Incorporating Equity Considerations in Transport Projects Evaluation: Developing a New Measure

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(Feitelson, 2002)
(1) Improve equitable transportation planning.
equity in economic evaluation involves great complexity:

- several types of equity
- various ways to categorize people
- numerous impacts to consider
- various ways of measuring these impacts
- Large-scale effects
- Long-term impacts
- Land use changes
- The externalities component
Equity analysis in EU-25, by evaluation method.

(HEATCO's database, 2006)
Cost-Benefit Analysis (CBA)

**Advantage:**
Ease and convenience of comparison and decision

**Limitations:**
- It does not distinguish between certain groups or people.
- It include the potential for optimism bias.
- The link between the total number of trips and the total benefits
- The monetary value of travel time: WTP
Cost-Benefit Analysis (CBA)

“Equity value of travel time”

• It eliminates the complex set of considerations and preferences of each individual.

• Biased results in the overall assessment of the project.
• HEATCO Refers to Intra-generational equity issues and recommends, at minimum, that a “winners and losers” table will be developed, and presented alongside the results of the monetized CBA.

DG Regional Policy Guidelines, TINA, RAILPAG, HEATCO: a comparative overview

<table>
<thead>
<tr>
<th>Equity (intragenerational)</th>
<th>DG Regional Policy 2003</th>
<th>Disaggregate (per private household)</th>
<th>Winners and losers tables at minimum, distributional matrices as a more sophisticated approach.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Either included in CBA (through shadow prices) or in MCA (quantified e.g. through statistical measures such as Gini index). No disaggregation of impacts between stakeholder categories.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: HEATCO, 2006).
The distributional matrix involves separating the costs and benefits of different alternative projects by income percentiles of the population affected by the projects.

Example Distributional Matrix for a Transport Project Appraisal

<table>
<thead>
<tr>
<th>Income Quintile</th>
<th>Transport Project Option 1</th>
<th>Transport Project Option 2</th>
<th>Transport Project Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(€'000)</td>
<td>(%) of total</td>
<td>(€'000)</td>
</tr>
<tr>
<td>&gt; €50,000</td>
<td>12,000</td>
<td>19</td>
<td>6,000</td>
</tr>
<tr>
<td>€28,000 - €49,999</td>
<td>14,000</td>
<td>22</td>
<td>8,000</td>
</tr>
<tr>
<td>€16,000 - €27,999</td>
<td>15,000</td>
<td>23</td>
<td>12,000</td>
</tr>
<tr>
<td>€8,000 - €15,999</td>
<td>13,000</td>
<td>20</td>
<td>14,000</td>
</tr>
<tr>
<td>&lt; €8,000</td>
<td>10,000</td>
<td>16</td>
<td>18,000</td>
</tr>
<tr>
<td>Total Net Benefit</td>
<td>64,000</td>
<td>100</td>
<td>58,000</td>
</tr>
</tbody>
</table>

UK transport appraisal guidelines is an example of such a matrix, geographical location, ownership (public or private) etc as can be used as recommended by the French manuals.

(Source: HEATCO, 2006; Quinet, 2000).
Israel

• a procedure aimed to determine how the accessibility improvements are distributed over weak and strong communities.

• **Household Equity Indicator**: a number that indicates whether the gaps in travel times between car-owning and car-less household have been reduced or increased.

• **Community Equity Indicator**: the ratio of the Average Aerial Speed (AAS) on the transport network improvements of the rich communities divided by the AAS improvements of the poor communities.
The theory of justice of Rawls (1971)

• considering the needs of individuals, we should not favor the majority at the expense of the least.

• “the greatest benefit of the least advantaged members of society”.

• examining the distribution of certain kinds of goods he labeled as ‘primary’ for all persons.

• Utilitarian

• Egalitarian
Accessibility:

• Accessibility is the most important product of transportation projects.

• Accessibility is capable of providing the overview relationship of transportation, activities, and land uses.

• Accessibility is critical to look at the long-term impacts.

• Ignoring accessibility may lead to serious biases.
The principle of Diminishing Marginal Utility applied to accessibility gains

(Martens, 2006)
Accessibility can better account for equity analysis.
National: Scandinavia, the Netherlands and Italy.
Regional: France, the United Kingdom, Australia, United State and Israel.
The Activity-Based Models

- Have the ability to analyze results by various groups of the population.

- Can track consumers' needs and abilities, which are expressed in the desire to participate in activities.

- Can reflect the socioeconomic characteristics of individuals.

- Can reflect the nature of land use and properties of the transportation system.
(3) Activity based models can significantly contribute to equity analysis.
“the expected value of the individual’s maximum utility“

\[ CS_n = \frac{1}{\alpha_n} \cdot \max_j (U_{nj} \forall j) \]

\[ LS_n = \frac{1}{\mu} \ln\left( \sum_{j=1}^{J} e^{\mu V_{nj}} \right) \]

(Ben-Akiva and Bowman, 1998)
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**Methodology**

• Case Study
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(Dong et al., 2006)
Value of Accessibility calculation process

\[
CS_n = \frac{1}{\alpha_n} \cdot \max_j (U_{nj} \forall j)
\]
\[
\alpha_n = \frac{dU_{nj}}{dY_n} = - \frac{dU_{nj}}{dC_n}
\]
\[
ABA_n = \frac{1}{\mu} \ln\left( \sum_{j=1}^{J} e^{\mu V_{nj}} \right)
\]
\[
E(CS_n) = \frac{1}{\alpha_n} \cdot \frac{1}{\mu} \ln\left( \sum_{j=1}^{J} e^{\mu V_{nj}} \right) + C
\]
Value of Accessibility calculation process

\[
\Delta E(CS_n) = \frac{1}{\alpha_n} \cdot \left[ \frac{1}{\mu} \ln\left(\sum_{j=1}^{J^1} e^{\mu V_{nj}}\right) - \frac{1}{\mu} \ln\left(\sum_{j=1}^{J^0} e^{\mu V_{nj}}\right) \right] = \frac{1}{\alpha_n} \cdot \Delta ABA_n
\]

\[V = c \cdot C + t \cdot T + \ldots\]

ABA in NIS = \( \frac{ABA_n}{\sum P_j c_j} \)

\[VOA = \sum_{n=1}^{N} \left( \frac{\Delta ABA_n}{\sum P_j c_j} \right) \]
Value of Accessibility calculation process

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A monetized activity based accessibility measure (VOA) can replace the value of time in CBA.
Thank You!

Questions and Comments?

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