First Steps Towards Sustainable Operation of Road Tunnels

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Australia
First steps towards sustainable operation of road tunnels

Available on PIARC website [here](https://www.piarc.org)
Sustainability Concept

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
### 3 Pillars of Sustainable Concept

<table>
<thead>
<tr>
<th>Social</th>
<th>Economic</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health; Housing; and Employment, etc.</td>
<td>Creating wealth; and Improving living standards.</td>
<td>Preserving species Natural resources; and Energy resources.</td>
</tr>
</tbody>
</table>
Positives & Negatives

Economic & Social
- Reduced travel times; and
- Relative safety.

Environmental
- Reduction in vehicle emissions; and
- Smaller footprint on surface.

Economic & Social
- Relatively higher cost; and
- Access to incidents can be constrained.

Environmental
- Use of natural resources;
- Power consumption;
- Air pollution – exhausts; and
- Removal of vegetation for portals.
### Objectives, Evaluation Criteria & Measures

<table>
<thead>
<tr>
<th>Transport System Objective</th>
<th>Project Objective</th>
<th>Evaluation Criteria &amp; Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social &amp; Economic Inclusion</td>
<td>• Improve access to employment and education for households in Melbourne. &lt;br&gt;• Improve access, amenity and safety for communities in particular parts of Melbourne &lt;br&gt;• Minimise adverse impacts on communities</td>
<td>• Jobs growth in key locations &lt;br&gt;• Additional placements accessible to students &lt;br&gt;• Changes in travel times for commuting &lt;br&gt;• Changes in travel times between residential areas &lt;br&gt;• Improved access to public transport &lt;br&gt;• Improved bicycle and pedestrian networks</td>
</tr>
<tr>
<td>Economic Prosperity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration of Transport and Land Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety, health and wellbeing</td>
<td></td>
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</tr>
</tbody>
</table>
Cost-Benefit Analysis

Systematic evaluation and assessment of costs and benefits.
Optional Alignment

1. Surface Road
2. Tunnel
3. Elevated Road

Benefit-Cost Ratio

3
1.5
2
# Project Phase & Cost Impact

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Impact on Operating Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>60 – 80 %</td>
</tr>
<tr>
<td>Construction</td>
<td>10 – 30 %</td>
</tr>
<tr>
<td>Operation</td>
<td>10 – 30 %</td>
</tr>
</tbody>
</table>
Relationship between the cost of maintenance and the level of influence exercised on these costs
North East Link Corridor Options
Design Phase – Economic Pillar

Economic Pillar

- Reduced travel time
- Creation of jobs, access to more affordable housing
- Costs include land acquisition, service relocation, design and construction of the link, project management, maintenance and operating costs.
- Project financing.
- Improved living standards.
Design Phase – Social Pillar

Social Pillar

- Reduction of travel noise
- Less travel time, more time to socialise
- Improved pathways for pedestrians and cyclists
Design Phase – Environmental Pillar

Environmental Impact Assessment Report

Public Exhibition of Report

Public Hearings Before Environmental Assessment Panel

Chair of Panel Makes Recommendations to Government

Minister for Planning Considers Report and Recommendation
Construction Phase

Economic Pillar
Social Pillar
Environmental Pillar
Operational Phase

Four key elements to consider

1. Routine tunnel maintenance
2. Reactive tunnel maintenance
3. Lifecycle maintenance
4. Tunnel services
# National Regulations

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>2003</td>
<td>Guidelines for preparation of sustainable development reports. Prepared by the Federal Ministry of Economic Affairs and Employment</td>
</tr>
<tr>
<td>France</td>
<td>2007</td>
<td>Grenelle de l'environnement</td>
</tr>
<tr>
<td>Spain</td>
<td>2010</td>
<td>Spanish directive for efficiency in projects</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td>Environment Protection and Biodiversity Conservation Act 1999</td>
</tr>
</tbody>
</table>
Tunnel Sustainability Initiatives

- Optimisation of tunnel profile to minimise material excavation and to minimise vehicle exhaust fumes during operation.
- Re-use of excavated material.
- Use of renewable fuel for construction and operation of a tunnel.
- Application of technologies, e.g. LED lighting.
Summary

- Road tunnels are important contributors to sustainable road transport
- Road tunnel sustainability needs to be well covered in the planning and design phases
- We need to continue to innovate sustainable measures
- Strong leadership in the road tunnel industry is essential for road tunnel sustainability
Thank you for your attention