

## Noise Survey Methodology

### 1. Noise Level Measurements

Measurement of current background noise levels is an essential tool for noise impact analysis. Measurements will be conducted by ISO 1996-2 standard. 2U1K will conduct the measurements with class 1 sound level meters at the 20 predetermined locations (174 representative sensitive receivers identified along the line. These receivers selected in a way to represent the their environment. To have an idea about bacground noise levels, noise monitoring were conducted at 20 locations. Noise and vibration measurement locations were selected in a sense that, stations will cover the locations which are predicted to have the most adverse effects from N&V. For construction and operational period of the project, same baseline conditions will apply, which includes existing railway and casual environmental noise at selected measurement station. Critical aspects of the 174 identified sensitive receptors such as; responsivity, sensitivity, extent etc. analyzed at the field and will be presented in environmental noise assessment chapter. Noise impact assessment and determination of the possible mitigation needs are conducted with a worst case scenario approach for linear projects (motorways, railways...), in other words; representative sensitive receivers are the ones with highest possibility to have adverse effects from N&V. In this way; regional noise impacts will be determined. Potential area of influence and project boundary are not the same concepts in terms of environmental noise. A pre-model study conducted and run to identify the potential area of influence to determine measurement locations and sensitive receptors. ) for 48 hours on the project site and peripherals as indicated on IFC requirements. A weather station will also collect meteorological data with sound level meters. Windspeed, direction, humidity and temperature values also will be submitted with the measurement results. Hourly measurement results will be presented with day and night equivalent noise values.

### 2. Railway Noise Modeling

The SRM II Dutch National Railway Noise Modeling Method or CNOSOSS will be followed during road modeling process. This method is the suggested and accepted noise model in the European Noise Directive END Railway traffic loads in terms of quantities and types of the rail vehicles per concerned time periods (day – night), speed profiles in different parts of the railway and physical characteristics from railway itself should be integrated to the project as well as topography and meteorological conditions.

The buildings on the peripheral of the railway need to be implemented by their heights. The environmental noise prediction software will be CadnaA by Datakustik which is widely used and well documented.

### 3. Noise Control & Mitigation Measures

According to impact assessment results, noise control cases will be modeled on locations where noise mitigation needs rise. The cost of scenarios for mitigation measures will be estimated. The exposure analyses need to be done on the population or buildings on the peripheral of the road according to IFC noise limits and WHO's or FTA criteria. The noise impact assessment for the receivers based on the noise limits, mitigation needs will be decided. The exposure criteria will be in accordance with the Project standards.

#### 4. Construction Noise Mapping

Noise levels due to construction activities (Cement batch plants & workshops will be included into the model) will be modelled with noise mapping software and examined according to IFC criteria. The quantities of machine and equipment for the stages of construction will be implemented to the model and noise levels will be calculated at receiving locations.

#### 5. Vibration Level Analysis

Vibration levels of construction and operation will be determined at receiving locations (Receiving locations considered for the vibration analysis the same as those chosen for the noise measurements, because mainly, first row of buildings were selected for the measurements, these would be the mostly affected ones for the operation vibrations and ground home noise). The levels will be assessed according to FTA criteria's depending to the receiver categorizations. In ESIA period, it is aimed to identify the background levels for the construction and operation activities. Our strategy is to calculate the construction sourced noise levels, and recommend continuous monitoring during the construction activities and first years of operation.

#### 6. Needed Documents

- GIS information in ".shp" format containing terrain layer, building layer including height, usage, population, closed physical borders of each building and railway including contour lines with relevant height data.
- Railway schedule in terms of train types per time for the railway sections, i.e. freight trains, high speed trains, intercity trains, car units, train configurations.
- Rail switch locations, train speed profile along the track
- Construction machine and equipment technical information and quantities.
- Blasting operation technical details for tunnel sections
- Transfer routes will be included to the model for the project

#### 7. Deliverables

- Baseline Noise Measurement Report
- Day – Nighttime period noise map.
- Mitigation measures and barrier implemented noise maps.
- IFC format Noise & Vibration Impact Assessment Report of which summary will be incorporated into the main body text of the revised ESIA Report.