Rio+20 and sustainable refrigeration?
Side event at the 32nd open ended workgroup 2012, Bangkok

Cooling – growth – climate change

Jürgen Usinger, GIZ Proklima

The future we want – Green Economy

We acknowledge that green economy in the context of sustainable development and poverty eradication will enhance our ability to manage natural resources sustainably and with lower negative environmental impacts, increase resource efficiency and reduce waste. (Para 60 final declaration)

The future we want
– Production and consumption

We recognize that urgent action on unsustainable patterns of production and consumption where they occur remains fundamental in addressing environmental sustainability and promoting conservation and sustainable use of biodiversity and ecosystems, regeneration of natural resources and the promotion of sustained, inclusive and equitable global growth. (Para 61 final declaration).

The future we want – HFC Phase down

We recognize that the phase-out of ozone-depleting substances is resulting in a rapid increase in the use and release of high global-warming potential hydrofluorocarbons to the environment. We support a gradual phase-down in the consumption and production of hydrofluorocarbons. (Para 222 final declaration)

New Publication by GIZ

Productivity

Housing / Facilities

Employment

Industry

Production

Health

Food

Nutrition

Hygiene

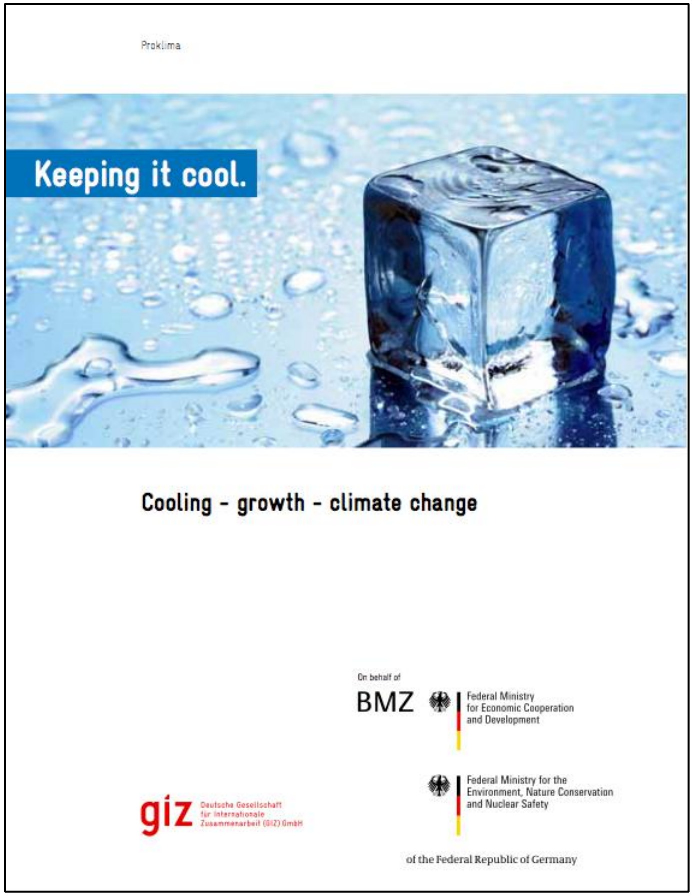
Chemicals

Resources

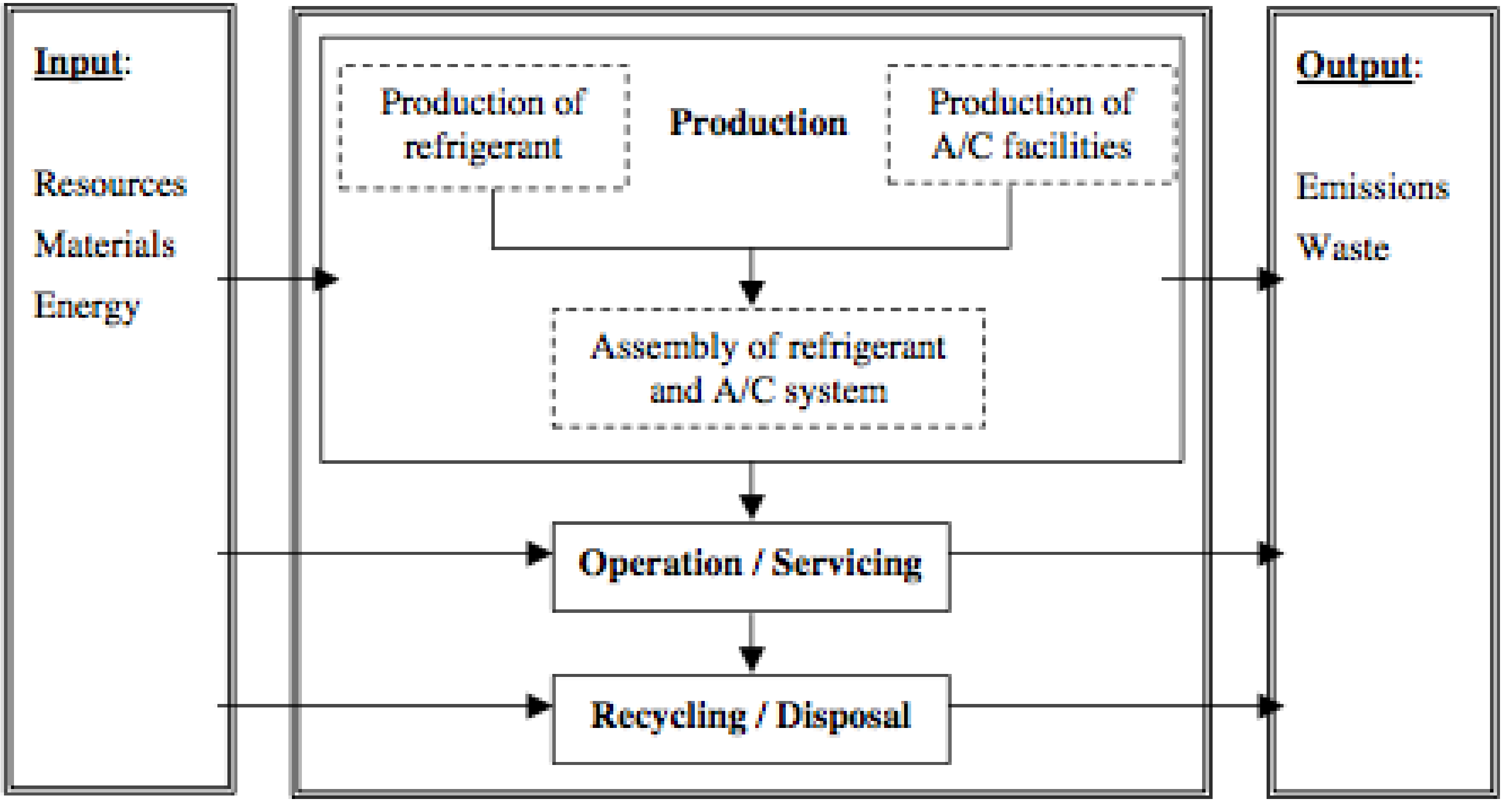
Waste management

Energy

Local ecosystems



Measuring Sustainability – Life Cycle Aspects



*Comparative Life Cycle Assessment of CFC-replacement, Weckert, University of Bayreuth, 2012

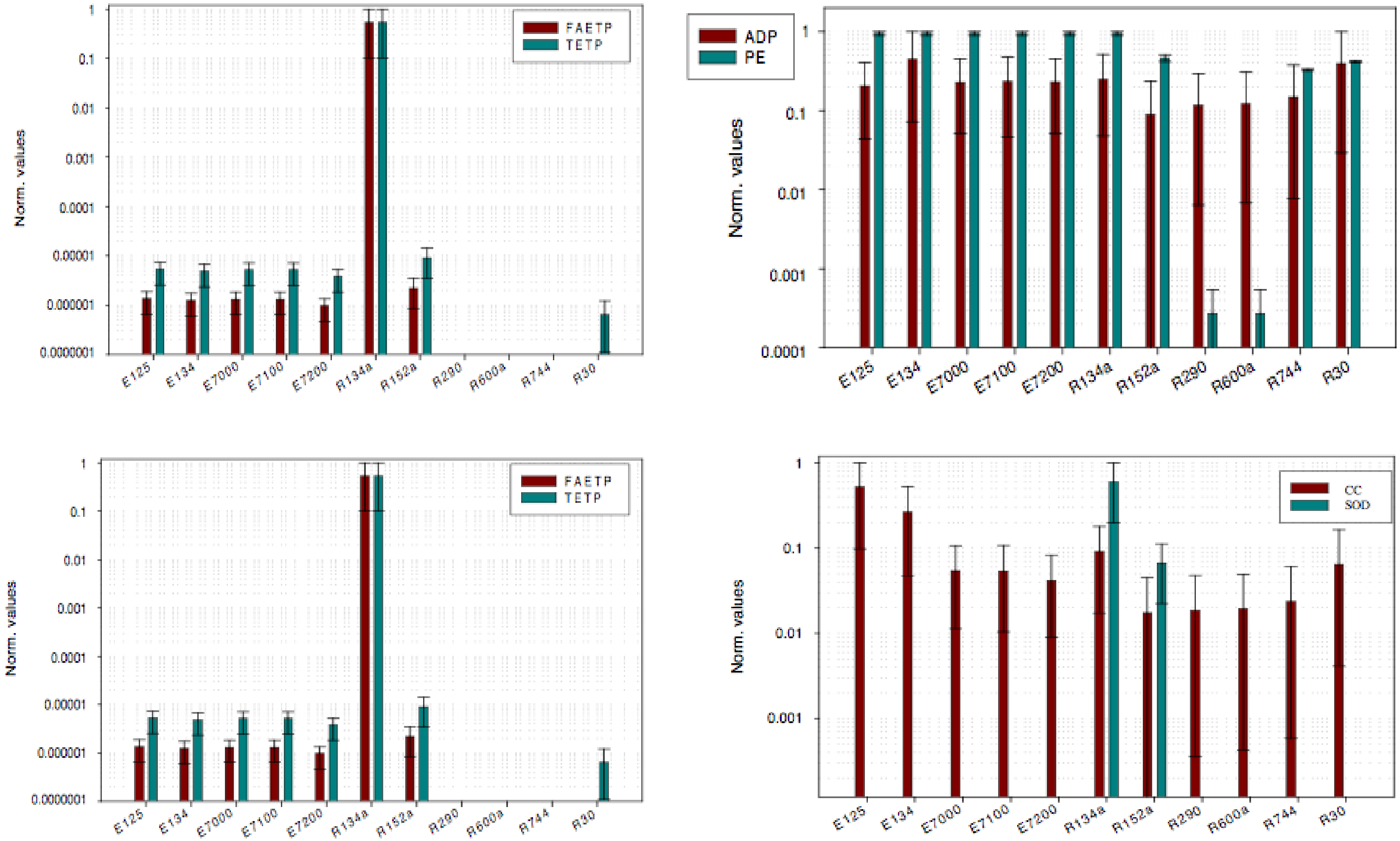
Explored risks during Life Cycle Analysis

- Stratospheric ozone depletion (SOD)
- Climate change (CC)
- Demand of non-renewable primary energy (PE)
- Depletion of abiotic resources (ADP)
- Fresh water aquatic toxicity (FAETP)
- Terrestrial ecotoxicity (TETP)
- Human toxicity (HTP)
- Eutrophication (EP)
- Photo-oxidant formation (POCP)
- Acidification (AP)
- others






Assessement of specific risks



*Comparative Life Cycle Assessment of CFC-replacement, Weckert, University of Bayreuth, 2012

Social organisation and resource application

Interactive levels of GHG Emission control				
Resources	Resource use	Individual behaviour	Social organisation	Global Governance
Raw Materials (Metals , Minerals, Oil Products Refrigerants) Wastes Wastes Emissions	Mining Transport Refining Transport Transport Energy supply & consumption Refrigeration A/C technologies Energy supply Recycling, Refining, Destruction decomposition	Skills, Management Handling, Production, Control Installation Use pattern, Application Maintenance Lifestyle Service, Repair, Disposal	Corporate Policies Product Production Design Infrastructure / Supply, Costs Utility sector Regulation of substances and handling Regulation of system performance Use Regulation Enforcement	Control of hazardous substances based CO2, CFC protocols International standards on energy etc. International Coalitions, associations ngo Multilateral mechanisms

Meteor
EI99 LCCP
LCA TEWI

Behavioral Aspects

Energy Consumption Research community	Effects of actual energy consumption
Food Refrigeration and Process Engineering Research Centre (FRPERC) report	The effect of door opening is 1-2% The influence of warm food is 4-10%
Mennink et al. (1998) tested a 200 litre refrigerator	The effect of door opening is 8% (2.2W) The influence of Adding food at room temperature is 11% (3.1W)
Refrigerators and Freezers, product case 5, Methodology Study Eco-design of Energy-using Products (MEEUP) for European Commission	Ice-up of the evaporator deteriorate the efficiency by 10-20% 1℃ difference in temperature causes a 4% difference in energy consumption.
ECUEL project SAVE (1999) in France used metered appliances in around 98 households for one month between January and July 1998 to monitor	Keeping a cold appliance in a non-heated storeroom rather than a kitchen gives an average energy saving of 36%. On average, freezers were operating at 3.1℃ colder than the recommended temperature (-18℃), leading to 17.6% more energy use.
In Japan, the surveys on Actual Energy Consumption of Top-Runner Refrigerators of Jyukankyo Research Institute (2006) monitored over 100 refrigerators in household for one year	Average annual actual electricity consumption was 65% larger than the JIS test value (Japan Industrial Standards test in 1999)

Replacement of Appliances in Mexican Households

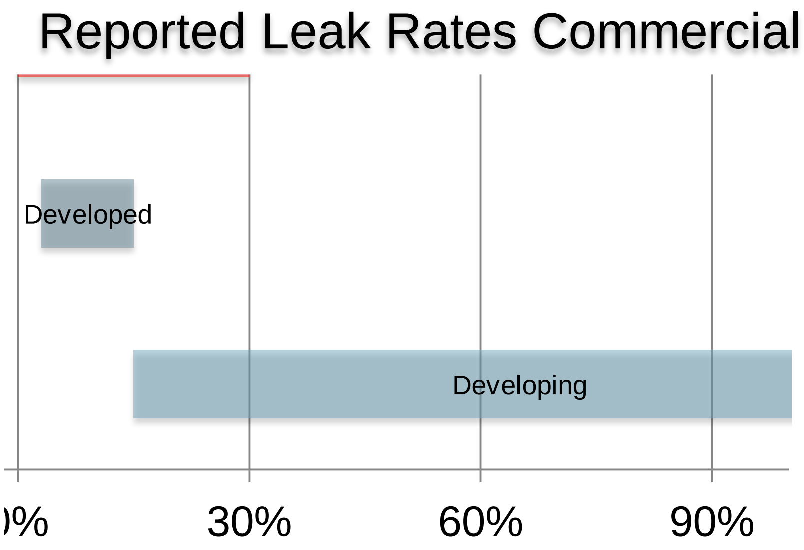
- households who replace their refrigerators with energy-efficient models decrease their energy consumption considerably less than was predicted by the Worldbank (-132kWh vs -481kWh)

- Even larger decreases were predicted for air-conditioners, who ended up increasing their electricity consumption (-1250kWh vs. +80 kWh)

- The Economics of Household Energy Efficiency,, Davis et al, 2012

Refrigerant Leakage

- The tightness of the system and its optimisation might influence the decision for a HFC substitute, but the probability of a complete leakage occurring and the corresponding environmental impact should be considered



Roadmap to sustainability

- Qualitative vs. Quantitative Analysis
- Using human resources (brains) vs. increased use of depletable resources
- Innovation vs. increasing material and energy use
- Use of renewable vs. fossil fuels for energy
- Use of renewable vs. depletable resources
- Effectiveness before Efficiency
- Take a precautionary approach in view of ecotoxicity (lessons learned from CFCs)

Controlling Refrigerants and System Performance

- Direct emission potential intrinsic to refrigerant
  → Need to address substances
- Indirect emission potential intrinsic to system design
  → Need to address system efficiency (by setting energy or operational standards)
- Adressing energy issues by choice of refrigerant is not effective public policy
  → leave it to market to operate within given framework
- Need to address issue of refrigerant and energy separately
  → Examples Ecodesign Directive / Refnat / HFC Phase down

Robust policies needed long term (2050)

- Refrigerants → use renewable, Natural refrigerants
- Energy → switch entirely to renewable energy

Thank you!

BMZ On behalf of 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