

# Reduction of the Environmental Impact of Fluorinated Gases in the Sudoe Space using Key Enabling Technologies KET4F-Gas

[www.KET4F-Gas.eu](http://www.KET4F-Gas.eu)



Research and Innovation

Ana B. Pereira

NOVA SCHOOL OF SCIENCE AND TECHNOLOGY | FCT NOVA  
NOVA University of Lisbon  
Campus de Caparica | 2829-516 Caparica | Portugal



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**KET4F-Gas Workshop**  
ONLINE\_ 29 de abril 2021  
10:00 horas

**Call To Action:**  
Políticas e Boas Práticas para uma  
Gestão Eficiente de Gases Fluorados

# *Reduction of the Environmental Impact of Fluorinated Gases in the Sudoe Space using Key Enabling Technologies KET4F-Gas*

Execution period: 01/04/2018 – 31/03/2021

**General objective:** KET4F-Gas will design, test and validate different **Key Enabling Technologies (KET)**, individually and combined. The aim is to implement the most efficient option for the **separation and recovery of fluorinated gases** used in refrigeration and air conditioning equipment. This KET will be based on more efficient treatment systems, designed according to the principles of **green chemistry**.

## **SUDOE area:**

Portugal, Spain and France

## **Budget:**

1 742 800 Euros - 75% European Regional Development Fund (ERDF)

## Beneficiaries

### Academic Institutions



FACULDADE DE  
CIÊNCIAS E TECNOLOGIA  
UNIVERSIDADE NOVA DE LISBOA

Universidade Nova de  
Lisboa (**FCT NOVA**)  
(PT)



UNIVERSITÉ  
DE PAU ET DES  
PAYS DE L'ADOUR  
(UPPA)  
(FR)



UNIVERSIDAD DE CANTABRIA -  
UNIVERSITÉ CLERMONT AUVERGNE  
(UCA/FRE)  
(ES)



UNIVERSIDADE  
DE VIGO  
(UVIGO)  
(ES)

Universidade de Vigo  
(**UVIGO**)  
(ES)



PERSONA CIENCIA EMPRESA  
UNIVERSITAT RAMON LLULL

Institut Químic de Sarrià  
CETS Fundació Privada (**IQS**)  
(ES)

### SMEs



EnviEstudos, s.a.

EnviEstudos SA  
(**EnviEstudos**) (PT)



APRIA Systems SL (**APRIA**)  
(ES)



INTERLUN, s.l.

Interlun (**Interlun**)  
(ES)



No Waste - Gestão e Recuperação de Resíduos,  
Lda (**No Waste**)  
(PT)



## Beneficiaries

### Public Administration



Consellería de Medio Ambiente e Ordenación do Territorio (**Xunta de Galicia**)  
(ES)

### Innovation Cluster

**TALENCE INNOVATION**  
SUD DÉVELOPPEMENT Agence De Développement  
Economique Du Sud Bordeaux

Talence Innovation AGCE DEV ECON (**Talence Innovation**)  
(FR)

### Environmental Federation



Fédération des Recherches en Environnement (**FRE**)  
(FR)

### Foundations

**FEUGA**  
FUNDACIÓN EMPRESA - UNIVERSIDAD GALLEGA

Fundación Empresa – Universidad Gallega (**FEUGA**)  
(ES)



Fundación Fundecytparque Científico y Tecnológico de Extremadura (**FUNDECYT-PCTEX**)  
(ES)



## Associate Partners

### Academic Institutions

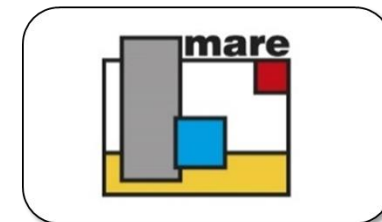


The Petroleum Institute (PI)  
(UEA)

### Industrial Partners



FCC Ambito, SAL (FCC)  
(ES)



Medio Ambiente, Agua, Residuos y  
Energía de Cantabria S.A. (MARE)  
(ES)

### European Platform



European recycling platform (ERP)  
(PT, ES)

### Non-governmental Organization (NGO)



ZERO - Associação Sistema Terrestre Sustentável  
(PT)



## Global Warming and the Greenhouse Effect

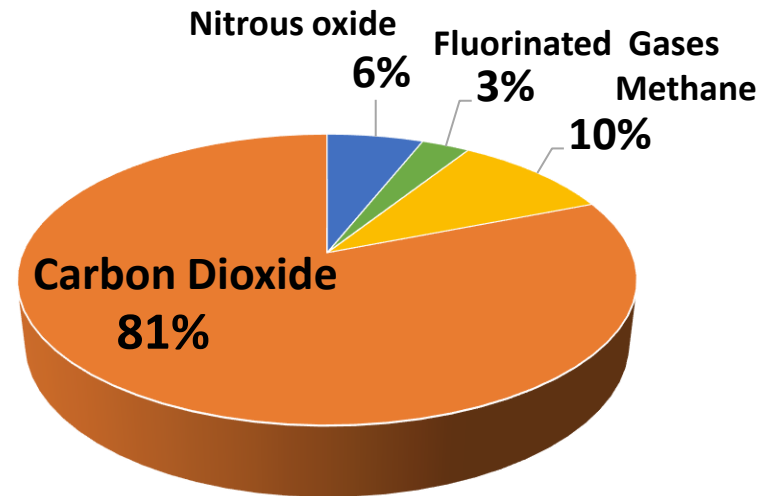


**Global warming** refers to a rise in the temperature of the surface of the earth. An **increase in the concentration of greenhouse gases** leads to an increase in the magnitude of the greenhouse effect (called enhanced greenhouse effect).

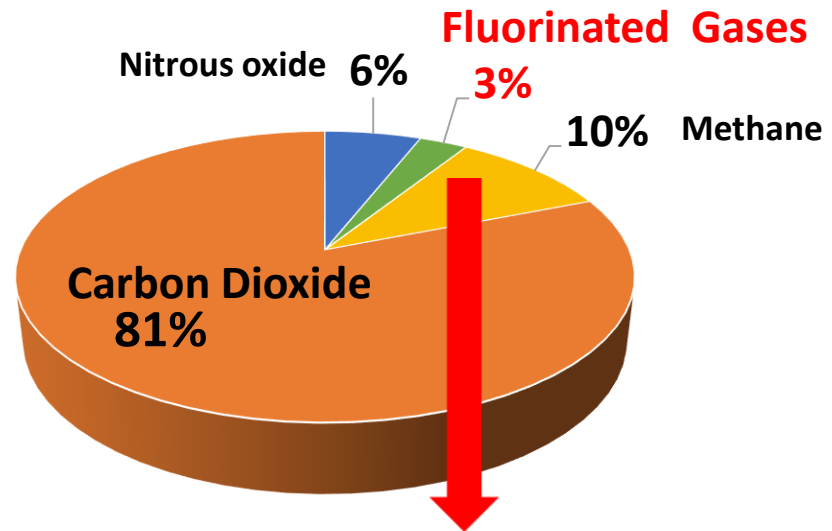
Human activities cause the release of greenhouse gases onto the atmosphere.

Since the start of the industrial era, the overall **effect of human activities on climate has been a warming influence.**

## Greenhouse Gas Emissions in 2018



## Greenhouse Gas Emissions in 2018



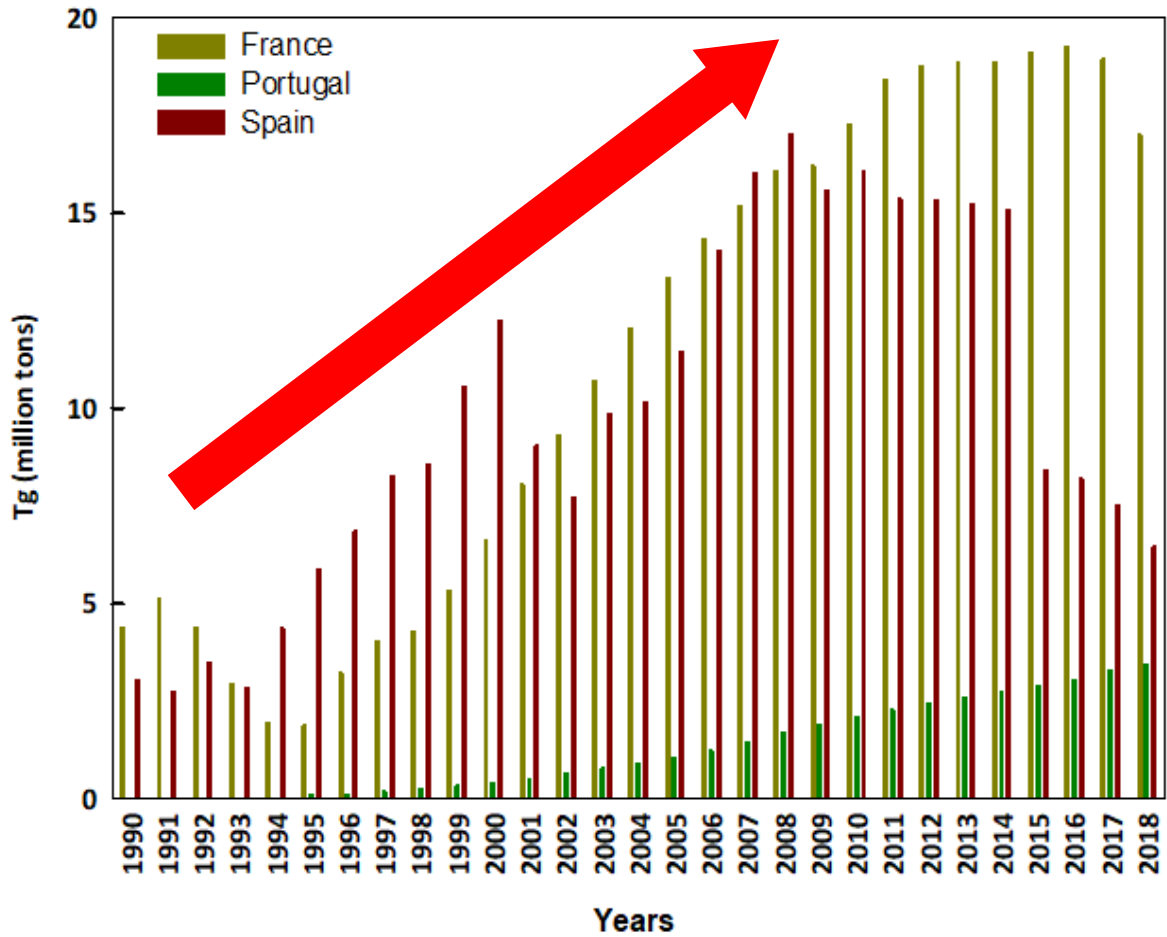
**Fluorinated Gases – 3%**

Global warming effect up to **23 000 times** greater than carbon dioxide

Will be responsible for **28-45 % of climate change** by 2050

Atmospheric **lifetime up to 50 000 years**

## HFC's Gases Emissions in SUDOE Countries



The worldwide production of fluorinated gases is expected to increase for foreseeable future

HFC emissions are projected to grow by nearly **140% between 2005 and 2020**

Refrigerants need proper disposal and recycling procedures

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# F-gases are Powerful Greenhouse Gases

Global warming effect up to 23 000 times greater than carbon dioxide (CO<sub>2</sub>), and **their emissions are rising strongly**



Direct

F-gases leakage



Indirect – parallel economy

Operation of refrigeration systems (consumption of a large amount of energy)

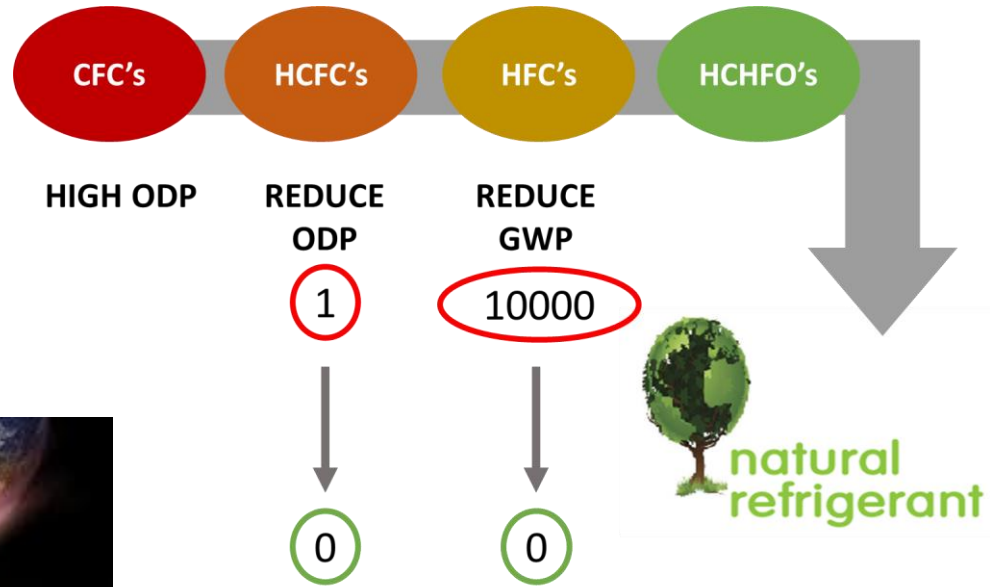


## Fluorinated Gases (F-gases) – HFC's

Synthesized compounds especially designed for different industrial applications such as refrigeration and air conditioning.

**Ozone Depletion Potential (ODP)** of approximately zero.

Non-toxic and non-flammable



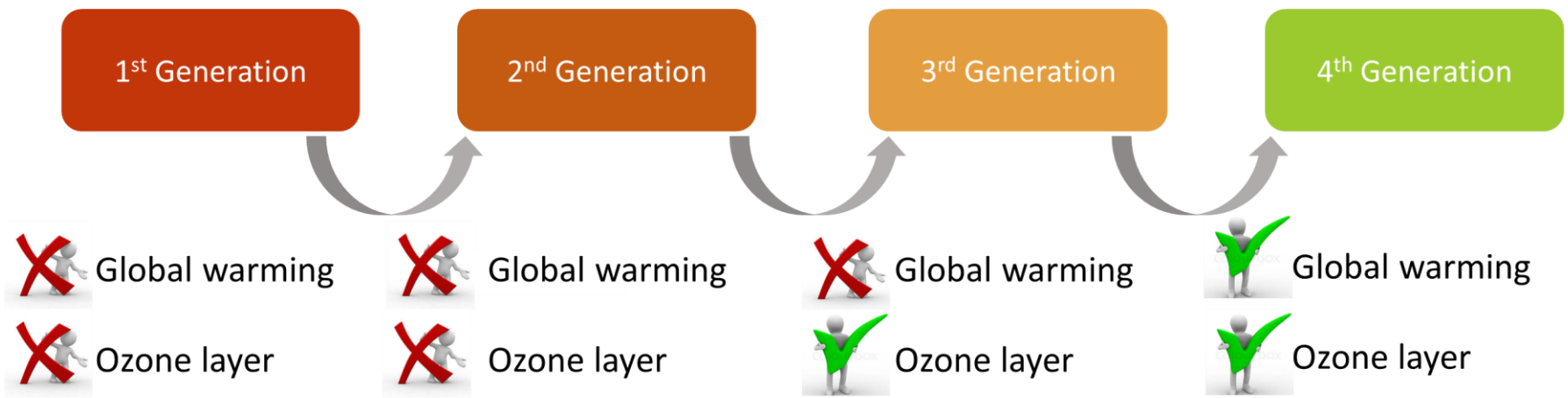
Present a high **Global Warming Potential (GWP)**



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# F-gases (Refrigerants 3G & 4G)



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## F-gases – economy

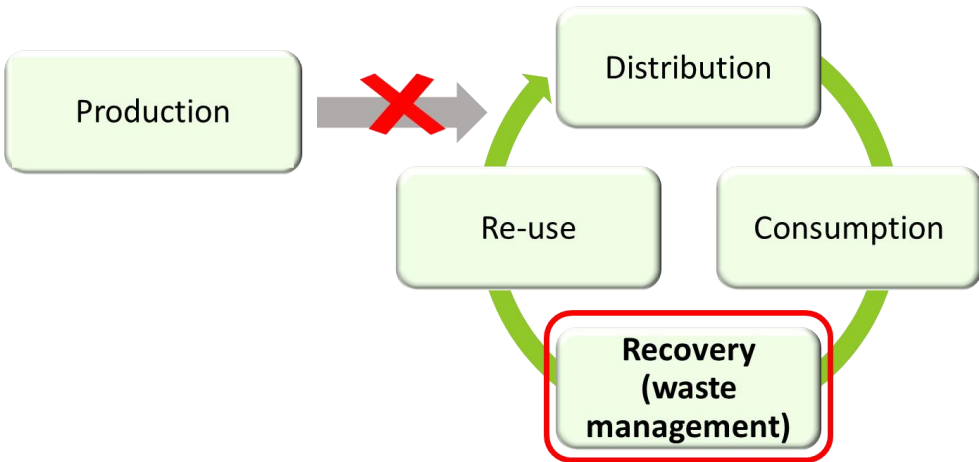
### Present → Linear Economy



... produce dangerous hydrogen fluoride and transform to trifluoroacetic acid in the atmosphere



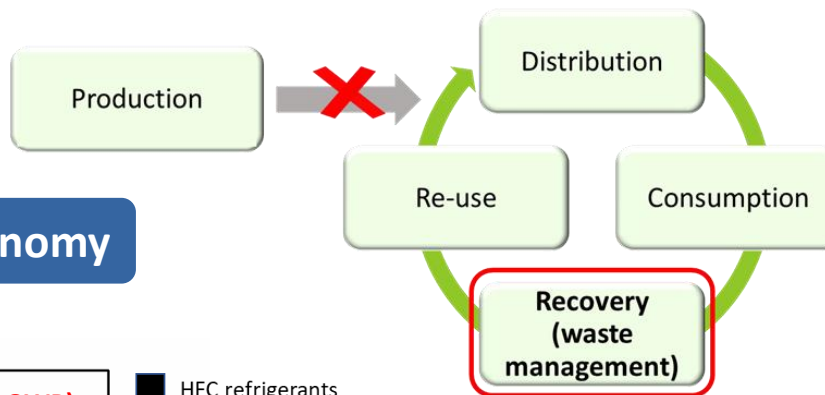
### KET4F-Gas → Circular Economy



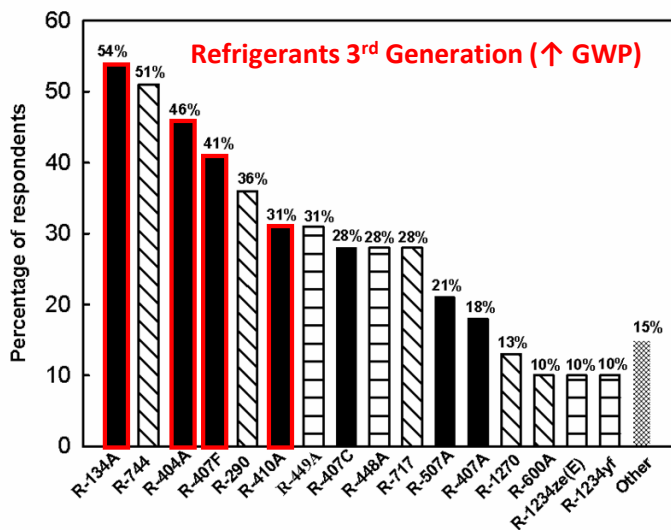
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**KET4F-Gas → Circular Economy**



- HFC refrigerants
- natural refrigerants
- HFOs and their blends
- Others (e.g. R22, R401A)

**Pure F-gases from Refrigerants 3G ↑ GWP**

R-32  
R-134a  
R-125



**Commercial Refrigerants 4G ↓ GWP**

ARM-31<sup>4G</sup>  
R-447<sup>4G</sup>  
R-513<sup>4G</sup>  
R-452B<sup>4G</sup>

Refrigerants Installed / Used for Commercial Refrigeration Questionnaire EU 2017

**Recycled F-gases do not have to be declared!!**





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Obrigada pela atenção!!  
Thank you for your attention

Ana B. Pereiro: [anab@fct.unl.pt](mailto:anab@fct.unl.pt)



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