Mobility and tourism

What levers for the energy transition?
Introduction

Context on transport emissions in France
Transport emissions from 1960 to 2050

Transport emissions since 1960 and the target by 2050 for the French national low-carbon strategy (SNBC)

References: from data of CITEPA, MTES
5 drivers of transport emissions

\[ \text{CO}_2 = \text{Transport demand} \times \text{Modal shift} \times \text{Vehicle occupancy} \times \text{Energy efficiency of vehicles} \times \text{Carbon intensity of energy} \]
Comparison of the different transport modes (1/2)

Transport emissions per kilometer, for the main transport modes in France

<table>
<thead>
<tr>
<th>Mode</th>
<th>SD</th>
<th>LD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train</td>
<td>7.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Train SD</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>Train LD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>74.4</td>
<td>132.1</td>
</tr>
<tr>
<td>Bus SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus LD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>155</td>
<td>177</td>
</tr>
<tr>
<td>Car SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car LD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airplane</td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>

SD: short distance
LD: long distance

CO₂ emissions per kilometer

Reference: [Impact du transport aérien sur le climat : pourquoi il faut refaire les calculs](#).
See [Methodological annex](#) for calculations.
Comparison of the different transport modes (2/2)

**Transport emissions per hour and per trip, for the main transport modes in France**

<table>
<thead>
<tr>
<th></th>
<th>CO₂ emissions per hour</th>
<th>CO₂ emissions per trip</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Train</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.56</td>
<td>0.19</td>
</tr>
<tr>
<td>SD</td>
<td>0.18</td>
<td>0.05</td>
</tr>
<tr>
<td>LD</td>
<td>1.10</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Bus</strong></td>
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<td></td>
</tr>
<tr>
<td>Average</td>
<td>3.2</td>
<td>1.8</td>
</tr>
<tr>
<td>SD</td>
<td>1.8</td>
<td>1.2</td>
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<tr>
<td>LD</td>
<td>5.2</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Car</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>6.7</td>
<td>6.5</td>
</tr>
<tr>
<td>SD</td>
<td>6.5</td>
<td>3.1</td>
</tr>
<tr>
<td>LD</td>
<td>7.9</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Airplane</strong></td>
<td>90</td>
<td>311</td>
</tr>
</tbody>
</table>

SD : Short distance  
LD : Long distance  

Reference: [Impact du transport aérien sur le climat : pourquoi il faut refaire les calculs.](#)

See [Methodological annex](#) for calculations
Faster, further and... with more emissions

Evolution of the mean transport speed, distances and emissions per capita, from 1960 to 2017 in France

Reference: thesis
Special focus
The impact of aviation
The importance of air transport within French mobility

Share of air transport within the total passenger mobility

Reference: thesis; CITEPA
Air transport emissions are increasing…

Evolution of French emissions by sector for 1990-2017 (factor 100 in 1990)

Reference: Citepa SECTEN 2019
Limited technology options for aviation

Possible technologies to reduce aviation emissions: energy efficiency and traffic management; biofuels; electric, hydrogen, electrofuels?

See on this topic: TSP-SupAéro Décarbo, 2020; T&E 2019; BL évolution, 2020; outil CAST
The contribution of aviation to climate change

2.4% of anthropogenic CO₂ emissions in 2018
3.5% of effective radiative forcing (ERF) in 2011
66% of ERF in 2018 from non-CO₂ effects
5 to 6% of additional radiative forcing in 2018

Sources: Lee et al, 2020; StayGrounded
Distribution of aviation emissions: some figures

For each decile of revenue per unit of consumption, personal travels

In the world

- More than 50% of emissions by the 1% most frequent fliers
- 11% of the population travelled by air in 2018

For the top 1% EU households (carbon footprints)

- 41% of their emissions from air transport
- 22 tCO₂e per capita for aviation, target of 2 t/capita

In France

- 4.6 more distance by air for people from D10 compared to D1

References: Gössling, Humpe, 2020; Ivanova, Wood, 2020; SDES, EMP 2019
Food for thought
What the ways forward could be
Modal shift: the revival of night trains

French and European night trains intended

Reference: MTE-DGITM, 2020
Other ways of travelling: the potential of cyclotourism

French and European cycle route networks

Reference: Velo&Territoires 2020; Eurovélo
Key points of the presentation

1) Context
   ➢ Target of **carbon neutrality** in France by 2050; **-5%/year** globally for staying below 1.5°C
   ➢ High importance of **demand-side measures** to reduce emissions, especially in the short-term
   ➢ Transportation **speed** influences **distances** (and destinations), which influence CO₂ emissions

2) The unsustainable path of aviation
   ➢ **High emissions** per trip, and total emissions **rising** due to traffic increases
   ➢ **Few technological options**, at least for the short- and medium-terms
   ➢ The traffic is **unequally distributed**, rising questions of social and climate justice

3) Some ways forward
   ➢ Change for **slower tourism** and more European / domestic / local travel **destinations**
   ➢ Shift from plane and car to **public transport** to reach these destinations
   ➢ Explore new **ways of travelling** and discover our landscapes or cultural destinations

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Link to the thesis