Rail Baltica
Coordinated by RB Rail

RB Rail AS

Mineral Material Supply Studies for Rail Baltica Railway Construction

Quantity Assessment Summary

17.09.2018.

Co-financed by the Connecting Europe Facility of the European Union

Content

Summary

RB Rail AS has carried out two desk studies on the supply of mineral materials for the construction of the Rail Baltica railway line in Latvia and Lithuania. Both studies were implemented by SIA Geo Consultants in Latvia and subconsultant UAB Geobaltic in Lithuania and was completed in August 2018. In Estonia similar study done out in 2017 by AS Teede Tehnokeskus on behalf of Rail Baltica OÜ.

Considering the scope of Rail Baltica project the implementation will require a large amount of mineral materials to be used by the construction sector of locally available mineral materials, sand, gravel, limestone and dolomite will considerably increase. It is planned to use all the mineral materials as efficiently as possible, though more detailed volumes needed for the construction of the Rail Baltica will come by the end of the detailed technical design process. The target is to reduce the amount of mineral materials needed for the construction as much as possible, thus increasing the sustainability of the project and track maintenance.

Information on railway layout, technical requirements and main characteristics is based on previous or current studies related to the technical documentation of the Rail Baltica project. The source information that was used for amount estimation of mineral materials contained data on track bed structure and longitudinal profile of the planned Rail Baltica railway route in the territory of Latvia and Lithuania. The quality requirements of the mineral materials are largely based on design guidelines for Rail Baltica railway line. International and national standards were used for identification and classification of mineral materials according to the granulometric composition as well as for the analysis of quality requirements.

Key objectives of these studies were as follows:

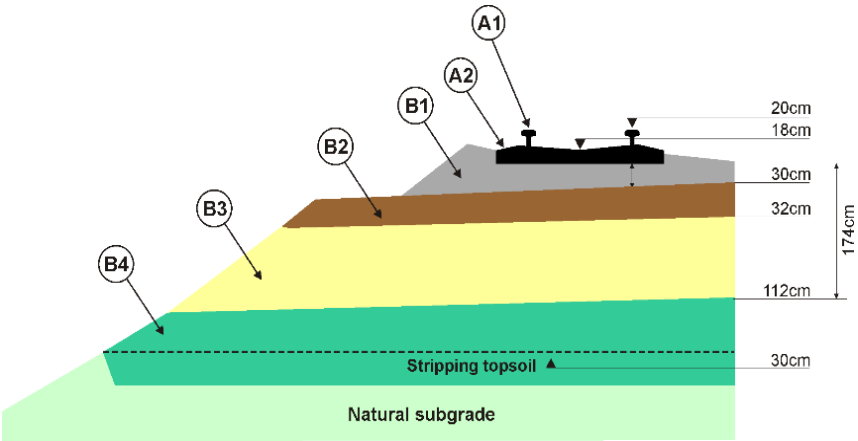
- Analysis of legally binding acts and regulations in the field of exploration and extraction of mineral materials;
- Amounts estimation of mineral materials;
- Quality requirements of mineral materials;
- Analysis of mineral material deposits;
- Survey of the quarry and deposits owner-operators;
- Further recommendations.

Key assumptions and input data

Table-1 Rail Baltica Design Guidelines quality parameters for mineral materials:

Parameters	Layers of the railway track bed		
	Embankment or excavation surface	Prepared subgrade	Sub-ballast
Bearing capacity (Ev2)[1]	upper embankment Ev2 ≥60 MPa (natural soils) Ev2 ≥80 MPa (treated soils)	Ev2 ≥80 MPa	Ev2 ≥120 MPa
Granulometric composition (d/D)[2]	damp areas from 0/63 to 0/500 mm flood zones from 0/63 to 0/500 mm and <5% of material with particle size (D) 0.08 mm	from 0/20 to 0/125 mm	From 0/32 to 0/40 mm
Resistance (LA+MDE)[3]	damp areas LA+MDE ≤100 flood zones LA+MDE ≤80	LA+MDE ≤60	LA+MDE ≤40
Sensitivity to water (MB)[4]	flood zones MB ≤0.1	-	-
Resistance to water absorption	-	≤ 0.2g/100g	≤ 0.1g/100g

Figure 1. Rail Baltica Railway Typical Cross Section 1



- Ballast (18 cm between and around the sleepers; 30 cm below the sleepers);
- Sub-ballast (32 cm);
- Prepared subgrade (112 cm);
- Thickness of the frost resistant layer determined in the design guidelines is 174 cm.

Table 2. Overall demand and locally available mineral materials for construction of railway and road infrastructure per sections of the Rail Baltica railway route

	Rail Baltica railway route sections in the territory of Latvia			
	Northern	Riga	Southern	Total
Overall demand of sand, sand-gravel and dolomite, mill. m3	8.6	10	3.8	22
Available reserves of dolomite, mill. m3	33	38	28	99
Available reserves of sand, sand-gravel, mill. m3	62	46	32	140

Figure 2. Most feasible deposits by type and explored stocks of mineral materials in Latvia

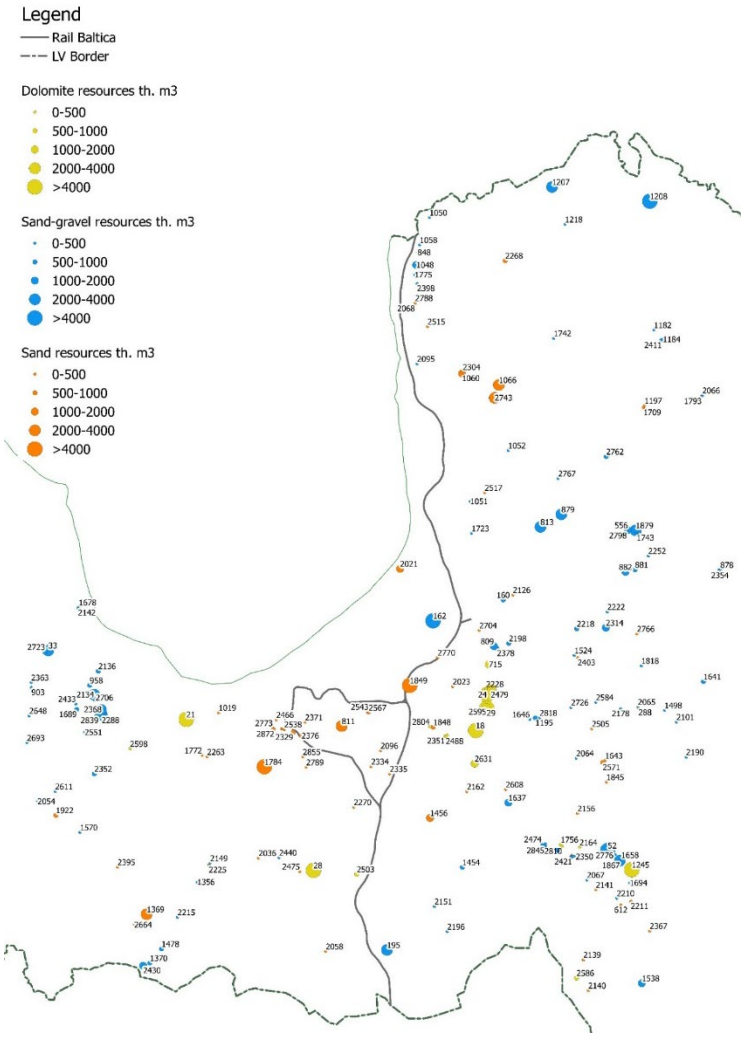


Table 3. Overall demand and locally available mineral materials for construction of railway and road infrastructure per sections of the Rail Baltica railway route

Constructive layer	Rail Baltica railway route sections in the territory of Lithuania				
	Kaunas–Ramygala	Ramygala–Latvia	Kaunas–Vilnius	Kaunas–Poland	Total
Overall demand of sand, sand-gravel and dolomite, mill.m3	8.2	9.3	9.6	9.2	36
Available reserves of dolomite, mill. m3	-	97	-	-	97
Available reserves of sand and gravel, mill. m3	94	26	266	52	438

Figure 3. Most feasible deposits by type and proven reserves of mineral materials in Lithuania

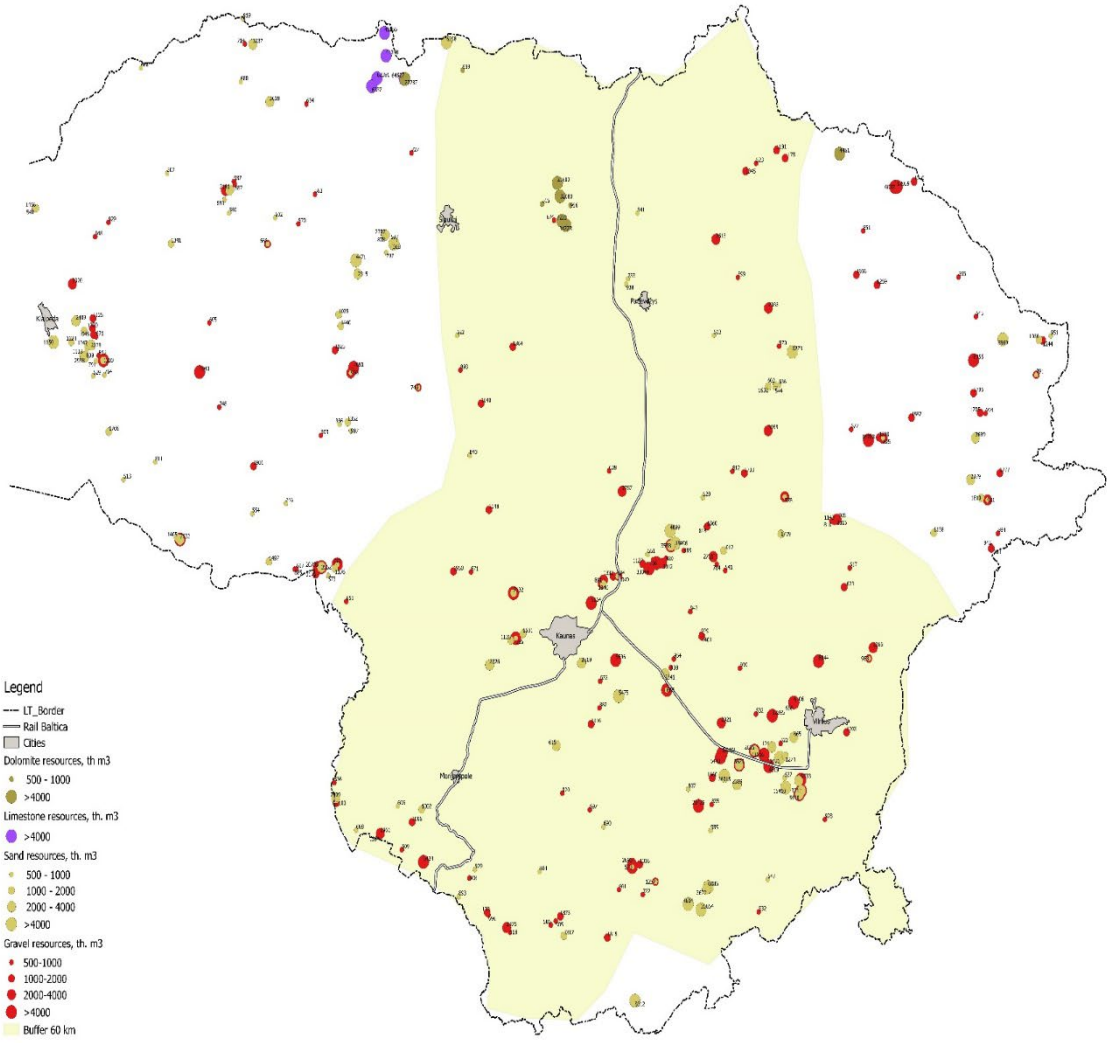
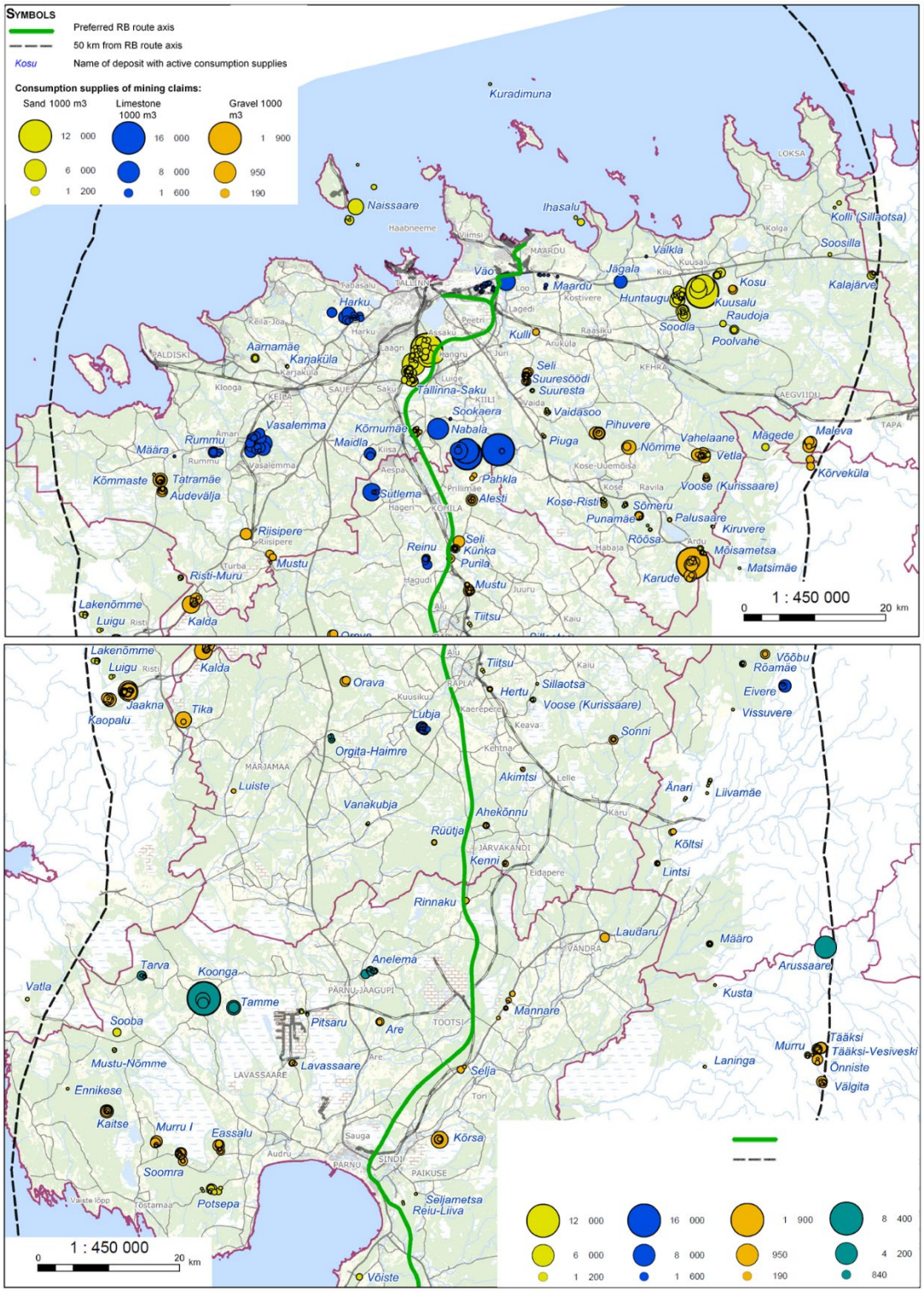
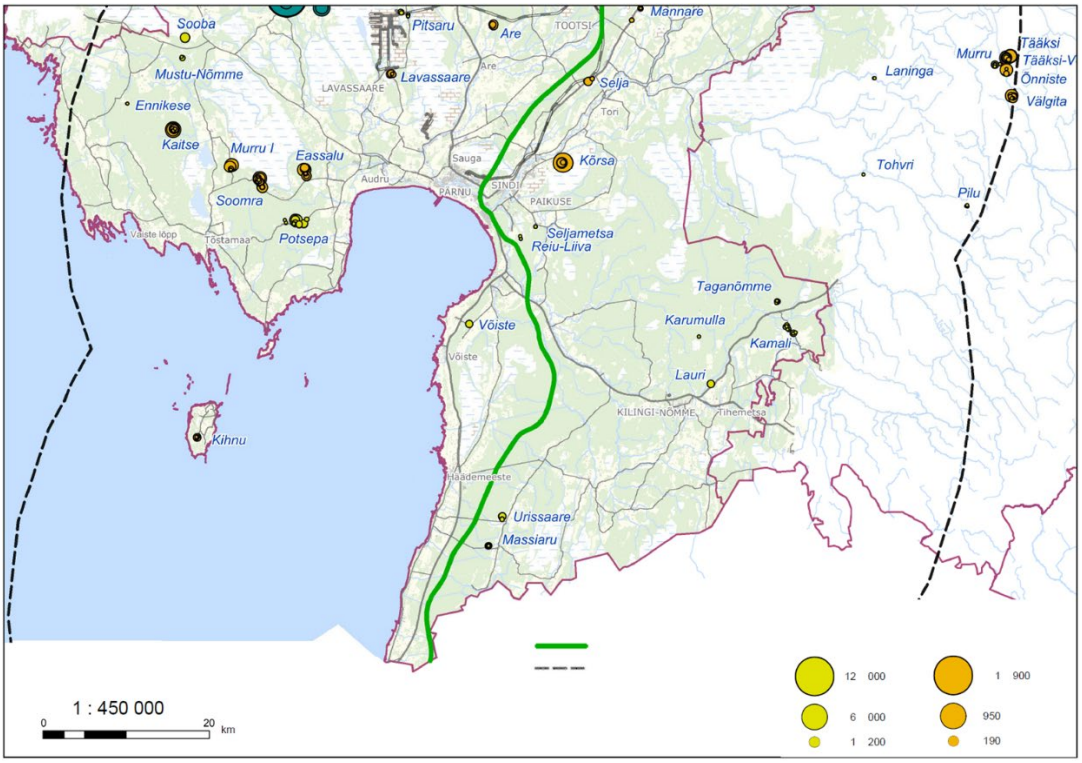


Table 4. Overall demand and locally available mineral materials for construction of railway and road infrastructure per sections of the Rail Baltica railway route

Type of aggregate	Rail Baltica railway route sections in the territory of Estonia			
	Pärnu, 1000 m3	Rapla, 1000 m3	Harju, 1000 m3	Total, 1000 m3
Crushed stone for track ballast	564	282	277	1123
KG1 crushed stone	557	277	271	1105
Crushed stone for road subbases and railway maintenance roads	241	93	92	426
Aggregates for railway embankment	3945	1828	3844	9617
Other aggregates for embankments for roads and railway maintenance roads	1787	1391	1777	4955
Available reserves of carbonary stone, m3	Satisfactory capacity	Good capacity	Satisfactory capacity with (LA35), not sufficient	Satisfactory capacity
Available reserves of sand, sand-gravel, m3	Satisfactory capacity	No quarries with sufficient capacity	Satisfactory capacity	Satisfactory capacity

Figure 4. Consumption supplies of mining claims by mineral resources in the service area of the Rail Baltica route in Estonia.





As assumed the demand for materials to be used for the construction will be higher during the first three to four years when substructures, bridges, viaducts, access roads and road crossings will be built. Based on very general assumptions the following annual demand of locally available resources could be forecasted:

- First year: 15% of the overall demand;
- Second year: 30% of the overall demand;
- Third year: 30% of the overall demand;
- Fourth year: 15% of the overall demand;
- Fifth year: 5% of the overall demand;
- Sixth year: 5% of the overall demand.

Main findings and conclusions of the studies

1. **What kind of mineral materials are currently locally available and are there enough re-serves?**

   Yes, there are enough reserves, except ballast layer which shall be imported. Locally available mineral resources are sand, sand-gravel, limestone and dolomite. Supply of crushed hard stone is not considered as locally available in the required amount and quality.

2. **What are the quality requirements for the mineral materials?**
   The quality requirements of the mineral materials are largely based on design guidelines for Rail Baltica railway line. International and national standards were used for identification and classification of mineral materials according to the granulometric composition as well as for the analysis of quality requirements.

3. **Is there currently sufficient information available on the quality parameters of the quarry mineral materials?**
   Acquired register data on the quality of locally available mineral materials are very fragmented and does not provide a completely clear picture on their compliance with the requirements set out in the design guidelines. Thus, further studies will be carried out in the near future.

4. **Does material supply logistics impose any significant constraints and what distance is considered to be sufficiently feasible from the Rail Baltica Railway corridor?**
   Material supply logistics does not impose any significant constraints in transportation of materials from them most feasible deposits. The quantity and availability of materials in the most feasible deposits within the primary investigation area of 60km-130km is fully sufficient for entire route of the Rail Baltica railway line.

5. **Would local producers be able to provide mineral materials in the required quality for the construction of Rail Baltica Railway?**
   The aim is to use as much as possible local materials and do it in the most efficient way. To assess the quality of the available mineral materials further investigation will be done during the Mineral Material Quality Assessment study. The procurement for it was announced in September 2018. Similar procurement in Estonia named Samples of Rail Baltica Mineral Resources and Laboratory Analysis was launched in October.

6. **Would it be required to consider opening new quarries?**
   It is considered that mineral material reserves are sufficient however Rail Baltica project would not be the only construction project, so it shall be taken into account if local producers would be able to provide mineral materials with the current capacity.

Further steps and actions to be taken

Consequently, the owner/operator or producer should apply for additional laboratory testing in order to clarify the existing or additional quality parameters of extracted mineral materials. Unfortunately, the existing legislation does not impose requirements for a stage of geological exploration in the active deposits that are under exploitation. Thus, if there is necessary to re-estimate stocks or specify certain quality parameters of mineral resources, all the stages of geological exploration should be implemented according to the national legislation.