Co-Benefits of Paris Climate Action: Road Transport Sector Analysis till 2050

Mathis Cavanié [1,2], Katsumasa Tanaka[2,3], Eric Zusman[4]

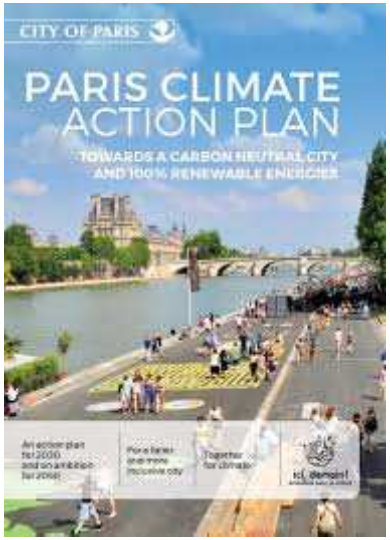
[1] Ecole des Ingenieurs de la Ville de Paris (EIVP)

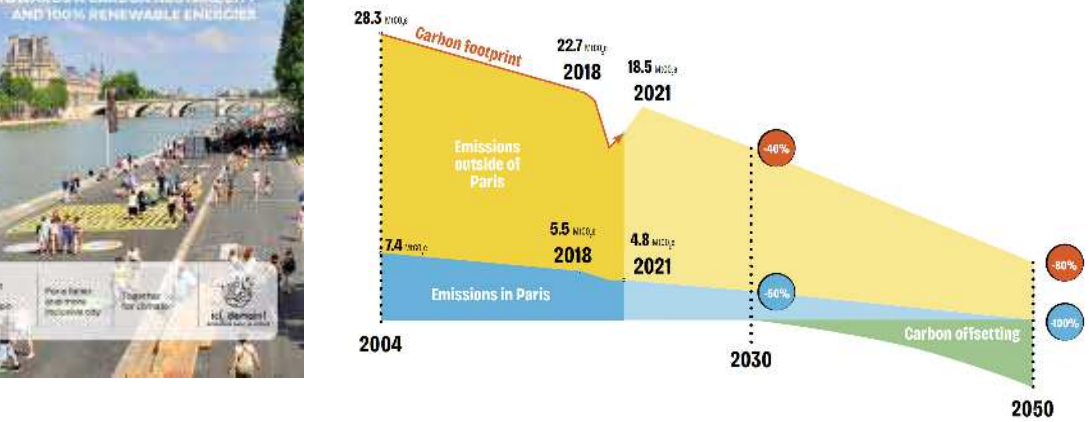
[2] Laboratoire des sciences du climat et de l'environnement (LSCE), Université Paris-Saclay, FRANCE

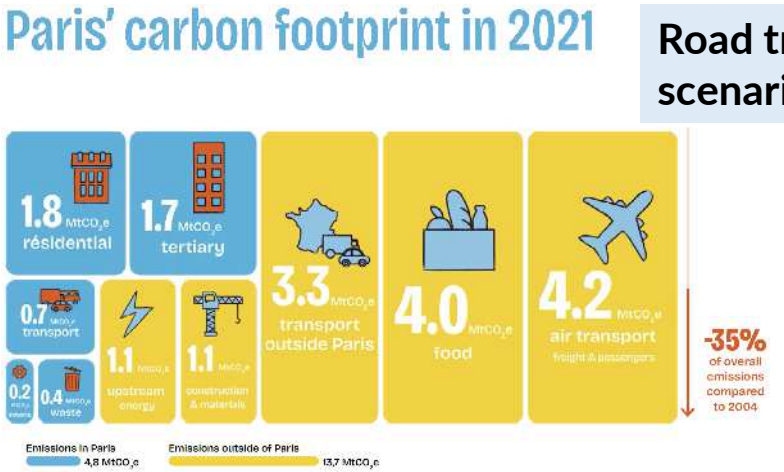
[3] National Institute for Environmental Studies (NIES), Tsukuba, JAPAN

[4] Institute for Global Environment Strategies (IGES), Hayama, JAPAN

Long-term Paris scenario







Road transport scenario till 2050?

Paris Climate Action Plan : Roadmap with measures concerning transport sector.

- How to assess co-benefits ?

1) Develop Baseline and Ambitious emissions scenarios for the Paris road transport sector

2) Calculate the climate effects of the two scenarios

3) Quantify the health benefits of the two scenarios

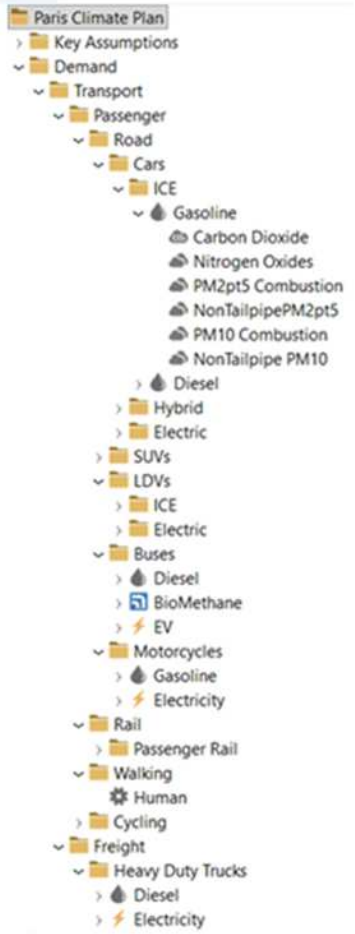
Example of measures: Low Traffic Zone

<u>Policy:</u> 5th November 2024 in Paris centre (1st, 2nd, 3rd, 4th districts)

nexqt.

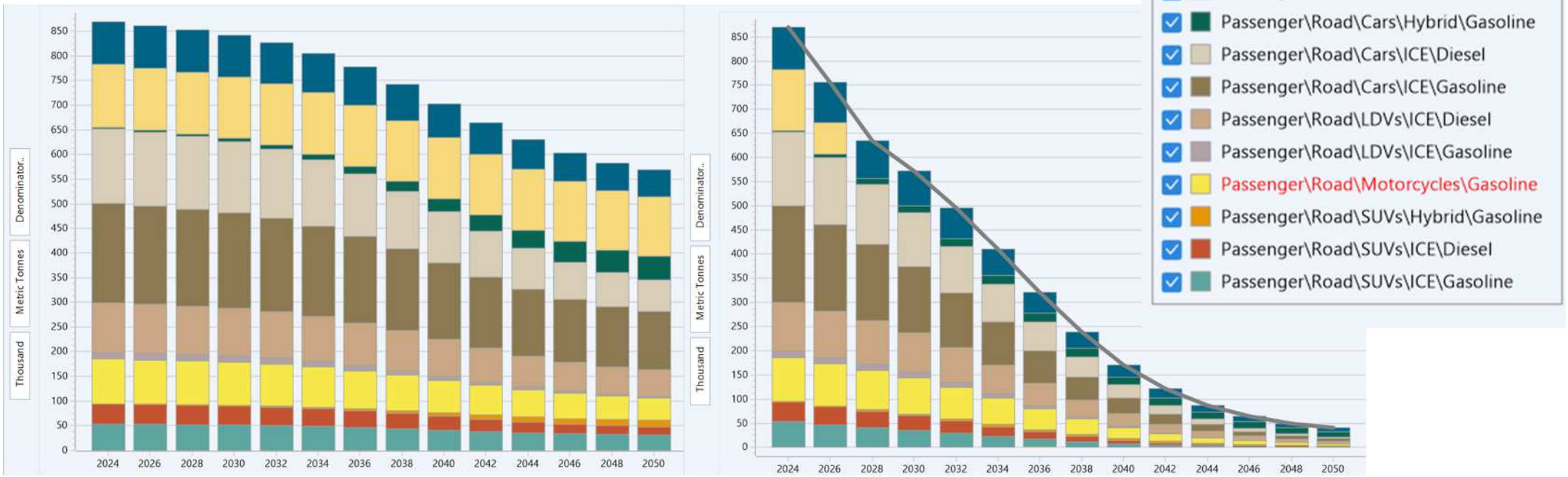
<u>Result :</u> Comparison of February, March, April, May, June, July 2024 to 2025

Scenarios for transport sector in Paris



Assumptions	Baseline	Ambitious
Policy level	Freezing current policies, following actual trends	Advancing future policies
Total number of private vehicles	1x population decrease	10x population decrease (in line with NEXQT data if a generalization of ZTL was made : -31% of private vehicles compared to 25%)
EV penetration of private vehicles in 2050	35%	95%
Passenger Load Factor	1.2	Rising to 1.9 in 2050
PM from brake and tyre	Same as 2024	Euro 7 regulation in 2030
Inflection year	2040	2035 (ban of ICE vehicles)

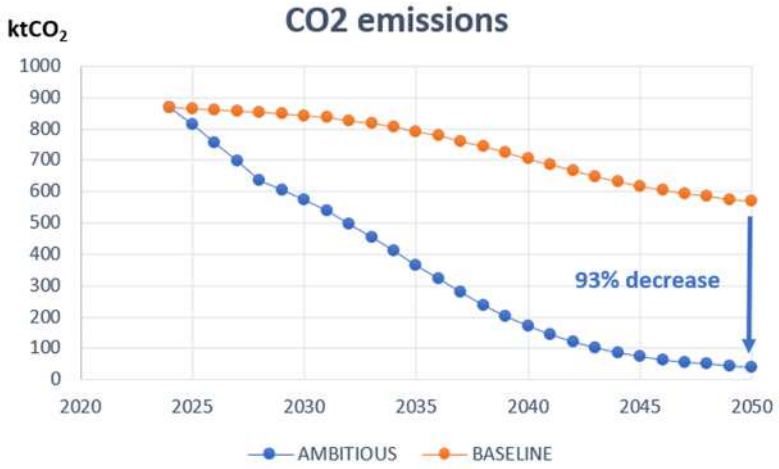
Results

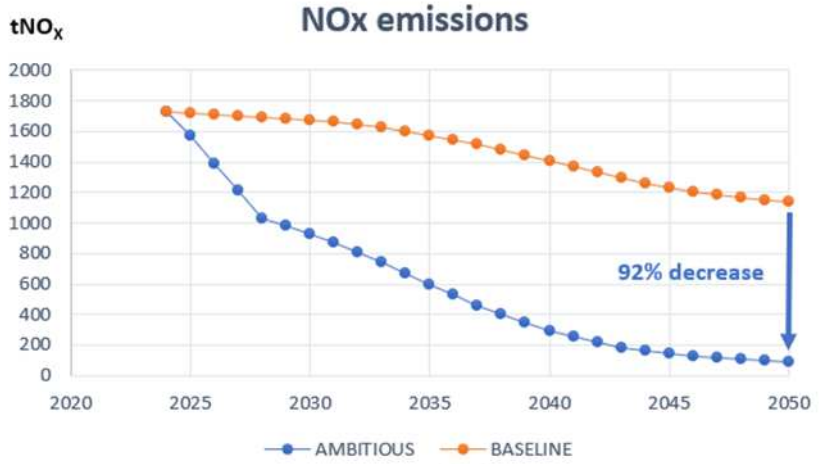


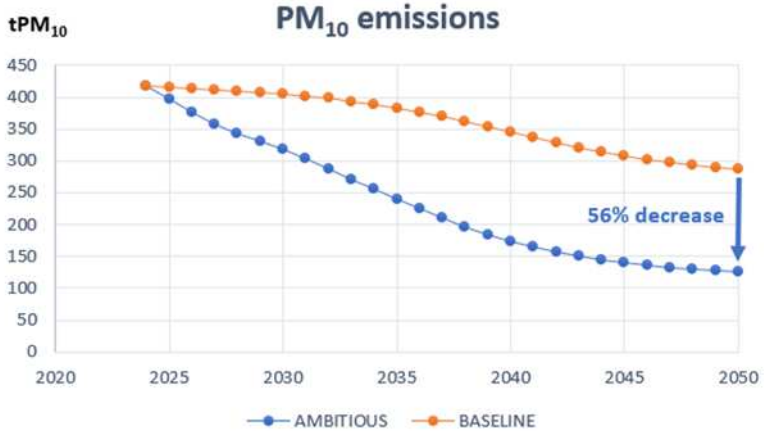
CO_2 Baseline

CO_2 Ambitious

Results

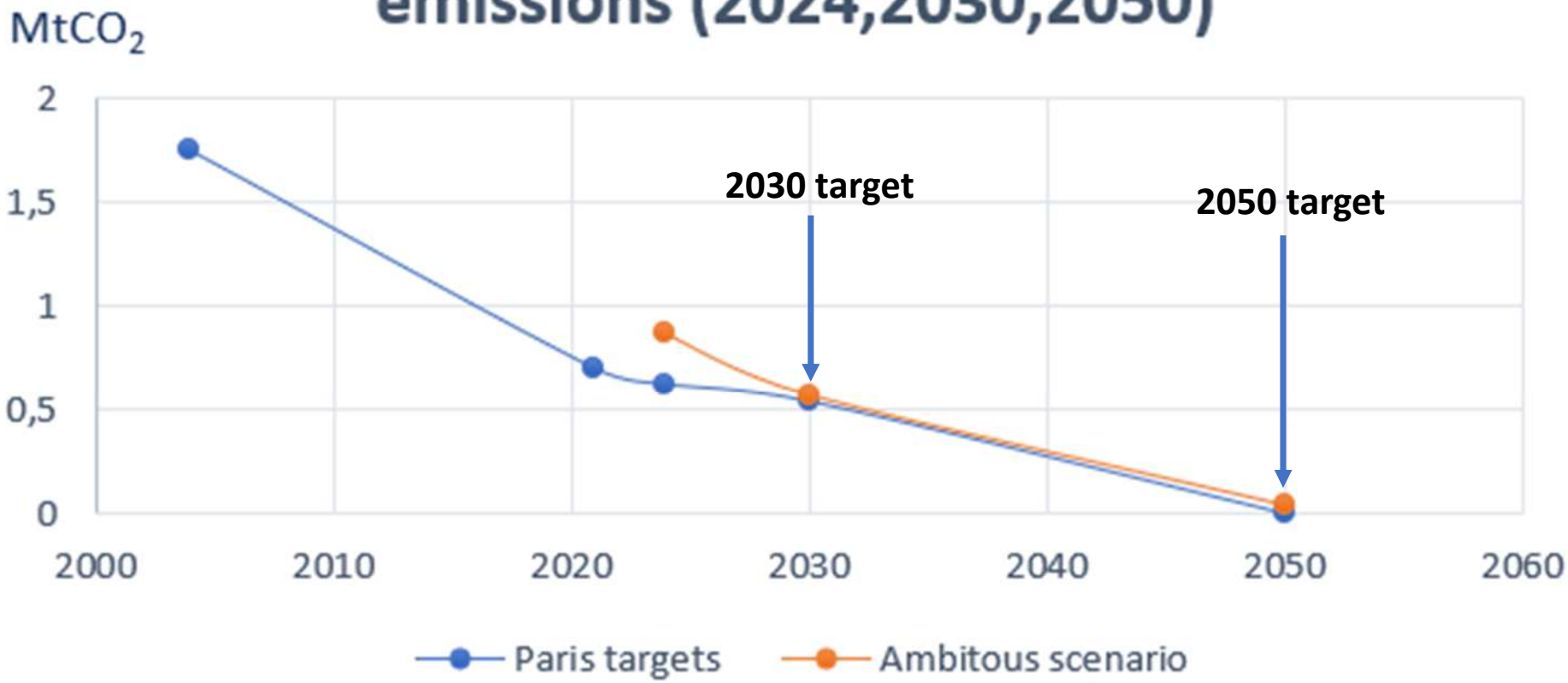

ktCO2
CO2 emissions
1000
900
800
700
600
500
400
300
200
100
0
2020
2025
2030
2035
2040
2045
2050
93% decrease
AMBITIOUS
BASELINE


tNOx
NOx emissions
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2020
2025
2030
2035
2040
2045
2050
92% decrease
AMBITIOUS
BASELINE

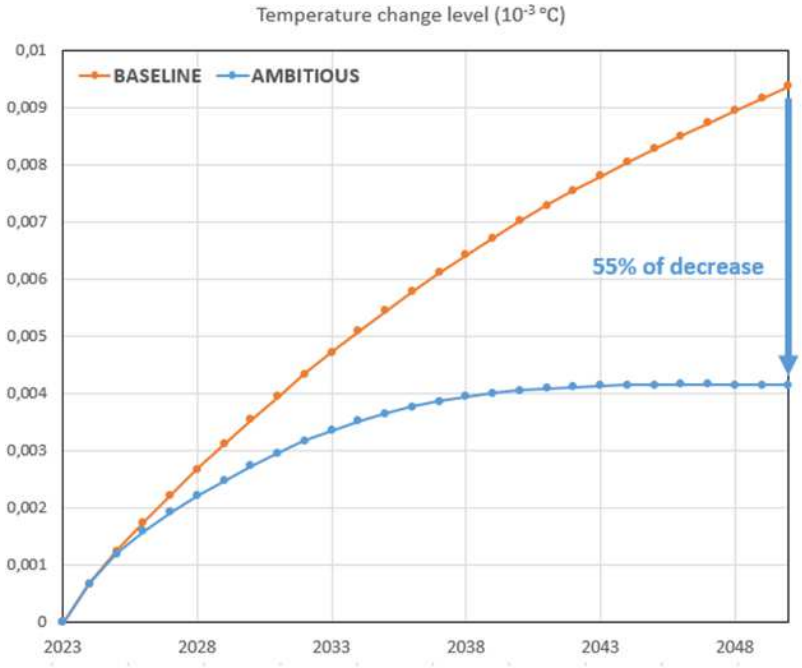

tPM10
PM10 emissions
450
400
350
300
250
200
150
100
50
0
2020
2025
2030
2035
2040
2045
2050
56% decrease
AMBITIOUS
BASELINE


tPM2,5
PM2,5 emissions
140
120
100
80
60
40
20
0
2020
2025
2030
2035
2040
2045
2050
39% decrease
AMBITIOUS
BASELINE

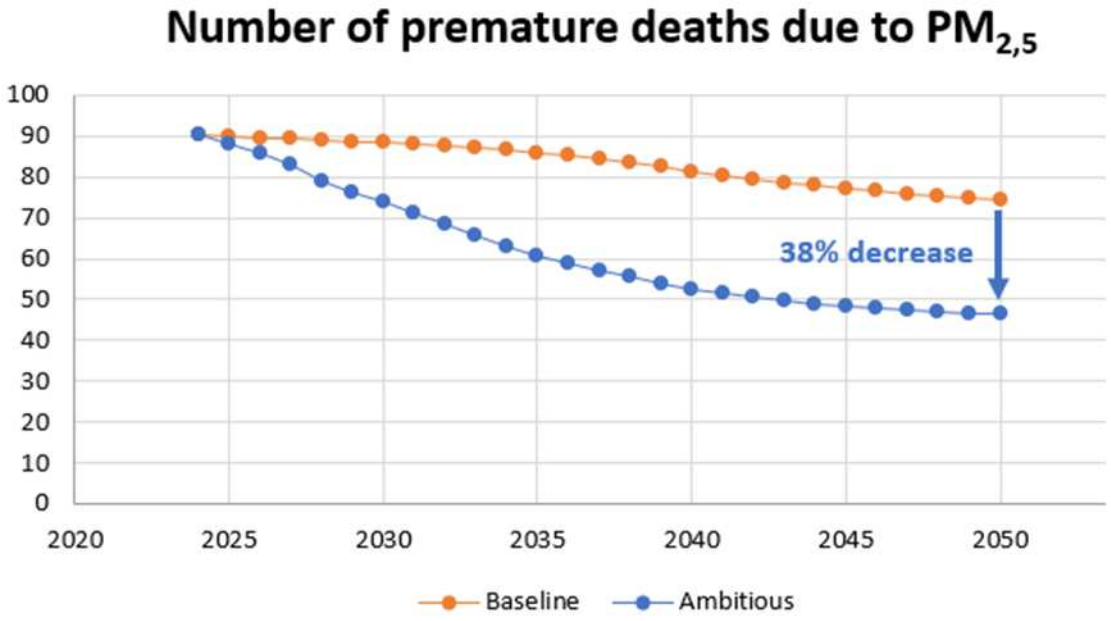
Comparison between City goals and Ambitious model on road transport emissions (2024,2030,2050)



Climate and health benefits



ACC2 outputs : the global temperature response to Paris emissions



Calculations based on Apte et al., 2015; Van Zelm et al., 2016

Ambitious scenario therefore generates substantial economic savings, amounting to over €1.1 billion by 2050 by saving approximately 552 lives.

Conclusions

Ambitious scenario = substantial emission reductions:

- CO_2, NO_x and PM_{10} decline more sharply than under Baseline
- NO_x reductions nearly **twice as large**, driven by diesel phase-out + EV uptake
- **$PM_{2.5}$ reductions** remain **modest** compared to other gas reductions due to persistent brake and tire emissions from electric vehicles

Climate impact:

- Ambitious scenario avoids **about half of the warming** projected under Baseline by 2050

Health benefits:

- Fewer premature deaths attributable to $PM_{2.5}$ exposure
- **552 lives saved** between 2024–2050

Economic value:

- Monetized with the French Value of a Statistical Life (€3M)
- Net present value: **over €1.1 billion saved**
- Provide both an **economic and ethical case** for ambitious policies