



# ATMO sphere





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Öko-Recherche  
Büro für Umweltforschung und -beratung GmbH



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## **Early action and current market trends in Germany**

Barbara Gschrey

## Special situation in Germany: Legislation and early action on ODS alternatives I

- First investigation of use and emissions of ODS in mid-1970s
- Industry agreement on reduction of ODS in aerosol sprays in late 1970s
- 1986 legislation on limits for ODS emissions from production facilities (e.g. highly emissive solvent use)
- 1987 Montreal Protocol
- 1988 EU and Germany ratify the Montreal Protocol, first EU ODS Regulation
- 1991 „FCKW-Halon-Verbotsverordnung“:

Progressive national legislation beyond EU rules

1995 Öko-Recherche is founded by specialist consultants





## Special situation in Germany: Legislation and early action on ODS alternatives II

- From 1989 public research on ODS alternatives including non-HFC alternatives
- Action by environmental organisations (Greenpeace)
- R&D of non-HFC alternatives to ODS in several sectors and market introduction:
  - Aerosol sprays
  - Domestic refrigeration: First hydrocarbon refrigerators (Greenfreeze)
  - Foam blowing
  - Fire protection

## Role of alternatives to HFCs in Germany today – Commercial refrigeration

- Example: Supermarket refrigeration - Stock

		2010	2011	2012	2013	2014	2015	2016
Sector	Used substances	Share of stock (%)						
Large supermarkets	R22	7%	0%	0%	0%	0%	0%	0%
	R404A	77%	81%	83%	82%	80%	75%	66%
	R134a	9%	10%	10%	11%	12%	13%	14%
	R422 reconstr.	6%	7%	4%	1%	0%	0%	0%
	<b>Alternatives</b>							
	CO <sub>2</sub>	1%	2%	3%	5%	8%	11%	<b>15%</b>
	HFKW-HFO-Blend R449A	0%	0%	0%	0,0%	0,2%	1,0%	<b>3,9%</b>
	HFKW-HFO-Blend R448A	0%	0%	0%	0,0%	0,0%	0,1%	<b>0,8%</b>
	Sum	100%	100%	100%	100%	100%	100%	100%

Natural refrigerants no longer niche products

Discounter	R404A	55%	54%	53%	52%	51%	48%	45%
	R134a	45%	46%	46%	46%	46%	47%	48%
	<b>Alternatives</b>							
	R410	0%	0%	0%	1%	1%	1%	<b>1%</b>
	CO <sub>2</sub>	0%	0%	1%	1%	2%	3%	<b>5%</b>
	R290	0%	0%	0%	0%	0%	1%	<b>1%</b>
	Sum	100%	100%	100%	100%	100%	100%	100%

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Data based on German F-gas inventory

## Role of alternatives to HFCs in Germany today – Mobile AC

- Example: Passenger cars - Stock

		2010	2011	2012	2013	2014	2015	2016
Sector	Used substances	Share of stock (%)						
Passenger cars	R134a	100%	100%	100,0%	99,8%	99,3%	98,5%	94,5%
	<b>Alternatives</b>							
	1234yf	0%	0%	0%	0,2%	0,7%	1,5%	~5,5%
	CO2 (adoption started)	0%	0%	0%	0%	0%	0%	>0%
	Sum	100%	100%	100%	100%	100%	100%	100%

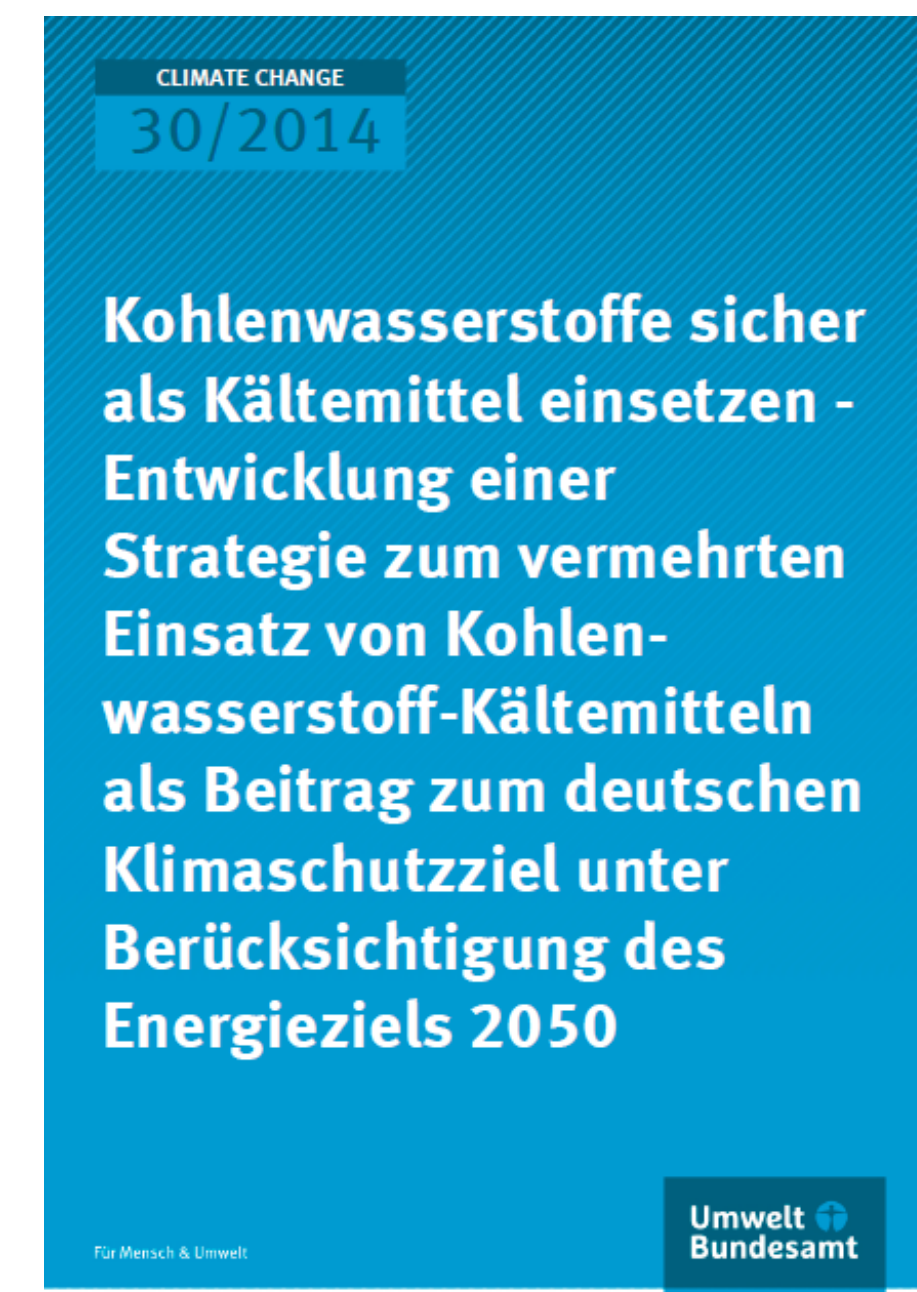
Data based on German F-gas inventory

- Around 60 buses using CO2 as a refrigerant

## Role of alternatives to HFCs in Germany today – Hydrocarbons

- Mobile room air conditioners using R290 for many years
- Air-to-water heat pumps run on R290 since the 1990s
- Introduction of heat pump laundry dryer with R290 in 2015, market share ca. 13% in 2016
- Strategy on promotion of hydrocarbons

[https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/climate\\_change\\_30\\_2014\\_kohlenwasserstoffe\\_sicher\\_als\\_kaeltemittel\\_einsetzen.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/climate_change_30_2014_kohlenwasserstoffe_sicher_als_kaeltemittel_einsetzen.pdf)







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**Thank you very much!**

