Aims of societal analysis:

• Assess societal impact of railway innovations that cannot be monetized and thereof escapes cost-benefit assessment.

• Integrate matters of equality and fairness into the analysis.

• Enable informed decision making about transport innovation by providing a more comprehensive picture of expected benefits and costs.
Steps:

1. Establish focus: accessibility for passengers
2. Wide survey on passengers’ use of train and perceptions on the NeTIRail-INFRA case-study lines
3. Assessment (overall qualitative but with quantitative elements) of innovations benefits (methodology and realisation)
4. Integration with economic cost-benefit analysis
5. Illustration of results into the GIS web tool developed in WP6
2\textsuperscript{nd} Step: user surveys

- When: June-December 2016;
- Where:
  - Bartolomeu-Zărnești line (Romania)
  - Ljubljana-Kamnik line (Slovenia)
  - Pivka – Ilirska Bistrica line (Slovenia)
  - Ankara- Kayas line (Turkey)
  - Divriği- Malatya line (Turkey)
- Total number of analysed questionnaires: 1074
Total number of interviews included in the analysis: 1074

- Slovenia: 488
- Romania: 317
- Turkey: 269
Key Findings: purpose of journey

Romania: Bartolomeu-Zărnești line

Current use of train / Purpose of journey (N=317)

- Commuting to/from Work: 59%
- Travelling to school/university: 17%
- Travelling to hospital/doctor: 5%
- Tourism: 5%
- Social/Recreation: 13%
- Business: 1%
Key Findings: purpose of journey

Slovenia: Ljubljana-Kamnik line

- Travelling to school/university: 49%
- Commuting to/from work: 40%
- Social/Recreation: 3%
- Business: 2%
- Tourism: 2%
- Other/ several purposes checked: 3%

Slovenia: Pivka – Ilirska Bistrica line

- Travelling to school/university: 49%
- Commuting to/from Work: 12%
- Social/Recreation: 16%
- Business: 4%
- Tourism: 13%
- Other: 6%
Key Findings: purpose of journey

Turkey: Sincan / Ankara – Kayaş line

Current use of train/ Purpose of journey (N=119)

- Travelling to school/university: 31%
- Travelling to hospital/doctor: 12%
- Commuting to/from work: 33%
- Social/Recreation: 23%
- Business: 1%

Turkey: Divriği – Malatya line

Current use of train/ Purpose of journey (N=143)

- Travelling to school/university: 30%
- Travelling to hospital/doctor: 5%
- Social/Recreation: 38%
- Business: 5%
- Tourism: 4%
- Other: 6%
- Several purposes checked: 6%
- Commuting to/from work: 6%
### Key Findings: passengers’ perceptions

#### Importance

<table>
<thead>
<tr>
<th>Line</th>
<th>Most important</th>
<th>2nd aspect</th>
<th>3rd aspect</th>
<th>4th aspect</th>
<th>5th aspect</th>
<th>6th aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartolomeu-Zărnestei (Romania)</td>
<td>Punctuality 77% (very) important</td>
<td>Travel time 74% (very) important</td>
<td>Frequency 72% (very) important</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ljubljana-Kamnik (Slovenia)</td>
<td><strong>Punctuality</strong> 90% (very) important</td>
<td>Frequency 88% (very) important</td>
<td>Travel time 87% (very) important</td>
<td>Safety 84% (very) important</td>
<td>Crowding 70% (very) important</td>
<td></td>
</tr>
<tr>
<td>Pivka – Ilirska Bistrica (Slovenia)</td>
<td><strong>Safety</strong> 90% (very) important</td>
<td>Travel time 83% (very) important</td>
<td>Punctuality 78% (very) important</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Sincan / Ankara – Kayaş (Turkey)</td>
<td><strong>Safety</strong> 100% (very) important</td>
<td><strong>Comfort</strong> 92% (very) important</td>
<td>Travel time 91% (very) important</td>
<td>Frequency 90% (very) important</td>
<td>Punctuality 89% (very) important</td>
<td>Crowding 73% (very) important</td>
</tr>
<tr>
<td>Divriği – Malatya (Turkey)</td>
<td><strong>Comfort and safety</strong> 90% (very) important</td>
<td>Travel time 82% (very) important</td>
<td>Punctuality 73% (very) important</td>
<td>Frequency 71% (very) important</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Key Findings: passengers’ perceptions

#### Satisfaction

<table>
<thead>
<tr>
<th>Line</th>
<th>Dissatisfaction higher</th>
<th>2nd aspect</th>
<th>3rd aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartolomeu-Zărnești (Romania)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ljubljana-Kamnink (Slovenia)</td>
<td>Crowding 22% (very) dissatisfied vs. 46% (very) satisfied</td>
<td>Travel time 20% (very) dissatisfied vs. 53% (very) satisfied</td>
<td>Frequency 19% (very) dissatisfied vs. 49% (very) satisfied</td>
</tr>
<tr>
<td>Pivka – Ilirska Bistrica (Slovenia)</td>
<td>Frequency 42% (very) dissatisfied vs. 26% (very) satisfied</td>
<td>Travel time 38% (very) dissatisfied vs. 30% (very) satisfied</td>
<td>Interchanges 30% (very) dissatisfied vs. 42% (very) satisfied</td>
</tr>
<tr>
<td>Sincan / Ankara – Kayaş (Turkey)</td>
<td>Crowding 39% (very) dissatisfied vs. 44% (very) satisfied</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Divriği – Malatya (Turkey)</td>
<td>Travel time 38% (very) dissatisfied vs. 39% (very) satisfied</td>
<td>Punctuality 37% (very) dissatisfied vs. 43% (very) satisfied</td>
<td>Frequency 36% (very) dissatisfied vs. 44% (very) satisfied</td>
</tr>
</tbody>
</table>
3rd Step: Assessment of innovations benefits

- Each innovation analysed in the context of a NeTIRail case-study line (same as CBA).

Social assessment

= score “accessibility”

(including perceptions and innovations’ impact)

X

score “route”

(including train use characteristics)
### Example: Task 4.2: Axle box acceleration (ABA) for regional lines, on-train monitoring applied to the line Bartolomeu-Zărnești

**Score “accessibility”**

<table>
<thead>
<tr>
<th>ELEMENT OF TRAVEL</th>
<th>Impact</th>
<th>Score “impact”</th>
<th>Perceptions: discrepancy between importance and satisfaction</th>
<th>Score “perceptions”</th>
<th>Final element’s score</th>
<th>Final indicator’s score</th>
<th>Final innovation’s score “accessibility”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowding</td>
<td>None</td>
<td>0</td>
<td>$0 \leq x \leq 10%$</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1.75</td>
</tr>
<tr>
<td>Comfort</td>
<td>None</td>
<td>0</td>
<td>$0 \leq x \leq 10%$</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>High</td>
<td>2</td>
<td>$10% &lt; x &lt; 20%$</td>
<td>1.5</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Punctuality</td>
<td>Medium</td>
<td>1.5</td>
<td>$10% &lt; x &lt; 20%$</td>
<td>1.5</td>
<td>2.25</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Frequency of trains</td>
<td>None</td>
<td>0</td>
<td>$0 \leq x \leq 10%$</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled journey times</td>
<td>None</td>
<td>0</td>
<td>$0 \leq x \leq 10%$</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Score “route”**

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Survey results</th>
<th>Value assigned</th>
<th>Final score “route” (sum of the aspects’ scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>&gt; 75%</td>
<td>2</td>
<td>2.75</td>
</tr>
<tr>
<td>Regular users</td>
<td>&gt; 50%</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Only train</td>
<td>&gt; 50%</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>No alternatives</td>
<td>&gt; 5%</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

**Final score:**

$1.75 \times 2.75 = 4.81$
Overall considerations

• Final scores are indicative

• Methodology applied for a specific case-study line, but results can be generalised

• Overall evaluation is qualitative

• Final output (ideally): sort of priority-scale for innovations
4th Step: Integrate societal assessment and CBA

How:
Integrate = narrative about pros and cons of each innovation from an economic and a societal perspective. No quantitative balancing along the lines “CBA vs SIA”, although each assessment separately is (also) a quantitative one.

• Example from a conclusion of the integration of CBA and SIA for the Task 4.2 innovation “Axle box acceleration (ABA) for regional lines, on-train monitoring“:

“Like all WP 4 innovations, the ABA system is particularly useful on secondary lines, where modern rolling stock is rarely used. The ABA system is a relatively expensive one-off investment but with clear returns in the long term and with additional benefits in terms of punctuality and safety. From a societal point of view, due to its positive effects on punctuality, this innovation seems to be particularly meaningful on routes used by commuters who put high value on this aspect.”
5th Step: Illustration in GIS web-tool
Thank you!

Dr Elisa Orru
Centre for Security and Society CSS
Albert-Ludwigs-Universität Freiburg
0049 (0)761 203-67710
Elisa.orru@css.uni-freiburg.de
www.css.uni-freiburg.de