**Annex No 3: Technical specification**

**Technical Specification**

**FOR PROCUREMENT**

“STUDY ON CLIMATE CHANGE IMPACT ASSESSMENT FOR THE DESIGN, CONSTRUCTION, MAINTENANCE AND OPERATION OF RAIL BALTICA RAILWAY”

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1. General
	1. Study on climate change impact assessment for the design, construction, maintenance and operation of Rail Baltica railway (hereinafter – the Study) is aimed to identify climate change associated risks for the design, construction, maintenance and operations of Rail Baltica railway. Furthermore, the study shall assess pre-designed infrastructure vulnerability and propose feasible climate change adaptation measures for the railway design, construction and operation phases.
	2. Aim of the Study is to help manage the additional risks arising from climate change, consider how Rail Baltica project is vulnerable to climate variability and change, assess current and future climate risks to the success of the project, identify and appraise relevant and cost-effective adaptation options to build climate resilience, and integrate adaptation measures (resilience measures) into Rail Baltica project lifecycle.
	3. The key objective in the face of uncertainty is therefore to define and implement design changes (adaptation options) which both provide a benefit in the current climate as well as resilience to the range of potential future climate change effects.
	4. The study outcomes are not intended to override, nor define, the design standards that project developers should be working to, and they are not a substitute for detailed design at the project level. Project design should always be undertaken in accordance with Rail Baltica Design Guidelines, national requirements and/or professional codes of practice as appropriate. However, in cases where national requirements or design codes do not yet incorporate consideration of climate change, these study outcomes may help to improve risk management still further.
2. Scope of the study: GENERAL REQUIREMENTS
	1. The following minimal list of the most important climate variables shall be considered for the Study:
		1. extreme (air) temperature (frequency and magnitude) and extreme heat, frost waves,
		2. rainfall (monthly average and annual average values),
		3. extreme rainfall (frequency and magnitude, as example maximum daily precipitation, maximum monthly precipitation, frequency and duration of such situations),
		4. snowfall (monthly average and annual average values, snow coverage duration),
		5. extreme snowfall (frequency and magnitude, as example maximum daily precipitation, maximum monthly precipitation, frequency and duration of such situations),
		6. maximum wind speed (wind direction, frequency and magnitude),
		7. humidity (frequency and magnitude),
		8. frost penetration depth of soil (average duration, average and maximum frost penetration depth),
		9. dew (frequency and magnitude)
		10. thunder (frequency and magnitude),
		11. other variables recommended by the Contractor.
	2. The following minimal list of the most important climate-related hazards shall be considered for the Study:
		1. sea level rise,
		2. sea water temperature change,
		3. seawater ice coverage duration,
		4. storm frequency and intensity,
		5. flood frequency and intensity,
		6. wild fire,
		7. draught and glazed frost,
		8. freezing rain,
		9. fluvial flooding,
		10. fog,
		11. storms (frequency and intensity),
		12. hail and snow storm (frequency and intensity),
		13. solar radiation,
		14. coastal erosion
		15. frost penetration depth of soil,
		16. ground instability/landslides,
		17. urban heat island effect (intensity)
		18. vegetation season length,
		19. other hazards recommended by the Contractor.
	3. Climate change assessment shall consider impacts at least on following risk areas:
		1. railway service availability,
		2. asset damage – asset deterioration and reduced life of an asset,
		3. infrastructure and operations reliability,
		4. operations safety,
		5. variance in OPEX and the need for additional CAPEX,
		6. railway business operations, including loss of income,
		7. increased risks of environmental damage and litigation,
		8. reputation damage,
		9. changes in market demand for goods and services,
		10. increased insurance costs or lack of insurance availability.

Appropriate (quantitative) assessment criteria shall be developed.

* 1. Design Guidelines respective parts change or update proposals within the scope of this service shall be assessed against the following criteria (non-exhaustive list):
		1. additional cost of adaptation measures (preventive vs. corrective measures), e.g. cost of non-implementation of specific requirements or measures to improve resilence to climate change,
		2. delays and additional cost due to the repair of environmental damages during the works or delayed start of railway operations,
		3. non-compliances to environmental requirements causing legal risks.
	2. The following Rail Baltica assets and processes shall be considerd for the Study:
		1. On-site assets and processes,
		2. Inputs (water, energy, others),
		3. Outputs (products, markets, customer demand),
		4. Transport links,
		5. Project types: rail bridge, rail viaduct / estacade, ralway track in cut or on embankment, overhead catenary system, signalling system, traction power supply system, access roads, station terminals, road viaducts over railway, noise barrriers, etc.
	3. The Study shall cover full asset lifetime as defined by Design Guidelines.
	4. Geographical area to cover:
	5. Estonia, Latvia and Lithuania for high level data and outputs,
	6. Rail Baltica railway corridor area in Estonia, Latvia and Lithuania for detailed data and outputs. As corridor is considered a space of approx. 20km to each side of railway axis. The Contractor may revise the definition of corridor are at the inception phase of the study if duly justified.
1. Reference material

The following guidelines, studies and plans / strategies is recommended to be used for the study (the Contracotor shall provide reasoning for this):

* 1. EU and national Climate Change related studies and strategies,
	2. Relevant river basin management plans,
	3. Relevant climatic and hydrological data on the study area,
	4. EIA, spatial planning and technical studies on Rail Baltica alignment in Estonia, Latvia and Lithuania,
	5. National design values of climatic data.
1. Scope of the study: SPECIFIC REQUIREMENTS

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| **WP** | **Title** | **Scope** |
| **WP 1** | **Analysis of climate projections, relevant studies and strategies** | WP1.1 Meteorological study on key meteorological indicators relevant for railway infrastructure design, construction, maintenance and operation. The following shall be covered within the scope:* 1. Identify key meteorological indicators relevant for railway infrastructure design, construction, maintenance and operation in Rail Baltica railway corridor,
	2. Collect available historical data of those indicators, including those relevant data in possession of national road, railway, aviation infrastructure management authorities,
	3. Collect available climatic projections of those indicators,
	4. Collect publicly available information and other necessary data,
	5. Define what are relevant extreme climatic variables and hazards and analyse their frequency in past 10-20 years.

WP 1.2 Overview and analysis of climatic projections in the region. The region is considered to be Baltic Sea Region:* + 1. Climatic projections shall contain high-level data – observed values and projections relevant to identified key meteorological indicators,
		2. Provide comprehensive data tables and schematic maps of these data both observed and future. Provide shematic maps for the geographical area of the study. Shematic map layout to be agreed with Contracting Authority,
		3. Provide key conclusions as to projected climate change.

WP 1.3 Analysis and benchmarking of strategies and studies with relevance to climate change adaptation in railways in EU and in particular in the Baltic Sea Region. |
| **WP 2** | **Risk identification and assesment, vulnerability assesment** | WP 2.1 Identification of climate hazards and variables * 1. Contractor shall identify relevant climate variables and secondary effects / climate-related hazards. It is likely that not all the climate statistics and projections of relevance will be available, thus the Contractor may provide justified expert’s guess based assumptions,
	2. Contractor shall analyze and present how changing climate variables and hazards can affect choice of technology options and identify those which are resilient to current climate variability as well as the range of potential climate futures over their lifetimes,
	3. Contractor shall assess sensitivity of Rail Baltica assets and processes to climate variables.

WP 2.2 Assessing the exposure to climate hazards: observed and future climate. * 1. The contractor shall assess Rail Baltica assets and processes exposure to observed and future climate periods, define exposure areas. Exposure data should be gathered for climate variables and related hazards to which assets have high or medium sensitivity.
	2. Contractor shall provide comprehensive schematic maps of assets having high or medium sensitivity to both observed and future climate. Provide shematic maps for the geographical area of the study. Shematic map layout to be agreed with Contracting Authority.

WP 2.3 Vulnerability assessment of the pre-designed infrastructure * 1. Contractor shall perform further analysis of critical design thresholds most sensitive to climate, e.g.analyse climate risks and test robustness of critical design components to a range of climate futures.
	2. Vulnerability assessment observed and future climate. for each climate variable/ hazard which could impact the project.

WP 2.4 Production of Risk assessment* 1. The risk assessment of analysing climate hazards and their impacts shall provide basis for Clients future decision-making. The risk assessment process shall work through assessing the likelihoods and severities of the impacts associated with the hazards identified and assessing the significance of the risk to the success of the Rail Baltica Global project delivery. The risk analysis shall build upon the vulnerability analysis and focusing on identifying risks and opportunities associated with the medium and high vulnerabilities.
	2. Risk assessment shall provide comprehensive understanding of cause-effect chains linking climate hazards to the performance of the project across technical, environmental, social and financial dimensions, as well as the interactions between factors to be considered.
	3. Contractor shall prepare and facilitate a risk identification and assessment workshop to identify how climate-related risks could affect the performance of the project and its options. Climate-related thresholds shall be defined quantitatively, the Contractor shall provide input information and finalize it after the workshop. Risk probability and impact (consequences) have to be assessed. The outcomes of the workshop shall be put into risk register and visualized in risk matrix
	4. To complete risk assessment task, the Contractor has to develop a comprehensive assessment of magnitude of each risk, first developing typical magnitude of consequences values for various risk areas.
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| **WP 3** | **Adaptation option development** | WP 3.1 Identification of and proposal for the climate change adaptation measures to be implemented in the design, construction and operation phases of Rail BalticaWP 3.2 Adaptation measures feasibility assessment and roadmap for implementation:* 1. The focus of adaptation measures feasibility assessment shall be reduction of climate change impacts on operational, environmental and social performance of Rail Baltica.
	2. The assessment criteria shall respond to all risk areas as per 2.3.
	3. Considerations of adaptation measure timing shall be provided, covering at least proposals on when to invest in adaptation measure (now along with delivering Rail Baltica or later during the project life-cycle / assets life-cycle or post the projects lyfe-cycle).
		1. The roadmap of adaptation measures implementation - Rail Baltica climate change adaptation action plan shall cover at least:Define adaptation measures for design, construction and operations and maintenance phases of the project,
		2. Provide timeline, cost and responsible authority for the implementation of the adaptation measures,
		3. Review and analyse Design Guidelines relevant parts and provide justified proposal of the design criteria to be changed,
		4. Review Design Guidelines part “Adaptation to Climate Change” (RBDG-MAN-029) and propose update in line with the findings of this Study,
		5. Develop proposals, if neededfor further in-depth studies to develop on most critical risks.
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1. Deliverables and deadlines
	1. The Contractors shall provide the folowing deliverables within specified deadlines:

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| --- | --- | --- | --- |
| **No.** | **Deliverable** | **Scope** | **Deadline** |
| 1 | Inception Report | 1. Update of methodology and organization
2. Climate related data and projection availability analysis. Contractor shall assess during the inception phase and present in the inception report. The contractor shall provide the methodology to substitute missing data (both historical and projections). Data shall be sourced from public databases. If some data are available fee-based, Contractor shall prepare and present the needed datasets and their costs at inception phase and Contracting Authority will take care on data acquisition.
3. Risk register, risk matrix, assessment of magnitude of risk consequences table
 | CD\* + 4 weeks |
| 2 | Interim Report  | Climatic projections analysis, risk and vulnerability assessment, adaptation measures long-list and initial assessment. | CD\* + 12 weeks |
| 3 | Draft Final Report | Draft Final Report | CD\* + 12 weeks |
| 4 | Final Report | Full scope of the Study  | CD\* + 16 weeks |
| 5 | Final report presentation workshop | Presentation of Study outcomes with focus on proposed adaptation measures and proposals to update Design Guidelines | CD\* + 18 weeks |
| 6 | Re-submission of final report  | Re-submission as per Contracting Authority comments | CD\* + 20 weeks |

* 1. Time schedule

| **Deliverables/Reports** | **No. of copies** | **Submission schedule** | **Approval through Contracting Authority** |
| --- | --- | --- | --- |
| Inception Report | 2 hard copies, 1 soft copy | CD\* + 4 weeks | 2 weeks after reception |
| Interim Report  | 2 hard copies, 1 soft copy | CD\* + 12 weeks | 2 weeks after reception |
| Draft final report | 2 hard copies, 1 soft copy | CD\* + 12 weeks | 2 weeks after reception |
| Final Report | 2 hard copies, 1 soft copy | CD\* + 16 weeks | 2 weeks after reception |
| Final report presentation workshop | 2 hard copies, 1 soft copy | CD\* + 18 weeks | 2 weeks after reception |
| Re-submission of Final Report  | 4 hard copies, 1 soft copy | CD\* + 20 weeks | 2 weeks after reception |

(\*) CD: commencement date of the procurement Agreement (contract)

* 1. Payment schedule and main conditions of the Procurement Agreement

5.3.1. Service Fee in the amount of EUR ([amount] euro and [amount] cents); and value added tax (VAT) at the prevailing rate (\* currently [●]%) amounting to EUR ([amount] euro and [amount] cents). Schedule of payment of Fee After delivery of the following Deliverables and signing of the Provisional Acceptance Note and/or Final Acceptance Note the Contracting authority (also – Principal) shall pay following amount of the Fee:

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| --- | --- |
| **Deliverable** | **Payment amount** |
| Interim Report  | 30% |
| Final Report | 30% |
| Re-submited Final Report | 40% |

5.3.2. Payments will be made within 30 (thirty) Days after the date of issue of the invoice.

5.3.3. Contractual Penalty: In the event of failure by the Contractor to meet any Study Milestone and/or supply any Deliverable, the Contractor shall be liable to pay to the Principal a penalty of zero point one percent (0.1%) of the amount of the total Fee payable under Procurement Agreement with respect to the relevant Study period for each day of delay with meeting any of the Study Milestones and/or supplying any of the Deliverables however, that the total amount of penalty payable by the Contractor under this Clause for the relevant works, shall not exceed ten percent (10%) of the total amount of the Fee payable in consideration of such works. In the event of failure by the Principal to pay any amount the Principal shall be liable to pay the Contractor (Fee) a penalty of zero point one percent (0.1%) of the amount of the amount invoiced for each day of delay with meeting the payment obligation; provided, however, that the total amount of penalty payable by the Principal under this Clause shall not exceed ten percent (10%) of the total amount remaining unpaid under the relevant invoice.

5.3.4. Principal’s Right to Terminate Immediately: The Principal may terminate Procurement Agreement immediately upon giving the other Party a written notice of termination explaining, in reasonable detail, the reason for termination, if CEF Co-financing for further financing of the Study are not available to the Principal. In such a case, the Principal shall pay the Contractor the fees in respect of the Study provided under this Agreement up to the date of the notification of the termination of this Agreement and the Principal is not obliged to pay contractual or any other penalty or damages to the Contractor.