C)

- 2012: China releases **new standards removing barriers** for the use of the climate friendly ACs based on R-290 technology
- Increased penetration with the right servicing capabilities and product standards (i.e. Ghana)
- More than 100 Mio Split ACs produced annually



Case II: Production conversion Palfridge Swaziland

Refrigerator Production Conversion Swaziland



- Complete production of about 60.000 refrigerators per year **converted from F-Gases to natural refrigerants**
- **1.5 million t CO₂eq with one year production** (over the lifetime of the products)
- **>500 trained employees and service technicians**
- **Joint development** of a PV solar powered refrigerator (low energy consumption, energy storage, improved insulation)
- Cooperation **with Palfridge** (Swaziland, University of Dresden and German Engineers)
- **Technology is “free”** for GIZ partners in developing countries



Case III: Efficient use

Supermarkets South Africa

- SA with more than 1000 large super- and hypermarkets
- Pilots to demonstrate natural refrigerants with improved energy efficiency (+20%)
- Local capacities of engineering & service personnel
- More than 50 supermarkets followed pilot already



Use of natural refrigerants

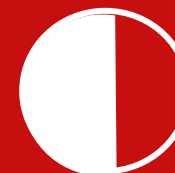
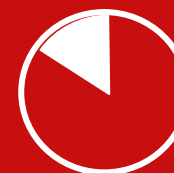


• GWP 1810

- No IPR
- 0 GWP

From pilot to market penetration

Pilot 2010 → Followers 2013 → Market 2015-2030



Capacity Building → Training



Case IV: End of life – recovery and recycling

Refrigerator Recycling Brazil



- First comprehensive refrigerator recycling plant in Brazil
- Collection of old refrigerators (ca. 40 millions to be collected)
- **Collection and destruction of F-Gases**
- Recycling of metals, plastics
- Involvement of informal waste sector
- Most old refrigeration and AC appliances **contain F-Gases**
- Besides being harmful for the climate, **F-Gases are highly toxic** and require collection and destruction
- Most developing countries have **no appropriate collection systems** in place

Conclusions



- ✓ Bilateral and private sector partnerships very effective in dealing with research and innovation
- ✓ Information and successful technology demonstration available
- ✓ Increasing number of experienced industries in Non-Annex I markets
- ✓ Direct emissions can be reduced at very low costs
- ✓ Transition away from HFCs results in additional energy efficiency gains
- ✓ R&AC sector activities can help to BRIDGE THE GAP



Green Cooling Initiative – Global Technology Network

Development of networks under the UNFCCC Technology Mechanism (Technology Executive Committee (TEC), Climate Technology Centre and Network (CTCN))

Objectives:

- **Mobilise technology** providers and investors in Germany and the EU for participation in sector networks and joint initiatives with developing countries
- **Create incentives for investments** in climate-friendly cooling technologies
- **Encourage the dialogue** between stakeholders from industry, government, research and NGOs (EU and Non-Annex I countries)
- **Promote partnerships** in relation to climate-friendly cooling technologies (North-South, South-South and triangular)



NEW! NAMAs in the refrigeration, air conditioning and foam sectors

A technical handbook by GIZ Proklima

10 Modules about :

- 1) Inventory
- 2) Cooling Needs
- 3) Technical Options
- 4) Economic Assessment
- 5) Mitigation Scenarios
- 6) Technology Roadmap
- 7) MRV System
- 8) Policy & Financial Framework
- 9) Implementation Plan
- 10) Co-benefits



NAMAs in the
refrigeration,
air conditioning
and foam sectors.

A technical handbook.



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Thank you!

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Info and Training Material

- Natural Refrigerants, 2008
- Natural Foam Blowing Agents, 2009
- Overview for NOUs, 2011
- GREE HC AC appliance installation, commissioning and service manual, published in 2011
- Best practices in refrigeration (GIZ PROKLIMA, 2010)
- Conversion guidebook for split air-conditioning systems, 2011
- Conversion of the production of XPS Foam to climate-friendly blowing agents, 2011

Praktikum: Informationsblatt

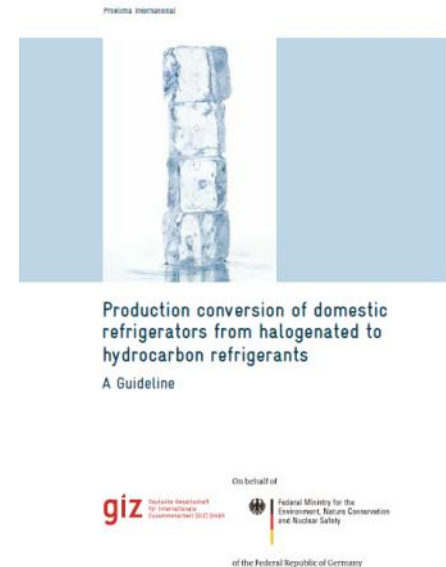


Operation of split air conditioning systems with hydrocarbon refrigerant
A conversion guide for technicians, trainers and engineers



Info and Training Material

- Guidelines on the safe use for HC refrigerants (GIZ Proklima and Tüv Süd), 2010
- Production conversion of domestic refrigerators from halogenated to hydrocarbon refrigerants, 2011
- Whitebooks with TÜV: Conversion of the production line of airconditioners to R290, 2011
- Production of room air conditioners, 2012
- Climate-friendly insulation (XPS foam), 2012
- Installation and Servicing of Air-conditioners, 2013
- More currently under development



Download from www.giz.de/proklima



Movies about PROKLIMA projects

Environmental friendly air-conditioning in India:

<http://www.dw.de/eco-friendly-cooling/a-16036590-1>

Green refrigerators in Swaziland:

<http://www.dw.de/green-refrigerators-in-swaziland/a-5609664-1>

Recycling refrigerators in Brazil:

<http://www.dw.de/recycling-refrigerators-in-brazil/a-14749211-1>

Green supermarkets in South Africa:

<http://www.dw.de/cape-towns-greener-grocer/a-5978571-1>



Jordan - Solar cooling in industrial and commercial

Objective: demonstrate feasibility and suitability of **solar power for air conditioning** in Jordan and the region

Expected Outcome:

- Innovative absorption technology demonstrated,
- local knowledge established for replication, **fit technology to local requirements** and establish local knowledge
- min. 3-5 pilot project up and running;
- **dissemination** in the region
- establishment of technology partnerships
- Reduction of direct and indirect GHG-emissions:
670 t CO₂eq/a (20,000 t CO₂eq over 30 years life time).
- **3-5 pilot projects** up and running;

Project Partners: *Ministries of Environment, GIZ, Technical University of Berlin, Jordan EPC company & manufacturer, Jordanian Universities and Research Institutes; Jordanian Operators from various commerce and industry sectors*

Project duration: 03/2012-02/2015



China – Climate-friendly foam production

- Successful technology demonstrations
- Sector ~ 500 companies (about 800 production lines)
- Annual production of about 125 000 m³ of foam plates (~ 4.5 million m²)
- Avoidance of approximately 1.5 million tons of CO₂eq (direct emissions)
- Conversion of 80% of the 500 companies to demonstrated technology (ca. 45 until 2015);
- Implementing Partner Organisation: Ministry of Environmental Protection/Foreign Economic Cooperation Office (MEP/FECO)
- Beneficiaries: Beijing Beipeng New Building Materials Co. Ltd; 2 Universities (laboratory equipment)





China - Converting XPS foam production from F-gases to climate-friendly CO₂ technology: **Results**

- First phase: conversion of 43 manufacturing plants until 2015
- A selected producer was equipped with appropriate new technology.
- Installation complies with international safety standards and is approved by TÜV.
- Since 2010: Production of XPS insulation boards under the new procedure.
- Other manufacturers were informed of experience in the project.
- Through the establishment of a HCFC-free production line emissions can be avoided by more than 490,000 tons of CO₂eq per year.