Sustainability Benefits Assessment in Urban Transport Project Appraisal

Position paper for a new method of transport project appraisal

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Introduction

• Transport is a key sector that influences urban growth

• Strongly related with the distribution of population densities and built form of the cities

• Any change in transport sector can directly effect social, economic and environmental aspects
Transport Project Appraisal

• Useful tool in decision making

• Comparison of options to make the best choice

• Ex-ante and ex-post

• To know impacts of a project, program or policy

• Prioritization among various projects and selection between competing options

• Resource allocation
Different Types of Project Appraisal Methodologies

• Project based such as CBA, CEA, MCA, EIA etc

• Strategic methodologies such as SEA

• Other methodologies such as hedonic price method, repeat sales method, cliometric methods and regional economic models
Issues in Project Appraisal

• Quantification and assessment of all impacts

• Quantification of an impact overtime

• Uncertainties in calculations like in CBA

• Subjectivity as in MCA

• Partial coverage as in SEA, EIA
Introducing SBA-UT

- Based on the TBL
- Integrates the concept of sustainable development with transition management
- Holistic and multi-level
- Strategic
Introducing SBA-UT

Transition to Sustainable Mobility

Sustainability benefits of urban transport sector before intervention

aggregate sustainability benefits

Improved sustainability benefits of urban transport sector after intervention

Impacts of a sustainable transport project

Global Community

Local Community

Individuals

X1

X2

Social

Economic

Environmental

Improvements in social, economic, and environmental conditions of individuals, local community and global community
Introducing SBA-UT

General equation:

$$
\begin{bmatrix}
SISO_k & SIEc_k & SIEn_k \\
SISO_j & SIEc_j & SIEn_j \\
SISO_i & SIEc_i & SIEn_i
\end{bmatrix}
- 
\begin{bmatrix}
SISO_l & SIEc_l & SIEn_l \\
SISO_m & SIEc_m & SIEn_m \\
SISO_n & SIEc_n & SIEn_n
\end{bmatrix}
= 
\begin{bmatrix}
\Delta SISO_i & \Delta SIEc_i & \Delta SIEn_i \\
\Delta SISO_l & \Delta SIEc_l & \Delta SIEn_l \\
\Delta SISO_m & \Delta SIEc_m & \Delta SIEn_m
\end{bmatrix}
$$

Where,

- $[SI]_k$ = Sustainability indicators matrix for the post-project scenario
- $[SI]_l$ = Sustainability indicators matrix for the pre-project scenario
- $[\Delta SI]_{ij}$ = Sustainability benefits matrix
- SI = Sustainability Indicator; $\Delta SI$ = Relative change in the value of indicator (in percentage points)
- So = Social; Ec = Economic; En = Environmental
- $j$ = Pre-project scenario; $k$ = Post-project scenario
- $i$ = individual level; $l$ = local level; $g$ = global level

By type of benefit:

$$
1 \times \begin{bmatrix}
SISO_i & SIEc_i & SIEn_i \\
SISO_j & SIEc_j & SIEn_j \\
SISO_l & SIEc_l & SIEn_l
\end{bmatrix}
= \begin{bmatrix}
\Sigma \Delta SISO & \Sigma \Delta SIEc & \Sigma \Delta SIEn
\end{bmatrix}
$$

By level of benefit:

$$
1 \times \begin{bmatrix}
SISO_j & SISO_l & SISO_g \\
SIEc_j & SIEc_l & SIEc_g \\
SIEn_j & SIEn_l & SIEn_g
\end{bmatrix}
= \begin{bmatrix}
\Sigma \Delta SI_j & \Sigma \Delta SI_l & \Sigma \Delta SI_g
\end{bmatrix}
$$
Introducing SBA-UT

<table>
<thead>
<tr>
<th>Level of benefit</th>
<th>Type of benefit</th>
<th>Social benefit points</th>
<th>Environmental benefit points</th>
<th>Economic benefit points</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Individual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Local Community</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Global Community</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Negative impacts are treated separately; analysis of negative impacts is used as filters*
Introducing SBA-UT – Example

### Sustainability Benefits Matrix for BRTS Project in Ahmedabad City

<table>
<thead>
<tr>
<th>Social Benefits</th>
<th>Economic Benefits</th>
<th>Environmental Benefits</th>
<th>Benefits (Total$^{BRTS}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>1.4</td>
<td>0.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Local</td>
<td>0.2</td>
<td>5.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Global</td>
<td>0.4</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>1.6</td>
<td>5.0</td>
<td>6.9</td>
</tr>
</tbody>
</table>

### Sustainability Benefits Matrix for MEGA Project in Ahmedabad City

<table>
<thead>
<tr>
<th>Social Benefits</th>
<th>Economic Benefits</th>
<th>Environmental Benefits</th>
<th>Benefits (Total$^{MEGA}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>7.0</td>
<td>-0.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Local</td>
<td>1.7</td>
<td>0.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Global</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>8.7</td>
<td>-0.2</td>
<td>9.5</td>
</tr>
</tbody>
</table>

#### Type of benefit

<table>
<thead>
<tr>
<th>S.no.</th>
<th>Indicator</th>
<th>Type of benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Improvement in average travel speed</td>
<td>Social, Individual</td>
</tr>
<tr>
<td>2.</td>
<td>Reduction in trip cost of commuters</td>
<td>Economic, Individual</td>
</tr>
<tr>
<td>3.</td>
<td>Landuse area improvement</td>
<td>Economic, Local Community</td>
</tr>
<tr>
<td>4.</td>
<td>Passenger capacity added to public transport system in the city</td>
<td>Social, Local Community</td>
</tr>
<tr>
<td>5.</td>
<td>Reduction in direct GHG emissions from city’s transport sector</td>
<td>Environmental, Global</td>
</tr>
</tbody>
</table>
Application of SBA

• Ex-ante and ex-post project appraisal
• Decision making in project prioritization
• Awareness creation
• Financing urban transport projects
Discussions

• Existing knowledge: Little information available on sustainability indicators

• Capacity challenge, challenge for users: Internal capacity and expert inputs

• Technical challenge, challenge for researchers: Strategic use of multiple tools, quantification of benefits
Conclusions

• SBA can be places in the category of strategic methodologies

• It can be seen as a more comprehensive form of SEA

• As the most recent paradigm of development is shifting towards Sustainable Development Goals (UN-Habitat, Habitat-III) the need for sustainability appraisal methods is urgent

• SBA-UT methodology can be easily adopted for all sectors
Looking forward to your comments and suggestions .....