Policy Options to Decarbonise Urban Passenger Transport

Results of expert opinion survey

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INTRODUCTION

- The expert survey is part of the ITF Decarbonising Transport project's thematic work stream on urban passenger transport, aiming to
  - Identify policy priorities, megatrends and pressing issues in this sector
  - Gather initial evidence on the effectiveness of new urban mobility options and emerging technologies

- The survey was sent to experts from the government, industry, civil society and academia etc.
  - 116 experts replied, around 65% completed fully the questionnaire
  - 85% of respondents European based, 15% are non-European based
URBAN TRANSPORT CHALLENGES
Pressing urban challenges differ based on the level of development.
## URBAN TRANSPORT CHALLENGES

- Environmental issues are the most pressing challenges in the middle- and high-income countries.

<table>
<thead>
<tr>
<th>Low-income</th>
<th>Middle-income</th>
<th>High-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Accidents and safety issues</td>
<td>Environmental impacts and energy consumption</td>
<td>Environmental impacts and energy consumption</td>
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<tr>
<td>2. Low equity of accessibility</td>
<td>Traffic congestion and parking shortage</td>
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<tr>
<td>3. Inadequate public transport services</td>
<td>Accidents and safety issues</td>
<td>Long commuting times</td>
</tr>
</tbody>
</table>
URBAN POLICY PRIORITY
POLICY PRIORITY

Policy priorities for each country group vary significantly

- Promoting active modes and shared mobility are consistent among all groups

<table>
<thead>
<tr>
<th></th>
<th>High-income</th>
<th>Middle-income</th>
<th>Low-income</th>
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</thead>
<tbody>
<tr>
<td>Developing autonomous vehicle technology</td>
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<tr>
<td>Adopting shared mobility services</td>
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<tr>
<td>Zero-emission vehicle programme</td>
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<tr>
<td>Low/Zero-emission zones</td>
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<tr>
<td>Car restriction schemes</td>
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<td>Congestion pricing</td>
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<td>Parking management and parking pricing</td>
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<tr>
<td>Land-use management strategies</td>
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<tr>
<td>Promoting active modes</td>
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<tr>
<td>Transit improvements and incentives</td>
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</tbody>
</table>
### POLICY PRIORITY

<table>
<thead>
<tr>
<th>Low-income</th>
<th>Middle-income</th>
<th>High-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Transit improvements and incentives</td>
<td>Transit improvements and incentives</td>
<td>Promoting active modes</td>
</tr>
<tr>
<td>2 Land-use management strategies</td>
<td>Promoting active modes</td>
<td>Adopting shared mobility services</td>
</tr>
<tr>
<td>3 Promoting active modes</td>
<td>Land-use management strategies</td>
<td>Zero-emission vehicle programme</td>
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<tr>
<td>4 Adopting shared mobility services</td>
<td>Adopting shared mobility services</td>
<td>Low/Zero-emission zones</td>
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</tbody>
</table>
COST-EFFECTIVENESS OF MEASURES
COST-EFFECTIVENESS OF MEASURES - in reducing CO₂ emissions

Average ranking of cost and effectiveness [scale 1-10]
COST-EFFECTIVENESS OF MEASURES
- in reducing CO₂ emissions

Car restriction scheme is considered to be the most cost-effective
ZERO-EMISSION VEHICLE, ZONES
## ZERO-EMISSION VEHICLES

- **On average, ZEV will take up less than 50% of the passenger car fleet by 2050**

### Expected penetration rate of ZEV

<table>
<thead>
<tr>
<th>Year</th>
<th>Low-income</th>
<th>Middle-income</th>
<th>High-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>2030</td>
<td>Less than 10%</td>
<td>Between 10% and 30%</td>
<td>Between 20% and 40%</td>
</tr>
<tr>
<td>2050</td>
<td>Between 10% and 30%</td>
<td>Between 30% and 50%</td>
<td>Between 50% and 70%</td>
</tr>
</tbody>
</table>
Full-battery electric cars will take the highest share among the electric car fleet by 2050.

Expected technology mix:
- Plug-in hybrid
- Full-battery electric
- Hydrogen fuel cell

<table>
<thead>
<tr>
<th>Year</th>
<th>Plug-in hybrid</th>
<th>Full-battery electric</th>
<th>Hydrogen fuel cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>2030</td>
<td>47%</td>
<td>40%</td>
<td>12%</td>
</tr>
<tr>
<td>2050</td>
<td>50%</td>
<td>21%</td>
<td>28%</td>
</tr>
</tbody>
</table>
ZERO-EMISSION VEHICLES

Average price difference between an electric car and an internal combustion engine (ICE) car?

Expected price difference compared to ICE Car

- Prices of electric cars are expected to remain higher than ICE cars by 2050, despite the price gaps being reduced over time.
Cost, charging facilities and vehicle performance are the top three barriers for the uptake of ZEVs.

- Vehicle purchase cost: 24%
- Vehicle recharge time: 23%
- Availability of charging facilities: 20%
- Vehicle range: 17%
- Lack of strict emission regulations: 10%
- Consumer knowledge and awareness: 7%
Cities in high-income countries are highly likely to implement ZEZ by 2050, whereas very unlikely for low-income cities.
SHARED MOBILITY SERVICES
SHARED MOBILITY SERVICES

When will shared mobility services have a significant mode share in cities? (e.g. > 10%)

Percentage of expert opinion

- Low-income
- Middle-income
- High-income

By 2020: 0%
- Low-income: 0%
- Middle-income: 13%
- High-income: 0%

2020 - 2030: 14%
- Low-income: 14%
- Middle-income: 30%
- High-income: 55%

2030 - 2050: 44%
- Low-income: 44%
- Middle-income: 62%
- High-income: 32%

After 2050: 42%
- Low-income: 9%
- Middle-income: 0%
- High-income: 0%
Current Bus, Car, Taxi and Mass transit trips will be significantly replaced by shared mobility services by 2050.

Bus will be affected the most by shared mobility, while NMT the least.

Percentage of expert opinion

- **Bus**: 4% < 20%, 43% 20% to 40%, 39% 40% to 60%, 13% > 60%
- **Car & Taxi**: 11% < 20%, 33% 20% to 40%, 31% 40% to 60%, 24% > 60%
- **Mass transit**: 31% < 20%, 22% 20% to 40%, 33% 40% to 60%, 13% > 60%
- **2/3-wheeler**: 48% < 20%, 29% 20% to 40%, 19% 40% to 60%, 5% > 60%
- **Walking & cycling**: 57% < 20%, 25% 20% to 40%, 11% 40% to 60%, 7% > 60%
Could average trip cost of on-demand bus services become lower than the regular bus services?

<table>
<thead>
<tr>
<th>With automation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>68%</td>
<td>32%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Without automation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>
SHARED MOBILITY SERVICES

Who is in the best position to lead a transition to shared mobility services?

- New mobility service providers: 45%
- Public transport operators: 31%
- Public-private partnership: 15%
- Automotive industry: 6%

Should shared mobility be a public transport option managed by local transport authorities?

- Yes: 70%
- No: 30%
## SHARED MOBILITY SERVICES

- Convenience and cultural barriers are top two barriers to the uptake of shared mobility services

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31%</td>
<td>Convenience and flexibility concerns compared to private vehicle ownership</td>
</tr>
<tr>
<td>30%</td>
<td>Cultural barriers to sharing rides with strangers</td>
</tr>
<tr>
<td>19%</td>
<td>Permits, standards and regulations (e.g. labour laws and regulations)</td>
</tr>
<tr>
<td>12%</td>
<td>Governmental or industry-level coordination and support</td>
</tr>
<tr>
<td>8%</td>
<td>Physical, digital and other infrastructure supply</td>
</tr>
</tbody>
</table>
AUTONOMOUS CARS
AUTONOMOUS CARS

By when do you think the autonomous cars will take a significant share of the urban passenger car fleet? (e.g. >20%)

Percentage of expert opinion

- Low-income
- Middle-income
- High-income

By 2020: 0%
2020 - 2030: 0%
2030 - 2050: 17% (Low-income: 30%, Middle-income: 58%, High-income: 54%)
After 2050: 69% (Low-income: 31%, Middle-income: 9%, High-income: 9%)
Never: 14% (Low-income: 9%, Middle-income: 9%, High-income: 7%)
AUTONOMOUS CARS

 Majority considers that autonomous cars will increase the overall car use

- Why do you choose increasing?
  - It will reduce travel and parking costs and provides improved mobility to those who are too young to drive or older people.

- Why do you choose decreasing?
  - It will reduce the car use by being more efficient at completing the tasks drivers currently perform. More car-sharing is also expected.

- Why do you choose no impact?
  - Other modes will also adopt automation technology to compete with autonomous car, thus offsets the growth potential of autonomous private car use.
Would you limit the increasing car use brought by autonomous car? (increase in trip distances and trip rates)

- Yes: 81%
- No: 19%

How would you limit this effect?

- Promote car sharing: 40%
- Increase vehicle usage cost: 31%
- Control urban sprawl: 17%
- Increase vehicle ownership cost: 16%
AUTONOMOUS CARS

- Autonomous cars have higher impacts on bus than on mass transit
- If autonomous cars are shared, the impacts on public transport trips will be higher

Percentage of expert opinion

<table>
<thead>
<tr>
<th></th>
<th>&lt; 20% trips replaced</th>
<th>20% - 40% trips replaced</th>
<th>&gt; 40% trips replaced</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bus</strong></td>
<td>38%</td>
<td>24%</td>
<td>36%</td>
</tr>
<tr>
<td>Not shared</td>
<td>13%</td>
<td>8%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Mass transit</strong></td>
<td>68%</td>
<td>24%</td>
<td>42%</td>
</tr>
<tr>
<td>Not shared</td>
<td>8%</td>
<td>8%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Bus</strong></td>
<td></td>
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</tr>
<tr>
<td>Shared</td>
<td>57%</td>
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<td></td>
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<td></td>
<td>27%</td>
<td></td>
<td></td>
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<tr>
<td><strong>Mass transit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared</td>
<td>16%</td>
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</table>
Safety and security concerns appears to be the biggest barrier for the uptake of autonomous cars.

- 26% Safety and security issues
- 22% Technological challenges
- 20% Legislation and regulatory issues
- 16% Consumer acceptance
- 16% High vehicle purchase cost
CONCLUSIONS

- TAILOR the decarbonising pathways to the climate and development priorities of different country groups
- MAXIMISE the co-benefits from CO\textsubscript{2} mitigation strategies, especially for the low-income countries (safety, accessibility, equity)
- TRANSIT to Zero-Emission Vehicles (cheaper and better performance) to achieve the decarbonising goal
- INTEGRATE shared mobility into multimodal transport planning to reduce emissions from urban mobility and meet public goals
- TACKLE the challenges of combining realistic behavioural factors towards autonomous cars and policy options that cities might pursue