THE KIGALI AMENDMENT AND RAC SECTOR IN AFRICA

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Presentation of the Kigali Amendment to the Montreal Protocol

- In October 2016 the Kigali Amendment was adopted by all Parties to the Montreal Protocol;
- The Kigali Amendment places the production and consumption of **hydrofluorocarbons (HFCs)** in the future under the control of the Protocol;
- The Kigali Amendment will make **a major contribution to the fight against climate change;**
- Controlling the production and consumption of **HFCs** will add to **the climate benefits** already achieved by the Montreal Protocol through the phase-out of ozone-depleting substances (ODS) including CFCs and HCFCs.

What are HFCs?

Definition

HydroFluoroCarbons (HFCs)

HFCs (or F-gases for English speakers) are gaseous halogenated compounds used to replace ozone-depleting substances (CFCs, HCFCs), but which enter into the greenhouse effect process. They are among the six (06) main greenhouse gases listed in the Kyoto Protocol:

- **Carbon**
- **dioxide (CO2),**
- **Methane (CH4),**
- **Nitrous oxide (N2O),**
- **Hydrofluorocarbons (HFCs),**
- **Perfluorinated hydrocarbons (PFCs),**
- **Sulfur hexafluorides (SF6),**

These fluorinated gases of synthetic origin are composed of carbon, fluorine and hydrogen atoms.

Field of use of HFCs substances

The main fields of use of HFCs are:

Sectors	HFCs substances used
Refrigeration and Air Conditioning (RAC) sector as refrigerants	**HFC-134a (R-134a), HFC-404A (R-404A), HFC-410A (R-410A), HFC-407C (R-407C)**
Sector Aerosols (sprays) Propellants	HFC-134a, HFC-227ea, HFC-152a,
Rigid polyurethane insulating foam sector (Blowing agents)	**HFC-134a, HFC-365 mfc**
Firefighting Sector (Fire Extinguishing Agents) Firefighting Sector (Fire Extinguishing Agents)	**HFC-227ea (FM200), HFC-236fa , HFC-125**

Properties of HFCs

- Are not harmful to the ozone layer (PAO = 0);
- Have a much better energy efficiency than CFCs (CFC-11, CFC-12);
- Have technical properties close to those of CFCs;
- Non-flammable or moderate flammability (in the case of HFC-152a);
- Low toxicity;Melting temperature allowing them to be used as refrigerants;
- HFCs can replace CFCs in the majority of their applications, while reducing the quantity of gas required.

Disadvantages of HFCs

HFCs contribute very significantly to the **greenhouse effect**,

- Long atmospheric lifetime (e.g. 264 years for HFC-23), but this duration varies greatly between HFCs (1.5 years for HFC-143a),

Greenhouse gases (GHG)	Lifespan(years)
SF_6	50 000
HFC (HFC-23)	**264**
HFC-143a	**1,5**
N_2O	120
CO_2	100
CH_4	12

- **HFCs** have high Global Warming Potentials (GWPs).

Annex F - HFCs substances regulated by the Montreal Protocol

18 HFCs substances controlled by the Kigali Amendment

Groupe	Substance	GWP
	Group I	
CHF2CHF2	HFC-134	1 100
CH2FCF3	HFC-134a	1 430
CH2FCHF2	HFC-143	353
CHF2CH2CF3	HFC-245fa	1 030
CF3CH2CF2CH3	HFC-365mfc	794
CF3CHFCF3	HFC-227ea	3 220
CH2FCF2CF3	HFC-236cb	1 340
CHF2CHFCF3	HFC-236ea	1 370
CF3CH2CF3	HFC-236fa	9 810
CH2FCF2CHF2	HFC-245ca	693
CF3CHFCHFCF2CF3	HFC-43-10mee	1 640

Group	Substance	GWP
Group I (continued)		
CH2F2	HFC-32	675
CHF2CF3	HFC-125	3 500
CH3CF3	HFC-143a	4 470
CH3F	HFC-41	92
CH2FCH2F	HFC-152	53
CH3CHF2	HFC-152a	124
Group II		
CHF3	HFC-23	14 800

Note: Compound HFCs (Blends) are also controlled, Example:

(HFC-404A: 3900, HFC-410A: 2100 , HFC-407C: 1800, etc.).

GWP of major HFCs compared to CFCs and HCFCs

PRG et PAO de certains des fluides frigorigènes les plus courants Les fluorocarbures les plus utilisés sont de puissants gaz à effet de serre			
Type	**Gaz**	**PRG[1]**	**PAO[2]**
SAO	CFC-12	10 900	1.0
	HCFC-22	1 810	0.055
HFC	HFC-404A	3 922	0
	HFC-410A	2 088	0
	HFC-134a	1 430	0
	HFC-32	675	0
HFO	HFO-1234yf	4	0
Naturel	Propane	3	0
	CO_2	1	0

Distribution of HFC use worldwide?

Use of HFC	Pourcentage
Refrigeration and Air Conditioning (RAC)	**79%**
Polyurethane foams (sandwich panels, sound insulation, etc.)	**11%**
Aerosols	**5%**
Others (fire protection, solvents, etc.)	**5%**

Important: Role of certification of skills and service companies operating in the RAC sector for the reduction and management of HFCs,

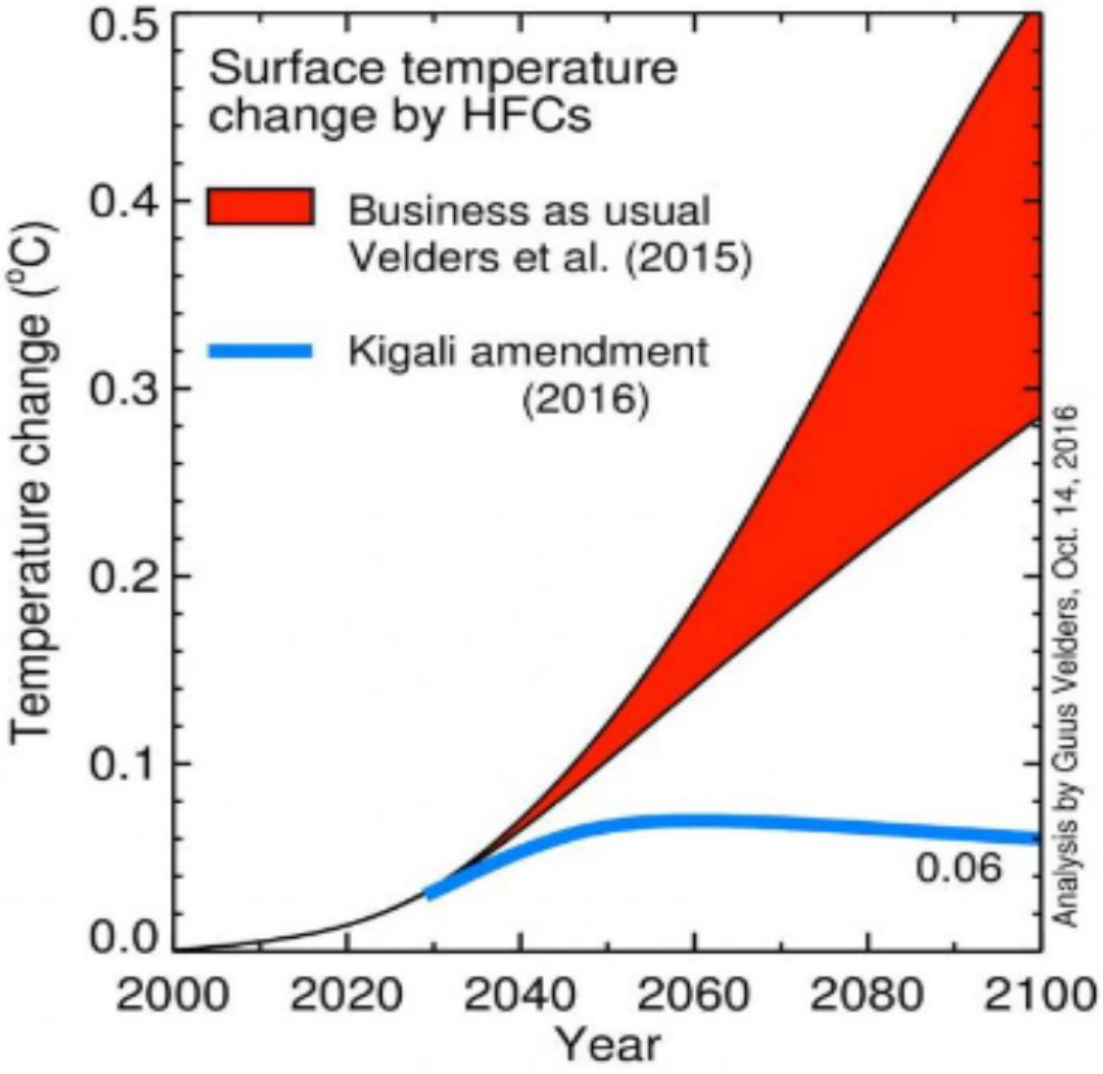
KIGALI AMENDMENTTO THE MONTREAL PROTOCOL

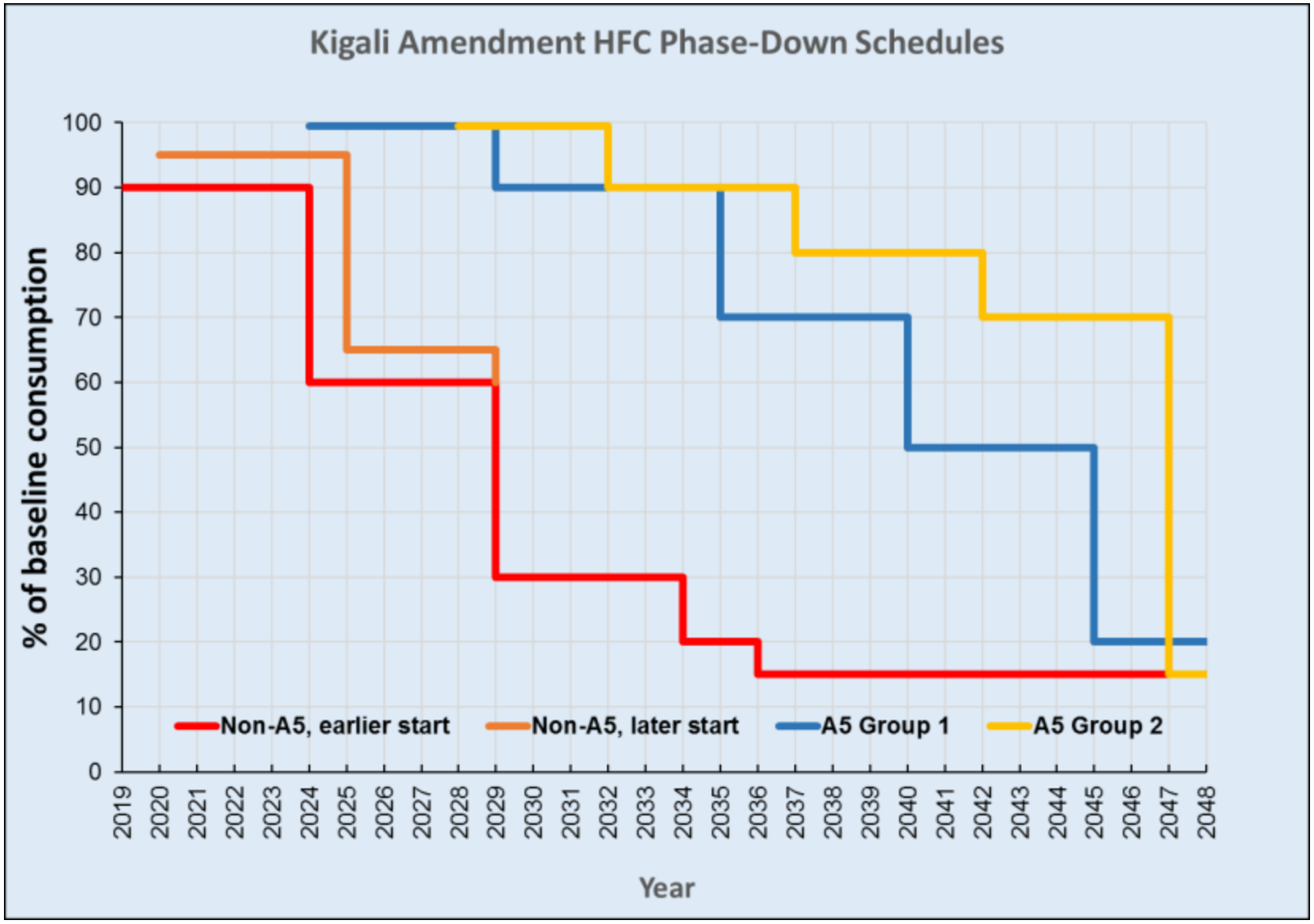
Kigali Amendment

- A global agreement signed in Kigali on 15 October 2016 by the 197 signatory countries of the 1987 Montreal Protocol on the protection of the ozone layer sets a timetable for the gradual cessation of the use of these gases.

- Their gradual elimination would **prevent up to 0.5°C by 2100**. This agreement, more binding than the Paris Climate Agreement, since it **provides for sanctions** in the event of non-compliance with commitments, should lead to a reduction in their consumption of 85% compared to 2011-2013 levels by 2047.

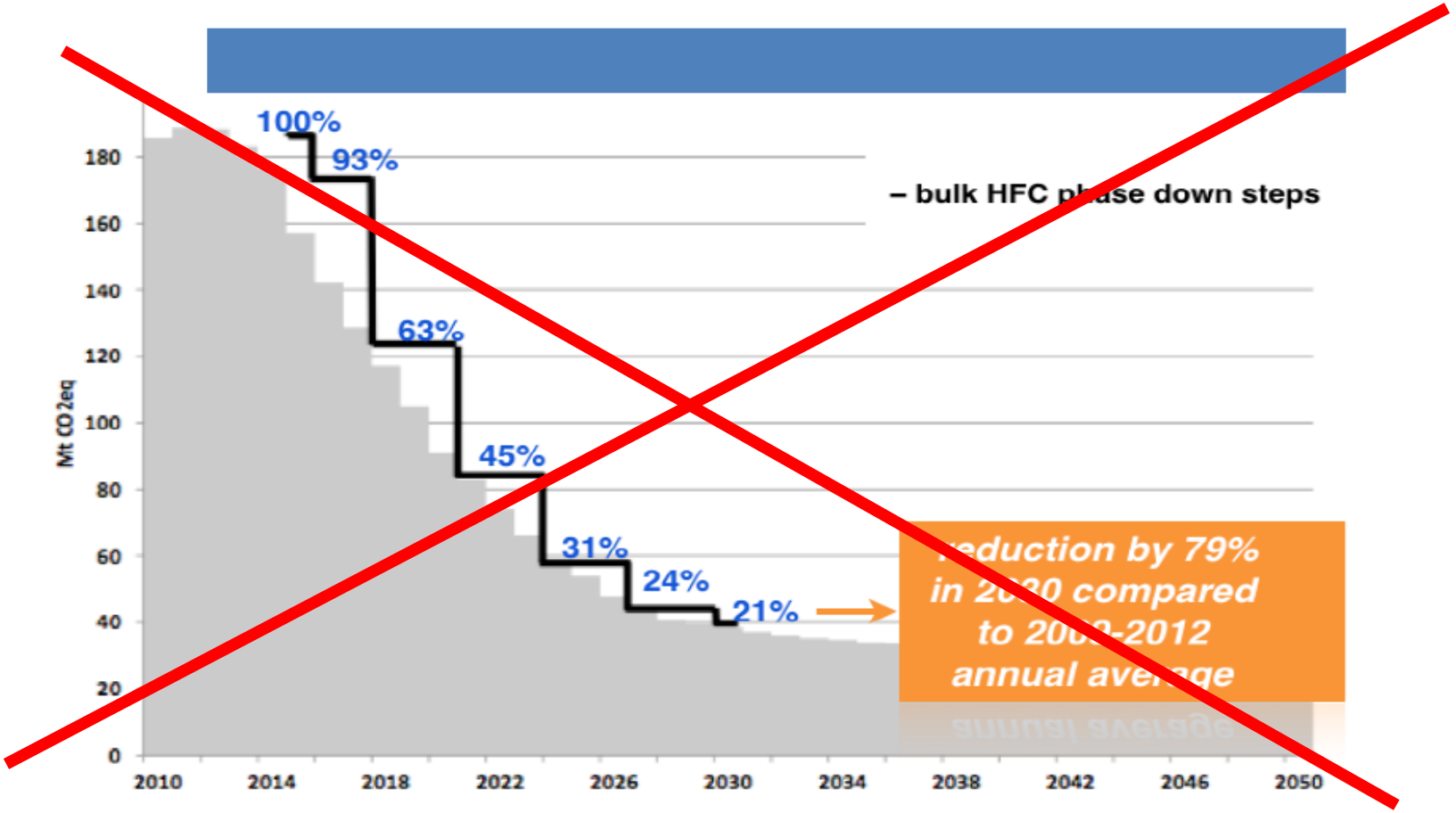
Scenarios of HFC contribution to Global Warming





HFC reduction schedule

EU F-gas Regulation (Regulation 517/2014) HFC phase-down schedule



CARBON NEUTRALITY BY 2050

Regulation 2024/573 Trends in the refrigeration / air conditioning sector (F-Gas III)

- Regulation (EU) 2024/573 on F-gases has the main objective of reducing greenhouse gas emissions from F-gases. This regulation represents a crucial step in the European Union's efforts to achieve climate neutrality by 2050.
- Regulation (EU) 2024/573, known as F-Gas III, marks a new milestone in the fight against **climate change** in the European Union. Published in the Official Journal of the European Union on 20 February 2024 and **applied since 11 March 2024,** this new revision replaces and repeals Regulation No 517/2014 (known as F-Gas II).
- It aims to drastically reduce the use of **fluorinated greenhouse gases (F-gases),** and imposes stricter restrictions, accelerating the **reduction of these gases** and encouraging the use of more **environmentally** friendly alternatives.

Regulation 2024/573 - continued

- **Staff training**
- Until now, the aptitude for handling **fluids** was issued **without a validity limit.**
- The new regulation requires refresher training before March 12, 2029. The aptitude will then be issued for 7 years with refresher training fo

- These new **training** met **als** with **skills** and **abilities** in **HFC replacement fluids**, including so-called "**natural" fluids** (**hydrocarbons** and **CO2** in particular).

Frequency of checking the tightness of the devices

FLUIDE	Charge en fluide de l'équipement	Périodicité des contrôles	
		Sans système de détection	Avec système de détection
HFC, PFC	5 Teq CO_2 ≤ charge < 50 Teq CO_2	12 mois	24 mois
	50 Teq CO_2 ≤ charge < 500 Teq CO_2	6 mois	12 mois
	Charge ≥ 500 Teq CO_2	(3 mois)*	6 mois
HFO	1 kg ≤ charge < 10 kg	12 mois	24 mois
	10 kg ≤ charge < 100 kg	6 mois	12 mois
	Charge ≥ 100 kg	(3 mois)*	6 mois

** Leak detection system with mandatory alert and check every 12 months*

The **placing** on the **market** of the **products** and **equipment** listed in the tables below is **prohibited** from the dates indicated.

Application		Seuils d'interdiction	Date d'interdiction
Équipements monoblocs	P calorifique ≤ 12 kW	GWP ≥ 150	01/01/2027*
	P calorifique ≤ 12 kW	Interdiction des gaz à effet de serre fluorés**	01/01/2032*
	12 kw < P calorifique ≤ 50 kW	GWP ≥ 150	01/01/2027*
	P calorifique > 50 kW	GWP ≥ 150	01/01/2030 *
Équipements Split	Charge < 3 Kg	GWP ≥ 750	01/01/2025
	Air-Eau P calorifique ≤ 12 kW	GWP ≥ 150	01/01/2027*
	Air-Air P calorifique ≤ 12 kW	GWP ≥ 150	01/01/2029*
	P calorifique ≤ 12 kW	Interdiction des gaz à effet de serre fluorés**	01/01/2035*
	P calorifique > 12 kW	GWP ≥ 750	01/01/2029*
	P calorifique > 12 kW	GWP ≥ 150	01/01/2033

**GWP ≤ 750 si cela est nécessaire pour satisfaire aux exigences de sécurité sur le site d'exploitation*

***soumis à réexamen en 2030*

The importance of the cold sector?

- The total number of refrigeration, air conditioning and heat pump systems in operation worldwide: **5 billion**, including:
- **2.6 billion** air conditioning units (fixed and mobile),
- **2 billion** domestic refrigerators and freezers.

- The refrigeration sector, including air conditioning – uses **20% of the total electricity** consumed worldwide;

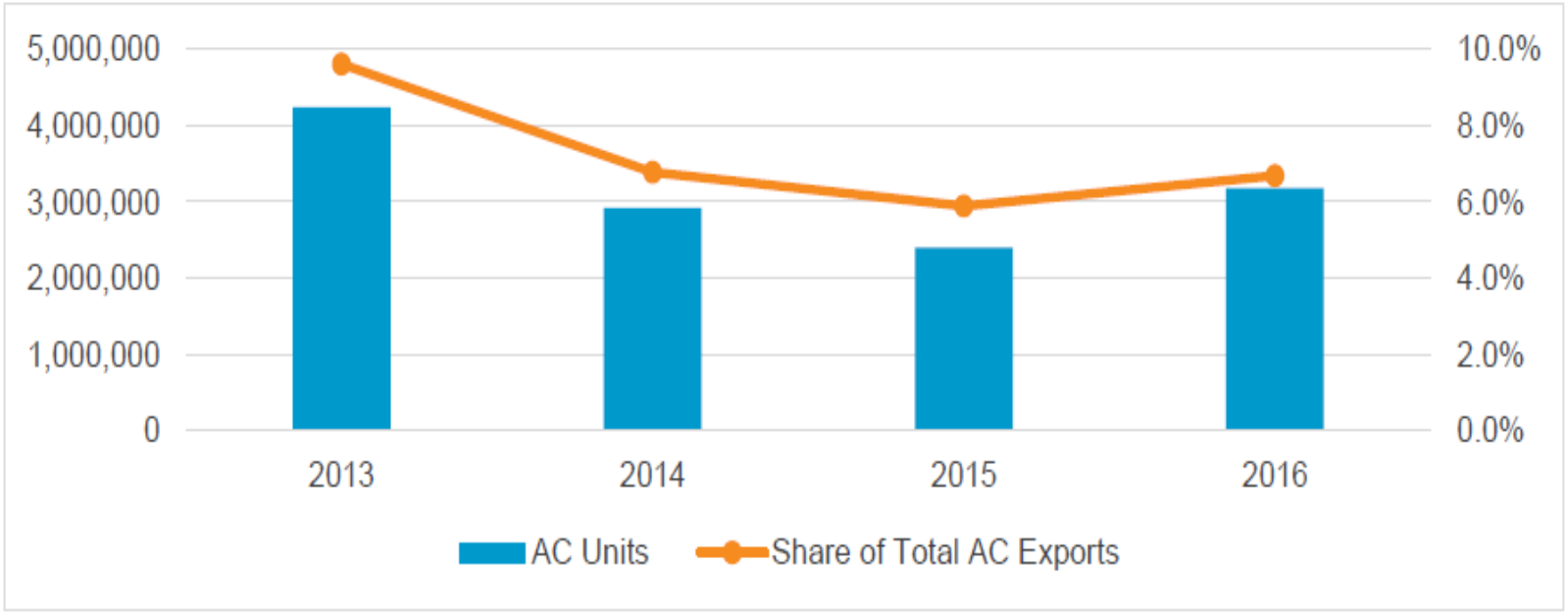
- Global electricity demand for refrigeration – including air conditioning – **could more than double by 2050**.
- **Emissions** from the refrigeration sect
- or represent **4.14 GtCO2eq**, or **7.8%** of total greenhouse gas emissions.

Source: IIR, 2019

Cold and food

- There is a growing need for food. "Due to population growth, the world will need *60% more food by 2050*. The sad reality is that much of the world's food supply is **lost to waste**.“
- Increased refrigeration in emerging economies is needed to meet this growing demand. Some *475 million tons of food* currently lost could be saved by wider application of refrigeration.
- Therefore, we must educate the public about the value of cold if we hope **to put in place policies that encourage the use of refrigeration,**

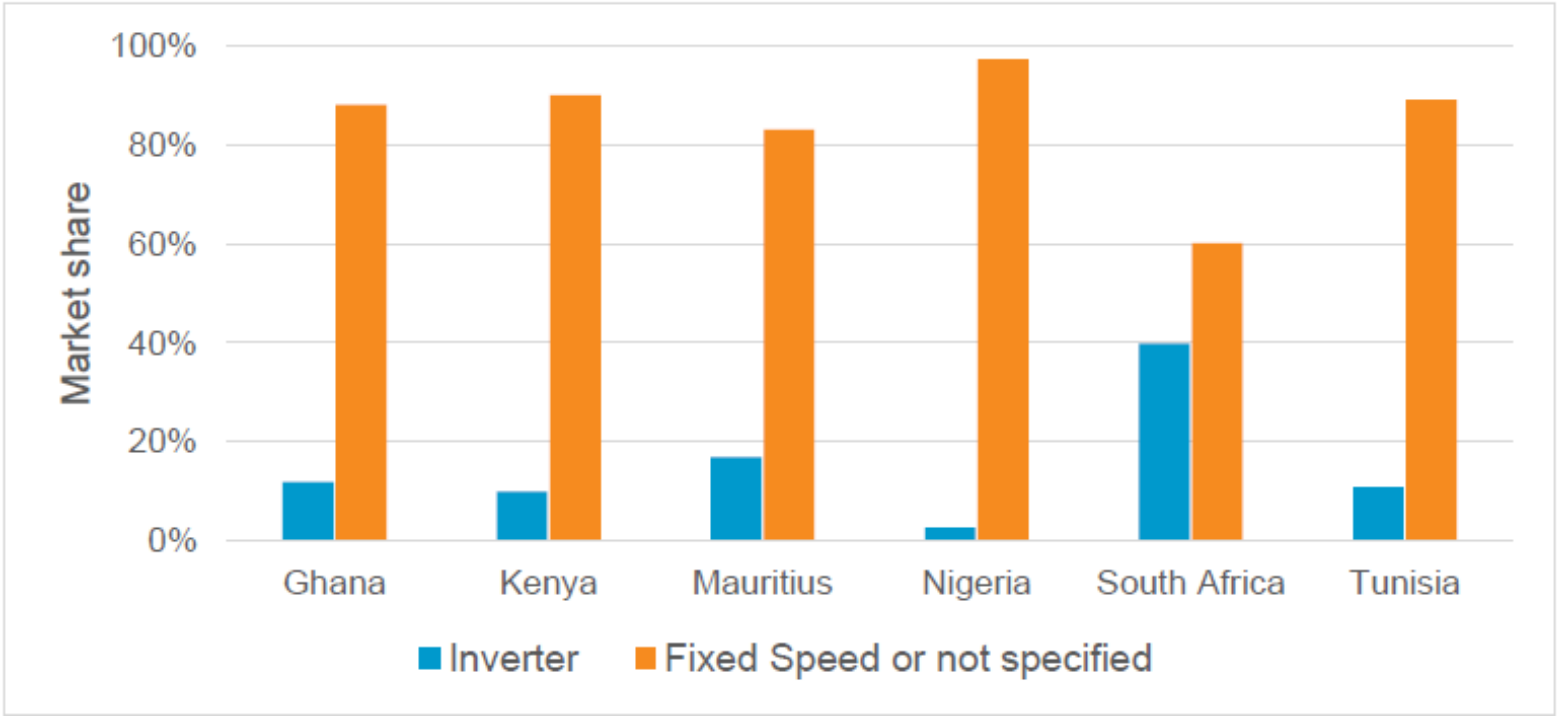
According to a study published by CLASP in 2018 on the A/C market in Africa



China's AC exports to Africa

In 2016, 6.7% of all Chinese AC exports went to Africa (Source: JRAIA)

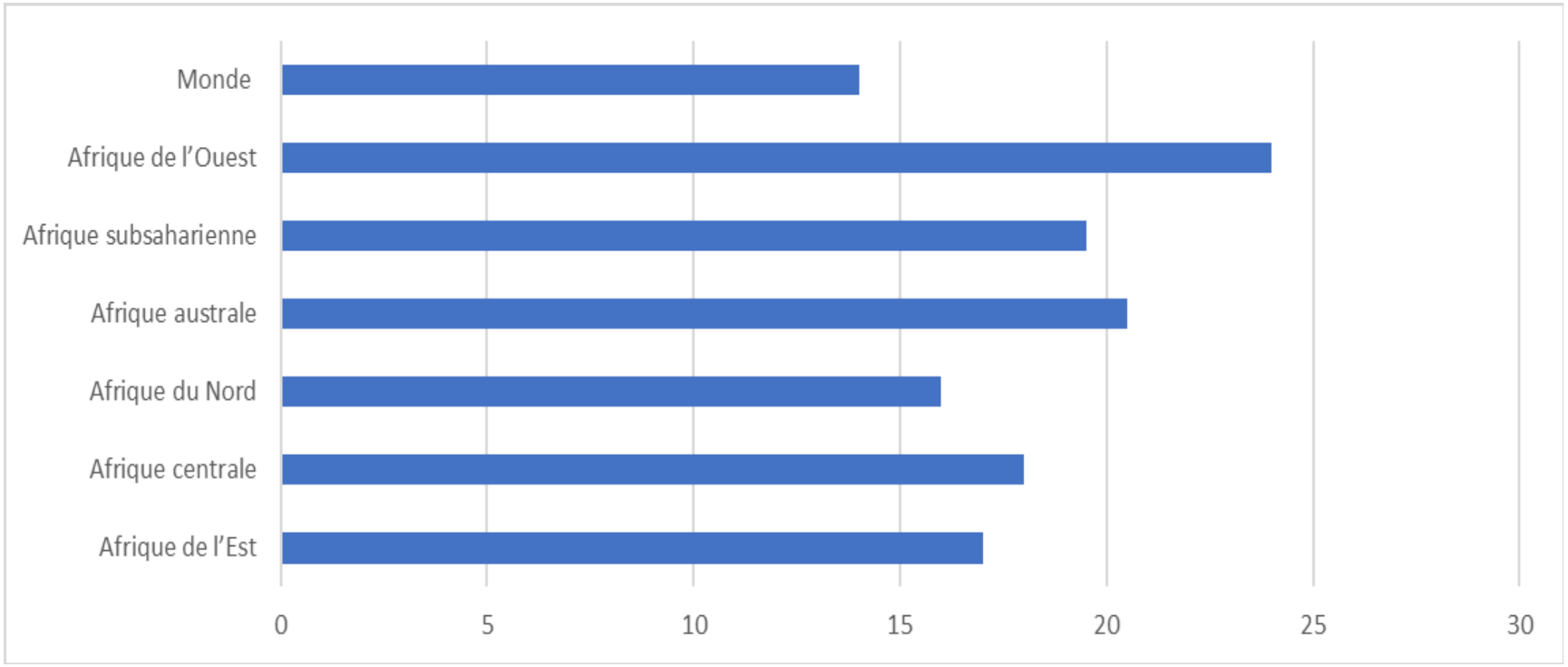
Penetration **of inverter technologies is low** in most African countries. Consumers **are not sufficiently aware of the benefits of this technology**. South Africa has the highest penetration rate, with AC inverters occupying 40% of the market; but in all other countries, inverter technologies represent **less than 20% of the market.**



Market share of AC compressor types in six African markets

Situation of food loss and waste in the African region

Levels of food loss and waste are high in Africa. Current estimates put the level in sub-Saharan Africa at close to 20% (Source FAO: February 2024 report)



Food losses in percentage in the Africa region

Thank you for your attention

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