ARUP

Public Water Management Company Srbijavode

European Bank for Reconstruction and Development

Environmental and Social Impact Assessment, Climate Change Assessment and Technical Assessment for Pambukovica Dam in Serbia

Cumulative Impact Assessment

Reference: 2025/17

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Abbreviations

Abbreviation	Definition
AoI	Area of Influence
BOD	Biochemical Oxygen Demand
BMP	Biodiversity Management Plan
CH	Critical Habitat
CI	Critical Impact
CM	Cadastral Municipality
COD	Chemical Oxygen Demand
CIA	Cumulative Impact Assessment
DO	Dissolved Oxygen
EHS	Environment, Health and Safety
EBRD	European Bank for Reconstruction and Development
ESIA	Environmental and Social Impact Assessment
E&S	Environmental and Social
GEP	Guaranteed Ecological Flow
GHG	Greenhouse Gas
HLA CAP	Historical Land Acquisition Corrective Action Plan
IFC	International Finance Corporation
IHA	International Hydropower Association
INNS	Invasive Non-Native Species
MAFWM	Ministry of Agriculture, Forestry and Water Management
MBTS	Metal-enclosed Box-Type Substation
PAP	Project Affected Person
PBF	Priority Biodiversity Feature
PM	Particulate Matter
PR	Performance Requirement
RWMS	Regional Waste Management System
VEC	Valued Environmental Components
WEMMP	Water and Environmental Monitoring and Management Plan
WMD	Water Management Directorate
WQ	Water Quality

1. Introduction

1.1 Overview

The Kolubara River basin in northwest Serbia has a history of frequent flooding and was identified as a significant risk area in the 2012 Preliminary Flood Risk Assessment. The severity of the issue was highlighted by a major flood in May 2014, which caused widespread damage. In response, the 2018 Kolubara River Basin Catchment Study proposed the construction of the Pambukovica Dam as a flood mitigation measure (the "Project").

The Project is envisaged to be on River Ub approximately 21km upstream from the confluence to Tamnava River, which is 15km west from the settlement of Ub. Location of the Project belongs to cadastral municipalities of Pambukovica, Radusa and Gola Glava. The Project would reduce flooding downstream through water retention in the reservoir and associated attenuation of high flows. The Project will be implemented by the Public Water Management Company Srbijavode ("Srbijavode"), the national body responsible for water management, including water use and protection from pollution. Srbijavode is also responsible for management of risks associated with water bodies (such as flood risk).

This Cumulative Impact Assessment (CIA) Report aims to assess the combined effects of multiple projects on key Valued Environmental Components (VECs) such as air quality, surface water, soil, noise, greenhouse gas emissions, land acquisition, and biodiversity. Following the IFC Good Practice Handbook [1], the methodology involves a structured approach: the assessment identifies and analyses the baseline status of each VEC; evaluates the cumulative impacts across multiple projects that may be being planned, constructed or operated in the vicinity of the Project; and determines the significance of these impacts to prioritise management actions.

This CIA Report has been developed as an integrated part of the ESIA Package and should be read alongside the Environmental and Social Impact Assessment.

1.2 Methodology

The methodology for this CIA Report will follow the six-step approach of the Cumulative Impact Assessment and Management – IFC Good Practice Handbook [1]. These are described in Figure 1 below.

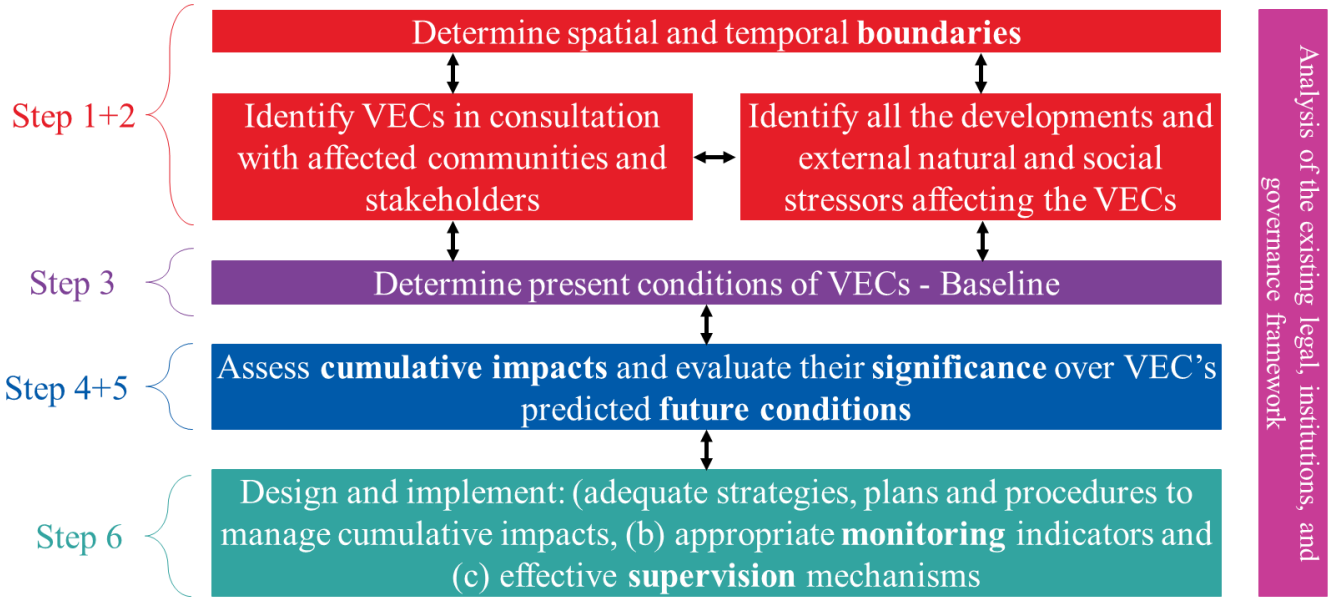
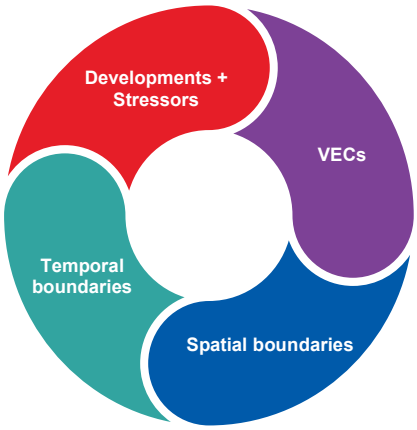


Figure 1. Overview methodology of the CIA. Source: IFC Cumulative Impact Assessment Good Practice Handbook adapted by Arup [1]

1.2.1 Step 1 – Scoping of Boundaries + Stressors

The primary objective of Steps 1 is to establish the spatial and temporal boundaries of the assessment. This was defined to analyse which associated facilities, planned projects or E&S stressors will be scoped into the analysis. Then, in accordance with the defined boundaries, stressors affecting the condition of the VECs were assessed, these encompassed other projects / E&S stressors such as associated facilities, proposed initiatives, and natural environmental processes such as extreme climatic events that could have a significant impact on the VEC. Once this process was completed, it was repeated again for each VEC, where separate spatial and temporal boundary were further refined. Spatial and temporal boundaries were defined up to the point where it is considered that the VECs are no longer experiencing significant impacts:

- For most of the VECs, other projects / E&S stressors considered within the spatial boundary within the Area of Influence (AoI) established in the ESIA.
- For the temporal boundaries, the Project lifespan is projected to be ~80 years. Given the uncertainties involved in the planning process and the lack of information, for some VECs a reasonable timeframe for consideration is the construction phase of the Project only.



1.2.2 Step 2 – Scoping of VECs

The primary objective of Step 2 is to identify the VECs that will be analysed in the CIA. In accordance with the IFC Good Practice Handbook, VECs are defined as *"environmental and social attributes that should be considered based on their relevance in assessing risks"*. VECs included in the CIA were limited to those that are directly or indirectly affected by the Project, with a particular emphasis on prioritising those that are most at risk from the Project's contribution to cumulative impacts. Based on the identified projects / E&S stressors and their potential to generate cumulative impacts, VECs were established.

The identification of VECs were limited to those recognised as significant based on tangible evidence. For example, a thorough review of the concerns expressed by stakeholders during the consultations conducted as

part of the Environmental and Social Impact Assessment (ESIA) process, impacts identified in the ESIA and future / planned activities of projects in the area etc.

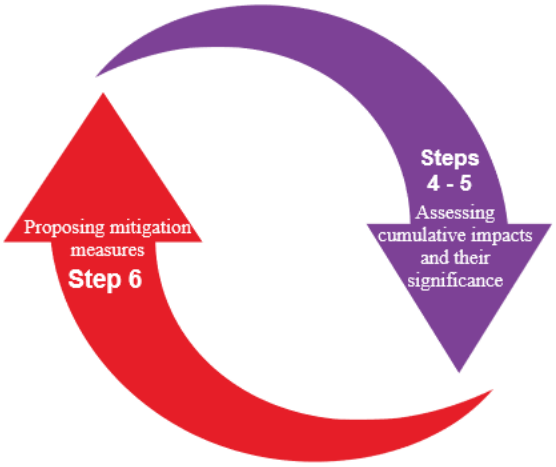
1.2.3 Step 3 – Baseline status of VECs

The main objective of this step was to assess the current conditions of the VECs and evaluate their potential responses to additional pressures. A thorough review of primary and secondary information was conducted during the ESIA process; therefore, this information was included as baseline for the CIA. Moreover, regarding future or planned projects, key sources were consulted such as the:

- Revised Fiscal Strategy by the Ministry of Finance (Addendum 3 – Overview of investment projects in the Republic Budget – expenditures for nonfinancial assets (over 20 million euros), in dinars) [2];
- EBRD, WB, EIB and KfW financed projects (last 5 years);
- Overview of Finalized, Ongoing and Planned Transportation and Construction Infrastructural Projects of the Deputy prime Minister and Minister of Construction, Transport and Infrastructure [3],
- Low Carbon Development Strategy of Serbia [4]; and
- Reform Agenda of the Republic of Serbia [5].

1.2.4 Step 4 and 5 – Assessing cumulative impacts on VECs and their significance

The principal objectives of these steps were to evaluate the potential changes in the conditions of VECs resulting from the identified impacts, to accurately define thresholds, and to assess the significance of the CIs.



An assessment was conducted to evaluate how the Projects will influence the future state of VECs by comparing their projected conditions with and without the Project. Subsequently, the significance of the cumulative impacts was analysed in relation to the vulnerability of the assessed VECs, comparing these changes to an established threshold level. This assessment was centred on the VECs, focusing on how various projects, including the Project, are affecting them, rather than examining how the Project affects different VECs. It is important to note that the significance of the CIs was evaluated after considering the mitigation measures already proposed for the Project in the ESIA. Thresholds in this CIA were established as the values at which the impact becomes a matter of concern. This definition depended on the VEC and the type of impact.

1.2.5 Step 6 – Management of Cumulative Impacts

The primary objectives of this step involved using the mitigation hierarchy to develop suitable management strategies aimed at addressing significant CIs on VECs. Given the significance of the impacts on VECs, for some of them, it became necessary to implement additional mitigation measures beyond those outlined in the ESIA. Consequently, an iterative process was established between this step and steps 4 and 5.

1.3 Assumptions and Limitations

The following assumptions and limitations should be noted throughout the Report:

- It is expected that the Transformer station and its connection to the kV line will be built before the operational phase of the Project.
- Water intake from the Ub River and groundwater for the construction and development of the Transformer station, as well as the connection to the kV line, was assumed.

- The Transformer station and its connection to the kV line construction will occur concurrently with the Project's construction.
- Ecological surveys that have informed the baseline for the Project are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, the absence of evidence of any species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, professional judgement allows for the likely presence of these species to be predicted with sufficient certainty to not significantly limit the validity of these findings.
- Limitation and assumptions pertaining to biodiversity survey and assessment are outline in the relevant chapters of ESIA Volume 1 Book 4: Biodiversity Impact Assessment.
- Analysis of the potential aquatic impacts of Phase 2 of operation has relied on assumptions about irrigation demand (assumed to be 4.2Mm^3 per year - see Technical Assessment Report Appendix 7 – Operational Rules). The analysis suggests that Phase 2 E Flow presented will be sufficient to support the E&S VECs downstream in the River Ub (i.e. within the Project zone of influence) and this is considered in the CIA which looks at impacts beyond the zone assessed in the ESIA. However this hydrological analysis should be confirmed through further modelling of both water quantity and quality (i.e. reservoir discharge water quality) in advance of commissioning Phase 2, particularly if the anticipated irrigation demand changes or projects with a water resource demand come online prior to Phase 2. This commitment is outlined in the Water and Environmental Monitoring and Management Plan (WEMMP) Action 3, which can be found in the Volume I Book 3 Surface Water. There may be a requirement to re-visit the findings of the CIA following any further analysis of Phase 2 reservoir releases.
- The initial socio-economic assessment was limited by the lack of statistical data at village level across all relevant parameters, and the sample size of affected households for primary data collection. Additional surveys with PAPs will be carried out during the disclosure period, ensuring the inclusion of specific subgroups to enhance the representativeness of the data and support the identification of individuals who may be disproportionately affected by the Project. This will contribute to more effective mitigation planning and stakeholder engagement. The data collected through these surveys will be used to update the SIA and HLA CAP, and will inform the preparation of the Livelihood Restoration Plan (including Entitlement Matrix). Land acquisition is still in progress and areas of impact in the ESIA refer to the Project, the reservoir, dam, and associated facilities (access roads). There is currently no information on the scope of temporary land acquisition during construction phase (site office, camp, storage and maintenance areas, deposit areas, etc.), though it can be assumed that the reservoir area, where land has already been expropriated will be used for these construction facilities, wherever possible.

2. Scoping

2.1 Identification of Spatial and Temporal Boundaries

To define the projects / E&S stressors to be analysed in the CIA, initially, the spatial scope as the Social Area of Influence was used, as illustrated in Figure 1.

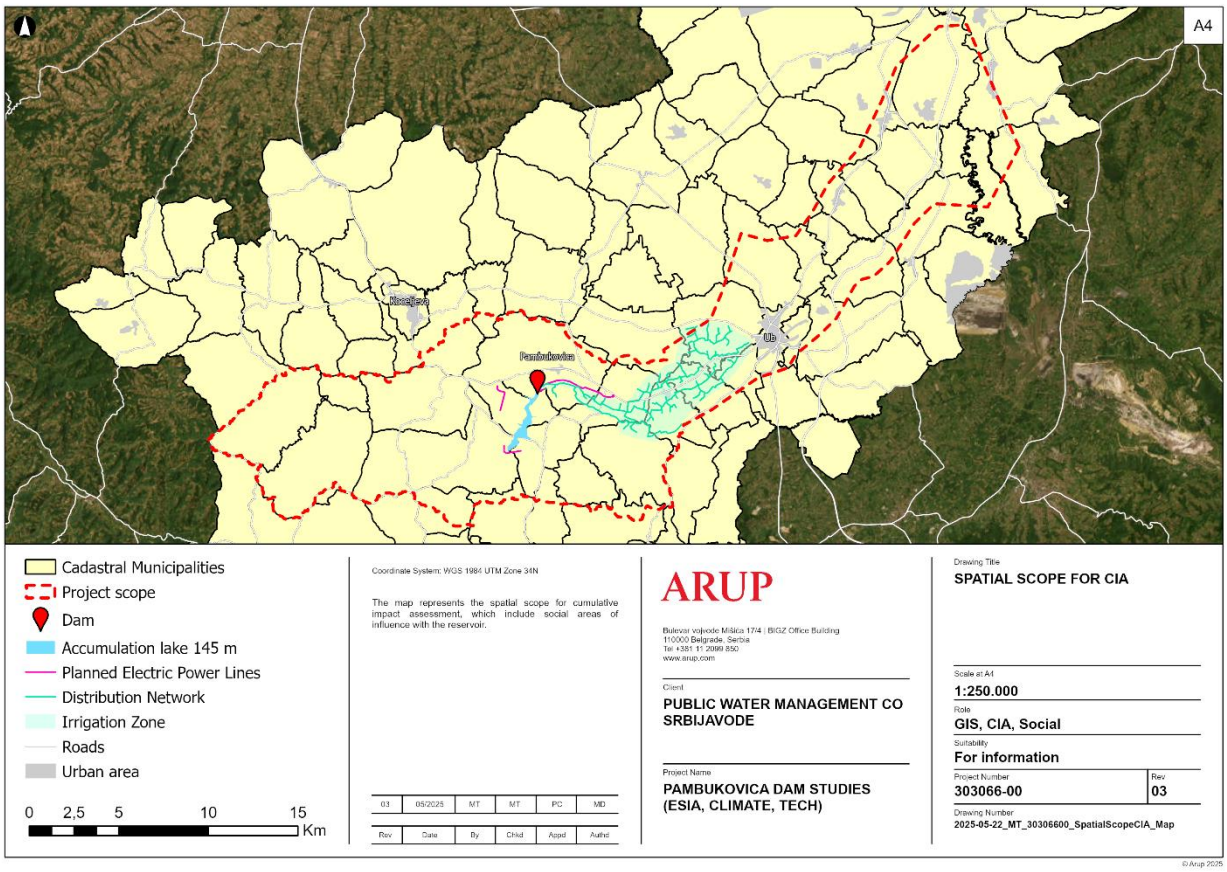


Figure 2: Spatial scope limit for the CIA

For the temporal scope, we reviewed projects financed by the EBRD, WB, EIB and KfW over the past five years, in addition to those included in the Revised Fiscal Strategy by the Ministry of Finance for the upcoming two years, among other sources.

2.2 Step 1 – Scoping of Projects and E&S stressors

Considering the extensive temporal and spatial scope, and taking into account the potential impacts generated by the various projects, Table 1 presents an analysis of each projects / E&S stressors, including the rationale for their inclusion or exclusion from the CIA.

Table 1: Potential projects / E&S stressors, descriptions and scoping status

Type	Name	Description	Scoped in or out
Associated facility	Phase 1 – Transformer station and connection to kV line	The Transformer station is designed to supply power to the Project and is planned to be constructed as a 10/0.4 kV transformer station connected to a separate 10 kV line. The planned transformer station will be built as either a free-standing unit (MBTS) or a pole-mounted unit. The primary power supply is provided from the distribution network (10 kV), to the transformer, supplied from two sides: • The first supply will be achieved through a 10kV overhead line that needs to be built, on reinforced concrete poles (aerial), from the existing 10kV line on reinforced concrete poles that serves to supply the 10/0.4 kV substation "Pambukovica 1". The new 10kV transmission line is approximately 2.1 km long and it is expected to be through underground cable. • The second supply will be achieved through a 10kV overhead line on reinforced concrete poles, which also needs to be built from the existing pole substation 10/0.4 kV "Čučuge rudnik pumpa". This new 10kV transmission line is approximately 0.4 km long and it is expected to be through underground cable. The exact location of the transformer station and separate 10 kV connections will be determined by the next stages of Project documentation and the requirements of the relevant power distribution company. However, currently there are potential locations near to the Ub River, which were considered for the CIA. The Transformer station and its connection to the kV line are **scoped in** to the CIA, under the assumption that their construction will occur concurrently with the Dam's construction, resulting in a temporal overlap. Additionally, given that the designs have not yet been finalised, potential locations for the lines are being considered based on those provided by the Client, which may lead to a spatial overlap with various AoIs related to the Dam.	**In**
Associated facility	Phase 2 – Irrigation system / Distribution Network	Construction of an irrigation system within Ub Municipality is planned to begin in parallel with finalisation of Phase 1 works. Irrigation works will involve construction of the key facilities of the irrigation system distribution network which include pump stations, pressure pipelines and the tanks for daily balancing of the inflow. The rest of the distribution network infrastructure is planned to be developed to full capacity in the subsequent two years. Development of the secondary distribution network is planned concurrently with the primary distribution network. The potential impacts relating the construction and operation of the irrigation network are assessed in the respective ESIA chapters, to the level of information available at the time of the ESIA preparation. This includes analysis of the potential impacts of increased abstraction during Phase 2 of operation on downstream receptors associated with the River Ub. However, details on the design and construction methodology for the irrigation system (i.e. the infrastructure that would convey water from the reservoir to surrounding agricultural land) was limited. Further assessment of this element of the project may trigger the need to update the CIA and/or ESIA. Phase 2 (irrigation phase) will be the subject of the separate E&S assessment. Based on the above, construction and operation of the irrigation system is **scoped out**.	Out
Associated facility	Phase 2 – Relocation of Telekom Srbija cable	The relocation of the existing Telekom Srbija cable is **scoped in** as there may be a potential cumulative impact resulting from the water requirements and construction phase biodiversity impacts of the relocation works during the operation of the Dam. Also, relocation of the	**In**

Type	Name	Description	Scoped in or out
		cable will require temporary construction works, and temporary access and use of the private land. While no permanent land take is expected, temporary loss of access and use of the land (temporary loss of productivity) can be expected, as can temporary disturbance of mobile species.	
Part of the Project	Upstream sediment traps	Upstream sediment traps are structures planned to be constructed in the upstream catchment area of the Pambukovica dam. Seven upstream sediment traps planned are: 1. Sediment Trap Dam 1 - Babinac Stream: Located in the Babinac Stream area. 2. Sediment Trap Dam 2 - Babinac Stream: Also located in the Babinac Stream area. 3. Sediment Trap Dam 3 - Joševa River: Located in the area of the Joševa River. 4. Sediment Trap Dam 4 - Joševa River: Also located in the area of the Joševa River. 5. Sediment Trap Dam 5 - Jasenovac Stream: Located in the Jasenovac Stream area. 6. Sediment Trap Dam 6 - Medvednjak Stream: Located in the Medvednjak Stream area 1. 7. Sediment Trap Dam 7 - Oglađenovačka River: Located in the area of the Oglađenovačka River. Although the construction is scheduled to occur concurrently with the Dam as this is part of the Project, the sediment traps are **scoped out**, as all the E&S impacts resulting from this activity were assessed as part of the Project and included in the ESIA chapters.	Out
PWMC Srbijavode Development	Kamenica reservoir	The construction of the Kamenica retention facility is planned along the Tamnava River. The area of the basin that will be managed by the Kamenica profile is predominantly hilly, featuring a river valley approximately 300 meters wide [2]. There is currently significant uncertainty regarding the design, capacity, and implementation schedule of the Kamenica scheme, even though it is included in the broader Kolubara catchment flood management strategy. This lack of clarity means that a robust assessment of cumulative impacts—particularly those related to flow regime, sediment transport, and water availability—cannot be meaningfully undertaken at this stage. To ensure that potential downstream cumulative effects are considered, the spatial boundary of the Cumulative Impact Assessment (CIA) for Pambukovica has been extended (from that used in the main ESIA chapters) to include Zone 4 (Tamnava and Kolubara rivers to the Sava confluence). Hydrological analysis indicates that changes in the Ub River resulting from the Pambukovica scheme are minor/ negligible and become further attenuated downstream, where the influence of Kamenica would also be realized. However, without finalized technical parameters for Kamenica, it is not possible to quantify the combined effects of both schemes at this time. That said, it should be noted that the potential cumulative depletion zone arising from the Kamenica Reservoir (River Tamnava) and Pambukovica Reservoir (River Ub) would be limited to approximately 25km of the Zone 4, from the Tamnava-Ub confluence downstream to the confluence with Sava River. Given the size of the Sava River, and the relative	Out

Type	Name	Description	Scoped in or out
		hydrological input from the CIA AoI (i.e. Kolubara River watershed), cumulative aquatic effects beyond Zone 4 are not anticipated. Taking into consideration stated above, Kamenica reservoir has been **scoped out.** However, if the Kamenica project progress to a defined design and implementation schedule, it is appropriate and necessary that its cumulative impacts—particularly in combination with Pambukovica—be assessed in a future update to the CIA (or separate CIA developed for the Kamenica reservoir), mainly related to water availability and biodiversity. This would ensure consistency with recommendations of both the Technical, Environmental and Social Assessment which covered Kamenica Reservoir and findings of the 2018 Kolubara Catchment Study	
Third Party Development	Serbia Rail Infrastructure Urgent Renewals	According to EBRD [3], the Project is designed to enhance the quality of rail infrastructure within the Serbian network, with a specific focus on improving operational speed and preventing derailments. These improvements will lead to increased reliability and safety for both passenger and freight rail services. Ultimately, this initiative aims to enhance the attractiveness of the railway sector and promote a shift towards more sustainable transportation modes. The Project started in October 2024 and is projected to finish in April 2039. There is currently an overlap between the AoI relating to labour and the Serbian Railway Infrastructure, specifically with Tents A and B. The AoI relating to labour was defined taking into consideration the availability of the local workforce for construction works, as well as potential for growth of this workforce through skill development and training. However, the sourcing of the workforce for the Project is unclear at this stage, as is the phasing of the works for the railway project. It is concluded that the railway project can be **scoped out**, as any overlapping impacts are likely to be positive.	Out
Third Party Development	Serbian Solid Waste Programme	According to the EBRD [4], the project encompasses the establishment of four regional waste management systems (RWMS) in Kalenic (Central Serbia), Sombor (Northern Serbia), Duboko (Western Serbia), and Nova Varos (Western Serbia), along with associated technical consultancy services to support project implementation and oversee construction activities. Although there may be a potential spatial overlap with one of the farthest part of the social AoI, as noted by the EBRD, the construction of the Kalenic landfill is expected to be completed by the second quarter of 2025. As a result, there will be no temporal overlap, which means this project is **scoped out**.	Out
Third Party Development	Central Balkan Corridor electricity transmission project	According to the Joint-Stock Company Elektromreza Srbije, the construction of the Trans-Balkan Electricity Corridor - Phase I, featuring a 400 kV power transmission system, is a project of significant national and regional importance. This initiative enhances the safety and stability of grid operations, offers higher-quality connections for transmission system users, and facilitates the integration of renewable energy sources [5]. It is noteworthy that this project has been included in the Revised Fiscal Strategy by the Ministry of Finance for the upcoming two years. As stated by the Joint-Stock Company Elektromreza Srbije [5], Section 3 involves increasing the voltage level of the Western Serbia transmission grid to 400 kV between PS Obrenovac and PS Bajina Bašta. This includes the construction of a new double-circuit 400 kV overhead power line between PS Obrenovac and PS Bajina Bašta, as well as the reconstruction of the existing PS Obrenovac and PS Bajina Bašta. While this section may potentially overlap with the project, the construction is scheduled to begin in April 2025, with completion	Out

Type	Name	Description	Scoped in or out
		anticipated in 2027 [6]. Therefore, it is likely that there will be no temporal overlap. As a result, this project will be **scoped out** due to current limitations in information regarding its exact location, which prevent us to confirm any spatial overlap. Furthermore, given that it is scheduled for completion in 2027, it is unlikely that there will be any temporal overlap.	
Environmental drivers	Climate change	The Climate Change chapter indicates that the water scarcity hazard rating is classified as medium to high. This situation intensifies the existing challenges related to water needs and may serve as an additional stressor on the cumulative impacts on surface water in the area. Furthermore, a decrease in the average annual precipitation in the Kolubara District is anticipated. As a result, this may reduce the capacity of precipitation to assist in dust dispersion, thereby influencing the environmental conditions related to dust dispersion.	**In**

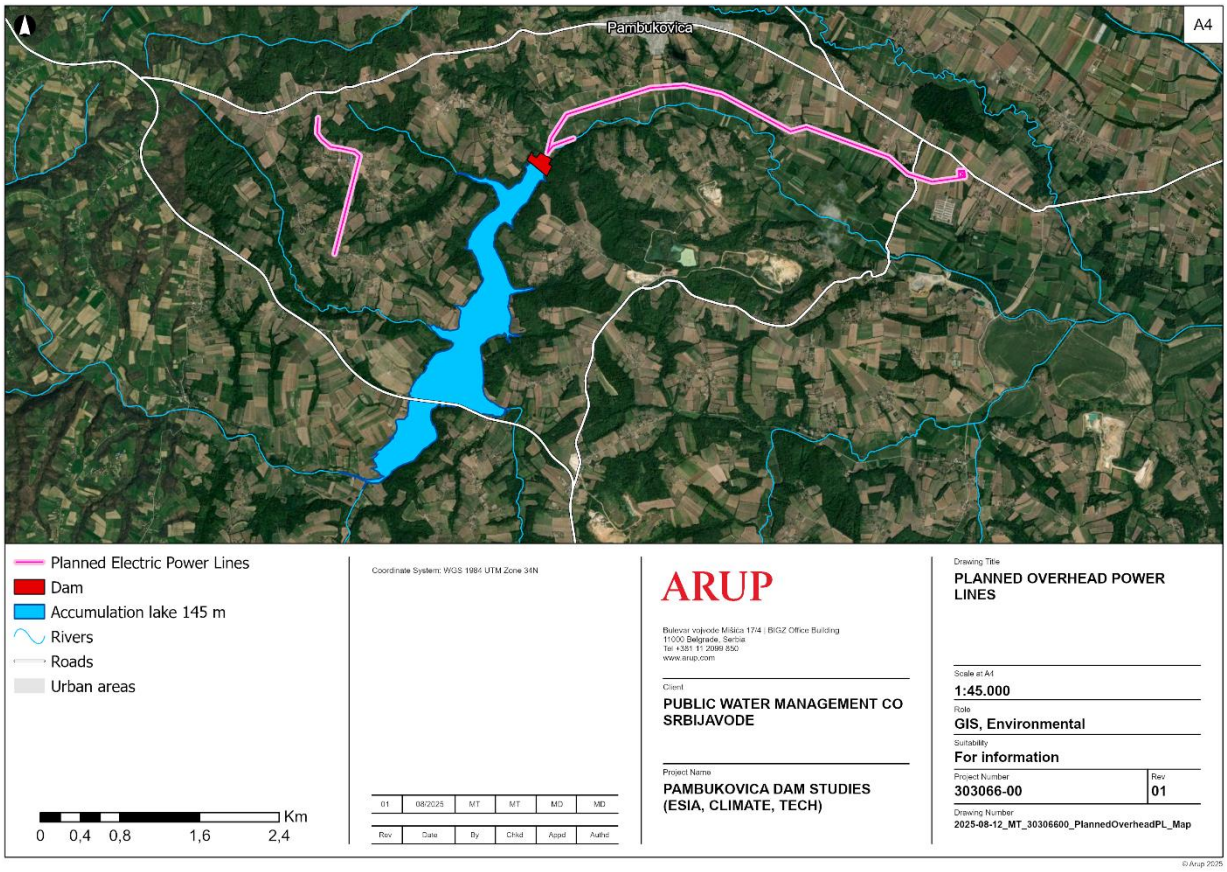


Figure 3 – Two planned Overhead Power Lines planned for construction, which will be used to connect Pambukovica dam (Transformer station and connection to kV line) to the electricity distribution network

2.3 Step 2 – Scoping of VECs

VECs are scoped in or out based on the development scoped in or out (Table 1) and whether there will be impacts expected to the VECs (Table 2).

Table 2: Potential VECs, scoping status and rationale for selection

VEC	Scoped in or out	Rationale for scoping decision
Surface water *Refer to section 3.1 and 3.2.*	Water availability - **In**	The Ub River may serve as a potential source for meeting water requirements during the construction of various developments. Given the requirements of the irrigation system and the minimum flow required for the Ub River, there may be a potential cumulative impact on water availability during the summer and autumn seasons.
	Water quality- **In**	Construction activities associated with the various projects may affect the water quality of the Ub River, potentially leading to cumulative impacts.
Groundwater *Refer to section 3.3*	**In**	Potential groundwater abstraction for construction and the associated risk of pollution resulting from construction activities across various projects.
Air quality *Refer to section 3.4*	**In**	Dust emissions expected during construction of the dam, transformer station and planned power lines.
Noise and vibrations *Refer to section 3.5*	**In**	Noise and vibration from construction machinery for the dam, transformer station and planned power lines.
Soil *Refer to section 3.6*	**In**	Risk of erosion and soil instability due to construction of the dam, transformer station and planned power lines.
GHG *Refer to section 3.7*	**In**	Cumulative emissions from construction and operation of various Projects.
Cultural heritage	Out	Cultural heritage scoped out as the Project is expected to produce only minor impacts.
Biodiversity (terrestrial and freshwater) *Refer to section 3.8*	**In**	There is potential for cumulative effects on biodiversity during construction and operations due to temporary and permanent habitat loss, lack of continuity during construction (river diversion / barrier effect of the dam) and habitat severance, changes in hydrological regime, among others.
Land acquisition *Refer to section 3.9*	**In**	Potential impact on loss of agricultural land (from expropriation or easement); loss of livelihood (from agricultural production); disruptions to the local land market due to limited availability of agricultural land due to the Transformer station, connection to kV line and the irrigation system resulting in higher demand for agricultural land and increased market value for agricultural land. Potential impact of temporary loss of access to land; temporary loss of use of agricultural land (loss of productivity) and permanent loss of high-quality agricultural land. Impacts on traditional livelihoods due to the relocation of Telekom Srbija cable.

3. Assessment of Cumulative Impacts

3.1 Water Availability

Although the final designs for the transformer station and its associated line are yet to be finalised, potential locations for these lines are near the Ub River. Water for the construction of the dam may be sourced from the Ub River, and the transformer station, along with its connection to the kV line, will be constructed prior to the operational phase of the Dam. This will entail additional water requirements, potentially from the same river; therefore, there is a possibility of cumulative impacts due to the overuse of water resources due to abstraction.

Moreover, it is anticipated that during the operational phase of the Dam, the water needs for the relocation of the Telekom Srbija cable may be partially met by using surface water from the Ub River.

Lastly, as detailed in the Climate Change Chapter of the ESIA, climate change may present an additional stressor, as the water scarcity hazard rating is categorized as medium to high. This situation exacerbates critical conditions for water needs, particularly with anticipated reductions in precipitation.

3.1.1 Spatial and Temporal Boundaries

In discussing the cumulative impacts on the water availability, this section will analyse the potential impacts at two key stages. Firstly, during the construction phase, which includes the activities related to the construction of the dam, the transformer station and the connection lines. Secondly, during the operation phase of the Project, it will examine the potential cumulative impact resulting from the relocation of the Telekom Srbija cable and the operation of both the Pambukovica Dam and the irrigation system on water availability.

In accordance with the description provided in the ESIA Volume I Book 3: Surface Water, the area in which the cumulative impacts will be evaluated will include Zone 0 to Zone 3 (Figure 4). The spatial boundary of the CIA has also been extended to include Zone 4, covering the Tamnava and Kolubara rivers to the confluence with the Sava River, as follows:

- *Zone 0:* Sub-catchment above reservoir area inclusive of Ub, Joseva, Ogladenovacka Rivers and Jasenovac and Medveniak Streams.
- *Zone 1:* Sub-catchment of reservoir / inundation area, inclusive of Ub River and Babinac Stream.
- *Zone 2:* Sub-catchment of Ub River downstream of proposed dam up to the confluence of two tributaries (Dokmirca and Bukovica Rivers).
- *Zone 3:* Sub-catchments of Ub River inclusive of town of Ub, up to the confluence with Tamnava River.
- *Zone 4:* River Tamnava and Kolubara from the Tamnava-Ub confluence downstream to the confluence with Sava River.
- The spatial scope of the Hydrology Study Area (in the ESIA), which has been extended for the CIA to include Zone 4 is considered appropriate and proportionate as:
  - Hydrological changes in the River Ub itself have been analysed and the predicted changes during both Phase 1 and Phase 2 are minimal.
  - Hydrological changes will be less downstream of the Ub-Tamnava confluence in Zone 4.
  - The Tamnava is a large river which means the minor changes predicted for the Ub will not result in significant changes in the Tamanna. The Ub catchment to the Tamnava confluence is 229.2km^2 and the Tamnava catchment to the Ub confluence is 260km^2. Therefore, at the Ub-Tamnava confluence the discharge is expected to more than double.

– Flows are further augmented approximately 11km downstream when the Tamnava converges with the Kolubara (within Zone 4).

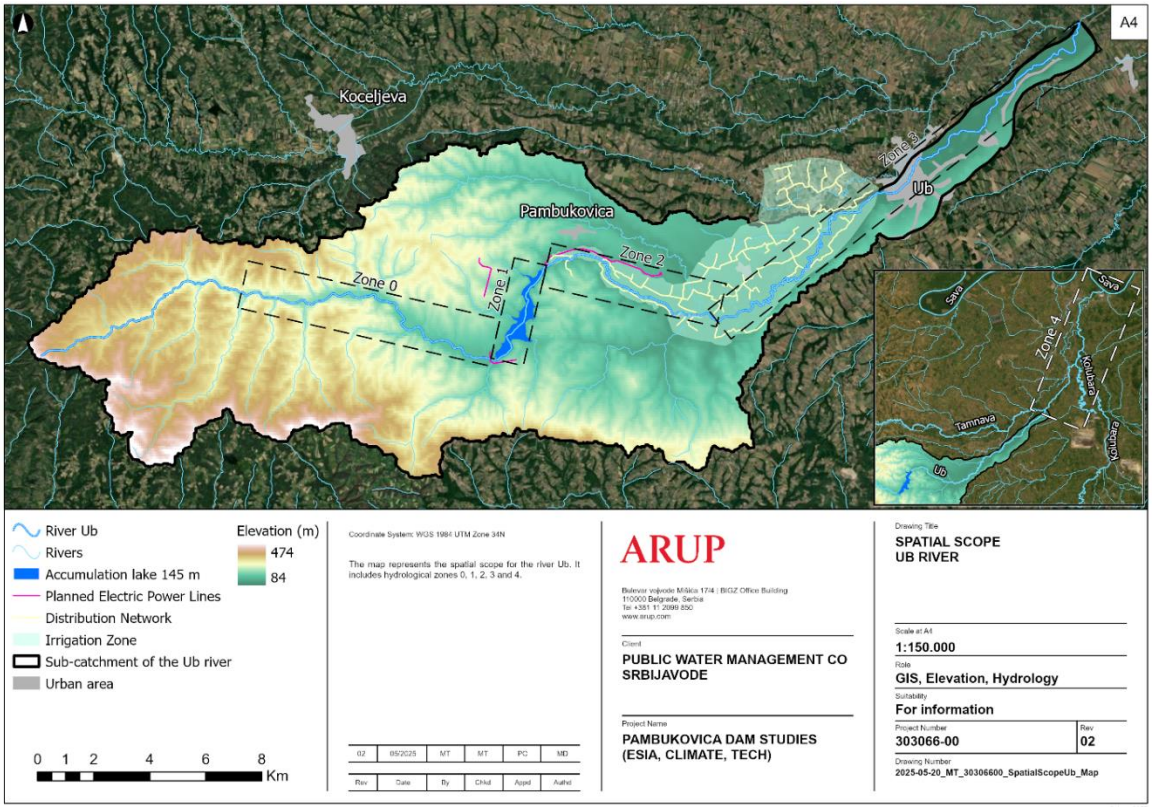


Figure 4. Water availability Spatial Boundary

3.1.2 Baseline

The Ub River is approximately 55.6 km long (from its highest part of catchment to confluence with Tamnava River) and plays an important role in the local hydrology and ecology. It can experience seasonal flooding, particularly during periods of intense rainfall or rapid snowmelt in the spring. This natural phenomenon can affect nearby agricultural lands and settlements. Regarding the high flow rates, the observed value during the 2014 flood event at the Ub station, as recorded by RHMS, was 146 m^3/s. Furthermore, the average flow for a wet year in 1970 was 2.71 m^3/s, while for a dry year in 1990, it was 0.22 m^3/s. The average flow in the dam profile is 0.68 m^3/s (Figure 5).

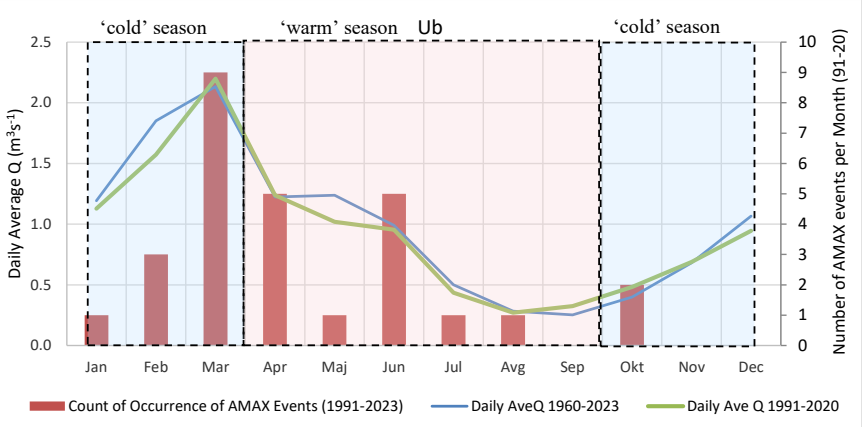


Figure 5. Monthly average daily average flows recorded at Ub gauging station for the periods 1960-2023 (blue) and 1991-2020 (green) and count of monthly occurrence of Annual Maximum flow for years between 1991-2020. (Source: Technical Assessment Report (Appendix 1 - Hydrology and Climate Change))

Finally, the Serbian minimum flow (determined using the GEP Serbian Standard Method) was employed to determine the minimum environmental flow required for downstream ecosystems, according to Serbian standards. As quantified in the ESIA Volume I Book 3: Surface Water, this flow may be 68 L/s during the cold season and 102 L/s in the warm season. It is important to note that, modelled operations phase E Flow (for Phase 1 and 2) downstream of the reservoir typically far exceed the Serbian minimum environment flow, as additional water is required to be released to maintain the Phase 1 (138.5 masl) and Phase 2 (14.5 masl) target reservoir levels. The release of additional water to maintain the target reservoir level will be delivered through the bottom outlet.

The potential for Project impacts on surface water and associated aquatic biodiversity are considered in detail in ESIA Volume I Book 3: Surface Water, and ESIA Volume 1 Book 4: Biodiversity Impact Assessment. When consider avoidance and/or mitigation measures all potential risk of the Project only were assessed as Minor – Moderate.

From a hydrological perspective, the impacts of Phase 1 of operation can be summarised as:

- A minor reduction in monthly average flows during winter (i.e. cold season) and spring (i.e. warm season), associated with storage in the reservoir.
- Monthly flows will mimic that of the baseline (albeit reduced) maintaining a natural hydrological regime, consisting of high flows and low flows in the required seasons. This is crucial to support and maintain the lifecycle of sensitive aquatic and riparian ecology downstream.
- In both the modelled 'average' and 'dry' year scenarios the operations phase flow will be higher than that under the baseline scenario for some months between July and December (depending on the year), delivering drought resilience for ecosystems along the Ub, Tamnava and Kolubara Rivers downstream. For example, the operations-phase E Flow in an average year will be higher than the baseline scenario in the months of July, August and September.

Phase 1 E Flow and Serbian Minimum Flow

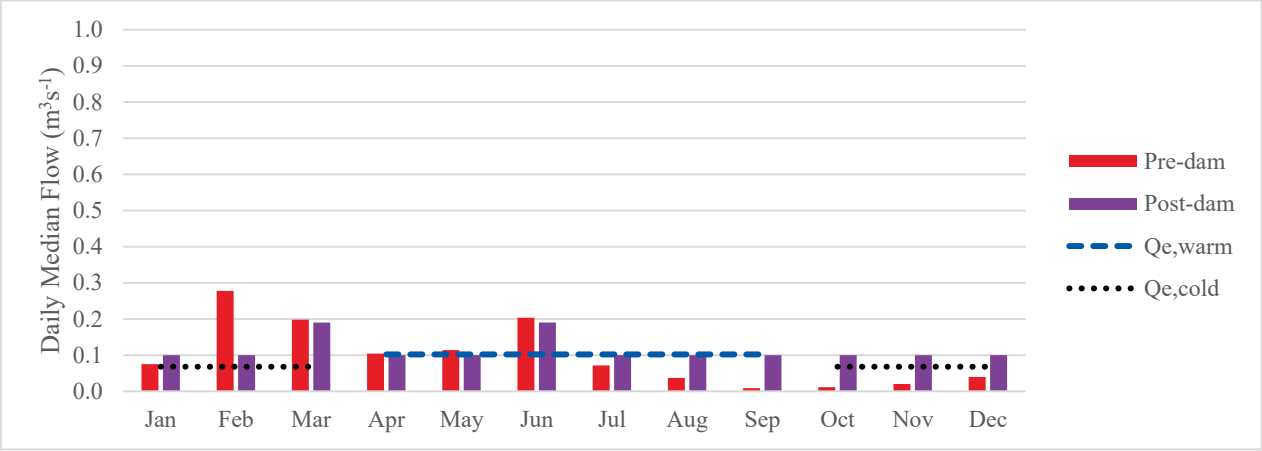


Figure 6. Example dry year (2020) monthly median (q50) daily average flow at Pambukovica Dam estimated from observed data (scaled from Ub station, red) and modelled with Project (purple)

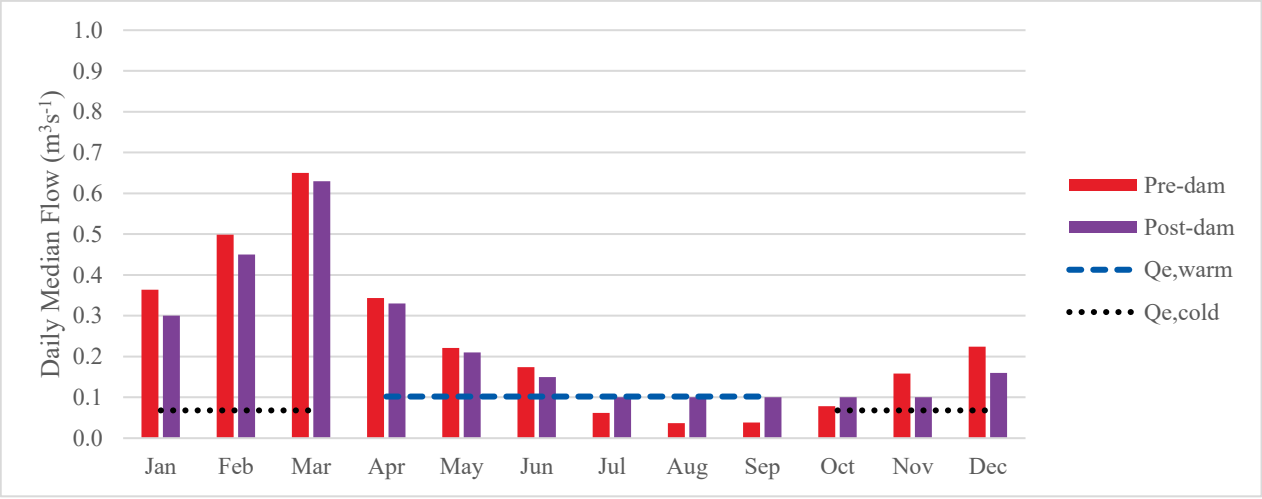


Figure 7. 1991- 2023 Monthly median (q50) daily average flow at Pambukovica Dam estimated from observed data (scaled from Ub station, red) and modelled with scheme (purple)

From a hydrological perspective, the impacts of Phase 2 of operation can be summarised as:

- The E Flow to the River Ub downstream of the dam (purple line: outflow to river) matches the natural baseline regime (red line: inflow to dam), other than for a short period in October / December where reservoir filling occurs. With the exception of this period of filling, daily flows will maintain a natural hydrological regime, consisting of high flows and low flows in the required seasons. This is crucial to support and maintain the lifecycle of sensitive aquatic and riparian ecology downstream.
- For the representative **dry year (2020)**, the reservoir storage would not fully recover to target level during Autumn / winter and further recharge in January February of the following year would be required. However, water availability is high at this time of year (indicated by the peaks on the lefthand side of the graph) and recharge to target is expected to be quick. Once the reservoir target level is achieved E flows would again mimic the natural regime. This is crucial to support and maintain the lifecycle of sensitive aquatic and riparian ecology downstream

- In dry years the E Flow will be higher than that under the baseline scenario as a result of delivery of the Serbian minimum flow, delivering drought resilience for ecosystems along the Ub, Tamnava and Kolubara Rivers downstream.

Phase 2 E Flow and Serbian Minimum Flow

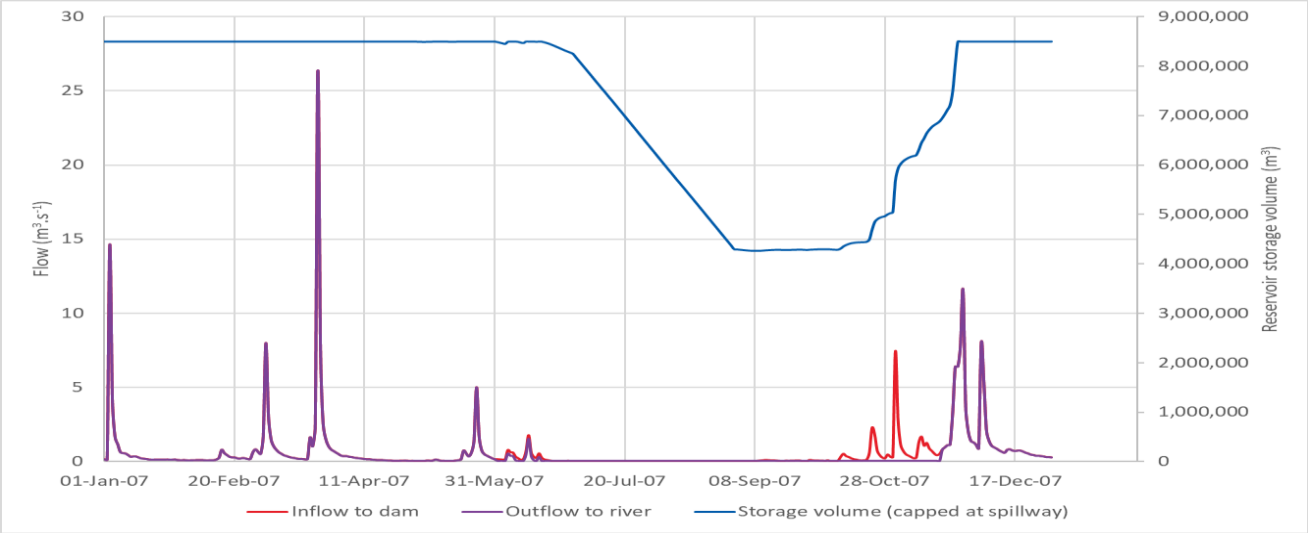


Figure 8 Example average year (2007) daily flow into Pambukovica dam, out of the dam to Ub RIver and the change in stored water volume within the dam, when capped at the spillway (Phase 2)

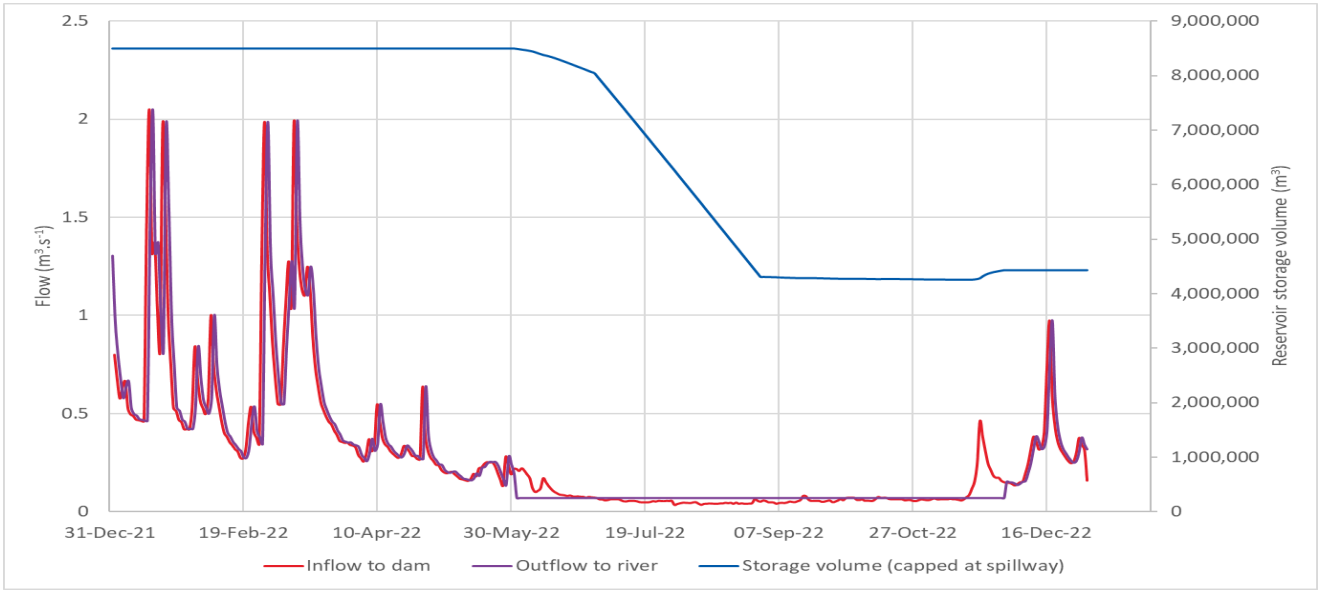


Figure 9 Example dry year (2020) daily flow into Pambukovica dam, out of the dam to Ub River and the change in stored water volume within the dam, when capped at the spillway (Phase 2)

3.1.3 Impact Assessment

There is potential for the projects screened into the CIA (i.e. construction of the Transformer Station and connection to kV line, and Relocation of Telekom Srbija cable to result in cumulative effects on water availability in the following ways:

- Abstraction from the River Ub catchment because of temporary river abstractions to facilitate construction activities for all projects.

With regards to temporary abstraction for construction of the associated facilities, the water requirements for the construction of this Project remain unknown currently. Moreover, there is uncertainty regarding whether the Ub River will be the sole source of supply, or if groundwater or third-party suppliers may serve as viable alternatives. The River Ub is subject to lower flows in August and September, extending into October and November in dryer years (Figure 6). Should a risk of cumulative water availability impacts be determined when further information is obtained, they will likely be more severe within this summer/autumn period. It should be noted that river water will not be used for technical water for construction (i.e. concrete batching), due to the need for specific chemistry/purity, however, river water may be used for associated activities such as dust suppression and vehicle cleaning.

It is currently not feasible to assess whether these projects may apply excessive pressure on the VEC, potentially increasing its vulnerability beyond acceptable limits. Nevertheless, an estimate of the months during which the impact could potentially be significant is provided, as are mitigation and monitoring measures (Section 3.1.4) designed to avoid significant impacts. Furthermore, any temporary abstraction licences would be permitted according to the applicable law and should consider risks of over-abstraction.

With regards the potential for long-term reduction in River Ub flows downstream of the Dam, due to the irrigation system, it is important to note that the water used is not directly sourced from the river; rather, it will be stored in the Dam. During Phase 1 (no irrigation) and Phase 2 (with irrigation) modelling suggests that operations phase flows in the River Ub will be adequate to support downstream VECs, with limited deviation from the natural baseline regime and increased resilience to drought in summer months. However, further modelling of water quantity and water quality of reservoir releases in advance of commissioning Phase 2 should be undertaken to confirm this, particularly if the anticipated irrigation demand changes or projects with a water resource demand come online prior to Phase 2. This will be required in advance of Phase 2 to ensure additional E&S impacts resulting from Phase 2 are assessed and mitigated. This commitment is outlined in the WEMMP Action 3.

Additionally, it is important to note that, as outlined in the Climate Change Chapter, ThinkHazard assigns a medium to high hazard rating for water scarcity. This indicates a likelihood of up to 20% for drought occurrences within the next decade. Additionally, as outlined in the Climate Change Chapter, a reduction in the average annual precipitation in the Kolubara District is anticipated. As a result, the period from July to January will be critical during construction and operation, as the potential impact could be significant. In this context, it is essential for associated facilities to establish rigorous mitigation measures to prevent exceeding the acceptable threshold of change (Serbian minimum flow required for downstream ecosystems – 68 L/s during the cold season and 102 L/s in the warm season).

Regarding the individual proposed mitigation measures, the Project will aim to enhance efficient water use in concrete production by minimizing waste and improving batching accuracy to reduce excessive consumption. Additionally, mitigation and monitoring measures to regulate water abstraction from the Ub River are proposed to ensure that it remains within sustainable limits and does not disrupt aquatic ecosystems. Mitigation measures for all associated facilities are currently unknown, but river abstraction licences would be in place. Additional mitigation measures to address the potential cumulative impacts are outlined and discussed in the following section.

3.1.4 Mitigation measures

Mitigation measures pertaining to the potential Project impacts of water availability *alone* are outlined in ESIA Volume I Book 3: Surface Water, and ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The additional mitigation measures set out below are designed to gather information on the likely risks of cumulative water availability, that could present during construction and operation of the Dam. These will inform the need for further assessment, stakeholder agreement and monitoring requirements.

Table 3: Cumulative impacts, mitigation and monitoring measures for water availability

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Changes in the water quantity of the Ub River due to water abstraction for construction activities *Construction phase*	In line with PR1 requirements and under the assumption that the Associated Facilities construction will occur concurrently with the Dam's construction, conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss potential in-combination effects, confirm whether the Ub River will be the source for construction water (If this is the case, it should be discussed the amount of water that will be required) and agree potential additional mitigation.	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode to engage with developers of Associated Facilities.
	Explore alternative sources of water during the warmer months, including groundwater and third-party suppliers that can fulfil the Project's requirements.	Logging the consideration of alternatives. Final construction methodology / water sources to be used.	Srbijavode
	Monitor flow rates during the warmer months and implement additional mitigation measures as needed.	Regular water monitoring surveys conducted during the warmer months.	Srbijavode
	Conduct regular meetings with relevant stakeholders during the warmer months to evaluate the status of the river and implement additional mitigation measures as necessary.	Compliance with the agreements resulting from the meetings held.	Srbijavode to engage with other developers and arrange the meetings
Changes in the water quantity of the Ub River due to water abstraction for irrigation activities *Operations Phase*	ESIA Volume 1 Book 4: Biodiversity Impact Assessment and ESIA Volume I Book 3: Surface Water commit to undertaking a review of E Flows in advance of Phase 2. This should also trigger an update of the Cumulative Impact Assessment.	Assessment of the Cumulative Effects of Phase 2 operations with future projects.	Srbijavode Lead: Project Biodiversity Specialist / Ecological Consultant; and Project Hydrologist

3.2 Water Quality

The construction activities associated with the Dam and the Transformer Station, as well as their connection to the kV lines, may potentially impact the Ub River due to excavations, earthworks, and the use of heavy machinery, among other factors. Although the final designs for the Transformer Station and its associated line are yet to be finalised, potential locations for these lines are near the Ub River. As a result, there is a possibility of cumulative impacts on water source pollution resulting from the construction activities of both projects.

3.2.1 Spatial and Temporal boundaries

The CIA spatial and temporary boundaries for water quality are consistent with those presented in Section 3.1 for water availability.

3.2.2 Baseline

Four samples were taken to analyse water quality for the Ub River over the course of four months in 2024. Despite temperature values being missing for several months at sampling site WQ UB 04, as shown in the data,

temperature increases are noted downstream of the town of Ub at WQ UB 05. Stations north of the town have similar temperatures ranging from 7.5-25 ˚C across the four months. These are in line with normal temperature ranges for their location. The Ub River may be receiving additional effluents from town of Ub and raising the temperature of the river.

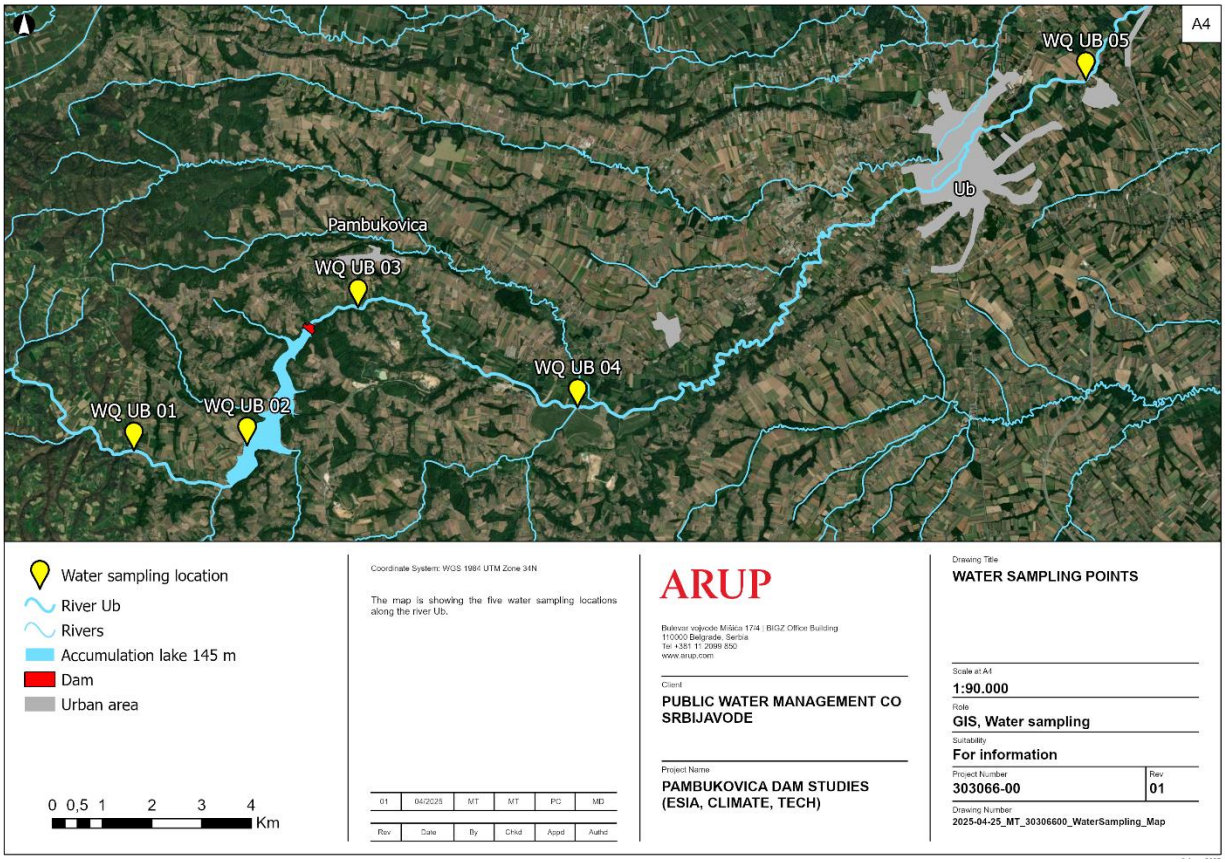


Figure 10. Locations of water sampling points

Regarding the oxygenation conditions, they were assessed through Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Figure 11 shows the DO concentrations across the four sampling months (Aug -Nov 2024). The results are consistent with those illustrated in the temperature analysis. DO decreases for the downstream sampling point WQ UB 05 which aligns with the higher water temperatures recorded at the site, and potentially indicating input of pollution from the town of Ub. DO concentrations at all four locations all fall within Class III or lower per the Serbian surface water quality standards.

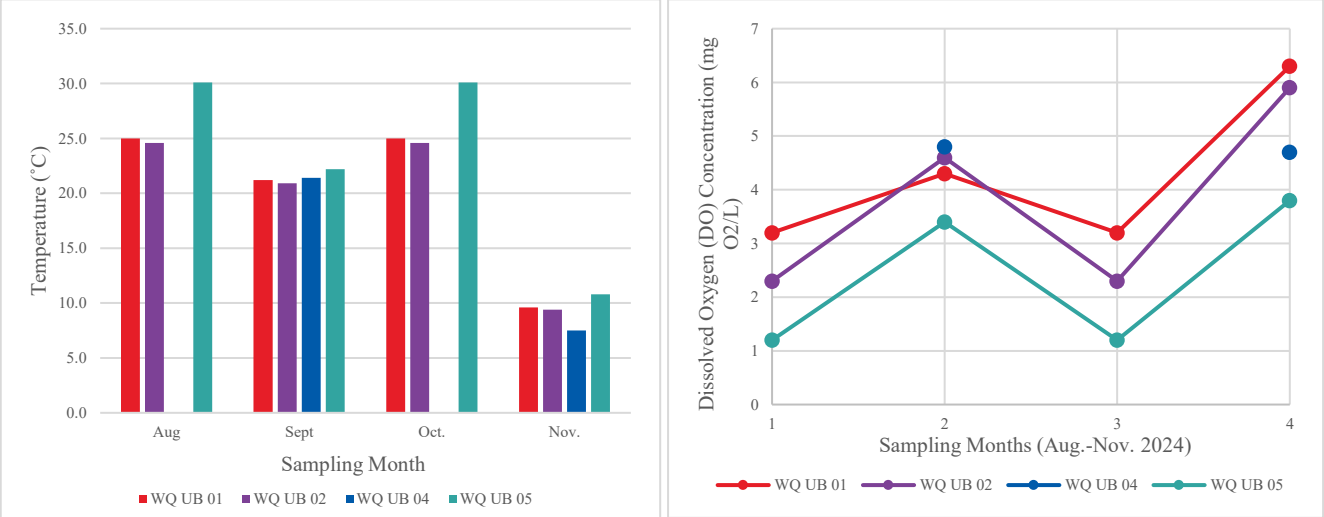


Figure 11. Temperature change and Dissolved Oxygen Concentrations in the River Ub at 4 locations over 4 months in 2024.

Concerning pH levels in Ub River, Serbian standards set the optimal Class I range for pH in surface waters to be between 6.5-8.5 with international standards of good rivers slightly widening this range to 6.0-8.5. Overall, all sampling sites fall within the Class I. Moreover, international standards for good river quality indicate conductivity can range anywhere from 10-1000 uS/cm. In Serbia, the national government has set Class I (best quality) as <1000. Only sampling point WQ UB 05 exceeds this limit and would fall between Class II and Class III with an average conductivity of 1124.5 uS/cm at 20˚C.

Regarding total N, the sampling indicated values ranging from <0.1 to 26 mg N/L. This wide variation can be attributed to a steep jump in total nitrogen quantities at sample site WQ UB 05. Nitrates and nitrites fall within generally acceptable ranges of Class I and Class II across the sampling sites. The contribution to the increase in total nitrogen is attributed to the presence of both ammonium ions and unionized ammonia, likely from domestic pollution entering the river at Ub town. Thus, agricultural runoff does not appear to be impacting the Ub river at significant levels for the short sample period studied. Future tests will need to be undertaken to determine the extent of agricultural runoff influence on the catchment.

Lastly, total phosphorus values ranged from 0.13-0.055 mg/L across the sampling points north of Ub town. As with other pollutant measurements, total phosphorus increased sharply for WQ UB 05 south of Ub town, recording total phosphorus concentrations as high as 4 mg/L. Apart from WQ UB 05, other sample points fall within Class III or below for all measurements. WQ UB 05 recorded class V values for total phosphorus and orthophosphates for all months measured.

3.2.3 Impact Assessment

The limit of acceptable change for the water quality VEC is that the multiple developments do not worsen the current water quality conditions, as shown below:

Table 4: Limits of acceptable change for the water quality VEC

Parameter / Monitoring Sample	WQ UB 01	WQ UB 02	WQ UB 04	WQ UB 05
Dissolved Oxygen (DO)	Class III	Class III	Class III	Class IV
Conductivity	Class I	Class I	Class I	Class II
pH	Class I	Class I	Class I	Class I

Parameter / Monitoring Sample	WQ UB 01	WQ UB 02	WQ UB 04	WQ UB 05
Nitrates	Class II	Class I	Class I	Class I
Total Phosphorus	Class I	Class I	Class I	Class III

The construction of the Dam is expected to result in various forms of pollution. Excavation, land clearing, and earthworks could lead to soil erosion and increased sedimentation in nearby water bodies, potentially altering aquatic habitats and reducing water quality. Additionally, the use of heavy machinery and construction materials poses a significant risk of chemical spills and leaks, which could contaminate freshwater ecosystems. Dust and airborne pollutants generated from construction activities may further degrade water quality and affect nearby vegetation, while in-stream construction works can disturb sediment deposits, leading to increased turbidity and a reduction in light penetration, which is crucial for aquatic life. Similar activities are anticipated for the construction of the Transformer Station and its connection to the kV line, albeit on a smaller scale.

For the Dam alone, impacts on water quality were deemed Moderate after the implementation of the mitigation measures. To mitigate these impacts, the Project will divert the river, creating dry conditions for dam construction. This will reduce the risk of water pollution through physical separation. Moreover, it will implement sediment control measures such as silt curtains, sediment ponds, or diversion channels to minimize the impacts of construction on water quality and aquatic habitats and will undertake long-term water quality monitoring to assess the success of water quality measures.

At this time, the mitigation measures for the construction of the Transformer Station and new transmission lines have not been established. It is anticipated that the construction of these developments will result in a lower impact due to the reduced scale of the works when compared to the Project. It is assumed that comparable mitigation measures will be implemented. Given that the construction of both projects will take place concurrently and that regular meetings will be held with relevant stakeholders, the cumulative impacts on the water quality VEC of the Ub River is considered to be relatively minor.

3.2.4 Mitigation Measures

Mitigation measures pertaining to the potential Project impacts of water quality *alone* are outlined in ESIA Volume I Book 3: Surface Water, and ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The additional mitigation measures set out below in Table 3 are designed to gather information on the likely cumulative water quality risks that could present during construction and operation of the dam; these will inform the need for further assessment, stakeholder agreement and monitoring requirements.

Table 5: Cumulative impacts, mitigation and monitoring measures for water quality

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Changes in the water quality of the Ub River resulting from construction activities *Construction phase*	In line with PR1 requirements and under the assumption that the Associated Facilities construction will occur concurrently with the Dam's construction, conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss potential in-combination effects, the current status of water quality in the river and agree potential additional mitigation.	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode and developers of Associated Facilities.

3.3 Groundwater Quality and Quantity

Water for the construction of the Dam may be sourced from groundwater. Given the Transformer Station, along with its connection to the kV line, will be constructed prior to the operational phase of the Dam, this may also require groundwater-sourced water. It is therefore important to consider the possibility of cumulative impacts arising from the overuse of water resources due to groundwater abstraction. Additionally, due to the construction activities and potential groundwater interventions for water extraction, there may be a cumulative impact on water pollution resulting from the construction of both projects.

3.3.1 Spatial and Temporal Boundaries

From a spatial perspective, considering the groundwater AoI established for the Dam, it is anticipated that the overlap of the projects will primarily occur within this same area. The temporal scope of this analysis will focus on the potential cumulative impact on groundwater during the construction phase, which encompasses activities related to the construction of the Dam, the Transformer Station, and the associated connection lines.

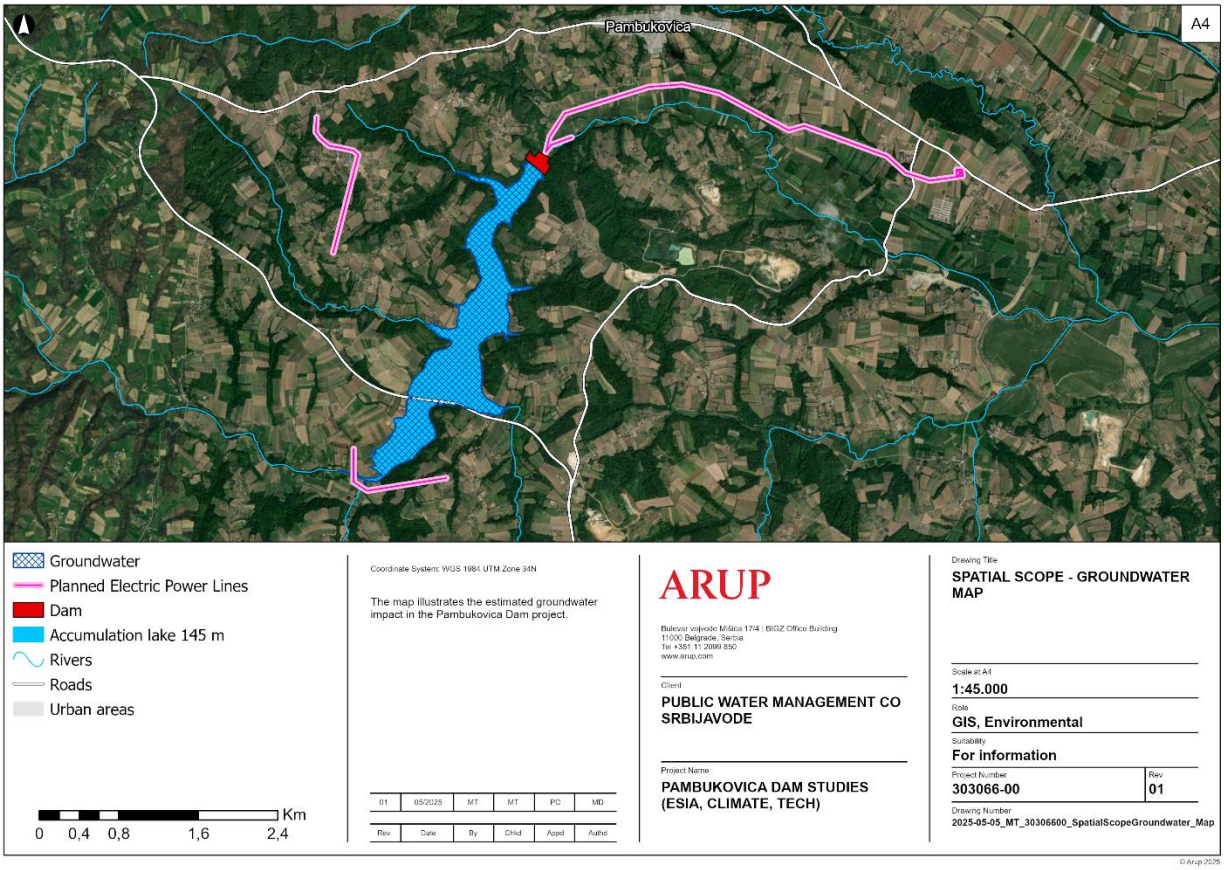


Figure 12. Groundwater Spatial Boundary

3.3.2 Baseline

To analyse groundwater level fluctuations two piezometric installations were embedded in the drilled boreholes (PB-01 and PB-06) during the geological investigations of 2016. The primary goal of these installations was to determine the exact hypsometric position of the groundwater level in relation to the river channel. Based on the measured levels, there is an asymmetry in the groundwater levels on the flanks of the Dam profile. In the piezometer PB-01, which monitors the level along the left flank, the groundwater level fluctuates around 147-145 m a.s.l. while in piezometer PB-06 on the opposite bank, the level is recorded around 128 m a.s.l. These data indicate differences in hydrogeological conditions on each flank.

The groundwater levels measured from 20 April to 1 July 2022 in all new piezometers and boreholes, as well as in the older piezometer PB-6, were relatively consistent. The only value that significantly deviated was recorded in the older piezometer PB-1, located on the left flank. Additionally, the investigation results, particularly the levels in the boreholes drilled in the left flank, suggest the likely presence of two aquifers: the higher aquifer, measured at piezometer PB-1, and the lower aquifer, whose level correlates well with the river level.

No primary information on groundwater quality was gathered during the ESIA. However in the ESIA, a monitoring program has been defined for tracking the quality and level of groundwater at two piezometers, one on the left and one on the right bank at the dam profile, in accordance with the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS," No. 30/18 and 64/19), Annex 2 – Remediation Values of Pollutants, Harmful and Hazardous Substances in the Aquifer Layer

3.3.3 Impact Assessment

The potential cumulative impacts on both the quantity and quality of groundwater are linked to the construction activities of both projects in the spatial scope. The threshold for acceptable conditions in this context is defined as maintaining the water levels identified in the assessments conducted in 2016 and 2022, as well as ensuring that the current environmental parameters of the groundwater do not deteriorate.

In relation to the individual impact assessment for the Dam, the ESIA determined that the impact is classified as Minor. Currently, the water requirements for the Dam, as well as for the other project being analyzed in this assessment, are not yet known. Additionally, there is uncertainty regarding whether groundwater will be the exclusive source of supply, or if the Ub River or third-party suppliers may provide viable alternatives. Due to the current uncertainty, it is not possible to determine the potential cumulative impacts with any certainty for groundwater quality and quantity.

3.3.4 Mitigation measures

Despite the uncertainty in potential impacts, proposed individual mitigation measures for the Dam include obtaining all necessary permits for groundwater utilisation, effectively managing excavated materials to prevent contaminants from infiltrating groundwater and ensuring monitoring at two piezometers—one located on the left bank and the other on the right bank at the Dam profile. These mitigation measures should be communicated with the developers of the transmission lines also to ensure that there is alignment in best practice.

Table 6: Cumulative impacts, mitigation and monitoring measures for groundwater quality and quantity

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Changes in groundwater quality and quantity *Construction phase*	In line with PR1 requirements and under the assumption that the Associated Facilities construction will occur concurrently with the Dam's construction, conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss potential in-combination effects, confirm whether groundwater will be the source for construction water and agree potential additional mitigation.	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode and developers of Associated Facilities.
	Conduct regular meetings with relevant stakeholders to discuss the report of the monitoring surveys and implement additional mitigation measures as necessary.	Meeting minutes / logging of construction methods and any agreements made.	Srbijavode to engage with other developers and arrange the meetings

3.4 Air Quality

The simultaneous construction activities for the Dam and the Transformer Station, along with the connection to the kV line, will jointly impact air quality during the construction phase, through potential increases in dust

generation. Furthermore, as discussed in the Climate Change Chapter, a reduction in the average annual precipitation in the Kolubara District is expected. Consequently, this may diminish the ability of precipitation to facilitate dust dispersion, thereby affecting the conditions for dust dispersion in the environment.

3.4.1 Spatial and Temporal Boundaries

For the temporal scope, the potential cumulative impact will be assessed during the construction phase, which includes the activities related to the construction of the Dam, the Transformer Station, and the connection lines.

For the spatial scope, the ESIA has defined an air quality area of influence extending 250 meters around the primary construction sites, 500 meters from the borrow pits, 100 meters from roads, and 50 meters from quarries. Additionally, for the proposed power lines, a buffer of 250 meters has been established, reflecting the anticipated locations of the main construction sites. However, since the exact location of the Transformer Station has yet to be determined, it could not be incorporated into the AoI. Thus, the spatial boundary for the impact of dust generation will encompass the AoI of both projects and their overlap.

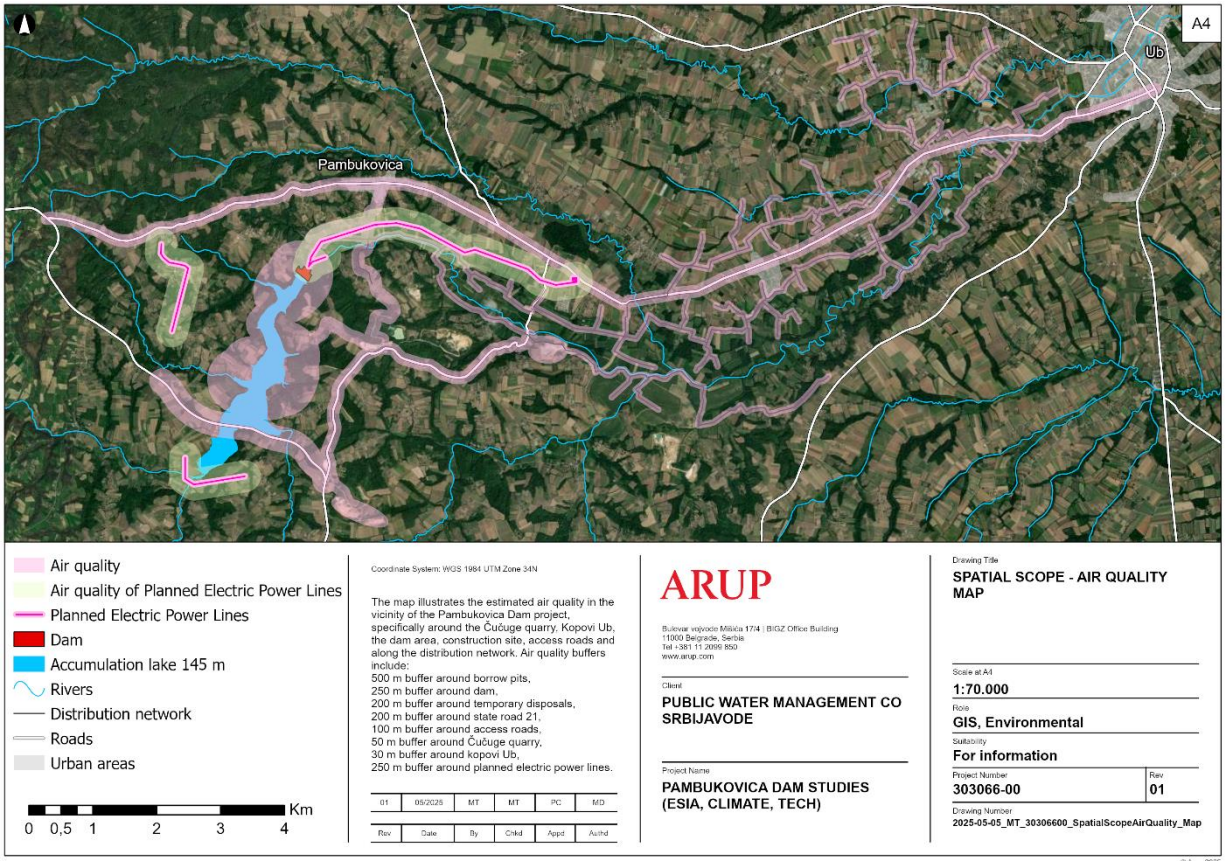


Figure 13. Air Quality Spatial Boundary

3.4.2 Baseline

The ESIA study reviewed local and regional sources of air pollution and concluded that local sources have a limited impact due to the low population density, the absence of industrial facilities, and low traffic intensity in the vicinity of the future Dam site. The primary regional source of pollution was identified as the 'Kolubara' Mining Basin, specifically the 'Tamnava - West Field' open-pit mine, located approximately 25 km northeast of the project area.

Based on data collected from all monitoring stations in the national network, as well as data gathered and processed from local air quality measurement results within local government networks, the Agency prepares the

Annual Report on the State of Air Quality in the Republic of Serbia. The nearest monitoring station where air quality is continuously monitored is in Valjevo, approximately 15 km south of the Dam site. However, this data cannot be considered fully representative of the area around the future dam and reservoir, nor can they be a reliable reference for air quality at the specific location, as significantly lower levels of pollutants are expected here, especially due to the low population density, absence of industrial facilities, and low traffic intensity.

The ESIA recommends a more accurate assessment of baseline conditions, ambient air quality monitoring is recommended during the pre-construction phase in the vicinity of potential sensitive receptors.

3.4.3 Impact Assessment

The threshold for acceptable conditions in this context is defined as not deteriorating the current environmental state, which will be assessed during the pre-construction survey. Additionally, this threshold is linked to adherence to the Air Quality Guideline values set forth in the World Bank Group EHS Guidelines, particularly concerning PM10 and PM2.5, with limit values of 50 µg/m³ for PM10 and 25 µg/m³ for PM2.5.

Typical construction activities, including land clearing, excavation, rock blasting, machinery operation, and material transportation for both projects, will generate dust and elevate particulate matter (PM) levels in the surrounding area. The individual impact assessment of the Dam identified this impact as direct, localized, and short-term; consequently, its magnitude and significance were regarded as Moderate in the ESIA. Comparable activities are expected during the construction of the Transformer Station and its connection to the kV line, although these will occur on a smaller scale.

To mitigate the impacts, the Project will implement several measures, including covering materials during transport and while they are stockpiled at the construction site to minimise dust dispersion, conduct regular dust monitoring surveys (PM10 and PM2.5) near sensitive receptors and apply various dust suppression techniques, among other actions.

At this time, the mitigation measures for the construction of the Transformer Station and new transmission lines have not been established. Assuming that similar mitigation measures will be implemented, that the construction of both projects will occur concurrently, that monitoring surveys will be conducted, and that regular meetings will be held with other developers in the area, the cumulative impact of increased dust generation is considered relatively minor.

3.4.4 Mitigation MeasuresBackCover

The additional mitigation measures set out below in Table 7 are designed to ensure an appropriate baseline is established, air quality impacts are monitored and regular engagement with other project developers is undertaken.

Table 7: Cumulative impacts, mitigation and monitoring measures for air quality

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Increase in dust generation due to construction activities *Construction phase*	Conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss results of the air quality survey and implement additional mitigation measures as necessary.	Compliance with the agreements resulting from the meetings held.	Srbijavode to engage with other developers and arrange meetings.

3.5 BackCoverNoise and Vibration

The concurrent construction of the dam and Transformer Station, along with the connection to the kV line, will generate a cumulative impact in noise and vibrations during the construction phase, resulting in an expected rise in both.

3.5.1 Spatial and Temporal Boundaries

Concerning the temporal scope, the potential cumulative impact will be assessed during the construction phase, which includes the activities related to the construction of the Dam, the Transformer Station, and the connection lines.

In terms of spatial scope, the ESIA has defined an noise AoI extending 250 meters around the primary construction sites, 500 meters from the borrow pits, 100 meters from roads, and 50 meters from quarries. Additionally, for the proposed power lines, a buffer of 250 meters has been established, reflecting the anticipated locations of the main construction sites. However, since the exact location of the Transformer Station has yet to be determined, it could not be incorporated into the area of influence. Thus, the spatial boundary for the impact of increase in noise and vibrations levels will encompass the AoI of both projects and their overlap.

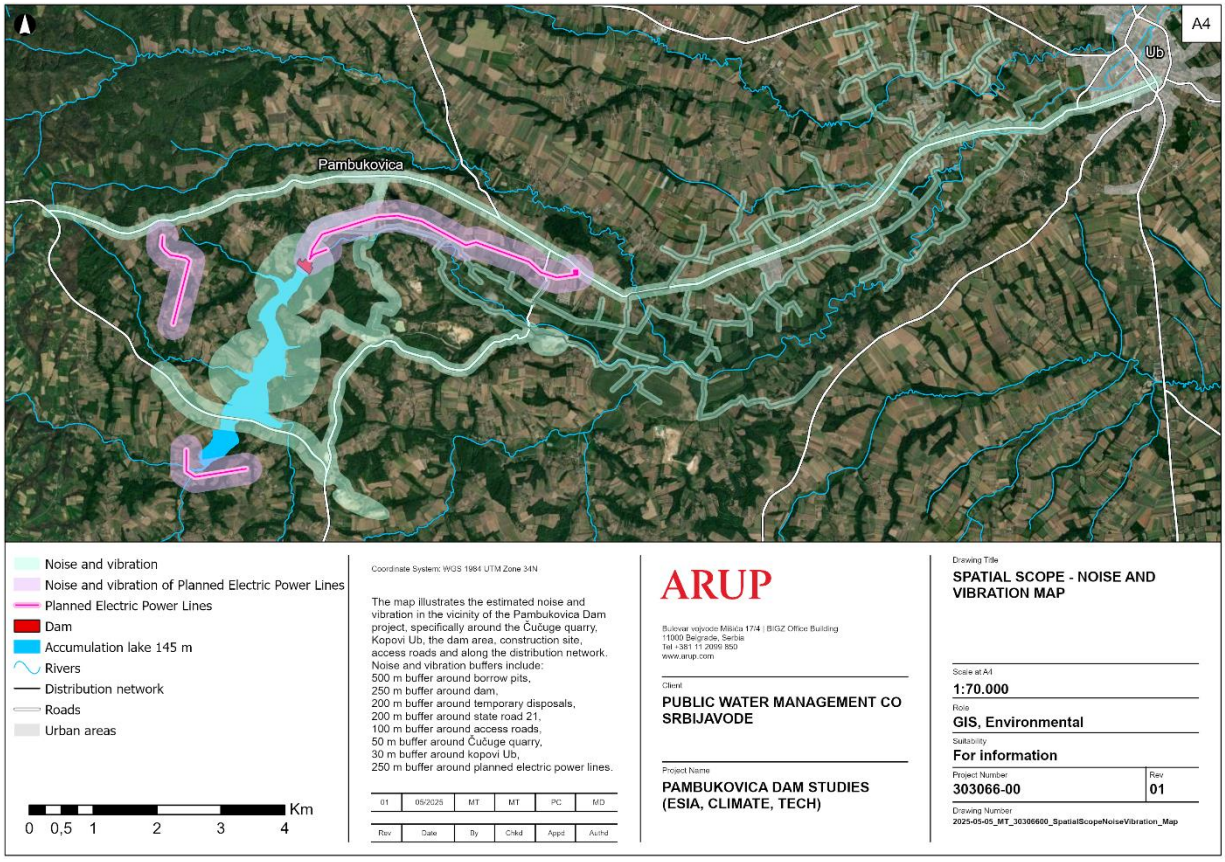


Figure 14. Noise and Vibrations Spatial Boundary

3.5.2 Baseline

The ESIA has concluded that the current noise levels in the Project area mainly originated from natural sources and occasional human activities, with the dominant sources being local traffic and agricultural machinery. Noise levels in this area generally do not exceed thresholds that could present significant negative impacts on the population. The area within the Project's scope is characterized by a rural environment, predominantly consisting of agricultural land, dispersed and sparsely populated settlements, with no industrial facilities present. Consequently, it is assumed that there are no elevated noise levels arising from anthropogenic impacts or industrial installations.

According to Article 18 of the Environmental Noise Protection Law, the legal entity that owns or operates a noise source is obligated to conduct an initial noise measurement at the location before putting the noise source into operation and to obtain a noise measurement report from an authorised professional organization. Given that construction machinery and activities within the Project represent noise sources in accordance with Article 4 of the same law, there is a regulatory obligation to conduct initial noise measurements before the commencement of works.

Regarding vibrations, no baseline vibration measurements have been conducted for the purposes of this Project. However, given the rural character of the area and the absence of industrial facilities or heavy traffic, it is assumed that existing vibration levels are low. The main potential sources of vibrations under current conditions are limited to occasional local road traffic, primarily agricultural machinery, and potentially construction equipment associated with the development of rural infrastructure. The existing road network in the area is not characterised by high traffic volumes or frequent passage of heavy vehicles that could lead to elevated environmental vibration levels.

3.5.3 Impact Assessment

The threshold for acceptable conditions in this context is defined as not deteriorating the noise baseline, which will be assessed during the pre-construction survey. Additionally, this threshold is linked to adherence to the Noise Guideline values set forth in the EHS IFC Guidelines, particularly concerning residential and industrial zones, with limit values of 55 dBA (daytime) and 45 dBA (nighttime) for residential and 70 dBA (daytime) and 70 dBA (nighttime) for industrial. Given uncertainties in a lack of data, threshold for vibrations is not defined in the context of the CIA.

Regarding noise during construction, the ESIA has assessed that noise generated by construction machinery will be intermittent and localized, and given the distance of residential buildings, it is not expected to have a significant negative impact on public health. The ESIA has also stated that traffic noise from material transport will not significantly contribute to overall noise levels, as residential settlements are located outside the main transport routes designated for material transport.

Moreover, the ESIA has considered that construction and transport machinery involved in the Dam construction will generate noise levels ranging from 70 dB(A) to 90 dB(A), depending on factors like the type of equipment, engine load, road surface quality, technical condition, operating methods, speed, and vehicle age, whereas noise levels during rock drilling are estimated to range from 100 dB(A) to 120 dB(A), and levels may exceed 130 dB(A) during blasting, depending on the amount of explosive used and the type of explosive applied. Comparable activities are expected during the construction of the Transformer Station and its connection to the kV line, although these will occur on a smaller scale.

The noise impact will be most pronounced at the construction site and its immediate vicinity, with impacts being temporary in nature. Consequently, the ESIA impact assessment for the Dam deemed impacts on noise and vibrations levels as direct, localised, and short-term, leading to conclude that its magnitude will be Minor, after mitigation measures are implemented.

To mitigate the impacts, the Project will implement several measures such as limiting construction activities to daytime hours to minimise disturbance to habitats and species within the AoI, minimise blasting frequency and intensity, optimise traffic management through regulation of vehicle speed, implement traffic control measures to prevent road congestion and overloading, and reduce any unnecessary engine idling, among others.

At this time, the mitigation measures for the construction of the Transformer Station and new transmission lines have not been established. Assuming that similar mitigation measures will be implemented, that the construction of both projects will occur concurrently, that monitoring surveys will be conducted, and that regular meetings will be held with other developers in the area, the cumulative impact of increased noise generation is considered relatively minor.

3.5.4 Mitigation measures

The additional mitigation measures set out below in Table 7 are designed to ensure an appropriate baseline is established, air quality impacts are monitored and regular engagement with other project developers is undertaken.

Table 8: Cumulative impacts, mitigation and monitoring measures for noise

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Increase in noise and vibrations levels due to construction activities *Construction phase*	In line with PR1 requirements and under the assumption that the Associated Facilities construction will occur concurrently with the Dam's construction, conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss potential in-combination effects, results of the noise monitoring surveys and agree potential additional mitigation.	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode and developers of Associated Facilities.

3.6 Soil

The simultaneous construction of the Dam and Transformer Station, along with the connection to the kV line, is anticipated to have a cumulative impact on the soil during the construction phase, leading to an expected increase in soil erosion and instability.

3.6.1 Spatial and Temporal Boundaries

Concerning the temporal scope, the potential cumulative impact will be assessed during the construction phase, which includes the activities related to the construction of the Dam, the Transformer Station, and the connection lines.

In terms of spatial scope, the ESIA has defined a soil AoI to extend around 100 m from the construction site, including areas around borrow pits and storage sites. Additionally, for the proposed power lines, a buffer of 100 meters has been established, reflecting the anticipated locations of the main construction sites. Thus, the spatial boundary for the impact of increase in soil erosion and instability will encompass the AoI of both projects.

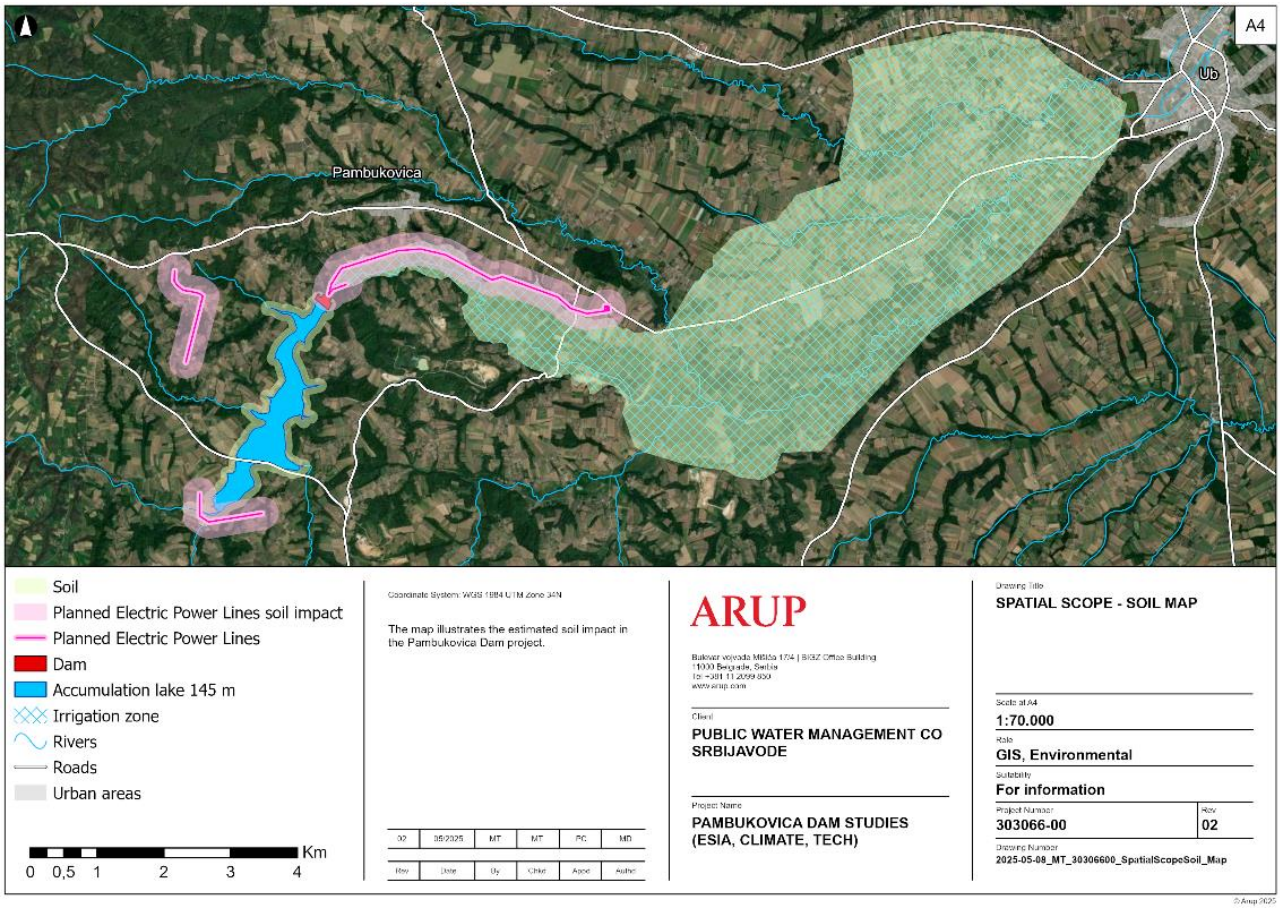


Figure 15 Soil Spatial Boundary

3.6.2 Baseline

According to the Detailed Regulation Plan for "Pambukovica Dam on the Ub River" ("Official Gazette of the Municipality of Ub", No. 30/16), the area covered by the Plan is predominantly undeveloped and primarily used for agriculture. Vegetation in this area consists of agricultural land, forested areas, and green spaces within the floodplain of the Ub River.

Data on vegetation cover, i.e., land use, were obtained using the *CORINE Land Cover* database, verified through digital orthophotos and field reconnaissance. The distribution of various land cover types in the catchment area of Pambukovica is presented in Table 9.

Table 9: Land use in the catchment area of Pambukovica

Soil cover	Area (km^2)	Percentage (%)
Complex of cultivated parcels	34,7	29,30
Mixed forests	0,9	0,79
Mineral resource exploitation sites	0,0	0,01
Incomplete urban areas	0,6	0,51
Non-irrigated arable land	1,4	1,17
Pastures	1,2	1,03
Transitional area of forest and maquis	1,0	0,80
Predominantly agricultural land with larger areas of natural vegetation	39,6	33,40

Soil cover	Area (km²)	Percentage (%)
Deciduous forests	39,1	32,98

In the analysed catchment area, as mentioned before, most of the land is utilised for agricultural purposes. Forests and forest land account for approximately 33% of the catchment area. The forestation coefficient for the entire catchment is k_f = 0,35, while the erosion coefficient of the catchment is 0,30.

3.6.3 Impact Assessment

The threshold for acceptable change is to ensure that there is no deterioration of erosion and instability in high-risk areas that will be intervened.

Construction activities such as excavation and earthworks may cause soil compaction, erosion, and loss of topsoil may generate an impact on soil erosion and land stability. In the ESIA, for the Dam, impacts in soil erosion, soil quality and land stability were considered as direct, localized, and short-term.

To mitigate the impacts, the Project will implement erosion control measures (e.g., silt fences, mulching, and temporary vegetation) and restore the natural topography and soil structure through grading and land rehabilitation efforts. At this time, the location and the mitigation measures for the construction of the Transformer Station and new transmission lines have not been established.

Assuming that similar mitigation measures will be implemented, that the construction of both projects will occur concurrently, the cumulative impact of in soil erosion and instability is minor and therefore, no additional mitigation measures are required.

3.7 Greenhouse Gases

The construction of the Pambukovica Dam, the Transformer Station, and the connection to the kV line is expected to have a potential cumulative impact on greenhouse gas (GHG) emissions.

3.7.1 Spatial and Temporal Boundaries

Concerning the temporal scope, the potential cumulative impact on GHG emissions will be assessed during the construction and operational phase. In terms of spatial scope, this is not applicable as the impacts of GHG emissions are global in scale.

3.7.2 Baseline status and Cumulative Impact Assessment

As per the Climate Change chapter of the ESIA, the carbon assessment was completed using the G-res tool[1], produced by the International Hydropower Association (IHA) for assessing, validating and reporting greenhouse gas (GHG) emissions associated with reservoirs without the need for field measurements. The outputs indicate the post-impoundment areal emissions are limited. Pre-impoundment emissions are higher due to the pre-impoundment area land cover including forest. The reservoir emission over 50 years is 8,427 tCO_2e/yr. This is generally regarded as comparable to global reservoirs.

According to the Low Carbon Development Strategy of Serbia [7], emissions in 2050 under the most conservative scenario, which reflects the greatest reduction, are projected to be 7,627 MtCO2eq. The emissions from the Dam will account for approximately 0.0001% of this total. Consequently, the cumulative impact of the Project is deemed Minor. However, it is recommended that these values be re-evaluated if other major projects in the area are identified, to assess all impacts in relation to the Serbian carbon budgets.

[1] https://www.grestool.org/

3.8 Biodiversity

3.8.1 Spatial and Temporal Boundaries

For the purposes of the CIA the AoI for biodiversity has been delineated to reflect the full spatial and temporal extent of potential Project-related and cumulative impacts. The AoI encompasses not only the direct Project footprint, such as the reservoir, dam structure, irrigation network, and access infrastructure—but also adjacent areas that may experience indirect, synergistic, or long-term effects. For the purposes of the biodiversity CIA, the terrestrial AoI consists of the Project area, including the irrigation zone. The aquatic biodiversity AoI is consistent with that described in Section 3.1.1. This includes Zone 0 – Zone 3 as defined in ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The aquatic AoI of the CIA had been extended to include Zone 4, covering the Tamnava and Kolubara rivers to the confluence with the Sava River. Given the size of the Sava River, and the relative hydrological input from the CIA AoI (i.e. Kolubara River watershed), cumulative aquatic effects beyond Zone 4 are not anticipated.

Note that the construction phase is considered to include all enabling works, including activities such as vegetation clearance, land preparation, and compound construction. No invasive works will be undertaken during the pre-construction phase.

3.8.2 Baseline

The landscape in Project area consists of a complex mosaic of agricultural fields, fragmented forests, riparian corridors, ephemeral streams, and rural settlements. Extensive surveys of the Project Biodiversity Study Area have been undertaken in 2023 and 2024; the survey methods applied, results, Critical Habitat (and Priority Biodiversity Features) Assessment and impact assessment have been undertaken and are presented in ESIA Volume 1 Book 4: Biodiversity Impact Assessment.

Surveys included a combination of traditional survey techniques, complemented by innovative techniques such as eDNA monitoring (metabarcoding for fish and notable mussels) and the deployment of acoustic loggers for bats. Surveys have confirmed the presence of 58 breeding/wandering/migratory bird species, 34 wintering bird species, 13 bat species, 7 reptile species, 8 amphibian species, 86 terrestrial invertebrates species, 57 taxa of aquatic invertebrates, 16 fish species, 35 plant species and 12 riparian and other mammals species. Habitat mapping has revealed a mosaic of arable land, modified habitats, and patches of natural habitats within the project area.

The key biodiversity receptors and pathways for effect considered within the Project impact assessment are described in Table 10, along with the assessment of residual impacts following the application of mitigation and/or avoidance measures; this includes habitat creation and offsets in line with the requirements of EBRD PR6. It is these residual impacts that will require cumulative assessment with other proposed or planned projects screened into the CIA (i.e. construction of the *Transformer Station and connection to kV line*, construction and operation of the *Phase 2: Irrigation system and Distribution Network*, and *Relocation of Telekom Srbija cable*).

Table 10: Summary of Biodiversity Groups, Key Species, Ecological Sensitivities and AoI

Taxonomic Group	Key Species (Examples)	CH / PBF Trigger	Potential Impacts	Residual impact following Project Mitigation (inc. PR6 offsets)
Priority Habitats (terrestrial)	Three of the habitat types recorded conform to those listed in Resolution 4 of Bern Convention. Therefore, PBF is triggered under EBRD criterion 1 ‘priority ecosystems’ for: - Balkan riverine willow scrub (F9.123)	PBF as a habitat typology (CH for species – see below)	**Construction** Pollution Temporary and permanent habitat loss Habitat fragmentation **Operation**	**Minor**

Taxonomic Group	Key Species (Examples)	CH / PBF Trigger	Potential Impacts	Residual impact following Project Mitigation (inc. PR6 offsets)
	- *Fagetum moesiace submontanum typicum* woodland (G1.69) - *Quercetum frainetto-cerris* woodland (G1.76811).		Long-term habitat alteration and fragmentation due to altered hydrology, vegetation changes, and human presence. Possible encroachment of invasive species in restored areas.	**Minor - Moderate**
Priority Habitats (freshwater)	River Ub - Littoral zone of inland surface waterbodies - Surface running water	Not triggered as a habitat (CH for aquatic species – see below)	**Construction** Changes in water quantity Changes in water qualtity / Pollution Temporary and permanent habitat loss Habitat fragmentation (including barriers and watercourse crossings) **Operation** Changes in water quantity Changes in water quantity / Pollution Fragmentation / barrier effect of dam	**Minor** **Minor**
Fauna (terrestrial): • Amphibians • Reptiles	Yellow-beilled Toad, European Green Toad, Common Spadefoot Toad, Greek Stream Frog and Fire Salamander Common Wall Lizard, European Green Lizard, Sand Lizard, Aesculapian Snake, Dice Snake	CH	**Construction** Injury or mortality Potential indirect effects such as predation due to habitat fragmentation. **Operation** Habitat fragmentation, Potential disturbance from operational activities such as noise, light, and human presence.	**Moderate** **Minor**
Fauna (terrestrial): • Birds	Middle Spotted Woodpecker, Little Egret, Red-backed Shrike, Grey-headed Woodpecker and European Turtle Dove.	PBF	**Construction** Injury or mortality during construction Potential indirect effects such as predation due to habitat fragmentation Disturbance/displacement of bird species within the local vicinity and the wider project footprint **Operation** Long-term impacts due to habitat fragmentation / change Altered movement corridors	**Moderate** **Minor**

Taxonomic Group	Key Species (Examples)	CH / PBF Trigger	Potential Impacts	Residual impact following Project Mitigation (inc. PR6 offsets)
			Potential disturbance from operational activities such as noise, light, and human presence.	
Fauna (terrestrial): • Bats	All species of bat recorded are considered as 'priority species' according to EBRD guidance	CH	**Construction** Accidental injury / mortality Disturbance/displacement of bat species within the local vicinity and the wider project footprint. **Operation** Potential indirect effects such as prey availability and higher energy expenditure. Disturbance/displacement of bat species within the local vicinity and the wider project footprint.	**Moderate** **Minor**
Fauna (terrestrial): • Other mammals		-	**Construction** Species accidental injury or mortality during construction Potential indirect effects such as predation due to habitat fragmentation. **Operation** Long-term impacts due to habitat fragmentation / change Altered movement corridors Potential disturbance from operational activities such as noise, light, and human presence	**Moderate** **Minor**
Fauna (aquatic): • Fish • Aquatic Invertebrates • Mussels • Riparian species	Fish: Balkan Loach, Spined Loach, Balkan Barbel Thick-shelled mussel	PBF / CH	**Construction** Injury or mortality during construction Lack of continuity during construction (river diversion) and habitat severance Potential disruption of breeding, spawning, and foraging areas, along with reduced connectivity between aquatic habitats. Changes in hydrological regime Changes in water quality, including increased sedimentation and risk of pollution event **Operation** Lack of continuity (barrier effect of dam) and habitat severance.	**Minor** **Minor – Moderate**

Taxonomic Group	Key Species (Examples)	CH / PBF Trigger	Potential Impacts	Residual impact following Project Mitigation (inc. PR6 offsets)
			Changes in hydrological regime Changes in water quality (nutrient and physico – chemical inc. temperature and DO) Changes in sediment regime downstream of the dam (inc. period flashing). Proliferation of INNS in the reservoir environment	

Overall, the recorded diversity of VECs confirms the ecological importance of the region and underlines the need to assess potential cumulative impacts considering both existing pressures and expected future changes in land use, water management, and infrastructure development.

3.8.3 Impact Assessment

The limit of acceptable change for biodiversity VECs is defined as the point beyond which the project and cumulative impacts result in a failure to achieve 'No Net Loss' for Priority Biodiversity Features and a net gain for Critical Habitat, as required under EBRD PR6. This includes measurable reductions in habitat extent, condition, or function that are not compensated through restoration, offsets, or other mitigation measures, and where ecological integrity or key species populations are at risk of decline.

3.8.3.1 Construction

The potential impacts of the construction of the Project are described and assessed in the ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The CIA for biodiversity examines the residual effects of the Project with the projects screened into the CIA (i.e. construction of the Transformer Station and connection to kV line, construction and operation of the Phase 2: Irrigation system and Distribution Network, and Relocation of Telekom Srbija cable). There is potential for cumulative effects on biodiversity during construction from the following impact pathways:

- Changes in water quantity because of abstraction for construction activities.
- Changes in water quality through construction pollution, including sediment.
- Temporary and permanent habitat loss.
- Habitat fragmentation (including temporary barriers and watercourse crossings).
- Species injury or mortality during construction.
- Potential indirect effects such as predation due to habitat fragmentation.
- Disturbance/displacement of species within the local vicinity and the wider project footprint (particularly birds and bats).
- Lack of continuity during construction (river diversion) and habitat severance.
- Potential disruption of breeding, spawning, and foraging areas, along with reduced connectivity between aquatic habitats.
- Temporary changes in hydrological regime during construction

There is limited information available for the projects screened into the CIA, however, taking the precautionary approach (in the absence of details), it is considered that some of the CIA projects give rise to cumulative impacts. It will be important as all projects develops to revisit this list and update the CIA. However, given the anticipated size of the CIA projects identified, which are relatively minor, there is no reason to believe there will be significant cumulative impacts. This assessment assumes that other CIA projects will adopt suitable mitigation to avoid adverse effects, and that CIA-specific mitigation measure for construction outlined in Table 11 are adopted.

3.8.3.2 Operation

The potential impacts of the operation of the Project are describe and assessed in the ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The CIA for biodiversity examines the residual effects of the Pambukovica dam project with the projects screened into the CIA (i.e. construction of the Transformer Station and connection to kV line, and Relocation of Telekom Srbija cable). There is considered to no credible pathway for cumulative effects on biodiversity as a result of operation of the dam and the Transformer Station and kV line.

With regards future water resources, analysis suggests that Phase 2 E Flow presented will be sufficient to support the E&S VECs downstream, with limited deviation from the natural baseline regime anticipated (as presented in ESIA Volume 1 Book 4: Biodiversity Impact Assessment and ESIA Volume I Book 3: Surface Water), however this should be confirmed through further modelling in advance of commissioning Phase 2. This should also trigger an update of the Cumulative Impact Assessment, to ensure that any new projects (e.g. Kamenica Reservoir) with the potential impact cumulative on water resources are identified and assessed.

3.8.4 Mitigation measures

Mitigation measures pertaining to the potential construction and operation biodiversity impacts of the Project *alone* are outlined in ESIA Volume 1 Book 4: Biodiversity Impact Assessment. The Biodiversity Management Plan (BMP) outlines all the Actions that are required to avoid adverse effects and to comply with EBRD PR6. These mitigation Action focus on minimizing negative effects on biodiversity and delivering net gains. In addition, the monitoring of water environment impacts during construction will be managed through the WEMMP, which includes provisions relevant to aquatic receptors as addressed in the Biodiversity Impact Assessment (ESIA Volume 1 Book 4: Biodiversity Impact Assessment).

The additional mitigation measures set out in Table 11 below are designed to gather information on the likely cumulative biodiversity risks, that could present during construction and operation of the dam. These will inform the need for further assessment, stakeholder agreement and monitoring requirements.

Table 11:Table of cumulative impacts for biodiversity, alongside proposed mitigation and monitoring measures

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Construction phase Construction effects including disturbance and temporary or permanent habitat loss	In line with PR1 requirements and under the assumption that the Associated Facilities construction will occur concurrently with the Dam's construction, conduct regular meetings with the developer responsible for the construction of the Transformer Station and connection lines, to discuss potential in-combination effects and agree potential additional mitigation. Srbijavode should apply best efforts to ensure any permanent habitat loss from the Associated Facilities is considered in final offset areas as outlined in ESIA Volume 1 Book 4: Biodiversity Impact Assessment	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode and developers of Associated Facilities.

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Operations phase Changes in the water quantity in the Ub-Tamnava-Kolubara watershed due to water abstraction	ESIA Volume 1 Book 4: Biodiversity Impact Assessment and ESIA Volume I Book 3: Surface Water commit to undertaking a review of E Flows in advance of Phase 2. This should also trigger an update of the Cumulative Impact Assessment. During the warmer months, it is essential to monitor flow rates to determine whether prioritizing the river supply over the irrigation system is necessary in a drought scenario. Additionally, analyse the need to implement further mitigation measures.	Assessment of the Cumulative Effects of Phase 2 operations with future projects.	Srbijavode Lead: Project Biodiversity Specialist / Ecological Consultant; and Project Hydrologist

3.9 Land Acquisition

The construction of the Reservoir and Dam, and the associated facilities consisting of the Transformer Station, and the connection to the kV line is expected to have a potential cumulative impact on the availability of arable agricultural land in the area. As most land acquisition impacts are permanent and irreversible, these cumulative impacts are expected regardless of the stage of project implementation. In accordance with the overriding requirements of the EBRD Environmental and Social Policy for associated facilities (para. 3.4) and PR 1 (paras 6 and 9), the principle of meeting the objectives of PR5 take precedence over the cumulative impact assessment. This means ensuring that no persons are left worse off as a result of economic or physical displacement arising from the Project, together with impacts from other associated developments.

3.9.1 Spatial and Temporal Boundaries

With regards to the temporal scope, the potential cumulative impacts are likely to occur primarily during the construction and operation phases, covering activities related to the construction of the Dam, the Transformer Station, and the connection lines.

While the land acquisition process formally takes place during the pre-construction phase, the associated permanent impacts (such as physical (if any) and economic displacement or loss of access) materialize immediately prior to or with the onset of construction. For this reason, land acquisition-related impacts are considered within the construction and operation phase. Nevertheless, transitional aspects of land acquisition, such as compensation payments and ownership transfers, occur in the pre-construction phase and are tracked through dedicated monitoring.

In terms of spatial scope, the ESIA has defined the AoI for land acquisition to extend past the area of land expropriated for the Project, and includes the entire municipalities Ub and Valjevo, as well as Koceljeva to the west. These municipalities might be impacted by a higher demand for agricultural land and increased market value for agricultural land, from PAPs looking to purchase new/replacement land following expropriation.

The location of the associated facilities falls within the area of influence of this Project and depending on the scope of impact from the associated facilities , could cause additional strains on the local land market. With respect to land related impacts, there's a possibility that some of the same landowners could be further affected, primarily through temporary land take. Permanent impacts are expected at the transformer location and at the pole sites of the overhead transmission line (OHL), while the areas between OHL poles and the underground connection from the last pole to the substation are expected to require only temporary land take. The footprint of these facilities is relatively small compared to the reservoir and dam, with the transformer station typically occupying about 0.1 ha, and approximately 0.072 ha required for pole foundations (based on a land requirement of about 0.01 ha/km for a total of 7.2 km of OHL). Easement requirements are estimated at approximately 0.625

ha for underground section and about 3.6 ha for the OHL section.
The land under and around poles generally remaining available for agricultural use. In cases where landowners hold multiple parcels in different locations, there is a chance they could be subject to expropriation (for permanent land acquisition) and/or easement (for temporary land acquisition) more than once.

3.9.2 Baseline

The overall area of the Project spans 2.674.664 m² across 265 land parcels which are being expropriated. Of these, 2.230.024 m² are located within the Municipality of Ub, specifically the cadastral municipalities (CM) of Pambukovica, Raduša, and Slatina. The other 444.640 m² of land targeted for acquisition are within the CM Gola Glava, which falls administratively under the jurisdiction of the City of Valjevo. The majority of expropriated land (74%) is agricultural land, 14% is forest land, 5% are rivers and 6% is existing road infrastructure. The remaining 1% includes construction land, house yards, infertile land and orchards. Most of the land is privately owned, except for the roads and rivers which are publicly owned.

The total area of agricultural land that is being expropriated is 197ha, while the total area of agricultural land in the four impacted cadastre municipalities is estimated at 5,419ha. Although not all the land that is registered as agricultural in the cadastre is cultivated, almost all the agricultural land that is being expropriated, is cultivated – flat areas with high class soil are typical along the riverbanks and most suitable for agricultural production. Hence, while the project is impacting less than 4% of all agricultural land in the four impacted cadastre municipalities, the owners are unlikely to be able to identify available agricultural land of the same quality in the vicinity of their residences.

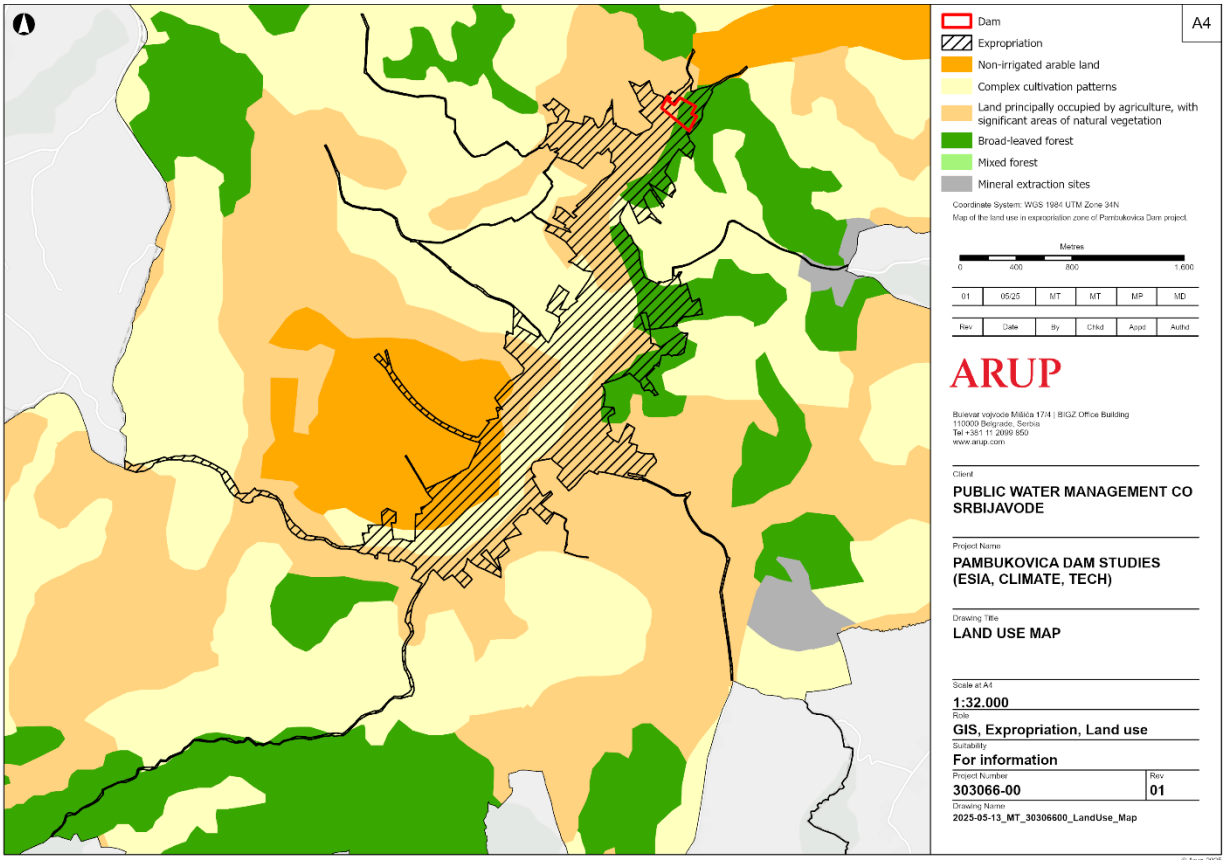


Figure 16: Area of expropriation relative to types of land

Temporary storage areas and access roads required for dam construction have been identified and presented in the main ESIA documents. All temporary disposal and access areas are within the Project boundary. If

permanent disposal of spoil or excavated material is required, the locations will be identified during a later stage of the Project by the Contractor and PWMC Srbijavode, and this commitment is reflected in the ESMP. A Resources and Materials Management Plan will be prepared to specify procedures and locations for any permanent disposal. Access routes to sediment traps have not yet been finalized and will be defined in the detailed design phase.

Information on land expropriation and PAPs requires further verification – existing data on land impacts needs to be reviewed and validated. Additionally, there may be further land acquisition needs related to road realignment, access to sediment traps, , road widening, and other ancillary project components.

3.9.3 Impact Assessment

The land acquisition for the associated facilities in the cumulative impact assessment will be either permanent or easement. The Project location is mostly rural area with an aging population traditionally focussing on agriculture, as their primary or secondary source of income. For the Project, the transformer station will require permanent land acquisition. The overhead 10 KV line will require permanent acquisition only for the pole locations, with the land under the line subject to easement. The underground connection will also require easement. In addition, temporary access will be needed for construction works. The expropriation for the Project is already ongoing, and permanent land loss is expected to impact the affected households. Prices for expropriation are determined at the municipality level (Ub, Valjevo) and take into account all land acquisition in these municipalities over a certain period. Compensation rates offered are typically higher than regular market sale prices for non-development purposes, which can make landowners reluctant to sell at actual market rates. The overall economic conditions and past development projects outside of the Project AoI in these municipalities have already affected the availability and the price of agricultural land. The risks identified in the ESIA include:

- Inability to purchase replacement land due to the limited availability of suitable land.
- Inability to purchase the same quality and area of land due to increased prices of land in the market.
- Loss of traditional livelihoods.

The Associated Facilities (i.e. the transformer station, the overhead 10kV line, the underground connection line and the relocation of the Telekom utility cable) will require limited additional land acquisition. The permanent land acquisition will be limited to transformer and pole locations, while the land under the line and cable relocation will involve easements. There is an opportunity to define the locations in a way that avoids or limits the impact on cultivated agricultural land.

All of the other elements considered under the CIA (linked to associated facilities, rather than the Pambukovica dam works) — such as temporary works, access roads, and smaller-scale land take —are expected to have relatively small and mostly temporary impacts on land owners an users and, by extension, agricultural production. The areas affected are limited in size, and the impacts are temporary in nature..

3.9.4 Mitigation measuresBackCover

Mitigation of impacts from land acquisition and loss of livelihood sources is directly related to the timely completion of the expropriation process and the implementation of the corrective actions, as identified in the historic land acquisition audit – compensation is defined at replacement value and there are no delays it the payment of agreed compensation. Other actions include collaboration with other developers of the associated facilities to ensure that developers consider limiting their impact on agricultural land during the planning and design stages. Actions related to livelihood restoration have also been considered that would support the households restoring their agricultural livelihoods and/or diversifying their livelihoods, including away from traditional agricultural production where appropriate.

At this time, the mitigation measures for the construction of the Transformer Station and new transmission lines have not been finalized. Assuming that similar mitigation measures will be implemented, including stakeholder engagement with the local community, that monitoring surveys will be conducted, and that regular meetings will be held with other developers in the area, the cumulative impact of land acquisitions is considered minor

Table 12:Table of cumulative impacts for land acquisition, alongside proposed mitigation and monitoring measures

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
Inability to purchase replacement land due to the limited availability of suitable land	Option analysis for future projects including associated facilities to minimise the need for expropriation and consider locations not used for active agricultural production. For associated facilities Srbijavode will share relevant information with the responsible developers and participate in coordination efforts to avoid and mitigate cumulative impacts. Srbijavode should apply best efforts to ensure any additional land acquisition meets the objectives of PR5 and principles set out in the HLACAP.	Planning and design documents	Developer of the transformer station and the transmission line with the support of Srbijavode For the associated facilities, Srbijavode to share relevant information with the responsible developer and maintain regular coordination
Inability to purchase the same quality and area of land due to increased prices of land in the market	Efficient finalisation of the expropriation process and payment of compensation. For the associated facilities (transformer substation and line), the role of Srbijavode will be to share relevant information with the responsible developer and participate in coordination efforts to avoid and mitigate impacts (assuming that construction of associated facilities takes place alongside with the dam works). These facilities are not under Srbijavode's direct control and are therefore not currently covered by HLACAP (inclusion will be addressed during its update). Srbijavode should apply best efforts to ensure any additional land acquisition meets the objectives of PR5 and principles set out in the HLACAP.	Records on the status of expropriation Updated HLACAP and Livelihood Restoration Plan	Municipalities Ub and Valjevo with Srbijavode for the completion of the expropriation process For the associated facilities, Srbijavode to share relevant information with the responsible developer and maintain regular coordination
Loss of traditional livelihoods	Job opportunities for the local communities on the Project – Contractors' Local employment strategy The HLACAP was amended to place greater emphasis on restoring existing agricultural livelihoods rather than relying on temporary jobs that may not be accessible to most PAPs. For the associated facilities (transformer substation and line), Srbijavode share relevant information with the responsible developer and participate in coordination efforts to avoid or reduce livelihood impacts, assuming that construction of associated facilities takes place alongside with the dam	Contractor's Local Employment Strategy Updated HLACAP and Livelihood Restoration Plan	Contractor with support from Municipalities For the associated facilities, Srbijavode to share relevant information with the responsible developer and maintain regular coordination

Cumulative Impact	Mitigation measure	Monitoring measures	Responsible
	works (inclusion will be addressed in updated HLA CAP).		
Impacts of land acquisition	In line with PR5 requirements and assuming that the construction of Associated Facilities will occur concurrently with the Dam's construction, conduct regular meetings with the developer(s) responsible for the construction of the Transformer Station and connection lines, to discuss potential overlapping or sequential impacts on land and livelihoods, and agree on any additional mitigation measures needed to ensure that affected persons are not made worse off.	Compliance with the agreements of the meetings held and implementation of agreed mitigations.	Srbijavode and developers of Associated Facilities.

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