# RAILWAY PROJECT

# Risk Assessment Report

**Pre-engineering phase 2**
23.10.2017

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**Appendices**

- Appendix N2 Hazard record 1.9.2017
- Appendix N3 Risk matrix
- Appendix N4 CSM regulation 402/2013

# 1 GENERAL

This is a risk assessment report of the Railway Project pre-engineering, phase 2.

Risk assessment is based on the basic principles of the common Safety Method on risk evaluation and assessment according to Commission Regulation (EC) No 402/2013 (Appendix N4). Method is used in the European Union member states in all railway changes.

Risk assessment is based on the pre-engineering Appendix A (*Scope of the Project*) and Appendix B (*Technical Specifications*).

# 2 RISK ANALYSIS

Hazard identification was done in workshops which included designers from VR Track Oy, CSI, UPM and LKSur.

Hazard identification covered all phases of the project (design, construction, commissioning and operation) and covered various risk types which included project risks, railway system risks, work safety risks, environmental risks and social risks. Potential problem analysis was used to identify the hazards.

Hazard identification is based on Appendix A (*Scope of the Project*) and Appendix B (*Technical Specifications*) produced in pre-engineering phase which is also the system definition for the analysis. Separate system definition was not established.

Participants, interviews, meetings and workshops are listed in the Hazard Record (Appendix N2).

Risk estimation was done with the Risk Matrix (Appendix N3). Actions for each risk level are presented in table 1.

**Table 1: Risk measures**

| | |
|---|---|
| Insignificant | Acceptable risk |
| Minor | Acceptable risk, follow up may be needed |
| Moderate | Measures must be planned |
| Significant | Measures must be planned and taken |
| Critical | Immediate measures must be planned and taken |

All identified hazards were recorded to hazard record.

# 3 RESULTS

Total of 70 hazards were identified in pre-engineering phase 2. Hazards were organized by four different types as seen in the table 2 and the figure 1.

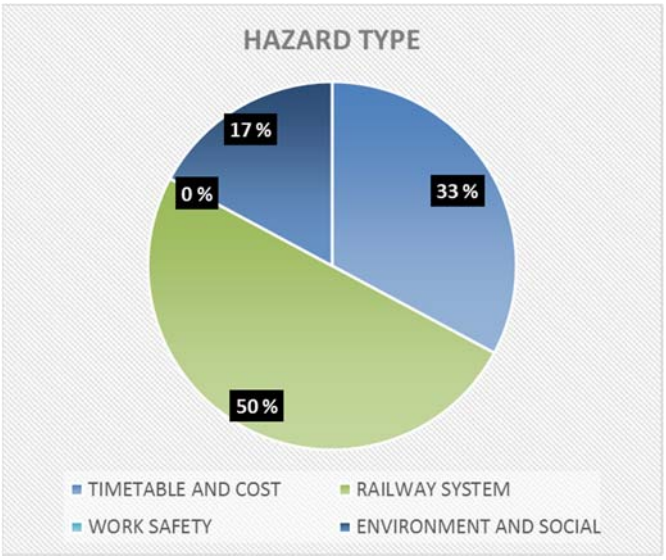


**Figure 1: Hazard type**

**Table 2: Hazard type**

| HAZARD TYPE | PCS |
|---|---|
| TIMETABLE AND COST | 23 |
| RAILWAY SYSTEM | 35 |
| WORK SAFETY | 0 |
| ENVIRONMENT AND SOCIAL | 12 |

Hazards were also organized by phase of the lifecycle in four categories. Results are presented in the table 3 and the figure 2. Risk analysis was focused on operation and construction phase hazards. Multiple choices could be made for single hazard so the total sum of the choices is over the total amount of hazards.

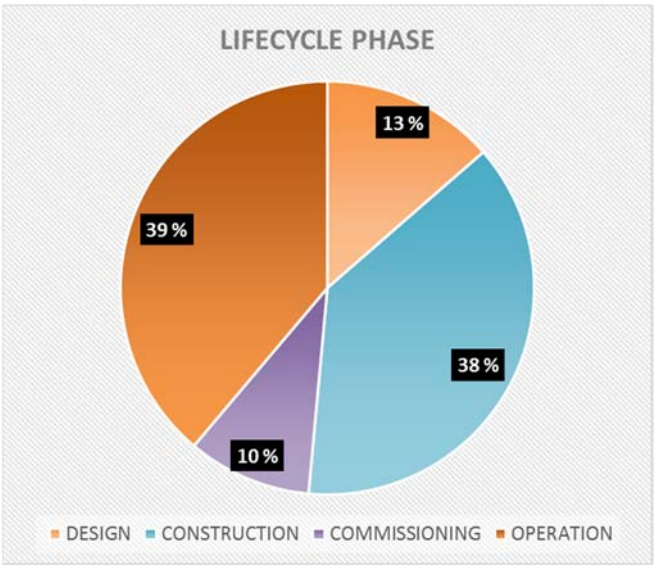


**Figure 2: Lifecycle phase of the hazard.**

**Table 3: Lifecycle phase of the hazard.**

| LIFECYCLE PHASE | PCS |
|---|---|
| DESIGN | 14 |
| CONSTRUCTION | 39 |
| COMMISSIONING | 10 |
| OPERATION | 40 |

Risk estimation is based on the 19.7.2017 version of the Risk matrix. Results are presented in the table 4 and the figure 3 below. Risk level of some of the hazards were not analyzed during the phase 2.

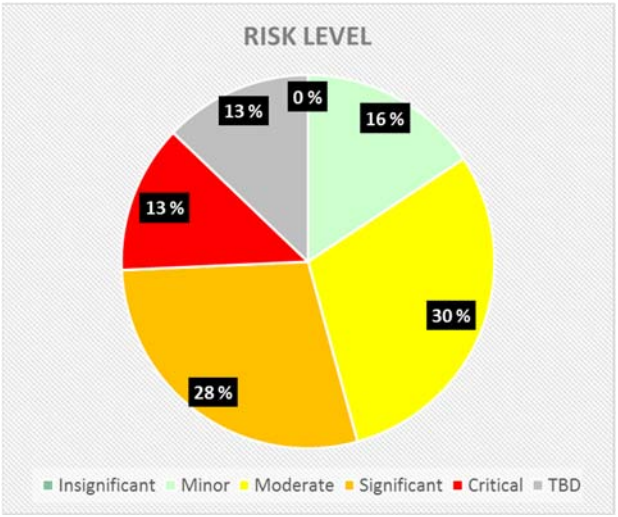


**Figure 3: Risk levels of the identified hazards.**

**Table 4: Risk levels of the identified hazards.**

| RISK LEVEL | PCS |
|---|---|
| Insignificant | 0 |
| Minor | 11 |
| Moderate | 21 |
| Significant | 20 |
| Critical | 9 |
| TBD | 9 |

State of the risk mitigation measures is either open, partially implemented or implemented. Partially implemented means that not all measures are implemented but the risk has been mitigated partially.

**Figure 4: State of risk mitigation measures.**

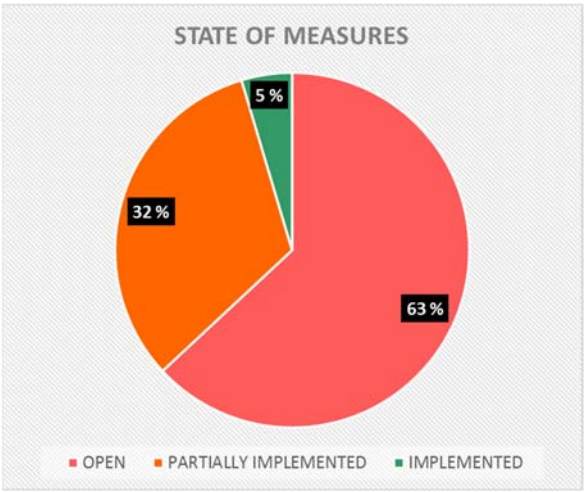


**Table 5: State of risk mitigation measures.**

| STATE OF MEASURES | PCS |
|---|---|
| OPEN | 41 |
| PARTIALLY IMPLEMENTED | 21 |
| IMPLEMENTED | 3 |

Residual risk level describes the risk level after planned or implemented risk mitigation measures. It is an expert estimation what is the risk level after measures have been taken. Residual risk level of some of the hazards were not analyzed during the pre-engineering phase 2.

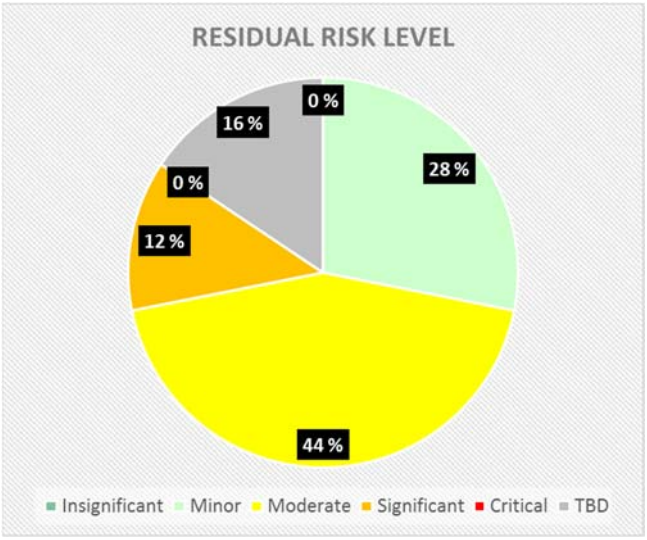


**Figure 5: Residual risk level after mitigation measures (planned or implemented)**

**Table 6: Residual risk level after mitigation measures (planned or implemented)**

| RESIDUAL RISK LEVEL | PCS |
|---|---|
| Insignificant | 0 |
| Minor | 18 |
| Moderate | 28 |
| Significant | 8 |
| Critical | 0 |
| TBD | 10 |

Hazard is controlled if the risk level or the residual risk level after implementing mitigation measures is in acceptable level (insignificant, minor or some cases moderate).

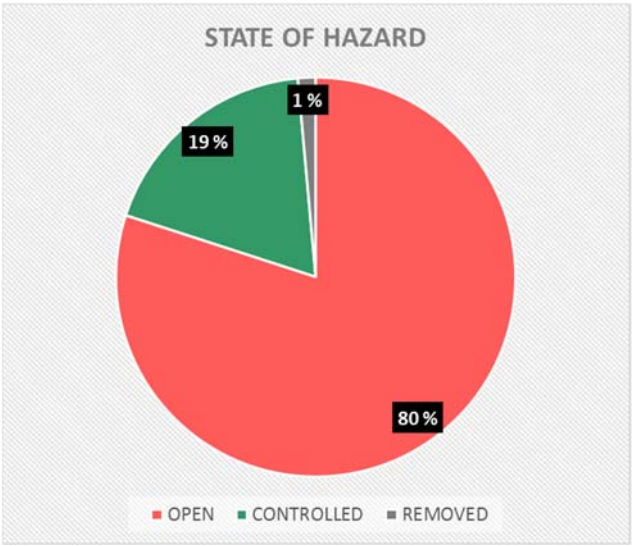


**Figure 6: State of the hazard**

**Table 7: State of the hazard**

| STATE OF HAZARD | PCS |
|---|---|
| OPEN | 56 |
| CONTROLLED | 13 |
| REMOVED | 1 |

# 4 CONCLUSIONS AND REQUIREMENTS

Overall multiple risks were identified and the average risk level is quite high because some basic elements, like safety management system, are not implemented yet. Having said that, acceptable residual risk level can be achieved with right mitigation methods. It is also possible that there is an error in risk estimation because of uncertainties that were present during risk estimation.

Safety management system for Infrastructure Manager and Railway Operator is the core of railway safety. Safety management system ensures constant improvements and safety control. Modern technical solutions demand efficient organization and safety culture. Safety management system also includes methods for risk management which will be covered later.

Defining roles, responsibilities and competence for all parties in railway system is vital for railway safety. Multiple risks evolve around the basic principles of the railway functions.

The role of the Environment Impact Assessment (EIA) and permitting is very important for the project and must be considered by the Railway Contractor. Risk mitigation measures must be updated once EIA is ready.

Constantly changing technical solutions also placed a challenge for the risk assessment so risk assessment is important to update in the next design and construction phases. More detailed analysis is needed. For example, Safety Case for signaling changes is an important element for safety which would not be possible to do in this phase.

Common safety method for the risk management is railway specific risk management process established in Europe around 10 years ago, every change in railway system is covered in the principles of the regulation. It was also used as the basis of this risk assessment.

Infrastructure Manager and Railway Operator shall have risk management process applicable with Common Safety Method for Risk Evaluation and Assessment (EU) No 402/2013 and (EU) 2015/1136 or ISO 31000 Risk Management – principles and guidelines. In case of the ISO 3100, requirements for independent assessment or external audit shall be defined.

Risk management process shall be continued in more detail level in the upcoming phases of the Railway Project.