Extending Cost-Benefits Analysis to a wider impact appraisal

Current state and perspectives for the transportation sector in Italy

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Assessing Transportation Impacts
The impacts of transportation

Transportation systems have effect on the whole ecosystem and its components
Main methods for assessing transportation impacts

Beyond simple business plans, there are several other appraisal methods

- **Cost-Benefit Analysis (CBA)**
  - Measure of a project’s societal value in monetary terms based on individuals’ Willingness-To-Pay from their private income

- **Cost-Effectiveness Analysis (CEA)**
  - Comparison of different project’s relative costs with their related outcomes

- **Economic Impact Assessment (EIA)**
  - Estimation of the impact of an investment on the general economy (e.g. Input-Output Analysis, CGE)

- **Wider Economic Impacts (WEI)**
  - Appraisal of economic impacts beyond the CBA usual ones

- **Multi-Criteria Analysis (MCA)**
  - Appraisal of policy options using normalized and weighted measures of their effects

- **Environmental Impact Analysis (EIA) and Strategic Environmental Assessment (SEA)**
  - Evaluation of the effects significantly affecting the environment

- **Sustainability Assessment (SA)**
  - Evaluation of sustainability indicators

- **External Costs Assessment (ECA)**
  - Estimation of main externalities of transport in monetary terms

- **Territorial Impact Analysis (TIA)**
  - Evaluation of impacts on the whole territory involved by a project

- **Social Impact Analysis (SIA)**
  - Evaluation of the effects of transport on society and individuals

- **Deliberative Appraisal (DA)**
  - Rational and informed judgment by citizens

Source: Author’s Venn diagram processing
Thematic scopes of appraisal methods

Each appraisal technique is oriented to specific application scopes

- **FINANCIAL**
  - Cost-Benefit Analysis (CBA)
- **ECONOMIC**
  - Cost-Effectiveness Analysis (CEA)
  - Economic Impact Assessment (EIA)
  - Wider Economic Impacts (WEI)
  - Economic Impact Assessment (EIA)
- **ENVIRONMENTAL**
  - Environmental Impact Analysis (EIA)
  - External Costs Assessment (ECA)
  - Sustainability Assessment (SA)
  - Territorial Impact Analysis (TIA)
- **SOCIAL**
  - Social Impact Analysis (SIA)
  - Deliberative Appraisal (DA)
The transportation Decision-Making process in Italy
The transport planning process in Italy

PROPOSALS FROM:
- Infrastructure managers
- Local administrations
- Others

EX-ANTE APPRAISAL

TRANSPORT AND LOGISTICS INFRASTRUCTURE STRATEGY

1a

EX-POST APPRAISAL

MULTI-YEAR PLANNING PROGRAM

- Objectives, Strategies and Mobility Scenarios
- Projects
- Feasibility Studies

PROGRAM REALIZATION

- National Rail Investment Program
- National Roads Investment Program
- Highway Grants
- Airports Investment Program
- Ports Authorities Program
- Regional Transport Plans

UPDATING

Benefit-Cost analysis or wider approaches?
Applying Cost-Benefit Analysis in Italy
## Project appraisal application scope

According to Italian regulation

<table>
<thead>
<tr>
<th>Sector</th>
<th>Type</th>
<th>Cost</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway</td>
<td>All types</td>
<td>&lt; 10 Mln€</td>
<td>Cost-Effectiveness Analysis (CEA)</td>
</tr>
<tr>
<td></td>
<td>All types</td>
<td>&gt; 10 Mln€</td>
<td>Cost-Benefits Analysis (CBA)</td>
</tr>
<tr>
<td></td>
<td>Relevant demand captured</td>
<td>&gt;&gt;&gt;</td>
<td>Local Economy Assessment</td>
</tr>
<tr>
<td>Road</td>
<td>Renewals</td>
<td>Any</td>
<td>Cost-Effectiveness Analysis (CEA)</td>
</tr>
<tr>
<td></td>
<td>Punctual, noservice revenues</td>
<td>&lt; 10 Mln€</td>
<td>Cost-Effectiveness Analysis (CEA)</td>
</tr>
<tr>
<td></td>
<td>No service revenues</td>
<td>&gt; 10 Mln€</td>
<td>Cost-Benefits Analysis (CBA) with risk and sensitivity analysis</td>
</tr>
<tr>
<td></td>
<td>With service revenues</td>
<td>Any</td>
<td>Cost-Benefits Analysis (CBA) with risk and sensitivity analysis</td>
</tr>
<tr>
<td>Rapid Transit</td>
<td>New lines or enhancements</td>
<td>&lt; 10 Mln€</td>
<td>Cost-Effectiveness Analysis (CEA)</td>
</tr>
<tr>
<td></td>
<td>New lines or enhancements</td>
<td>&gt; 10 Mln€</td>
<td>Cost-Benefits Analysis (CBA)</td>
</tr>
</tbody>
</table>

# Costs-Benefit Analysis according to Italian regulation

## Costs and benefits to be taken into account for railway projects analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Investor’s point of view</th>
<th>Financial Analysis</th>
<th>Cost-Benefit Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment costs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Operation costs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Maintenance costs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Avoided costs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Residual value</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Infrastructure revenues</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>New operation railway costs due to the project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation cost savings due to mode share change</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>User time savings</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Environmental impacts                                                |                          |                    |                       |
| Road congestion change due to new modal share                        |                          |                    |                       |
| Accidents change due to new modal share                              |                          |                    |                       |
| Air pollution change due to new modal share                          |                          |                    |                       |
| Noise pollution change due to new modal share                        |                          |                    |                       |
| Greenhouse gases emission change due to new modal share              |                          |                    |                       |

- **Society’s point of view**
- **Net zero**

Source: Italian Ministry of Infrastructure and Transport, Operational Guidelines for the evaluation of public works investments – Railway Sector

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Mario Tartaglia | Extending Cost-Benefits Analysis in Italy
Cost-Benefit Analysis: some limitations

The standard application of Cost-Benefit Analysis (CBA) to an intervention on the transportation system involves the evaluation of direct benefits to transport users, plus some direct external impacts (externalities).

However, usually CBA does not capture all the impacts of an intervention (OCDE/ITF, 2017), for instance:

- missing some additional wider economic impacts (mainly benefits, e.g., on productivity, connection, labour market);
- overlooking the intangible and non-financial outcomes associated with transport investments or changes;
- disregarding individual diversity and needs; it thus tend to favor persons who are already mobile and participating in the market (Hananeland Berechman, 2016);
- missing to identify and respond to the social implications (Cavallaro et al. 2022);
- hindering authorities’ ability to adequately assess social implications, impeding a fully informed decision-making and the development of effective side policies (Bruzone et al., 2023);
- missing to incorporate transportation performance reliability (OCDE/ITF, 2017).

Source: Author’s processing based on literature
Widening the Appraisal Approach
Issues in improving Cost-Benefit Analysis

✓ A first approach for overcoming the limitations the traditional Cost Benefit Analysis (CBA) could be aimed to extend its scope. However, some issues should be taken into account:

✓ Methodological inconsistency could emerge if using different social or economic theories when considering additional impacts

✓ Some intangible impacts, such as the social ones, could not be easily quantified in monetary measures

✓ Including wider economic impacts could result in double counting some contributions to the overall economic effect

✓ An alternative approach is to apply complementary appraisal frameworks. In such case, CBA should be considered only one of several evaluation tools, and it could not be easy to build a comprehensive picture for the assessment.
Assessing environmentally sustainable investments in EU

Regulation (EU) 2020/852 sets a framework aimed to decide whether an economic activity is environmentally sustainable.

1 – definition of six climate and environmental objectives

- **1** Climate change mitigation
- **2** Climate change adaptation
- **3** Sustainable use and protection of water and marine resources
- **4** Transition to a circular economy
- **5** Pollution prevention and control
- **6** Protection and restoration of biodiversity and ecosystems

2 - conditions that an economic activity must meet in order to qualify as environmentally sustainable

- **1** Making a **substantial contribution** to at least one environmental objective
- **2** Doing **no significant harm** to any of the other five environmental objectives
- **3** Complying with minimum safeguards
- **4** Complying with the technical screening criteria

Source: https://ec.europa.eu/sustainable-finance-taxonomy/
Sustainability assessment for infrastructures and mobility

The Scoring System included in the Italian regulation

**SUSTAINABILITY SCORING**

**W₁%** Financial and Economic
- Cost-Effectiveness Analysis
- Cost-Benefit Analysis
- Impact on economic development

**W₂%** Environmental
- Substantial contribution to at least one environmental objective
- Doing no significant harm to any of the other five environmental objectives

**W₃%** Social
- Accessibility
- Impact on Employment
- Other social impacts

**W₄%** Governance
- Compliance to strategic goals
- Stakeholder engagement
- Procurement agency qualification
- Supply chain qualification

Wider Economic Impacts

Source: Italian Ministry of Infrastructure and Transport, Operational Guidelines for the definition of a multidimensional approach for the evaluation of public works, Scoring model for sustainable infrastructure and mobility, 21 October 2022
# Social impact KPIs according to Italian regulation

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rail</th>
<th>Road</th>
<th>MRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project beneficiaries by socio-demographic composition (No.)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>People declaring issues in accessing railway infrastructure (%) in the project area</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Commuters for work reason using only private transport (%)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Change in accessibility levels</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Removals of physical barriers for accessing infrastructure</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Equity in access rules to transport services</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Employment generated during the building phase</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Employment generated during the operating phase</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Initiatives for fostering young and female employment during the building phase</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Initiatives for safeguarding worker rights in the whole supply chain during the building phase</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Initiatives for workers safety</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Measures for mitigating negative impacts on citizens life quality during the building phase</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Measures for safeguarding and enhancing public spaces close to building sites</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Other social benefits produced by the interventions (on territorial attractivity, social capital)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
Case Studies
Evaluating wider impacts of transportation

Some case studies recently developed by FS Research Centre

Check them out at:
https://www.fsitaliane.it/content/fsitaliane/en/fs-research-centre/studies-and-research.html
Wider effects of railway projects: example

The Palermo-Catania High Speed Railway, Italy: some project’s effects compared to the baseline scenario

Building Phase (short term)  Operation Phase (medium /long term)

ECONOMIC IMPACT
- Value Added: 6,083 Mln€
- Employment: 83,000 FTE

ACCESSIBILITY OF BASIC SERVICES
- Gini Index reduced by 0.3%

ACCESSIBILITY TO EDUCATION AND CULTURE
- Gini Index reduced by 0.5%

AGGLOMERATIVE EFFECTS
- Productivity increased by 5%

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Conclusions
Final remarks

- There is a general need for extending the traditional Cost Benefit Analysis (CBA) approach in the order to take into account some additional impacts of transportation on environment, economy, policy, and society.

- A large literature debate exists about methodological issues in extending CBA to some impact categories. It mainly concerns both double counting risks and reliability of intangible effect economic evaluation.

- Such issues are faced differently in different countries, with varying willingness to accept the inclusion of wider impacts inclusion.

- In Italy, following the European Union guidelines, the current regulatory approach is to apply complementary appraisal frameworks.

- Nevertheless, there is room for methodological progress about extending the traditional CBA range for including broader impacts.
Thanks for your attention!

Any questions?

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