

**COLLOQUE EUROPÉEN**  
DÉCARBONATION DES MOBILITÉS

*l'avenir*  
**DU FINANCEMENT**  
des infrastructures de transport

22 fév. 2022 - Maison de la Chimie - Paris



## **GREEN'INDER : DECARBONIZATION OF THE CITIES**

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Green'inder

# Team Presentation



**ESIEE Paris, France**

**ESIEE**  
PARIS

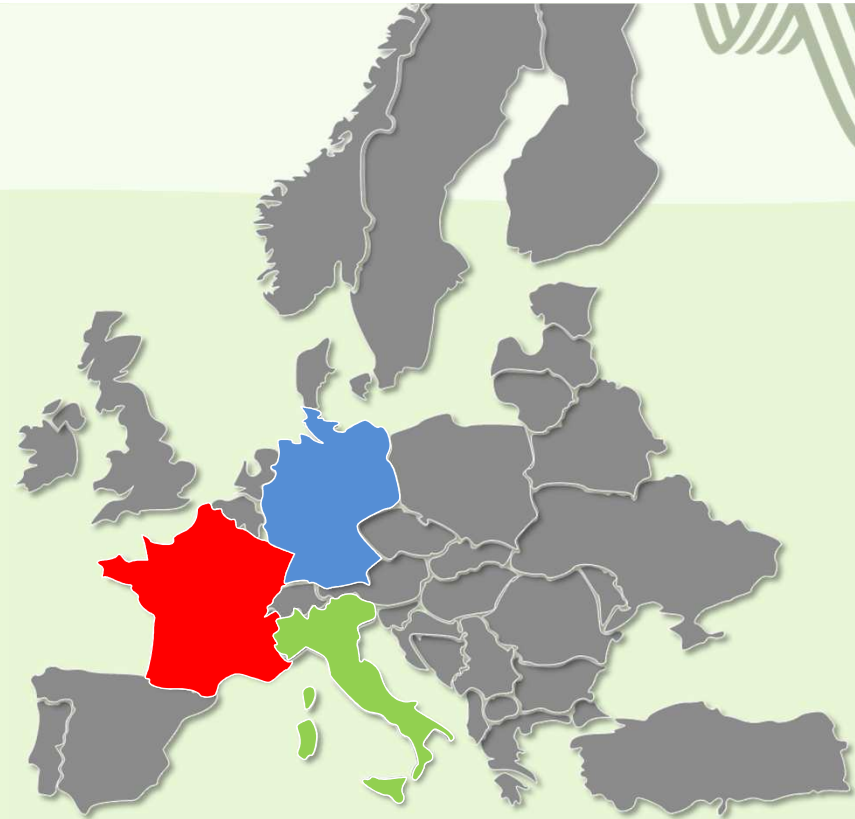


**University of Bologna, Italy**

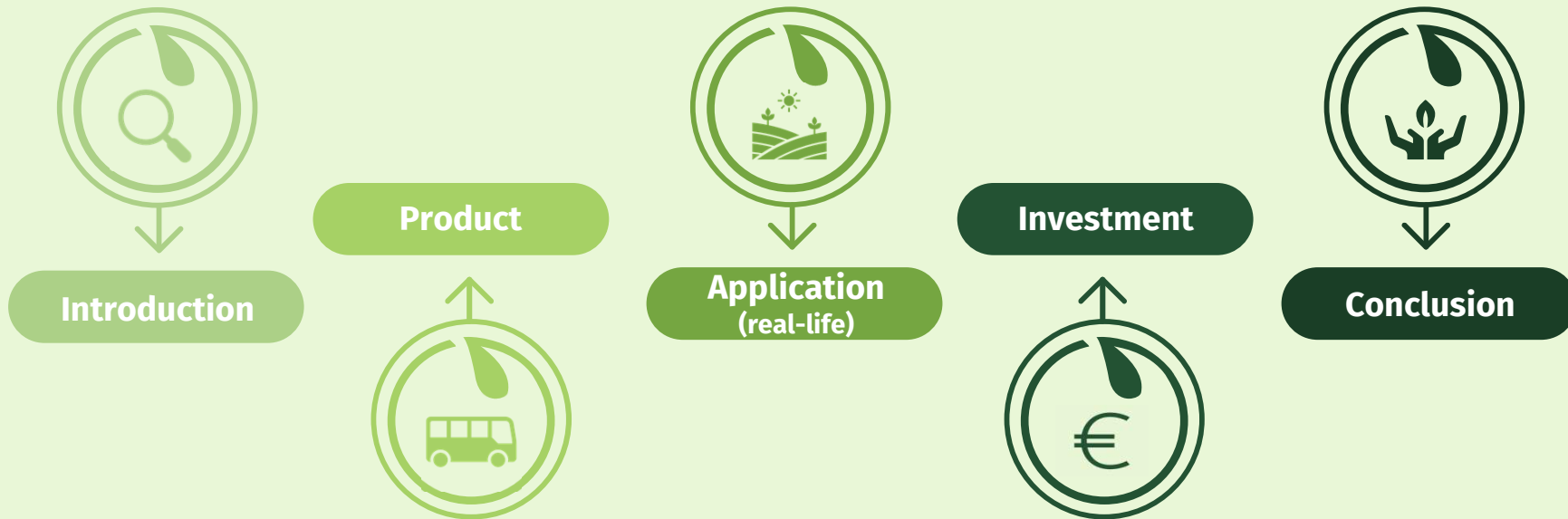


**TH Köln – University of Applied Sciences, Germany**

**Technology**  
**Arts Sciences**  
**TH Köln**



# Summary



## Introduction

### How to develop green transport infrastructure ?



**Major environmental risk to health**  
(Stroke, Heart disease, ...)



**5 Million deaths from air pollution**  
(Worldwide, 2020)



**Transportation**  
(29% of 2019 Greenhouse Gas Emissions)

**Air pollution – The silent killer**

## Product



# Green'inder

Collect, rinse, drive : a safe way to capture CO<sub>2</sub>



**Rectangular tube (Aluminium) :  
Adsorption of CO<sub>2</sub>**

**Rectangular tube :  
7 x 2.5 x 0,25 m**

**E-Bus dimension : 3.5 x 10 m**



## Product



### Silica Gel

- Weight : 25 kg
- Length : 1.5 m



### PEI (POLYETHERIMIDE) RESIN (IONE EXCHANGE)

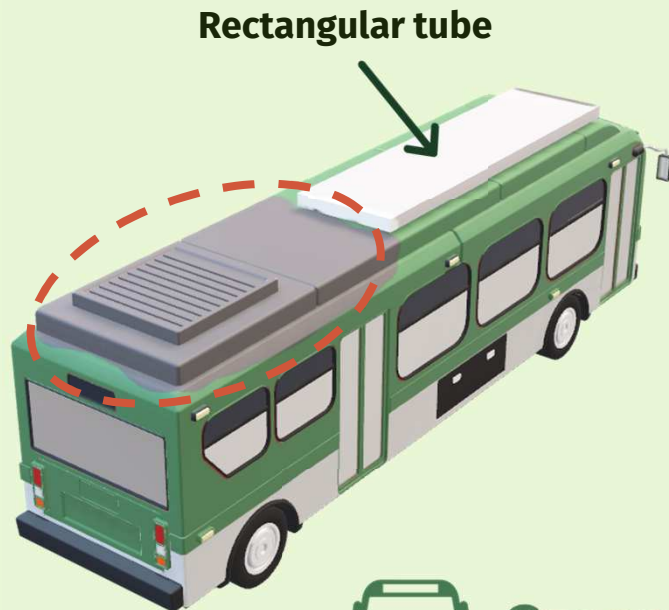
- Adsorb CO<sub>2</sub> → CO<sub>2</sub> liquid
- Capacity of adsorption : 9600 g/m<sup>3</sup> of CO<sub>2</sub>
- Rubber material
- Length : 4 m

### Silica Gel

- Weight : 25 kg
- Length : 1.5 m



## Product



**Green'inder**

Collect, rinse, drive : a safe way to capture CO2

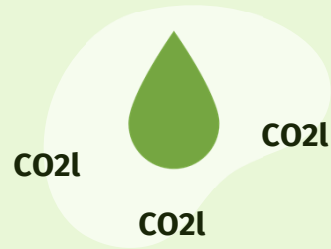
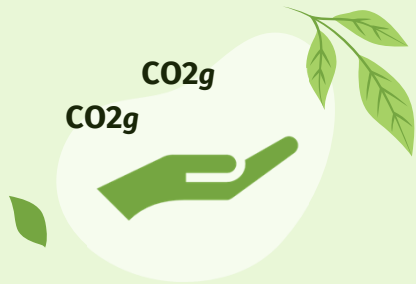
### Photocatalyser : A safe way to collect NOx

- Semi-permanent capacity for removing NOx from the ambient air : **styrene acrylic paint**
- Photocatalyst Paint + H2O → H2O + NOx
- Significant effect of TiO2-materials in reducing NOx : **91 %** of NO reduced & **71 %** of NO2 reduced

**0,44g/m<sup>2</sup> of NO2 a day** ←



# Product



Collect

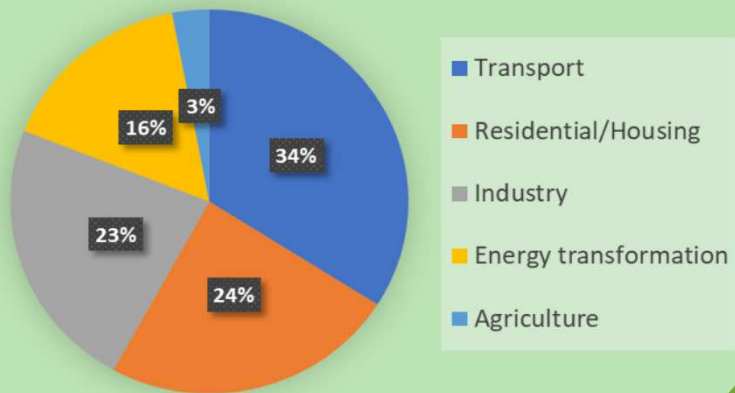
Rinse

Sell

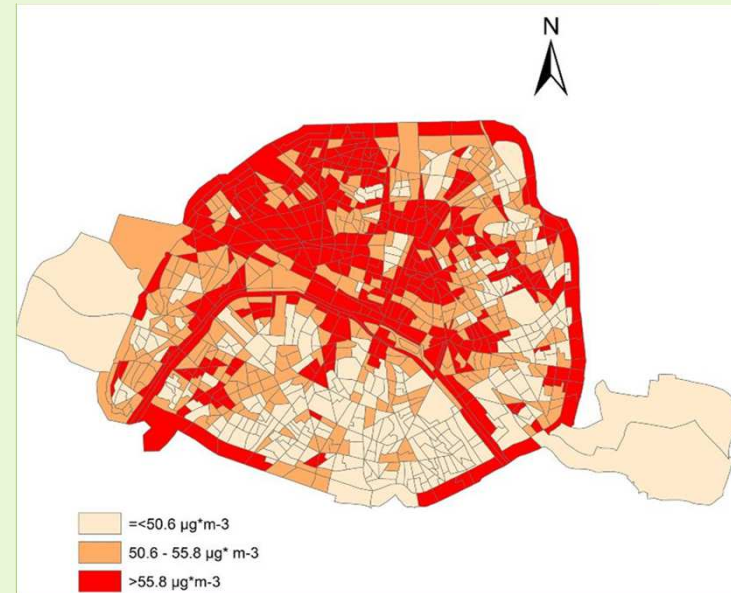


## Application (Real-Life)

### CO2 Emissions in France



Source : AirParif, 2019

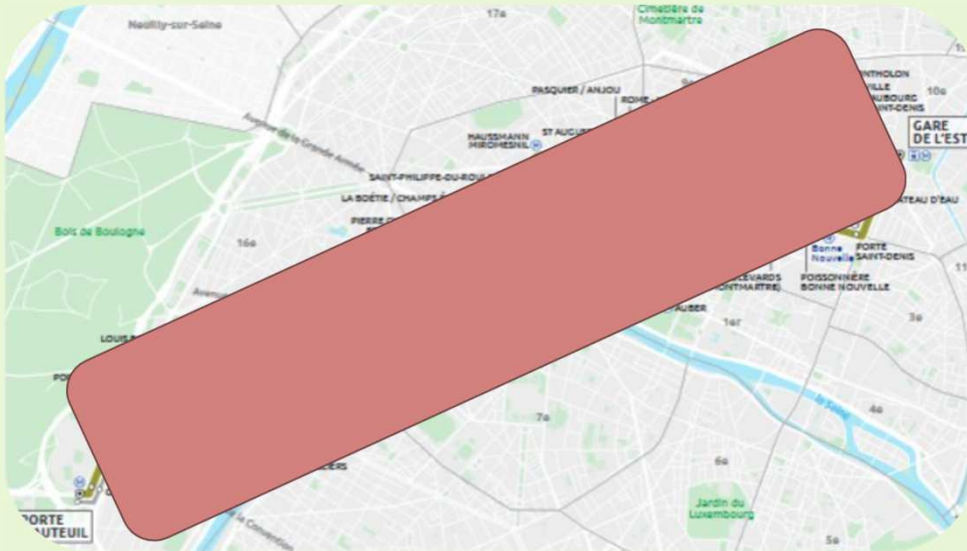


### Particles concentration in Paris

(CO2, NOx, ...)

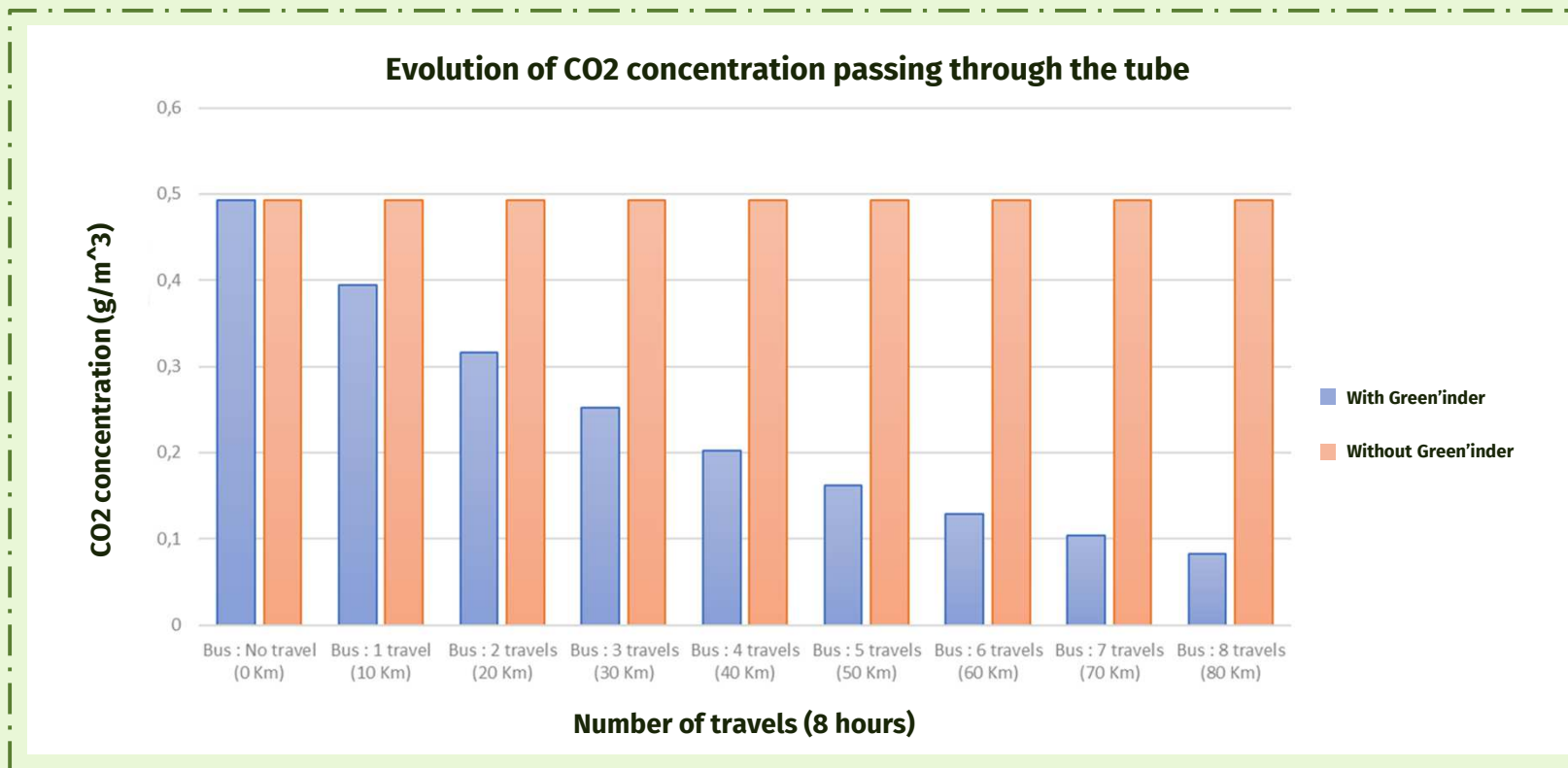
## Application (Real-Life)

Example of a bus track (Bus 32 : Gare de l'est → Porte d'Auteuil) :



- Total distance (round-trip) : 20 Km
- High concentration of cars

## Application (Real-Life)



## Application (Real-Life)



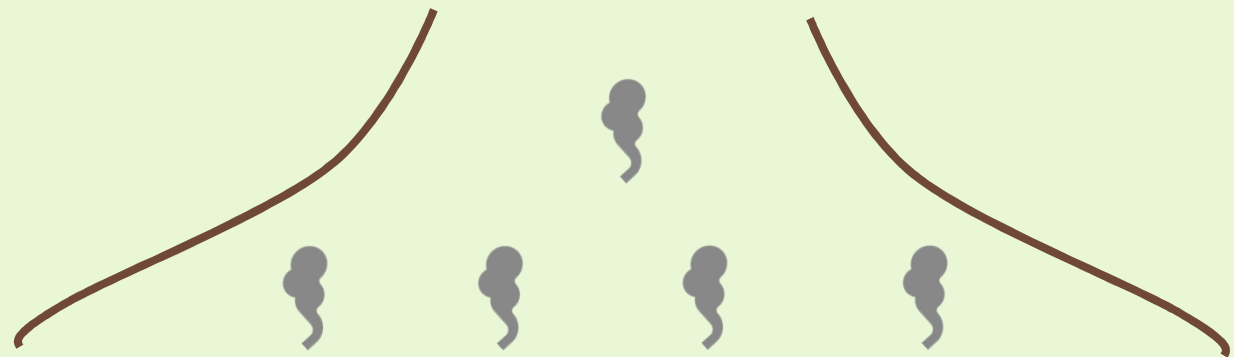
**Green'inder**

Collect, rinse, drive : a safe way to capture CO2

**ESTIMATED EFFICIENCY :**



**9600 g of CO2 per day**



**One car → 1200 g of CO2 per 10 km**

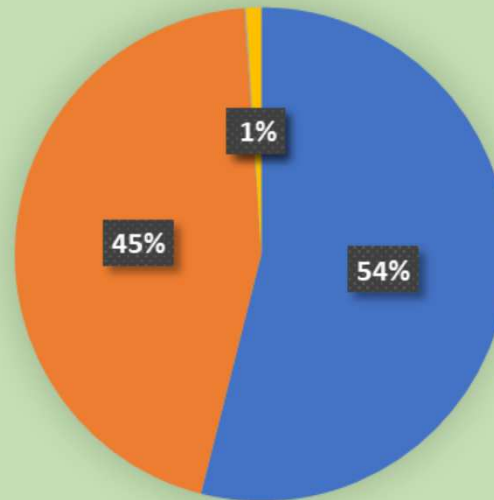


## Investment



**A bus :**  
3.5 Tons of CO2 per year

## Estimation cost



- Resin : 3000 € / Tube
- Maintenance : 2500 € / Year
- Aluminium Tube
- Silica Gel : 45 € / 100 Kg

## Investment

## Life Cycle

### Recycle the resin

- After 3 cycles : recyclable material → turn into small objects : kitchen tools, house tools...

### Store the water

- Creation of storage rooms where thousands of liters are stored
- Sell to private companies or electricity factories specialized in wastewater treatments



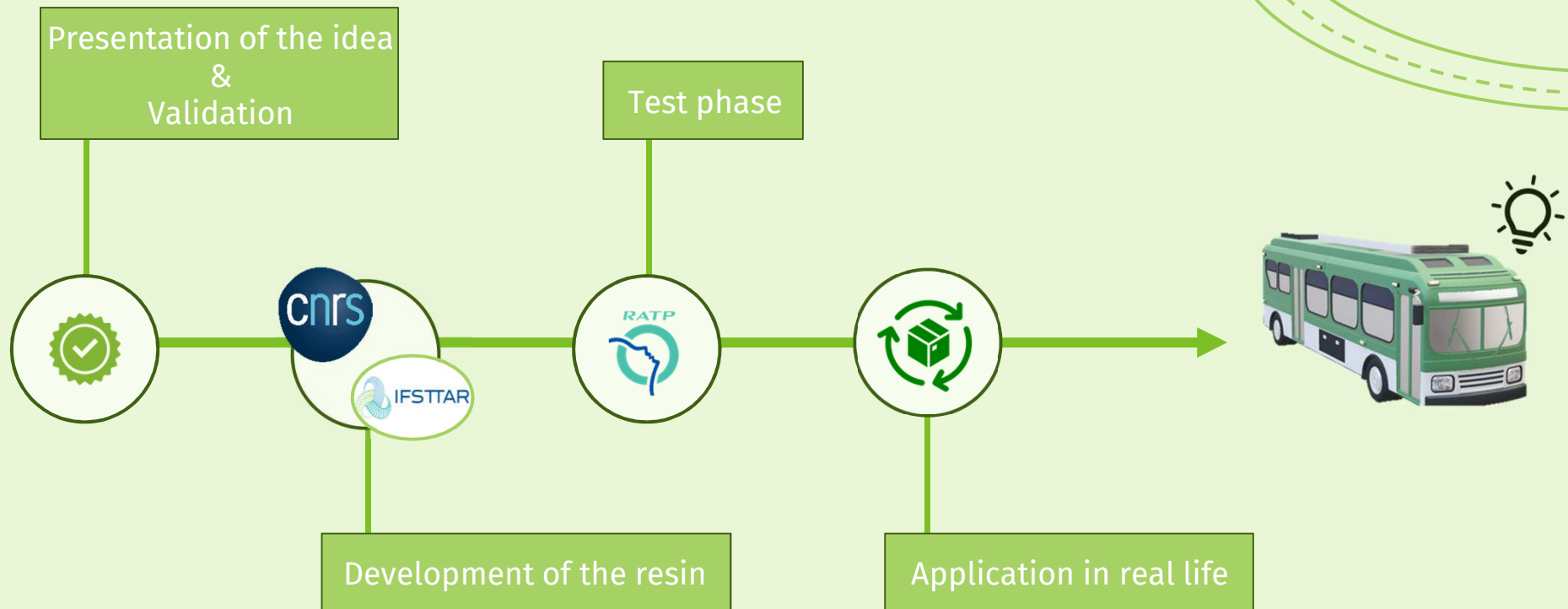
### Collect the tube

- Easily removable from the top of the bus
- Replace the tube : a new one/old one which have enough efficiency
- Establishment of a process

### Rinse the resin

- RATP Facilities : Rinse the resin/Change the silica gel and store the polluted water in tanks

## Conclusion





**THANK YOU!**



**Green'inder**

Collect, rinse, drive : a safe way to capture CO2





## Team Members



**Billy**

Civil Engineering



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