MORAVA CORRIDOR MOTORWAY PROJECT
CLIMATE CHANGE RISK ASSESSMENT SUMMARY

To:	JP Morgan, UK Export Finance, Multilateral Investment Guarantee Agency (Lender Group)				
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1. INTRODUCTION

1.1 Project Overview

The Government of the Republic of Serbia (GoS) is developing the Morava Corridor Motorway Project (the Project) which will connect central Serbia and Pan-European Corridors 10 and 11. The Project is a 112 km dual-carriageway motorway located approximately 200 km south of Belgrade in a low-level flood plain along the Morava River.

Ramboll UK Limited (Ramboll) has been retained to provide Independent Environmental and Social Consultant (IESC) services for the benefit of JP Morgan, UK Export Finance and the Multilateral Investment Guarantee Agency (the Lender Group). In its role as IESC, Ramboll completed an Environmental and Social Due Diligence (ESDD) review, the results of which were reported to the Lender Group and other stakeholders in our Gap Analysis Report issued on 29/05/2020.

One of the findings of the Gap Analysis Report was that a Climate Change Risk Assessment (CCRA) should be conducted for the Project to meet the requirements of the Equator Principles 4 (EP4). The CCRA includes an assessment of physical climate change risks that could pose a material risk to the Project, and Issue 3 of the CCRA was issued on 03/12/2020. This document comprises a summary of the CCRA for disclosure by the Lender Group. Please refer to the full CCRA report for detailed analysis.

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1.2 Climate Change in Serbia

Climate change has exposed Serbia to more frequent extreme weather events, primarily floods. Significant flooding was recorded in 1980, 1981, 1988, 1999, 2002, 2005 and 2006; with the most extreme flood occurring in 2014 when more than 200 mm of rain fell in western Serbia within a week.

Serbia has also experienced droughts in recent years. In particular, in 2012, temperatures exceeded 35ºC for more than 50 days, resulting in more than 1,000,000 hectares of lost

agricultural production and over USD141 million in damages. Climate change projections indicate that Serbia faces a high probability of continuing temperature increases, along with more frequent and prolonged droughts and heatwaves.

In order to understand the risks of climate change to the Project, site-specific climate projections and national-level sources of climate change information were collated and reviewed. Both national-level and site-specific sources of climate information indicate a clear increasing trend in annual mean temperatures, seasonal temperatures, and extreme temperatures in the Project location within the 25-year funding period of the Project.

Although there is limited publicly-available information available for climate parameters, some of the national-level sources of climate information indicate increasingly extreme precipitation trends in Serbia. In particular, the USAID climate risk profile for Serbia states that total annual precipitation on extreme rainfall days is predicted to increase by 21% to 31% by the mid-century. This is corroborated by site-specific climate projections from the CMIP5 climate model ensemble, which suggest that significant increases are likely to occur at the Project location. These climate model projections suggest that the current 1 in 10 maximum daily precipitation event will become 1 in 8 by 2035, and the 1 in 100 maximum daily precipitation even will become 1 in 66 by the same time. Such an increase in extreme rainfall events would present a risk to the Project given the history of flooding in the region in recent years.

2. OUR APPROACH

Our approach to conducting the CCRA focused on collecting and reviewing information relating to both the design of the Project and expected climate change impacts in the region that are likely to be relevant over the 25-year funding period of the project.

The methodology included the following steps:

- Review of publicly available data to gather information on historic and projected climate in Serbia at the national level;
- Definition and review of down-scaled climate projections for the Project region;
- Identification of climate risks to the Project in the context of climate change;
- Consultation with the motorway (Bechtel-Enka Joint Venture or BEJV) and river regulation (Jaroslav Cerni Water Institute or JCWI) design teams to understand whether and how design parameters incorporate allowance for climate change effects, and whether any additional design measures were employed to mitigate the effects of extreme weather and climate change;
- Professional judgement to assess whether the planned mitigation measures are likely to be sufficient to mitigate the impacts of climate change; and
- Development of recommendations to improve Project resilience.

3. CLIMATE RISKS AND RECOMMENDATIONS

Following review of Project documentation and discussions with BEJV, it is apparent that the project has not been designed specifically to be resilient to future climate. However, given the focus on the 25-year project funding period and existing mitigation measures, most physical climate risks identified are unlikely to pose a significant risk to the Lenders or to the Project as a whole, providing the mitigation measures are successfully implemented.

The risks arising from the predicted climate change effects were evaluated and the following principal recommendations are made.

3.1 Refinement of Flood Modelling

BEJV confirmed that historic rainfall data for the period 1961 – 2019 was used as the basis for the design (asset drainage) and flood risk was evaluated from JCWI parameters that included historical flood data including 2014 when a serious flood event occurred in the region. An additional factor of safety was employed in setting finished levels (1.0 m) and design freeboard (0.5 m) for the Project.

It is considered that the above factors of safety in the Project design may be sufficiently protective against effects of fluvial flooding in the short term. However, due to the absence of a comprehensive catchment-wide flood model, a material risk remains that this may not be the case across the financing period as a whole until such evidence is provided. This is exacerbated by the projection of increased likelihood of high intensity precipitation events in the future.

The fluvial risk was already considered material to the Project during the ESDD review, and a recommendation was made for a full catchment 2D model to be developed to inform potential risks to the Project. This need is further emphasised by the CCRA, and it is imperative that this modelling is carried out and that climate change projections are incorporated for the lifecycle of the asset. A Catchment Management Plan should be developed and used to mitigate flood risk to the Project in the future, together with relevant operations and maintenance (O&M) procedures. The Project has confirmed that development of a catchment-scale 2D model is in progress, and initial results will be available by Q1 2021.

3.2 Climate Change and Drainage Design

The motorway drainage is designed to a 1 in 10 year historical precipitation event, with 'oversized' pipes to act as additional storage and some outfalls discharging at levels that could be compromised by fluvial flooding.

Failure of the drainage system to absorb future rain events may lead to risk of aquaplaning and general operational safety.

It is recommended that a 'climate change' allowance is calculated and the performance of the most critical drainage sections that discharge into the flood plain are reviewed, specifically in the context of demonstrating its ability to accommodate different future high intensity precipitation events.

3.3 Inclusion of Climate Resilience Measures in the Operation and Maintenance Manual

Recognising that climate change is uncertain and that resilience planning is a long-term exercise, we recommend that measures are included in the O&M Manual to reduce potential climate risks and enhance the resilience of the Project.

The O&M Manual should provide detail of routine maintenance frequency, including ensuring that drainage systems and culverts are free from debris and no blockages occur at critical points. The manual should specify that drainage systems should be inspected prior to predicted heavy rainfall events to reduce the risk of flooding.

In addition, we recommend regular inspection and repair of materials that are less resilient to climate extremes (e.g. pavement surface) should be undertaken during the operational phase. In

particular, a regular programme of maintenance of bridge structures should be undertaken. This should include general inspection (and post flood inspection), monitoring and replacement of the asset components where necessary to avoid structural failure.

The O&M Manual and design performance should be reviewed at the outset of each major maintenance event, and be informed by up to date climate projections to ensure the climate resilience of the asset is adequate on an ongoing basis for the rest of the Project lifecycle.

Ramboll considers that the above climate change allowance considerations in the O&M Manual are material to the Project compliance and should be mandated in the loan documentation.