Deliverable D5.1

Societal and legal effects of transport decision: Stakeholder analysis

Submission date: 27/05/2016
Lead contractor
Albert-Ludwigs University Freiburg (ALU-FR)

Contributors

<table>
<thead>
<tr>
<th>Organization</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert-Ludwigs University Freiburg (ALU-FR)</td>
<td>Elisa Orru (author)</td>
</tr>
<tr>
<td>ADS Electronics (ADS)</td>
<td>Lucian Anghel</td>
</tr>
<tr>
<td>INTADER</td>
<td>Elif Hatica Öztürk</td>
</tr>
<tr>
<td>Slovenske Zeleznice (SZ)</td>
<td>Vlasta Miklavžin</td>
</tr>
<tr>
<td>University of Leeds (UNIVLEEDS)</td>
<td>James Laird, Manuel Ojeda</td>
</tr>
</tbody>
</table>

Project coordinator

University of Sheffield
## Document status

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
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<tr>
<td></td>
<td>December 2015</td>
<td>Draft questionnaires circulated by Elisa Orrù (ALU-FR)</td>
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<tr>
<td></td>
<td>January – February 2016</td>
<td>Comments on the draft questionnaires by UNIVLEEDS and Sheffield</td>
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<tr>
<td></td>
<td>March 2016</td>
<td>Reworking of the questionnaires with substantial input from UNIVLEEDS</td>
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<tr>
<td>0.1</td>
<td>1/4/2016</td>
<td>D5.1 drafted and circulated by Elisa Orrù (ALU-FR)</td>
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<tr>
<td></td>
<td>4/4/2016 – 11/4/2016</td>
<td>Feedback and integrations by INTADER, SZ (Prometni Institut) and ADS-ELECTRONICS on section 4 (description of the NeTIRail case-study lines). Comments by INTADER and SZ (Prometni Institut) on the questionnaires and feedback on the planned surveys. Feedback and integrations by UNIVLEEDS on section 5 (survey plan) and on annex 1 (draft questionnaires). General feedback by VTI and RC-CF.</td>
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<tr>
<td>0.2</td>
<td>April/May 2016</td>
<td>Re-drafting of D5.1 by Elisa Orrù (ALU-FR) incorporating the feedback by other partners.</td>
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<tr>
<td>0.2</td>
<td>14/05/2016</td>
<td>D5.1 sent to the Project Management team by ALU-FR</td>
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<tr>
<td>0.2</td>
<td>25/05/2016</td>
<td>Feedback by the Project Management team</td>
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<tr>
<td>1.0</td>
<td>27/05/2016</td>
<td>Final version issued</td>
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Reviewed YES / NO
Executive Summary

Deliverable 5.1 “Societal and legal effects of transport decision: Stakeholder analysis” identifies the stakeholder groups and the non-economic societal issues influenced by railway innovations, especially by the innovations planned in NeTIRail-INFRA.

The results aim to be complementary to the ones reached in WP1, which concentrates on economic aspects. The results of WP1 and WP5 will be integrated in D5.3 “Balancing societal effects and cost-benefit of different infrastructure decisions”.

Section 1 of this deliverable introduces the topic and presents the structure of the deliverable.

Section 2 identifies stakeholders and stakes. In NeTIRail-INFRA WP5 the following stakeholder groups are individuated as relevant: residents, employees, passengers and future generations, while the stakes at play include safety, health/environment, employment and accessibility.

Section 3 introduces the framework to assess the non-economic social impact of railway innovations, presenting theories and values that can serve this scope.

Section 4 focuses on the NeTIRail-INFRA planned innovations and on the case-study lines. It describes the lines and the surrounding areas highlighting socially relevant aspects and discusses how the planned innovations might impact on the stakeholder categories identified above.

The analysis conducted in sections 2-4 shows that the stakeholder category “passengers” and the stake “accessibility” are the most relevant for NeTIRail-INFRA WP5. Accessibility appears to be strictly connected with reliability, which is at the centre of the analysis carried out in WP1, thus offering a good basis for the integration of the results of WP1 and WP5 to be realised in D5.3.

Section 5 presents the design for the on-train survey with passengers to be carried out in the next months. The questionnaires are designed to investigate passengers’ needs and perceptions in the areas that will be affected by the planned innovations.

Section 6 presents the next steps of the work in WP5.
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## Abbreviations and acronyms

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<td>CBA</td>
<td>Cost-benefit analysis</td>
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2. Introduction

D5.1 aims to identify the stakeholder groups and the non-economic societal issues influenced by railway innovations and especially by the innovations planned in NeTIRail-INFRA.

The results aim to be complementary to the ones reached in WP1, which concentrates on economic aspects. The results of WP1 CBA and WP5 will be integrated in D5.3 “Balancing societal effects and cost-benefit of different infrastructure decisions”.

The social impact of technology innovations has been defined as “the consequences on a human population of any action that alters how people live, think, behave and react to each other”,¹ including intended and unintended, positive and negative consequences. In order to analyse the social impact of a given action, it is critical to identify stakeholders, interests and values (stakes).

There is clearly no clear-cut distinction between economic impact and non-economic societal impact. For instance, cheaper, faster and more reliable freight transport can increase revenues in a particular area. This might, in turn, create more job opportunities, in which case we would have a positive social impact deriving from an economic benefit. These dependencies, however, are by no way obvious or univocal. For instance, the same improvements making freight transport faster, cheaper and more reliable can also encourage industry to relocate production where the workforce is cheaper. This would, in turn, lead to unemployment in the previous production areas, in which case we would have a negative social impact deriving from an economic benefit. These examples illustrate that the connection between economic and non-economic social impact, even when the latter can be seen as derivative from the former, is not a straightforward and univocal one, since it is the product of human choices and often dependent on broader non only economic but also political factors. Moreover, not all non-economic effects are derivative of economic ones. For instance, access to health services or education for particular groups (i.e. groups object of discrimination) can be strongly influenced by social and cultural circumstances that do not derive from economic factors. Taking into account these considerations, WP5, as a matter of perspective, focuses on non-economic impact as if it were always non-derivative. This means that, instead of focusing primarily on economic aspects and trying to derive social non-economic effects from them, WP5 looks directly for the social impact of railway innovations.

The following section (section 2) identifies stakeholders, stakes and the related impact categories. First, it offers an overview of the stakeholder groups involved in transport and railway innovations, then concentrating on the groups relevant for NeTIRail and in particular for WP5. These are: residents, employees, passengers and future generations.² Second, it concentrates on stakes and

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² Employers, local businesses and local government could also be specified as stakeholder groups relevant for NeTIRail-INFRA. For now, they are considered sub-categories of the group “residents”, but they will be considered separately if further research indicates that they are relevant as such.
discusses how they relate to the different stakeholder groups. The identified stakes are: safety, health/environment, employment and accessibility.

Section 3 introduces the framework to assess the non-economic social impact of railway innovations, presenting theories and values that can serve this scope. Each of these theories assigns priority to one or more values, such as utility, human dignity, consent, justice and fairness. The strengths and shortcomings of each theory when applied to concrete case-studies are discussed as well.

Section 4 focuses on the NeTIRail-INFRA planned innovations and on the case-study lines. For the planned innovations in WP2-4, it describes how they might impact on the stakeholder categories identified above. Focussing on the lines, section 4 further describes the social function of the line and the surrounding area in order to identify societal-sensitive issues, i.e. the presence of infrastructure important for health, employment, education, culture etc. and the presence of protected or disadvantaged social groups. For the innovations planned in WP2 a further step is taken: since at this stage of the project the specific interventions planned for each line are known, the last part of section 4 analyses the possible social impact of these innovations for the lines concerned.

The analysis conducted in sections 2-4 shows that in NeTIRail-INFRA the stakeholder category “passengers” and the stake “accessibility” are the most relevant ones, both because these are the categories most affected by the planned innovations and because we will have the opportunity to further investigate them through the on train survey. Accessibility, moreover, appears to be strictly connected with reliability, which is at the centre of the analysis carried out in WP1, thus offering a good basis for the integration of the results of WP1 and WP5 to be realised in D5.3.

Section 5 presents the design for the on-train survey with passengers to be carried out in the next months. The questionnaires are designed to investigate passenger needs and perceptions in the areas that will be affected by the planned innovations. The survey results will serve as a basis for both the economic CBA under WP1 and the non-economic social impact assessment in WP5.

Section 6 concludes by presenting the next steps of the work in WP5.

3. Identifying stakeholders and stakes

3.1 Stakeholders

Stakeholders are all persons and groups that have an interest in a given project. This definition covers a broad range of individuals and groups. Considering transport policies in general, for instance, stakeholders include: the central government, local governments, infrastructure operators, transport operators, automotive industry, rail industry, transport system suppliers, private sector businesses, academia, start ups and travellers.

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Referring more specifically to rail transport projects, the following categories of stakeholders can be identified: passengers, business customers, regulators, employees, investors, suppliers, associations and experts. These groups can be further split into sub-categories. For instance, the category “passengers” includes passengers travelling for private reasons and passengers travelling for professional reasons; business customers include public and private sector businesses, regulators can be politicians and authorities at the European, national, regional and local level, associations and experts include lobbies, NGOs, citizens’ action committees, residents and researchers.

In the NeTIRail-INFRA project, the following stakeholders groups are identified: “transport planners, infrastructure managers and procurement, infrastructure maintenance staff, rail operators, academia and R&D centres, and manufacturing/supply industry”.

The analysis to be conducted in this deliverable concentrates on non-economic social aspects and therefore further circumscribes the range of relevant stakeholders. In particular, from a societal, non-economic point of view, the following stakeholders groups seem to be the most relevant for assessing the societal impact of rail innovations: residents, employees, passengers, future generations. For each of these categories, subgroups can be specified, for instance, as mentioned above, passengers can be divided into those who travel for business reasons and those who travel for personal reasons, while residents include children, adults and elderly people, each of them bearing different needs and interests.

### 3.1.1 Residents of the surrounding area

Innovations can affect the lives of this stakeholder group both positively and negatively:

- **Positively**: for instance, by increasing their opportunities to reach destinations important for job opportunities, healthcare, education etc. (increase in mobility and accessibility) and by reducing pollution and noise (for instance, by reducing track vibrations). Also ticket fares might be reduced.
- **Negatively**: for instance, increasing noise (for instance by increasing the traffic volume) or increasing costs for living in an area by making it more attractive.

### 3.1.2 Employees of the railway branch, both actual and potential

In this case as well, consequences of railway innovations can be positive or negative:

- **Positive consequences**: for instance, for those who are hired for the realisation of the innovations, railway innovation can mean a job opportunity. Mechanisation of certain activities can also lead to an improvement of the work conditions of employees;
- **Negative consequences**: innovations can make competences of long-term employees become obsolete, redundant or less profitable, for instance as a consequence of mechanisation. This might mean loss of employment or a worsening of employment.

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5 Annex 1 to the NeTIRail Grant Agreement, p. 46
6 See description of WP5, Annex 1 to the NeTIRail Grant Agreement, 38-40.
conditions. Moreover, innovations may reduce the number of maintenance workers required, thus potentially leading to loss of jobs.

### 3.1.3 Passengers, including potential passengers

Passengers can also be affected both positively and negatively by railway innovations:

- Positively, for they can benefit from innovations increasing punctuality, reliability and comfort of the rail services. The may also benefit for reduced costs, if the innovations lead to ticket fares reductions;
- Negatively, since they might be disadvantaged by increases in fare rates or by the redesign of routes privileging the most rentable destinations and stops.

### 3.1.4 Future generations

Future generations can be affected by the same advantages and disadvantages mentioned for the other groups, but should be taken into account separately. Indeed, certain effects can emerge or significantly increase not immediately after a certain innovation is introduced, but with a consistent delay which makes them irrelevant for the present generations but significant for future ones.

### 3.1.5 Overview

The table below summarises the categories of stakeholder relevant for railway transport in general, in NeTIRail-INFRA and in WP5 respectively. It shows how the focus is progressively restricted to identify the stakeholder groups relevant for the non-economic impact analysis in WP5. The larger circle indicates the stakeholders relevant for transport policies in general, including the categories of stakeholders in the scope of the NeTIRail-INFRA Project and of WP5 (two smaller circles).
The stakeholder category “passengers” is particularly important in NeTIRail-INFRA because we have the opportunity to conduct surveys on their perceptions and needs.

In section 3, the potential effects on the different groups are contextualised for each NeTIRail-INFRA case-study.

Before considering the selected lines and their context, however, it is necessary to concentrate on the “stakes”, i.e. interest and values that can be affected by railway innovations.

### 3.2 Stakes

Existing studies on the non-economic social impact of transport innovations identify four stakes, or interests: safety, health/environment, employment and accessibility.\(^7\) Social impact assessment highlights how the innovations influence each of them.

#### 3.2.1 Safety

Safety refers to the protection from dangers and risks and can involve all the stakeholder categories taken into account in NeTIRail-INFRA WP5.

Safety is important for residents of the areas surrounding the railway, for they can be exposed to damages resulting from accidents such as derailments or crashes especially at points where the railway crosses footpaths, streets and roads.

Safety is also important for railway employees, for accidents might happen during works on the infrastructure, maintenance activities and travel.

Finally, passengers clearly have an interest in safety while travelling by train.

The most common impact category through which safety is measured is the number of accidents.

#### 3.2.2 Health and environment

Health and environment are a further category of stakes useful to identify the social impact of transport innovations. They refer to consequences on health caused by polluting emissions and noise. This category seems to be more relevant for the stakeholder groups including residents and employees.

For instance, rail innovations can have a great impact on residents in terms of pollution and noise: pollution can be reduced if rail travel options are made available, which can encourage people to

\(^7\) ‘SYNTHESIS - Synopsis of ASSIST Findings. Input Document to the ASSIST Final Conference on Assessing the Social and Economic Impacts of Past and Future Sustainable Transport Policy in Europe. Project Co-Funded by European Commission 7th RTD Programme. Fraunhofer-ISI, Karlsruhe, Germany.’, ASSIST (Assessing the social and economic impacts of past and future sustain-able transport policy in Europe) Report, (2014). Bert Van Wee and Sabine Roeser, ‘Ethical Theories and the Cost–Benefit Analysis-Based Ex Ante Evaluation of Transport Policies and Plans’, *Transport Reviews* 33, no. 6 (2013): 743–60, doi:http://dx.doi.org/10.1080/01441647.2013.854281. Costs are also stakes, especially for private businesses using freight railway transport. However, since the focus of this analysis is on non-economic social impact, they are not considered here.
renounce travelling by more polluting means such as cars. Moreover, rail travel has more ‘active travel’ associated with it than car travel does. Thus a switch from car to rail typically implies an increase in walking and cycling which leads to health benefits.\(^8\) But also electrifying lines previously relying on diesel as power source can improve health and environment protection. Especially to the local environment, however, if fossil fuels are used in the electricity generation it may not provide significant overall environmental benefits, but will still remove the pollution further away from urban areas.\(^9\)

Employees have also a stake in working under healthy conditions, for instance by avoiding to come in contact with materials and substances that can be harmful for health (although these aspects can also be included under the category “safety”).

The most common impact categories used to assess consequences in terms of health and environment are CO\(_2\) emissions, other polluting emissions such as NO\(_x\) and particulates, and noise.

### 3.2.3 Employment

Employment, understood as job opportunities and work conditions, is a further element that can be influenced by railway innovations. This category is relevant for all stakeholder groups identified in NeTIRail-INFRA WP5.

For residents in the areas affected by the innovations, these can mean new employment opportunities, although this is not automatic and mostly depend on the choices made by the companies and organisations realising the innovations. Residents can also profit from railway innovations in terms of employment if the innovations make destinations offering job opportunities better accessible (although these aspects can also be included in the category “accessibility”, as we will see below). But residents can also be disadvantaged by railway innovations if these make their area less attractive compared to the newly available destinations. For instance, people might prefer to go shopping in a bigger town or city rather than in the local shops and stores, thus reducing the employment opportunities in the local commercial sector.

Employees of the railway sector are affected by the consequences of innovations on employment as well. For them, railway innovations might represent an opportunity to work under better conditions, if for instance the innovations make possible to carry out the most risky, harmful or exhausting activities by machines instead of humans. On the other hand, such innovations can also make employees’ competences obsolete and they can lose their job as a consequence.

For passengers, railway innovations can open new employment opportunities by making destinations important for work (better) reachable. However, this effect can also be appraised in terms of accessibility (see below).

The impact categories to measure effects on employment can include changes in the number of employed people, but also changes in income, working times and shifts and absences from work due to health problems.

\(^8\) Thank to James Laird (UNIVLEEDS) for this observation on active travel.

\(^9\) Thank to Jonathan Paragreen (USFD) for this specification on the use of fossil fuels for generating electricity.
3.2.4 Accessibility

Accessibility is a key element for assessing the social impact of transport innovations. However, it is not univocally defined. There are at least two main meanings of accessibility in the context of transport. In a narrow meaning, accessibility is understood as the ease for all categories of persons, including disadvantages ones such as people with reduced mobility, to access the means of transport. In a broader meaning, which is the most commonly used in the social impact assessment of transport policies, accessibility means the opportunity to reach destinations or activities. Accessibility is critical for assessing the impact on the stakeholder categories “residents” and “passengers”.

Residents’ accessibility is significantly affected by railway innovations, because these can make destinations important for employment, health care, education, culture etc. better reachable than before. So for instance residents who used other means of transport before the innovations, or who did not travel at all to particular destinations, can become railway passengers. Depending on the innovations introduced, however, residents can also be negatively affected. For instance, if the innovations reduce the capillarity of the net by closing stations or designing new routes that exclude (or reduce the number of trains for) destinations previously served by the railway. Also increases in tickets prices introduced as an upshot of the innovations can negatively affect the accessibility of residents.

Passengers are also greatly affected by changes in accessibility. For instance, railway innovations can reduce travel time, including both the regular (scheduled) travel time and the “extraordinary” travel time caused by delays and train cancellations. Improvements in these respects can positively affect the accessibility of passengers, for they can more easily and reliably reach their destinations. These aspects are very important in the NeTIRail-INFRA project, for, as we will see below, most of the planned innovations affect elements that have an impact on travel time. These aspects of accessibility are strictly related to reliability, a factor in the focus of WP1 and can therefore be an important point of convergence for the work in WP1 and WP5. Another factor affecting accessibility is cost: the affordability of travelling can be negatively affected by increases in tickets fares and vice versa.

Accessibility is usually measured as changes in travel times, but also the number of the reached destinations (including remote ones), connections to other public transport systems and costs (ticket prices) can be taken into account.

The table below summarises the stakes affected by railway innovations, linking them to stakeholders and the impact categories used for quantification.

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4. Social impact: non-economic assessment

Once stakeholders and stakes are identified, a framework is needed to assess the impact of railway innovations for each category. While for economic impact assessment there is a broad range of available and consolidated methods (such as the PRAISE rail forecasting model, which will be used in WP1), for non-economic assessment the situation is more challenging. This section offers an overview of relevant theories that can be used for analysing railway (and in general transport) innovations. After presenting them in general terms, it discusses the strengths and shortcomings of each of them when applied to concrete case studies.

4.1 Values and theories

Theories relevant for the ex ante evaluation of transport projects cover a broad spectrum. The categorization and the description of ethical theories presented in this section follow the one suggested by Van Wee and Roeser. According to this classification, at the one end of the spectrum is situated utilitarianism, as a part of consequentialist theories, while at the other end is situated egalitarianism, as belonging to deontology theories. A further group of theories belonging to deontology is contractualism. Both consequentialism and deontology are monistic theories, i.e. they look for an above-all value that can guide decisions. Contextualist theories take another view and stress the need to take into account multiple values at the same time. The most known form of contextualism is ethical intuitionism. The table below summarises the categorisation.

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Table 4.1 – Theories for assessing the social impact of transport innovations

Each of these theories assigns priority to one or more values in order to evaluate the social impact of innovations. In the following subsections these values are presented, including utility, human dignity, consent, justice and fairness.

4.1.1 Utility

Utility is the central value for some forms of consequentialisms.

Consequentialism evaluates different options focusing on their consequences. The relevant moral question for consequentialist theories is which option maximises the outcomes: the best option is the one that achieves (or is likely to achieve) the best results.

The question becomes then how to evaluate the outcomes, i.e. on the basis of which value(s) to consider them better or worst. The most important value adopted by consequentialist theories to evaluate results is utility. According to such approach, the maximisation of utility should be the purpose of moral actions and therefore an option is better than another one in ethical terms if it maximises utility.

Utility can be understood in an egoistic or altruistic way. In the former case, by utility is meant the utility of a single individual or company, in the latter the utility of society. The most important form of altruistic consequentialism is utilitarianism. A classical formulation of its most basic principle is provided by Jeremy Bentham, who argued that moral actions should aim to reach “the greatest happiness for the greatest number”.

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Jeremy Bentham and James H. [Hrsg Burns, A Fragment on Government, Cambridge Texts in the History of Political Thought (Cambridge [u.a.]: Cambridge Univ. Pr., 1988) as quoted
Utilitarianism provides the moral and philosophical background of conventional CBA, which compares the expected costs (disutilities) and benefits (utilities) of different options.

Utilitarianism as a moral theory has been criticised for being blind towards distribution issues. Classical utilitarianism, indeed, focuses on the maximisation of the overall utility (or happiness), without considering how such advantages (and the disadvantages they might imply) are distributed among different individuals and groups. From a utilitarian perspective, as long as the overall utility is maximised, it is not relevant whether advantages and disadvantages are equally distributed among the affected (groups of) people, or whether particularly disadvantages groups would be further penalised by a particular option.

4.1.2 Human dignity, consent, justice and fairness

Human dignity, consent, justice and fairness are the values prioritised by different forms of deontology theories.

Deontology is a moral approach that focuses on the principles for actions, rather than on their consequences. According to such approach, an action is morally good if it is in accordance with particular general rules or moral principles.

The most classical formulation of deontological approaches has been provided by Immanuel Kant. For him, the most basic moral principle can be formulated as follows: “Act only according to that maxim whereby you can, at the same time, will that it should become a universal law”, whereby a maxim is understood as a principle for action that can motivate an individual to act in a particular way. Another well-known formulation of this principle prescribes to treat other human beings always as ends in themselves and never as means to an end. For Kant this rule (called “categorical imperative”) is always valid and must be followed in all circumstances, independently of the consequences that an action inspired by it can bring about. This second formulation of the principle makes the link to the value of human dignity explicit: each human being should be treated as bearing equally dignity.

Deontological approaches, as Van Wee and Roeser highlight, can be useful in correcting the deficiencies of utilitarianism identified above, since they remind us that each individual should be treated as a moral being and her fundamental rights cannot be sacrificed in the name of the overall utility. However, a position that does not take into account at all the consequences of different options might be difficult to apply in concrete situations, where different policy options must be compared to each other.


13 NeTIRail WP1 aims to carry out a distributionally weighted CBA, so in NeTIRail distributional issues will play a role also for economic CBA. Its results will be then compared with the ones of the non-economic social impact assessment of WP5.

Contractualism and egalitarianism are two families of moral theories closely related to deontology that can partially overcome the shortcomings of Kant’s deontology.

Contractualism focuses on rules of cooperation between moral agents and introduces imaginary contracts to ask whether the relevant people would sign them. The answer to the question whether an action or option is morally good or not is translated into the following: would a certain option respect or rather violate principles that would form the basis of an agreement between the relevant persons? Contractualist theories introduce the possibility of compensations: people might sign a contract that implies disadvantages for them if they in turn receive advantages as compensation.

Egalitarianism focuses on principles of justice and fairness.

John Rawl’s theory of justice is a combination of contractualism and egalitarianism. His theory introduces a “thought experiment” in which individuals sign a contract under a “veil of ignorance”. This means that they do not know their position in society, whether they are rich or poor, healthy or not, if they belong to a privileged group or not etc. Under this “veil of ignorance” people are supposed to make choices that protect primary goods such as basic liberties and that make even the position of the worst-off people acceptable.

Amartya Sen’s and Martha Nussenbaum’s capability approach is an example of egalitarian theories. Sen and Nissenbaum argue that what matters are not primary goods as such but the capability of accessing them. A certain option is good if it equalises capabilities, not goods. Capabilities can be different for each person depending on their individual characteristics or on societal and contextual factors. For instance, in a less affluent society a relatively low income can be enough to feel socially adequate, while in richer society a higher income might be necessary to achieve the same results.

4.1.3 Multiple values

Consequentialist and deontological theories are monistic theories. They argue that there is one moral principle that can provide guidance in every situation, i.e. utility or the categorical imperative. A different position is defended by contextualist theories and in particular by the best known form of contextualism, namely moral intuitionism.

According to moral intuitionism there is a plurality of irreducible moral principles. These principles are intuitively self-evident and cannot be derived form “higher” principles. They might conflict with each other and it is not possible to identify a principle that should prevail in every situation. Rather, the decision about which principle(s) should be given priority and how to balance them with each other is context-dependent.

The table below summarises the main characteristic of the discussed theories.

---

<table>
<thead>
<tr>
<th>Family of theories</th>
<th>Basic principles/questions</th>
<th>Central values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UTILITARIANISM</strong></td>
<td>Look for “the greatest happiness for the greatest number” (Bentham)</td>
<td>Utility</td>
</tr>
<tr>
<td><strong>DEONTOLOGY</strong></td>
<td>“Act only according to that maxim whereby you can, at the same time, will that it should become a universal law” (Kant)</td>
<td>Human dignity</td>
</tr>
<tr>
<td><strong>CONTRACTUALISM</strong></td>
<td>Would a contract containing the proposed innovation be signed by the members of the moral community?</td>
<td>Hypothetical consent</td>
</tr>
<tr>
<td><strong>EGLITARIANISM</strong></td>
<td>Are primary goods accessible to everybody? Is the distribution of advantages and disadvantages fair? What are the implications for disadvantaged or protected groups?</td>
<td>Justice, equity, fairness</td>
</tr>
<tr>
<td><strong>CONTEXTUALISM</strong></td>
<td>Moral evaluations are context-dependent</td>
<td>Multiple, irreducible moral values</td>
</tr>
</tbody>
</table>

Table 4.2 – Theoretical framework for assessing non-economic societal impact of transport innovations

4.2 Pros and cons of each theory when applied to concrete case-studies

Van Wee and Roeser discuss the pros and cons of non-consequentialist monistic theories when applied to transport policies. In particular, they highlight how they can integrate the results of a CBA analysis based on utilitarian considerations only.

Deontology stresses the importance of moral obligations and can re-balance the results of a CBA by, for instance, taking into account promises previously made by policy makers. According to such theories, if politicians have already committed to a particular innovation, it might be preferable to realise it even if the CBA reveals that it is not worthwhile. Moreover, deontology stresses the moral value of each individual, including individuals belonging to future generations. It highlights that no individuals can be “sacrificed” (in Kantian words “used as pure means”) for increasing the utility of the society, particular groups or other individuals. Such considerations can be particularly important when planned innovations have negative consequences on the environment, for instance polluting particular areas or creating high pollution risks for the future. In such cases, deontology forbids treating the people living in the concerned area or the future generations as “pure means”, i.e. to inflict damages on them that the persons profiting from the innovations would not accept for themselves. The main shortcomings of deontology when applied to transport innovations are, according to Van Wee and Roeser, that it is difficult to apply them when the considered innovations cause complex effects.

Contractualism, by asking whether individuals would sign an imaginary contract on the planned innovations, make clear who would take advantage from the innovations and who would be
disadvantaged by them. It is thus possible to identify “winners” and “losers” in transport policies. Contractualist approaches function well when the persons who would carry the risks (or potential negative consequences) of a planned innovation are the same who would profit from it. For instance, drivers carry both the advantages and the disadvantages of an increased speed limit, for they would be able to reach their destinations quicker, but also be exposed to a higher risk of car accidents. In such cases, to test whether the innovations are “acceptable” or not might be quite straightforwardly, for instance by asking drivers which kind of contract they would sign. Such simple-to-handle situations, however, are quite uncommon. More often the group of the persons profiting from an innovation is not the same that pays the major costs for it. For instance, if a new road is built, the people living along the new route (and thus suffering from increased pollution and noise) are usually not the same that will use the new road. One of the main problems of contractualism, then, is that it can easily lead to a stalemate. Since in most cases there are people negatively affected by the innovations, these people can exercise a sort of veto and impede the realisation of the innovations. This shortcoming, however, can be reduced by introducing compensations. These can encourage people to sign a contract even if they lose in some respects, given that they also get some compensation for the disadvantages.

The main strength of egalitarian theories is to introduce considerations regarding the distribution of advantages and disadvantages and to focus the attention on particular groups. Also the idea that certain primary goods should be available to everybody is an important point to be considered when integrating utilitarian CBAs. For instance, accessibility to health care or education institutions can be seen as a primary good and then be considered a very important element for evaluating a proposed transport innovation. Considerations regarding the particular characteristics of the affected groups can re-balance CBAs as well. Regarding the increased pollution of particular transport innovations, for instance, one might consider whether these would strongly affect children (for instance because a new road is built nearby a school), who are more vulnerable than adults. The main difficulty of egalitarian theories when applied to transport policies is that it is difficult to come to a decision about the fairness of a planned innovation. Once the distribution of advantages and disadvantages and their effects on particular groups are evaluated, a decision must still be taken whether these effects are acceptable or not.

In general, non-consequentialist theories are helpful for integrating utilitarian CBAs with considerations regarding equity and fairness. Hence, from a moral, legal and social point of view, it is

19 Of course, one could distinguish between the position of the ones who drive fast and expensive cars and those who drive cheap cars, since the two groups would probably have different views on this point. However, for the sake of simplicity, we do not consider such distinctions here.

important to integrate them in the evaluation of transport innovations. However, as we have seen, each of these theories has shortcomings when applied to complex real-word situations. The suggestion of Van Wee and Roesers, which will be followed here, is not to opt a priori for a given theory, but to adopt a context-sensitive approach, selecting for each situation the theory (or theories) that best fits the scenario. This implies, on a meta-level, an option for non-monistic theories, such as contextualism and moral intuitionism, which acknowledge the existence of multiple, irreducible moral values.

5. NeTIRail-INFRA case-study lines: societal impact of the planned innovations

In NeTIRail-INFRA, three clusters of innovations are planned. WP2 focuses on innovations regarding the track infrastructure, aiming to reduce maintenance interventions. WP3 focuses on the overhead line power supply infrastructures in order to improve their performances. WP4, finally, aims to develop smart technology solutions for low-density lines, in order to minimise the time expenditures and the costs related to maintenance.

At this stage of the project, information on which interventions are planned for which lines is available only for WP2. Consequently, a discussion of the possible effects of specific innovations on particular lines is possible only for the interventions planned in WP2.

For WP3 and WP4, the preliminary non-economic social impact assessment can be currently sketched on a general basis, and will be refined in the subsequent WP5 tasks as soon as more detailed information is available.

The following section develops the general assessment for the WP2, WP3 and WP4 innovations, while the sections 4.2-4.8 analyse the NeTIRail case-study lines and the specific interventions planned for them in WP2, indicating their possible social impact.

5.1 Overall preliminary assessment of planned innovations

Overall, WP2 innovations focus on improving the S&C system, avoiding corrugations, tailoring lubrication and effectively designing transition zones. These innovations are expected to:

- Reduce train cancellations and delays, due to less planned maintenance, less S&C failures and less track/vehicle failure, less track unavailability, thus improving availability, train punctuality and reliability;
- Improve traffic capacity (including increasing the numbers of freight timetables slots) and overall capacity (numbers of passengers and tons of freight) due to increased operation speed at S&C, reduced maintenance and reduced track unavailability;
- Reduce voyage time due to the improvement in the S&C system;
- Improve passengers’ comfort;

21 This analysis is developed from the table “Innovations summary”, NeTIRail internal document.
- Increase running safety and reduce derailments.

WP3 aims to individuate the best technologies to minimize the negative impact of climate change on the overhead power supply system, tailor the new power supply infrastructure to the needs of each line, minimise the life cycle costs and increase reliability of overhead power supplies infrastructures. These innovations are expected to:

- Reduce ticket fares due to the reduction of lifecycle costs;
- Reduce train cancellations and delays, due to less planned maintenance, less track/vehicle and overhead/vehicle failure, thus improving availability, train punctuality and reliability;
- Improve traffic capacity (including increase the numbers of freight timetables slots) due to increased availability of tracks due to less maintenance activity;
- Increase safety of the train operations, due to reduction of failure rates.

Finally, WP4 aims to introduce new smart infrastructure for monitoring tracks of low-density lines, including the use of smartphone sensors in order to assess the track conditions and vulnerabilities. These innovations are expected to:

- Reduce ticket fares due to the reduction of lifecycle costs;
- Reduce train cancellations and delays, due to less planned maintenance and less track failures, thus improving availability, train punctuality and reliability;
- Improve traffic capacity (including increase the numbers of freight timetables slots) due to increased availability of tracks due to reduced maintenance activity;
- Improve ride comfort;
- Increase safety, due to reduction of derailments.

Overall, reductions in ticket fares, reductions of voyage time, improvements of availability, punctuality, reliability, improvements of traffic capacities for passenger trains and improvements in ride comfort can lead to increased accessibility and improvements in terms of health/environment for residents due to the reduction of emissions by motorway traffic. Also safety of passengers, residents and railway employees can be positively affected by the innovations. On the other hand, increases in traffic capacity and especially in the frequency of freight trains can have negative consequences for residents in terms of health/environment by increasing noise. In terms of employment, the innovations can represent a job opportunity for residents but the reduction of maintenance costs through mechanisation can also reduce job opportunities of railway personnel.

The table below summarises the overall discussion of the social impact of the planned innovations.

<table>
<thead>
<tr>
<th>WP</th>
<th>Expected Impact (technical)</th>
<th>Expected impact (social aspects)</th>
<th>Consequences on stakes and stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP2</td>
<td>Reduced planned maintenance, S&amp;C and track/vehicle failures, track unavailability =&gt; Reduced train cancellations and delays</td>
<td>Improved availability, train punctuality and reliability</td>
<td>Improved accessibility for residents and passengers. Improved health/environment conditions for residents (emissions).</td>
</tr>
<tr>
<td></td>
<td>Reduced maintenance and track unavailability =&gt;</td>
<td>Improved traffic capacity and overall capacity</td>
<td>Improved accessibility for residents and passengers.</td>
</tr>
</tbody>
</table>

22 This effect is not reported in the table below because it is not related to particular innovations.
<table>
<thead>
<tr>
<th>WP3</th>
<th>Reduced lifecycle costs</th>
<th>Increased safety of the train operations</th>
<th>Reduced ticket fares</th>
<th>Improved accessibility for residents and passengers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced planned maintenance, track/vehicle and overhead/vehicle failures =&gt; Reduced train cancellations and delays</td>
<td>Improved availability, train punctuality and reliability</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved health/environment conditions for residents (emissions).</td>
</tr>
<tr>
<td>Reduced maintenance =&gt; increased availability of tracks</td>
<td>Improve traffic capacity</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved health/environment conditions for residents (emissions).</td>
</tr>
<tr>
<td>Reduced failure rates</td>
<td></td>
<td></td>
<td></td>
<td>Worsening of health/environment conditions for residents (noise).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WP4</th>
<th>Reduced lifecycle costs</th>
<th>Increased safety of the train operations</th>
<th>Reduced ticket fares</th>
<th>Improved accessibility for residents and passengers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced planned maintenance and track failures =&gt; Reduce train cancellations and delays</td>
<td>Improved availability, train punctuality and reliability</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved health/environment conditions for residents (emissions).</td>
</tr>
<tr>
<td>Reduced maintenance activity =&gt; increased availability of tracks</td>
<td>Improve traffic capacity</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved accessibility for residents and passengers.</td>
<td>Improved health/environment conditions for residents (emissions).</td>
</tr>
<tr>
<td>Smart monitoring and maintenance =&gt; reduced derailments</td>
<td>Improved ride comfort, increased safety</td>
<td>Improved accessibility for residents, passengers and employees.</td>
<td>Improved safety for residents, passengers and employees.</td>
<td>Improved health/environment conditions for employees (less dangerous tasks).</td>
</tr>
</tbody>
</table>

Table 5.1 - Table of overall expected social impact
5.2 Bartolomeu-Zărneşti line (Romania)

5.2.1 Description of the line and of the area

The Bartolomeu-Zărneşti railway has a length of 23.9 Km and was inaugurated on June 6th, 1891. It is a non-electrified, low-density secondary line, used mostly for passenger traffic (see NeTIRail D 1.1). The Bartolomeu-Zărneşti includes 3 stations and 5 stops (see Time Table below) and it is covered in about 35 minutes.

<table>
<thead>
<tr>
<th>Station / Stops</th>
<th>km</th>
<th>R1470 1</th>
<th>R1470 3</th>
<th>R1470 5</th>
<th>R1470 7</th>
<th>R1471 1</th>
<th>R1471 3</th>
<th>R1471 5</th>
<th>R1471 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRASOV</td>
<td>0.0</td>
<td>06:06</td>
<td>07:45</td>
<td>09:24</td>
<td>12:00</td>
<td>14:20</td>
<td>16:12</td>
<td>17:48</td>
<td>20:15</td>
</tr>
<tr>
<td>* BARTOLOMEU</td>
<td>3.1</td>
<td>06:12</td>
<td>07:51</td>
<td>09:29</td>
<td>12:05</td>
<td>14:26</td>
<td>16:18</td>
<td>17:54</td>
<td>20:21</td>
</tr>
<tr>
<td>G-RAL T.MOSOIU HC.</td>
<td>25.2</td>
<td>06:43</td>
<td>08:22</td>
<td>10:00</td>
<td>12:36</td>
<td>14:56</td>
<td>16:48</td>
<td>18:25</td>
<td>20:52</td>
</tr>
</tbody>
</table>

Table 5.2 Time table of Bartolomeu - Zarnesti line

It is situated in the Transylvanian region, among the Southern Carpathians. The line connects Bartolomeu, a suburban area of the city Braşov, with the small town Zărneşti. Several small towns and stations are situated along the route (see map below – small grey squares indicate train stations).

In the past, the line was important for both economy (due to the high concentration of factories in the area) and tourism. Today, this line is considered to have a great development potential for both freight and passenger transport.

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23 Thank to Lucian Anghel from ADS for extensive integration on the area description and for providing the travel times of the line.
24 RCCF Time Table - [http://www.regiotrans.ro/mersul--trenurilor--brasov-zarnesti](http://www.regiotrans.ro/mersul--trenurilor--brasov-zarnesti)
According to the 2011 census, the Brasov region has a population of 597,439 inhabitants. The urban area, with a population of 463,416 inhabitants, has an average density of 428 inhabitants/km². The average density recorded in the rural area of the county is 50 inhabitants/km². In Brasov lives 62% of the urban population of this region.

Most of inhabitants are Romanias (90.75%), followed by Hungarian (7.77%), Germans (0.51%), Romani people (0.56%) and other ethnicities (0.7%).

It was founded in Brasov First Romanian School, first attested in documents in 1495. It hosted Coresi's printing press, which printed the first almanac in Romanian and the first Romanian grammar.

Today, university-level eductaion of the area is concentrated in the Brasov municipality. It includes two public – the "Transylvania" University and the Air Force Academy "Henri Coanda" - and three private institutions - "Spiru Haret" University "Dimitrie Cantemir" and the "George Barțiu".

Students travel from the rural areas to Brasov mostly by road or train transport provided by public or private companies.


Industrialisation of the Braşov area began in the interwar period and was accelerated during the Communist era. Notwithstanding a certain decline in recent years, industry is still very important in the area, heavy industry being predominant, but also including clothes, food, pharmaceutical and other factories and manufactures.\(^{27}\)

The major employers in the county are concentrated in the metropolitan area of Braşov, which attracts employees from the neighboring villages.

The local transport network is good developed and mostly consists of bus lines. The Braşov rail central station is a major traffic centre in Romania, connecting Braşov to other of the most important Romanian cities. In 2008 started the construction of the Braşov Airport and the construction of a highway is planned.\(^{28}\)

The Brasov County\(^{29}\) is one of the most diverse areas in terms of tourism offer in Romania. Its attractions include natural reserves and national parks and historical and archaeological destinations. Tourists travel to this region to practice winter sports, extreme sports as well. Natural attractions include the Piatra Craiului Mountains National Park, hosting rare species of flora and fauna.

The Zărneşti town has a populaton of about 26,677 people\(^{30}\). It used to be an important industrial centre. During the deindustrialisation process that began in 1989, however, most of the factories were closed and today an important economic activity of the area is tourism.\(^{31}\) Several schools (including kindergartens, primary and high schools) and three hospitals (including a psychiatric hospital) are present in the city.

The town of Râşnov and the village of Cristian, situated along the route, count about 17,527 and 4,965 inhabitants respectively.\(^{32}\)

### 5.2.2 Potential innovations

According to D2.2, the innovations potential for this line are:

- “The use of heavier rail sections (e.g. 54kg/m; 60 kg/m, etc.); now there are mixed sections with various rails types.
- Replacing wooden sleepers with concrete sleepers or even pre-stressed concrete sleepers on the entire route;
- Adopting mechanized maintenance to ensure better track geometry and no human errors.
- Adopting rail grade quality from R260 to R350HT and beyond.

• Replacing the remaining 10% of jointed rail with welded rail, so the maintenance activities will decrease.”

These planned improvements aim to reduce maintenance costs in order to make the line more economic. Less maintenance interventions could also mean increased punctuality of the trains and reduced train cancellations (NeTIRail internal document WP2).

5.2.3 Possible effects
Crucial for assessing the societal impact of the mentioned innovations on the Bartolomeu-Zărnești line is to know for which purposes the line is mostly used. The area description provided above suggested that tourism (for both directions) and work/access to major health, education and cultural services (especially for passengers with destination Bartolomeu) could be the most important reasons for travelling.

The passenger survey to be carried out in the next months will be critical for finding out the actual reasons for travelling on this route. Since an important part of tourism taking place in the area is linked to winter sports, in evaluating the survey results the season in which they were administered should be taken into account (a survey carried out in winter might show a higher number of passengers travelling for tourism than one carried out in summer and vice versa).

On the basis of more detailed information on the reasons for traveling and possible clarifications on the planned innovations, possibilities for further societal effects can be explored. For instance, the accessibility to primary goods and services can be influenced by an increase in trains punctuality and reliability; increased income from tourism might have an impact on economic aspects. The planned innovations seem not to have an impact on environmental aspects (this would be the case if a conversion of the line into an electrified line were planned) or on safety. However, these considerations might be revised during the course of the NeTIRail project. Another important factor that could be explored is the possible impact on fairness/distributional matters, i.e. whether particular groups (i.e. elderly, low-income classes, people needing health treatment) could particularly profit or be disadvantaged by the suggested innovations.

5.3 Ljubljana-Kamnik line (Slovenia)
5.3.1 Description of the line and of the area
The Ljubljana-Kamnik line is a non-electrified, busy passenger line. It has a length of 26.3 km and includes 5 stations and 10 stops. It is situated in Northern Slovenia and was opened to traffic in 1891.

The route connects the capital of Slovenia, Ljubljana, with the town of Kamnik. Several smaller towns are situated along the track. One decisive factor for the construction of the line was the establishment of a gunpowder factory on the river Kamniška Bistrica. Today, the route is one of the most important commuter lines of the Slovenian rail network (see NeTIRail D1.1).
As to June 2009, Kamnik’s population consisted of 28,859 people. In the past, the city was important for its industries, which in part declined after 1990. Today, Kamnic is gaining importance as a residential area for people working in Ljubljana, thus increasing both construction activity and traffic problems.

Ljubljana is not only the administrative capital of Slovenia, it is also its largest city and the major cultural, educational, economic, and political centre of the country. It has a high concentration of industries, which are also the most important employer, especially in the food and pharmaceutical sector. It hosts important scientific and research institutions and is a critical transport connection centre.

5.3.2 Potential innovations

According to NeTIRail D2.2, the most important potential innovation for this line would be to transform it in an electrified line. This is critical for improving commuter lines because electrification allows an increase in travel speed but also to shorten acceleration and deceleration in proximity of the train stations. Given the high station density of commuter and suburban lines, these innovations are expected to have a critical impact on the lines. Electrification, however, can be realised only in the long-term.

Beyond electrification, the NeTIRail D2.2 lists the following improvement suggestions:

- “Upgrading ballast from lime stone to a hard stone composition.

• The use of heavier rail sections (e.g. 60 kg/m).
• Replacing wooden sleepers with concrete sleepers or even pre-stressed concrete sleepers.
• Adopting mechanized maintenance to ensure better track geometry and no human errors.
• Adopting rail grade quality from R260 to R350HT and beyond”.

These innovations are expected to bring improvements for freight transport.

5.3.3 Possible effects
The possible innovations that will be introduced to improve this line can potentially have great social impact. Particularly the electrification of the line can have effects in terms of accessibility, environment, and other social aspects.

For instance, better train connections can improve accessibility to the employment, health care, cultural and educational facilities offered by the city of Ljubljana. The way these innovations are introduced and their consequences (i.e. increase in ticket fares) should be considered and evaluated in order to establish whether the benefits and disadvantages of increased mobility are equally distributed.

Regarding environmental and further issues, an improved rail connection to the city of Ljubljana might assist in decreasing car traffic and consequently pollution. Also the electrification of the line as such might contribute to pollution reduction. On the other side, a better connection between the capital and Kamnik can make Kamnik even more attractive as a residential area for people working in Ljubljana. This might lead, in turn, to a further increase in the number of commuters, a further intensification of the construction activity and, possibly, increased costs for living. All these aspects should be taken into account when evaluating the planned innovations.

Surveys will be critical for assessing the effective potential of improvement for this line. In particular, they can offer important information about the factors that matter to passengers and their level of satisfaction regarding the actual situation.

5.4 Pivka – Ilirska Bistrica line (Slovenia)
5.4.1 Description of the line and of the area
The route Pivka - Ilirska Bistrica is an electrified, secondary line with mixed traffic of freight and passenger trains (NeTIRail D1.1 and D2.2). It is 24.5 km long and connects the two small towns of Pivka and Ilirska Bistrica (respectively around 6000 and 4500 inhabitants as of 2008 and 2012).
Pivka lies on the line that connects Trieste with Ljubljana and in Pivka departs a segment of the line connecting to the Croatian port of Rijeka. The route is the shortest track connecting the port of Rijeka to central Europe and is thus of great economic importance, especially for freight transport. However, due to technical conditions (limited axle load category), the line is currently underutilised.

5.4.2 Potential innovations
The innovations envisaged in WP2 for this line aim to decrease the maintenance costs and in detail include (NeTIRail D2.2):

- Upgrading ballast from lime stone to a hard stone composition.
- The use of heavier rail sections (e.g. 60 kg/m).
- Replacing wooden sleepers with pre-stressed concrete sleepers.
- Adopting mechanized maintenance to ensure better track geometry and no human errors.
- Adopting rail grade quality from R260 to R350HT and beyond. IM’s of the line Pivka – Ilirska Bistrica, began the process of improving the rail grade.
- Converting power supply system from 3kVcc to the European standard: 25kVac/ 50Hz.
- Reducing high gradient for gaining traction power and lowering energy consumption”.

5.4.3 Possible effects
The potential of the line is mostly commercial and improvements will aim at expanding the utilisation of the line for freight transport. The planned innovations, hence, seem to have little impact in terms of accessibility or employment for residents and passengers.
However, they might have an impact in terms of employment for the rail sector employees. For instance, mechanised maintenance can relieve problems connected to dangerous or particularly consuming works, but it can also imply a reduction of the number of employees.

Moreover, increased freight traffic might generate disadvantages in terms of noise for people residing along the route and, if coupled with a decrease of passenger train traffic, it might imply disadvantages in terms of accessibility for current passengers. Passenger surveys might be interesting for assessing the reasons for travelling and the importance assigned by passengers to this route.

### 5.5 Divača – Koper line (Slovenia)

#### 5.5.1 Description of the line and of the area

The Divača – Koper route is an electrified, single track, freight dominated route. It is 48 km long. It connects Divača, an important railway node, with the city of Koper and its port on the Adriatic coast of Slovenia.

The route consists of two sections, Divača – Prešnica and Divača – Pula, which have been constructed respectively in 1876 and 1967. The line was electrified in 1976 (NeTIRail D2.2).

Divača is an intersection point for the railway lines connecting Trieste/Venice with Pula and Ljubljana with Vienna. Koper is the only seaport city of Slovenia and is critical for connecting Slovenia with the European economy. The line is thus particularly important for international freight traffic. In the Divača area are present the Škocjan Caves, declared World Heritage by the UNESCO due to their natural, historical and cultural uniqueness.

The route has the characteristics of a mountain railway.
5.5.1 Potential innovations

D2.2 mentions the need to add a second track which will be shorter and with less inclination and possibility to transform the route into a dedicated freight line.

Consequently, the planned innovations mainly aim to increase the axle load capacity, to reduce the maintenance costs and to introduce mechanised maintenance. As specific measures, D2.2 mentions:

- “Should be used heavier rail sections (e.g. 52 kg/m, 54 kg/m, 60 kg/m, etc.). Now are ongoing activities, during regular maintenance, of replacing rails from 49E to 60E (60 kg/m) with pandrol fastening system, but on wooden sleepers. This category of rail permits upgrade of the track to support axle load of 25 tons. IM’s of this line have already started to introduce the UIC 60 type rail as modernization.

- For significant improvement, wooden sleepers should be replaced with pre-stressed concrete sleepers. Pre-stressed concrete sleepers (PSC) and elastic fastenings will provide resilience of the track, ensure the smooth movement of trains at high speeds and have a long life of 50 to 60 years and very low maintenance.

- Inspection of track and maintenance activities should reach a high level of precision and quality; should be considered mechanized maintenance as modernization, in order to ensure better track geometry, facilitate increasing speeds and smooth travel.

- Adopting long welded rails or even continuously welded rails on the entire route, will ensure noiseless travel and minimum maintenance.
• Upgrading ballast from lime stone to a hard stone composition, like granite, quartzite, and other hard rocks, will decrease time and costs of maintenance and also better resist movement for higher loads.

• A significant improvement will be achieved by replacing the rails at the quality of R260 to R350HT and beyond. As shown in the comparative table, IM’s of the line Divača-Koper, began the process of improving the rail grade. Immediate results will be seen by increasing load axle capacity and reducing maintenance costs, especially for vulnerable sections such as curves and switch and crossings points”.

Additionally, D2.2 envisages a conversion of the power supply system in order to conform it to the European standards, thus making the line compatible with European railway networks.

### 5.5.1 Possible effects

The proposed innovations aim at expanding the utilisation of the route for freight transport, as such they are unlikely to have positive consequences in terms of accessibility or employment for residents and passengers.

Transforming the route in a freight dedicated line, on the other hand, can negatively impact on accessibility and employment for residents and passengers.

The innovations, moreover, can have an impact in terms of employment for the rail sector employees. The mechanisation of maintenance activities can both positively affect work conditions and, negatively, lead to a reduction of maintenance personnel.

Considering wealth and environment consequences, increased freight traffic might generate disadvantages in terms of noise for people residing along the route. The construction of a new track should also take into account the existence of the Škocjan Caves in the Divača area.

### 5.6 Ankara- Kayaş line (Turkey) 35

#### 5.6.1 Description of the line and of the area

The Ankara-Kayaş route is an electrified, busy passenger line. It connects the two suburban areas of Turkey’s capital Ankara Sincan and Kayaş. It is 37 km long and has 27 stations. It is the second most important line for passenger transportation among the Turkish state railway lines (See NeTIRail D1.1).

The route is important for commuter traffic.

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35 Thank to Elif Hatica Öztürk (INTADER) for providing information on the Kayas and Divriği district, for updating the census information and for providing the travel times of the Turkish lines.
Ankara, the Turkey’s capital since 1923, has a population of 5,270,575 (2015 census) inhabitants, thus being the second largest Turkish city after Istanbul. A large part of employment opportunities in Ankara are in the public sector, particularly in the administrative institutions of the Turkish government. Industry is also an important employer in Ankara, which hosts the largest industrial park of Turkey. Especially the defence and armament industry are present, both publicly owned and private. Additionally, in Ankara are located production facilities of several global companies of the automotive industry. Ankara is located at the centre of Turkey’s transport network, thus being important also from a commercial point of view. The Turkish public railway system (TCDD) connects Ankara with the other Turkish major cities.36

The suburban town of Sincan has a population of 506,950 inhabitants (2015 census) and is 27 km distant from Ankara. Most of the people commute to Ankara to work, although there are some economic activities in the agriculture and light industry branches in Sincan too.37

Kayas is a district of Ankara with 587,565 inhabitants (2014 census). The income profile of the average population of Kayas is low-income families working in manufactories located in industrial estates. The suburban line has big importance for commuters as it connects Kayas to Sincan and other industrial estates.

36 Source: https://en.wikipedia.org/wiki/Ankara
37 Source: https://en.wikipedia.org/wiki/Sincan,_Ankara
5.6.1 Potential innovations
The most important innovations for commuter lines aim to increase the travel speed and reduce the acceleration and deceleration times in proximity of the stations. To this aim, the NeTIRail D2.2 envisages the following interventions:

- “Adopting mechanized maintenance to ensure better track geometry and no human errors.
- Adopting rail grade quality from R260 to R350HT and beyond.
- The use heavier rail sections (e.g. 60 kg/m)”.

5.6.2 Possible effects
Improvements in the connections between the suburban areas of Sincan and Kayaş and Ankara can have an important social impact, particularly in terms of accessibility and environment. The impact of the improvements appears even more considerable given the number of commuters involved.

Better train connections can improve accessibility to the employment, health care, cultural and educational facilities offered by Ankara. However, in assessing such impact, also factors regarding distribution (i.e. increase in ticket fares) should be taken into account.

A better train connection between these areas can also contribute to decrease pollution and other disadvantages caused by motorway traffic.

Passenger surveys will be very important for assessing the effective improvement potential of this line. They can offer important information about the factors that matter to passengers and their level of satisfaction regarding the actual situation.

5.7 Divriği- Malatya line (Turkey)

5.7.1 Description of the line and of the area
The route Divriği- Malatya is a secondary, rural line, used both for passenger and freight trains. It is electrified and 207,4 km long (NeTIRail D1.1). It connects the small town of Sivas (Divriği being a district of Sivas) in Central Anatolia with the city of Malatya in Eastern Anatolia. Most of the region around the track is a low-density population area. Two towns are situated along the over 200 km route: Hekimhan (around 19.946 inhabitants for the district, according to the 2014 census) and Yazihan (around 14.315 inhabitants for the district, according to the 2014 census). Population density increases in proximity of Malatya.
Divriği is a small town of around 16,040 inhabitants (as of 2015). A large iron mine is present in Divriği, representing the most important iron reserve of Turkey. It was opened in 1935. The capacity of the mine has been recently reduced from 150,000 ton to 400,000 ton per year. Currently, around 250 people are working in the mine.

Malatya is a city with a population of 772,904 people (2015 census). The economy is prevalently agricultural, being Malatya the world’s most important producer of dry apricots, but industries are present as well.

Most of the population in the Anatolian region is Turk, but especially in the south-eastern part the Kurd minority is important.

### 5.7.2 Potential innovations

One purpose of the potential innovations is to decrease the maintenance costs in order to make the line more economic (NeTIRail D2.2). Less maintenance interventions could also mean increased punctuality of the trains and reduced train cancellations (NeTIRail internal document WP2).

Suggestions for improvement include:

- “The use heavier rail sections (e.g. 54kg/m; 60 kg/m, etc.); now there are mixed sections with various rail types.
- Adopting mechanized maintenance to ensure better track geometry and no human errors.
- Adopting rail grade quality from R260 to R350HT and beyond.
• Replacing the remaining 20% of jointed rail with welded rail, so the maintenance activities will decrease” (NeTIRail D2.2).

5.7.3 Possible effects
The possible effects are discussed together with the ones regarding the Malatya-İskenderun route.

5.8 Malatya-İskenderun line (Turkey)

5.8.1 Description of the line and of the area
The Malatya-İskenderun route is 373.7 km long and is electrified. It is a freight-dominated line and connects the city of Malatya with the commercial center Iskenderun.

This line has a crucial economic significance, for it connects the backcountry with the Port of İskenderun and the Iron and Steel plants of the city. The iron ore mined in Divriği is transported to İskenderun by train.

The route crosses a less populated, rural area, the city of Osmaniye (512,873 inhabitants as of 2015) being the most populated centre touched by the route.
İskenderun is a city of 246,207 (2015) inhabitants on the Mediterranean coast. The city is an important commercial and industrial centre, especially for its ironworks and steelworks. It hosts one of the largest Mediterranean ports of Turkey.³⁸

5.8.1 Potential innovations
A series of innovations were considered in NeTIRail-INFRA for this route.

First, a possibility will be explored to transform the route into a freight dedicated one.

Second, a cluster of innovations are planned that aim to modernise the infrastructure, thus decreasing the costs and the time losses due to maintenance. Costs for maintenance are estimated to be the major expenditures for this route. As examples of measures for modernising the infrastructure, NeTIRail D2.2 mentions:

- “Inspection of track and maintenance activities should reach a high level of precision and quality; should be considered mechanized maintenance as modernization, in order to ensure better track geometry, facilitate increasing speeds and smooth travel.
- Adopting long welded rails or even continuously welded rails on the entire route will ensure noiseless travel and minimum maintenance.
- Upgrading ballast from lime stone to a hard stone composition, like granite, quartzite, and other hard rocks, will decrease time and costs of maintenance and also better resist movement for higher loads.
- A significant improvement will be achieved by replacing the rails at the quality of R260 to R350HT and beyond.”

5.8.1 Possible effects
The planned innovations are expected to increase the usage capacity of the line, by decreasing breaks and failures due to maintenance operations. This would mean a higher freight train density, i.e. more and possibly faster trains per day.

A better connection between the hinterland and the port of İskenderun might have a significant impact on the economic activities both on the areas of origin of the route and of destination. In particular, the area of Divriği, where the minerals for the plants in İskenderun are extracted, could experience an increase in its productivity, which will also affect the plants in İskenderun and the port activity. In both cases, this expansion can lead to an increase in employment possibilities, with important social impact.

On the other hand, increasing the freight train density might have a negative social impact in terms of noise. However, given the prevalently rural character of the area crossed by the route, this might not represent a significant problem.

Transforming the route in a dedicated freight line might introduce disadvantages in terms of accessibility for the passengers currently travelling on the line. A survey with passengers on this route will highlight the reasons for which they use they travel by train, how important the line is for them and also the existence of alternative solutions.

³⁸ https://en.wikipedia.org/wiki/%C4%B0skenderun.
6. Survey design

6.1 Scope and aim of the surveys

The questionnaire developed in WP5 is an essential element of the analysis of passenger demand. While some data on demand can be obtained from the train operator companies (e.g. prices, timetables, number of passengers), part of the data needed is not available. Interviewing passengers in the lines of the case study can provide us with this data. The questionnaire should collect information about who are using the trains (socio-demographic characteristics), what are the travel habits of passengers and passengers' perception of the train services that are likely to be affected by the innovations (mainly travel time reliability).

The survey will be of importance to the WP1 as well and to the CBA to be carried out in that WP. The implementation of the set of technological innovations in the railways developed by NeTIRail-INFRA will have implications in terms of costs and benefits for society. The analysis of these changes in costs and benefits requires a good understanding of the current state of the railways systems where the innovations are going to be implemented. The first part of the Cost-Benefit Analysis is related to the impacts on users, i.e. on passenger and freight transport. Crucially, we need to understand the demand for the railways, and how changes in the provision of services can affect this demand.39

After analysing the characteristics of the case-study lines, the NeTIRail consortium decided to concentrate the surveys on the 5 passenger routes. Indeed, the innovation planned in NeTIRail will principally affect passengers, rather than residents or freight-lines employees. The selected routes are:

- Bartolomeu-Zărneşti line (Romania)
- Ljubljana-Kamnik line (Slovenia)
- Pivka – Ilirska Bistrica line (Slovenia)
- Ankara- Kayaş line (Turkey)
- Divriği- Malatya line (Turkey)

The questionnaires have been developed taking into account that some routes have short travel times. These are the travel times for the short routes:

- Bartolomeu-Zărneşti line (Romania): approximately 40 minutes, whit 41% of passengers travelling for the whole route and almost all passengers travelling at least 25 minutes;
- Ljubljana-Kamnik line (Slovenia): approximately 40 minutes;
- Pivka – Ilirska Bistrica line (Slovenia): approximately 16 minutes, the line has three stops;
- Ankara- Kayaş line (Turkey): approximately 30 minutes from Sincan to central Ankara and approximately 20 minutes from Kayas to central Ankara.

6.2 Questionnaires

39 Thank to Manuel Ojeda for integrating this part on the general scope of the surveys.
The draft questionnaires are attached at the end of the Deliverable (s. Annex 1).

6.3 Remaining work towards the surveys
ALU-FR and UNIVLEEDS will develop and distribute a survey strategy with guidelines on how to administer the surveys.

The remaining steps towards the surveys for which effort by the partners administering the interviews is need are:

- Translating the questionnaire;
- Adapting the options for the questions 6 (ticket type), 7 (currency, not for Slovenia) and 22 (income ranges);
- Carry out a pilot survey in June;
- Send feedback to WP1 and WP5 leaders on the pilot surveys;
- Carry out and complete the surveys in October.

7. Next steps in WP5

The preliminary assessment provided in this deliverable will be reiterated on the basis of more specific information regarding:

- the concrete innovations planned for each line under WP3 and WP4 and
- the results of the on-train surveys to be carried out in the next months and which will be analysed in D5.2.

Probably, the future assessment will focus on passengers and accessibility as major stakeholders and stakes categories respectively, since the overall preliminary assessment carried out in section 4.1 shows that most of the innovations will have effects in terms of accessibility and because through the surveys we will have the opportunity to know more about passengers perceptions and needs. This also fits the analysis of WP1, since accessibility seems to be strictly connected with reliability, which will be in the focus of WP1 analysis.

Once these refinements are complete, a quantification effort will be needed in order to quantify the social impact assessment and combine the results of WP1 and WP5 for Task 5.3.

A preliminary step to quantification will be to build value trees for each of the stakes identified. Using value-tree analysis (VTA) we will aim to reconstruct the structure of the connection between the more general, abstract values and interests (in our case accessibility, safety etc.) and the concrete criteria that can enhance or impair their realisation.\(^\text{40}\) An important purpose of VTA is to avoid redundancy, i.e. to ensure that each criterion appears only once in the tree structure. We will build value-trees for each analysed stakeholder group. For instance, a preliminary draft of the tree of the stake “accessibility” for the stakeholder group “passengers” is shown in the figure below:

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The first column indicates the stake analysed. The second and third columns divide it into sub-categories of stakes, becoming less and less abstract. The fourth column indicates the measurable impact categories to establish the entity of the changes. The last column indicates the criteria that will adjust the quantification of the changes for the non-economic social impact assessment.

These criteria combine the results of the on-train surveys with the theoretical framework and the related values presented in section 3. For instance, changes in terms of accessibility will be evaluated also taking into account the importance assigned to the route by passengers, their reasons for travelling and the equal distribution among different stakeholders sub-categories (children, elderly people, high- and low-income people etc...).
8. References


Keeney, Ralph, Ortwin Renn, Ralph Keeney, and Ortwin Renn. ‘Die Wertbaumanalyse : Entscheidungshilfe für die Politik’, 1984.


### RAIL TRAVEL SURVEY

Dear Passenger
Thank you for agreeing to answer this questionnaire about your journey today. This survey is being undertaken by XX on behalf of the NeTIRail-INFRA Project, funded by the European Union. The information you provide will be treated as confidential and will only be used to help plan the railways. Please contact XXX at XXX@XXX for more information.

We would like to start with questions regarding THIS JOURNEY:

**Q1** Please list the stations where you get on and off a train on your journey. This includes your starting station, your final station and any stations where you change trains.

<table>
<thead>
<tr>
<th>starting station:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interchange stations:</td>
</tr>
<tr>
<td>final station:</td>
</tr>
</tbody>
</table>

**Q2** At what time was the train scheduled to depart? (in 24h. format) ... : ...

**Q3** How many minutes before the departure time did you arrive to the station? .......

**Q4** How many minutes does this journey take, from starting to final station? ......

**Q5** What is the purpose of your journey?

- Travelling to school/university
- Travelling to hospital/doctor
- Tourism
- Commuting to/from Work
- Social/Recreation
- Business
- Other (Please Specify)

**Q6** Please indicate which ticket you purchased for this journey

- First Class
- Standard one-way
- Standard return
- I hold a Season ticket
- Reduced
- Advance
- Other (Please Specify)

**Q7** How much did you pay for the ticket selected above? ....... €

**Q8** How often do you make this journey?

- 5 or more days a week
- Once a week
- Less than once a month
- 2 to 4 days a week
- 1 to 3 times a month
- Made journey once only

**Q9** Do you sometimes use other means of transport to reach the destination of your current trip?

- No, only train
- Bicycle
- Car
- Motorbike
- Bus
- Taxi
- Other (Please Specify)
About your travel PREFERENCES, NEEDS and PERCEPTIONS:

Q10 What would have been an ideal train departure time for you?
(for example, imagine you could suggest a new service to the train operator) (in 24h. format) ... ...

Q11 When was the last time you experienced a train delay in this line?

Today ...........................................  Yesterday ...........................................  Less than 5 days ago ...............
Less than 2 weeks ago ...............  Less than 1 month ago ...............  Less than 2 months ago ..........
More than 2 months ago..........  Cannot remember ....................  Never in this line .................

Q12 In that occasion, how many minutes was the train delayed? ...... minutes

Q13 In general, how often do the trains on this line arrive on time to the destination?

Always on time ......................  Often on time ..............................  Sometimes on time .............
Rarely on time (often late) .......  Never on time (always late) .......  Don’t know/cannot say .......

Q14 In general, when a train in this line is late, normally it is late by:

Less than 2 minutes late ..........  2 to 5 minutes late ...........  5 to 10 minutes late ..........
10 to 15 minutes late ............  15 to 20 minutes late .......  20 to 30 minutes late ........
More than 30 minutes late .......  Trains are never late ...........

Q15 Imagine a hypothetical case where trains on this line were always on time: would you choose a train that departs later than your current service? (e.g. the next service)

Yes........  No........

Q16 Imagine that the train operator could make all the trains be always on time, but in order to do this, they must increase the scheduled travel time (to allow for contingencies).

How many minutes extra would you be happy to accept in the scheduled travel time, if it is guaranteed that all trains will be always on time?

Less than 2 minutes extra .........  2 to 5 minutes extra ...........  5 to 10 minutes extra ..........
10 to 15 minutes extra ............  15 to 20 minutes extra .......  20 to 30 minutes extra ........
More than 30 minutes extra .......  0 minutes, I would not like any contingency time ...........

Q17 If your answer to Q16 was 0 minutes, the reason for this was:

 Delays are not a problem in this line .......  Delays are a problem, but should be sorted in a different way .......
 Other reason [please specify]:

Q18 Please rank the following travel aspects regarding how important they are to you and how satisfied you are with the current level in this train line:

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Importance</th>
<th>Satisfaction with current service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1: Very important</td>
<td>2</td>
</tr>
<tr>
<td>Travel time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punctuality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crowding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interchanges</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Some questions about yourself

Q19 What is your employment status?
- Full time paid employment...
- Part time paid employment...
- Full time self employment...
- Part time self employment...
- Student...
- Unemployed...
- Unable to work...
- Retired...
- Looking after home/family...
- Other...

Q19b If employed, do you have flexibility regarding when to arrive and/or when to finish work?
- Yes: always or very often ...
- Sometimes ...
- No: I have a fixed schedule at work ...

Q19c How often do you use this train route for the journey to work?
- Regularly ...
- Reasonably often ...
- Only occasionally ...
- Rarely (e.g. when car has broken down) ...
- Never ...

Q19d If you could no longer travel to work on this route what would you do?
- Learn to drive and buy a car ...
- Buy a car ...
- Use a car ...
- Take the bus ...
- Walk/cycle ...
- Work from home all the time ...
- Move house ...
- Give up work but look for another job ...
- Give up work completely ...
- Other (please specify) ...

Q20 Gender: Female ...
Male ...

Q21 Age: ... years

Q22 What is your annual personal income? (Before tax and other deductions. If you do not have a regular employment or retirement income, please include any allowances or support from other household members, state benefits, etc. you receive.)
- Under LEVEL 1 € ...
- LEVEL 1-2 € ...
- LEVEL 2-3 € ...
- LEVEL 3-4 € ...
- LEVEL 4-5 € ...
- LEVEL 5-6 € ...
- LEVEL 6-7 € ...
- More than LEVEL 7 € ...
- Don't know/Refuse ...