Final Report
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Environmental and Social Scoping Study for the Belgrade WtE project in Serbia

E&S Scoping Report

FICHTNER

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Abbreviations and Acronyms

Abreviation	Explanation
ADC	Air Dispersion Calculation
a.s.l	above sea level
b.g.l	below ground level
BOD	Biological Oxygen Demand
CHP	Combined Heat and Power (Plant operated with RDF)
C&D waste	Construction & Demolition waste
CoB	City of Belgrade
COD	Chemical Oxygen Demand
COD	Commercial Operation Date
DHP	District Heating Plant
DP	Displaced Person
DPR	Detailed Plan of Regulation
EBRD	European Bank for Reconstruction and Development
EC	European Community
EIA	Environmental Impact Assessment
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
EU	European Union
FGC	Flue gas cleaning
GHG	Greenhouse Gas
HH	Household
IBA	Important Bird Area
IFC	International Finance Corporation
IFC PS	IFC Performance Standard
IPPC	Integrated Pollution Prevention and Control
LAR	Land Acquisition and Resettlement
LARR	Land Acquisition and Resettlement Review
LFG	Landfill gas
MBT	Mechanical-Biological Treatment
MoF	Ministry of Finance
No.	Number
Off.	Official
PAP	Project Affected Person
PIU	Project Implementation Unit
PS	IFC Performance Standard
PUC	Public Utility Company
PPP	Private Public Partnership
RAP	Resettlement Action Plan
RDF	Refuse Derived Fuel
RS	Republic of Serbia
SEP	Stakeholder Engagement Plan
SEPA	Serbian Environmental Protection Agency
TSP	Total Suspended Particles
TOC	Total Organic Carbon
WtE	Waste to Energy
WWTP	Waste Water Treatment Plant

1. Introduction and scope of work

The City of Belgrade (CoB) aims to improve the current city's solid waste disposal practice on a public private partnership (PPP) basis (Belgrade Waste to Energy (WtE) Project, or "the Project"). The objective of the CoB is:

- To close the existing Vinča landfill, which is without liners, leachate, LFG, and storm water managememt systems and does not comply with existing EU and Serbian standards as soon as possible;
- To introduce a modern waste management system as soon as possible;
  - to treat mechanically and thermally the maximum quantities of residual municipal solid waste (MSW) remaining after CoB's recycling efforts;
  - To reduce MSW and Construction & Demolition (C&D) waste to be landfilled to a minimum, extending the lifetime of the little landfill space available, and
  - To restrict the use of landfilling to a minimum of not recyclable/recoverable treatment residues and inert waste.

Ultimately, this shall also contribute to Serbia meeting the requirements of the EU Waste Framework Directive and the Landfill Directive 1999/31/EC on recovery requirements and reducing biodegradable MSW going to landfill.

The project includes the following main components:

- The core component is a WtE facility, which may consist of a mass burn incineration plant or a mechanical bilological treatment (MBT) plant to produce RDF and a RDF CHP plant to recover the energy from the RDF;
- An interim landfill for untreated residual MSW, until the new MBT/WtE facility(ies) is (are) available;
- A landfill for the residues from the MBT/WtE plant;
- A C&D waste recycling facility including an inert waste landfill;
- The rehabilitation,final capping and gas utilization of the existing Vinča Landfill, a >30 year old infrastructure located in the valley of the Osljan stream, 15 km east from the center of Belgrad to reduce its environmental impact. After the urgent stabilization of the landfill by the City, the PPP project foresees the construction of its final stable shape by concessionaire. Measures will be taken to drain as much as possible leachate out of the old landfill and send it to a new leachate treatment plant, once this is operational. Storm water diversion channels will also be added, as well as a LFG capture and possible utilization.

The set of tender documents for the first round of competitive dialogue for the PPP project offertwo potential sites for the WtE plants:

- New Vinča site, which offers space for the new landfills and new WtE facilities; and
- New Cerak site, which may be used for the new WtE facilities of the project.

The E&S Study considers 3 options of possible project concepts, taking into account the above 2 site options.

It is expected that by 2019 the new interim landfill will be available and the existing landfill operation could be closed. However, CoB does not target to landfill MSW but to pre-treat and utilize it. Three options are under consideration, namely:

- **Option 1:** Construct a Mechanical-Biological Treatment (MBT) plant at the new Vinča site, which will produce Refuse-Derived Fuel (RDF); transport of the RDF to the new Cerak site, close to a residential area located ca. 15 km west of the landfill; construct a new Combined Heat and Power (CHP) plant in the new Cerak site, near its existing District Heating Plant (DHP).

- **Option 2:** Transport of the untreated residual mixed MSW to the new Cerak site; burn the MSW in a new Incineration Plant to be built near the new Cerak site's existing DHP.

- **Option 3:** Incinerate the untreated residual mixed MSW at the new Vinča site in a new Incineration Plant.

Additionally at all options the contractor may integrate equipment to remove recyclable or organic materials (sorting, composting, digestion) for further reduction of the waste quantity that will finally be processed in the treatment facilities of the above noted options.

Additional options may be procured for the PPP project, such as constructing a MBT plant to produce RDF to be consumed in a CHP Plant at the new Vinca site. Such options are, however, not part of the scope of the present assessment.

The IFC has the mandate to prepare for and support the CoB to execute a tender process for private sector participation in the Belgrade WtE Project. Fichtner has been hired by IFC to act as the technical, environmental and social consultant in IFC 's transaction advisory service to the CoB.

Fichtner's consultancy services on the environmental and social subjects of the project consist generally of the following tasks:

- Phase 1:
  - Prepare an Environmental & Social (E&S) Scoping Study that covers selected project options and includes Terms of Reference (ToR) for a detailed ESIA (the ToR to be prepared at a later stage);
  - Execute a Land Acquisition and Resettlement Review (LARR);

- Phase 2:
  - Review the Resettlement Action Plan (RAP) and the Stakeholder Engagement Plan (SEP) prepared by the CoB;
  - Optional: if deemed necessary, elaborate the ToR for an update of the RAP and the SEP.

The present report contains the **draft E&S Scoping Stud**y and related Annexes, including the LARR. The ‘scope’ of the E&S scoping Study refers to the geographical, technical and potential impacts that need to be fully addressed in the ESIA. Therefore, the purpose of the scoping is to:

- identify the key environmental and social effects/impacts/risks likely to occure during the project pre-construction (in the framework of the scoping study land acquisition and involuntary resettlement is analysed), costruction and operation phase and linked with the project altenatives and related project components.
- define the methodology to be used in the ESIA to assess and address these effects/impacts/risks in greater detail.

The preliminary assessment of E&S impacts considers:

- Existing landfill operated by PUC:
  - Operation of the existing Vinča landfill in the project transition period of (2) 3 years (2016 - end of 2018).
- PPP project measures implemented by the PPP-contractor:
  - Rehabilitation and closure of the existing Vinča landfill (different construction measures 2019 - 2023), operation of LFG capture and utilization and leachate treatment and landfill monitoring until 2046;
  - Construction of a new landfill at the new Vinča site, comprising:
    - the interim landfill (construction 2017/18, operation 2019-2020);
    - the landfill for treatment residues including the plants to maturate and solidify these residues (construction 2019/20, operation 2021-2046);
    - the C&D waste recycling plant and inert waste landfill (construction 2017/18, operation 2019-2046).
  - Construction, Operation and Management (O&M) phases for the 3 WtE options selected as most suitable at the current project phase (construction starting in 2017; operation 2021-2046);

The consultant developed the E&S Scoping Study and the LARR, and reviewed the existing SEP prepared by the CoB based on the following requirements:

1. Project’s relevant social and environmental laws, regulations and policies of Serbia relating to concessions, land acquisition, resettlement, ethnic minorities, social and environmental protection;
2. IFC PS on Environmental and Social Sustainability (2012) (PS) 1 to 8;
3. World Bank Group Environmental, Health and Safety Guidelines, namely:

a) WBG General EHS guidelines (April 30, 2007);
b) WBG EHS guidelines for Waste Management Facilities (December 10, 2007).

4. Good International Industry Practice, where applicable[1].
5. IFC's Good Practice Handbook on Stakeholder Engagement (May 2007);
6. IFC's Handbook for Preparing a RAP (March 2002);
7. IFC's Good Practice Note on Addressing Grievances from Project-Affected Communities (September 2009).

An important output of the E&S Scoping Study is a detailed **ToR** for the elaboration of an Environmental and Social Impact Assessment (ESIA) for the project (to be made available in a later stage).

As part of the E&S Scoping Study, a **draft Land Acquisition and Resettlement Review** (LARR) is presented in Annex B. The objective of the LARR is to present a review of the current land acquisition process being planned/undertaken for the extension of the Vinča landfill, and the planned involuntary resettlement of the informal settlers/households (mostly Roma) living on the landfill area. The key objective of the LARR is to (i) assess the consistency of the process (planning and implementation to date) with national legislation and IFC PS5, and (ii) suggest remedial and/or mitigation measures to enhance compliance with IFC PS5. The information contained in the LARR should be taken into account by the CoB when populating the RAP.

[1] GIIP: According to IFC PS, GIIP are "defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally".

2. Description of the PPP Project

The presently tendered PPP project offers two potential project sites:

- Vinča site, consisting of the existing landfill and the new Vinča site which offers space for the new landfills and new WtE facilities; and
- Cerak site, which may be used for some of the WtE facilities of the project.

Figure 2-1 shows the location of the two potential project sites.

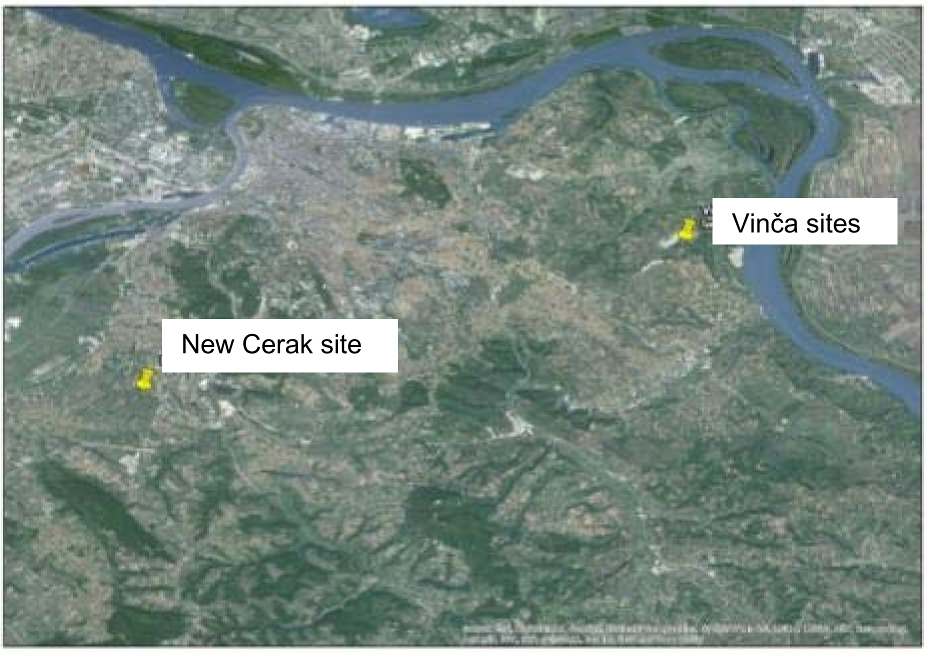

Figure 2-1: Location of the Vinča site and the Cerak site

2.1 The project elements

The CoB intends to modernize their waste management as fast as possible, i.e. to close their exiting landfill as soon as a replacement facility becomes available. The following figure presents a tentative timeschedule of the landfill activities of PUC and the PPP project.

, It is assumed that an interim landfill in accordance with Serbian and EU standards, n, will earliest be constructed by contractor in 2019. Waiting for the MBT/WtE facilities would mean to operate the existing landfill until 2021.

Until the beginning of 2019 the existing landfill will be fully operated and managed by PUC. . In order to mitigate the evident risk of landslides, CoB plans to construct some urgently required stabilization measures that are explained in the study . Only at the date of closure of the existing landfill operation and start of the interim landfill the PPP contractor will take over the services .

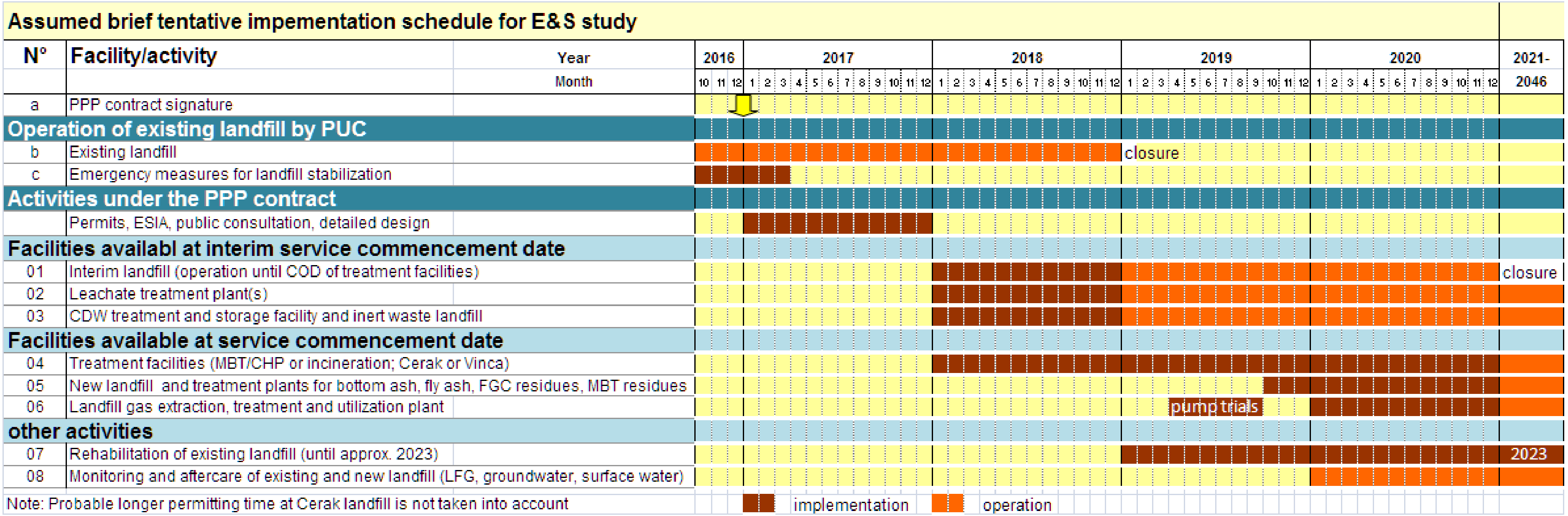

Figure 2-2: Tentative implementation schedule of the PPP project assumed for this E&S study

The PPP project is composed of a number of facilities and project activities making the project quite complex. It furthermore leaves certain project decisions open to the tender process, such as the selection of

- the site; and
- the WtE technology and approach.

The PPP project is composed of the following components:

→ **Facilities starting operation in 2019:**

- **Interim landfill cell for untreated residual MSW**
  At closure of the operation of the existing landfill at Vinča site, start the operation of the new interim landfill for untreated residual MSW. This landfill is an engineered landfill according to non-hazardous waste landfill standard of the EU directive. It will be equipped with bottom liners, leachate collection system and LFG capture. The collected gas will be piped to the LFG flare and utilization plant component of the project.

  This landfill cell will be closed when the WtE facility starts operation, which is expected in 2021.

- **Leachate treatment facility**
  A leachate treatment facility will be built to treat the leachates collected from the existing and new Vinča site (interim landfill, landfill for incineration residuals (bottom and fly ash) and C&D) . The plant will treat the leachate to Serbian and EU standards, allowing discharge to surface water. It will become operational, when the existing landfill is closed (end of 2018).

- **C&D waste facility**
  The C&D waste facility will receive:
  - construction and demolition rubble (about 100,000 t/a) and
  - excavation soil (about 100,000 t/a)

  The C&D waste facility will be composed of at least 3 components:
  - a C&D waste crusher for concrete and bricks, in order to produce aggregate material for recycling
  - an interim storage place where minimum 70% of the mineral C&D material delivered (soil and crushed C&D waste) can be stored until to their recycling or recovery.
  - an inert waste landfill, where up to 30% of C&D waste, which are not recoverable, can be landfilled.

→ **Facilities starting operation in 2021:**

- **WtE facility**
  The tender documents leave open the WtE approach and technology to the bidders. The WtE shall be the major treatment component and the backbone of Belgrade's future MSW management.The WtE facility will

comply with high EU construction, operation and emission standards for waste incineration plants.

The WtE facility in combination with a landfill for disposal of residues will replace the landfill operations for untreated MSW. The assumed capacity of the plant is 500,000 t/a of residual MSW.

Several WtE options are under consideration for this E&S Study. 3 options have been assumed as most likely. The options are described in the following:

- **Option 1:**
  - PUC delivers the untreated residual mixed MSW to a Mechanical-Biological Treatment (MBT) plant at the new Vinča site.
  - Construct a Mechanical-Biological Treatment (MBT) plant at the new Vinča site, which will produce Refuse-Derived Fuel (RDF). MBT treatment rejects will be landfilled at the landfill cell for treatment residues.
  - Transport the RDF to the new Cerak site, located ca. 15 km (direct line).
  - Construct a new Combined Heat and Power (CHP) plant to burn the RDF at the new Cerak site, directly beside an existing District Heating Plant (DHP)
  - Transport of the treatment residues to the new Vinča landfill to the landfill cell for treatment residues.

- **Option 2:**
  - PUC delivers the untreated residual mixed MSW to the new Cerak site, thus modifying the transportation logistics for the residual MSW;
  - Construct a new mass burn incineration plant at new Cerak site near the existing DHP;
  - Incinerate the residual MSW in a new Incineration Plant
  - Transport of the treatment residues to the new Vinča landfill to the landfill cell for treatment residues..

- **Option 3:**
  - PUC delivers the untreated residual mixed MSW to the new Vinča site;
  - Construct a new mass burn incineration plant at the new Vinča site;
  - Incinerate the residual MSW in a new Incineration Plant;
  - Deposit the treatment residues at the new Vinča landfill without the need for long transports.

Additional WtE options may be proposed for the PPP project by the bidders, such as constructing a MBT plant in the new Vinča site to produce RDF to be consumed in a CHP Plant at the new Vinca site.. Such options are, however, not part of the scope of the present assessment.

- **Landfill for disposal of WtE residues at new Vinca site**
  This landfill also includes the treatment facilities for the residues:
  - Maturation area for the bottom ash;
  - Crusher and metal removal for bottom ash and
  - Solidification plant for fly ash and FGC residues.

  First discussions with the bidders came to the result, that they have different treatment targets in mind in respect to residues. While some bidders want to treat the residues to a level, where the residues are considered as non-hazardous waste, others bidders target to reach the level of inert waste.

  Depending on the treatment level, the landfill will
  - either be designed , constructed and oparted in accordance with EU and Serbian non-hazardous waste standards, i.e. including bottom liner and leachate collection, but without LFG collections, as this will not generate,
  - or an inert waste landfill cell will be build in accordance with EU and Serbian standards.

- **LFG extraction for the existing landfill (post 2019 period)**
  - Under this component the following is planned:
  - Carry out LFG pumping trials on the existing landfill;
  - Based on the outcome, design appropriate measures for gas capture;
  - Drill vertical wells for LFG capture and install piping and compressor station with a flare;
  - Depending on the gas pumping trials, construct a LFG utilization facility.

→ **Other activities:**

- **Rehabilitation of the existing landfill**
  Once the interim landfill for residual MSW becomes operational, which is expected by the beginning of 2019, PUC will stop the existing Vinča landfill operation and no more MSW will be received and landfilled . The existing landfill will then be handed to the PPP contractor for rehabilitation, LFG capture and utilization, capping, recultivation and monitoring. The exact measures at the existing landfill to be carried out by the contractor are not known yet, as these are subject to the tender process and later detailed design for the existing landfill closure and rehabilitation that will be prepared by the contractor in accordance with Serbian, EU legislation and applicable requiremenst of the WBG EHS guidelines for Waste Management Facilities.

  For this E&S study the following likely measures are assumed, carried out by the PPP contractor:

  1. Rehabilitation of the landfill:
     a) Design of the rehabilitation measures to be taken;
     b) Finalize the dam at the eastern slope of the landfill, which is directed to the Danube River;

c) Relocate already landfilled waste in order to reach a final stable shape of the landfill;
d) Finish introducing horizontal drainage pipes to extract the leachate trapped inside the landfill body;
e) Try to collect as much as possible leachate from these pipes as well as specific leachate drainage ditches around the landfill body;
f) Pipe the leachate to the leachate treatment plant, to be build downstream the existing landfill body;
g) Improve storm water diversion channels and add additional ones, where needed, separated from the leachate drainage ditches;
h) Deviate surface water wells feeding the Ošlijan stream upstream the landfill body, which presently enter in the existing landfill;
i) Temporary cover and vegetation of the landfill with soil material and low plants until constructing the final capping.

2. Capping of the landfill:
   a) Once the landfill settlements have stabilized, after about 3 to 5 years, construct final capping in accordance with Serbian, EU standards and applicable requirements of the WBG EHS guidelines for Waste Management Facilities.

- **Monitoring and aftercare of existing and new landfill and operation of LFG and leachate facilities**
  Under this component the PPP contractor will monitor the landfill, and where necessary take the action to maintain it in good shape and prevent damages.

  Furthermore the PPP contractor will operate the leachate treatment plant and the LFG plant.

Additionally at all options in accordance with the tender documents the PPP contractor may integrate equipment to remove recyclable or organic materials (sorting, composting, digestion) for further reduction of the MSW quantity that will finally be processed in the WtE facilities of the above noted options. As this is not very likely, this option has not been considered in this E&S study.

Figure 2-4 to Figure 2-5 show schematic representations of the three project options under analysis.

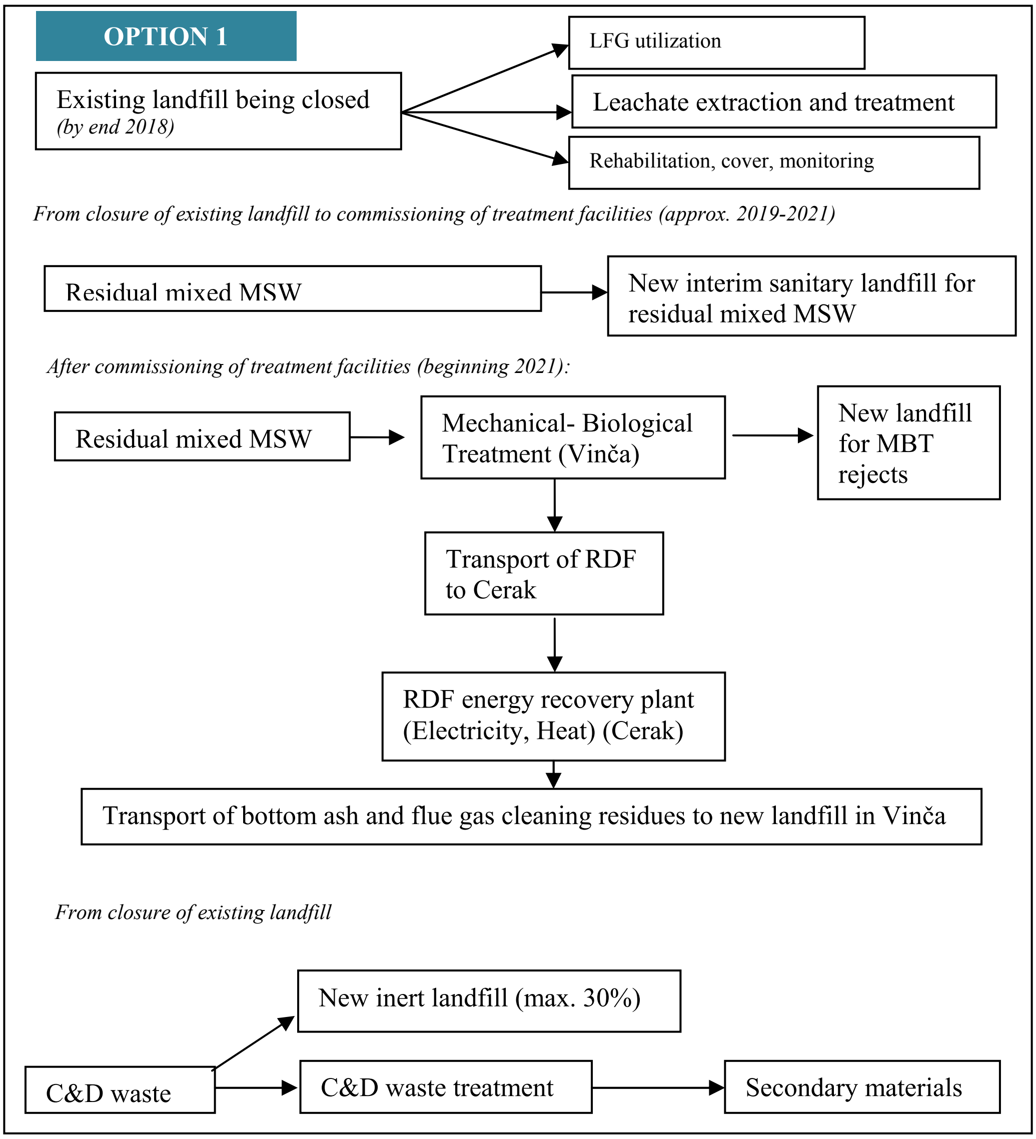

Figure 2-3: Project Option 1

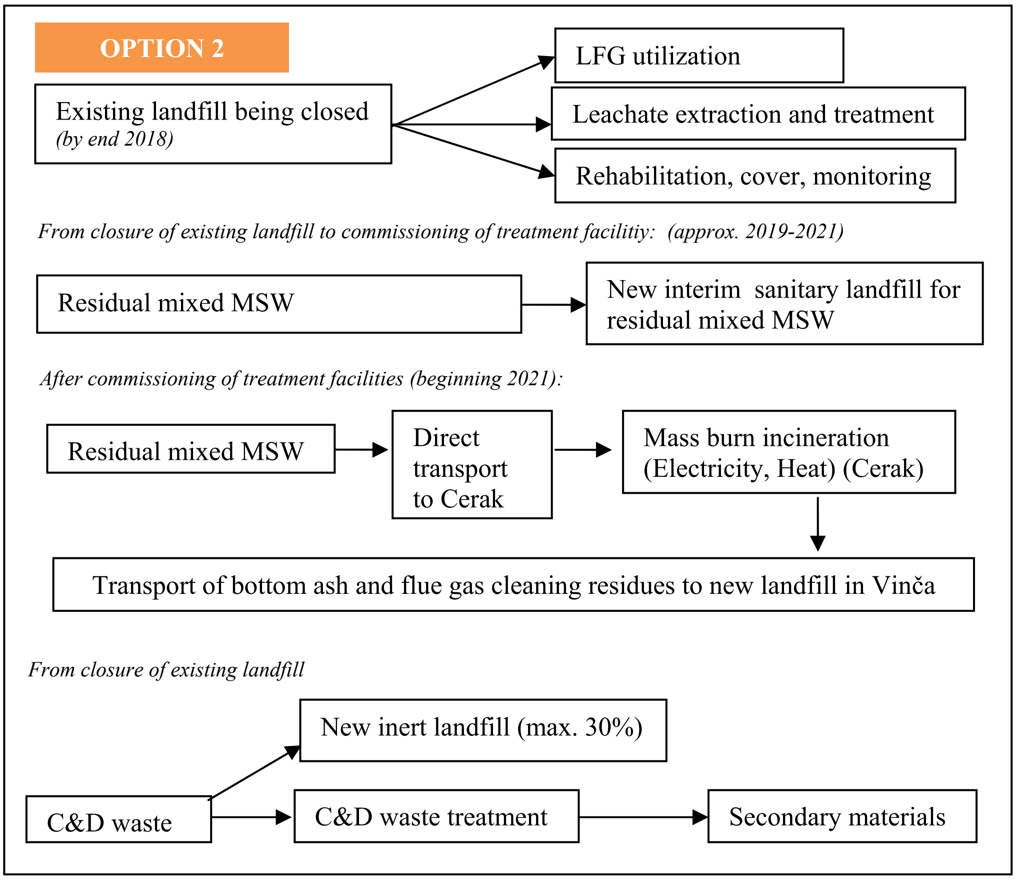

Figure 2-4: Project Option 2

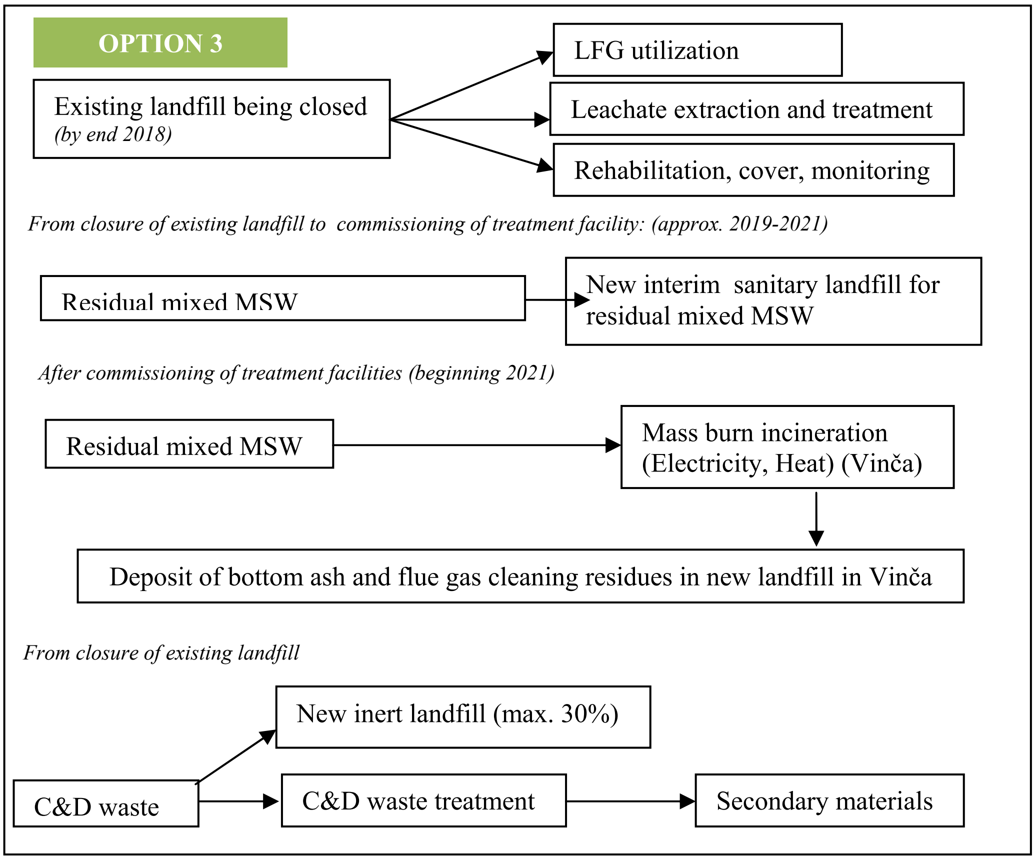

Figure 2-5: Project Option 3

2.2 The potential project sites

2.2.1 The Cerak DHP

The following figure shows the Cerak DHP site and its surroundings.

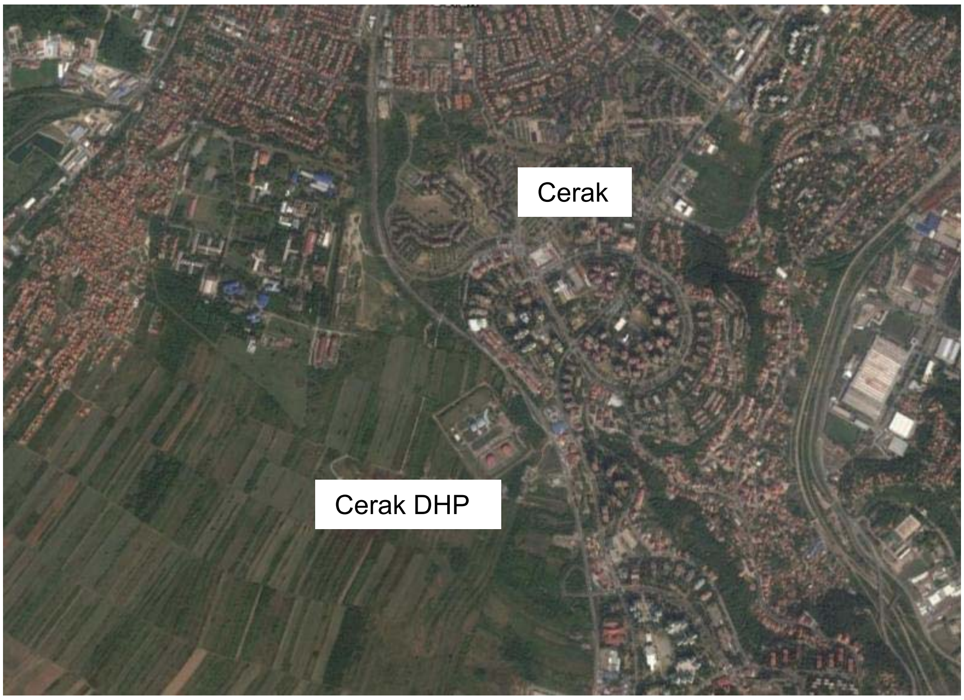

Figure 2-6: Ortophoto showing the location of the new Cerak site and existing DHP (source: Google Earth Pro; imagery date: 24.09.2015)

The Cerak DHP (Figure 2-7) provides district heat to the adjacent district heating network of Cerak.

Figure 2-7: The Cerak district heating plant (source: Fichtner, September 2015)

The plant is located in close proximity (ca. 120 m) to residential buildings, as shown in Figure 2-8.

Figure 2-8: Distance from the DHP Cerak to the closest residential buildings

The Cerak DHP is composed of 5 boilers and 4 heat exchangers which are arranged in parallel configuration. The boilers feed one common header which supplies the heat exchangers. The plant is operated with natural gas, having HFO available as reserve in a tank storage on the site.

The heating temperature in the feeder fluctuates and increases up to 120°C. The district heating network is operated for:

- heating (October to April); *and*
- hot water supply all year around.

The main feed is below 70 MWth, but in peak times the capacity demand may increase to up to 220 MWth.

2.2.2 The new Cerak site

Figure 2-9 shows a satellite view of the Cerak site and of the existing structures of the DHP. The new and existing Cerak site is linked to the Ibarska Magistrala (route 2), has a 35 kV power connection, and connection to natural gas. A 110 kV connection for evacuation of electricity does not exist.

Figure 2-9: Satellite view of the new Cerak site, including the district heating plant; infrastructure connections

Options 1 and 2 foresee that a mass burn incineration plant or a CHP plant burning RDF is located at the new Cerak site. As the DHP boiler house and offices and the HFO tanks cannot be removed, the mass burn incineration plant or RDF CHP plant must be placed on the free areas around the main existing structures. Land outside the Cerak site is not available. Figure 2-10 shows the areas which in principle are available to locate the WtE plant within the available plot.

The bidders considering the Cerak site shall also consider the outcomes of the preliminary environmental and social impact assessment of the project options addressed in Section 6 of this report.

Figure 2-10: Available areas for construction of the WtE plant in the new Cerak site

Table 2-1 summarizes the state of the available infrastructures at site.

Table 2-1: Infrastructures available at the new Cerak site

Parameters	New Cerak site
Road access	Access via existing access road from Ivarska Magistrala (route 22), from crossing at coordinates 44°44'11.30"N, 20°25'5.59"E
Power supply	35 kV connection is available on the site
Power evacuation	It is assumed that electricity generated in the WtE plant (Incineration Plant in Option 2, or CHP Plant in Option 1) could not be fed into the 35 kV grid, given its capacity. Therefore, the Contractor will need to build a grid connection line to the next 110 kV substation located 4.2 km from the new Cerak site.
Heat evacuation	Heat shall be fed into the district heating Feeder in the heating plant, located on the new Cerak site.
Natural gas supply	Connection available at the site. The district heating company operates a HFO storage, which is used in case of emergency.
Water supply	Available on site for normal use.
Sewage	Sewerage connection available at the site
Internet connection	Not available. To be established by the Contractor.

2.2.3 The existing Vinča landfill

Figure 2-11 gives an overview of the location of the Vinča sites and surroundings.

The existing Vinča landfill has been in use since 1978, initially as one of the several municipal landfills in Belgrade. During the 1990s the other landfills have been gradually closed and the Vinča landfill has remained the only active landfill in the city, receiving the waste from 13 municipalities. The PUC (Public Utility Company) “Gradska Cistoca” operates the landfill, which is owned by the CoB.

The Vinča landfill was constructed in the 70’s using the specifications and requirements of the time. Therefore, it does not present the characteristics of a modern sanitary landfill. It is being used as a dump site for both municipal and industrial waste and the site operations are not in compliance neither with actual Serbian regulatory requirements, nor with international standards and good practice.

The area of the existing landfill is about 40 ha. The landfill height is between 5 and 50 m. About 1,700 t of waste is disposed daily at the landfill[2]. The landfill is not equipped with any technical control systems. No bottom liner system (natural or artificial) has been used which has resulted in uncontrolled migration of leachates to the subsurface. No leachates collection and treatment has been installed so the leachate is discharged to the nearby surface water recipients (Figure 2-12).

No sewage system is present at the site. Septic water is removed by tanker trucks.

[2] Strategic Environmental Impact Assessment of the Plan of Detailed Regulation of the sanitary landfill Vinča - Urbanistic Institute of Belgrade, 2015

Figure 2-11: Ortophoto showing the location of the new Vinča site and the existing landfill (dated 23.03.2015)

Storm water is partly deviated by diversion ditches. It enters partially into the landfill body and mixes with leachate. Storm water is discharged to the surface water recipient (Figure 2-13). The lack of comprehensive storm water deviation resulted in landfill instability issues with the risk of landslides at the landfill body. Several landslides already happened in the past.

Figure 2-12: Leachates from the landfill body (Source: Strategic Environmental Impact Assessment of the DPR, 2015 - date of the photo unknown)

Figure 2-13: Storm water drainage ditch in the southern part of the landfill body (Source: Strategic Environmental Impact Assessment of the DPR, 2015 - date of the photo unknown)

The accumulation of LFG is not technically controlled or utilized which leads to its subsurface migration and release into the air. Consequently, monitoring of LFG is not possible. The annual LFG generation is estimated to be approximately 66 MNm^3/year[3].

The landfill is partially fenced but does not have any vegetation barrier. The dispersion of litter and the air dispersion of waste particles downwind of the landfill are not controlled. No adequate water supply for fire protection is provided at the site.

Presently, the landfill accepts MSW, construction and demolition waste, bulk waste, healthcare waste (sterilized and properly packed), and waste tires. Separate dedicated sections have been established for disposal of treated health care waste (13,000 t/a) and waste tires (600 t/a). Bulky waste is collected and disposed on a monthly basis (2,500 m^3/month). C&D waste (approx 180,000 t/a in 2014 of rubble and soil) is partly used as material for daily and interim cover of the tipping area. Table 2-2 shows the average composition of residual MSW generated in Belgrade in 2012-2014.

Type of waste	Household Waste (~80% of MSW)	Commercial Waste (~20% of MSW)	Total residual MSW
Food waste	28.6%	13.6%	25.6%
Paper	8.9%	20.0%	11.1%
Cardboard	9.8%	29.7%	13.8%
Plastics	13.6%	14.7%	13.8%
Textile	4.3%	1.7%	3.8%
Diapers	4.8%	0.3%	3.9%
Leather	1.2%	0.4%	1.0%
Garden green waste	8.1%	0.5%	6.6%
Wood	1.0%	4.0%	1.6%
Glass	4.9%	6.7%	5.2%
Metals	2.2%	2.5%	2.3%
Inert	12.3%	5.4%	10.9%
Hazardous waste	0.5%	0.3%	0.4%
Total	100.0%	100.0%	100.0%

Table 2-2: Composition of residual MSW (quarterly analysis in Belgrade 2012-2014)

The waste is received at the gate, weighted at the weighbridge and the waste type and quantity are recorded.

The disposed waste is immediately compacted and covered as practicable, daily to weekly by C&D waste or soil (brought to the site externally). The filled parts of the landfill have been closed and interim covered by soil and planting grass. A final shaping and capping will be carried out under the PPP project.

[3] Vinca landfill DD, COWI, 2007

Formerly recyclable materials were extracted by waste pickers at the tipping front of the landfill. Meanwhile this practice has been changed by the PUC . Now a small temporary MSW sorting plant that has been constructed and operated by Lafarge Serbia[4] is located close to the entrance area of the existing landfill where MSW is sorted and RDF is produced. The RDF is transported to the cement facility of Lafarge in Beocin. According to the CoB the sorting plant will be decommissioned once the PPP contractor will take over the existing landfill (2019), except if there might be an agreement between Lafarge Serbia and the PPP contractor.

2.2.4 The new Vinča site

As the present area of the existing landfill is practically filled up, the CoB has decided to extend the site. A DPR (Detailed Plan of Regulation) has been developed and approved by the CoB after 30 days of public disclosure and the land is in the process of being acquired by the City. Figure 2-14 shows the Vinča sites, with the existing landfill area marked by a yellow line, and the new Vinča site located between the yellow and the red line. According to the DPR, the landfill site area will be extended from the existing 43 ha (yellow line in Figure 2-14) to about 97 ha in total (red line in Figure 2-14). The extension area (new Vinča site) is about 54 ha.

Figure 2-14: Present landfill site and new Vinča site (proposed extension area)

Within the new Vinca site , besides the new landfills, the future WtE and/or MBT facility would be built. A possible layout of the facilities is described

[4] http://www.lafarge.rs/

in the DPR, while the specific locations of the project facilities at this site will be defined finally within the technical concept that will be proposed by the PPP contractor.

Table 2-3 summarizes the state of the available infrastructures at site.

Table 2-3: Infrastructures available at the Vinča landfill project site

Parameters	New Vinča site
Road access	The only access is via existing access road from Kaludjerica 2 - Bulevar Kralja Aleksandra, Smederevski route (route 100), from crossing at coordinates 44°45'54.36"N, 20°33'49.55"E
Power supply	35 kV connection is on the site. Depending on the electricity demand this may need to be reinforced
Power evacuation	It is assumed that b) electricity generated by the LFG power generator could be evacuated through the existing 35 kV connection. c) electricity generated in the WtE cannot be fed into the 35 kV grid, given its capacity. Therefore the Contractor shall build a grid connection line to the next 110 kV substation located 5.2 km from the Site
Heat evacuation	Potential to connect to the next district heating network in Konjarnik, about 10 km on the road from Vinča site.
Natural gas supply	Not available
Water supply	Available on site for normal use by means of two potable water tanks. No water is available for emergency situations.
Sewage	Not available
Leachates	Treatment in the new leachate treatment plant. Exact discharge destination in the direction to Danube river to be defined during permitting.
Internet connection	Not available. To be established by the Contractor.

2.2.5 The WtE facilities

As described under Section 1 of this report, depending on the project Option to be selected, different WtE facilities may be built:

- Under Option 1, a Mechanical-Biological Treatment (MBT) Plant and a Combined Heat and Power (CHP) Plant to burn RDF are planned;
- Under Options 2 and 3, an Incineration Plant is planned.

A summary of the technical characteristics of the facilities is presented herein (Table 2-4), based on an initial technical and financial note prepared by IFC and Fichtner in March 2015. The technical characteristics of the facilities shall be updated and further detailed by the contractor, and shall be used during the project ESIA stage.

Facility	General description Assumions used for the E&S study. The actual set up is subject to the tender process.	Design capacity [t/a] *	Area required [ha]	Rejects/recyclables from waste treatment [t/a] (indicative values)			
				Fly ash/FGC - residues (Sanitary landfill)	MBT-Residues (Sanitary landfill)	Bottom ash (inert landfill or recovery)	Metals (recycling)
MBT Plant (Option 1)	• Enclosed MBT facility with the following main components • -Mechanical treatment • -Biological treatment • -Biofilter or regenerative-thermal oxidation -RTO • Vehicles	500,000	6	-	93,600	--	4,300
RDF CHP Plant (Option 1)	• Stoker fired incineration (State-of-the art technology), 2 lines • Production of electricity and heat (demand for heat at 3,000 to 3,600 h/a) • Flue gas cleaning is designed to fulfil EU requirements	302,000	3	26,100	--	22,300	--
Incineration Plant (Options 2 and 3)		500,000	3	30,000		104,100	4,500

* Scenario: 100% of residual MSW being treated

Table 2-4: Technical summary of the WtE facilities (indicative values at design capacity)

2.3 Investigation area of the E&S study

To address the expected direct and indirect environmental and social risks and impacts of the PPP project options two investigation areas have been defined: (1) a direct impact zone (DIZ), and (2) an indirect impact zone (IIZ).

The DIZ and the IIZ are defined separately for environmental issues and for social (incl. community H&S) issues.

2.3.1 DIZ - Environmental issues

The direct impact zone of the **existing Vinča site** for environmental issues covers a radius of ca. 1.6 km from the center of the existing landfill. The radius has been determined primarily with the aim to include the aquifer area from the site to the closest surface water recipient (the Osjlan swamp). Such radius is considered sufficient to address all other direct physical and biological effects from the existing and the new sites as well (Figure 2-15).

The direct impact zone of the **new Vinča site** for environmental issues has been established to cover a radius of ca. 1 km from location of the proposed WtE facilities (Figure 2-15).

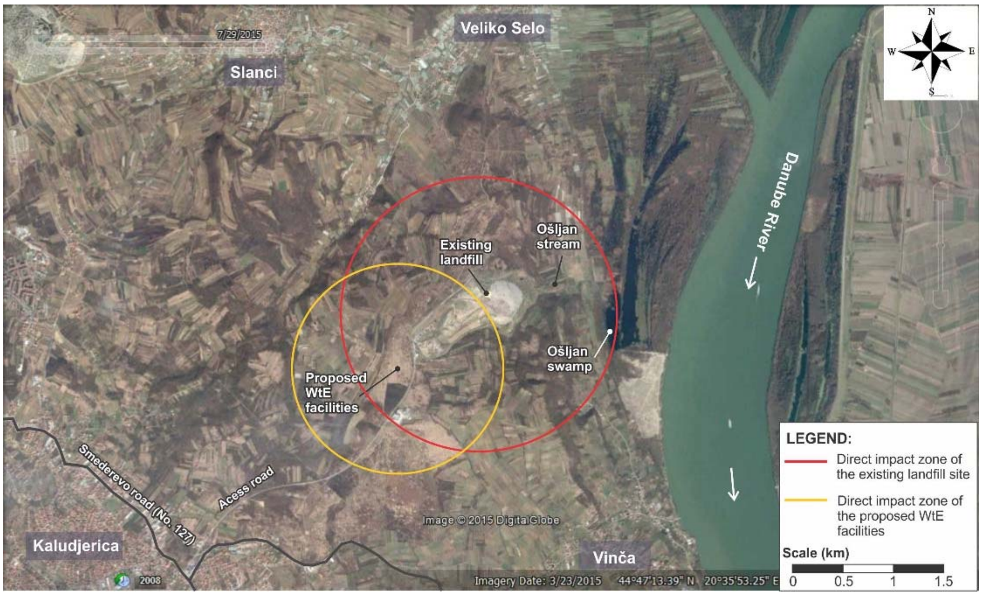

Figure 2-15: DIZ for environmental issues at the new and the existing Vinča sites

The direct impact zone for environmental issues at the **new Cerak site** has been established as an area in the radius of ca. 1 km from the district heating plant site perimeter (Figure 2-16). Such radius is considered sufficient to take account of all direct potential physical and biological effects of the project options, in this case the Incineration Plant or the Combined Heat and Power Plant.

Figure 2-16: DIZ for environmental issues at the new Cerak site

2.3.2 IIZ - Environmental issues

The indirect impact zone for environmental issues at the **existing Vinca site** covers a radius of ca. 2,2 km from the center of the existing landfill. The radius has been established to include the discharge point to the Danube River immediately downstream of the landfill (Figure 2-17).

The indirect impact zone for environmental issues at the **new Vinca site** covers a radius of ca. 2 km centered in the location of the WtE facilities. This circle includes the area with a radius of up to 20 times the stack height, which is about 1.6 km from the stack of the proposed waste treatment plant in Option 3 (assuming that this is 80 m high). In addition, the routes connecting the Vinča landfill and the new Cerak site are considered another indirect impact zone for environmental issues related to the new Vinca site (Figure 2-17).

Figure 2-17: IIZ for environmental issues at the new and the existing Vinca sites

The indirect impact zone at the **new Cerak site** has been established as a circle with a radius of up to 20 times the stack height, which is about 1.6 km from the stack of the proposed waste treatment plant (assuming that this is 80 m high) in Options 1 and 2. In addition, the routes connecting the Vinča landfill and the new Cerak site are considered another indirect impact zone for environmental issues (Figure 2-18).

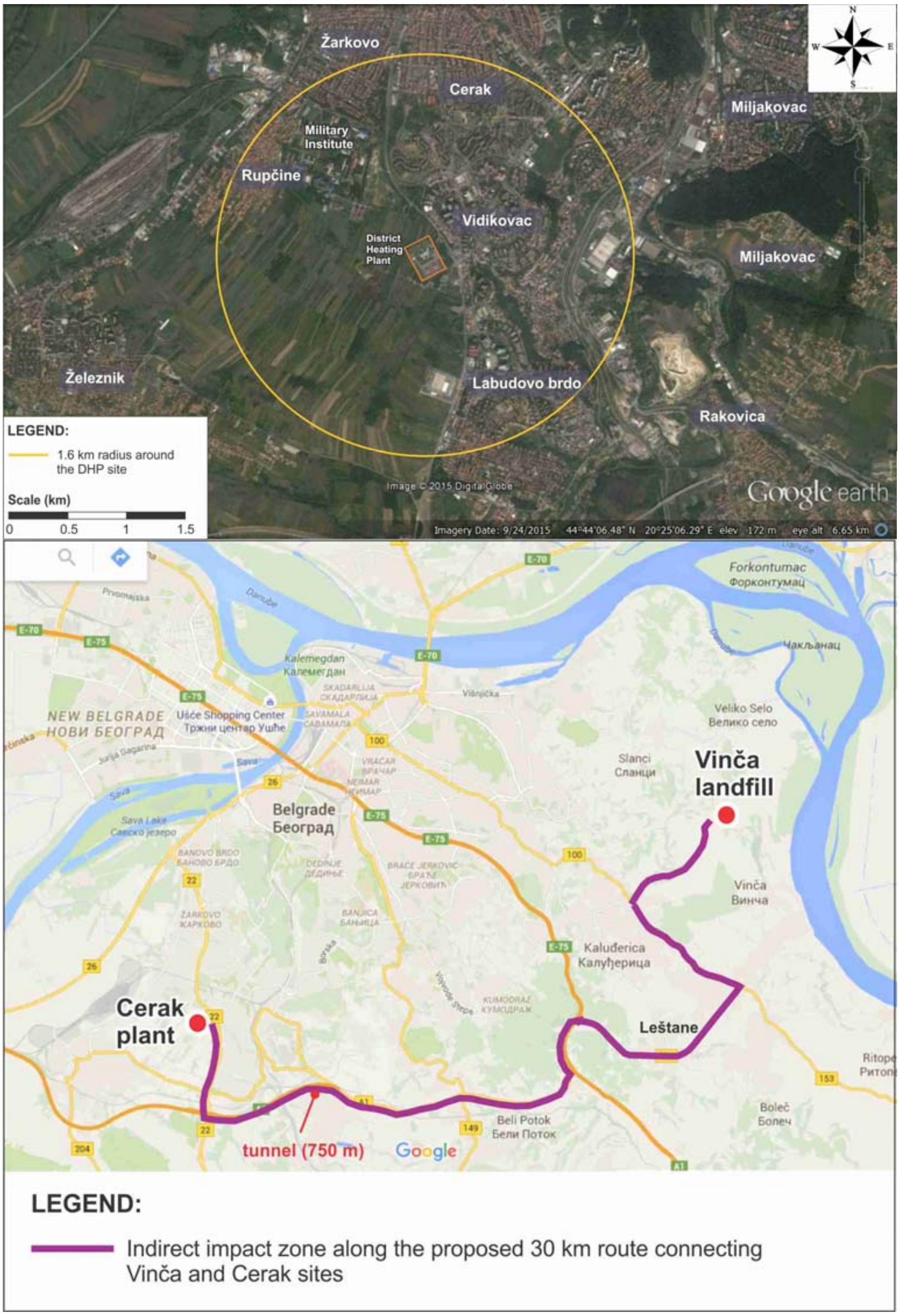

Figure 2-18: IIZ for environmental issues at the new Cerak site

2.3.3 DIZ - Social and Community H&S issues

The direct impact zone for social and community H&S issues at the **Vinca sites** is considered the same as the one for environmental issues. This includes especially all expropriated land owners, the PAPs to be resettled from the landfill area, the waste-pickers working on the site and the eventual cultural sites. There is one settlement inside the DIZ (see Section 5.3.1).

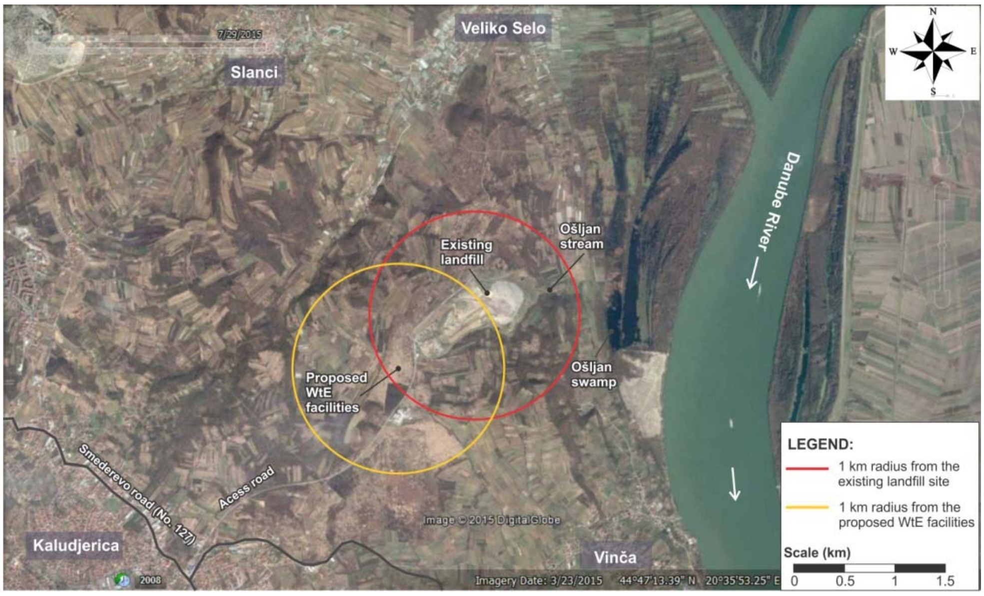

Figure 2-19: DIZ for social and community H&S issues at the new and the existing Vinca sites

The direct impact zone for social issues at the **new Cerak site** is the residential area close to the District Heating Plant across the road, as the residents of the area are potentially affected by air emissions, noise and visual impacts during both the construction and the operation phases. For the effects of determination of the DIZ, this is the area included within a circle with 1km radius.

Figure 2-20: DIZ for social and community H&S issues at the new Cerak site

2.3.4 IIZ - Social and Community H&S issues

The indirect impact zone for social and Community H&S issues for both sites includes the entire municipalities of Grocka, Zvezdara and Cukarica (the municipality of Zvezdara is included because of the traffic impacts between the new Vinča site and the new Cerak site).

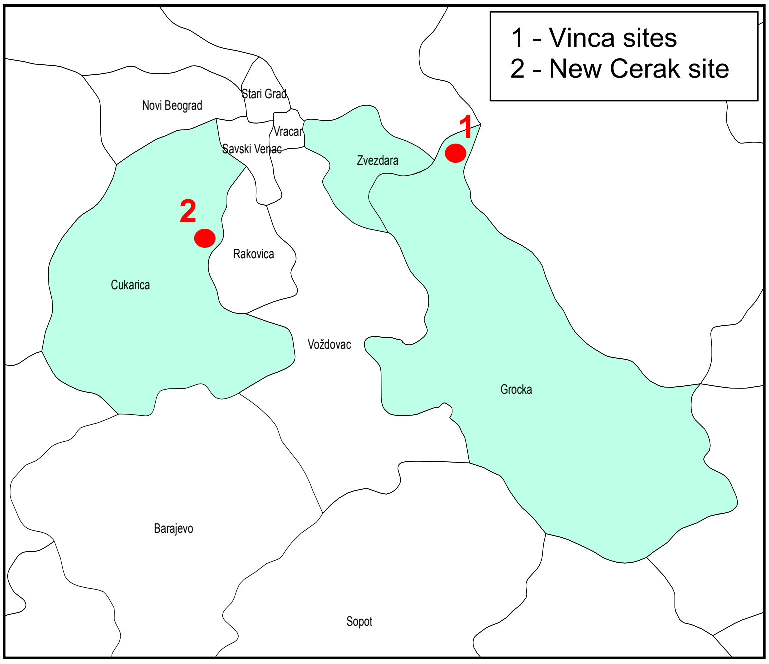

Figure 2-21: IIZ for social issues (green marked municipalities) at the Vinca sites and the new Cerak site

The village Kaludjerica (mun. Zvezdara) is located at the access road before it becomes a highway. Other municipalities along the access road are located along the highway, but the impacts are assessed to be negligible there.

Indirect impacts for social issues are considered at the municipality level as all administrative issues (expropriation procedure, disclosure, stakeholder engagement, grievance mechanism) will be dealt on municipal level (in addition, data are only available on municipal level).

3. Methodology

The present section presents the methodology used by Fichtner to conduct the E&S Scoping Study and the LARR (Annex B) for the project.

3.1 E&S Scoping Study

The initial phase of the E&S Scoping Study involved the direct liaison of Fichtner with the CoB and IFC to deeply understand the project, its options, and the scope of the E&S assignment. With this objective, phone-conferences, written communications and site visits to the new Vinča site and the new Cerak site (9th and 10th of September 2015) have been undertaken.

3.1.1 Baseline assessment

The CoB and PUC have made available to the Consultant a set of background information and previous reports presenting a description of the project and of the project sites from an environmental and social point of view. Statistical data and previous studies for the sites have been also made available[5]. Underground water samples have been taken by Institut MOL d.o.o. and analysed (please refer to Section 3.1.8 for further information).

Fichtner analysed available data from official statistical sources and carried out 2 site visits and 7 key informant interviews in order to describe the baseline conditions of the area concerning the environmental and social receptors. This allowed undertaking an initial identification of areas of impact and sensitivities of the receptors (please refer to Section 5 for additional details).

The baseline assessment (Section 5) allowed determining the number, nature and scale for additional baseline and technical studies that will be required in the project sumplemental ESIA to accurately document the baseline conditions for those areas identified as containing potential sensitive receptors, or selected representative environments. The ToR for supplemental ESIA will be prepared in a later stage of the tender process when the preferable project technical option be selected by CoB and bidders.

3.1.2 Preliminary assessment of key E&S risks and impacts

There is no international consensus on an agreed approach for assessing the significance of impacts on the environment/social components. For the preliminary assessment of the project impacts, an evaluation matrix based on different factors is used in this Scoping Report to allow a transparent

[5] Please refer to Annex C: List of Meetings, Site Visits.

evaluation procedure. The method allows the preliminary identification and prediction of impacts according to:

- Scale: Local, Regional, National or International;
- Duration: Permanent or Temporary (Short, Medium or Long Term);
- Magnitude: Low, Medium or High;
- Certainty: Possible, Likely, Highly Likely or Definite;
- Direction: Positive (beneficial) or Negative (adverse);
- Cumulative or not (an impact can be considered cumulative if the site is presently or will in the future (based on present knowledge) be affected by the same factor (e.g., water pollution)).

Considering the above listed factors, the significance of the impact can be finally determined:

- Significance: Nil or Negligible, Low, Medium, High or Very High.

In case mitigation or compensation measures are applicable, the residual impacts are then classified.

This assessment is necessarily preliminary and dependent on the amount and quality of the baseline information available. Given this, the evaluation of impacts identifies the need for further investigations, e.g. in form of a separate specialist study. These investigations may need to be undertaken by the PPP Contractor or the Governmental Authorities during the detailed design phase or immediately before construction/operation.

3.1.3 Elaboration of ToR for the supplemental ESIA

Based on the results of this E&S study the ToR for the supplemental ESIA will be prepared, in a later stage of the tender process as already stated.

3.1.4 Consideration of national, EU and applicable international , regulations and standards

The E&S scoping assignment is undertaken in close cooperation with Serbian environmental and social experts, which assure that the national laws, regulations and policies are taken into account. On the other hand, Fichtner's experts assured that the Study follows, EU legislation, IFC PSs and applicable World Bank Group (WBG) Environmental Health and Safety general and sectorial guidelines[6].

In order to clearly point any differences that may exist between the national laws/regulations/policies and the international standards, a gap analysis in a table form is presented in Section 4.7.

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6 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

3.1.5 Stakeholder Mapping and Analysis

The E&S Scoping Study presents a preliminary Stakeholder Mapping and Analysis. This provides an overview of the project affected communities and identifies the interests and potential concerns of each stakeholder group. A Stakeholder Matrix is shown in the section dedicated to the social institutional framework (Section 4.5).

3.1.6 Preliminary Livelihood Assessment

A preliminary Livelihood Assessment of the affected communities is undertaken. Special attention is dedicated to impacts on vulnerable and marginalized groups, including members of the Roma community that may be among the most affected people in the framework of this project. These aspects are covered in the Sections dedicated to Resettlement and Waste Pickers situation (Sections 6.6.2 and 6.6.3).

3.1.7 Screening Air Dispersion Calculation

A preliminary screening of the air quality impacts of the project is undertaken by means of a Screening Air Dispersion Calculation (ADC) using the U.S. EPA (United States Environmental Protection Agency) approved model SCREEN 3. SCREEN3 is a first-level screening model, designed to aid in determining if further modeling is required. The model enables users to prepare an initial screening analysis to establish a conservative or worst-case estimate of short-term air quality impacts from a specific source. If predicted screening concentrations are under the level of concern, generally no further analysis is required.

The screening analysis allows the quantification, as a preliminary estimate, of the contribution of the project components for the concentrations of air pollutants in the areas of the new Vinča site and the new Cerak site.

To determine the pollutant mass emission rates, the screening air dispersion calculation assumes that the Emission Limits of the EU Industrial Emissions Directive are complied with for the project facilities. The technical parameters are estimated based on Fichtner’s engineering assumptions, as well as on Fichtner’s previous work with similar plants.

The screening air dispersion models only deal with buoyant plumes, i.e. plumes which are less dense (hotter or have lower molecular weight) than air. For this reason, the impacts on ambient air quality derived from the operation of this project component could not be quantitatively assessed during the E&S Scoping Study/Screening ADC.

The methodology, assumptions and results of the Screening ADC can be consulted in detail in Annex A.

3.1.8 Groundwater quality assessment

In order to characterize the groundwater quality in and around the new Vinča site, the E&S Scoping Study includes a one-time sampling of groundwater downstream (2 points at a minimum) and upstream (1 point at a minimum) of the landfill. The sampling of groundwater was connected to the geotechnical investigations which were undertaken to assess the stability of the project area. The same boreholes were used for both purposes..

The groundwater quality baseline assessment has been contracted by IFC to the Institut MOL d.o.o., a licensed laboratory for Chemistry, Biotechnology and Consulting based in Belgrade. The drilling and sampling operations have been initiated in end of 2015. The first laboratory results have been received in end of February 2016. A summary of the main conclusions can be found in this E&S Scoping Report, Section 5.1.4.

3.2 Land Acquisition and Resettlement Review

The key components of the LARR are:

a) Assessment of the Land Acquisition methodology and process for the extension of the Vinča landfill (undertaken and to be undertaken).
b) Assessment of the Resettlement needs and process (undertaken and to be undertaken).

The LARR was prepared after the collection and analysis of secondary and primary data as summarised below:

i. Analysis of secondary data (expropriation data and documents, including sample notification letters, expropriation contracts and valuation methodology used) provided by the Municipality and existing studies (i.e. situation of waste-pickers in Belgrade (Simpson-Hebert 2005), review of EBRD documentation of Gazela Bridge project)

ii. Seven key informant interviews were undertaken between September and December 2015 with government representatives (tax administration, municipality land office and several departments of the CoB administration). Interviews were done in the presence of IFC staff and representatives of the City. No direct stakeholder interviews were conducted at this stage.

iii. Two site visits to the Vinča and Cerak sites were made in September 2015.

For further details, please refer to Annex B.

3.3 Review of Draft RAP and SEP

The CoB is expected to develop a RAP and a Stakeholder Engagement Plan (SEP) for the Project. Fichtner shall undertake a revision of these plans to assess their consistency with the IFC PSs.

As of the date of this draft E&S Scoping report, the RAP was not available. The analysis of this report shall be included in the Final E&S Scoping Report, if available by that time.

The SEP prepared by the CoB was reviewed and the results are included in Section 7 of this report. Gaps between the content of the SEP and IFC PSs are assessed and mitigation measures suggested (please refer to Section 4.7 of this report).

4. Legal, policy and institutional framework

The project is expected to be designed, built and commissioned under the respect of national law (many of it based on European Directives) and in a way consistent with IFC PS and applicable World Bank guidelines.

This Section presents a list and a summary of the most relevant national and international legal and policy requirments applicable to the project. In addition, a gap analysis between the international and the national requirements is undertaken, and recommendations are made to overcome the gaps encountered.

The national institutional framework with relevance for the Scoping process is in addition described.

4.1 National environmental legal and policy framework

4.1.1 Strategic incentives related to waste management

As a candidate country to the EU, Serbia has largely transposed the EU legislative requirements related to waste management, including the **Waste Framework Directive 2008/98/EC** and the **Directive on the Landfill of Waste 99/31/EC**. The country is obliged to fully transpose the Directives' requirements by the end of 2018. Deadlines for implementation of the transposed requirements will depend on accession negotiations with the EU Commission and will be set in the Directive Specific Implementation Plans. Currently, only preliminary deadlines for implementation have been set: 2034 for the Waste Framework Directive and 2032 for the Landfill Directive.

The **National Waste Management Strategy** is the basic document that provides mechanisms for implementation of the transposed requirements. The latest Strategy was adopted in 2010 and relates to the period 2010-2019. During 2015 the Strategy has been under revision and the amended document is expected to be adopted in 2016. The new draft Strategy sets the following national targets: (1) achieve 100% compliance of landfills with EU standards by 2030, (2) complete rehabilitation and closure of all dump sites by 2034, (3) recycle 50% of municipal waste by 2030, and (4) reduce biodegradable waste disposed on landfills to 35% by 2030[7].

It should be noted that the Belgrade Waste to Energy Project has been considered in other National Sector Strategies (e.g. The Preparatory Study for Development of National Sludge Management Strategy[8] from wastewater treatment plants). The Serbian National Water Management

[7] Transposition and implementation of environmental and climate change Acquis - Chapter 27:Status and plans – Ministry of Agriculture and Environment of Serbia, September 2015
[8] The Preparatory Study for Development of National Sludge Management Strategy - Ministry of Agriculture and Environment, Draft, December 2015

Strategy estimates that the future Belgrade WWTP will be a significant sludge generator (about 30.000 t of dry sludge per year). If the sludge from the Belgrade WWTP would be co-incinerated at the Project, this would solve the management for an estimated 24% of the total sludge production in Serbia (expected by 2041 when the Urban Wastewater Treatment Directive is fully implemented).

4.1.2 Regulation of Waste Management Facilities

The main legislative document in Serbia regulating the **waste management** is the Law on Waste Management (Off. Journal of RS, No. 36/2009, 88/2010). The Law is supplemented by 29 by-law documents regulating specific waste management aspects. In 2015 the Law has been revised and amended to more precisely transpose certain requirements of the Waste Framework Directive and its adoption is expected shortly (by 2016).

Landfilling of waste is regulated by the Decree on Disposal of Waste on Landfills (Off. Journal of RS, No. 92/2010). The Decree is supplemented by two by-laws: (1) Regulation on Categories, Testing and Classification of Waste (Off. Journal of RS, No 56/2010), which sets out the more detailed requirements for waste acceptance criteria; and (2) Regulation on Application and Content of a Permit for Storage, Treatment and Disposal (Off. Journal of RS, No. 72/2009), which transposes some requirements of the Landfill Directive for landfill permit application, conditions and content.

Incineration and co-incineration of waste is regulated by the Decree on Types of Waste that can be Thermally Treated, Conditions and Criteria for Location, Technical and Technological Requirements for Design, Construction and Operation of Treatment Facility, Management of Residual Waste (Off. Journal of RS, No. 102/2010, 50/2012). The Decree transposed the requirements of the EU Industrial Emissions Directive and sets the emission limit values for combustion plants which (co)incinerate waste.

Combustion of LFG is regulated by the Decree on emission limit values of air pollutants (Off. Journal of RS, No. 71/2010, 6/2011)[9].

Wastewater discharge from landfills is regulated by the Decree on emission limit values of polluting substances discharged into water and deadlines for compliance (Off. Journal of RS, No. 67/2011.).

Rehabilitation and closure of the (existing) non-sanitary landfills is regulated by the Law on Waste Management (Off. Journal of RS, No. 36/2009, 88/2010) which requires the local authority (the CoB in this case) to prepare the technical document for remediation, closure and rehabilitation of such landfill and to submit it to the Ministry of Agriculture and Environment for approval. The content and scope of the technical document

[9] The Decree is expected to be replaced in the short-term period by two new legislative documents: (1) Decree on emission limit values of air pollutants from combustion plants, and (2) Decree on emission limit values of air pollutants from stationery emission sources.

is defined by the recently adopted Regulation on methodology for preparation of technical design for landfill rehabilitation and remediation (Off. Journal of RS, No. 74/2015).

4.1.3 Permitting of Waste Management Facilities

Environmental requirements are part of the **permitting procedure** at the two instances: (1) during EIA and (2) as part of obtaining a waste management permit or an integrated (IPPC) permit[10].

Serbia has largely transposed the EU regulatory requirements related to EIA into national legislation, including the EIA Directive (Directive 92/11/EC, as amended). An EIA is required during the conceptual design stage of a project. The fulfilment of EIA requirements is a prerequisite for the construction permit. The national EIA procedure comprises the phases of screening, scoping, impact assessment and public consultation.

Obligation to do an EIA is regulated by the Decree on the List of projects for which the EIA is mandatory and the List of projects for which the EIA may be required (Off. Journal of RS, No. 114/2008). The “List 1” sets the facilities for which an EIA is mandatory, and among others, it includes the following facilities:

- municipal waste landfills for areas with more than 200,000 inhabitants;
- waste disposal installations for the incineration of non-hazardous waste with a capacity exceeding 70 tonnes per day;
- thermal power stations and other combustion installations with a heat output of 50 MW or more.

The authority in charge for EIA approval of the “List 1” facilities is the Ministry of Agriculture and Environment.

Once the facility is operational and has the operational permit, it has to obtain an **integrated (IPPC) permit**. The Law on Integrated Pollution Prevention and Control (Off. Journal of RS, No. 135/2004, 25/2015) sets the requirements for obtaining an IPPC permit. The Law and supplementing by-laws transpose the requirements of the IPPC Directive 1996/61/EC. The Industrial Emissions Directive 2010/75/EU has not been fully transposed yet (expected by the end of 2018).

An IPPC permit is mandatory for the following waste management facilities:

- Municipal waste incineration plants with capacity over 3 tonnes/h;
- Installations for waste disposal undertaking biological or physico-chemical treatment at over 50 tonnes per day;

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[10] Installations for which an IPPC permit is mandatory are not obliged to obtain a waste management permit.

- Landfills receiving more than 10 tons of waste per day or with total capacity over than 25,000 tonnes.

An IPPC permit is issued by the Ministry of Agriculture and Environment.

4.1.4 Regulation on other environmental parameters

Ambient air quality standards are defined by the Decree on Conditions of Ambient Air Quality Monitoring (Off. Journal of RS, No. 11/2010, 75/2010, 63/2013) harmonized with the respective Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC).

Hazardous waste is primarily regulated by the Law on Waste Management (Off. Journal of RS, No. 36/2009, 88/2010) and the Regulation on Categories, Testing and Classification of Waste (Off. Journal of RS, No 56/2010).

Standards for **surface water quality, groundwater and sediment** are regulated by the Decree on limit values of polluting substances discharged into surface water, groundwater and sediment and deadlines for compliance (Off. Journal of RS, No. 50/2012) setting the limit values of polluting substances and defining five classes of the ecological status: high, good, moderate, poor and bad. Limit values of parameters related to general water conditions, oxygen regime, nutrients, salinity, metals, organic matter and microbiology are defined by the Regulation on parameters of ecological and chemical status of surface water and parameters of chemical and quantitative status of groundwater (Off. Journal of RS, No.74/2011). Limit values for priority and priority hazardous substances are set by the Decree on limit values of priority and priority hazardous substances polluting surface waters and deadlines for compliance (Off. Journal of RS, No.35/2011).

Standards for **contaminated soil and groundwater** are stipulated by the Regulation on the program for systematic monitoring of soil quality, indicators for evaluation of soil degradation and methodology for preparation of remediation program (Off. Journal of RS, No.88/10).

Environmental noise is regulated by the Law on Environmental Noise (Off. Journal of RS, No. 36/2009, 88/2010) as the main legislative document. The permitted noise levels are defined by the Decree on environmental noise indicators, limits values, assessment methods of the noise indicators, the nuisance and the harmful effects (Off. Journal Of RS No. 75/2010).

4.2 National social legal and policy framework

4.2.1 Public consultation and information disclosure framework

Public consultation and information disclosure is regulated in Serbia by the following laws:

- Freedom of Information Law (Official Gazette no. 120/04, 54/07, 104/09, 36/10).
- Environmental Impact assessment Law of the Republic of Serbia (Official Gazette No 135/04 and 36/09).
- Expropriation Law (Official Gazette of RS, number 53/95,23/01-FCC Official Gazette of SRJ, number br. 16/2001 – decision FCC and Official Gazette of RS, number 20/2009, 55/13).

The freedom of information in respect to information of public interest is regulated by the **Freedom of Information Law**. This act applies to all information in possession of public authorities for the purpose of protection and achievement of public interest, as well as the democratic environment. This law is however not connected to the obligation of the Government to publicly disclose the Decision of Public Interest, and by no means facilitates disclosure without request. It thus not adhere to the requirements of Citizen Engagement activities.

The **Expropriation Law** is the relevant and applicable law related to public disclosure of the Decision of Public Interest as a condition precedent to commencement of any activities of expropriation.

The disclosure of environmental impact documents is regulated by the **Environmental Impact Assessment Law**. The line authority allows and facilitates public disclosure of the document, and organizes the public consultation of the EIA Study. In addition, the line authority is obliged after receiving the request to give his approval and no-objection to the EIA, to inform the Project Implementation Unit, all interested stakeholders including institutions, organizations and the general public about the date and place of public disclosure, public presentation and public consultation of the EIA. The relevant authority shall allow access to all interested organizations and bodies to the whole of the documentation in respect to the process of EIA subject to a written request of the interested party. The request shall be adhered within 15 days.

4.2.2 Land acquisition and resettlement framework

The land acquisition and resettlement issues are governed in Serbia by the Law on Expropriation. Please consult the project-related stipulations of this law in Section 4.7 - Gap analysis.

The CoB is currently preparing a general Resettlement Framework. This document is expected to include provisions for resettlement of persons as result of ongoing and future projects of public interest in the City. The exact date of issue of this document has not been set, but it is expected to be adopted in 2016 after the Housing Law is amended. A draft was requested but not made available to the Consultant. For further details, please refer to the LARR in Annex B to this report.

4.2.3 Law on Housing

The Serbian Law on Housing has been published in the Official Gazette of RS br. 83/2014Official Gazette of RS . no 50/92, 76/92, 84/92 - amend, 33/93, 53/93, 67/93, 46/94, 47/94 - amend, 48/94, 44/95 – and other law, 49/95, 16/97, 46/98, 26/2001, 101/2005 – and other law 99/2011).

The law will determine the foundation for the Belgrade City Resettlement framework through determining the entitlements for social housing in case of resettlement. A draft of the new law is currently being prepared which will include changes to the provision of social housing. The approval procedure is expected to begin early in 2016.

4.2.4 Occupational Health and Safety Framework

The **Law on Occupational Health and Safety** (Off. Journal of RS, No. 101/2005) is the main legislative document regulating Occupational Health and Safety issues in Serbia. The Law was enforced in 2005 and incorporated the principles of the EU Workplace Health and Safety Directive (89/391/EEC).

The Law is based on general principles of prevention and requires: (1) avoiding risks, (2) evaluating the risks, (3) combating the risks at source, (4) adapting the work to the individual, (5) replacing the dangerous by the non- or the less dangerous, (6) prioritizing collective protective measures (over individual protective measures) and (7) giving appropriate instructions to the workers.

Enforcement of the Law is provided by implementation of the set of by-laws (regulations and decrees) which stipulate specific requirements related to the general principles defined by the Law.

4.3 National environmental institutional framework

Waste management issues in Serbia are managed on the state and the local level.

The Ministry of Agriculture and Environment is in charge for the country's strategic waste management planning, approval of the regional waste management plans, management of hazardous waste, issuing of permits, consents and licences, inspection and control of local authorities. The Ministry is in charge of regional landfills and municipal waste landfills servicing more than 200,000 inhabitants.

Cities and local municipalities are in charge of local waste management planning, management of municipal, non-hazardous and inert waste, issuing of approvals and permits and inspection and control of non-hazardous and inert waste issues. For Belgrade, the City authority in charge is the Secretariat for Environment, Directorate of Waste Management

The Serbian Environmental Protection Agency (SEPA) is the state agency in charge for maintenance of the waste management database, as part of the country' environmental information system.

Licensed laboratories are accredited by the Ministry to perform waste testing and classification for the purposes of trans-boundary transport, treatment or disposal.

Occupational health and safety is under the responsibility of the Ministry of Labour and Social Policy. Particularly, the Directorate for Occupational Health and Safety is in charge for legislation preparation and the Labour Inspectorate is competent for supervision of the legislation enforcement.

4.4 National social institutional framework

This section includes a brief analysis of the main institutional stakeholders relevant for the project and lists their responsibility in the framework of the project. A preliminary Stakeholder Matrix is presented which includes the different groups of PAPs and Civil Society Organizations.

4.4.1 Government Institutions

Immovable properties can be expropriated or rights on them restricted only under the umbrella of Public Interest determined in accordance with the law. The Public Interest is determined either by passing a separate Law for a specific Project, or under guidance, principles and procedures as provided by the Law on Expropriation.

When determined by law, the principles for passing laws in general for the Republic of Serbia apply. When the Public Interest is determined by the Government for a specific project (as was the case with this Project) the guiding principles are provided in the Article 20 of the Law on Expropriation.

The proposal for determination of Public Interest can be submitted by any entity recognized to be beneficiary of expropriation. In this case the proposal was prepared and submitted by the CoB, namely the Directorate for Waste Management within the Secretariat for Environmental Protection of the CoB.

The proposal shall be submitted to the Government through the Ministry of Finance. Once received, the Government shall decide on the proposal for determination of Public Interest within 90 days from submission. Together with the determination of Public interest, the Government shall define the Beneficiary of expropriation.

4.4.2 City of Belgrade

The CoB has the overall responsibility for the preparation and implementation of the Project. As such, the City is the Beneficiary of expropriation, i.e. the entity designated by the Government to have the mandate to acquire land on its behalf for purposes proposed in the Decision of Public Interest.

The management of the Project on behalf of the City is the responsibility of the **Directorate for Waste Management** within the Secretariat for Environmental Protection of the CoB. The Directorate coordinates between the various stakeholders and agencies in the preparation of documentation required for the project, both in terms of scope and timing. The Directorate will also be responsible for monitoring of the Project implementation on behalf of the City.

During the tender preparation phase, the City established the **Project Implementation Unit (PIU)** in order to bring together all different aspects of the project under one team. The role of the Project Implementation Unit within the overall management structure of the project is to coordinate, manage, and monitor the practical day-to-day implementation of the project including among other things land acquisition, resettlement activities, public disclosure of information, consultations with the PAPs etc. The head of the PIU is the head of the Directorate for Waste Management. Other members include other representatives from the Secretariat for Environmental Protection, representatives from the Mayor’s office, Public Defenders Office Secretariat for Social Welfare, Municipality of Grocka and Zvezdara, as well as Secretariat for Finance, Secretariat for Urban Planning and Construction, and Secretariat for Culture.

The activities of the PIU as described above now lay with the Directorate for Waste Management. However other members of the PIU are still involved with various aspects of the projects as they fall within their regular scope of work. They will assist the Directorate during the project implementation.

The legal representative of the CoB is the **Public Defender's Office** who represents the City and acts on its behalf throughout the Project. With regards to the expropriation process this representation includes, but is not limited to the following activities: submitting the proposals for expropriation to the Municipality of Grocka, submitting all supporting documents to third parties and agencies of relevance, negotiations in respect to compensation, signing the compensation agreements, etc.

The CoB is also responsible for insuring an adequate budget is available to allow timely payment of compensation and allowances. One of the objectives of the PIU was the preparation of the project budget for the early stages of the project (including land acquisition). Now the Directorate for Waste Management and the Public Defender's Office are working together to prepare the budget for the remaining activities (which includes evaluation and compensation for assets on expropriated land plots).

One of the roles of the PIU is to prepare the RAP and the SEP [11] in order to undertake the resettlement and land acquisition process in accordance with IFC PSs (please refer to further details on Annex B of this report). The **Secretariat for Social Affairs** within the City administration is responsible for the preparation of the general Resettlement Framework for the CoB and it will also prepare the RAP for this project in line with this framework. The Secretariat is also responsible for the consultation with the PAPs and coordination with the NGOs. The disclosure of these planning documents is the responsibility of the **Mayor**.

The CoB is also responsible for the timely disclosure of information related to the project. In this case this role is mostly divided between the Directorate for Waste Management and the Mayor's office.

4.4.3 PUC "Gradska Cistoca"

The Public Utility Company "Gradska Cistoca" is one of several public utility companies currently operating within the CoB providing services in waste collection and management, as well as cleaning and maintenance of public areas.

The company operates the Vinča landfill and employs individuals and companies sorting the waste at the landfill. The PUC is actively consulted by the Directorate for Waste Management in order to mitigate the adverse economic and livelihood impacts on the waste pickers due to the implementation of this project.

[11] The first draft of the SEP guiding the stakeholder engagement activities was prepared by the CoB in February 2016 and will be disclosed to those affected by and interested in the project once finalized. The SEP is a living document; therefore it will be subject to updates during the project life-cycle.

4.4.4 The Municipality

The respective line department of the Municipality where properties are being expropriated administers the expropriation process at the local level in conjunction with the Beneficiary of Expropriation / its legal representative. In this case, that is the Municipality Grocka. The Municipality Zvezdara is also potentially affected by the project, however since there is no land acquisition in the village of Kaludjerica in the Municipality of Zvezdara (location of the access route to the new Cerak site), the role of that municipality is relatively limited.

With regards to the Municipality Grocka, the first step in terms of land acquisition is the review of the expropriation proposal in terms of eligibility to be administered. Once the municipality reviews all the legal and technical documents, it sends out individual invitations to hearings to all PAPs. During these hearings, the municipality informs the PAPs about the project, presents them with all the information about the level of impact on their property with maps, their entitlement and the steps which will be taken afterwards, provides them with legal advice and informs them about their rights.

Once the information process is over, the municipality and the PAPs come to a decision on expropriation. However, if the PAPs have a dispute about the decision, or they dispute whether the procedure was not in line with the respective provisions of the applicable law, the PAP can register their appeal with the Ministry of Finance. The Ministry reviews the case, which takes between 30 to 60 days, and decides on the merits of the appeal. Only after the Ministry makes its decision can the expropriation become effective and the valuation process can begin. Alternatively, the judicial process is initiated on the validity of expropriation (in the case of the project with the signature of the expropriation contract, but. refusal of the compensation agreement, or directly with the refusal to sign the expropriation contract).

At the valuation stage the Municipalities mandate is to administer the proposals of the parties and gather all necessary evidence. Once the compensation amount is determined the responsible officer drafts a compensation agreement which is presented to the land owner (PAP). The compensation agreement becomes effective if all parties agree on the compensation amount. The Municipality has to record the outcome and register the agreement with the cadastre office in order to finalise the transfer of ownership.

The Municipalities also have the responsibility to decide on expropriation of unviable parcels (under Article 10 of the Expropriation Law), as well as on the process of reverse expropriation in cases where the land acquired has not been utilized within 3 years after the decision has become effective (statutory limitation to this request is 5 years).

4.4.5 Municipal Land Registry Office/The Republic Geodetic Authority

The Real Estate Cadastre under the Republic Geodetic Authority is the basic and public register of real estate and property rights, and is within the authority of the Republic Geodetic Authority and the respective territorially based affiliates.

Real estate properties registered in this registry are:

- land (cadastral plots of agricultural, forestry, construction, water and other land);
- overhead and underground buildings (hereinafter: objects);
- separate parts of buildings that make up the whole building (apartment, office space, garage etc.)

Under Serbian Law, registration has a constitutional strength for any right on immovable property to be transferred. It also announces the commencement of the land acquisition process i.e. expropriation.

4.4.6 Tax Administration Office

In case of agricultural land, once the valuation stage has commenced the local Tax Administration Office assesses the value of the subject property at the request of the Beneficiary of Expropriation. The assessment is then performed on a case by case basis and a separate valuation report is prepared. The report shall clearly present:

- the basis for valuation,
- which criteria and standards have been applied when determining the price of land per square meter,
- whether the comparison was done on the basis of the sales price of such property,
- whether it served as a corrective to the revenue that can be expected from this area taking into account land use and activity of the opposing party,
- whether the Tax Administration Office analysed the so-called comparable transaction in the recent past,
- which approach is applied in case no transaction in the immediate area was registered and therefore comparable indicators on prices shall be used.

4.4.7 Accredited Experts

The valuation of assets on the expropriated land (including structures, utility connections, crops, forests, nurseries, vineyards, etc.) under the Expropriation Law is provided by independent accredited experts within their field of expertise. Usually these include civil engineers, agricultural engineers, environmental specialists, forest experts and others depending on the affected assets.

The valuation is based on a site visit where baseline data respecting the assets on the land affected is collected. This site visit is public and the Beneficiary of Expropriation, as well as the PAPs, participate in it. Once the data is collected on site the experts prepare the valuation of the assets based on the procedures determined by the law and their expertise.

4.4.8 Courts

The Basic Courts have a role throughout the entire process of expropriation in case of any disputes arising between the Beneficiary of Expropriation and the PAPs in respect to compensation, adherence to legal proceedings, etc.

If after 60 days the Beneficiary of Expropriation and the PAPs have not agreed on the compensation amount or compensation in kind, the case is automatically submitted by the Municipality to the relevant Court. In the cases where compensation in kind has been agreed but the value of the two properties are not the same, the Court will decide on the balance.

The Court of Appeal decides on any appeal to decisions of the Basic Court.

4.4.9 PAPs’ representatives (Roma NGOs)

In order to adhere to the requirements of citizen engagement activities and mitigating the potential risks of the Project, PAPs are to be actively involved in the Project cycle. They shall be allowed to elect representatives to present their requirements, demands, views and opinions on the Project to other stakeholders.

The Secretariat for Social welfare confirmed that there are several NGOs present at the Vinča landfill area which try to secure the rights of the Roma population working and living at the landfill and which are likely to be affected by the project (i.e. by physical and economic displacement). Most notably these are:

- Amnesty International;
- *Praksis*;
- Society for the Improvement of Local Roma Communities;
- Regional Center for Minorities (*Regionalni centar za manjine*);
- National Council of Roma (*Nacionalni savet Roma*).

Other PAPs are:

- the private and corporate land owners who are interested in getting a maximum compensation for their land which will be expropriated
- the waste pickers working on the site, who will need a different job opportunity,
- the residents along the access roads between Vinča and the new Cerak site (in the case of realization of the new Cerak site option).
- the residents of the residential area "Vidikovac" near the new Cerak site.

4.5 Stakeholder Matrix

Based on the institutional framework presented in Sections 4.3 and 4.4, Table 4-1 presents the Stakeholder Matrix for the Project.

Table 4-1: Stakeholder Matrix

Nr.	Stakeholder	Location	Phase / Alternative	Interest
Government Institutions				
1	CoB Secretariat for Environmental Protection Directorate for Waste Management	Belgrade	All phases / all alternatives	Responsible for the project, Project Implementation Unit (PIU)
2	PUC “Cistoca”	Belgrade	All phases / all alternatives	Responsible for Waste Management, present and future employer for Waste Collectors at Vinča landfill site
3	Secretariat for Social Affairs (City Center for Social Work Belgrade)	Belgrade	Transition phase / all alternatives	Responsible for physical displacement of informal settlers, namely 14 HHs (mostly Roma HHs) from the landfill site
4	Secretariat for Development	Belgrade	Transition phase / all alternatives	Selection of terrain for social housing or other settlement provision for informal settlers affected by involuntary resettlement
5	Municipal Land Office	Grocka Municipality	Transition phase / all alternatives	Expropriation according to the law of RS
6	Municipal Tax Administration	Grocka Municipality	Transition phase / all alternatives	Expropriation according to the law of RS
7	Ministry of Agriculture and Environment	Belgrade	All phases / all alternatives	National waste management planning; approval of the EIA Scope and of the EIA Report; information of the Public
8	National Council of Roma.	Belgrade / National Level	Transition phase, all alternatives	Legitimate representative of the rights of the

Nr.	Stakeholder	Location	Phase / Alternative	Interest
				Roma community in Serbia. => Livelihood restoration of informal settlers affected by involuntary resettlement
9	Group for advancement of Roma within the Office for Human and Minority rights of the Government of Serbia	Belgrade / National Level	Transition phase, all alternatives	Livelihood restoration of informal settlers affected by involuntary resettlement
PAPs				
10	Private Landowners at the landfill site	Vinča	Transition phase / all alternatives	Fair compensation
11	Legal entities landowners at the landfill site	Vinča	Transition phase / all alternatives	Fair compensation
12	Informal Settlers (mostly Roma HH) living on the landfill area subject to involuntary resettlement	Vinča	Transition phase / all alternatives	Similar / better livelihood, keeping jobs and residence or if resettled getting a similar or better situation
13	Waste-Pickers working on the Landfill site	Vinča	Transition phase / all alternatives	Maintaining present job profile or improvement of job situation
14	Residents along the Access Road between the new Cerak site and Vinča	Kaludjerica / Zvezdara	Construction and O&M / Option 1&2	Avoid disturbance (air pollution, traffic noise) as much as possible
15	Residents of Vidikovac and adjacent residential Areas	The new Cerak site	Construction and O&M / Option 1&2	Avoid traffic, smell, noise, sight of waste as much as possible
NGOs				
16	Amnesty International	Belgrade	Transition phase / all alternatives (focus Vinča landfill)	Effective implementation of resettlement and livelihood restoration of Roma to be resettled
17	Praksis NGO	Belgrade	Transition phase / all alternatives (focus Vinča landfill)	Effective implementation of resettlement and livelihood restoration of Roma to be resettled

Nr.	Stakeholder	Location	Phase / Alternative	Interest
18	Society for the Improvement of Local Roma Communities	Belgrade	Transition phase / all alternatives (focus Vinča landfill)	Effective implementation of resettlement and livelihood restoration of Roma to be resettled
19	Regional Center for Minorities (*Regionalni centar za manjine*)	Belgrade	Transition phase / all alternatives (focus Vinča landfill)	Effective implementation of resettlement and livelihood restoration of Roma to be resettled
20	National Council of Roma (*Nacionalni savet Roma*)	Belgrade	Transition phase / all alternatives (focus Vinča landfill)	Effective implementation of resettlement and livelihood restoration of Roma to be resettled

4.6 International policy framework

According to the ToR for the assignment and the nature of the project, the following is the international policy framework applicable to the project:

- IFC PSs on Environmental and Social Sustainability (2012) 1 to 8;
- World Bank Group Environmental, Health and Safety Guidelines, namely:
  - WBG General EHS guidelines (April 30, 2007);
  - WBG EHS guidelines for Waste Management Facilities (December 10, 2007).
- Good International Industry Practice, where applicable.
- IFC's Good Practice Handbook on Stakeholder Engagement (May 2007);
- IFC's Handbook for Preparing a RAP (March 2002);
- IFC's Good Practice Note on Addressing Grievances from Project-Affected Communities (September 2009).

Table 4-2 presents an preliminar analysis of the applicability of the IFC PSs to the project.

Table 4-2: IFC PS (2012) and applicability to the project

IFC PS	Triggered (Y/N)	Comment
PS 1: Assessment and Management of Environmental and Social Risks and Impacts	Y	The Project must establish a system for assessment and management of social and environmental impacts and comply with the requirements relating to ESIA, ESMP and disclosure of project information related to E&S project. This requires the development

IFC PS	Triggered (Y/N)	Comment
		of a good management system appropriate to the size and nature of the business activity to promote sound and sustainable E&S performance, as well as lead to improved financial outcomes. A SEP must be part of the E&S system, defining activities for engagement of workers and the local communities directly affected by the project and other interested stakeholders. Other elements of the PS1 applicable to the project are: • Emergency Preparedness and Response; • Monitoring and Review; • Disclosure of Information; • Grievance Mechanism for affected communities.
PS 2: Labour and Working Conditions	Y	The winning bidder would be obliged to establish a written HR policy composed of the Code of Conduct and the Code of Ethics consistent with Serbian labor law and PS2 requirements, and provide access to these documents to all staff, The Serbian labor law reflects 8 fundamental, 4 governance and 64 technical ILO conventions Serbian has ratified. The HR policy specifically has to outlines requirements in relation to terms of employment, working hours and overtime, training, leave, retirement, employment welfare, disciplinary actions, health and safety, wages and benefits, the principle of equal opportunity, worker's organizations, fair treatment and non-discrimination and grievance mechanisms. The policy explicitly has to prohibit child and force labor. The winning bidder has to prepare OHS risk assessment, OHS management plan for all working positions, and OHS trainings in accordance with the Serbian legislation. Following OHS management practice established, all new employees are provided with the necessary OHS trainings on handling hazardous materials, medical waste and exposure to vector-borne diseases. Good international industry practices are applied with regard to the use of personal protective equipment and maintenance of health care equipment. The OHS monitoring

IFC PS	Triggered (Y/N)	Comment
		procedures are integrated into day-to-day operations and the implementation of OHS management plans is monitored, revised and updated regularly. The winning bidder will establish and insure that all workers are aware of the grievance mechanism and it is easy accessible to them.
PS 3: Resource Efficiency and Pollution Prevention	Y	The winning bidder will be obliged to develop and implement, prior to the construction works commence, an environmental and social management system ("ESMS") in accordance with Serbian legislation and IFC PSs. The ESMS shall manage environmental and social ("E&S") risks and impacts of the project in a structured way on an ongoing basis. The ESMS shall be initiated and at all times duly supported and funded by the PPP contractor s management, and shall incorporate: • an overarching policy that states the principles guiding the achievement of sound E&S performances and confirms the commitment to operating the Project in accordance with the Serbian legislation and IFC PS and being guided by the applicable aspects of the WBG EHS General Guidelines and the EHS Guidelines for Waste Management Facilities, whichever is more stringent; • organizational capacity and competency to implement the ESMS. In particular the winning bidder will define key E&S roles and responsibilities, assign them to staff with appropriate skills and expertise, and train staff on management of E&S risks and impacts; • processes to identify E&S risks and impacts of the Project over the entire Concession. The development of the ESIA is part of this process; • management programs to define mitigation and performance improvement measures and actions that address identified E&S risks and impacts and define detailed timelines for implementation of specific measures. The programs shall consist of documented combination of operational procedures, practices, plans and

IFC PS	Triggered (Y/N)	Comment
		relevant supporting documents. The programs shall include sub-EHS subplans that shall cover construction and O&M phases as applicable and, for construction phase, shall include mitigations and performance improvement measures both applicable to the entire alignment and tailored to each specific construction segment/site:. These plans shall be defined later in the ESIA.
PS 4: Community Health, Safety and Security	Y	Plans for protection of community health and safety will be required, including plans to prevent and respond to emergencies affecting downstream water users (drainage/spills), road users (vehicles and pedestrians esp. at Cerak and Kaludjerica), and the wider community, as well as to protect the community from any adverse effects during construction (spills, noise, dust, air emissions, smoke from fires, traffic accidents).
PS 5: Land Acquisition and Involuntary Resettlement	Y	Land acquisition for a project may result in physical and economic displacement of PAPs. Project developers are required to avoid physical or economic displacement or minimize and mitigate and/or compensate impacts on displaced PAPs, paying particular attention to the design of measures to restore and/or improve livelihoods and living conditions of those affected. Land acquisition of 65 ha of land in 64 lots [12] owned by 47 individual owners, 21 groups of owners and 4 different legal entities (legal entities own 11 of the 64 lots) with limited agricultural use, expropriation process under way, 5 contestations of expropriation contracts by state owned companies, all other expropriation contracts signed, min 50% of people in court for contestation of valuation / compensation proposal. Monitoring of lawsuits required [13]. Only 1 PAP has signed compensation agreement.

[12] The 64 lots contain one or several cadastral land plots. Owners and groups may own one or several cadastre land plots. It is unclear what has motivated the Municipal Land Office to define these 64 lots, as they are neither consistent with the cadastre nor with the size of the plots nor with the ownership.
[13] Land expropriation should be solved before the start of the project, however pending court procedures about valuation results do not hinder the project implementation. For details please refer to Annex B LARR.

IFC PS	Triggered (Y/N)	Comment
		Process of reduction in numbers of waste pickers has started already with reduction of number of companies from 6 to 1 (150 waste pickers to approx 50) [14]. Reintegration of workforce into recycling process or livelihood restoration measures may be required (please refer to Section 5.3.11). Physical displacement of 14 households (mostly Roma). Detailed RAP to be prepared and implemented including livelihood restoration measures.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	N	Does not apply: the project activities are not located in modified habitats containing "significant biodiversity value", natural habitats, critical habitats or legally protected areas.
PS 7: Indigenous Peoples	N	The Roma Community in Serbia is not considered as Indigenous People. However, their level of vulnerability will be taken into account in the framework of other applicable PSs and particular attention and additional support will be provided where needed.
PS 8: Cultural Heritage	Y	The one segmemt of Vinca project site, according to Serbian authorities has the status of a "preliminary protected" archeological locality. Therefore PPP contractor will be obliged to develop and implement cultural Heritage management plan in accordance with the requirements of the Serbian legislation and PS8. , .)

4.7 Gap analysis

In order to clearly point any differences that may exist between the national laws/regulations/policies and IFC PSs, a gap analysis covering all the project-relevant environmental and social issues is presented in Table 4-3. Suggestions are made on the actions needed to cover any gaps found.

[14] The contracts of existing companies expired and were not renewed, instead an open tender was issued, at which the existing companies did not participate.

Table 4-3: Gap analysis between the national and IFC PSs requirements for the project

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
Assessment and management of impacts			
IFC PS 1 The objectives of the PS1 are: • to identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence; • to avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment; • to ensure that affected communities are appropriately engaged on issues that could potentially affect them; • to promote improved social and environment performance of companies through the effective use of management systems.	*Law on Environmental Impact Assessment (135/2004, 36/2009)* The law requires: • identification and assessment of environmental impacts, both adverse and beneficial, in the project's area of influence; • a mitigation measures hierarchy (avoidance, minimization, mitigation, compensation) for adverse environmental impacts.	• No requirement in the national law that contractor has to establish an E&S policy • • National EIA requirements in respect to social impact assessment are limited an dnot in line with PSs • Serbian regulation does not require Environmental and Social Management Programs and related Environmental and Social Action Plans • No requirements on Stakeholder Engagement, grievances for affected parties	• The PPP contractor will be obliged to prepare project EIA in accordance with Serbian legislation, but in addition shall carryout the supplemental ESIA that will cover gaps between Serbian EIA requirements and project applicable IFC PSs requirements. • The PPP contractor will develop an Environmental and Social Management lan (ESMP) that covers project ESHS impacts during both construction and operational project phases in accordance with PS1. • The PPP contractor will develop and implement Contractor Management and Monitoring Plan in order to manage and monitor EHS planning and performance of the project EPC contractors • The PPP contractor will update SEP and implement public consultations in respect to the project EIA and supplemental ESIA. • The PPP contractor will be obliged to organize disclosure of project relevant information and public consultation process in accordance with PS1 requirements • The PPP contractor will be obliged to design and implement grievance mechanism for affected

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
			communities and other interested parties during project construction and operational phases in accordance with PS1 requirements
Occupational Health & Safety (incl. working conditions)			
IFC PS 2 The objectives of the PS 2 are: • To promote the fair treatment, non-discrimination and equal opportunity of workers; • to establish, maintain and improve the worker-management relationship; • to protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the Client´s supply chain (by managing and monitoring the works, third parties and the supply chain) ; • to promote safe and healthy working conditions, and the health of workers; • to avoid the use of forced labor.	• Serbia has ratified the relevant conventions of the International Labour Organisation (ILO) including fundamental ones related to forced labour, discrimination, child labour, equal remuneration, freedom of association, right to organise and collective bargaining; • The Law on Labour (Off. Journal of RS, No. 24/2005, 61/2005, 54/2009, 32/2013, 75/2014) broadly conforms to the requirements of the PS 2 in the areas of human resources policies and working relationships, child and forced labour, non-discrimination and equal opportunity, workers organisations, conditions of work and grievance mechanism; • The Law on Occupational Health and Safety (Off. Journal of RS, No. 101/2005) promotes safe and healthy working conditions.	• Monitoring of performance of third party employers in respect to labour issues is not legally required; • Management of supply chain issues related to labour is not specifically regulated	The ESIA and associated ESMP shall cover this gap by defining measures related to supply chain and third party workers' managing and monitoring,
WBG General EHS guidelines & WBG EHS Guidelines for Waste Management Facilities • Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers; • Provisions should be made to provide OHS orientation training to all new employees, new task employees, and visitors; • Hazardous areas, equipment, and materials should be marked appropriately in accordance with international standards; • The workers shall be protected from	• The Law on Occupational Health and Safety (Off. Journal of RS, No. 101/2005) regulates implementation of precautions, orientation training for employees and visitors, labeling of hazardous areas, equipment and materials, monitoring programs. • PPE usage is regulated by the Regulation on PPE (Off. Journal of RS, No. 100/2011) and the Regulation on preventive measures for safe and healthy work during use of personal protective equipment (Off. Journal of RS, No. 92/2008);	No gaps identified.	Not deemed necessary

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
physical, chemical, biological and radiological hazards resulting from single or multiple exposures; • PPE shall be made available to workers, and considered to be a last resort that is above and beyond the other facility controls; • extra precautions or rigor is expected in application of precautions in special hazard environments; • Occupational health and safety monitoring programs should be put in place to verify the effectiveness of prevention and control strategies.	• Precautions in special hazard environments are specifically regulated by the Decree on preventive measures for safe and healthy work due to risk of explosive atmospheres (Off. Journal of RS, No. 101/12, 12/13), the Regulation on preventive measures for safe and healthy work during exposure to biological hazards (Off. Journal of RS, No. 96/10), the Regulation on preventive measures for safe and healthy work during exposure to noise (Off. Journal of RS, No. 96/11), and the Regulation on preventive measures for safe and healthy work during exposure to vibrations (Off. Journal of RS, No. 93/11).		
WBG EHS Guidelines for Waste Management Facilities The following principles should be considered in managing the occupational, health, and safety risks of informal laborers/scavengers/waste pickers: • Waste scavenging should not be allowed under any circumstances in hazardous and non-hazardous industrial waste management facilities; • Facilities dedicated to the management of MSW should work with environment entities in the development of simple infrastructure that can allow for the sorting of waste; • Operators of existing facilities with scavenging workers should exercise commercially viable means of formalizing their work.	• The Law on Waste Management (Off. Journal of RS, No. 36/2009, 88/2010) requires all waste management facilities (hazardous and non-hazardous) to have the Operational Plan of the Facility which is updated every 3 years and, among other issues, has to include the issues of site security and control of scavenging. • The Law on Waste Management (Off. Journal of RS, No. 36/2009, 88/2010) provides the legal framework for inclusion of individual waste scavengers to the system and formalising their work. The provisions are related to the definition of individual waste picker (Article 5 point 29) and the Operational plan of the waste management facility (Article 16, paragraph 2, point 3), which requires control of individual waste pickers at the facility.	No gaps identified.	Not deemed necessary
Community Health & Safety			
IFC PS 4 The objectives of the PS 4 are:	• Air emissions from thermal treatment of waste are regulated by the Decree on Types of Waste that can be Thermally	The Serbian legislation is being adapted gradually to the EU directives. Some gaps are expected.	• The PPP contractor will be obliged to develop and implement an Emergency

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
to anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life cycle from both routine and non-routine circumstances. *WBG General EHS guidelines* • Project activities involving wastewater discharges, water extraction, diversion or impoundment should prevent adverse impacts to the quality and availability of groundwater and surface water resources; • Planning, designing and siting of a project shall be undertaken with the objective of avoiding hazards posed to the public while accessing project facilities; • All new buildings accessible to the public should be designed, constructed, and operated in full compliance with local building codes, local fire department regulations, local legal/insurance requirements, and in accordance with an internationally accepted life and fire safety (L&FS) standards (ex.: Life Safety Code); • Prevention and control of traffic related injuries and fatalities should include the adoption of safety measures that are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents; • Projects should have procedures in place that ensure compliance with local laws and international requirements applicable to the transport of hazardous materials (IATA requirements, IMDG Code90, UN Model Regulations, Basel Convention commitments); • Projects should avoid the generation and transmission of communicable and vector-borne diseases; • All projects should have an Emergency Preparedness and Response Plan that is	Treated, Conditions and Criteria for Location, Technical and Technological Requirements for Design, Construction and Operation of Treatment Facility, Management of Residual Waste (102/2010,50/2012); • Ambient air quality standards are regulated by the Decree on Conditions of Ambient Air Quality Monitoring (11/2010, 75/2010, 63/2013); • Effluent standards are regulated by the Decree on emission limit values of polluting substances discharged into water and deadlines for compliance (67/2011); • Surface water, groundwater and sediment standards are regulated by the Decree on limit values of polluting substances discharged into surface water, groundwater and sediment and deadlines for compliance (50/2012); • Soil and groundwater contamination standards are regulated by the Regulation on the program for systematic monitoring of soil quality, indicators for evaluation of soil degradation and methodology for preparation of remediation program (88/10); • Hazardous substances management is regulated by the Law on chemicals (25/2015), the Law on transport of hazardous materials (88/2010) and the Law on confirming of the Convention of Transboundary Effects of Industrial Accidents (42/2009).Environmental noise standards are regulated by the Decree on environmental noise indicators, limit values, assessment methods of the noise indicators, the nuisance and the harmful effects (75/2010)		Preparedness and Response Plan in close collaboration and consultation with the potentially affected communities and other stakeholders and will include detailed preparation to safeguard the health and safety of workers and the communities in the event of emergency. Any other specific gaps shall be assessed during the ESIA stage.The supplemental ESIA shall follow the standards which are more restrictive. • The PPP contractor will be obliged to develop and implement an Transport management plan that will cover both project phases

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
commensurate with the risks of the facility.			
WBG EHS Guidelines for Waste Management Facilities • The projects must apply measures to prevent, minimize, and control physical, chemical, and biological hazards to the community (visitors and trespassers to the waste management facilities); • Litter, noise, dust and odours shall be controlled.			
Impact minimization; sustainable use of resources			
IFC PS 3 The objectives of the PS 3 are: • to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; • to promote a more sustainable use of resources, including energy and water; • to reduce project-related GHG emissions.	• Resource Efficiency is regulated by the Law on Environment (72/2009) requiring all legal or private entities to use resources (including energy and water) in a sustainable way; • Reduction of GHG emissions is indirectly regulated by the Law on Environment requiring all legal or private entities to implement energy efficient technologies and use renewable energy sources; The Law on Environmental Impact Assessment (135/2004, 36/2009) requires assessment of project-related impacts on the climate settings; • Air emissions from thermal treatment of waste, ambient air quality standards, liquid effluent standards, surface water, groundwater and sediment standards, soil and groundwater contamination standards and Hazardous substances management are regulated in Serbia as per the description on the previous line of this table.	• No specific provision in the Serbian regulation in respect to reduction of project-related GHG emissions, no recommended methodology for GHG emission calculation. • The Serbian legislation is being adapated gradually to the EU directives. Some gaps are expected.	Any specific gaps shall be assessed during the supplemental ESIA stage.The supplemental ESIA shall follow the standards which are more restrictive
WBG EHS Guidelines for Waste Management Facilities • Recommends management strategies	• The local government authorities are required to manage and organize waste collection and transport and to prevent litter and clandestine dumping, as per the	No gaps found	

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
applicable to MSW in the areas of waste collection & transport, waste receipt, unloading, processing & storage, biological treatment, incineration facilities, and landfilling related to: • minimize litter and clandestine dumping; • minimize dust, bio-aerosols and odours; • prevent, minimize, and control vehicle air emissions; • control the incoming waste stream; • control of contaminated runoff; • manage noise levels; • fire prevention and control; • prevent, minimize and control solid waste from incineration; • prevent, minimize and control water effluents; • landfill siting; • groundwater and leachates monitoring.	Law on Waste Management (36/2009,88/2010); • Waste collection and transport is required to be carried out in a closed vehicle or container or in any other appropriate way which prevents pollution of air, water, land and the environment, as per the Law on Waste Management (36/2009,88/2010). The Decree on Disposal of Waste on Landfills (92/2010) requires landfills to have equipment for vehicle cleaning and disinfection; • Vehicle emissions are regulated by the Regulation on classification of motor and trailer vehicles and technical requirements for vehicle in road traffic (78/2015); • Control of the type and quantity of the incoming waste at the landfill including the recoverable secondary materials and the procedure for waste rejection / segregation are regulated by the Decree on on Disposal of Waste on Landfills (92/2010) requires landfills to; • Control and treatment of contaminated runoff from all waste manipulation and handling areas, including storages is regulated by the Decree on on Disposal of Waste on Landfills (92/2010); • Control of litter, air emissions, noise and vibration and fire prevention during waste receipt, unloading, processing and storage at the treatment facility is required by the Law on Waste Management (36/2009,88/2010); • Biological treatment of waste is regulated by the Law on Waste Management (36/2009,88/2010) requiring measures for control of leachate and runoff, air emissions and fire prevention; • Thermal treatment of waste is regulated by Decree on Types of Waste that can be		

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
	Thermally Treated, Conditions and Criteria for Location, Technical and Technological Requirements for Design, Construction and Operation of Treatment Facility, Management of Residual Waste (102/2010,50/2012);; • Prevention, minimisation and control of ash and other residuals from the thermal treatment of waste is regulated by the Law on Waste Management (36/2009,88/2010) and the Decree on Types of Waste that can be Thermally Treated, Conditions and Criteria for Location, Technical and Technological Requirements for Design, Construction and Operation of Treatment Facility, Management of Residual Waste (102/2010,50/2012); • Landfill siting is regulated by The Decree on on Disposal of Waste on Landfills (92/2010) setting the land use, topographic, hydrogeological, geological, hydrological, natural and cultural heritage and traffic criteria; • Leachate generation is regulated by the Decree on Disposal of Waste on Landfills (92/2010), including landfill siting, liner systems, leachate treatment, and control of runoff from the active face; • Groundwater monitoring and leachate collection and monitoring are regulated by the Decree on Disposal of Waste on Landfills (92/2010); • LFG control and monitoring is regulated by the Decree on Disposal of Waste on Landfills (92/2010). It sets the provision for using the gas as a fuel or its thermal destruction. Control of dust and odour emissions at the landfill is regulated by the same Decree; • Closure and post-closure of landfills is regulated by the Decree on Disposal of		

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
	Waste on Landfills (92/2010). Closure of the existing (non-sanitary) landfills is regulated by the Regulation on methodology for preparation of technical design for landfill rehabilitation and remediation (74/2015).		
Land Acquisition and Involuntary Resettlement			
IFC PS 5 Objective: To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by: (i) providing compensation for loss of assets at replacement costs[15] and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of Information, consultation, and the informed participation of those affected.	Expropriation Law (Official Gazette of RS, number 53/95,23/01-FCC Official Gazette of SRJ, number br. 16/2001 – decision FCC and Official Gazette of RS, number 20/2009, 55/13) The Expropriation law provides for compensation at market value The Expropriation Law provides with adequate disclosure provisions	The methodology used in valuing losses to determine their replacement cost; and a description of the proposed types and levels of compensation under local law and such supplementary measures as are necessary to achieve replacement cost for lost assets Gap between market and replacement cost identified in the case of landfill site (due assessment based on available land transactions in the distant past +20y)	Objective: To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by: (i) providing compensation for loss of assets at replacement costs and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of Information, consultation, and the informed participation of those affected.
IFC PS 5 The Client will compensate for loss of structures	The Expropriation Law provides for accredited experts to valuate the structures	Generally a clear methodology exists, but in practice there is some flexibility to valuate according to market- or replacement value. It is expected that the harmonization of the new law for housing will bridge the gaps.	A Clear methodology for valuation at replacement cost needs to be adopted. Adoption of clear entitlement framework and strategy for social housing for the informal settlers affected by involuntary resettlement (mostly belonging to the Roma community) including an element of choice.
IFC PS 5	A) The Expropriation Law provides for compensation taking into account the cost of	No legal gaps	All assets shall be compensated at replacement cost .

[15] Replacement cost is defined as the market value of the assets plus transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. Market value is defined as the value required to allowAffected Communities and persons to replace lost assets with assets of similar value. The valuation method for determining replacement cost should be documented and included in applicable Resettlement and/or Livelihood Restoration plans" GN5

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
Compensation at full replacement cost should be provided for assets other than land such as crops, fruit trees, and woodlots, irrigation infrastructure and other improvements made to the land.	installation(without deprivation of value) and the amount of yield the vineyard /orchard would produce in respect to its fruitfulness extended time needed to reproduce such a vineyard/orchard B) and C) Compensation at market price of planting material (nursery plants and other reproduction material) that the previous owner had not used by the date of immovable property to expropriation. D) Compensation for expropriated mature or approximately mature forest represents the value of forest products and other forest products determined according to market prices at truck road or another loading place of purchase, less the costs of the production		
IFC PS 5 A census will be carried out to collect appropriate socioeconomic baseline data to identify the persons who will be displaced by the project, determine who will be eligible for compensation and assistance, and discourage ineligible persons, such as opportunistic settlers, from claiming benefits.	Census not compulsory in a socioeconomic meaning (identification of affected households with names and profession).	PAP census needs to be integral part of Resettlement Planning [16].	The Beneficiary to conduct a socioeconomic survey for collection of primary data (including socio-economic data and asset inventory).
IFC PS 5 In the case of physical displacement, the client will develop a RAP that covers, at a minimum, the applicable requirements of PS5 regardless of the number of people affected (...) Particular attention will be paid to the needs of the poor and the vulnerable. The client will document all transactions to acquire land rights, as well as compensation measures and relocation activities (…) If people living in the project area are required to move to another location, the client will (i) offer displaced persons choices	RAP not compulsory under national Law The Expropriation Law provides for replacement housing in case a house, business facility or flat is subject of expropriation. If difference in value between the two the proprietor shall receive the difference in cash, The principle is the same living conditions in terms of location, area of the house/flat or business facility. Consultations are envisaged and the	Late RAP can jeopardize the true objective and rather become a “post festum” implementation plan. The Plan will be designed to mitigate the negative impacts of displacement, develop a resettlement budget and schedule, and establish entitlements to all categories of affected people. RAP needs to foresee permanent resettlement and full	A RAP to be developed in consultation with those affected and disclosed to those affected as soon as possible in the project development. Particular attention and support to be provided to those vulnerable

[16] A census has been carried out in the framework of the project on those affected by involuntary resettlement (informal settlers close to the landfill, mostly Roma) but not socio-economic data has been collected (see cut-off date for eligibility in this table, Section 6 and Annex B (LARR) for additional details).

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
among feasible resettlement options, including adequate replacement housing or cash compensation where appropriate; and (ii) provide relocation assistance suited to the needs of each group of displaced persons. New resettlement sites built for displaced persons must offer improved living conditions. The displaced persons' preferences with respect to relocating in preexisting communities and groups will be taken into consideration. (...) In the case of physically displaced persons (i) who have formal legal rights to the land or assets they occupy or use; (ii) who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law the client will offer the choice of replacement property of equal or higher value, security of tenure, equivalent or better characteristics, and advantages of location or cash compensation where appropriate. Compensation in kind should be considered in lieu of cash. Cash compensation levels should be sufficient to replace the lost land and other assets at full replacement cost in local markets. (...) In the case of physically displaced persons who have no recognizable legal right or claim to the land or assets they occupy or use. The census will establish the status of the displaced persons the client will offer them a choice of options for adequate housing with security of tenure so that they can resettle legally without having to face the risk of forced eviction. Where these displaced persons own and occupy structures, the client will compensate them for the loss of assets other than land, such as dwellings and other improvements to the land, at full replacement cost, provided that these persons have been occupying the project area prior to the cut-off date for eligibility. Based on consultation with such displaced persons, the client will provide relocation assistance sufficient for them to restore their standard of living at an adequate alternative site.	prevailing choice is the choice of the proprietor. Compensation in kind is considered in lieu of cash The principle of cash compensation is at market value for structures The Expropriation Law provides for replacement property provisions as a primary compensation for agricultural land. In case of infrastructure projects Compensation determined by Tax Authority and is based on market value	livelihood restoration and compensations at replacement cost . In kind compensation preferable to cash compensation. In the case of vulnerable settlers, a social worker could be assigned to each individual household to manage resettlement issues and support PAPs in official communications and administrative procedures.	

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
IFC PS 5 Consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, while balancing environmental, social, and financial costs and benefits, paying particular attention to impacts on the poor and vulnerable	The Law on Waste Management Official Gazette of the Republic of Serbia, nos. 43/03, 61/05 and 1/09 provides requirements for waste disposal sites which are compulsory. Alternative considerations are part of technical studies. The expropriation law does not specifically require exploration of alternatives to minimize resettlement.	No gap but there is the need to ensure that minimization of physical and /or economic displacement is investigated during project design. Mitigation should be maximized to the extent practically possible.	Technical alternatives are explored, however there is no way around resettlement of the informal settlers (mostly members of the Roma community) living on the landfill area. Modernization of the existing landfill is the project objective.
IFC PS 5 Formal and informal rights “Displaced persons may be classified as persons (i) who have formal legal rights to the land or assets they occupy or use; (ii) who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law;or (iii) who have no recognizable legal right or claim to the land or assets they occupy or use. The census will establish the status of the displaced persons.	The Expropriation Law of Serbia does not consider informal land rights, according to National legislation the community on the landfill are "illegal squatters" that have no legal claim for compensation.	There is a gap between the national legislation and IFC PS5 when it comes to informal land rights. Census and consideration of this community and their entitlement to be resettled is done to comply with international standards. However, changes in the national legislation are expected for 2016.	The resettlement activities need to comply with the international framework (IFC PS 5)
IFC PS 5 Cut-off date for eligibility “In the absence of host government procedures, the client will establish a cut-off date for eligibility. Information regarding the cut-off date will be well documented and disseminated throughout the project area.”	Expropriation Law, Official Gazette of RS, number 53/95,23/01-FCC Official Gazette of SRJ, number br. 16/2001 – decision FCC and Official Gazette of RS, number 20/2009, 55/13 The Law on expropriation defines the cut-off date when the expropriation is registered at the relevant Cadastral office.	Cut off date was not formally announced and publicly communicated. Also the census is not complete with regard to socio-economic data of affected households.	Clear entitlement framework and eligibility to be adopted. Cut Off date to be formally announced after additional survey. The client should accommodate individuals or groups who are not present at the time of registration but who have a legitimate claim to membership of the affected Community.
IFC PS 5 Additional assistance to PAP (vulnerability) “Additional measures, such as the provision of emergency health care, should be designed for vulnerable groups during physical relocation, particularly pregnant women, children, the elderly, and the handicapped. Assistance may	No specific vulnerability assistance is foreseen in the expropriation law. The new housing law will clarify the assistance with social housing. The specific regulation is not officialized yet. The law on expropriation provides for	There are gaps regarding the vulnerability assistance A clear entitlement framework is pending due to ongoing legal reforms. According to City officials, they	If persistent gaps in resettlement entitlements (e.g. provision of social housing), it should be considered to shift responsibility for RAP to the concessionaire.

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
also include cash allowances that compensate affected people for the inconvenience associated with resettlement and defray the expenses of relocating to a new location, such as moving and lost workdays". Livelihood restoration" To improve, or restore, the livelihoods and standards of living of displaced persons."	replacement housing in case a house, business facility or flat is subject of expropriation. If difference in value between the two the proprietor shall receive the difference in cash, The principle is the same living conditions in terms of location, area of the house/flat or business facility. Consultations are envisaged and the prevailing choice is the choice of the proprietor.	cannot adopt entitlement framework more strict than national regulation (at least if having financial implications) without going against the law / creating precedence.	
IFC PS 5 The extent of monitoring activities will be commensurate with the project's risks and impacts. Monitoring the implementation of the RAP and in particular "carry out a program of monitoring with particular attention to those who are poor and vulnerable so as to track their standards of living and effectiveness of resettlement compensation, assistance, and.."	No specific monitoring procedures are defined in the expropriation law. "Monitoring" is done by law suites at the local courts.	There are gaps regarding the monitoring procedures. Implementation of a monitoring program of resettlement activities is required.	The ESIA should define a proper Environmental and Social Monitoring Plan, the RAP should include monitoring indicators and activities and foresee an external RAP completion audit to be accomplished before start of construction. [17] A repeat socio-economic census after resettlement should be implemented in order to monitor if the livelihoods have effectively been restored.
Public Information, Disclosure and Stakeholder Engagement			
IFC PS 5 Ensure that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. (…) Consultation should capture men's and women's views and concerns. In addition, clients should ensure all households and communities are informed early in the planning process about their options and rights regarding displacement and compensation. Affected households and	No formal SEP is envisaged by the National Law. Disclosure of information is a principle. EIA law does not actually refer to an Environmental and social impact assessment – meaning there is no requirement under Serbian law to publicly disclose any information related to expropriation or social impacts of the project	According to National law, no formalized SEP but various public information activities. The SEP submitted by CoB has gaps concerning the level of detail and concrete planning of activities, not yet corresponding with PS 5. So far, the SEP is too general and oriented on a template rather than on the real analysis of information	SEP to be further developed and implemented as per IFC PS 1 and the stakeholder engagement component included in the RAP as per PS 5. The consultation should capture men's and women's views and concerns. In addition, clients should ensure all households and communities are informed early in the planning process about their options and rights regarding displacement and compensation.

[17] The external completion audit is considered necessary by the consultant developing this scoping study due to the level of vulnerability of those affected by involuntary resettlement.

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
communities should also have the opportunity for informed participation in key phases of resettlement planning so that the mitigation of adverse project impacts is appropriate and the potential benefits of resettlement are sustainable.		requirements of PAPs.	Affected households and communities should also have the opportunity for informed participation in key phases of resettlement planning so that the mitigation of adverse project impacts is appropriate and the potential benefits of resettlement are sustainable. The key stakeholder groups are the economically and/or physically displaced persons and the host community as well (if any) as any governmental or other parties responsible for approving and/or delivering resettlement-related plans and assistance.
Grievance Mechanism			
IFC PS 5 The client will establish a grievance mechanism consistent with IFC PS 1 as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner (…) As with the RAP (see paragraph 19 of PS 5), the scope of the grievance mechanism will vary with the magnitude and complexity of the project and its associated displacement.	Only legal remedy available for specific situations as allowed under the National law. These legal remedies are provided by the Ministry of Finance and Competent Court at various instances	No grievance mechanism provisions in the National Law, with interpretations as assigned under IFC PS 5, included in the Law on Expropriation.	Define a project specific grievance redress mechanism (GRM) in the RAP as well as the procedures for GRM constitution and composition. A GRM is suggested in the draft SEP [18] developed by the CoB including forms, telephone hotline etc. The GRM suggested in the SEP needs to be implemented and communicated to all stakeholders.
Cultural Heritage			
IFC PS 8 The objectives of the PS 8 are:	*Law on Cultural Heritage, Act No. 71 of 1994 The part of Vinca project site, according to Serbian authorities has the status of a "preliminary protected" archeological locality.*	• Examination by the National Institute for Protection of Cultural Monuments was	The PPP contractor will be obliged to develop and maintain an cultural heritage management plan with the special focus on the design and

[18] See Section 7 of this report for additional details.

Relevant international standards	Relevant national legislation	Gaps	Recommended actions to bridge the gaps
• to protect cultural heritage from the adverse impacts of project activities and support its preservation; • to promote the equitable sharing of benefits from the use of cultural heritage.		carried out.	implementation of mitigatigation measures such as preparation and implementation of a chance-find procedure in line with IFC PS 8, training of contractors on this chance-find procedure, identification of sensitive areas to contractors and oversight during excavation by Serbian authorities. The plan shall also design the consultation process with the relevant national or local regulatory agencies that are entrusted with the protection of cultural heritage

5. Baseline description

5.1 Physical environment

5.1.1 Environmental Setting

5.1.1.1 The new and the existing Vinča sites

As described under Section 2, the Vinča sites are composed of the existing site (about 43 ha) and the new site (about 54 ha) adding up to a total of 97 ha for both sites.

The new and the existing Vinča sites are situated in a valley in a rural suburban area in the Belgrade south-east between the Danube River alluvial plain to the east and a hilly upland to the west. The valley is surrounded by a horseshoe-shaped topographic ridge from north, west and south. The terrain is sloped towards the Danube River. The south ridge is at about 250 m a.s.l. and the terrain gradually decreases towards west and north to 71 m a.s.l. (elevation of the Danube River plain).

The 3 km-long local access road connects the Vinča sites from the south-east to the regional two-lane road No. 127 (Smederevo road) (Figure 5-1).

Figure 5-1: View from the access road towards the Vinča sites

The Vinča sites and their surroundings are presented in Figure 5-2.

Note: Proposed extension = new Vinča site

Figure 5-2: Aerial photo of the surroundings of the new and the existing Vinča sites (dated 23.03.2015)

Existing Vinča site
The landfill area lies at the altitude between 170 and 110 m a.s.l. The Danube River runs about 1.8 km to the east of the center of the landfill site. The landfill was sited in 1978 on a cultivated land. The closest settlements to the center of the landfill are the villages of:

- Veliko Selo (about 2.6 km to the north),
- Vinča (about 2 km to the south-east),
- Kaludjerica (about 2.6 km to the south-west),
- Slanci (about 2.6 km to the north-west).

New Vinča site
The new Vinča site comprises a mix of cultivated land with vegetables and vacant greenfield areas. The closest settlements to the envisaged location of the WtE/MBT plant(s) are the villages of:

- Veliko Selo (about 1.7 km to the north-west),
- Vinča (about 2 km to the south-east),
- Kaludjerica (about 1.6 km to the south-west),
- Slanci (about 3.2 km to the north-west).

The closest house to the Vinča sites (apart from those of the informal settlers on the new Vinča site) is located 800 meters to the north-east of the perimeter of the new Vinča site .

The check of the compliance of new Vinča site with the landfill siting criteria of the World Bank can be consulted on Section 1.1.1.

5.1.1.2 The new Cerak site

The new Cerak site and its surroundings are presented in Figure 5-4.

The new Cerak site (incl. the DHP) has a total surface area of about 8 ha and is located in the southern part of Belgrade, in a hilly area (up to 195 m a.s.l). The site elevation is about 175 m a.s.l.

The district heating plant was built in the mid-1980s on a vacant land. It is understood (from the site representatives) that fill material (made ground) was used to level and grade the site. Therefore the site is significantly elevated (up to 5 m) above the area to the north and to the west, while to the east it is flat, i.e. at the same elevation as its eastern surrounding.

The site is surrounded by a mix of vacant land and small agricultural plots from the north, west and south. To the north-east, east and south-east after a small belt of green land, and across the road, buildings of the Vidikovac residential area are located in a distance of ca. 120 m from the district heating plant site. It is a group of about 3-storey residential buildings. In the 500 m radius east and south-east to the site, additional high-rise buildings (also part of the Vidikovac settlement) are located (Figure 5-3).

Figure 5-3: Some of the residential receptors north-east to the new Cerak site ("second row") (source: Fichtner, September 2015)

The two-lane regional road (Ibarska Magistrala – state road No. 2) passes about 80 m to the east, between the site and the Vidikovac settlement. The proposed WtE plant under Options 1 and 2 is planned to be developed on vacant land within the Cerak site, as fits best to the contractor. Figure 5-4 shows the location assumed for this E&S study. The actual siting is, however, task of the PPP contractor.

Figure 5-4: Aerial photo of the new Cerak site surroundings (dated 24.09.2015)

5.1.2 Climate

Belgrade is characterised by a moderate continental climate with variable seasons, and higher temperatures in the autumn than the spring. The temperature fluctuations between the seasons are significant and characterised by cold winters and hot summers.

The mean annual temperature in the period 1981 – 2010 was 12.5°C. The hottest month is July (the average is 23°C), the coldest is January (1.4°C). The highest temperature recorded was 43.6°C (in 2007), the lowest was -26.2°C (in 1947)[19]. The temperature trend in the city for the period 1949-2009 shows increase of about 0.2°C per decade.

The city climate has a pronounced seasonality in precipitation. The mean annual precipitation in the period 1981 – 2010 was 690.9 mm. Precipitation is at its highest in June (101.2 mm) and at the lowest in February (40 mm)[19]. The precipitation trend for the period 1949-2009 shows increase of about 0.36 mm per year.

In the period 1981-2010, the mean annual humidity recorded was 68% (from 61% in the summer to 79% in the winter). The mean annual number of days with snow cover was 39. The mean annual number of days with fog was 24[19].

The predominant winds blow from the south-east and the west. The south-eastern wind blows throughout the year. Its average speed in the period 1981-2010 was 3.1 m/s. It was strongest in September and the winter (maximum recorded speed was 35.9 m/s). The average speed of the western wind in the period 1981-2010 was 2.3 m/s and it was strongest in the summer[20]. Calm periods are infrequent, occurring mostly in the summer. The wind rose for Belgrade (Republic Hydro-meteorological Institute - Vračar monitoring station, 1981-2010) is provided in Figure 5-5.

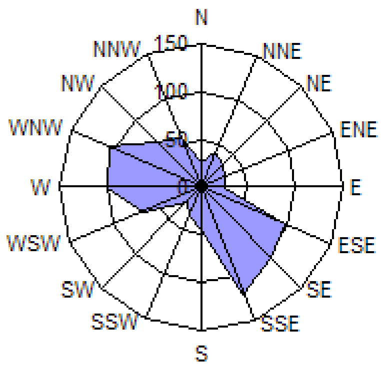

Figure 5-5: Wind frequency in Belgrade (1981-2010)

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[19] Republic Hydro-meteorological Institute – Data for the monitoring station Vračar (from 1887 to date)

[20] Initial National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change – The Ministry of Environment and Spatial Planning, 2012

Monitoring of the local meteorological settings at the Vinča and Cerak sites has not been reported. The local city network of monitoring stations covers both sites. The station closest to the new Vinča site is "Zeleno Brdo", located about 5.5 km to the west. The station closest to the new Cerak site is "Košutnjak", about 3 km to the north of the site.

Both the new Vinča site and the new Cerak site study areas are located in the hilly upland region, so their microclimate settings might slightly deviate from the presented data recorded in the city centre. The mean annual temperature might be a bit lower (about 11.0°C) and the mean annual precipitation a bit higher (up to 730 mm). Occurrence of valley fog is regular during the late autumn and winter[21].

5.1.3 Geology

5.1.3.1 The new and the existing Vinča sites

The geological settings of the area are described based on geological information available in the spatial planning documentation and landfill development plans.

The geological composition of the area of the new and existing Vinča sites is characterised by the presence of the Danube alluvial plain and the slightly hilly upland above it.

The alluvial plain spreads up to 400 m from the right bank of the Danube. The alluvial sediments are about 15 m thick. Its upper section (2-3 m) is little permeable (hydraulic conductivity $k=10^{-5} – 10^{-6}$ cm/s), made of clay and silty sediments. The lower section consists of sand and gravel sediments of high permeability ($k=10^{-1} –10^{-3}$ cm/s).

The upland terrain is covered by a thin layer (up to few meters) of loess ($k=10^{-3} – 10^{-4}$ cm/s) and other Quartarian sediments (alluvial, diluvial, colluivial, prolluvial, $k=10^{-5} – 10^{-7}$ cm/s). The Vinča landfill is situated in the valley of a minor stream (Ošljan stream). Different geomorphological processes in the stream valley resulted in formation of the Quartarian layer comprising mostly clayey sand and marl sand deposits.

The Neogene sediment complex (the Sarmatian layer of Miocene) underlies both the alluvial plain and upland terrain. It consists mostly of marl sand, clayey sand and marl and is tens of meters thick.

The schematic view of the geological cross-section of the area is illustrated in Figure 5-6.

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[21] Ecological Atlas of Belgrade – The Institute of Public Health of Belgrade, 2002

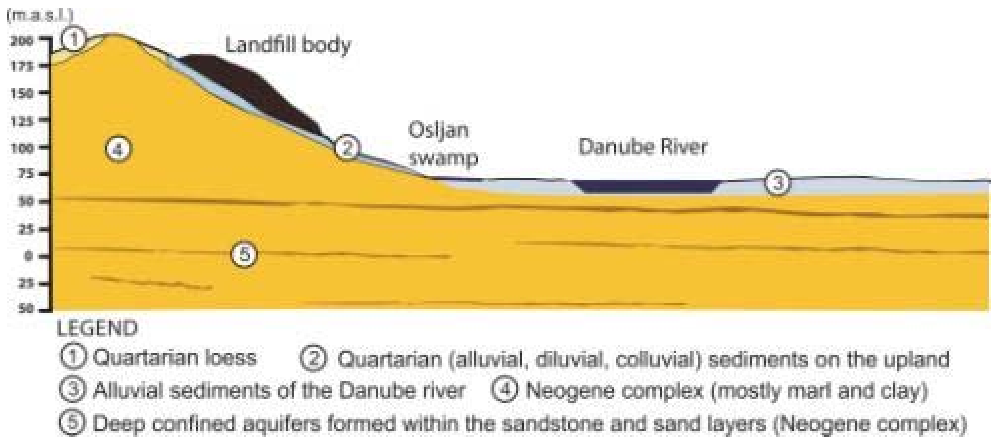

Figure 5-6: Schematic geological cross-section of the study area

5.1.3.2 The new Cerak site

Based on the Geological Map of Yugoslavia (1:100.000 sheet Belgrade) and other available geological literature, the site area is located on the Quaternary sediments underlain by the 200 m-thick Neogene complex of middle Miocene age (Sarmatian M_3^1).

In the vertical cross-section, the Quaternary (diluvial, proluvial) cover comprises loess and clay sediments. Deeper Miocene sediments consist of sands, sandy clays and limestone. The heating plant site was levelled and graded by fill material (made ground) of an unknown thickness.

As stated previously in this report, the immediate underground of the site is fill material (made ground) which was used to level and grade the site.

5.1.4 Hydrogeology

The hydrogeological settings of the sites are described based on the information available in the spatial planning documentation and landfill development plans.

5.1.4.1 The new and the existing Vinča sites

The geomorphological complexity of the area of the Vinča sites and the heterogeneous lithological composition have resulted in a complex subsurface hydrogeological regime at the sites, followed by sliding processes. The numerous near-surface diffuse groundwater discharges are present in the wider area of the Vinča sites as small sources (about 0.1 l/s) to feed the Ošljan stream.

The shallow aquifer has been formed within the sand and gravel deposits of the Ošljan stream running below the existing landfill body. The thickness of deposits is in the range of 3 – 7 m, depending on the terrain morphology. The groundwater level (GWL) formed within this shallow aquifer fluctuates during the season in the range 1.7 – 2 m b.g.l. The aquifer has a good

permeability (hydraulic conductivity $k=10^{-3}$ cm/s, transmissibility T=2.4 to 22.6 m^2/s). The usage of water from this aquifer is highly unlikely.
The groundwater quality in the shallow aquifer has been occasionally analysed from 2010 on. Several monitoring wells have been installed in the area of the Vinča sites but only few have remained in usage in the last few years. Results from 2010 indicate presence of heavy metals in one well but its location has not been clearly reported and cannot be indicated on a map.

Two shallow monitoring wells have remained actively used in the last few years. The first well is located at the south-eastern boundary of the existing site, close to the existing maintenance area, upstream of the existing landfill body. The location of this well is presented on the map in Annex D. The monitoring results indicate that most of the time concentrations of pollutants were below the remediation values, except once in 2013 when lead (143 µg/l) exceeded the remediation value [22] of 75 µg/l. The results from 2014 are provided in Table 5-1.

The second well is reported as being located west and downstream to the existing landfill body, close to the Ošljan stream (the main recipient of leachate). Monitoring of this well is reported only in 2012 and 2013. The exact location of this well is not clearly reported and thus cannot be indicated on the map. The monitoring results indicate exceedance of nickel, chromium (total) and lead remediation values. Nickel exceeded 3 times and lead and chromium exceeded twice in each 2013 and 2012. Exceedances varied in between slightly and considerably increased (up to 240 µg/l for nickel, 616 µg/l for lead, 506 µg/l for chromium).

Table 5-1: Regular groundwater monitoring at the existing Vinča landfill site - results from 2014 (Source: PUC)

Parameter	Measured Value	Serbian remediation value (OJ RS 88/10) [µg/l]	US EPA MCL*
Temperature	14.4° C	-	-
Electro conductivity	2190 µS/cm	-	-
Suspended solids	108 mg/l	-	-
pH	7.65	-	-
BOD_5	46 mg/l	-	-
COD	57.52 mg/l	-	-
Nitrates	<0.04 mg/l	-	10 mg/l
Nitrites	<0.04 mg/l	-	1 mg/l
Total P	0.15 mg/l	-	-
Ammonium ion	0.31 mg/l	-	-
Total inorganic N	0.31 mg/l	-	-
Chlorides	491.24 mg/l	-	-

[22] Remediation value is the same as “intervention value”. It’s a value that indicates that remedial action is necessary.

Parameter	Measured Value	Serbian remediation value (OJ RS 88/10) [µg/l]	US EPA MCL*
Sulphates	101.99 mg/l	-	-
Phosphates	<0.08 mg/l	-	-
Cu	<0.50 mg/l = <500 µg/l	75	1.3 mg/l **
Cr	<10 mg/l = <10,000 µg/l	30	0.1 mg/l
Ni	<20 mg/l = <20,000 µg/l	75	-
Zn	<30 mg/l = <30,000 µg/l	800	-
Cd	<5.0 mg/l = <5,000 µg/l	6	0.005 mg/l
Pb	<50 mg/l = <50,000 µg/l	75	0.015 mg/l **
Mn	402 µg/l	-	-
Hg	<0.5 mg/l = <500 µg/l	0.3	0.002 mg/l
As	<5.0 mg/l = <5,000 µg/l	60	0.010 mg/l
Phenol	207.22 µg/l	2000	-
Mineral oil	<0.01 µg/l	600	-
Benzene	<0.20 mg/l = <200 µg/l	30	0.005 mg/l
Toluene	<0.20 mg/l = <200 µg/l	1000	1 mg/l
Styrene	<0.20 mg/l = <200 µg/l	300	0.1 mg/l
Xylene	<0.20 mg/l = <200 µg/l	70	10 mg/l
Ethylbenzene	<0.20 mg/l = <200 µg/l	150	0.7 mg/l

* US EPA MCL = Maximum Contaminant Level | The groundwater protection standard may be equivalent to the Maximum Contaminant Level (MCL) established in the Safe Drinking Water Act

** Action Level = if more than 10% of water samples exceed the action level, water systems must take additional steps

Standards are exceeded

It is evident that the exceedance of heavy metals remediation values in groundwater wells periodically occurs. However, the level of present data cannot be considered sufficient for the relevant site and subsurface characterization.

The alluvial aquifer of the Danube River has been formed within the sediments consisting of sand, clayey-sand and gravels. The aquifer has high permeability (hydraulic conductivity $k=10^{-2} – 10^{-3}$ cm/s, transmissibility $T=87$ to 103 m^2/s). Groundwater level is in a direct hydraulic connection with the Danube River fluctuating during the year, very close to the terrain surface, forming a swampy area on the right river bank. Presence of public or private wells extracting groundwater from this aquifer is considered unlikely.

The aquifer formed within the Neogene sediments: It is understood that deep confined aquifer intervals exist within the Neogene (Miocene) layers where sandy and clay sand and sandstones occur. The aquifers have been identified during the reported deep drilling works undertaken in the area south of the existing landfill body (location is unknown) at the depth intervals of 100-105 m b.g.l. and 128-133 m b.g.l[23]. The piezometric head in the confined aquifers is at about 20 m b.g.l. According to the laboratory analysis, hydraulic conductivity of the sand and sandstone aquifer is about 10^{-3} cm/s.

Presence of public or private wells that are tapping this aquifer in the radius of 2 km is not known at this stage, however it is considered not very likely.

<u>Groundwater investigations in December 2015 – January 2016 performed by the Institute Mol</u>

As part of this E&S Scoping Study, the following investigations have been undertaken within the area of the new and existing Vinča site:

- geotechnical investigations including seven boreholes drilling (15-20 m deep) and laboratory analyses,
- installation of three 20 m-deep groundwater monitoring wells using three of the drilled boreholes, and
- one-time sampling and laboratory analysis of groundwater from the three newly-installed monitoring wells and from four geotechnical boreholes (seven groundwater samples in total [24]).

[23] Local Waste Management Plan of Belgrade (2011-2021), Faculty of Geography (University of Belgrade), 2012Local

[24] Seven boreholes (BHs) were drilled in total, used for soil sampling for geotechnical analysis. Three of them were transformed to monitoring wells (MWs) and could be used for future monitoring. The difference between MWs and BHs is that MWs are equipped with appropriate construction (casing, screen, gravel pack), and BHs are not.

The investigation was undertaken in the period December 2015-January 2016 by the Institut MOL d.o.o., a licensed laboratory for Chemistry, Biotechnology and Consulting based in Belgrade.

The approach of the groundwater investigation was to analyse the groundwater quality at one point upstream and two points downstream of the existing landfill. The location of the monitoring wells (MW) and geotechnical boreholes (BH) are presented in Figures 5-7 (upstream) and 5-8 (downstream).

Figure 5-7: Location of boreholes (BH) and monitoring wells (MW) upstream of the existing Vinča site (Institut Mol d.o.o., 2016)

Figure 5-8: Location of boreholes (BH) and monitoring wells (MW) downstream of the existing Vinča site (Institut Mol d.o.o., 2016)

All the groundwater samples were analysed for basic physical and chemical parameters, heavy metals, cyanides, phenols, VOCs, PAHs, mineral oil, PCB, AOC, and organochlorine pesticides.

Upstream sampling results: The BH-5 (MW) was situated upstream and out of the existing Vinča landfill site with the aim to be representative of the baseline groundwater conditions (outside of the existing landfill's influence). The results of the ground water sampling are shown in Table 5-2. They show that no contaminants monitored in BH-5 (MW) exceed the Serbian remediation standards that indicate the need for remediation. The two boreholes (BH-6 and BH-7) used for the geotechnical investigations were also used for groundwater sampling. The results (see Table 5-2) showed higher values of specific electroconductivity, BOD_5 and COD than BH-5 (MW), but no contaminants exceeded the Serbian remediation standards that indicate the need for remediation.

Downstream sampling results: The samples of boreholes 1 and 2 are characterized by high specific electroconductivity and high values of BOD_5 and COD. Several parameters exceeded the national remediation standards, as well as the US EPA MCL (where defined) as follows: Zinc in BH-1 (MW); and Chromium, Nickel and Arsenic in BH-2 (MW).

On the other hand Boreholes 3 and 4 do not show any landfill typical groundwater contamination.

The obtained results are provided in Table 5-2.

Table 5-2: Groundwater quality results at the existing Vinča site (December 2015) and comparison with the national and the US EPA standards

Parameter	Unit	Upstream groundwater samples			Downstream groundwater samples				Serbian Remediation standards (OJ RS 88/10) [unit matches the column "Unit"]	US EPA MCL [mg/l]*
		BH-5 (MW)	BH-6	BH-7	BH-1 (MW)	BH-2 (MW)	BH-3	BH-4		
Temperature	°C	12.9	16.0	15.0	11.3	20.5	13.4	20.5	-	-
Colour (descriptively)	-	without	without	light gray	light yellow	black	without	light gray	-	-
Odour	-	without	unpleasant	unpleasant	without	unpleasant	without	unpleasant	-	-
Floating matters (descriptively)	-	without	without	without	without	without	without	without	-	-
Turbidity	NTU	<0.05	<0.05	0.88	<0.05	45.60	0.66	1.26	-	-
Conductivity	µS/cm	941	4311	3563	5938	17972	1811	1207	-	-
Dissolved oxygen	mg/l	5.8	3.9	3.7	4.2	1.8	4.8	4.4	-	-
pH	-	7.77	7.09	7.14	7.06	7.59	7.18	7.79	-	-
Evaporation residue	mg/l	470.0	4134.0	2896.0	4444.0	9158.0	1260.0	2186.0	-	-
Suspended matter	mg/l	22.0	82.0	89.0	25.0	72.0	91.0	115.0	-	-
Sedimentary matter	ml/l	<0.1	3.8	2.7	0.3	3.1	3.4	4.0	-	-
Chemical oxygen demand (COD)	mg O_2/l	11.86	142.29	131.62	288.54	3142.3	94.86	39.53	-	-
$KMnO_4$ consumption	mg/l	5.69	135.91	119.76	214.93	3097.6	82.18	21.49	-	-
Biological oxygen demand (BOD)	mg O_2/l	3.1	42.0	39.1	88.0	890.0	26.0	10.0	-	-
Adsorbable organically bound halogens (AOX)	µg/l	832	<10	<10	257	5960	50	<10	-	-
Total nitrogen (N)	mg N/l	8.00	34.42	29.49	23.55	1349.1	55.47	22.26	-	-
Ammonia nitrogen (NH +-N)4	mg N/l	0.55	18.46	16.16	1.91	440.72	21.06	1.94	-	-
Nitrites (NO -)2	mg NO -/l2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	1
Nitrates (NO -)3	mg NO -/l3	1.70	<0.1	1.20	<0.1	<0.1	<0.1	<0.1	-	10
Chlorides (Cl^-)	mg/l	3.40	277.30	217.40	980.50	1208.0	33.10	38.10	-	-
Sulphates (SO 2-) 4	mg/l	5.30	72.60	61.40	96.80	1.70	66.30	32.80	-	-
Phosphates (PO 3-)4	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Fluorides (F^-)	mg/l	<0.1	<0.1	<0.1	<0.1	0.20	<0.1	0.20	'	4

Parameter	Unit	Upstream groundwater samples			Downstream groundwater samples				Serbian Remediation standards (OJ RS 88/10) [unit matches the column “Unit”]	US EPA MCL [mg/l]*
		BH-5 (MW)	BH-6	BH-7	BH-1 (MW)	BH-2 (MW)	BH-3	BH-4		
Bromides (Br^-)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Sulphides (S^{2-})	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Calcium (Ca)	mg/l	88.94	330.48	281.56	481.44	129.74	91.40	74.26	-	-
Magnesium (Mg)	mg/l	62.45	198.29	161.65	371.79	123.93	210.93	62.46	-	-
Sodium (Na)	mg/l	23.08	352.21	311.35	176.77	57.50	1711.2	64.76	-	-
Potassium (K)	mg/l	5.37	33.53	23.32	2.02	3.46	1425.2	15.44	-	-
Iron (soluble), (Fe)	mg/l	<0.09	5.63	4.18	<0.09	4.20	9.76	0.18	-	-
Mangan (soluble), (Mn)	mg/l	0.03	3.36	2.58	1.08	0.90	0.49	0.42	-	-
Boron (B)	mg/l	<0.1	1.3	1.0	0.67	0.16	7.04	0.39	-	-
Total organic carbon (TOC)	mg/l	5.6	42.3	40.0	117	32.1	1134	16.3	-	-
Carbon-dioxide (CO_2)	mg/l	17.53	39.44	36.57	102.01	63.54	569.71	17.53	-	-
Bicarbonates (HCO -)	mg/l	541.47	926.92	893.32	1092.1	896.33	6513.7	370.16	-	-
Heavy metals										
Chromium (Cr), total	mg/l	<0.003	<0.003	<0.003	<0.010	0.31	<0.003	<0.003	0.030	0.1
Barium (Ba)	mg/l	0.05	0.38	0.26	0.18	0.58	0.18	0.06	0.625	2
Nickel (Ni)	mg/l	<0.003	<0.003	<0.003	<0.003	0.60	<0.003	<0.003	0.075	-
Lead (Pb)	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.075	0.015 **
Copper (Cu)	mg/l	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.075	1.3 **
Zinc (Zn)	mg/l	0.020	<0.016	<0.016	4.73	0.07	<0.016	<0.016	0.8	-
Cadmium (Cd)	mg/l	<0.0003	<0.0003	<0.0003	<0.0003	0.0003	<0.0003	<0.0003	0.006	0.005
Mercury (Hg)	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.002
Arsenic (As)	mg/l	<0.003	<0.003	<0.003	<0.003	0.20	<0.003	<0.003	0.060	0.010
Cyanides (CN^-)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.5	0.2
Phenols	mg/l	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	2.0	-
Volatile Organic Compunds										
Chloroform	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	400	0.07
1,2-dichlorethane	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	400	-
Trichlorethylene	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	500	0.005
Tetrachlorethylene	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	40	0.005

Parameter	Unit	Upstream groundwater samples			Downstream groundwater samples				Serbian Remediation standards (OJ RS 88/10) [unit matches the column "Unit"]	US EPA MCL [mg/l]*
		BH-5 (MW)	BH-6	BH-7	BH-1 (MW)	BH-2 (MW)	BH-3	BH-4		
Carbon tetrachloride	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.005
Vinyl chloride	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	0.002
2,4-dichlorphenoxyacetic acid (2,4 - D)	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.07
1,4-dichlorbenzene	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	50	-
1,1-dichlorethylene	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	0.007
Polycyclic aromatic hydrocarbons (PAH)										
Naphtalene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	70	-
Pyrene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	-
Fluorene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	-
Phenanthrene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	5	-
Fluoranthene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1	-
Benzo(a)pyrene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.05	0.0002
Anthracene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	5	-
Benzo(a)anthracene	µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5	-
Mineral oil C10-C40	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.6	-
Polychlorinated biphenyls (PCB) as Arohlor 1260	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.0005
Aromatic organic compounds										
Benzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	30	0.005
Xylene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	70	10
Toluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1000	1
Ethylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	150	0.7
Organochlorine pesticides										
Aldrin	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
Dieldrin	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	-
Endrin	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.002
Endrin ketone	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Endosulfan sulphate	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Heptachlor	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.3	0.0004
Heptachlorepoxide	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	3.0	0.0002

Parameter	Unit	Upstream groundwater samples			Downstream groundwater samples				Serbian Remediation standards (OJ RS 88/10) [unit matches the column "Unit"]	US EPA MCL [mg/l]*
		BH-5 (MW)	BH-6	BH-7	BH-1 (MW)	BH-2 (MW)	BH-3	BH-4		
Cis-chlordane	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	-
Trans-chlordane	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
4,4-metoxychlor	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
HCH-alpha	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.0	-
HCH-beta	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
HCH-delta	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
Lindane (HCH-gamma)	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
p,p'-DDD (p,p'-Dichlordiphenyldichlorethan)	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	-
p,p'-DDE (p,p'-Dichlordiphenyldichlorethen)	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-
p,p'-DDT (p,p'-Dichlordiphenyltrichlorethan)	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		-

* US EPA MCL = Maximum Contaminant Level | The groundwater protection standard may be equivalent to the Maximum Contaminant Level (MCL) established in the Safe Drinking Water Act

** Action Level = if more than 10% of water samples exceed the action level, water systems must take additional steps

Standards are exceeded

5.1.4.2 The new Cerak site

Based on the hydrogeological data available[25], no shallow aquifer exists within the Quartarian sediments. However, loess sediments may contain some local groundwater accumulation in periods of increased precipitation. The existence of a deep confined aquifer may be expected within the Sarmatian limestones at significant depths (tens of meters).

Groundwater investigations in December 2015 – January 2016 performed by the Institute Mol

A one-time groundwater sampling was performed in the period December 2015 – January 2016 by the Institut MOL d.o.o. Two groundwater monitoring wells were installed at the new Cerak site and two groundwater samples were taken. The groundwater depths were not reported.

The results show that no contaminants exceeded the Serbian remediation standards that indicate need for remediation, as well as the US EPA MCL. The groundwater sampling results are provided in Table 5-3. A map with the drilling locations has not been provided by the Institute Mol.

[25] Detailed plan of regulation of the Ibarska magistrala road in the area of the district plant Cerak (Off. Journal of Belgrade, No. 33/2010)

Table 5-3: Groundwater quality results at the new Cerak site (December 2015) and comparison with the national and the US EPA standards

Parameter	Unit	BH-2/1 (MW)	BH-2 (MW)	Serbian Remediation Standards (OJ RS 88/10) [unit matches the column “Unit”]	US EPA MCL [mg/l]*
Temperature	°C	14.0	14.7	-	-
Colour (descriptively)	-	without	without	-	-
Odour	-	without	without	-	-
Floating matters (descriptively)	-	without	without	-	-
Turbidity	NTU	0.07	<0.05	-	-
Conductivity	µS/cm	636	766	-	-
Dissolved oxygen	mg/l	5.4	4.7	-	-
pH	-	7.62	7.56	-	-
Evaporation residue	mg/l	558.0	460.0	-	-
Suspended matter	mg/l	18.0	<15.0	-	-
Sedimentary matter	ml/l	1.0	0.5	-	-
Chemical oxygen demand (COD)	mg O_2/l	19.76	22.73	-	-
$KMnO_4$ consumption	mg/l	12.64	17.7	-	-
Biological oxygen demand (BOD)	mg O_2/l	6.0	7.0	-	-
Adsorbable organically bound halogens (AOX)	µg/l	<10.0	23.6	-	-
Total nitrogen (N)	mg N/l	7.85	7.98	-	-
Ammonia nitrogen (NH_4^+-N)	mg N/l	0.06	0.15	-	-
Nitrites (NO_2^-)	mg NO_2^-/l	<0.1	<0.1	-	1
Nitrates (NO_3^-)	mg NO_3^-/l	1.2	1.3	-	10
Chlorides (Cl^-)	mg/l	7.40	4.10	-	-
Sulphates (SO_4^{2-})	mg/l	1.40	7.20	-	-
Phosphates (PO_4^{3-})	mg/l	<0.1	<0.1	-	-
Fluorides (F^-)	mg/l	<0.1	<0.1	'	4
Bromides (Br^-)	mg/l	<0.1	<0.1	-	-
Sulphides (S^{2-})	mg/l	<0.1	<0.1	-	-
Calcium (Ca)	mg/l	102.00	116.69	-	-
Magnesium (Mg)	mg/l	12.89	36.68	-	-
Sodium (Na)	mg/l	10.04	11.50	-	-
Potassium (K)	mg/l	1.17	1.65	-	-

Parameter	Unit	BH-2/1 (MW)	BH-2 (MW)	Serbian Remediation Standards (OJ RS 88/10) [unit matches the column “Unit”]	US EPA MCL [mg/l]*
Iron (soluble), (Fe)	mg/l	<0.09	<0.09	-	-
Mangan (soluble), (Mn)	mg/l	0.02	0.14	-	-
Boron (B)	mg/l	<0.1	<0.1	-	-
Total organic carbon (TOC)	mg/l	14.3	17.4	-	-
Carbon-dioxide (CO_2)	mg/l	8.76	13.15	-	-
Bicarbonates (HCO -)3	mg/l	263.09	406.87	-	-
Heavy metals					
Chromium (Cr), total	mg/l	<0.003	<0.003	0.030	0.1
Barium (Ba)	mg/l	0.02	0.13	0.625	2
Nickel (Ni)	mg/l	<0.003	<0.003	0.075	-
Lead (Pb)	mg/l	<0.003	<0.003	0.075	0.015 **
Copper (Cu)	mg/l	<0.06	<0.06	0.075	1.3 **
Zinc (Zn)	mg/l	0.04	<0.016	0.8	-
Cadmium (Cd)	mg/l	<0.0003	<0.0003	0.006	0.005
Mercury (Hg)	mg/l	<0.0001	<0.0001	0.0003	0.002
Arsenic (As)	mg/l	<0.003	<0.003	0.060	0.010
Cyanides (CN^-)	mg/l	<0.01	<0.01	1.5	0.2
Phenols	mg/l	<0.02	<0.02	2.0	-
Volatile Organic Compounds					
Chloroform	µg/l	<0.1	<0.1	400	0.07
1,2-dichlorethane	µg/l	<0.1	<0.1	400	-
Trichlorethylene	µg/l	<0.1	<0.1	500	0.005
Tetrachlorethylene	µg/l	<0.1	<0.1	40	0.005
Carbon tetrachloride	µg/l	<0.1	<0.1	-	0.005
Vinyl chloride	µg/l	<0.1	<0.1	5	0.002
2,4-dichlorphenoxyacetic acid (2,4 - D)	µg/l	<0.1	<0.1	-	0.07
1,4-dichlorbenzene	µg/l	<0.1	<0.1	50	-
1,1-dichlorethylene	µg/l	<0.1	<0.1	10	0.007
Polycyclic aromatic hydrocarbons (PAH)					
Naphtalene	µg/l	<0.4	<0.4	70	-
Pyrene	µg/l	<0.4	<0.4	-	-
Fluorene	µg/l	<0.4	<0.4	-	-

Parameter	Unit	BH-2/1 (MW)	BH-2 (MW)	Serbian Remediation Standards (OJ RS 88/10) [unit matches the column "Unit"]	US EPA MCL [mg/l]*
Phenanthrene	µg/l	<0.4	<0.4	5	-
Fluoranthene	µg/l	<0.4	<0.4	1	-
Benzo(a)pyrene	µg/l	<0.4	<0.4	0.05	0.0002
Anthracene	µg/l	<0.4	<0.4	5	-
Benzo(a)anthracene	µg/l	<0.4	<0.4	0.5	-
Mineral oil C_{10}-C_{40}	mg/l	<0.05	<0.05	0.6	-
Polychlorinated biphenyls (PCB) as Arohlor 1260	mg/l	<0.01	<0.01	0.01	0.0005
Aromatic organic compounds					
Benzene	µg/l	<1.0	<1.0	30	0.005
Xylene	µg/l	<1.0	<1.0	70	10
Toluene	µg/l	<1.0	<1.0	1000	1
Ethylbenzene	µg/l	<1.0	<1.0	150	0.7
Organochlorine pesticides					
Aldrin	µg/l	<0.01	<0.01	0.1	-
Dieldrin	µg/l	<0.01	<0.01		-
Endrin	µg/l	<0.01	<0.01		0.002
Endrin ketone	µg/l	<0.01	<0.01	-	-
Endosulfan sulphate	µg/l	<0.01	<0.01	-	-
Heptachlor	µg/l	<0.01	<0.01	0.3	0.0004
Heptachlorepoxide	µg/l	<0.01	<0.01	3.0	0.0002
Cis-chlordane	µg/l	<0.01	<0.01	0.2	-
Trans-chlordan	µg/l	<0.01	<0.01		-
4,4-metoxychlor	µg/l	<0.01	<0.01	-	-
HCH-alpha	µg/l	<0.01	<0.01	1.0	-
HCH-beta	µg/l	<0.01	<0.01		-
HCH-delta	µg/l	<0.01	<0.01		-
Lindane (HCH-gamma)	µg/l	<0.01	<0.01		-
p,p'-DDD (p,p′-Dichlordiphenyldichlorethan)	µg/l	<0.01	<0.01	0.01	-
p,p'-DDE (p,p'-Dichlordiphenyldichlorethen)	µg/l	<0.01	<0.01		-
p,p'-DDT (p,p'- Dichlordiphenyltrichlorethan)	µg/l	<0.01	<0.01		-

* US EPA MCL = Maximum Contaminant Level | The groundwater protection standard may be equivalent to the Maximum Contaminant Level (MCL) established in the Safe Drinking Water Act

** Action Level = if more than 10% of water samples exceed the action level, water systems must take additional steps

5.1.5 Stability of the existing Vinča Landfill

The instability of the existing landfill body is a significant and presently unresolved issue. A landslide on the landfill occurred in May 2014 and was triggered by the extremely high precipitation when a month's rate of rain fell in just a few days. As a consequence, a landslide occurred in the north-eastern parts of the landfill, along the unsecured slopes, and buried the part of a runoff diversion ditch and an internal road. The landslide scar height is between 2 and 15 m. The locations of the active landslides (shown as "eclipses") and cracks on the landfill body area are provided in Figure 5-9. The cracks on the existing landfill body are few tens of meters long and indicate the still active landslides (Figure 5-10).

Figure 5-9: Landslides at the existing Vinča landfill

Figure 5-10: Cracks on the existing Vinča landfill body (Source: Strategic Environmental Impact Assessment of the DPR, 2015 - date of the photo unknown)

The PUC did not perform a landfill body stability assessment. However, the urgent stabilization of the landfill is an evident need and a minimum stabilization will be undertaken by the CoB in 2016, until the small available budget is exhausted. The foreseen measures are:

- A dam will be built at the bottom of the main landfill slope directed to the Danube River to prevent further sliding.
- As far as possible horizontal drainage pipes will be installed to support the extraction of leachate trapped inside the landfill body. The leachate will be discharged downstream to the Ošljan stream and swamp.
- As far as possible the existing drainage ditches will be repaired to avoid storm water entering the landfill body and drain the storm water around the landfill body downstream towards the Ošljan stream and swamp.

These measures will improve the baseline of the existing landfill before closure and handing over to the PPP project.

5.1.6 Natural Hazards

Earthquake

According to the data from the Institute for Seismology of Serbia, the macroseismic intensity of the local ground with 10% probability of exceedance in 50 years (return period 475 years) for both the new and existing Vinča sites and the new Cerak site is VII of the EMS-98 (European macroseismic scale) which refers to (damaging earthquake). .

Definition of the damaging earthquake' effect in buildings (VII degree of macroseismic intensity) is that (1) majority of masonry buildings (simple stone or unreinforced stone) suffer moderate structural damage and a few of them suffer heavy structural damage and that (2) a few of reinforced concrete buildings suffer slight structural damage or non-structural moderate damage[26].

Assessment of the seismic risk at the site should be part of the geotechnical engineering of the landfill design.

Flooding

The new and the existing Vinča sites are not considered prone to flooding, given that the site is more than 40 m elevated compared to the Danube River. The risk of flooding at the new Cerak site is not considered significant, given its location on the hill and the absence of surface water in the area.

Colluvial erosion

The colluvial process has been developed at the wider slope area towards the Danube River including the existing Vinča landfill. The landslides are active, with depths between 10 and 15 m. The geotechnical assessment[27] suggested that the extension of the landfill (construction of new landfill cells) should not be planned in the slope area towards the Danube River.

5.1.7 Surface water

5.1.7.1 The new and the existing Vinča sites

There are three surface water features affected by the new and the existing Vinča sites are: the Ošljan stream, the Ošljan swamp, and the Danube River.

The existing landfill was established in the narrow valley of the **Ošljan stream**, a minor surface water running towards the Danube River. Consequently, the Ošljan stream is the main drainage direction of the landfill leachate, which nowadays is not captured nor treated. In the upper part of the valley, where parts of the new and the existing Vinča site are situated, the stream slope is about 7°, after which it runs towards the flat swampy area of the Danube plain, fed by spring water and leachate, where it is discharged into the Ošljan swamp.

Being the main drainage of the landfill leachate, the Ošljan stream water quality is heavily affected. The monitoring point where the stream water sample has been periodically taken is presented on the map in Annex D. The most recent sampling results (from 2014) are presented in Table 5-2 (Report on surface water monitoring in the new Vinča site - "Zaštita na radu i zaštita životne sredine Beograd", July 2014).

[26] European Macroseismic Scale EMS-98 – European Seismological Comission, 1998
[27] Undertaken by the Urbanistic Institute of Belgrade for the purpose of preparation of the Plan of Detailled Regulation of the Vinča Landfill (2015)

The monitoring shows regularly elevated values of BOD_5, COD, suspended solids, total N, total P, and sulphides. Periodically, elevated values of TOC, total chromium, nickel and cyanides have been recorded. These results point to exceedances in addition of total Cr, ammonium ion and chlorides. The exceedances are not only to the national criteria, but also to the acute/maximum and chronic/annual limit values valid in the USA and in the EU.

Serbian limit values are based on “good” ecological status (II class) as defined by the Decree on limit values of polluting substances discharged into surface water, groundwater and sediment and deadlines for compliance (Off. Journal of RS, No. 50/2012). For the parameters where limit values depend on the type of surface water body (BOD, nitrates, ammonium ion, total phosphorus, phosphates, chlorides), the limit values for Type 1 of surface water bodies have been applied. Surface water body types are defined by the Regulation on determining the surface water bodies (Off. Journal of RS, No. 96/2010). Given that the surface water body type for the Ošljan stream is not established by the Regulation, its type is determined based on the first surface water body to which the stream discharges to, and that is the Danube River. The Danube is categorised as Type 1 surface water body (Large lowland rivers with fine sediment) therefore the corresponding limit values have been applied to the Ošljan stream.

Table 5-4: Water quality results of the Ošljan stream from 2014 (Source: DPR)

Parameter	Measured Value	Serbian limit value for class II (good ecological status) for Type 1 of surface water bodies	US EPA NRWQC * [µg/l]		EU EQS **** for Inland Surface Water	
			Freshwater CMC ** (acute)	Freshwater CCC *** (chronic)	Annual Average	Maximum allowable Concentr.
Temperature	14.2° C	N.A.	Species dependent		-	-
Electroconductivity	26,000 µS/cm	1000 mS/cm = 1,000,000 µS/cm	-	-	-	-
Suspended solids (TSS)	1,518 mg/l	25 mg/l	-	-	-	-
pH	8.44	6.5 – 8.5	-	6.5 - 9	-	-
BOD_5	4,756 mg/l	5 mg/l	-	-	-	-
COD	5,954 mg/l	10 mg/l	-	-	-	-
Nitrates	<0.04 mg/l	1 mg/l	-	-	-	-
Nitrites	<0.04 mg/l	0.03 mg/l	-	-	-	-
Total P	10.8 mg/l	0.2 mg/l	-	-	-	-
Ammonium ion	1,490 mg/l	0.3 mg/l	-	-	-	-
Chlorides	3,425 mg/l	100 mg/l	860 mg/l	230 mg/l	-	-
Sulphates	75.9 mg/l	100 mg/l	-	-	-	-
Phosphates	<0.08 mg/l	0.1 mg/l	-	-	-	-
Cu	<50 µg/l	5 µg/l (H=10) 22 µg/l (H=50) 40 µg/l (H=100) 112 µg/l (H=300) *****	-	-	-	-
Total Cr	1,360 µg/l	50 µg/l	-	-	-	-
Cr 3+	310 µg/l	-	86 µg/l (H=10) 323 µg/l (H=50) 570 µg/l (H=100) 1,401 µg/l (H=300)	11 µg/l (H=10) 42 µg/l (H=50) 74 µg/l (H=100) 182 µg/l (H=300)	-	-

Parameter	Measured Value	Serbian limit value for class II (good ecological status) for Type 1 of surface water bodies	US EPA NRWQC * [µg/l]		EU EQS **** for Inland Surface Water	
			Freshwater CMC ** (acute)	Freshwater CCC *** (chronic)	Annual Average	Maximum allowable Concentr.
			*****	*****		
Cr 6+	1,050 µg/l	-	16 µg/l	11 µg/l	-	-
Ni	180 µg/l	20 µg/l (average annual concentration)	67 µg/l (H=10) 260 µg/l (H=50) 468 µg/l (H=100) 1186 µg/l (H=300) *****	7.4 µg/l (H=10) 29 µg/l (H=50) 52 µg/l (H=100) 132 µg/l (H=300) *****	4 µg/l	8,6 µg/l
Zn	60 µg/l	300 µg/l (H=10) 700 µg/l (H=50) 1000 µg/l (H=100) 2000 µg/l (T=500) *****	120 µg/l	200 µg/l	-	-
Cd	<5 µg/l	(average annual concentration) ≤0,08 µg/l (H<40) 0,08 µg/l (H<50) 0,09 µg/l (H<100) 0,15 µg/l (H<200) 0,25 µg/l (H>200) *****	0.8 µg/l (H=40) 1 µg/l (H=50) 2 µg/l (H=100) 4 µg/l (H=200) *****	0.13 µg/l (H=40) 0.15 µg/l (H=50) 0.25 µg/l (H=100) 0.4 µg/l (H=200) *****	< 0.08 µg/l (H<40) 0.08 µg/l (H=40-50) 0.09 µg/l (H=50-100) 0.15 µg/l (H=100-200) 0.25 µg/l (H>200) *****	<0.45 µg/l (H<40) 0.45 µg/l (H=40-50) 0.6 µg/l (H=50-100) 0.9 µg/l (H=100-200) 1.5 µg/l (H>200) *****
Pb	<50 µg/l	7.2 µg/l (average annual concentration)	5 µg/l (H=10) 30 µg/l (H=50) 65 µg/l (H=100) 209 µg/l (H=300) *****	0.2 µg/l (H=10) 1.2 µg/l (H=50) 2.5 µg/l (H=100) 8.1 µg/l (H=300) *****	1.2 µg/l	1.3 µg/l

* NRWQC: National Recommended Water Quality Criteria | The US EPA NRWQC presented in this table are those defined for Aquatic Life
** CMC = Criterion Maximum Concentration
*** CCC = Criterion Continuous Concentration
**** EU EQS = European Union Environmnetal Quality Standards (for Inland Surface Water)
***** H = Hardness

Standards are exceeded

The Ošljan swamp is located about 600 m to the east of the existing Vinča site. It is the main recipient of leachate from the landfill and is a natural sedimentation lagoon. The swamp is separated from the Danube by the 400 m wide belt of a marshy undeveloped land.

The monitoring results of the swamp water quality show a similar level of pollution as the Ošljan stream. The monitoring point where swamp water samples have been periodically taken is presented on the map in Annex D.

The parameters that have been regularly elevated are $BOD_{5,}$ COD, suspended solids, total N, total P. Periodically, elevated values of TOC, total chromium and cyanides have been recorded. The most recent sampling results from 2014 are presented in Table 5-3 (Report on surface water monitoring in the Vinča existing landfill site - “Zaštita na radu i zaštita životne sredine Beograd“, July 2014). These results point to exceedances in addition of ammonium ion and chlorides. The exceedances are not only to the national standards, but also to the acute/maximum and chronic/annual limit values valid in the USA and in the EU.

Table 5-5: Water quality results of the Ošljan swamp from 2014 (Source: DPR)

Parameter	Measured Value	Serbian limit value for class II (good ecological status) for Type 1 of surface water bodies	US EPA NRWQC * [µg/l]		EU EQS **** for Inland Surface Water	
			Freshwater CMC ** (acute)	Freshwater CCC *** (chronic)	Annual Average	Maximum allowable Concentr.
Temperature	13.2° C	N.A.	Species dependent		-	-
Electroconductivity	1,096 µS/cm	1000 mS/cm = 1,000,000 µS/cm	-	-	-	-
Suspended solids (TSS)	211 mg/l	25 mg/l	-	-	-	-
pH	8.37	6.5 – 8.5	-	6.5 - 9	-	-
BOD_5	154 mg/l	5 mg/l	-	-	-	-
COD	192.1 mg/l	10 mg/l	-	-	-	-
Nitrates	2.79 mg/l	1 mg/l	-	-	-	-
Nitrites	<0.04 mg/l	0.03 mg/l	-	-	-	-
Total P	0.31 mg/l	0.2 mg/l	-	-	-	-
Ammonium ion	45.75 mg/l	0.3 mg/l	-	-	-	-
Chlorides	144.7 mg/l	100 mg/l	860 mg/l	230 mg/l	-	-
Sulphates	36.25 mg/l	100 mg/l	-	-	-	-
Phosphates	<0.08 mg/l	0.1 mg/l	-	-	-	-
Cu	<50 µg/l	5 µg/l (H=10) 22 µg/l (H=50) 40 µg/l (H=100) 112 µg/l (H=300) *****	-	-	-	-
Total Cr	<50 µg/l	50 µg/l	-	-	-	-
Cr 3+	<50 µg/l	-	86 µg/l (H=10) 323 µg/l (H=50) 570 µg/l (H=100) 1,401 µg/l (H=300)	11 µg/l (H=10) 42 µg/l (H=50) 74 µg/l (H=100) 182 µg/l (H=300)	-	-

Parameter	Measured Value	Serbian limit value for class II (good ecological status) for Type 1 of surface water bodies	US EPA NRWQC * [µg/l]		EU EQS **** for Inland Surface Water	
			Freshwater CMC ** (acute)	Freshwater CCC *** (chronic)	Annual Average	Maximum allowable Concentr.
			*****	*****		
Cr 6+	<50 µg/l	-	16 µg/l	11 µg/l	-	-
Ni	50 µg/l	20 µg/l (average annual concentration)	67 µg/l (H=10) 260 µg/l (H=50) 468 µg/l (H=100) 1186 µg/l (H=300) *****	7.4 µg/l (H=10) 29 µg/l (H=50) 52 µg/l (H=100) 132 µg/l (H=300) *****	4 µg/l	8,6 µg/l
Zn	0.86 mg/l = 0.00086 µg/l	300 µg/l (H=10) 700 µg/l (H=50) 1000 µg/l (H=100) 2000 µg/l (T=500) *****	120 µg/l	200 µg/l	-	-
Cd	<5 µg/l	(average annual concentration) ≤0,08 µg/l (H<40) 0,08 µg/l (H<50) 0,09 µg/l (H<100) 0,15 µg/l (H<200) 0,25 µg/l (H>200) *****	0.8 µg/l (H=40) 1 µg/l (H=50) 2 µg/l (H=100) 4 µg/l (H=200) *****	0.13 µg/l (H=40) 0.15 µg/l (H=50) 0.25 µg/l (H=100) 0.4 µg/l (H=200) *****	< 0.08 µg/l (H<40) 0.08 µg/l (H=40-50) 0.09 µg/l (H=50-100) 0.15 µg/l (H=100-200) 0.25 µg/l (H>200) *****	<0.45 µg/l (H<40) 0.45 µg/l (H=40-50) 0.6 µg/l (H=50-100) 0.9 µg/l (H=100-200) 1.5 µg/l (H>200) *****
Pb	<50 µg/l	7.2 µg/l (average annual concentration)	5 µg/l (H=10) 30 µg/l (H=50) 65 µg/l (H=100) 209 µg/l (H=300) *****	0.2 µg/l (H=10) 1.2 µg/l (H=50) 2.5 µg/l (H=100) 8.1 µg/l (H=300) *****	1.2 µg/l	1.3 µg/l

* NRWQC: National Recommended Water Quality Criteria | The US EPA NRWQC presented in this table are those defined for Aquatic Life
** CMC = Criterion Maximum Concentration
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**** EU EQS = European Union Environmnetal Quality Standards (for Inland Surface Water)
***** H = Hardness

Standards are exceeded

The Danube River runs about 1.3 km to the east of the existing landfill site. In this area, the Danube has the characteristics of a plain river with a broad meandering valley, a river bed cut into its powerful alluvial deposits, with numerous effluents, alluviums, and islands. The maximum water levels occur in spring, and the minimal ones from autumn to December.

The Danube River water quality close to the Vinča landfill area has been regularly monitored. The PUC has been hiring "Zaštita na radu i zaštita životne sredine Beograd" to do the monitoring. The monitoring results do not indicate the presence of any specific pollutants that could be associated with the landfill. This is not unexpected, given the high volume of the river (the average flow rate in Belgrade is about 5,500 m^3/s), offering large dilution of contaminants.

5.1.7.2 The new Cerak site

Given that the site is located on the upper part of the hill, no surface water bodies are present in the wider site area. Rainfall either infiltrates into the soil or as a surface runoff runs downhill towards the south[28].

5.1.8 Soil

5.1.8.1 The new and the existing Vinča sites

Pedological data for the area indicate black soil as the dominant. The most common is black soil with signs of loess, loamy carbon black soil and brownised carbon black soil[29].

The existing landfill is the main source of potential soil pollution. Given the lack of a vegetation barrier around the existing landfill, dispersion of waste particles to the downwind land is a known issue.

Soil monitoring has not been established at the existing landfill. Limited soil investigations have been undertaken occasionally. The existing landfill documentation refers to the 2010 investigation when microbiological pollutants were detected in soil samples. No information is available on the sampling locations and depths. Another limited investigation has been undertaken in 2014 (as part of the Strategic EIA of the DPR) and included testing of six samples taken from depths between 0.5 m and 5 m around the existing landfill, within the area of the new Vinča site. The location of the sampling points is presented on the map in Annex D. The results are shown in Table 5-6 and compared to the Serbian and Dutch standards (which are equal for the analyzed pollutants).

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[28] Detailed plan of regulation of the Ibarska magistrala road from the Pilota Mihajlovića Street to the motorway roundabout (Off. Journal of Belgrade, No. 33/2010)

[29] Plan of Detailed Regulation of the sanitary landfill Vinča - Urbanistic Institute of Belgrade, 2015

Table 5-6: Results of soil sampling at the new Vinča site area from 2014 (mg/kg dry) (Source: DPR)

Parameter	3-0122	3-0123	3-0124	3-0125	3-0126	3-0127	Serbian soil standards [mg/kg dry]		Dutch soil standards [mg/kg dry]	
							STLV *	SRV **	TV +	IV ++
Nickel	201.22	43.31	62.58	35.63	70.56	41.04	35	210	35	210
Chromium	292.2	170.45	121.75	97.4	146.1	92.4	100	380	100	380
Cadmium	3.77	1.26	1.07	0.94	1.95	2.78	0.8	210	0.8	12
Lead	53.36	24.38	29.73	39.08	38.67	43.34	85	530	85	530
Copper	34.07	28.80	27.11	43.58	24.75	20.80	36	190	36	190
Zinc	79.66	75.87	75.76	71.07	67.72	71.18	140	720	140	720
Arsenic	17.10	14.23	12.86	9.80	10.92	11.56	29	55	29	55
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	10	0.3	10
PAH	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1	40	1	40
Mineral oil	0.51	0.28	1.84	3.98	3.09	0,23	50	5000	50	5000

* STLV = Serbian Target Limit Value (mg/kg) - OJ RS 88/10
** SRV = Serbian Remediation Limit Value (mg/kg) - OJ RS 88/10
+ TV = Dutch List Target Value (mg/kg dry matter)
++ IV = Dutch List Remediation Intervention Values (mg/kg dry matter)

Standards are exceeded

The results indicate the exceeded target limit values of nickel (63 - 201 mg/kg), chromium (146 - 292 mg/kg) and cadmium (1.26 - 3.77 mg/kg) in three samples, but no exceedance of the remediation values. All other parameters values in samples were below the limit. The naturally occurring background levels of heavy metals in soil in the area have not been determined, but it is a known issue that soil in Serbia can have increased background concentrations of metals. ("Report on soil condition in Serbia" published by Serbian Environmental Agency (SEPA) in 2009). The narrow scope of investigation and unknown sampling strategy is rather limiting for interpretation of the results.

5.1.8.2 The new Cerak site

Pedological data for the area indicate brown forest soil (eutric cambisol) as the dominant.

The potential sources of soil pollution in the area are the operations of the district heating plant (primarily unloading and storage of heavy fuel oil) and the road traffic along the state road No. 2 (Ibarska Magistrala).

No data on soil monitoring at the heating plant site are available. The proposed WtE plant site is a vacant land on the made ground. No information on historical pollution of the site is available.

In order to establish the baseline environmental conditions of the site, soil sampling is recommended as part of the ESIA.

5.1.9 Ambient Air Quality

5.1.9.1 The new and existing Vinča sites

Existing Vinča site
Migration of LFG is uncontrolled at the existing Vinča landfill and presents the main source of air pollution. Measurement of methane and carbon dioxide concentrations has been done only in the landfill body once in 2014 (Report on air quality monitoring in the Vinča landfill - *Zaštita na radu i zaštita životne sredine Beograd*, July 2014). The locations of the sampling points are presented on the map in Annex D. The results show that methane concentration in the rehabilitated area was 3% v/v and in the working face was 5.4-6% v/v (5%-15% being the explosion limits). Surface emissions measurements have not been reported.

In 2014, measurement of 24-hour average concentrations of NH_3, H_2S, and total suspended particles (TSP) has been carried out at two monitoring points (Report on air quality monitoring in the Vinča landfill - *Zaštita na radu i zaštita životne sredine Beograd*, July 2014). One monitoring point was adjacent to the landfill entrance road, another was in the maintenance area. The location of the monitoring points is presented on the map in Annex D. The results show that the TSP concentration at the landfill entrance road exceeded the daily limit once (123.2 µg/m^3 over 120 µg/m^3 limit) during that month. Given the location of the sample taking at the access road, it can be assumed that the TSP was caused by incoming and exiting traffic.

Table 5-7 and Table 5-8 show the results for both monitoring points averaged as monthly concentrations. A comparison with the WBG EHS General Guidelines is not undertaken, as these pollutants are not considered in this document.

Table 5-7: Ambient air monitoring results at the monitoring point 1

Pollutant	Average monthly concentration [µg/m^3]	Serbian maximum 24h concentration [µg/m^3] - Decree No. 11/2010, 75/2010, 63/2013
NH_3	< 69.4	100
H_2S	< 50	150
TSP	78.8	120

Table 5-8: Ambient air monitoring results at the monitoring point 2

Pollutant	Average monthly concentration [µg/m^3]	Serbian maximum 24h concentration [µg/m^3] - Decree No. 11/2010, 75/2010, 63/2013
NH_3	2.3	100
H_2S	< 50	150
TSP	70.2	120

The issue of airborne dust is present at the existing landfill and is a source of diffuse air emissions affecting the cultivated land downwind of the site.

5.1.9.2 The new Cerak site

The main stationary source of air pollution at the site is the existing heating plant through its 80 m-high stack. The plant uses natural gas as a primary fuel and heavy fuel oil as an emergency substitute fuel.

The plant monitored the local ambient air quality during the heating season (October to April) in the period 2006-2009 in terms of monthly averages of SO_2, NOx and soot (PM_{10}). The last ambient air quality data available in the public domain are dated from 2007-2009[30]. Measurements covering the period 2006-2009 have been made available to Fichtner by the plant's management.

Based on these data, no exceedance of limit values has been reported for SO_2 and NOx. The average monthly concentrations of SO_2 varied between 10 and 32 µg/m^3, NOx was in the range 11-25 µg/m^3. Concentrations of soot had been reported to occasionally exceed the limit values (2 days in February 2006, 2 days in January 2007 and 2008, 2 days in January 2009, and 1 day in February 2009 - likely a result of heavy fuel oil use). The average monthly concentrations of soot were in the range 18-30 µg/m^3. These results are summarized in Table 5-9. To determine the concentrations of NO_2, an ambient air NO_2/NOx ratio of 0.75 has been applied to the original results based on EPA, 2013. The WBG General EHS Guidelines standards are shown just as an indication.

[30] Annual reports on the state of the environment in Belgrade (2007-2009) - Institute for Public Health of Belgrade

Table 5-9: Average monthly ambient air concentrations of pollutants in the area of the DHP Cerak in the heating period between 2006 and 2009

Pollutant	Average monthly concentrations [μg/m^3]	WBG General EHS guidelines [μg/m^3] *
SO_2	10 - 32	125 (24 hr IT1)
PM_{10}	18 - 30	150 (24 hr IT1)
NOx	11 - 25	N.A.
NO_2	8 - 19	200 (1 hr GL)

* Given the difference between the reported averaging period (monthly) and the averaging period of the guidelines (24 hr and 1 hr), a direct comparison is not possible.

The main source of air emissions from traffic is the two-lane road (Ibarska Magistrala) passing about 80 m east to the site.

5.1.10 Environmental Noise

5.1.10.1 The new and existing Vinča sites

At present there is no noise monitoring data available for the Vinča sites and its surrounding area. Present noise sources are related to the existing landfill operations and work of heavy equipment during waste hauling, unloading, disposal and compacting. Thousands of birds regularly feeding at the landfill present the significant occupational noise source.

No noise sources are located at the new Vinča site, except for the access road to the existing landfill.

The sites are not considered noise-sensitive due to the following reasons: (1) the favourable topographic settings of an isolated valley enabling noise suppression conditions; and (2) the significant distance (about 1.7 km) to the closest noise-sensitive receptors.

5.1.10.2 The new Cerak site

At present there is no noise monitoring data available for the site and its surrounding area. The prevailing local noise environment is typical of an urban area.

No data on noise monitoring are available for the operation of the heating plant where the boiler room is the main noise source during the heating season (October to April).

The closest noise receptors are residential buildings located about 120 m north-east to the site. The regional two-lane road passes between the site and the receptors and its traffic presents the main source of background noise in the area.

The site is considered medium noise-sensitive given the presence of background noise sources and the residential area nearby.

5.1.11 Traffic and Transport

In terms of transport links, the most relevant consideration is the connection of the new Vinča site with the new Cerak site (needed for Options 1 and 2).

The route that seems most preferable is about 30 km long, by-passing the CoB from the south, passing close to the settlements of Kaludjerica, the new Vinča site and Leštane. The route comprises several two-lane roads with the annual average daily traffic (recorded in 2014) in between 8.785 and 15.268, depending on the section. The average daily volume of trucks (light, medium and heavy duty) in 2014 was between 601 and 1009[31].

The schematic view of the route is provided in Figure 5-11. The Figure indicates the 2014 average annual daily traffic - the total volume and the volume of light, medium and heavy duty trucks (in brackets).

Figure 5-11: The main transport connection between the new Vinča site and the new Cerak site and respective traffic volumes

The traffic volume data is not available for three sections: (1) the landfill access road (minor road, not monitored), (2) Beli Potok – Orlovača (not monitored, likely because the motorway construction is planned), (3) Orlovača to the heating plant (considered a city road and not monitored).

[31] Average annual daily traffic in 2014 - Roads of Serbia
http://www.putevi-srbije.rs/index.php/brojanje-saobra%C4%87aja

It should be noted that the section between Bubanj Potok and Orlovača roundabout is part of the major Corridor X Belgrade Bypass Project of construction of four-lane motorway. The project is a long-term and presently only certain sub-sections of the motorway have been constructed. Once the Bypass is completed, nearly one half of the new Vinča site – the new Cerak site route would be carried out on the four-lane motorway.

5.1.12 Preliminary screening of the landfill siting

Based on the information presented in the previous sections, a compliance preliminary assessment of the new landfills siting at the new Vinca site with the WBG criteria for landfill siting[32] is presented (Table 5-10). The WBG landfill siting criteria apply to MSW landfills only. However, the Belgrade WtE project implies other kinds of landfills (landfills for C&D waste, and treatment residues resulting from the WtE plants' operation). This preliminary assessment of landfill siting compliance shall be interpreted considering this fact. The PPP contractor will be obliged to perform the full scale landfill siting assessment within the alternative analyses in the supplemental ESIA in accordance with Serbian, EU requirements and applicable requirements of the WBG EHS guidelines for Waste Management Facilities.

Table 5-10: Comparison of the proposed new landfill site with the WBG siting criteria

IFC Landfill Siting Criteria	Compliance assessment
Proximity to potentially incompatible land uses	
Residential development should be typically further than 250 meters from the perimeter of the proposed landfill cell development	Compliant. The closest house to the Vinca sites (apart from those of the informal settlers) is located 800 meters to the north-east of the perimeter of the new Vinča site.
Visual impacts should be minimized by evaluating locational alternatives	Compliant. The location alternatives have not been evaluated, given that the proposed site has topografically favourable location in respect to minimisation of visual impacts (which was one of the criteria used to select this site in the 1970s). The site is remote and no visual receptors are present.
Siting should be further than 3 km of a turbojet airport and 1.6 km of a piston-type airport, or as permitted by the aviation authority	Compliant. There is no airport in the radius of 3 km.

[32] WBG EHS Guidelines for Waste Management Facilities, 2007

IFC Landfill Siting Criteria	**Compliance assessment**
Proximity and use of groundwater and surface water resources	
Private or public drinking, irrigation, or livestock water supply wells located downgradient of the landfill boundaries should be further than 500 meters from the site perimeter, unless alternative water supply sources are readily and economically available and their development is acceptable to regulatory authorities and local communities	Compliant. No water supply wells are present 500 m downgradient from the site perimeter.
Areas within the landfill boundaries should be located outside of the 10-year groundwater recharge area for existing or pending water supply development.	Compliant. There is no existing or pending water supply development in the wider site area.
Perennial streams should not be located within 300 meters downgradient of the proposed landfill cell development, unless diversion, culverting or channeling is economically and environmentally feasible to protect the stream from potential contamination.	Compliant. There is a local stream running in the valley (the Ošljan stream). This will be diverted when constructing the new landfill cells and potential leachate will be treated. As part of the closure of the existing landfill and installation of the leachate collection and treatment system (for both the closed landfill and the new one), the stream will be protected from further contamination.
Site geology and hydrogeology	
Landfills should be located in gently sloped topography, amenable to development using the cell (bund) method, with slopes which minimize the need for earthmoving to obtain the correct leachate drainage slope of about 2%.	Compliant. The proposed new landfill site is located in a gently sloped topography (toward the Danube) providing favourable conditions for leachate drainage.
Groundwater's seasonally high table level (i.e. 10 year high) should be at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development	Compliant. Groundwater seasonally high table level is not considered a concern at the proposed landfill site.
Suitable soil cover material should be available on-site to meet the needs for intermediate (minimum of 30 cm depth) and final cover (minimum of 60 cm depth), as well as bund construction (for the cell method of landfill operation). Preferably, the site would have adequate soil to also meet required cover needs (usually a minimum of 15 cm depth of soil)	Compliant. For the new landfill for treatment residues dajly cover is not required. The final cover is proposed to be made with C&S Waste (excavated soil or broken rubble) and treated bottom ash.

IFC Landfill Siting Criteria	Compliance assessment
Potential threats from natural hazards such as floods, landslides, and earthquakes	
Landfills should be sited outside of a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, amenable to an economic design which would eliminate the potential for washout	Compliant. The new Vinča site is not considered prone to flooding, given that the site is more than 40 m elevated compared to the Danube River.
There should be no significant seismic risk within the region of the landfill which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures; otherwise, side slopes should be adjusted accordingly to prevent failure in the event of seismic activity	Partly compliant. The site is located in the area where the EMS-98 macroseismic intensity is VII (damaging earthquake). Seismic risk assessment and geotechnical engineering measures in the design will be needed to prevent failure in the event of seismic activity. Given that close to inert treatment residues will be landfilled, even in case of seismic activity no serious environmental problems are expected
No fault lines or significantly fractured geologic structures should be present within 500 meters of the perimeter of the proposed landfill cell development which would allow unpredictable movement of gas or leachate	Compliant. There are no fault lines or significantly fractured geologic structures in the wider site area. The new landfills for the waste treatment residues and the C&D waste will not produce LFG, and there is little risk of contaminated leachate.
There should be no underlying limestone, carbonate, fissured or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit above sensitive groundwaters.	Compliant. There are no sensitive porous rock formations (limestone, carbonate, fissured rock) underlying the landfill site. No sensitive groundwater bodies are present.

5.2 Biological environment

5.2.1 Protected areas

Based on the information of the Institute for Nature Conservation[33], no sites of international importance (e.g. Ramsar, IBA, proposed Natura 2000) or national natural designated areas are present in the wider surroundings of the new Vinča site and the new Cerak site sites. No presence of notable flora or fauna species has been reported.

[33] http://serbia.gdi.net/zzps/

5.2.2 Flora, fauna and habitats

5.2.2.1 The new and the existing Vinča sites

Flora

Based on the partial biotope survey and mapping in the study area[34] (the wetland along the Danube has not been included), the predominant biotope is cultivated land comprising individual plots with fruits or vegetables. To a minor extent, habitats of shrubs, grasslands and sparse or individual trees are present in the surroundings. The variety of habitats has been reported high, but present in small patches.

The most common tree vegetation is locust, poplar, willow, and ash. Given the features of the dominant carbon black soil, the area has been reported as being favourable for planting a variety of oak species.

Fauna

New Vinča site

Due to the large proportion of arable farmland present, species considered most likely to be present within the study area are small seed eating rodents that are well adapted to cultivated areas, such as species of hamsters, voles, mice and shrews.

Existing Vinča site

Over the years, the existing landfill has become a significant regional habitat for numerous bird species regularly feeding on the landfill material. Given its proximity to the major water body, the Danube River, the existing landfill attracts species flying over considerable distances to feed at the existing site. Labelled birds have been identified being from Croatia, Hungary, Ukraine, etc. The information on the observed species is based on public information sources[35]. The predominant birds are scavengers, i.e. various species of gulls whose large daily visiting populations have been reported being in the range of 35.000 to 43.000 (Figure 5-12).

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[34] Strategic Environmental Impact Assessment of the Plan of Detailed Regulation of the sanitary landfill Vinča - Urbanistic Institute of Belgrade, 2015

[35] Belgrade for Beginners – RTV Studio B, 17.02.2015. https://youtu.be/A3bBw_42aws?list=PLXQrwQ9iEAP0RwIVnbc3eDVatqxY1v4TJ

Figure 5-12: Birds at the existing landfill site (source: "24sata" daily newspaper, photo by Aleksandar Stanković)

In addition to gulls, some raptor species (Common Buzzard, White-tailed Eagle, Common Kestrel) have also been observed, most likely flying from their habitats in the north (the South Banat region) across the Danube. Some species (e.g. stork) have been observed wintering at the site. The Ošljan swamp is a wetland habitat attracting the waterflow. Although the landfill has become an unofficial important bird monitoring site for ornithologists, such large bird populations present an occupational and public health concern. There are no airports in the 3 km-radius so the aircraft hazard is assumed to be low.

In addition to birds, the existing landfill site is a habitat for different vermin species such as rats and insects.

With the closure and covering of the existing landfill and the new interim landfill, the number of birds visiting the site is expected to decrease, as no further raw residual MSW will be landfilled.

5.2.2.2 The new Cerak site

No information on habitat mapping is available for this study area. Being located in an urbanised area with anthropogenic influence, the area generally appears to have a low conservation value. Only sparse or individual trees and shrubs are present. Given the semi-natural habitats, the species considered most likely to be present are small mammals (seed eating rodents).

5.2.3 Landscape

5.2.3.1 The new and the existing Vinča sites

The new Vinča site and its surroundings are defined topographically as being the upland hilly area gently rising above the Danube River. The area is a mix of agricultural strip-farmed land, greenfield areas of shrubs and sparse trees and the Danube River as a prominent landscape feature. As shown in earlier maps the new Vinča site is comprised of parts of the Ošljan stream up the ridges and partially over the edges of the valley.

The landscape is heavily affected by the presence of the existing landfill. The new landfill will be located in the valley besides the existing landfill, on a lower terrain than the surrounding area and is not visible up until the final section of the access road.

No landscape-sensitive receptors [36] have been identified.

The typical landscape in the landfill valley is shown in Figure 5-13.

Figure 5-13: Landscape of the landfill valley (view from the south)

5.2.3.2 The new Cerak site

The study area is characterized by a gently undulating relief and the urban landscape is degraded by the presence of roads, residential blocks, commercial and industrial facilities (the heating plant). The only natural element in the area is the greenfield mix of grassland and shrubs, north, west and south to the site.

[36] Landscape-sensitive receptor is the one whose visual context of the viewpoint has high value (high scenic quality) such as National Park, recreational space, open area or any space where the viewer is focused on the landscape.

Given the dense vegetation along the main road (Ibarska Magistrala) which has a screening function, the district heating plant site is not visible from the road. It is likely visible from the distance west to the site and from the high-rise buildings in the area.

No landscape-sensitive receptors have been identified.

5.3 Human environment

5.3.1 Geographic Location

5.3.1.1 The new and the existing Vinča sites

The sites are located on the territory of the village Vinča within the Grocka Municipality. The Grocka Municipality is one of 17 municipalities of Belgrade and is a suburban area. The project area is located in the northern part of the Municipality belonging to the Podunavlje macro-region in the valley of the Danube.

The closest settlements to the sites are shown in Figure 5-14 and are the villages of:

- **Veliko Selo** (about 2.6 km to the north of the existing Vinca site perimeter; about 1.7 km to the north-west of the location of the WtE/MBT plants at the new Vinča site).

  It belongs to the Palilula Municipality with an entirely agricultural economy. The settlement is built on the southern slopes of the hill of *Milićevo brdo* (279 masl), in the micro-valley of the short creek of *Vrelski potok*. East and north of the settlement extensive fields and greenhouses produce fruits and especially vegetables for the population of Belgrade. Agricultural lands are very often flooded by the Danube (about 2 kilometres away from Veliko Selo). This area is called *Velikoselski Rit* (the *Veliko Selo marsh*) and by the general urban plan for the development of Belgrade by the year 2021, it is projected as the future new city port.

- **Vinča** (about 2 km to the south-east of the existing Vinča site perimeter and of the location of the WtE/MBT plants at the new Vinča site).

  The Vinča village is statistically classified as a rural settlement (village). Originally it was situated 3 km from the road of *Smederevski put*, but as the settlement expanded it now stretches from the Danube to the *Smederevski put*, making urban connections to the surrounding settlements of Ritopek, Boleč, Leštane and Kaludjerica, thus establishing one continuous built-up area with Belgrade itself.

- **Kaludjerica** (about 2.6 km to the south-west north of the existing Vinča site perimeter; and about 1.6 km to the south-west of the location of the WtE/MBT plants at the new Vinča site).

  On the Tri Tiganja section the road which leads to the Belgrade city dump and the Nuclear Institute Vinča are located. There is a developing commercial zone along the road and the crossroads. This area is traversed by the access road to the landfill and the road connection between the new Vinča site and the new Cerak site.

- **Slanci** (about 2.6 km to the north-west of the existing Vinca site perimeter; about 3.2 km to the north-west of the location of the WtE/MBT plants at the new Vinca site).

  It belongs to the Paliluala Municipality and connects Belgrade with Veliko Selo, the easternmost settlement in the municipality of Palilula. The settlement is officia*lly classified* as a rural area / village, as agriculture dominate *its economy.* In recent years, some industrial facilities (warehouses and concrete plants) are developing between Belgrade (Lešće) and Slanci, along the Slanci road.

Figure 5-14: Overview of the surrounding villages of the Vinča sites

The new Vinča site is largely uncultivated scrubland without residential areas, with the exception of a Roma settlement situated directly at the existing delimitation of the existing landfill (Figure 5-15).

Figure 5-15: New Vinča site with Roma settlement seen from the existing landfill

The closest house to the Vinca sites (apart from those of the informal settlers) is located 800 meters to the north-east of the perimeter of the extension area.

5.3.1.2 The new Cerak site

The new Cerak site is in the neighbourhood of aVidikovac residential area, Čukarica Municipality. The residential area is of a mixed residential type, with both single-family houses (mostly row- or semi-detached houses), multi-family low-rises (ground+2 floors) and a few higher residential buildings (ground+5/6 floors). The nearest buildings next to the new Cerak site (lining Ibarska magistrala) are all apartment blocks (Figure 5-16 and Figure 5-17).

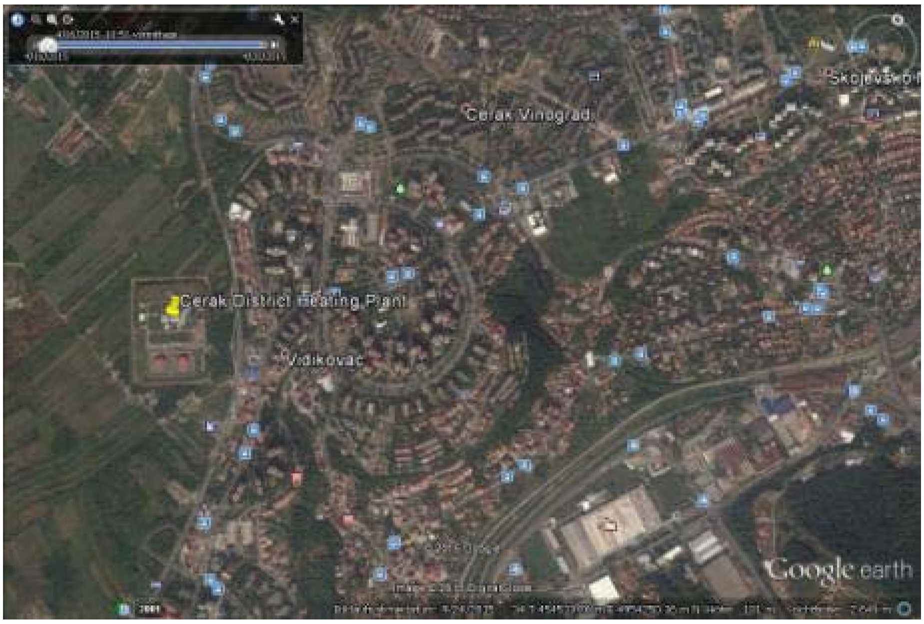

Figure 5-16: Neighborhoods in the surrounding of the new Cerak site


Figure 5-17: Residential area seen from the new Cerak site

The new Cerak site is located at the western edge of the Vidicovac neighborhood. This neighbourhood was constructed in 1985-1987 and consists of the urban area around the Vinogradski Venac and Cerski Venac streets. It is a natural and architectural western extension of Cerak Vinogradi. It is a residential area, bounded by Jablanička street (and Cerak) to the north, Ibarska magistrala freeway E 763 to the west and Vidikovac neighbourhood (200m distance) in the municipality of Rakovica to the south.

The nearest settlement bordering the access road of the project area is located 120 m south in the Vidicovac neighbourhood.

5.3.2 Population in the vicinity of the project sites

Due to the absence of more precise statistical data the socio-demographic baseline data are used on the municipality level. This does not give a representative picture of the project affected population but the nearest feasible approximation. For more details, a socio-economic survey of the residential population in an area of influence to be defined would need to be undertaken. If any of the options involving the new Cerak site is selected this could be relevant as there is a considerable population (residential area) in the immediate vicinity of the project site.

In the following demographic data available statistics are shown for both project sites. For the new Vinča site, data are largely available on the municipality (Grocka) level, but also sometimes on the village level. For the new Cerak site, data are on the level of the Municipality Čukarica. The new Cerak site is covered under Čukarica urban localities.

5.3.2.1 The new and the existing Vinča sites

The following table shows the population data by sex and localities of Municipality of Grocka (Census 2011).

Table 5-11: Population data by gender and locality (2011), Grocka

Locality	Total Population	Male	Female	Number of Households
Municipality of Grocka	83,907	41,661	42,246	27,134
Urban Localities	8,441	4,134	4,307	2,911
Other Localities	75,466	37,527	37,939	24,223
Relevant localities				
The new Vinča site	6,779	3,390	3,389	2,055
Kaludjerica	26,904	13,410	13,494	8,801
Leštane	10,473	5,198	5,275	3,516

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

5.3.2.2 The new Cerak site

The following table shows the population data by sex and localities of Municipality of Čukarica (Census 2011).

Table 5-12: Population data by sex and locality (2011), Čukarica

Locality	Total Population	Male	Female	Number of Households
Municipality of Čukarica	181,231	85,903	95,328	65,440
Urban Localities	151,919	71,486	80,433	56,680
Other localities	29,312	14,417	14,895	8,760
Relevant localities				
City Proper (incl. in urban localities)	141,551	66,358	75,193	53,214

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

There are no recent population data for the specific settlement of Cerak (which is counted under urban localities / City Proper [37]). The number of residents of the direct area of influence of new Cerak site can therefore not be determined at this stage. It can nevertheless be said that, due to the high density of population and the proximity of multi storey buildings, the number of affected people (through noise, smell, traffic impacts) is likely to be considerable.

A more detailed social survey of the residential blocks in the immediate vicinity (500 m - 1 km radius) of the existing District Heating Plant / the new Cerak site would be recommended for the ESIA study, if the finally selected project will use the new Cerak site.

5.3.2.3 Zvezdara

The following table shows the population data by gender and localities of Municipality of Zvezdara (Census 2011).

Table 5-13: Population data by gender and locality (2011), Zvezdara

Locality	Total Population	Male	Female	Number of Households
Municipality of Zvezdara	151,808	70,614	81,194	58,527
Urban Localities	151,808	70,614	81,194	58,527
Other Localities	-	-	-	-
Relevant localities				
City Proper (incl. in urban Localities)	151,808	70,614	81,194	58,527

Source: Statistical Yearbook Belgrade 2013 (population of 2011 Census)

A part of the connection road (off-motorway) between the new Vinča site and the new Cerak site leads through the Municipality of Zvezdara (locality Kaludjerica). Thus, the urban population of this Municipality is partly affected by the transport between the new Vinča site and the new Cerak site. No statistical data about the residential population at the access roads is available. The residential population shall be included in public information campaigns and stakeholder engagement activties. Other Municipalities that

[37] Statistical Yearbook Belgrade 2013

are traversed by the motorway between the new Vinča site and the new Cerak site are not included in this baseline assessment.

5.3.2.4 Summary of findings

Generally, the data show that both municipalities concerned by the the new Cerak site options have a much larger population and are located in the City Proper, whereas the new Vinča site is a predominantly rural area and the area of Kaludjerica a suburb extension.

5.3.3 Ethnic Minorities

The following table shows the population of Municipalities by Ethnicity / Nationality/Religion.

Table 5-14: Population of municipalities by Ethnicity / Nationality

Nationality/ Ethnicity/Religion	Total	Selected Municipalities		
(selected by highest number in total)*	Belgrade	Grocka	Zvezdara	Čukarica
Total	1,659,440	83,907	151,808	181,231
Serbs	1,505,448	78,979	137,132	166,258
Yugoslavs	8,061	96	695	648
Montenegrins	9,902	256	971	1,137
Croats	7,752	129	486	713
Macedonians	6,970	374	723	794
Romanies / Roma	27,325	855	1,644	3,163
Bosnians	1,596	69	168	137
Goranians	5,328	349	372	352
Muslims	3,996	198	364	242
Non-declared and non-determined	38,971	941	3,878	3,809
Unknown	23,728	1,068	3,801	2,370

* Others (below 2000 people in total) are not represented. Inconsistencies in description between Nationality, Religion and Ethnicity are shown as per official representation.
Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

The population figures show that the main population is Serbian (94% Grocka, 90% Zvezdara, 92% Čukarica). Most other minority nationalities are from neighbouring countries (Ex-Yugoslavia). It is further remarkable that by far the biggest minority group are Roma, even given the fact that a considerable number might not be officially declared as belonging to this group (see also Simpson-Hebert, M., Mitrovic, A., Zajic, G. and Petrovic, M. (2005)).

At this stage and with the available statistical figures, no specification is possible concerning the immediate vicinity (area of influence) of the project. It is however estimated, that Roma constitute the biggest group in the waste management sector (waste pickers/collectors), which is confirmed by the analysis cited above. For the new Vinča site the peopleaffected by resettlement needs are Roma. These also are the majority of the sorting staff active in the sorting plant of Lafarge (also no precise figure available).

5.3.4 Land Use and Agriculture

The following table shows selected data for agricultural production.

Table 5-15: Agricultural production data

Crops / area harvested in ha	Total	Selected Municipalities		
	Belgrade	Grocka	Zvezdara	Čukarica
Maize	52,669	2,566	6	1,132
Potatoes	4413	700	6	107
Carrots	574	101	11	14
Onions	1103	233	11	21
Beans	1192	189	3	17
Peas	979	200	11	13
Cabbage and Kale	1527	240	14	53
Tomatoes	2004	530	13	43
Green Peppers	687	103	11	3

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

5.3.4.1 Vinča

The economic situation in the Municipality of Grocka is characterized by a strong agricultural base; agricultural surface is in average bigger than in other municipalities and agriculture is more diverse, with maize complemented by vegetable and fruit production. In other municipalities maize is the only crop.

5.3.4.2 Cerak

Agriculture in Čukarica Municipality is comparatively less than in other Municipalities in terms of surface and focusing on maize production. However, the yield per ha is the highest compared to other municipalities. Generally, the economy in Cerak is not based on agricultural production, but rather on industry and services.

5.3.5 Employment and economic activities

The following table presents the employment situation (2013) and the number legal entities in sectors of economic activity.

Table 5-16: Employment and Economic Activities

	Total	Selected Municipalities		
	Belgrade	Grocka	Zvezdara	Čukarica
Employees (2013)	563,000	9,000	39,000	32,000
Legal Entities (total)	71,241	1,284	5,738	5,466
- Agriculture, Forest and Fisheries	447	14	26	27
- Mining	98	2	7	7
- Manufacturing	6,398	182	538	609
-Electricity, Gas, Steam, air conditioning supply	343	6	16	14
- Water supply and waste water management	261	9	20	34
- Construction	4,440	118	464	401
-Wholesale and retail trade, repair of motorcycles and cars	20,064	413	1748	1769
-Transportation and Storage	1,847	73	158	158
-Accommodation and Food Service	2,233	35	145	145
- Information and Communication	3,134	31	232	241
- Finance and Insurance Activities	663	6	24	30
- Real Estate	715	3	46	42
-Professional, scientific and technical activities	7979	92	667	581
- Administrative and Support Activities	3065	22	170	187
- Public Administration and Defence, Compulsory Social Security	453	19	20	16
- Education	904	15	59	74
- Human Health and Social Work Activities	285	8	15	21
- Arts, Entertainment and Recreation	3,327	70	248	341
-Other Service Activities	14,585	166	1105	769

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

The municipality of Grocka is the smallest and most rural Municipality of the three reviewed municipalities. Its economy is more rural / village type, with less industry and services. Zvezdara Municipality in comparison has only less than double the population; but offers more than four times employment opportunities. Čukarica has quite similar number of legal entities as Zvezdara, but also less employment.

5.3.5.1 Summary of findings

The areas of influence of the project are characterized by agriculture fields and scrub land in the surrounding of the Vinča landfill, newly urbanized and economic activity zones along the access road from the Vinča landfill to the motorway in Zvezdara Municipality, and residential areas in the vicinity of the new Cerak site.

5.3.6 Poverty and Vulnerability

According to UNDP, absolute poverty in Serbia is still high at 10%. South and Southwest Serbia remain the most economically and socially deprived regions. The most vulnerable are youth, Roma and women (Serbian Statistical Office 2014 / rs.undp.org).

The at-risk-of-poverty or social exclusion rate in 2014 amounts to 43.2%. Moreover, the at-risk-of-poverty rate is 25.6%. These persons are not necessarily poor, but they are at the higher risk of poverty than the others.

Individuals up to 18 years of age are the most exposed to the poverty risk (29.6%), while the lowest at-risk-of-poverty rate is found in the group of persons aged 65 and over (20.7%).

The highest at-risk-of-poverty rates have individuals in households composed of two adults with three or more dependent children, 35.2%.

Table 5-17: At risk of poverty by status in labour market and by gender

Risk of Poverty in % by Status of Employment 2014	Male (18y+)	Female (18y+)	Total (18y+)
Employed Persons	16.4	13.4	15.1
Employees	8.4	8.7	8.6
Self Employed	39.7	36.0	38.4
Non-Employed Persons	38.9	32.2	35.1
Unemployed Persons	51.0	42.5	47.1
Retired persons	13.6	12.7	13.0
Other inactive persons	27.9	33.5	31.7

Source: Release Poverty and Social Inequality in Republic of Serbia, 2015

According to the activity status for persons aged 18 and over, the most exposed to the at-risk-of-poverty are unemployed persons (47.1%), while the lowest at-risk-of-poverty rate have employees working for employers (8.6%). In case of self-employed persons, this rate amounts to 38.4%. The at-risk-of-poverty rate for pensioners is 13.0%. (Release Poverty and Social Inequality in Republic of Serbia, 2015)

Nevertheless it was recorded that the poverty rate of women is lower than the rate of men, especially among unemployed person; one would expect a higher poverty rate among women (higher vulnerability and double/triple burden). However, this does not seem to be the case according to the general data, and specific data on the project affected people or the residential population in the area of influence are not available.

The upcoming census survey for the Roma settlers on the landfill site will provide socio-economic data on poverty for this specific PAP group.

5.3.7 Education Situation

The following table shows the education situation in the selected Municipalities (Census 2011).

Table 5-18: Education level by Municipalities

	Total	Selected Municipalities		
Education Level	Belgrade	Grocka	Zvezdara	Čukarica
Total pop. (age 15 and over)	1,426,710	70,731	130,225	154,854
Without Education	16,751	1,426	833	1,707
Incomplete Primary Education	58,259	4,298	3,297	5,005
Primary Education	198,842	14,939	14,595	19,023
Secondary Education	749,079	41,226	67,865	84,395
High Education	117,317	4,006	12,257	14,004
Higher Education	279,642	4,357	30,575	30,279
Unknown	7,000	479	803	441
Illiterates	12,429	1,012	612	1,313

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

Table 5-19: Education by gender for primary and secondary schools in Belgrade

Education (2013/2014)	Schools	Teachers	Pupils		
(Beginning of Year)	Number	Number	total	male	female
Primary Schools	116	5764	83069	42575	40494
Secondary Schools	87	6124	55815	28702	27113

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

When comparing the education situation in the three selected Municipalities it is apparent that the two Belgrade City areas have a much higher education level (in terms of high and higher education) in relation to the population over 15 years than the more rural Grocka municipality. Also the illiteracy level is higher. The percentage of illiterates is around 0.9% at the overall Belgrade level. On the level of the reviewed municipalities, illiteracy levels are similar to the Belgrade's average. Grocka has 1.4%, Zvezdara 0.4% and Čukarica 0.8% illiteracy ratio (in relation to the total population above 15 years old). Though there are no specific data on the project sites, it can be stated that the illiteracy level among the Roma community and the other social groups involved in waste picking is much higher, as the school attendance is still below average among the poorest, and especially within the Roma community (refer also to Simpson-Hebert, M., Mitrovic, A., Zajic, G. and Petrovic, M. (2005)).

There are slightly less female pupils than male pupils in Belgrade primary and secondary schools. The female pupil ratio in primary schools is 48.7% and with 48.6 % very comparable in Secondary schools. That means that there is not much difference between primary and secondary schools in terms of male/female education in Belgrade.

However, as seen before, women have a higher unemployment rate than men across all education levels as for example among unemployed persons with higher education 66% are women. This can however be related to the reproductive and caring role of women, traditional gender roles among certain sections of the population and not necessarily to work related discrimination.

Access to following education facilities exists in all three municipalities:

Table 5-20: Education institutions in selected municipalities

Type of School	Grocka Municipality	Zvezdara Municipality	Cukarica Municipality
Primary School	7	14	20
Secondary School	1	8	5
Higher Education Institution	-	-	-

Source: http://www.beograd.rs/cms/view.php?id=1524

5.3.8 Health Situation

The following table shows the causes of death cases as an indicator for the health situation in the selected municipalities.

Table 5-21: Health Situation in Selected Municipalities

Health Situation	Total	Selected Municipalities		
	Belgrade	Grocka	Zvezdara	Čukarica
Deaths 2013	20,288	835	1706	1976
Cause of Death:				
Infections and parasitic diseases	86	2	11	13
Neoplasm / Cancer	5,283	201	473	556
Diseases of circulatory system	10,602	451	870	1024
Diseases of respiratory system	912	43	66	84
Diseases of digestive system	770	45	61	75
Pregnancy / Childbirth	1	-	-	1
Deaths by violence	609	31	49	49
Symptoms and other ill-defined conditions	431	10	21	31
Other groups of diseases	1516	47	148	138

Source: Statistical Yearbook Belgrade 2013 (population of 2011 census)

In 2013, more than 75% of deaths have been caused by diseases of the circulatory system and cancer. Violence is a more frequent cause in

Zvezdara than in other Municipalities. In average 2% of all death cases in Belgrade are caused by violence, in Zvezdara as an outskirt settlement this figure is 8% (6% in Čukarica) and 5.6% in Grocka Municipality.

These figures do not show the access to health care infrastructure neither the frequency of hospital visitation, which would make the picture more complete, but do have little link with the project, so that only one indicator was presented here.

5.3.9 Historical and Cultural Sites

5.3.9.1 The new and the existing Vinča sites

The area of the Vinča sites is well known for its historical and cultural value, for its Roman history (e.g. archaeological chance finds of pottery at the site Oslijane), as well as for its Neolithic heritage.

At its peak, the Vinča culture along the banks of the Danube, with major advances in writing and farming, was the most sophisticated Neolithic culture in the world. The first known form of a writing system anywhere in the world was created in the Vinča culture, with about 700 characters and symbols, mainly carved in pottery goods (Wachter, 2013).

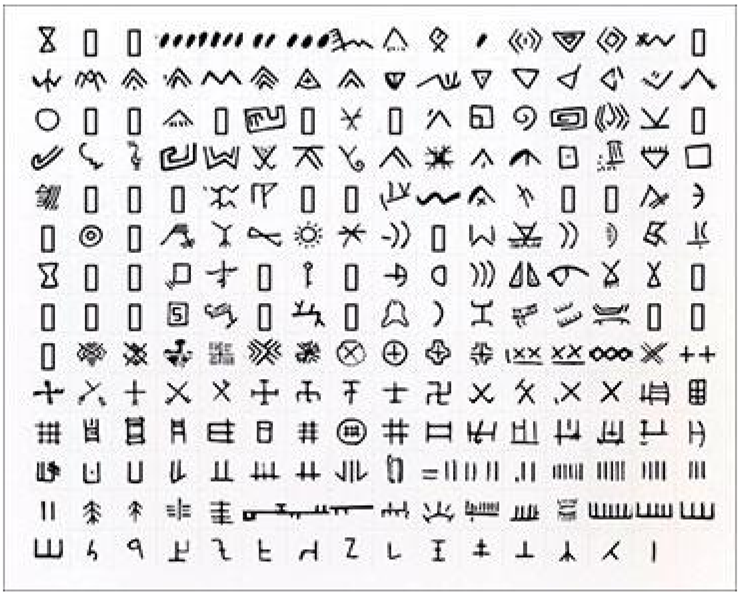

Figure 5-18: Writing system of the Vinca culture

Source: Wachter, 2013

Though the Vinča culture has been largely forgotten today, this highly sophisticated, prehistoric culture found along the banks of the Danube River was once the largest civilization in Europe. The Vinča culture existed long before others appeared in Mesopotamia or Egypt, and many of its innovations – in writing, farming and copper metallurgy – are some of the earliest examples of technological advancements, not just in Europe, but in the world (Wachter, 2013).

In 1908, the Serbian archaeologist Miloje Vasić discovered a prehistoric settlement on Belo Brdo Hill close to the village of Vinča, a site located 14 km downstream of Belgrade on the right bank of the Danube River. This Neolithic archaeological culture was named Vinča culture after the first excavation site. Additional sites were found in Serbia and in neighbouring countries.

It is estimated that this culture began around 7,800 – 7,500 years ago and lasted more than a thousand years, after which most settlements were destroyed and abandoned. The major historical sites associated with this culture were located at Vinča, Lepenski Vir, Belovode and Vršac (see Wachter, 2013).

The archeological site "Osljan" is located within the boundary of the existing landfill (Figure 5-19 and Figure 5-20). The site has status of a "preliminary protected" archeological locality according to the Serbian Law on Cultural Heritage protection, and is not classified as critical cultural heritage following PS 8.

Figure 5-19: Approximate location of a potential archaeological site (as identified in the DPR)

Figure 5-20: Archeological site "Osljan" located within the landfill boundary (marked in red) (SEIA, 2014)

There are certain assumptions that traces of Neolithic and Roman culture likely exist in the area of the Vinča landfill. As of today a protective archeological excavation was not conducted.

5.3.9.2 The new Cerak site

There are no historical and cultural objects at the new Cerak site, as this is located within the area already operated by the district heating company. The new Cerak site would as therefore be covered by the location permit issued for the entire site prior to start of construction (in the 1980s). The location permit includes consent by the National Institute for Protection of Cultural Heritage - Belgrade (*Republicki zavod za zastitu spomenika kulture - Beograd*).

If a new facility would be constructed in the new Cerak site as part of the WTE Project on a newly to be acquired area / extension area, a request for a location permit to be issued for that particular land plot would be needed. This would include submission of the request to the National Institute for Protection of Cultural Heritage - Belgrade. The institute would then issue a declaration regarding the presence or absence of known cultural heritage sites on the location. Obtaining the location permit would be the responsibility of the concessionaire. However, it is planned to construct the new facility on land already covered by the existing location permission.

5.3.10 Situation of informal settlers on the Vinča site

There is an informal settlement of mostly Roma next to the existing landfill site and within the new site, which needs to be relocated/ resettled. The informal settlement is composed of 14 households (66 individuals) who mostly work in the waste sorting process and who live in an informal settlement near to the actual disposal site. The houses are generally self-constructed, makeshift structures.

Figure 5-21: Part of the informal settlement (mostly Roma) at the Vinča landfill site (September 2015)

The heads of households and/or other household members are presently employed with PUC “Cistoca” [38]. In order to prepare resettlement, a socio-economic census was made by the CoB in cooperation with the Office for Social Services of Municipality Grocka. The census information is however limited to few data (Names of HH members, Contract with PUC, Address of Origin, Education, Health Insurance and Health Problems (please refer to Annex B (LARR) for further details).

The City considers the date of the census as Cut off date, but no specific date was publicly declared as confirmed by the CoB. No evidence of a publicly declared cut-off date was provided. Also the data are partly incomplete, socio-economic/ livelihood data and asset inventory are missing.

The CoB was recommended by IFC to proceed in a way consistent with national legislation and IFC PS5 and therefore that before proceeding with resettlement a RAP including also the livelihood restoration component should be prepared in consultation with those affected, publicly disclosed and implemented.

According the CoB’s representative, the CoB is aware (after the experience of Gazela Bridge Project) that forced evictions are a sensitive issue and should be avoided. From discussion with the CoB it was recorded that although at national level they are not obliged to compensate informal settlements they will do so, due to their level of vulnerability. However, the legal basis needs to be created for this still (with the reform of housing law and the Belgrade resettlement framework). The decision about replacement housing is still pending.

[38] According to the census of June 2015, a total of 28 persons of the informal PAP community has contracts with PUC.

According to the CoB, the census survey and collection of socio-economic data will be repeated in the beginning of 2016 (as the data are not complete and not compliant with the requirements of IFC PS 5). After the socio economic census, more socio-economic data are expected to be available. These will be used by the CoB to populate the RAP.

5.3.11 Waste pickers' situation

There are an estimated 9,000 to 16,000 poor people, mostly Roma, scavenging or waste-picking in Belgrade. They collect waste and resell the useful items, particularly cardboard, for their daily income. Belgrade's waste pickers are among the most vulnerable of its residents, they are mainly composed of members of Roma community, as well as poor migrants from other areas of Serbia and Kosovo and other poor residents of the town.

Waste pickers at Vinča site
Until 2015 a substantial number of waste pickers (approximately 150) has been working on the existing Vinča landfill site (Figure 5-22).

Figure 5-22: Waste Pickers at the landfill in Vinča (September 2015)

Waste pickers at the tipping front are not acceptable from a health and safety point of view. Therefore in 2015 this practice began to end. PUC "Gradska Cistoca" did not renew the contracts with the waste picker companies (see below) thus removing 100 out of 150 waste pickers. Only one among the companies (Sava Intl.) has been fully compliant with the contract.

Table 5-22. Former Waste Picking Companies

Nr	Name of Company	Employees
1	Green-Tek	7-19
2	Ecounija	0-11
3	Sargon	2-5
4	Sava International	15-24
5	Escorpie	8-17
6	Eco-Turtle	(stopped operation already before 2015)
	Total	32-76 [39]
	PUC *	40

*Waste Pickers have permission to work on the site and a purchase contract with PUC for recyclables but are not formally employed with PUC.
Source: PUC (2015)

According to PUC, in the end of 2015 an open tender was issued for temporary operation of a sorting plant for selected waste for which none of the former waste picking companies applied. The only applicant complying with the requirements was the company Lafarge, which was subsequently awarded the contract for building and operation of a waste sorting plant (for an interim/ transitional period). The plant is expected to be fully operational in March 2016.

At the time of the site visit in September 2015 approximately 50 waste pickers were still active. The interim waste sorting process with Lafarge that operates the temporary waste sorting facility was about to start during the site visit.

PUC has also direct contracts with individual waste pickers, who work on the landfill. Among these are the informal settlers (14 HH of mostly Roma community) who work and live on the site (please refer to the physical resettlement impact assessment in Section 6).

PUC employs 40 persons on the Vinča landfill. A list of PUC employees including names and performance of quantities of waste collected by individual persons is available and presented in the Annexes to the LARR (Annex B of this report). According to PUC it is attempted to maintain all current employees either for the remaining jobs on the site or in other areas of the City’s waste management system.

As communicated by CoB as well as by PUC, the company Lafarge plans to continue as far as possible employment for all initially contracted waste-pickers, however this will be a short-term and temporary solution, as the continuity of Lafarge’s operation beyond the transition period is not certain.

There is also a possibility to join the sorting company that will operate the waste sorting facility, but it should be taken into account that a waste sorting

[39] The number of waste pickers "employed" by former companies varies, because they did not have fixed contracts and showed up to work on irregular basis. Remuneration was based on performance / quantities of collected materials.

facilty is not included in the project thus the contractor may chose not to employ all or part of the waste pickers operating at the landfill.

5.3.12 Conclusion: socio-economic conditions and social baseline

The socio economic baseline was presented based on available statistical data on municipality level. The municipality boundaries do however not match exactly with the area of influence of the project. For a detailed socio-economic baseline a survey would need to be undertaken in the villages around the new Vinča site and in the housing blocks near the new Cerak site (Vidikovac). These surveys are required in the ESIA additionally to those of the RAP, which are detailed in the LARR (see Annex B).

6. Preliminary assessment of impacts and mitigation framework

The preliminary assessment of E&S impacts and the definition of a mitigation framework consider the different project phases and components as follows:

- Existing landfill operated by **PUC**:
  - Operation of the existing Vinča landfill in the project transition period of 3 years (2016 - end of 2018) (Section 0).
- PPP project measures implemented by the **PPP-contractor**:
  - Rehabilitation and capping of the existing Vinča landfill, including LFG capture and utilization and leachate treatment facilities (different construction measures 2019 - 2023, operation of plants and landfill monitoring until 2046) (Section 6.2);
  - Construction of a new landfill at the new Vinča site (Section 6.3), comprising:
    - the interim landfill (construction 2017/18, operation 2019-2020);
    - the landfill for treatment residues including the plants to maturate and solidify these residues (construction 2019/20, operation 2021-2046);
    - the C&D waste recycling plant and inert waste landfill (construction 2017/18, operation 2019-2046).
  - Construction, Operation and Management (O&M) phases for the three WtE options selected as most suitable at the current project phase (construction starting in 2017; operation 2021-2046); preliminary assessment of the 3 WtE options (Section 6.4).

It shall be noted that the PPP project still is under tendering and the actual measures have not been determined yet. Therefore this preliminary E&S study is based on an assumed of the project setup as described above.

Furthermore it shall be noted, that HSE issues are not addressed in the following subsections 0 to 6.4, but this is addressed in Section 6.5.

6.1 Transitional Period (2016-2018)

This stage does not belong to the PPP project.

As stated above, the CoB targets to improve its waste management disposal practices as fast as possible, and to replace the existing landfill, which lacks the modern technological standards of a sanitary landfill. However, the PPP project launched to realize this target has only reached the tender stage in the first quarter of 2016. It will still take considerable time until the tender process is completed and the contractor designs, permits and constructs an interim landfill according to EU standards. It is expected that the interim landfill will become available by the beginning of 2019. At that time the PPP contractor will take over the MSW treatment and disposal operations from PUC. The PPP contractor will not operate the existing landfill at any time.

The period from today until COD of the interim landfill is called "transitional period" in this study. The transitional period implies the continuation of the operation of the existing Vinča landfill.

Presently in some parts the existing Vinča landfill is highly prone to landslides, which may occur most likely in times of heavy rains. Therefore, it is urgent to take emergency measures to stabilize the most endangered areas of the existing landfill. Subject to the available budget, some very urgent stabilization of the landfill will be undertaken by the CoB in 2016, while the major part of the rehabilitation measures will be left to the PPP Contractor after closure of the landfill operation in 2019. As described under Section 5.1.5, the following stabilization measures are foreseen by CoB:

- Built a dam at the bottom of the main landfill slope directed to the Danube River to prevent further sliding.
- As far as the budget allows, horizontal drainage will be facilitated by installing pipes to support the extraction of leachate trapped inside the landfill body. The leachate will be discharged untreated downstream to the Ošljan stream and swamp.
- As far as the budget allows, repair the existing drainage ditches to avoid storm water entering the landfill body. Drain the storm water around the landfill body downstream towards the Ošljan stream and swamp.

A leachate treatment plant will be built as part of the PPP project during the transition phase, but probably it will only become operational in 2019, together with the interim landfill.

The informal settlers (mostly Roma) living close to the existing landfill are expected to be resettled before the transitional period commences, for what no impact during this period is expected on this community.

6.1.1 Impacts on the physical environment

This section analyses the potential impacts on the physical environment at the existing Vinča site during the transitional period.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.1.1.1 Air quality and odours

No detailed or regular air quality data exist for the existing Vinča site, as described in detail in Section 5.1.9 of this report.

Existing environmental impacts
The following impacts are verified presently at site:

- Dust is detectable at site (sensorial assessment during the site visit);
- Bioaerosol emissions are expected (no measurements are available);
- Odor emissions are detectable at site (sensorial assessment during the site visit). No information is available in respect to odor complaints from the neighborhood. However, given the presence of residential areas downwind of the site (south-eastern wind to Vinca village is predominant in the winter), odor nuisance cannot be excluded.

These impacts will continue to be verified throughout the transitional period.

Mitigation measures
No mitigation measures for air and odour emissions are planned during the transition period by PUC and CoB. Mitigation measures are planned to be realized under the PPP contract starting in 2019 (see Section).

Potential environmental impacts post mitigation
Throughout the transition period the potential impacts to air and odor will not be mitigated or eliminated because no mitigation measures are foreseen by the CoB.

Impact classification
The impact of this stage of the project on air quality and odours is classified as high. Despite being a local impact, it will last for the entire transitional period, as no mitigation measures are planned. Furthermore the impact is considered cumulative, given that air emissions and odours are presently verified at site (although not quantified).

Project transitional period Impacts on air quality and odor	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	High
Mitigation measures applicable?	No
Significance of the residual impacts	High
Specialist study required?	No

6.1.1.2 Climate change

Existing environmental impacts
The following impacts are verified presently at site:

- LFG: The existing data point to concentrations of methane in the working face close to its lower explosion limits. Besides being a greenhouse gas (GHG), methane also implies a safety and explosion risk.

As the landfill exists since the 1970ies, the LFG potential and thus the potential for fugitive LFG emissions (GHG emission) over the next 15 to 20 years is large.

Mitigation measures
No mitigation measures are planned during the transition period by PUC nor by the CoB. Mitigation measures are planned to be realized under the PPP contract starting in 2019 (see Section 2).

Potential environmental impacts post mitigation
Throughout the transition period the potential impacts to climate change will remain the same because no mitigation measures are foreseen.

Impact classification
Although locally emitted, the LFG emissions have a global climate change effect, even if of low magnitude. It is expected that this impact will be felt during the whole transitional period, as no mitigation will be applied. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having low significance.

Project transitional period Impacts on climate change	
Factors	
Scale	International
Duration	Medium term
Magnitude	Low
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	Low
Mitigation measures applicable?	No
Significance of the residual impacts	Low
Specialist study required?	No

6.1.1.3 Surface and groundwater

The Danube River water quality close to the Vinča landfill area has been regularly monitored. The monitoring results do not indicate the presence of any specific pollutants that could be associated with the existing landfill. However, this is not the case for the Ošljan stream and the Ošljan swamp (see Section 5.1.7 for further details).

The investigations conducted in December 2015-January show that groundwater contamination with heavy metals is possible downstream of the landfill (see Section 5.1.4 for further details). The investigations have been undertaken locally, i.e., no regional scale data are available.

Existing environmental impacts

The following impacts are verified presently at site:

- Uncontrolled discharge of leachate from the existing landfill to the swampy area along the Danube River,
- Uncontrolled percolation of leachate contaminating the shallow aquifer of the Ošljan stream and further the Danube alluvial aquifer.
- The storm water diversion channel at the eastern part of the landfill body was damaged by the landslide in 2014 and presently hinders storm water drainage as well as runoff of leachate leaving the landfill body.

Mitigation measures

- No direct measures to control the leachate are foreseen by PUC and CoB. Mitigation measures are planned to be realized under the PPP contract starting in 2019 (see Section 2);
- Within the emergency measures that will be undertaken to protect the landfill from further landslides, also other measures may be taken to:
  - drain leachate out of the landfill body;
  - reinstate storm water diversion and drainage ditches.

To which extent such measures will be implemented is not decided yet by CoB.

Potential environmental impacts post mitigation
The emergency measures may partly mitigate the present impacts as follows:

- Storm water drainage will reduce the quantity of storm water entering the landfill body and thus the quantity of leachate generated in the landfill body.
- Draining leachate out of the landfill body will:
  - increase the leachate quantity discharged through the Ošljan stream, and
  - reduce the quantity of leachate percolating into the ground and groundwater aquifers below the landfill body.

Impact classification
At least locally, it is possible to affirm that the landfill causes a contamination of surface and groundwater. No data suggest that this contamination may be regional. It is expected that the water contamination will last for the entire transitional period. Given the preliminary nature of these conclusions, two specialist studies are suggested to be undertaken during the ESIA stage:

- **Groundwater quality assessment** - detailed subsurface characterisation and development of the conceptual contaminant transport model.
- A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

Project transitional period Impacts on surface and groundwater	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	High
Mitigation measures applicable?	Yes
Significance of the residual impacts	Medium
Specialist study required?	Yes: - Groundwater quality assessment; - Surface water quality assessment

6.1.1.4 Soil

Existing environmental impacts
The existing landfill is the main source of soil pollution and erosion in the area having the following impacts:

- Windblown waste: Given the lack of a vegetation barrier around the landfill, dispersion of MSW pieces to the downwind land is a known issue. Presently the MSW at the tipping area is covered with soil every few days, as practicable.
- Consumption of land due to still evident landslide risk: The landslides which already happened at the landfill body caused an extension of occupied land and thus losses of surrounding soil and erosion effects.

Mitigation measures

- Measures for windblown waste:
  - Emplace and compact the MSW immediately after delivery;
  - Keep the tipping area small;
  - Cover the tipping area daily;
  - Install nets and screens to capture windblown MSW.
- Build a dam at the south-eastern limits of the existing landfill body to stabilize the steep landfill body slopes;
- Reduce water in the landfill:
  - Dewater the landfill body to reduce the sliding risk;
  - Storm water drainage to reduce water entering the landfill body.

Potential environmental impacts post mitigation

Many of the mitigation measures are already applied today. These will imply a substantially reduced landslide risk and consequently less soil and land erosion.

Impact classification

The impacts on soil are confined to the site and the immediate vicinity, but can be of medium magnitude if not mitigated. The measures predicted in the context of the urgent landfill stabilization will help reduce the risk of landslides, and as therefore the further losses and contamination of soil. The daily coverage of waste as suggested may help bring the impacts to a low significance level.

Due to a lack of baseline data about the present soil contamination, a specialist baseline study is suggested to be undertaken as part of the ESIA. The **soil contamination assessment** should include a detailed investigation around the landfill body to assess the potential historical contamination (including the issue of deposition of airborne dust downwind from the landfill).

Project transitional period Impacts on soil	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	Medium
Mitigation measures applicable?	Yes
Significance of the residual impacts	Low
Specialist study required?	Yes: - Soil contamination assessment.

6.1.1.5 Noise and vibrations

At present there is no noise/vibrations monitoring data available for the Vinča landfill site and its surrounding area.

Existing and potential environmental impacts

- Landfill operations
  - Sensorial perception allows classifying the noise directly at site as "uncomfortable".
  - Presence of yelling scavenging birds;
  - The noise is an important source of nuisance for landfill operators.
- The construction of the dam and leachate dewatering (landfill stabilization emergency measures) may cause additional impacts for some months:
  - Earth/waste moving and excavations with associated heavy equipment, circulation of vehicles, and in general the construction operations;
  - Soil/waste compaction during building the dam/reallocation of waste;
  - Certain increase of traffic volume of heavy trucks transporting the rehabilitation material and equipment to the existing landfill;
  - The noise will be an important source of nuisance for the construction workers.

Mitigation measures

- No mitigation measures are foreseen for the landfill operation activities.
- Additionally to already practiced bird control techniques, the following may be considered:
  - gas cannons,
  - visual deterrents,
  - distress calls,
  - physical barriers such as nets,
  - utilization of birds of prey, or

  - flying of kites over the landfill.
- During construction of the dam, potential mitigation measures might be:
  - Appropriate construction management;
  - Turn off engines during breaks;
  - Machines and equipment that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures;
  - Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment such as hearing protection).
  - Train the drivers in noise prevention behavior;
  - Train the construction staff on how to mitigate unnecessary noise emissions.

Potential environmental impacts post mitigation
- No mitigation of impacts for landfill operations;
- The scavenging bird population may be reduced by additional control measures;
- Construction of the dam:
  - The impacts occur temporarily during the construction phase only;
  - Good construction management and worker awareness will prevent excessive noise emissions;
  - The additional noise and vibrations may become negligible if the management measures are applied, especially when in comparison to those caused by the landfill operations.

Relevance to receptors
The importance of the noise impact at the existing Vinča site is reduced due to the significant distance to the closest residential areas (Vinča is the closest village, located about 2 km to the south-east of the center of the exiting landfill). Furthermore, there are direct impacts on landfill and construction workers.

Impact classification
The noise and vibrations impacts will continue to be verified at site during the transitional period of 3 years, and will be increased due to the stabilization emergency measures. These may, however, be mitigated to a low significance level.

The mitigation of the impacts caused by scavenging birds shall be refined during the ESIA stage. This shall be based on a **qualitative baseline assessment of bird fauna** that should indicate the value of the study area for birds. In connection to the next stages of the project (see following sections 6.3 to 6.5), the baseline study will also allow to assess the effects that the landfill closure may have on the gull population, the potential substantial increase of gulls on other neighbouring non-sanitary landfills, and the appropriate timing of rehabilitation works.

Project transitional period Impacts on noise levels and vibrations	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	Medium
Mitigation measures applicable?	Yes
Significance of the residual impacts	Low
Specialist study required?	Yes: - Qualitative assessment of bird fauna

6.1.1.6 Landscape and visual aspects

Potential existing environmental impacts

- Heavy degradation of landscape caused by the presence of the landfill.

Mitigation measures

No mitigation measures are foreseen. These can mainly be performed after closure of the landfill in rehabilitation and capping stage (see Section 6.2).

Potential environmental impacts post mitigation

The landscape will remain heavily degraded by the presence of the existing landfill.

Impact classification

Given the favorable topographic settings of the site and the distance to the receptors, the visual effect of the landfill, which will remain until the transitional phase is over, will continue to be rather limited.

Project transitional period Impacts landscape and visual aspects	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Low
Certainty	Possible
Direction	Negative
Cumulative?	Yes
Significance	Low
Mitigation measures applicable?	No
Significance of the residual impacts	Low
Specialist study required?	No

6.1.2 Impacts on the biological environment

This section analyses the impacts to be delivered on the biological environment at the existing Vinča site during the transitional period.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.1.2.1 Flora

Existing environmental impacts

- Adverse effect on vegetation around the landfill body.

Mitigation measures

- No mitigation measures for the vegetation around the landfill are foreseen. These can be performed after closure of the landfill.

Potential environmental impacts post mitigation

- The devastated vegetation around the landfill body will continue to be adversely affected.

Impact classification

- The impact on vegetation during the transitional period will be negative and of medium magnitude.

Project transitional period Impacts on flora	
Factors	
Scale	Local
Duration	Medium term
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	Yes
Significance	Medium
Mitigation measures applicable?	No
Significance of the residual impacts	Medium
Specialist study required?	No

6.1.2.2 Fauna

Existing and potential environmental impacts

- Over the years, the landfill has become a significant regional habitat for numerous bird species regularly feeding on the landfill material. The landfill has artificially increased the local population of birds, which are assumed to depend, at least to a certain point, of the landfill for survival. As discussed in Section 6.2.1.5 related to noise impacts, birds control techniques are suggested to be implemented at site. These measures will cause a decrease on bird populations. The related impact cannot be accurately determined at this stage.

Mitigation measures

- No mitigation measures are suggested to mitigate potential impacts caused by the bird control measures because the impact cannot be accurately determined at this stage. However, it is expected that such measures are applicable. These shall be defined during the ESIA stage.

Impact classification

The impact that bird reduction measures may have on the populations feeding at site is preliminarily assessed to be negative, as these populations have been artificially increased due to the landfill, and are, at least to a certain point, dependent on it. This impact shall be further assessed during the ESIA stage. This shall be based on a **qualitative baseline assessment of bird fauna** that should indicate the value of the study area for birds. In connection to the subsequent stages of the project (see following sections 6.3 to 6.5), the baseline study will also allow to assess the effects that the landfill closure may have on the gull population, the potential substantial increase of gulls on other neighbouring non-sanitary landfills, the appropriate timing of rehabilitation works, and the best suited bird control measures.

Project transitional period Impacts on fauna	
Factors	
Scale	Regional
Duration	Long term
Magnitude	Medium
Certainty	Possible
Direction	Negative
Cumulative?	No
Significance	Medium
Mitigation measures applicable?	Yes
Significance of the residual impacts	Medium
Specialist study required?	Yes: - Qualitative assessment of bird fauna

6.1.3 Impacts on the human environment

6.1.3.1 Other Community Health and Safety Impacts

Community health and safety (CHS) impacts are directly connected to the impacts in the physical environment related to **air emissions**, **noise**, **odour**, **soil**, **surface and ground water**. These impacts have been discussed in Section 6.1.1 of this report. No increase in traffic volume is likely at this stage, for what no increase in CHS emergency risks related to transport is expected.

Existing other CHS impacts
Other CHS impacts are verified during the project's transitional period, during which the Vinca landfill will continue its operations:

- Visitors and trespassers are subject to the **exposure to physical, chemical and biological hazards** resulting from contact with materials contaminated with human fecal matter, toxic substances (batteries), chemicals, pathogenic organisms, sharps waste (needles), exhaust fumes of waste collection trucks, dust from disposal operations, etc.
- Additional risks arise due to the **absence of hygiene facilities** to at least wash hands with water and soap (to prevent infections and spread of diseases), and change clothes.
- The neighboring community may be exposed to the **spread of diseases** when uncollected garbage and litter reaches them via wind, vermin, scavenging birds and vehicles, while attracting vectors and exposing the community to hazardous substances. The distance to the next villages is, however, an extenuating factor.
- People passing by the area may be subject to injuries or even death caused by a new **waste landslide**.
- The uncontrolled migration of LFG to the surface poses an e**xplosion risk**.

- The adjacent informal settlers (mostly Roma) living close to the landfill are expected to be resettled before the transitional period commences, for what no impact during this period is expected on this community.

Mitigation measures

- Resettlement of the adjacent informal settlers by the CoB;
- The emergency measures to stabilize the landfill to be undertaken by the CoB will avoid new landslides;
- No other mitigation measures for CHS impacts are planned during the transition period by the PUC and the CoB. Mitigation measures are planned to be realized under the PPP contract starting in 2019.

Potential CHS impacts post mitigation

- The impacts on the adjacent informal settlers will be eliminated;
- The risk of new landslides will be greatly reduced;
- The other CHS impacts will remain the same.

Impact classification

The magnitude of the impact of this stage of the project on CHS is classified as very high due to the presence of the informal settlers, the generally poor operational practices verified, and the risk of new landslides and explosions. The resettlement of this community will eliminate any CHS impacts that could be delivered on them. The emergency measures to be undertaken by the CoB will greatly reduce the landslide risk. However, other impacts on visitors and trespassers cannot be excluded. Considering the present situation at site (as above described), these are classified as of high significance. The certainty for such impacts to be delivered is classified as “possible” only, as the site is not a passage area and the probability of trespassing outsiders is not assumed to be high. Any impact delivered on CHS may be permanent (permanent injury or chronic disease), although the project transitional phase will last only three years.

Project transitional period **Other impacts on CHS**	
Factors	
Scale	Local
Duration	Permanent
Magnitude	Very high
Certainty	Possible
Direction	Negative
Cumulative?	No
Significance	High
Mitigation measures applicable?	Yes
Significance of the residual impacts	Medium
Specialist study required?	No

6.2 Closure and rehabilitation of the existing Vinča landfill

Once the interim landfill for residual MSW becomes operational (see Section 6.4), which is expected by the beginning of 2019, the existing Vinča landfill will be closed by PUC and no more MSW will be received and landfilled there. The existing landfill will then be handed to the PPP contractor for rehabilitation, LFG capture and utilization, capping, recultivation and monitoring. The measures at the existing landfill to be carried out by the contractor are not known yet, as these are subject to the tender process and later detailed design. Insofar the following assessment is based on assumptions.

The assessment of impacts of this stage is divided into two time periods:

- the construction phase, where the site will be subject to movement of machinery and vehicles, presence of workers, and earthworks; during this stage, the structures necessary for the rehabilitation measures will be constructed, the shape of the landfill will be finalized and the emergency measures initiated in the previous stage (see Section 6.2) will be continued;
- the monitoring phase, where the PPP Contractor will perform maintenance of the rehabilitation structures and of the landfill shape, will operate the leachate collection and treatment system, and will extract and use the LFG.

In further detail, for this E&S study the following likely measures are assumed:

1. Rehabilitation of the landfill:
    a) Design of the rehabilitation measures to be taken;
    b) Finalize the dam at the eastern slope of the landfill, which is directed to the Danube River;
    c) Relocate already landfilled waste in order to reach a final stable shape of the landfill;
    d) Introduce horizontal drainage pipes to extract the leachate trapped inside the landfill body;
    e) Try to collect as much as possible leachate from these pipes as well as specific leachate drainage ditches around the landfill body;
    f) Pipe the leachate to the leachate treatment plant, to be build in 2017/18 downstream the existing landfill body;
    g) Improve storm water diversion channels and add additional ones, where needed, separated from the leachate drainage ditches;
    h) Deviate surface water wells feeding the Ošlijan stream upstream the landfill body, which presently enter in the existing landfill;
    i) Temporary cover and vegetation of the landfill with soil material and low plants until constructing the final capping.
2. LFG capture:
    a) Carry out LFG pumping trials;
    b) Based on the outcome, design appropriate measures for gas capture;

c) Drill vertical wells for LFG capture and install piping and compressor station with flare;
d) Depending on the gas pumping trials, construct a LFG utilization facility.

3. Capping of the landfill:
   a) Once the landfill settlements have stabilized, after about 3 to 5 years, construct final capping in accordance with Serbian and EU standards.

The leachate treatment plant is planned to be operational by the time of the landfill closure and the leachate will be treated as it becomes captured better and better during the rehabilitation works. Storm waters and surface waters will continue to be diverted and drained to surface water retention basins and then discharged to the Danube without treatment, as these originate from non contaminated sources.

The measures above listed, except for the final capping, are expected for the years 2019 to 2021.

6.2.1 Impacts on the physical environment

This section analyses the impacts which might occur on the physical environment at the existing Vinča site after its closure and during its rehabilitation. The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

Already in 2016, it is expected that the CoB will realize several emergency measures to stabilize the landfill body, as outlined in Section 5.1.5. However, the measures will be limited due to the very restricted budget availablibility The measures are not determined and decided yet. Only during this rehabilitation stage the PPP Contractor will further develop these measures. Therefore, the environmental situation at the closure date of the existing landfill is expected to be practically the same as of today.

It shall be noted that, as the operation of the existing landfill is closed, no further impacts will appear from former, now stopped activities, such as:

- Traffic delivering MSW;
- Landfill operation by compactors and equipment;
- Traffic delivering materials for daily coverage;
- Birds feeding from fresh MSW.

These landfill activities are moved to the interim landfill, whose impacts are analysed in Section 6.3.

6.2.1.1 Air quality and odor

Construction phase

Potential environmental impacts pre-mitigation
Potential impacts are as follows:

- Emissions of dust and bioaerosols due to:
  - Earthworks (leveling, excavations, shaping) involving soil and reallocation of already placed MSW by heavy machinery;
  - Circulation of vehicles and machinery;
- Odor emissions: when reallocating waste to re-shape the landfill body, odor emissions will be released;
- Other emissions: the construction traffic will also contribute for the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.

The impacts occur temporary during the construction phase only. Dust emissions are limited locally, as dust precipitates rapidly.

Mitigation measures
By contract the PPP contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Odor emissions cannot be controlled during reallocation of waste;
- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Water internal and temporary dirt roads whenever resuspension of dust is expected or verified;
- Prohibit any fire on the landfill;
- Train drivers in dust prevention and fuel conservation;
- Train staff in dust prevention measures during construction;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for workers.

Potential environmental impacts post-mitigation

- Odor emissions will occur during reallocation of waste without possibility to control;
- Good construction management and worker awareness will reduce fuel consumption and dust emissions.

Relevance to receptors
Given the relative long distance to the next settlements (Vinča is the closest village, located about 2 km to the south-east of the center of the exiting landfill), these impacts are not expected to affect the residential communities. Thus, impacts affect only the workers. It is expected that by the time of these construction measures, the informal settlers at new Vinča site are no longer living at site.

Monitoring phase

Potential environmental impacts without rehabilitation
Without rehabilitation measures the following potential impacts will continue:
- Windblown dust;
- Odor emissions from degradation of MSW.

Mitigation measures
- Temporary cover with vegetation (grass shrubs) will highly reduce odor and dust emissions;
- Once the landfill settlements have stabilized, after about 3 to 5 years, construct waterproof final capping in accordance with Serbian and EU standards and vegetation (grass, shrubs), which will highly reduce odor and dust emissions;
- Monitoring and maintenance of temporary cover and capping;
- Monitoring and maintenance of vegetation in order to cut trees originating from windblown seeds, which would destroy the capping.
- Train staff in monitoring and maintenance.

Potential environmental impacts post-mitigation
The mitigation measures will minimize windblown dust and prevent odor emissions from the closed existing landfill to negligible amounts.

Relevance to receptors
Given the relative long distance to the next settlements (Vinča is the closest village, located about 2 km to the south-east of the center of the existing landfill), these impacts are not expected to affect the residential communities. Thus impacts affect only the workers.

Impact classification

During construction, the emissions of air pollutants and odors will impact the site locally and temporarily. Furthermore the impact is considered cumulative, given that air emissions and odors are presently verified at site (although not quantified). Mitigation measures will allow reduce the impacts to a low significance level.

During the monitoring stage, and without any rehabilitation measures, the impacts as identified under Section 6.1 would continue to be verified in the long run. However, the rehabilitation measures planned will allow bringing such hypothetical high significance impacts to a negligible level.

Closure and rehabilitation of the Vinča landfill Impacts on air quality and odor		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Negligible
Specialist study required?	No	No

6.2.1.2 Climate change

Construction phase

Potential environmental impacts pre-mitigation

- The construction traffic will contribute for the increase in the emission of greenhouse gases from burning fossil fuel.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Train drivers in fuel conservation.

Potential environmental impacts post-mitigation

Good construction management and worker awareness will reduce fuel consumption and consequently GHG (mostly CO2) emissions.

Monitoring phase

Potential environmental impacts without rehabilitation

The rehabilitation measures are designed to reduce the following presently existing impacts:

- Fugitive LFGs emissions of major quantities of LFG generated;
- Risk of ignition of LFG and explosion;
- Underground migration of LFG to neighboring land.

Mitigation measures

- Carry out LFG pumping trials;
- Based on the outcome of pumping trials design appropriate measures for LFG capture;

- Drill vertical wells for LFG capture;
- Install piping and compressor station with flare;
- Depending on the gas pumping trials, construct a LFG utilization facility with energy generation;
- Temporary cover of landfill body with vegetation (grass shrubs) to reduce possibility of fugitive emissions;
- Once the landfill settlements have stabilized, after about 3 to 5 years, construct waterproof final capping in accordance with Serbian and EU standards and vegetation (grass, shrubs) to prevent LFG escaping other than through gas wells.

Potential environmental impacts post-mitigation

- Due to the above mitigation measures, the fugitive emissions of GHG are expected to be highly reduced and the majority of the LFG will be collected and utilized or flared;
- Risk of ignition and migration of LFG is minimized to negligible amounts;
- Reduction of GHG potential due to conversion of LFG (methane) to CO_2 and utilization of LFG as energy source, replacing other fossil energy.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the LFG emissions during the monitoring stage have a global climate change effect, even if of assumed low magnitude in this case. It is expected that, without the rehabilitation, this would be a long term impact that would be felt for the next 15 to 20 years. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having low significance. After rehabilitation (or post-mitigation), the impact can be reduced to negligible.

Closure and rehabilitation of the Vinča landfill Impacts on climate change		
Factors	**Construction**	**Monitoring**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

6.2.1.3 Surface and groundwater

The Danube River water quality close to the Vinča landfill area has been regularly monitored. The monitoring results do not indicate the presence of any specific pollutants that could be associated with the landfill. However, this is not the case for the Ošljan stream and the Ošljan swamp (see Section 5.1.7 for further details).

The investigations conducted in December 2015-January show that groundwater contamination with heavy metals is possible downstream of the landfill (see Section 5.1.4 for further details). The investigations have been undertaken locally, i.e., no regional scale data are available.

Although the CoB will take some emergency measures to stabilize the existing landfill body (see Section 6.3), the measures will not actually allow mitigating impacts on surface water and groundwater. Subject to the budget available, the measures of CoB will direct some preliminary dewatering of the landfill body and preliminary reinstatement of drainage ditches, thus mitigating only partly the water pressure in the landfill body. Major work remains to be done by the contractor in this rehabilitation stage.

Construction phase

Potential environmental impacts pre-mitigation

The Ošljan stream might be affected during construction by:

- Sediment run-off to the Ošljan stream during the site clearing and earth/waste-moving activities, caused by heavy rains.
- Run-off of pollutants and spillages e.g. lubricants, fuel, etc. from the workshop, fuel station areas and vehicles.
- Run off of septic waste water;
- Potential seepage of tanks.

The impacts occur temporary during the construction phase only.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Ensure adequate construction management;
- Clean and maintain drainage ditches and culvert regularly;
- Ensure adequate slopes of stored excavated material;
- Provide closed or chemical toilets;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks and spills;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;

- Train workers with regard to clean up of leaks and spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will reduce spills and contamination by hazardous substances or septic waters.

Monitoring phase

Potential environmental impacts without rehabilitation
The rehabilitation measures are designed to reduce the following presently existing impacts:
- Generation of highly contaminated leachate:
    - uncontrolled discharge from the landfill to surface water, i.e. contaminating the Ošljan stream and degrading the swamp alluvial belt along the Danube River;
    - percolating into the ground and ground water at the bottom of the landfill body, which is not lined;
- Stormwater enters in the landfill body causing further leachate generation;
- Surface water from upstream the landfill body enters in the landfill body causing further leachate generation.
- The Ošljan stream is interrupted and blocked by the existing landfill body.

Mitigation measures
The target of the mitigation measures is to capture the leachate from the landfill and capsulate and isolate the landfill body, so that no further water enters and thus the landfill body falls dry over time:

- Leachate treatment plant
    - in 2017/18 construct a leachate treatment plant downstream the existing landfill body, able to reach Serbian water treatment standards for discharge to surface water;
- Leachate
    - Introduce horizontal drainage pipes to extract the leachate trapped inside the landfill body;
    - Collect leachate from these pipes as well as leachate drainage ditches around the landfill body;
    - Pipe the leachate to the leachate treatment plant;
    - Discharge treated leachate to the Ošljan stream and swamp.
- Storm water (non contaminated)
    - Design and construct a final stable shape of the landfill body, which eases fast storm water run off;
    - Improve existing storm water diversion ditches and culverts and add additional ones, where needed and drain storm water around the landfill body to the downstream Ošljan stream and swamp;
    - Construct storm water retention basins to control water release to the Ošljan swamp and Danube River.

- Upstream surface water (non contaminated)
  - Capture water of surface water wells upstream the existing landfill and drain it via pipe or ditches around the landfill body;
  - Deviate the part of the Ošlijan stream which is upstream the existing landfill body, and drain it around the landfill body;
- Landfill capping
  - Temporary cover and vegetate landfill (grass, shrubs) with soil material and low plants until constructing the final capping. Plants stabilize the slopes.
  - Once the landfill settlements have stabilized, after about 3 to 5 years, construct waterproof final capping in accordance with Serbian and EU standards and vegetation (grass, shrubs). Plants stabilize the slopes.
- Landfill bottom sealing
  - No measures are possible to seal the landfill at the bottom.
- Monitoring and maintenance
  - Monitoring and maintenance of temporary cover, capping and drainage structures;
  - Monitoring and maintenance of vegetation in order to cut trees caused by windblown seeds, which would destroy the capping;
  - Train staff in monitoring and maintenance.

Potential environmental impacts post-mitigation
The mitigation measures will create the necessary preconditions for a gradual recovery of the affected waters in the upcoming years.

- Cessation of uncontrolled leachate discharge, as leachate will be captured and treated to high standards;
- Treatment of leachate will prevent further degradation of the swamp alluvial belt along the Danube River;
- Non-contaminated storm water and surface waters are deviated around the landfill body;
- Contaminated storm water will no further generate, as the landfill is covered or capped;
- The landfill body is isolated and capsulated, preventing the entrance of new water volumes into the landfill body and thus preventing the generation of new leachate;
- Bottom liner cannot be build at an existing landfill, however, the landfill isolation and prevention of generation new leachate, i.e. the drying out of the landfill body, also halts further leachate percolating to ground water.

In conclusion, the impacts from leachate to surface water and groundwater will be minimized but not avoided. At present, no details are known about these operations (location, required efforts and equipment, timing, etc.). The ESIA shall analyze the impacts in detail.

Impact classification

During construction, any eventual impacts delivered to water and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

At least locally, it is possible to affirm that the landfill causes a contamination of surface and groundwater. No data suggest that this contamination may be regional. It is expected that the rehabilitation measures will contribute to partly reduce the impact of the landfill. The lack of bottom lining is the main reason for the impossibility to completely avoid impacts on water. Given the preliminary nature of these conclusions, two specialist studies are suggested to be undertaken during the ESIA stage:

- **Groundwater quality assessment** - detailed subsurface characterization and development of the conceptual contaminant transport model.
- A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

Closure and rehabilitation of the Vinča landfill Impacts on surface and groundwater		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Medium
Specialist study required?	Yes: - Groundwater quality assessment; - Surface water quality assessment	

6.2.1.4 Soil

Construction phase

No impacts on soil will occur, as the works will be carried out on the existing landfill body.

Monitoring phase

Potential environmental impacts without rehabilitation
Without rehabilitation the existing landfill would remain uncovered, having the following soil impacts:

- Windblown waste to neighboring plots and land;
- Soil erosion at areas already temporarily covered;
- Risk of landslides of the landfill body;
- Soil contamination through leachate percolation.

Mitigation measures

- Capture and treatment of leachate in accordance with Section 1.1.1.1;
- Deviation of surface and storm water to prevent percolation into the landfill body in accordance with Section 1.1.1.1;
- Landfill capping and monitoring and maintenance as set out in Section 1.1.1.1;
- Finalize the construction of a dam at the south-eastern limits of the existing landfill body, started by CoB/PUC in 2016;
- Construct a final stable shape of the landfill body.

Potential environmental impacts post-mitigation

- Capping prevents windblown waste;
- Planting of grasses and shrubs over the closed landfill body will prevent soil erosion;
- Leachate treatment prevents soil contamination;
- Closure of landfill operation and stable shaping prevent risk of landslides.

Impact classification

The impacts on soil during the monitoring stage are confined to the site and the immediate vicinities, but can be of medium magnitude if not mitigated, i.e., if the rehabilitation works would not be undertaken.

Due to a lack of baseline data about the present soil contamination, a specialist baseline study is suggested to be undertaken as part of the ESIA. The **soil contamination assessment** should include a detailed investigation around the landfill body to assess the potential historical contamination (including the issue of deposition of airborne dust downwind from the landfill).

Closure and rehabilitation of the Vinča landfill Impacts on soil		
Factors	**Construction**	**Monitoring**
Scale	N.A.	Local
Duration	N.A.	Long term
Magnitude	N.A.	Medium
Certainty	N.A.	Definite
Direction	N.A.	Negative
Cumulative?	N.A.	Yes
Significance	N.A.	Medium
Mitigation measures applicable?	N.A.	Yes
Significance of the residual impacts	N.A.	Low
Specialist study required?	Yes: - Soil contamination assessment.	

6.2.1.5 Noise and Vibrations

Construction phase

Potential environmental impacts pre-mitigation

Noise/vibration emissions impacts are caused by.

- Earth/waste moving and excavations with associated heavy equipment, circulation of vehicles, and in general the construction operations;
- Waste compaction during reallocation of waste for landfill shaping;
- Certain increase of traffic volume of heavy trucks transporting the rehabilitation material and equipment to the existing landfill.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working conditions in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Monitor noise emissions against noise control targets at the construction site;
- Machines that exceed acceptable noise limits should be equipped with silencers, lagging materials or specially designed acoustic enclosures;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment).
- Train drivers in noise prevention behavior;
- Train construction staff in matters on mitigation of noise emissions.

The impacts occur temporarily during the construction phase only.

Potential environmental impacts post-mitigation

- Good construction management and worker awareness will prevent excessive noise emissions.

Relevance to receptors

The impact will be temporary and is expected of low impact on community receptors given the distance to the closest residential receptors (Vinča is the closest village, located about 2 km to the south-east of the center of the existing landfill). It is expected that, at the time this stage is launched, the informal settlers that neighbor the site have been already resettled. There are direct impacts on landfill and construction workers.

Monitoring phase

After the landfill closure, the noise emissions related to the operation of the old Vinca landfill will disappear. It is expected that the populations of gulls and other birds occupying the existing landfill will be reduced, as no further food can be found on the existing landfill body. The landfill operation and birds will be moved to the interim landfill (see Section 6.4 on this matter).

However, a new source of noise will appear: the LFG capture and utilization plant.

Potential environmental impact pre-mitigation
Potential environmental impacts of the LFG capture and utilization plant are:

- Operation of compressor station;
- Operation of flare, if needed;
- Operation of gas engines.

Mitigation measures
- Capsulation of compressor;
- Equip the gas engine with silencers in order to respect the noise levels allowed by law.

Potential environmental impact post-mitigation
Operation of gas capture and utilization plant at noise levels as allowed by law.

Impact classification
The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

The impacts during operation related to the operation of the LFG capture and utilization plant and the leachte treatment plant will be mitigated by design, i.e., the plant will be constructed under respect of the applicable legal noise limits. This will allow mitigate any noise impacts to a low significance level.

Closure and rehabilitation of the Vinča landfill Impacts on noise and vibrations		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

6.2.1.6 Landscape and Visual aspects

Construction phase

Potential environmental impact pre-mitigation
During construction heavy machinery and equipment will circulate around and within the site. Piles of excavated material, storage areas, and deposits of construction material and wastes will be seen. Clouds of dust originated from the machinery movements and earth activities will cause an additional impact in the area.

Mitigation measures
- As soon as the construction activities end, all the construction equipment shall be removed and all the debris shall be collected from the working area.
- To avoid impacts related to the emissions of dust, apply the measures defined under Section 1.1.1.1.

Potential environmental impact post-mitigation
After application of the mitigation measures, the impacts on landscape and visual aspects will be reduced to a level of negligible significance.

Monitoring phase

Potential environmental impact pre-mitigation
- Unpleasant shape of existing landfill;
- No plants (grass, shrubs) on the landfill - brown field.

Mitigation measures
The construction of the rehabilitation and capping measures will improve the shape of the existing landfill body and thus the visual impact and landscape. The contractor shall install measures to reduce environmental impacts of the existing landfill:

- Design of the rehabilitation measures to be taken;
- Finalize the dam at the eastern slope of the landfill, which is directed to the Danube River;
- Construct final stable shape of the landfill;
- Temporary cover and vegetate (grass, shrubs) landfill with soil material and low plants until constructing the final capping. Plants stabilize the slopes.
- Once the landfill settlements have stabilized, after about 3 to 5 years, construct waterproof final capping in accordance with Serbian and EU standards and vegetation (grass, shrubs). Plants stabilize the slopes.
- Monitoring and maintenance of temporary cover and capping;
- Monitoring and maintenance of vegetation in order to cut windblown trees, which would destroy the capping;
- Train staff in monitoring the rehabilitated existing landfill body.

Potential environmental impact post-mitigation
The rehabilitation of the existing landfill will have a positive effect in the landscape of the area.

- Shaping the landfill body will incorporate it better in the landscape;
- Planting of grass and shrubs over the closed landfill body will add a new feature to the landscape and reduce any negative visual effects.

Impact classification
Given the favorable topographic settings of the site, the distance to the receptors, the temporary nature of the construction works and the mitigation framework, the visual effect of the construction works and machinery will be negligible.

The possible visual effects of the existing landfill in case no rehabilitation would be undertaken would continue to be of low significance, given the favourable topographic settings of the site and the distance to the receptors. With the rehabilitation works, any possible negative effect would be reduced to negligible.

Closure and rehabilitation of the Vinča landfill Impacts on landscape and visual aspects		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

6.2.2 Impacts on the biological environment

This section analyses the impacts to be delivered on the biological environment at the existing Vinča site during its rehabilitation and closure.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.2.2.1 Flora, fauna and habitats

Construction phase
There is no impact on flora, fauna and habitats during the rehabilitation stage, as the existing landfill is brownland and practically no clearance of trees and shrubs is necessary.

Monitoring phase
The closure of the existing landfill will halt the exposure of biodegradable waste, which attracts the scavenger birds in search for food. That will be beneficial in respect to reducing the public and occupational health hazards due to potential transmission of pathogens. However, at closure of the landfill operation at the existing landfill the landfill operation and birds will be moved to the interim landfill (see Section 6.4 on this matter). This implies that no impact to the birds will be verified in direct connection to this project stage.

Potential environmental impact pre-mitigation
None.

Mitigation measures
None.

Impact classification
No impacts are expected from construction and monitoring of this phase of the project.

Closure and rehabilitation of the Vinča landfill Impacts on flora, fauna and habitats		
Factors	**Construction**	**Monitoring**
Scale	N.A.	N.A.
Duration	N.A.	N.A.
Magnitude	N.A.	N.A.
Certainty	N.A.	N.A.
Direction	N.A.	N.A.
Cumulative?	N.A.	N.A.
Significance	N.A.	N.A.
Mitigation measures applicable?	N.A.	N.A.
Significance of the residual impacts	N.A.	N.A.
Specialist study required?	N.A.	N.A.

6.2.3 Impacts on the human environment

6.2.3.1 Other Community Health and Safety Impacts

Community health and safety (CHS) impacts are directly connected to the impacts in the physical environment related to **air emissions**, **noise**, **odour**, **soil**, **surface and ground water**. These impacts have been discussed in Section 6.2.1 of this report.

Construction phase

Potential CHS impacts pre-mitigation
The construction activities at this stage may increase the community exposure to (other) health, safety and security risks, such as:

- exposure to hazardous materials during construction and transport;
- Increase of traffic volume of heavy trucks to the landfill with related risks for accidents and spills;
- accidents within the construction site (falls on open trenches, injuries or dead caused by loose heavy material, etc.);
- misbehavior of security forces (abuses of power, disrespect for the local inhabitants, etc.).

Mitigation measures

- fence the construction site;
- place entrance prohibition and other warning signs at the fence;
- securely store the unused material (especially rolling material such as pipes and other tubes);
- disclose relevant project-related information to enable the stakeholders to understand these risks and potential impacts, as well as its proposed prevention, mitigation and emergency response measures;
- prevent or minimize the potential for community exposure to hazardous materials;
- develop accident prevention/emergency preparedness policy and measures for the site and the transportation routes;
- in case security services are contracted, assure that those providing security are not implicated in past abuses, are adequately trained, have an appropriate conduct towards the citizens and other workers, and act within the applicable law.

Potential CHS impacts post-mitigation
By applying the mitigation measures as above defined, the impacts on CHS can be greatly reduced.

Monitoring phase

Potential CHS impacts without rehabilitation
If no rehabilitation is undertaken at the existing Vinca landfill, the impacts on CHS as described previously in Section 6.1.3.1 could be verified:

- Visitors and trespassers are subject to the **exposure to physical, chemical and biological hazards** resulting from contact with materials contaminated with human fecal matter, toxic substances (batteries), chemicals, pathogenic organisms, sharps waste (needles), exhaust fumes of waste collection trucks, dust from disposal operations, etc.

- Additional risks for visitors arise due to the **absence of hygiene facilities** to at least wash hands with water and soap (to prevent infections and spread of diseases), and change clothes.
- The neighboring community may be exposed to the **spread of diseases** when uncollected garbage and litter reaches them via wind, vermin, scavenging birds and vehicles, while attracting vectors and exposing the community to hazardous substances. The distance to the next villages is, however, an extenuating factor.
- The risk of injuries or even death caused by a new **waste landslide** is considered low at this stage, as the emergency measures undertaken in the previous stage (transitional period) should greatly reduce this risk.
- The uncontrolled migration of LFG to the surface poses an e**xplosion risk**.

Mitigation measures

- Continuation of the stabilization measures initiated in an urgent fashion during the previous project stage (transitional period);
- Temporary cover and vegetation of the landfill with soil material and low plants;
- Carry out LFG management:
  - Carry out LFG pumping trials;
  - Based on the outcome of pumping trials design appropriate measures for LFG capture;
  - Drill vertical wells for LFG capture;
  - Install piping and compressor station with flare;
  - Depending on the gas pumping trials, construct a LFG utilization facility with energy generation.
  - Temporary cover of landfill body with vegetation (grass shrubs) to reduce possibility of fugitive emission.
  - Once the landfill settlements have stabilized, after about 3 to 5 years, construct waterproof final capping in accordance with Serbian and EU standards and vegetation (grass, shrubs) to prevent LFG escaping other than through gas wells.

Potential environmental impacts post-mitigation

- The fugitive emissions of LFG are expected to be highly reduced, which will minimize the risk of explosion;
- Finalization of the stabilization measures will reduce the risks of landslide;
- Temporary and final cover and vegetation of the landfill will reduce exposure to physical, chemical and biological hazards, as well as spread of wind blown waste in the surroundings of the site.

Impact classification

The impacts to CHS are classified as “possible” only due to the relative distance to the next settlements and to the fact that the site is not a passage area. However, if any impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

By restricting the entrance to the site with fences and warning signals, the impacts on the community during construction shall be reduced to a "medium" significance level. The rehabilitation measures shall allow reducing the impacts of the monitoring stage to a "low" significance level.

Closure and rehabilitation of the Vinča landfill Other impacts on CHS		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Low
Specialist study required?	No	No

6.3 New landfill at the new Vinča site

Under the project a new landfill will be constructed at the new Vinča site, which will have areas for different waste types:

1. An interim landfill for MSW, planned to be operational for about 2 years from about beginning of 2019 to the beginning of 2021, i.e. until the treatment facilities (MBT/CHP or incineration plant) will start operation. However, there are discussions to not immediately close down the interim landfill, but to keep it for
   - surplus waste operations and
   - as landfill in emergency and shut downs of the MBT/WtE plants.

   Insofar the interim landfill will get a temporary cover after its 2 years term, while final closure and capping will probably only be carried out at the end of the contract term.
2. A non-hazardous waste landfill for residues from the MBT and CHP plant or incineration plant, whatever is implemented as treatment option. This landfill area also will include treatment (maturation[40], solidification[41]) facilities for bottom ash, fly ash and FGC-residues. MBT residues depend on the MBT process chosen by the PPP contractor and as the MBT concept is not known yet, the residues cannot be specified. Therefore the following mainly concentrates on residues from WtE plants. Envisaged COD is 2021;
3. An inert waste landfill for non-recyclable and non-recoverable C&D waste. Together with this landfill also a crusher for C&D waste targeting recycling and a temporary storage for recyclable C&D waste will be established. Envisaged COD is 2019.

6.3.1 Impacts on the physical environment

This section analyses the impacts to be delivered on the physical environment at the new Vinča site during the construction and operation of the new landfill areas.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.3.1.1 Air quality and odor

Construction phase

Potential environmental impacts pre-mitigation

Potential impacts are as follows:

- Emissions of dust:

[40] Maturation is used for bottom ash, in order to allow chemical processes to fade down before being recovered or landfilled.

[41] Solidifiaction of fly ash and FGC residues targets to reduce the leachability and mobility of the residues and thus reduce the waste classification from hazardous to non-hazardous.

    - Earthworks (leveling and excavations) and vegetation clearing, which may lead to the release of significant amounts of dust into the air.
    - Stationary plant (mixers, crushers, etc)
    - Movement of vehicles and machinery associated to the works and backup diesel generators.
- Other emissions: The construction traffic will also contribute for the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.
- There are no significant odour emissions during construction.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Prohibit burning material at the project site;
- Cover of trucks transporting dusty materials;
- Use silo trucks for pulverous material;
- Water the work fronts whenever suspended dust is visible or during dry periods;
- Cover stockpiled soil and C&D material to prevent windblown soil;
- Water internal dirt and temporary roads;
- Train drivers in dust prevention and fuel conservation;
- Train staff in dust prevention measures during construction;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for workers.

The impacts occur temporarily during the construction phase only. Dust emissions are limited locally, as dust precipitates rapidly

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will reduce fuel consumption and dust emissions.

Relevance to receptors
These impacts are limited in space and time. Given the relative long distance to the next settlements (the first house (isolated) is located 800 m to the north-east of the perimeter of the extension area), these impacts are not expected to affect the residential communities, but only the construction workers.

O&M phase

→Interim Landfill
The operation of the interim sanitary landfill for residual mixed MSW will be undertaken for about 2 years, from beginning of 2019 until the MSW treatment facilities (MBT/CHP or incineration plant) are available. However, the impacts may also occur later, if surplus waste or waste from MBT/WtE shut-downs needs to be landfilled or stored.

Potential environmental impacts pre-mitigation
Potential impacts are:
- Dust and bioaerosols emissions generated during the waste unloading, compaction process of the MSW and placing material for daily and temporary coverage;
- Dust from traffic driving on the landfill roads for delivery and exit;
- Odor occurs from waste vehicles and unloading and compaction of waste and from badly compacted and covered waste due to biodegradation;
- Exhaust emissions: The MSW delivering vehicles and landfill machinery will contribute to the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides, sulfur dioxide and greenhouse gases.
- Windblown waste during periods of strong winds;
- Waste moved by birds and animals.

Dust emissions are limited locally, as dust precipitates rapidly.

Mitigation measures
The contractor has to comply with the applicable law and the contract and thus mitigate any adverse impacts:

- Apply effective compaction routines and daily cover of the MSW to minimize dust, odor and bioaerosols emissions, windblown waste and spreading of waste by birds and other animals;
- Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing;
- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Prohibit burning material at the project site, this may cause explosions due to the existence of LFG;
- Cover of trucks transporting cover materials as well as MSW;
- Water internal dirt and temporary roads, when very dry;
- Use modern and efficient equipment;
- Operate tipping front with small open areas;
- Train drivers in dust prevention and fuel conservation;
- Train landfill staff in dust prevention measures during operation as well as prevention of landfill fires.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce dust and odor emissions, as well as and fuel consumption;
- Windblown waste will be minimized.

<u>Impact classification</u>

During construction, the emissions of air pollutants and odors will impact the site locally and temporarily. The impact is in addition considered cumulative, given that the construction of this landfill will be undertaken while the existing Vinca landfill is still being operated. Mitigation measures will allow reduce the impacts to a low significance level.

During O&M of the interim landfill, the contractor shall apply good landfill operation practices, which will reduce the significance of the impacts on air quality and odours to a low significance level. The interim landfill will be operated during two years, after which any residual impact of its operation will be eliminated. the operation of the landfill will be initiated only after the existing Vinca landfill is closed. However, cumulative effects are expected due to the simultaneous operation of this and the C&D waste landfill.

New landfill at the new Vinča site - Interim landfill Impacts on air quality and odor		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Medium term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

→ Landfill for residues from MBT/WtE facilities

Bottom ash will be maturated before landfilling. Fly ash and FGC residues will be solidified. Subject to the design of the contractor, the residues will either be treated to a level where these need to be placed in an EU non-hazardous waste landfill or to a level with “inert waste” characteristics. The residues do not cause any organic contamination.

Potential environmental impacts pre-mitigation

Treatment residues do not generate LFG. Potential environmental impacts might be caused by:

- Dust emissions:

    - generated during the unloading and treatment of the treatment residues. Fly ash and FGC residues contain high concentrations of hazardous substances.
    - generated from traffic driving on the landfill roads for delivery and exit;
- Exhaust emissions: The delivering vehicles and landfill machinery will contribute to the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.

Dust emissions are limited locally, as dust precipitates rapidly

Mitigation measures

- Immediately solidify fly ash and FGC residues to immobilize their mobility and their hazardousness;
- Control fly ash and FGC residues and prevent exposure to the air while untreated;
- Prevent dust emissions of bottom ash maturation;
- Prevent dust emissions from transportation and treatment of fly ash and FGC residues, i.e. work in enclosed systems;
- Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing;
- Maintain all machinery and equipment in good working conditions in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Cover trucks transporting residues and cover materials as well as MSW, use closed vehicles for transport of fly ash and FGC-residues;
- Water internal dirt and temporary roads, when very dry;
- Use modern and efficient equipment;
- Train drivers in dust prevention and fuel conservation;
- Train landfill staff in dust prevention.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce dust and fuel consumption;
- Dust emissions from fly ash and FGC residues will be controlled.

<u>Impact classification</u>

During construction, the emissions of air pollutants and odors will impact the site locally and temporarily. The impact is not considered cumulative, given that the construction of the treatment residues landfill will be undertaken at a stage when the other landfills will already be operational. Mitigation measures will allow reduce the impacts to a low significance level.

During O&M of the landfill, the contractor shall apply good landfill operation practices, which will reduce the significance of the impacts on air quality and odours to a low significance level. Cumulative effects are expected at this stage, since the operation of the landfill will be undertaken simultaneously with the C&D waste landfill.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on air quality and odor		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	No	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

→ C&D waste landfill

Potential environmental impacts pre-mitigation

- There is no LFG from the treatment and landfill for non-recyclable and non-recoverable construction and demolition waste;
- Dust emissions generated during the unloading and treatment of the C&D waste (crushing);
- Dust from traffic driving on the landfill roads for delivery and exit;
- Dust from stockpiling untreated and treated C&D waste;
- Exhaust emissions: the delivering vehicles and C&D machinery will contribute to the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.

Mitigation measures

- Comply with workers health and safety rules and provide personnel with Personal Protective Equipment & Clothing;
- Maintain all machinery and equipment in good working conditions in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Water internal dirt and temporary roads, when very dry;
- Use modern and efficient equipment;
- Cover stockpiled soil and C&D material to prevent windblown soil;
- Train drivers in dust prevention and fuel conservation;
- Train C&D waste operation staff in dust prevention.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce dust and fuel consumption.

Impact classification

During construction, the emissions of air pollutants and odors will impact the site locally and temporarily. The impact is considered cumulative, given that the construction of the C&D waste landfill will be undertaken at the same time as the construction of the interim landfill for MSW. Mitigation measures will allow reducing the impacts to a low significance level.

During O&M of the landfill, the contractor shall apply good landfill operation practices, which will reduce the significance of the impacts on air quality and odours to a low significance level. Cumulative effects are expected at this stage, since the operation of the landfill will be undertaken simultaneously with the interim landfill for MSW (for the 2 years of its operation) and with the landfill for treatment residues.

New landfill at the new Vinča site - C&D waste landfill Impacts on air quality and odor		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

6.3.1.2 Climate change

Construction phase

Potential environmental impacts pre-mitigation

Potential impacts are as follows:

- Other emissions: The construction traffic will contribute for the increase in the emission of greenhouse gases (carbon dioxide).

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;

- Train drivers in fuel conservation.

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will reduce fuel consumption and consequently CO_2 (GHG) emissions.

O&M phase

→ Interim Landfill
The operation of the interim sanitary landfill for residual mixed MSW will be for about 2 years, from beginning of 2019 until the MSW treatment facilities (MBT/CHP or incineration plant) are available. After that period the Interim Landfill will be interim covered and the LFG collected and send to the LFG treatment at the existing landfill. However, impacts may also occur later, if surplus waste or waste from MBT/WtE shut-downs needs to be landfilled or stored.

Potential environmental impacts pre-mitigation
Potential impacts are:
- LFG: Given the disposal of residual mixed MSW, the landfill will generate LFG. However, LFG generation is a slow process, and the suitable LFG can only be yielded after 3 to 5 years, depending on the conditions;
- Some fugitive emissions of LFG can be expected over the complete 2 years O&M period.
- LFG will continue generating after closure of the interim landfill and will be collected. However, as LFG capture is not perfect, a small part will emit as fugitive emission.
- Exhaust emissions: The MSW delivering vehicles and landfill machinery will contribute to the increase in the emission of greenhouse gases (carbon dioxide).

Mitigation measures
The contractor has to comply with the applicable law and the contract and thus mitigate any adverse impacts.

LFG:
- In order to mitigate LFG emission to the air in the long term, a gas collection system will be designed and constructed and connected later, when LFG quality is suitable, to the LFG utilization system operated for the existing landfill, converting LFG (methane) into CO_2;
- Impermeable landfill capping will be installed about 3 to 5 years after closure, when settlement of landfill has stabilized to increase LFG capture and minimize fugitive LFG emissions;
- Regularly monitor LFG emissions;
- Regularly monitor areas already covered and capped.

Exhaust emissions:
- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;

- Turn off engines during breaks;
- Train drivers in fuel conservation.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce fuel consumption and consequently GHG (CO_2) emissions.
- LFG will continue generating after closure of the interim landfill and will be collected. However, as LFG capture is not perfect, a small part will emit as fugitive emission.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the LFG emissions during the O&M stage of the interim sanitary landfill have a global climate change effect, even if of assumed low magnitude in this case. It is expected that, without the capping, capture and utilization, this would be a long term impact that would be felt for the next 15 to 20 years. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having low significance. After mitigation, the impact can be reduced to negligible.

New landfill at the new Vinča site - Interim landfill Impacts on climate change		
Factors	**Construction**	**Operation**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

→ Landfill for residues from MBT/WtE facilities

Potential environmental impacts pre-mitigation

Bottom ash, fly ash and FGC residues do not generate LFG. Potential environmental impacts might be:

- Exhaust emissions: The delivering vehicles and landfill machinery will contribute to the increase in the emission of greenhouse gases (carbon dioxide).

Mitigation measures

The Contractor is required to apply effective disposal routines to mitigate dust emissions.

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Train drivers in fuel conservation.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce fuel consumption and consequently GHG (CO_2) emissions.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the GHG emissions during the O&M stage of the treatment residues landfill caused by machinery and equipment have a global climate change effect, even if of assumed low magnitude in this case. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having low significance. After mitigation, the impact can be reduced to negligible.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on climate change		
Factors	**Construction**	**O&M**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

→C&D waste landfill

Potential environmental impacts pre-mitigation
Treatment residues do not generate LFG. Potential environmental impacts might be:

- Exhaust emissions: The delivering vehicles and landfill machinery will increase the emission of greenhouse gases (carbon dioxide).

Mitigation measures
The Contractor is required to apply effective disposal routines to mitigate dust emissions.

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Train drivers in fuel conservation.

Potential environmental impacts post-mitigation

- Good landfill operation and worker awareness will reduce fuel consumption and consequently GHG (CO_2) emissions.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the GHG emissions during the O&M stage of the C&D waste landfill caused by machinery and vehicles have a global climate change effect, even if of assumed low magnitude in this case. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having low significance. After mitigation, the impact can be reduced to negligible.

New landfill at the new Vinča site - C&D waste landfill Impacts on climate change		
Factors	**Construction**	**O&M**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

6.3.1.3 Surface water

Construction phase

Potential environmental impacts pre-mitigation

The Ošljan stream might be affected during construction by:

- Sediment run-off to the Ošljan stream during the site clearing, grading and earth-moving activities, caused by heavy rains.
- Run off of septic waste water;
- Run-off of pollutants and spillages e.g. lubricants, fuel etc. from workshop, fuel station areas and vehicles;
- Potential seepage of tanks.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Adequate construction management;
- Provide measures for temporary surface water deviation and drainage to control run-off, caused by rainfall, around the construction site;
- Clean and maintain drainage ditches and culvert regularly;
- Use temporary settlement basins;
- Arrange temporary deviation of the Ošljan stream;
- Ensure adequate slopes of stored excavated material;
- Provide closed or chemical toilettes;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Use double walled tanks;
- Refuel vehicles at destined places;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Potential changes of surface run-off will be permanent in accordance with the design;
- Sediment run-off to the Ošljan stream during the site clearing, grading and earth-moving activities caused by heavy rains will not be fully controllable;
- Septic waste water will be treated;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Tanks will be double walled, preventing uncontrolled seepage.

<u>O&M phase</u>

→ Interim Landfill

Potential environmental impact pre-mitigation

The interim landfill will receive MSW. Potential effects of dumping MSW if the interim landfill would not materialize may be:

- Storm water entering into the landfill and generating leachate;
- Surface water entering into the landfill and generating leachate;
- Potential contamination by organically and heavy metal contaminated leachate discharging from the landfill body to surface water bodies, specifically the Ošljan stream;
- Potential contamination of water recourses by fuel and consumables spillage at fuel station and workshops.

The impacts may also occur later, if surplus waste or waste from MBT/WtE shut-downs needs to be landfilled or stored.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Minimize leachate generation by
  - Deviation of storm and surface water from the landfill body to drain it uncontaminated to the Ošlijan stream;
  - Shape landfill body adequately from the beginning to drain stormwater away from tipping area;
  - Minimization of tipping area, cover the remaining landfill area in such a way that storm water is drained away at the surface;
  - After closure install temporary cover and vegetation (grass, shrubs)
  - After stabilization of settlements construct final capping and vegetation (grass, shrubs) to prevent entrance of storm water.
  - Clean and maintain drainage ditches and culvert regularly;
- Collect and treat leachate by
  - Installing a bottom liner and leachate collection system in accordance with EU standards;
  - Building and operating a leachate and waste water treatment plant which will serve all leachate collected at new and existing Vinča site;
  - Regularly inspect leachate collection system;
- Arrange permanent deviation of the Ošljan stream within the landfill site area;
- Establish wheel washing facilities;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP (leachate treatment plant).

- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Capture and treatment of leachate to Serbian surface water standards will prevent further degradation of the swamp alluvial belt along the Danube River;
- Non-contaminated storm water and surface waters are deviated around the landfill body;
- Contaminated storm water will be added to the leachate;
- After closure the landfill body will be isolated and capsulated, preventing the entrance of new water volumes into the landfill body and thus prevent the generation of new leachate;
- Spillages at workshops and fuel stations are controlled by paved areas.

In conclusion the above implies that the impacts from leachate to surface water will highly be minimized.

Impact classification

During construction, any eventual impacts delivered to surface water will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new landfill according to Serbian and EU norms, it is expected that any potential impacts on surface water will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the interim landfill may become a regional problem. It is thought that the Ošljan stream and swamp dilute any pollution before it reached the Danube and can be spread further downstream.

A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

New landfill at the new Vinča site - Interim landfill Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Surface water quality assessment	

→ **Landfill for residues from MBT/WTE facilities**

Potential environmental impacts pre-mitigation

As stated in Section 6.3.1.1, bottom ash, fly ash and FGC residues will be treated (maturated, solidified) to either reach qualification for EU non-hazardous landfill type or to reach a level with "inert waste" characteristics. The residues do not cause any organic contamination. Without mitigation measures, potential environmental impacts might be:

- Bottom ash, fly ash and FGC residues might be leached out and mobilized to the surface water stream. As these include hazardous substances, this could cause high contamination of the surface water body.
- Potential contamination of water resources by fuel and consumables spillage at fuel station and workshop.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Solidify fly ash and FDC residues before landfilling;
- Maturate, crush and remove ferrous metals from bottom ash before landfilling. Where possible recover the bottom ash as construction material;
- In case of treatment of the treatment residues to non-hazardous waste landfill conditions:
  - Minimize leachate generation by
    - Deviation of storm and surface water from the landfill body to drain it uncontaminated to the Ošlijan stream ;
    - Shape landfill body adequately to drain stormwater away from tipping area;
    - Minimization of tipping area, cover the remaining landfill area in a way, that storm water is drained away at the surface;

        - After closure install impermeable final capping to prevent entrance of storm water.
        - Clean and maintain drainage ditches and culvert regularly;
    - Collect and treat leachate by
        - Installing a bottom liner and leachate collection system in accordance with EU standards;
        - Building and operating a leachate and waste water treatment plant which will serve all leachate collected at new and existing Vinča site;
        - Regularly inspect leachate collection system;
- In case of treatment of residues to inert waste characteristics:
    - no surface water contamination will occur, as inert waste would be landfilled.
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- In case of treatment of the treatment residues to non-hazardous waste landfill conditions:
    - Potential leachate is only contaminated with heavy metals;
    - Capture and treatment of leachate to Serbian surface water standards will prevent further degradation of the swamp alluvial belt along the Danube River;
    - Contaminated storm water will be added to the leachate;
    - Non-contaminated storm water and surface waters are deviated around the landfill body;
    - After closure the landfill body will be isolated and capsulated, preventing the entrance of new water volumes into the landfill body and thus prevent the generation of new leachate;
- In case of treatment of residues to inert waste characteristics:
    - no impacts on surface water will occur.
- Spillages at workshops and fuel stations are controlled by paved areas.

Impact classification

During construction, any eventual impacts delivered to surface water will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

The impacts of the operational phase of the landfill for waste treatment residues depend on the type of treatment to which these will be subject prior to landfilling. The present impact assessment assumes the worst case scenario, i.e. that the residues that will be landfilled have been subject to treatment to non-hazardous waste landfill conditions. This implies a risk of water contamination. Considering the obligation of the PPP Contractor to construct the new landfill according to Serbian and EU norms, it is expected that any potential impacts on surface water will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the landfill may become a regional problem. It is thought that the Ošljan stream and swamp dilute any pollution before it reached the Danube and can be spread further downstream.

A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Surface water quality assessment	

→ C&D waste landfill

Potential environmental impacts pre-mitigation

- There is no impact caused by the C&D on surface water, as C&D waste is inert;
- Potential contamination of water recourses by fuel and consumables spillage at fuel station and workshop as well as at the C&D waste crusher may happen.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles and C&D waste crusher at destined places;

- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Good construction management and worker awareness will reduce spills and contamination by hazardous substances.

Impact classification

During construction, any eventual impacts delivered to surface water will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

The operational phase of the landfill for C&D waste implies a low significance possible risk of water contamination derived from the vehicles' and machinery's usage, maintenance and re-fueling. None of the existing data suggest that any contamination originating in the landfill may become a regional problem. It is thought that the Ošljan stream and swamp dilute any pollution before it reached the Danube and can be spread further downstream.

A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

New landfill at the new Vinča site - C&D waste landfill Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Surface water quality assessment	

6.3.1.4 Soil and groundwater

Construction phase

Potential environmental impacts pre-mitigation

Soil and groundwater sources could be affected by:

- Percolation of septic waste water
- Percolation of pollutants and spillages e.g. lubricants, fuel etc. from workshop, fuel station areas and vehicles.
- Percolation of potential seepage of tanks.
- Earthworks, excavations, and movement of heavy vehicles will have a negative impact on soil and induce ground disturbance.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Adequate construction management;
- Clean and maintain drainage ditches and culvert regularly;
- Provide closed or chemical toilettes;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Refuel vehicles at destined places;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Provide secondary containment and spill response equipment in case of accident;
- Remove contaminated soil in case of accident;
- Use double walled tanks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances;

Potential environmental impacts post-mitigation

- Septic waste water will be treated;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Tanks will be double walled, preventing uncontrolled seepage;
- Good construction practice will minimize negative impact on soil and induce ground disturbance.

O&M phase

→Interim Landfill

Potential environmental impacts pre-mitigation

The interim landfill will receive MSW. Potential effects of dumping MSW if the interim landfill would not materialize may be:

- Storm water entering into the landfill and generate leachate;
- Surface water entering into the landfill and generate leachate;
- Organically and heavy metal contaminated leachate may percolate into the unprotected ground and contaminate soil and ground water aquifers.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Minimize leachate generation by
  - Deviation of storm and surface water from the landfill body to drain it uncontaminated to the Ošlijan stream;
  - Shape landfill body adequately to drain stormwater away from tipping area;
  - Minimization of tipping area, cover the remaining landfill area in a way, that storm water is drained away at the surface;
  - After closure install temporary cover and vegetation (grass, shrubs)
  - After stabilization of settlements construct final capping and vegetation (grass, shrubs) to prevent entrance of storm water.
  - Clean and maintain drainage ditches and culvert regularly;
- Prevent leachate percolation into the ground by collecting and treating leachate through
  - Installing a bottom liner and leachate collection system in accordance with EU standards;
  - Building and operating a leachate and waste water treatment plant which will serve all leachate collected at new and existing Vinča site;
  - Regularly inspect leachate collection system;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Refuel vehicles at destined places;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP (leachate treatment plant).
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Bottom liner will prevent leachate directly percolating into the ground and the landfill body.
- Capture and treatment of leachate to Serbian surface water standards will prevent further degradation of the swamp alluvial belt along the Danube River;
- Contaminated storm water will be added to the leachate;
- Spillages at workshops and fuel stations are controlled by paved areas.

Impact classification

During construction, any eventual impacts delivered to soil and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new interim landfill according to Serbian and EU norms, it is expected that any potential impacts on soil and groundwater will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the landfill may become a regional problem.

A **groundwater quality assessment** shall be undertaken to indicate the migration pathways and to assess the potential impacts of the new landfill on receptors and the need for groundwater remediation.

New landfill at the new Vinča site - Interim landfill Impacts on soil and groundwater		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Groundwater quality assessment	

→ **Landfill for residues from MBT/WtE facilities**

Potential environmental impacts pre-mitigation

As stated in Section 6.3.1.1, bottom ash, fly ash and FGC residues will be treated (maturated, solidified) to either reach qualification for EU non-hazardous landfill type or to reach a level with “inert waste” characteristics. The residues do not cause any organic contamination. Without mitigation measures, potential environmental impacts might be:

- Bottom ash, fly ash and FGC residues might be leached out by storm or surface water and get mobilized. These leachates may percolate into the ground. As these include hazardous substances, this could cause high contamination of the soil and groundwater.
- Potential contamination of water recourses by fuel and consumables spillage at fuel station and workshop.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Solidify fly ash and FDC residues before landfilling;
- Maturate, crush and remove ferrous metals from bottom ash before landfilling. Where possible recover the bottom ash as construction material;
- Treatment of residues to non-hazardous waste landfill conditions:
  - Minimize leachate generation by
    - Deviation of storm and surface water from the landfill body to drain it uncontaminated to the Ošlijan stream ;
    - Shape landfill body adequately to drain stormwater away from tipping area;
    - Minimization of tipping area, cover the remaining landfill area in a way, that storm water is drained away at the surface;
    - After closure install impermeable final capping to prevent entrance of storm water.
    - Clean and maintain drainage ditches and culvert regularly;
  - Collect and treat leachate by
    - Installing a bottom liner and leachate collection system in accordance with EU standards;
    - Building and operating a leachate and waste water treatment plant which will serve all leachate collected at new and existing Vinča site;
    - Regularly inspect leachate collection system;
- Treatment of residues to inert waste characteristics:
  - no soil or groundwater contamination will occur, as inert waste would be landfilled.
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP (leachate treatment plant);
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- In case of treatment of the treatment residues to non-hazardous waste landfill conditions:
  - Potential leachate is only contaminated with heavy metals.
  - Bottom liner will prevent leachate directly percolating into the ground und the landfill body;
  - Contaminated storm water will be added to the leachate;

- In case of treatment of residues to inert waste characteristics:
  - no impacts on soil and groundwater will occur.
- Spillages at workshops and fuel stations are controlled by paved areas.

Impact classification

During construction, any eventual impacts delivered to soil and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

The impacts of the operational phase of the landfill for waste treatment residues depend on the type of treatment to which these will be subject prior to landfilling. The present impact assessment assumes the worst case scenario, i.e., that the residues that will be landfilled have been subject to treatment to non-hazardous waste landfill conditions. This implies a risk of water contamination. Considering the obligation of the PPP Contractor to construct the new landfill according to Serbian and EU norms, it is expected that any potential impacts on surface water will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the landfill operation may become a regional problem.

A **groundwater quality assessment** shall be undertaken to indicate the migration pathways and to assess the potential impacts of the new landfill on receptors and the need for groundwater remediation.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on soil and groundwater		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Groundwater quality assessment	

→ C&D waste landfill

Potential environmental impacts pre-mitigation

- There is no impact cause by C&D on soil and groundwater, as C&D waste is inert;
- Potential contamination of water resources by fuel and consumables spillage at fuel station and workshop as well as at the C&D waste crusher.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles and C&D waste crusher at destined places;
- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP (leachate treatment plant for the other landfills);
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Good construction management and worker awareness will reduce spills and contamination by hazardous substances.

Impact classification

During construction, any eventual impacts delivered to soil and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

The operational phase of the landfill for C&D waste implies a low significance possible risk of water contamination derived from the vehicles' and machinery's usage, maintenance and re-fueling. None of the existing data suggest that any contamination originating in the landfill operation may become a regional problem.

A **groundwater quality assessment** shall be undertaken to indicate the migration pathways and to assess the potential impacts of the new landfill on receptors and the need for groundwater remediation.

New landfill at the new Vinča site - C&D waste landfill Impacts on soil and groundwater		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Groundwater quality assessment	

6.3.1.5 Noise and vibrations

Construction phase

Potential environmental impacts pre-mitigation

- Earthmoving and excavations with associated heavy equipment, circulation of vehicles, and in general the construction operations;
- Soil compaction for bottom lining causes vibrations;
- Traffic delivering material and equipment;
- Noise is an important source of nuisance for the construction workers.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working conditions in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Monitor noise emissions against noise control targets;
- Machines that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment).
- Train drivers in noise prevention behavior;
- Train construction staff on how to mitigate noise emissions.

The impacts occur temporarily during the construction phase only.

Potential environmental impacts post-mitigation

- Good construction management and worker awareness will prevent excessive noise emissions.

O&M phase

→ Interim Landfill

Potential environmental impacts pre-mitigation

The interim landfill replaces the existing landfill. Thus noise impacts are moved from the existing landfill to the interim landfill. Potential impacts are:

- Waste moving and compaction by heavy equipment (compactors) generate noise and vibrations;
- Waste delivery vehicles cause noise while entering, unloading and exiting;
- Noise is important source of nuisance for the landfill workers;
- Presence of yelling scavenging birds.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Turn off engines during breaks;
- Monitor noise emissions against noise control targets;
- Utilize compaction equipment with silencers;
- Machines that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment);
- Train drivers in noise prevention behavior;
- Train landfill staff in matters on how to mitigate unnecessary noise emissions;
- Control the scavenging birds:
  - Keep tipping area small;
  - Daily cover the tipping area;
  - Apply further bird control techniques:
    - gas cannons, visual deterrents, distress calls,
    - physical barriers such as nets,
    - utilization of birds of prey, or
    - flying of kites over the landfill.

Potential environmental impacts post-mitigation

- The impacts occur temporary during the two years operation phase only;
- Good operation management and worker awareness will prevent excessive noise emissions;
- Reduced population of birds will reduce noise impact.

Impact classification
The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the interim landfill, the contractor shall apply good operation landfill practices, which will reduce the significance of the impacts on noise and vibrations to a low significance level. The interim landfill will be operated during two years, after which any residual impact of its operation will be eliminated. The operation of the landfill will be initiated only after the existing Vinča landfill is closed. However, cumulative effects are expected due to the simultaneous operation of this and the C&D waste landfill.

The mitigation of the impacts caused by scavenging birds shall be refined during the ESIA stage. This shall be based on a **qualitative baseline assessment of bird fauna** that should indicate the value of the study area for birds.

New landfill at the new Vinča site - Interim landfill Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Medium term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Qualitative baseline assessment of bird fauna	

→ Landfill for residues from MBT/WtE facilities

Potential environmental impacts pre-mitigation
The landfill for residues together with the MBT/WtE replace the interim landfill from 2021 ongoing, except if surplus waste or waste during shut downs of the MBT/WtE occur. Thus noise impacts are moved from the interim landfill to the treatment facilities for bottm ash (maturation), fly ash and FGC residues (solidification[42]), located close to the landfill for these redidues and the landfill for treatment residues itself. Potential impacts are:

[42] Solidifiaction of fly ash and FGC residues targets to reduce the leachability and mobility of the residues and thus reduce the waste classification from hazardous to non-hazardous.

- Moving of residues and emplacement by heavy equipment on the landfill body;
- Operation and moving of bottom ash at the bottom ash maturation area by wheeled loaders;
- Operation of the solidification plant for fly ash and FGC resideus;
- Transport of treated residues to landfill area;
- Vehicles delivering the residues to the bottom ash and fly ash/FGC residue treatment facility cause noise while maneuvering and unloading;
- Noise is an important source of nuisance for the workers;
- Noise of birds is not expected, as the residues cannot feed the birds.

Mitigation measures
The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Turn off engines during breaks;
- Monitor noise emissions against noise control targets;
- Utilize heavy equipment and vehicles with silencers;
- Equip solidification plant with silencers or specially designed acoustic enclosures to comply with noise regulations;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment).
- Train drivers in noise prevention behavior;
- Train landfill staff on how to mitigate noise emissions.

Potential environmental impacts post-mitigation
- Good operation management and worker awareness will prevent excessive noise emissions;
- Modern equipment and silencers will keep noise at acceptable level.

Impact classification
The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the landfill for treatment residues, the contractor shall apply good landfill operation practices, which will reduce the significance of the impacts on noise and vibrations to a low significance level. Cumulative effects are expected at this stage, since the operation of the landfill will be undertaken simultaneously with the C&D waste landfill.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

→ C&D waste treatment and inert waste landfill

Potential environmental impacts pre-mitigation
Potential noise and vibration impacts are caused by:

- Operation of the C&D waste crusher;
- Moving treated C&D secondary construction material and placement on storage by heavy equipment;
- Loading of trucks taking C&D secondary material away;
- Moving of C&D waste and emplacement on the landfill by heavy equipment;
- Vehicles delivering the C&D waste to the C&D waste facility while maneuvering and unloading.

Noise is an important source of nuisance for the workers.

Mitigation measures
The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Turn off engines during breaks;
- Monitor noise emissions against noise control targets;
- Utilize heavy equipment and vehicles with silencers;
- Equip C&D waste crusher with silencers or specially designed acoustic enclosures;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment).
- Train drivers in noise prevention behavior;
- Train C&D staff in matters on how to mitigate unnecessary noise emissions;

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will prevent excessive noise emissions;
- Modern equipment and silencers will keep noise at acceptable level.

Impact classification

The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the landfill for C&D waste, the contractor shall apply good landfill operation practices, which will reduce the impacts on noise and vibrations to a low significance level. Cumulative effects are expected at this stage, since the operation of the landfill will be undertaken simultaneously with the C&D waste landfill.

New landfill at the new Vinča site C&D waste landfill Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

6.3.1.6 Traffic and transport

Construction phase

Potential environmental impacts pre-mitigation

The construction of the new landfill will require transportation and delivery of materials by trucks along the existing road network. These impacts will be temporary and limited to the period of construction. The following potential impacts are expected:

- Traffic with construction materials to and from the new Vinča site;
- Traffic with construction workers to and from the new Vinča site;
- The existing regional two-lane road (Smederevski put) can be congested in certain periods of the day.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Set up a Traffic Management Plan;
- Determine specific routes for trucks to avoid unexpected traffic;
- Placement of signs and notices along heavily travelled routes;
- Avoid transportation during rush hours;
- Schedule heavy transports to times with little traffic.

Potential environmental impacts post-mitigation
- Good construction management will prevent excessive transportation and interference with the normal traffic.

<u>O&M phase</u>

→ Interim Landfill

Potential environmental impact pre-mitigation
As residual MSW already is delivered to the existing landfill today, no additional impact is expected during this stage.

Mitigation measures
None. Logistics management for the delivery of residual MSW is task of PUC.

<u>Impact classification</u>
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

New landfill at the new Vinča site - Interim landfill Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Short term	N.A.
Magnitude	Medium	N.A.
Certainty	Likely	N.A.
Direction	Negative	N.A.
Cumulative?	No	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

→Landfill for residues from MBT/WtE facility

Potential environmental impacts pre-mitigation
Internally at the new Vinča site, no additional transportation impacts are foreseen.

The routes and impacts from transporting waste within the different treatment options and between Vinča and Cerak new sites and finally the residues to the new landfill site for treatment residues are covered under Section 6.4.1.7of this report.

Impact classification
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilities Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Short term	N.A.
Magnitude	Medium	N.A.
Certainty	Likely	N.A.
Direction	Negative	N.A.
Cumulative?	No	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

→ C&D waste landfill

Potential environmental impacts pre-mitigation
As C&D waste is already delivered to the existing landfill today, no additional impact is expected.

Mitigation measures
None. Logistics management for the delivery of C&D waste is task of PUC and third parties.

Impact classification
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

New landfill at the new Vinča site C&D waste landfill Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Short term	N.A.
Magnitude	Medium	N.A.
Certainty	Likely	N.A.
Direction	Negative	N.A.
Cumulative?	No	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

6.3.1.7 Landscape and visual aspects

Construction phase

During construction heavy machinery and equipment will circulate around and within the site. Piles of excavated material, storage areas, and deposits of construction material and wastes will be seen. Clouds of dust originated from the machinery movements and earth activities will cause an additional impact in the area.

Mitigation measures

- As soon as the construction activities end, all the construction equipment shall be removed and all the debris shall be collected from the working area.
- To avoid impacts related to the emissions of dust, apply the measures defined under Section 1.1.1.1.

Potential environmental impact post-mitigation

After application of the mitigation measures, the impacts on landscape and visual aspects will be reduced to a level of negligible significance.

O&M phase

→ Interim Landfill

Potential environmental impact pre-mitigation

If badly planned, the landfill would have the following potential impact:

- Scattered waste all around the site;
- Easy visibility, if approaching the site;
- Landfill fires, causing plumes located over the site;
- Ugly shape;
- Huge accumulations of birds;
- Wind-blown waste.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Long term design for the complete landfill body including the landfill areas for interim landfill, C&D waste and treatment residues;
- Shape the landfill body to fit into the surrounding environment;
- Organized tipping of the MSW at the determined tipping area;
- Use the topography for partially hiding the landfill body and operations;
- Plant a green belt along the landfill boundaries or the site boundaries as visual screen, composed of grass, shrubs and trees, both deciduous and evergreen;
- Operate landfill according to good international operation practice;
- Emplace residues in accordance with the landfill plan.
- Emplace and compact the MSW immediately after delivery;
- Keep the tipping area small;
- Cover the landfill daily;
- Take measures to control the scavenging birds;
- Prevent landfill fires and in case of occurrence extinguish them rapidly;
- Prohibit using fire or smoking on the landfill;
- Install nets and screens to capture windblown MSW;
- After closure cap and recultivate the landfill with grass and shrubs.

Potential environmental impacts post-mitigation

- Wind blown waste will be reduced;
- Fires will be prevented or immediately extinguished;
- Shaping the landfill body will incorporate it better in the landscape;
- Planting of grass and shrubs over the closed landfill body will add a new feature to the landscape and reduce any negative visual effects;
- The suggested provision of bird control measures may reduce the visits of gulls and other birds.

Impact classification

Given the favorable topographic settings of the site, the distance to the receptors, the temporary nature of the construction works and the mitigation framework, the visual effect of the construction works and machinery will be negligible.

The possible visual effects of the interim landfill during its operation are of low significance, given the favourable topographic settings of the site and the distance to the receptors. When taking into account the listed mitigation measures, any possible negative effect would be reduced to negligible.

New landfill at the new Vinča site - Interim landfill Impacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

→Landfill for residues from MBT/WTE facility

Potential environmental impact pre-mitigation

If badly planned and operated, the treatment residues would just be dumped having the following potential impact:

- Scattered treatment residues all around the site;
- Accumulations of wind blown residues outside the landfill;
- Easy visibility, if approaching the site.

As the residues are inert, they are not prone to fire nor interesting for birds and other animals.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Long term design for the complete landfill body including the landfill areas for interim landfill, C&D waste and treatment residues;
- Shape the landfill body to fit into the surrounding environment;
- Use the topography for partially hiding the landfill body and operations;
- Plant a green belt along the landfill boundaries or the site boundaries as visual screen, composed of grass, shrubs and trees, both deciduous and evergreen;
- Delivery of the treatment residues to the destined treatment facilities for their maturation, crushing and solidification;
- Operate landfill according to good international operation practice;
- Emplace residues in accordance with the landfill plan;
- After closure of landfill parts cap and recultivate the landfill with grass and shrubs.

Potential environmental impacts post-mitigation

- Organized landfill operation to good management practice prevents scattered and windblown waste;

- Shaping the landfill body will incorporate it better in the landscape;
- Planting of grass and shrubs over the closed landfill body will add a new feature to the landscape and reduce any negative visual effects.

Impact classification

Given the favorable topographic settings of the site, the distance to the receptors, the temporary nature of the construction works and the mitigation framework, the visual effect of the construction works and machinery will be negligible.

The possible visual effects of the landfill for treatment waste during its operation are of low significance, given the favourable topographic settings of the site and the distance to the receptors. When taking into account the listed mitigation measures, any possible negative effect would be reduced to negligible.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facilityImpacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

→ C&D waste landfill

Potential environmental impact pre-mitigation

If badly planned and operated, the C&D waste would just be dumped having the following potential impact:

- Scattered C&D waste all around the site;
- Accumulations of wind blown sandy C&D waste outside the landfill;
- Easy visibility, if approaching the site;
- As the residues are inert, they are not prone to fire nor interesting for birds and other animals.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Long term design for the complete landfill body including the landfill areas for interim landfill, C&D waste and treatment residues;
- Shape the landfill body to fit into the surrounding environment;

- Shape the storage area to fit into the surrounding environment;
- Use the topography for partially hiding the landfill body and operations;
- Plant a green belt along the landfill boundaries or the site boundaries as visual screen, composed of grass, shrubs and trees, both deciduous and evergreen;
- Delivery of the C&D waste to the destined treatment facility for its separations, crushing and storage;
- Operate landfill according to good international operation practice;
- Emplace residues in accordance with the landfill plan;
- After closure of landfill parts cover and recultivate the landfill with grass and shrubs.

Potential environmental impacts post-mitigation

- Organized landfill operation to good management practice prevents scattered and windblown waste;
- Shaping the landfill body will incorporate it better in the landscape;
- Planting of grass and shrubs over the closed landfill body will add a new feature to the landscape and reduce any negative visual effects.

<u>Impact classification</u>

Given the favorable topographic settings of the site, the distance to the receptors, the temporary nature of the construction works and the mitigation framework, the visual effect of the construction works and machinery will be negligible.

The possible visual effects of the landfill for C&D waste during its operation are of low significance, given the favourable topographic settings of the site and the distance to the receptors. When taking into account the listed mitigation measures, any possible negative effect would be reduced to negligible.

New landfill at the new Vinča site - **C&D waste landfill** Impacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Negligible
Specialist study required?	No	No

6.3.2 Impacts on the biological environment

This section analyses the impacts to be delivered on the biological environment at the new Vinča site during the construction and operation of the new landfill.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.3.2.1 Flora, Fauna and Habitats

Construction phase

Potential environmental impact pre-mitigation
The construction of the new landfill will impact as follows:

- Increased landfill footprint to the adjacent land west and south to the existing landfill body;
- Clearance and loss of (primarily) farmland;
- To a minor extent loss of habitats such as individual trees, grassland and shrubs;
- Littering, tree and shrub cutting and disturbances beyond the construction area disturbing fauna, flora and habitats.

Mitigation measures
Loss of farmland and some trees and shrubs cannot be avoided. By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Clearly delimit the temporary working area and the landfill area;
- Reinstate temporary working areas;
- Plant a green belt along the landfill boundaries or the site boundaries, composed of grass, shrubs and trees, both deciduous and evergreen;

- Prohibit littering;
- Prohibit leaving the delimited areas with vehicles without prior consent;
- Sensitize workers in environmental issues.

Potential environmental impact post-mitigation

- Increased landfill footprint is not avoidable;
- Proper site management will prevent littering, tree and shrub cutting and disturbances beyond the construction area disturbing fauna, flora and habitats.
- The green belt will minimize/partly compensate for losses of flora and habitats.

O&M phase

→ Interim Landfill

Potential environmental impact pre-mitigation

As the interim landfill will only be operated for about 2 years, the impacts are timely limited. These are:

- Littering beyond the landfill area disturbing fauna, flora and habitats;
- Pollution of the surrounding area with windblown waste;
- Impacts on animals entering the landfill area;
- Scavenging birds.

However, impacts may also occur later, if surplus waste or waste from MBT/WtE shut-downs needs to be landfilled or stored.

Mitigation measures

- Treat the waste and only landfill the residues, as planned under the PPP project, once the facilities are available in 2021.
- Prohibit littering;
- Install nets and screens to capture windblown MSW;
- After major settlements have occurred after some years construct final capping and recultivate it with grass and shrubs[43].
- As discussed in Section 6.3.1.5 related to noise impacts of the interim landfill, birds control techniques are suggested to be implemented at site. These measures will cause a decrease on bird populations. The related impact cannot be accurately determined at this stage.
- No mitigation measures are suggested to mitigate potential impacts caused by the bird control measures because the impact cannot be accurately determined at this stage. However, it is expected that such measures are applicable. These shall be defined during the ESIA stage.

[43] This mitigation measure will be applied during O&M to mitigate an impact caused during construction.

Potential environmental impact post-mitigation

- Proper site management will prevent littering, tree and shrub cutting and disturbances beyond the landfill area;
- Fencing the site will prevent livestock or wildlife coming in contact with the waste.
- Plantation of grass and shrubs when capping filled parts of the landfill may promote the development of new habitats.

Impact classification

Although the construction activities are limited in time, some of the impacts on flora and habitats (losses) will be permanent and cannot be avoided. On the other hand, mitigation measures may be undertaken to reduce the footprint of the activities to the strictly necessary area.

During O&M of the interim landfill, further impacts on flora and fauna may be verified due to spread of waste and direct contact of animals with the landfill. Mitigation measures are easily applicable in this case and will contribute to reduce the significance of the impacts to a low level.

The impact that bird reduction measures may have on the populations feeding at site is preliminarily assessed to be negative, as these populations have been artificially increased due to the existing Vinca landfill, and are, at least to a certain point, dependent on such facilities. This impact shall be further assessed during the ESIA stage. This shall be based on a **qualitative baseline assessment of bird fauna**.

New landfill at the new Vinča site - Interim landfill Impacts on flora, fauna and habitats		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Permanent	Medium term
Magnitude	Medium	Medium
Certainty	Definite	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Qualitative baseline assessment of bird fauna	

→ **Landfill for residues from MBT/WTE facility**

This landfill, in combination with the WtE plants, will replace the interim landfill for MSW as soon as the treatment facilities are operational. It will end the landfilling of untreated MSW, except for eventually appearing surplus waste or waste stored or landfilled during MBT/WtE shut-downs.

As the treatment residues are inorganic, the landfill will no further be available as feeding area for scavenger birds.

Potential environmental impact pre-mitigation
Potential impacts on flora are not expected during the O&M stage (these will be delivered during construction only). Impacts on fauna are:

- Cut off of the food source for a population of landfill birds, including eventually protected birds. Negative impact on the abundance and distribution of scavenging birds (gulls) in the wider area, whose population was increased by the availability of food at the landfill. The related impact cannot be accurately determined at this stage.

Mitigation measures
- No mitigation measures are suggested to mitigate potential impacts caused by the lack of a food source. This is because the impact cannot be accurately determined at this stage. However, it is expected that such measures are applicable. These shall be defined during the ESIA stage.
- After major settlements have occurred after some years construct final capping and recultivate it with grass and shrubs.

Potential environmental impact post-mitigation
- Birds: because no mitigation measures for the lack of a food source for the birds can be defined at this stage, the potential impact post-mitigation cannot be accurately assessed. It is primarily assumed that the significance post-mitigation will be low.
- Vegetation: plantation of new grass and shrubs when capping filled parts of the landfill may promote the development of new habitats.

Impact classification

Although the construction activities are limited in time, some of the impacts on flora and habitats (losses) will be permanent and cannot be avoided. On the other hand, mitigation measures may be undertaken to reduce the footprint of the activities to the strictly necessary area.

The operation of the landfill for treatment residues is directly connected to the closure of the interim landfill for residual MSW. The closure of the interim landfill will cause the loss of a (assumed major) food source for birds in the area. It can, as therefore, be assessed that the O&M of the landfill for treatment residues will cause impacts on the bird population. This impact is preliminarily assessed to be negative, as these populations will be artificially increased due to the interim sanitary landfill, and are, at least to a certain point, dependent on such facilities. This impact shall be further assessed during the ESIA stage. This shall be based on a **qualitative baseline assessment of bird fauna**.

New landfill at the new Vinča site - Landfill for residues from MBT/WTE facility Impacts on flora, fauna and habitats		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Permanent	Long term
Magnitude	Medium	Medium
Certainty	Definite	Likely
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Qualitative baseline assessment of bird fauna	

→ C&D waste landfill

The landfill replaces the mixed emplacement of C&D waste at the existing landfill.

Potential environmental impact pre-mitigation

- As the C&D waste is inert, the landfill will not become a feeding place for birds.
- Potential impacts on fauna, flora and habitats during O&M are not expected.

Mitigation measures

- After major settlements have occurred after some years construct final capping and recultivate it with grass and shrubs.[43 above].

Potential environmental impact post-mitigation

- Plantation of grass and shrubs when capping filled parts of the landfill may promote the development of new habitats.

Impact classification

Although the construction activities are limited in time, some of the impacts on flora and habitats (losses) will be permanent and cannot be avoided. On the other hand, mitigation measures may be undertaken to reduce the footprint of the activities to the strictly necessary area.

The operation of the landfill for C&D residues is not predicted to cause any impacts on the biological environment at site.

New landfill at the new Vinča site - C&D waste landfill Impacts on flora, fauna and habitats		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Permanent	N.A.
Magnitude	Medium	N.A.
Certainty	Definite	N.A.
Direction	Negative	N.A.
Cumulative?	Yes	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

6.3.3 Impacts on the human environment

6.3.3.1 Historical sites

Only major sites (as Belo Brdo) in Vinča have a recognized protection status (Decision Institute Nos. 653/5 of 10.11.1965, cultural property of exceptional character, Decision, "Off. Gazette of SRS" no. 14/79). The area of the new Vinča landfill has not been determined for the cultural good, not enjoying prior protection under the Law on Cultural Property (Official Gazette of RS, No.71 / 94). The space within the boundaries of the Plan is not covered by the framework of spatial cultural - historical whole, and does not contain individual cultural goods.

However, the area around the new Vinča site is known for its historical cultural sites, which might be negatively affected by the extension of the landfill. The Plan of Detailed Regulation notes that the area covered by the Plan of detailed regulation of the sanitary landfill Vinča, Grocka is located in the zone of expected archaeological finds” (DPR: p 20-22) (Figure 6-1 below).

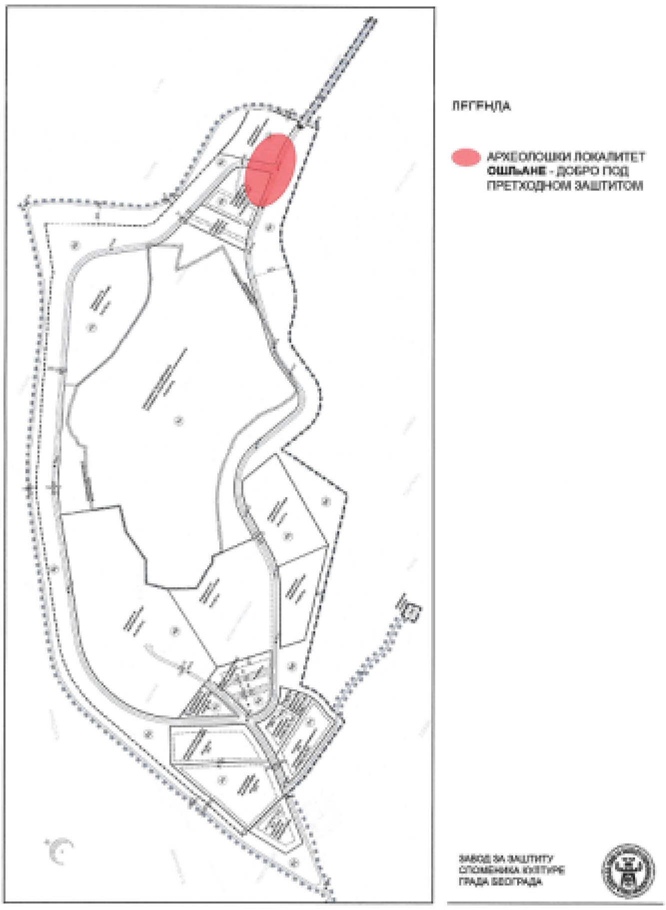

Figure 6-1: Location of a potential archaeological site (SPU report)

<u>Construction phase</u>

Potential environmental impact pre-mitigation

With an historical road passing along the right bank of the Danube River, the possibility for change finds cannot be excluded during the construction of the new Vinca landfill. The construction works may damage (partly or completely) any artifacts, constructions or sites.

Mitigation measures (measures for protection)

- A systematic prior archaeological investigation or an avoidance of certain areas does not seem to be required.
- However, a thorough chance find procedure will need to be implemented during construction: in the event that during work archaeological objects or remains are found, investor and contractor shall be required to immediately suspend the works and notify the Office for the Protection of Cultural Monuments, as well as to take all measures to ensure that the findings are not destroyed, not damaged, but kept in place and in a position in which it is detected in accordance with the Law on Cultural Property, Art. 109 ("Off. Gazette of RS", No.71 / 94).

Standard "Chance Find Procedure"
In case of finding historical artifacts during the construction works following activities should be carried out in order not to destroy cultural heritage:

- stop the construction activities in the area of the chance find
- delineate the discovered site or area
- secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the equivalent take over
- notify the supervisory Engineer who in turn will notify the responsible local authorities and the Office for the Protection of Cultural Monuments immediately (within 24 hours or less)
- responsible local authorities and the Office for the Protection of Cultural Monuments would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the Office for the Protection of Cultural Monuments (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values
- decisions on how to handle the finding shall be taken by the responsible authorities and the Office for the Protection of Cultural Monuments. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage
- implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Office for the Protection of Cultural Monuments; and
- Construction work could resume only after permission is given from the responsible local authorities and the Office for the Protection of Cultural Monuments concerning safeguard of the heritage.

These procedures must be referred to as standard provisions in construction contracts. During project supervision, the site engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

O&M phase

No impacts on cultural heritage are expected during the O&M phase.

Impact classification
- There is no designated culturally protected site on the new Vinča site.
- The new Vinča site is located in a historically/ archaeologically relevant area with a probability of chance finds.

In case damages to cultural sites or objects occur during construction, these may become permanent.

New landfill at the new Vinča site - all landfill types Impacts on cultural heritage		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Permanent	N.A.
Magnitude	Medium	N.A.
Certainty	Possible	N.A.
Direction	Negative	N.A.
Cumulative?	No	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

6.3.3.2 Other Community Health and Safety Impacts

Community health and safety (CHS) impacts are directly connected to the impacts in the physical environment related to **air emissions**, **noise**, **odour**, **soil**, **surface and ground water** and **transport**. These impacts have been discussed in Section 6.3.1 of this report.

Construction phase

Potential CHS impacts pre-mitigation

The construction activities at this stage may increase the community exposure to (other) health, safety and security risks, such as:

- exposure to hazardous materials during construction;
- accidents within the construction site (falls on open trenches, injuries or dead caused by loose heavy material, etc.);
- misbehavior of security forces (abuses of power, disrespect for the local inhabitants, etc.).

Mitigation measures

- Fence the construction site;
- place entrance prohibition and other warning signs at the fence;
- securely store the unused material (especially rolling material such as pipes and other tubes);
- disclose relevant project-related information to enable the stakeholders to understand these risks and potential impacts, as well as its proposed prevention, mitigation and emergency response measures;
- prevent or minimize the potential for community exposure to hazardous materials;
- develop accident prevention/emergency preparedness policy and measures;

- in case security services are contracted, assure that those providing security are not implicated in past abuses, are adequately trained, have an appropriate conduct towards the citizens and other workers, and act within the applicable law.

Potential CHS impacts post-mitigation
By applying the mitigation measures as above defined, the impacts on CHS can be greatly reduced.

O&M phase

→ **Interim landfill**

Potential CHS impact pre-mitigation
Other CHS impacts may be verified during the operation of the interim landfill, if no mitigation is undertaken:

- Visitors and trespassers are subject to the **exposure to physical, chemical and biological hazards** resulting from contact with materials contaminated with human fecal matter, toxic substances (batteries), chemicals, pathogenic organisms, sharps waste (needles), exhaust fumes of waste collection trucks, dust from disposal operations, etc.
- The neighboring community may be exposed to the **spread of diseases** when uncollected garbage and litter reaches them via wind, vermin, scavenging birds and vehicles, while attracting vectors and exposing the community to hazardous substances. The distance to the next villages is, however, an extenuating factor.
- The uncontrolled migration of LFG to the surface poses an **explosion risk**.

Mitigation measures
- Apply effective compaction routines and daily cover of the MSW;
- Prohibit littering;
- Install nets and screens to capture windblown MSW;
- Control the scavenging birds;
- Install a collection and utilization system for LFG;
- Fence the landfill site;
- Place entrance prohibition and other warning signs at the fence.

Potential CHS impacts post-mitigation
- Windblown waste will be minimized due to nets and daily cover of MSW;
- Proper site management will prevent littering;
- Fencing the site and controlling the birds will prevent livestock or wildlife from coming in contact with the waste and transporting it to the surroundings;
- Fencing the site will avoid trespassing;
- Collecting and using the LFG will reduce the explosion risks to a minimum.

Impact classification

The impacts to CHS are classified as "possible" due to the relative distance to the next settlements and to the fact that the site is not a passage area. However, if any impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

By restricting the entrance to the site with fences and warning signals, the impacts on the community during construction shall be reduced to a "medium" significance level. The measures suggested for the operational phase shall allow reducing the impacts of this stage to a "low" significance level.

New landfill at the new Vinča site - Interim Landfill Other impacts on CHS		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Low
Specialist study required?	No	No

→ Landfill for residues from MBT/WtE facilities

As stated in Section 6.3.1.1, bottom ash, fly ash and FGC residues will be treated to either reach qualification for EU non-hazardous landfill type or to reach a level with "inert waste" characteristics. The residues do not cause any organic contamination.

Potential CHS impact pre-mitigation

Other CHS impacts may be verified during the operation of the landfill for waste treatment residues, if no mitigation is undertaken:

- Visitors and trespassers are subject to the **exposure to physical, chemical and biological hazards** resulting from contact with hazardous materials.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Solidify fly ash and FDC residues before landfilling;

- Maturate, crush and remove ferrous metals from bottom ash before landfilling. Where possible recover the bottom ash as construction material;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Fence the landfill site;
- Place entrance prohibition and other warning signs at the fence.

Potential environmental impacts post-mitigation
- Fencing the site will avoid trespassing;
- The other mitigation measures will reduce the risk of CHS impacts even if trespassing occurs.

Impact classification
The impacts to CHS are classified as "possible" only due to the relative distance to the next settlements and to the fact that the site is not a passage area. However, if any impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

By restricting the entrance to the site with fences and warning signals, the impacts on the community during construction shall be reduced to a "medium" significance level. The measures suggested for the operational phase shall allow reducing the impacts of this stage to a "low" significance level.

New landfill at the new Vinča site - Landfill for residues from MBT/WtE facilities Other impacts on CHS		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Low
Specialist study required?	No	No

→ C&D waste landfill

Potential CHS impact pre-mitigation
Other CHS impacts may be verified during the operation of the landfill for C&D waste, if no mitigation is undertaken:

- Visitors and trespassers are subject to the **exposure to physical hazards** resulting from contact with the inert C&D waste.

Mitigation measures
- Fence the landfill site;
- Place entrance prohibition and other warning signs at the fence.

Potential environmental impacts post-mitigation
- Fencing the site will avoid trespassing.

<u>Impact classification</u>
The impacts to CHS are classified as "possible" only due to the relative distance to the next settlements and to the fact that the site is not a passage area. However, if any impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

By restricting the entrance to the site with fences and warning signals, the impacts on the community during construction shall be reduced to a "medium" significance level. The fencing during the operational phase shall allow reducing the impacts of this stage to a "low" significance level.

New landfill at the new Vinča site - C&D waste landfill Other impacts on CHS		
Factors	**Construction**	**Monitoring**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Low
Specialist study required?	No	No

6.4 Construction, Operation and Management (O&M) of the MSW treatment facilities

The PPP tender also includes treatment facilities (MBT/CHP or incineration plant). These will take considerably longer to be constructed than the landfills. As the CoB wants to switch as soon as possible to sustainable MSW management, the interim solution of an interim landfill as analyzed as part of Section 6.3 has become necessary. As soon as the treatment facilities (MBT/CHP or incineration plant) are operational, the interim landfill will be closed and probably one of three options, as described in Section 2.1, will be operated. The three options under analysis in this Scoping Report are:

- **Option 1:**
  - Construct a Mechanical-Biological Treatment (MBT) plant at the new Vinča site, which will produce Refuse-Derived Fuel (RDF);
  - Transport of the RDF to the new Cerak site, close to a residential area located ca. 15 km west of the landfill;
  - Construct a new Combined Heat and Power (CHP) plant in the new Cerak site, near its existing District Heating Plant (DHP);
  - Transport the treatment residues (bottom ash, fly ash, FGC residues) to the landfill at new Vinča site.

- **Option 2:**
  - Transport of untreated residual mixed MSW to the new Cerak site;
  - Construct a new MSW incineration plant at the new Cerak site, besides an existing DHP.
  - Transport the treatment residues (bottom ash, fly ash, FGC residues) to the landfill at new Vinča site.

- **Option 3:**
  - Construct a new MSW incineration plant at new Vinča site;
  - Move the treatment residues (bottom ash, fly ash, FGC residues) to the landfill at new Vinča site, besides the new incineration plant.

6.4.1 Impacts on the physical environment

This section analyses the impacts on the physical environment at the new Vinča site and at the new Cerak site during the construction and operation of the MSW treatment facilities (MBT/CHP or incineration plant).

The analysis of impacts includes all options and the direct and indirect impact areas as defined in Section 2.3 of this report.

6.4.1.1 Air Quality

Construction phase

Potential environmental impacts pre-mitigation

- Emissions of dust:
  - Earthworks (leveling and excavations), vegetation clearing and construction, which may lead to the release of significant amounts of dust into the air.
  - Stationary plant (mixers, crushers, etc).
  - Movement of vehicles and machinery associated to the works and backup diesel generators.
- Other emissions: The construction traffic will also contribute for the increase in the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.

The impacts occur temporary during the construction phase only. Dust emissions are limited locally, as dust precipitates rapidly.

Mitigation measures

By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Under the OHS Section 6.5.2.9 of this report, mitigation measures are recommended for workers.
- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits to reduce fugitive dust;
- Train drivers in dust prevention and fuel conservation;
- Train staff in dust prevention measures during construction;
- Prohibit burning material at the project site;
- Cover of trucks transporting dusty materials;
- Use silo trucks for pulverous material;
- Water the work fronts whenever suspended dust is visible or during dry periods;
- Cover stockpiled soil and C&D material to prevent windblown soil;
- Water internal dirt and temporary roads.

Potential environmental impacts post-mitigation

- Good construction management and worker awareness will reduce fuel consumption and dust emissions.

Relevance to receptors

- At the new Vinča site, given the relative distance to the next settlements (Vinca is the closest village, located 2 km south-east of the WtE facilities), these impacts are not expected to affect the residential communities, but only the workers.

- In the new Cerak site, where living areas are located nearby, the impacts may affect residential areas due to their proximity to the site.

O&M phase

A screening analysis using Breeze SCREEN3 has been undertaken for the Project in order to determine the approximate impact of the emissions of all the options in the air quality of the project sites during operation. The screening analysis, whose complete report can be consulted in Annex A, considered that the emission limits from the EU Industrial Emissions Directive (IED) are respected by the CHP and the Incineration Plants. The impact of the emissions from the MBT Plant was not simulated.

The screening exercise considered the simultaneous operations of the new and the existing facilities in the new Cerak site. This was done by incorporating in the model emission data for all facilities.

The existing air quality data do not have the necessary spatial nor temporal representativeness to be considered quantitatively in the assessment.

The operation of the CHP or the Incineration Plants is not expected to imply *per se* significant impacts on the air quality in the respective Project areas, under the assumption that these facilities fulfill the emission limits defined in the IED. The same is verified when the simultaneous operation of the DHP in Cerak is considered for the simulation. The results show that there is a certain risk that the WBG EHS guidelines recommendation for new projects (that their contribution shall not be more than 25% of the applicable air quality standards) is not fulfilled. However, a lack of baseline data and other limitations of the model do not allow withdrawing a definitive conclusion.

The results of the screening ADC point that the maximum concentrations could be found ca. 400 meters and/or 1,000 m away from the sites. The wind data show that the predominant winds in Belgrade blow from the southeast and the west. This implies that the impact areas are most likely located northwest and east of the sites. At Vinča, these areas correspond to agricultural fields, where no continuous human presence is expected. To the east and northwest of the Cerak site, residential and commercial buildings are located. At this stage it is not possible to state exactly how the sensitive receptors will be affected.

A detailed assessment is advised as a mean to obtain more precise predictions and assurance of the fulfillment of the national and international standards in the normal and emergency operation modes.

→ Option 1

Potential environmental impacts pre-mitigation
As pre-mitigation situation it is assumed that the CHP Plant in Cerak is not combustion controlled and does not have any emission control equipment. In addition, it is assumed that the MBT Plant's emissions are not filtered before exhaustion.

- New Vinča site:
  - Dust and bioaerosols emissions generated during the waste unloading process of the MSW at the MBT;
  - Dust and bioaerosols from processing waste in the MBT plant;
  - Vehicle exhaust emissions: The MSW delivering vehicles, RDF transportation vehicles and vehicles delivering treatment residues will contribute to the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.
- New Cerak site:
  - Dust emissions generated during the waste unloading process of RDF;
  - Dust emissions generated during the loading of treatment residues (bottom ash, fly ash, FGC residues).
  - Flue gas emissions from the combustion of RDF. The flue gases carry residues from incomplete combustion and harmful pollutants such as fly ash, heavy metals (mercury, cadmium, etc.), organic and inorganic compounds (HCl, HF, SO_2 and dioxins/furans);
  - Vehicle exhaust emissions: The RDF transportation vehicles and vehicles transporting away treatment residues will contribute to the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide.

Mitigation measures
In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:
- New Vinča site:
  - Operate enclosed reception area/bunker with negative pressure and fast roller shutter gates for waste vehicle entry/exit;
  - House all treatment processes of all odor prone treatment steps and operate at negative pressure;
  - MBT off-gas treatment to comply with standards of the EU Industrial Emissions Directive (IED).
  - Install continuous online air monitoring equipment that can reliably and accurately measure relevant parameters in accordance with EU-IED and Serbian regulations;
  - Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing;
  - Maintain all equipment in good working condition in order to minimize emissions to acceptable standards;
  - Turn off engines during breaks;

- Post and enforce speed limits for delivering vehicles to reduce fugitive dust;
- Cover of truck loads transporting RDF and treatment residues;
- Train drivers in dust prevention and fuel conservation;

- New Cerak Site
  - Develop a comprehensive air emission monitoring, reporting and response plan as part of the project ESMS;
  - Develop a site specific O&M manual, taking into account Serbian, EU and IFC/WBG requirements;
  - Install a RDF combustion facility which ensures a 2 seconds retention time of flue gases at a min. of 850°C;
  - Flue gas treatment facility to comply with standards of the EU Industrial Emissions Directive (IED) for Incineration Plants;
  - Install continuous online air monitoring equipment that can reliably and accurately measure relevant parameters in accordance with EU-IED and Serbian regulations;
  - Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing;
  - Maintain all equipment in good working condition in order to minimize emissions to acceptable standards;
  - Turn off engines during breaks;
  - Post and enforce speed limits for delivering vehicles to reduce fugitive dust;
  - Train drivers in dust prevention and fuel conservation;
  - Cover of truck loads transporting RDF and treatment residues;

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will reduce fuel consumption and dust emissions during transport;
- Off-gas from MBT plant and flue-gas from CHP plant will be treated to high EU standards.

Impact classification

During construction, the emissions of air pollutants will impact the sites locally and temporarily. Mitigation measures will allow reducing the impacts to a low significance level.

During O&M, the air emissions of the plants (MBT in Vinca and CHP in Cerak) will be controlled by designing the facilities under respect of the EU emission standards. The air dispersion screening calculation undertaken for the project showed that this shall allow limiting the negative impacts on air quality to a low significance level. However, a detailed assessment is necessary during the ESIA stage to withdrawn definitive conclusions. This shall consist of a **background air quality assessment** and of a **detailed air dispersion calculation**.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low-*
Specialist study required?	Yes: - Background air quality assessment - Air dispersion calculation	
*Air modelling within the ESIA will give more exact indication on the level of significance. However, EU standards are designed to reach low significance		

→Option 2

Potential environmental impacts pre-mitigation

As pre-mitigation situation, it is assumed that the incineration facility to be built at the new Cerak site is not combustion controlled and does not have any emission control equipment.

- Dust and bioaerosols emissions generated during the waste unloading process of the residual MSW at the incineration plant;
- Dust emissions generated during loading process of treatment residues (bottom ash, fly ash, FGC residues).
- Vehicle exhaust emissions: The MSW delivering vehicles and the vehicles taking treatment residues will contribute to the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide;
- Flue gas emissions from the incineration of MSW. The flue gases carry residues from incomplete combustion and harmful pollutants such as fly ash, heavy metals (mercury, cadmium, etc.), organic and inorganic compounds (HCl, HF, SO_2 and dioxins/furans).

Mitigation measures

In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- Operate enclosed MSW reception area/bunker with negative pressure and fast roller shutter gates for waste vehicle entry/exit;
- Install a incineration facility, which ensure 2 s retention time of flue gases at min. 850°C;
- Flue gas treatment to comply with standards of the EU Industrial Emissions Directive (IED) for Incineration Plants;

- Install continuous online air monitoring equipment that can reliably and accurately measure relevant parameters in accordance with EU-IED and Serbian regulations;
- Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing
- Maintain all transport vehicles and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits for delivering vehicles to reduce fugitive dust;
- Cover of truck loads transporting treatment residues;
- Train drivers in dust prevention and fuel conservation;

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will reduce fuel consumption and dust emissions during transports;
- Flue-gas from incineration plant will be treated to high EU standards.

Impact classification

During construction, the emissions of air pollutants will impact the new Cerak site locally and temporarily. Mitigation measures will allow reducing the impacts to a low significance level.

During O&M, the air emissions of the incineration plant will be controlled by designing it under respect of the EU emission standards. The air dispersion screening calculation undertaken for the project showed that this shall allow limiting the negative impacts on air quality to a low significance level. However, a detailed assessment is necessary during the ESIA stage to withdrawn definitive conclusions. This shall consist of a **background air quality assessment** and of a **detailed air dispersion calculation**.

Construction, O&M of MSW treatment facilities - Option 2 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low*
Specialist study required?	Yes: - Background air quality assessment - Air dispersion calculation	
*Air modelling within the ESIA will give more exact indication on the level of significance. However, EU standards are designed to reach low significance		

→ Option 3

Potential environmental impacts pre-mitigation

As pre-mitigation situation, it is assumed that the incineration facility at the new Vinca site is not combustion controlled and does not have any emission control equipment.

- Dust and bioaerosols emissions generated during the waste unloading process of the MSW at the incineration plant;
- Dust emissions generated during transport process of treatment residues (bottom ash, fly ash, FGC residues) to landfill.
- Vehicle exhaust emissions: The MSW delivering vehicles and vehicles taking treatment residues will contribute to the emission of other air pollutants such as hydrocarbons, nitrogen, carbon monoxide, nitrogen oxides and sulfur dioxide;
- Flue gas emissions from the incineration of MSW. The flue gases carry residues from incomplete combustion and harmful pollutants such as fly ash, heavy metals (mercury, cadmium, etc.), organic and inorganic compounds (HCl, HF, SO2 and dioxins/furans).

Mitigation measures

In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- Operate enclosed reception area/bunker with negative pressure and fast roller shutter gates for waste vehicle entry/exit;
- Install a incineration facility, which ensure 2 s retention time of flue gases at min. 850°C;
- Flue gas treatment to comply with standards of the EU Industrial Emissions Directive (IED) for Incineration Plants;

- Install continuous online air monitoring equipment that can reliably and accurately measure relevant parameters in accordance with EU-IED and Serbian regulations;
- Comply with worker health and safety rules and provide personnel with Personal Protective Equipment & Clothing
- Maintain all transport vehicles and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Post and enforce speed limits for delivering vehicles to reduce fugitive dust;
- Train drivers in dust prevention and fuel conservation.

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will reduce fuel consumption and dust emissions during transports;
- Flue-gas from incineration plant will be treated to high EU standards.

Impact classification

During construction, the emissions of air pollutants will impact the new Cerak site locally and temporarily. Mitigation measures will allow reducing the impacts to a low significance level.

During O&M, the air emissions of the incineration plant will be controlled by designing it under respect of the EU emission standards. The air dispersion screening calculation undertaken for the project showed that this shall allow limiting the negative impacts on air quality to a low significance level. However, a detailed assessment is necessary during the ESIA stage to withdrawn definitive conclusions. This shall consist of a **background air quality assessment** and of a **detailed air dispersion calculation**.

Construction, O&M of MSW treatment facilities - Option 3 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low*
Specialist study required?	Yes: - Background air quality assessment - Air dispersion calculation	
*Air modelling within the ESIA will give more exact indication on the level of significance. However, EU standards are designed to reach low significance		

6.4.1.2 Odor

<u>Construction phase</u>
Odor impacts are not expected during construction of the MSW treatment facilities.

<u>O&M phase</u>

→ Option 1

Potential environmental impacts pre-mitigation
Odor emissions are due to biological decomposition of MSW:

- New Vinča site
  - odor emissions during delivery, unloading and storing of MSW in the bunker;
  - odor emissions during processing in the MBT;
- New Cerak site
  - RDF is odor neutral.

Mitigation measures

- New Vinča site
  - Enclose reception area/bunker with negative pressure and fast roller shutter gates for waste vehicle entry/exit;
  - House all treatment processes of all odor prone treatment steps and operate at negative pressure;
  - Operate an efficient ventilation system with negative pressure;
  - Collect all contaminated air from the MBT;
  - Operate bio filters for off-gas treatment.
- New Cerak Site
  - not needed.

Potential environmental impacts post-mitigation
Odor emissions are handled sustainably to a minimum. However, it is impossible to prevent or treat them 100%.

<u>Impact classification</u>

During O&M, the odour emissions from the MBT at the new Vinca site and from waste handling at both sites can be controlled by means of technical solutions. However, the impact cannot be completely mitigated.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on odor		
Factors	**Construction**	**O&M**
Scale	N.A.	Local
Duration	N.A.	Long term
Magnitude	N.A.	High
Certainty	N.A.	Definite
Direction	N.A.	Negative
Cumulative?	N.A.	Yes
Significance	N.A.	High
Mitigation measures applicable?	N.A.	Yes
Significance of the residual impacts	N.A.	Low
Specialist study required?	N.A.	No

→ Option 2 and Option 3

Potential environmental impacts pre-mitigation

Odor emissions are due to biological decomposition of MSW:

- odor emissions during delivery, unloading and storing.

Mitigation measures

- Enclosed reception area/bunker with negative pressure and closing gates for waste vehicle entry/exit;
- Operate an efficient ventilation system with negative pressure;
- Incinerate the collected odor loaded off-gas from the bunker area.

Potential environmental impacts post-mitigation

Odor emissions are handled sustainably to a minimum. However, it is impossible to prevent or treat them 100%.

Impact classification

During O&M, the odour emissions from waste handling at the new Vinča site (Option 3) or the new Cerak site (Option 2) can be controlled by means of technical solutions. However, the impact cannot be completely mitigated.

Construction, O&M of MSW treatment facilities - Options 2 and 3 Impacts on odor		
Factors	**Construction**	**O&M**
Scale	N.A.	Local
Duration	N.A.	Long term
Magnitude	N.A.	High
Certainty	N.A.	Definite
Direction	N.A.	Negative
Cumulative?	N.A.	Yes
Significance	N.A.	High
Mitigation measures applicable?	N.A.	Yes
Significance of the residual impacts	N.A.	Low
Specialist study required?	N.A.	No

6.4.1.3 Climate change

The GHG impacts from this phase are those related to emissions from the new MSW treatment facilities (MBT/CHP or incineration plant), as well as to emissions from the transportation routes for MSW, RDF and treatment residues. The transportation routes for the 3 options are presented in Section 6.4.1.7 below. A detailed assessment of the impacts shall be undertaken as part of the ESIA.

Construction phase

Potential environmental impacts pre-mitigation
Potential impacts are as follows:
- The construction traffic will contribute for the increase in the emission of greenhouse gases (GHG - carbon dioxide).

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Maintain all machinery and equipment in good working condition in order to minimize emissions to acceptable standards;
- Turn off engines during breaks;
- Train drivers in fuel conservation;

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will reduce fuel consumption and consequently CO_2 (GHG) emissions.

O&M phase

→ Option 1

Potential environmental impacts pre-mitigation
Potential impacts are:
- New Vinča site
  - CO_2 emissions from degradation of organic waste in the MBT: the effect of carbon dioxide emissions from biogenic sources is usually treated as a neutral process since the baseline assumption is a situation in which the material would have anyway degraded at ambient temperatures. Therefore, the process is considered to produce no net GHG emissions (Eunomia, date unknown). This will be the case for the present E&S Scoping Study. This approach is, however, questioned by the scientific community (Eunomia, date unknown) and shall be assessed during the ESIA stage.
  - Delivery traffic for residual MSW to Vinča site, from transfer stations and direct delivery. This type of transport already exists today. No additional impact is expected.
- Transport between the new Vinča site and the new Cerak site

- CO_2 emissions from transport between the new Vinča site and the new Cerak site due to using fossil fuels. Transportation routes to be considered are:
  - transportation of RDF from the Vinča site to the Cerak site.
  - transportation of treatment residues (bottom ash, fly ash, FGC residues) from the Cerak site to the Vinča site.
- New Cerak site
  - The new RDF-CHP plant will emit GHG caused from the incineration of waste based on fossil (plastic) and organic (wood, food waste, paper cardboard) waste. The effect of carbon dioxide emissions from biogenic sources will be treated as neutral in this E&S Scoping Study. As previously described, the ESIA shall discuss this approach. Emissions from fossil sources burning are to be expected.

Mitigation measures

- New Vinča site
  - No mitigation measures are needed
- Transport
  - Ensure that transportation vehicles are fully loaded by means of a good logistics management;
  - Promote ecological driving practices among the drivers to avoid unnecessary consumption of fuel.
- New Cerak site
  - There are no mitigation measures for the abatement of CO_2 from the RDF-combustion in Cerak.

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will reduce fuel consumption and thus GHG emissions during transports.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the CO_2 emissions during the O&M stage of Option 1 have a global climate change effect, even if of assumed low magnitude in this case. The CO_2 from the MBT Plant and the burning of organic waste in the CHP Plant are considered to be neutral. The validity of approach shall be studied during the ESIA stage. The CO_2 from the burning of plastics in the CHP Plant is expected and cannot be mitigated. Mitigation measures are only applicable for the emission of CO_2 from the transportation routes between the two sites.

A **climate change impact assessment** is recommended to be part of the ESIA.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Transport: Definite WtE: Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Low
Specialist study required?	Yes: - Climate change impact assessment	

→ Option 2

Potential environmental impacts pre-mitigation

Potential impacts are:

- new Cerak Site
  - Delivery of residual MSW to Cerak site, from transfer stations and direct delivery. This type of transport replaces the delivery traffic for MSW to existing Vinca site which exists today. The resulting impact is considered null.
  - The incineration plant will emit GHG caused from the incineration of waste based on fossil (plastic) and organic (wood, food waste, paper cardboard) waste. The effect of carbon dioxide emissions from biogenic sources will be treated as neutral in this E&S Scoping Study. As previously described, the ESIA shall discuss this approach. Emissions from fossil sources burning are to be expected.
- Transports between new Vinca site and new Cerak site
  - CO_2 emissions from transports between new Cerak site and new Vinca site due to using fossil fuels. The transportation route to be considered is:
    - transportation of treatment residues (bottom ash, fly ash, FGC residues) from Cerak to Vinca.

Mitigation measures

- Transport
  - Ensure that transportation vehicles are fully loaded by means of a good logistics management;
  - Promote ecological driving practices among the drivers to avoid unnecessary consumption of fuel.
- New Cerak site
  - There are no mitigation measures for the abatement of CO_2 from the waste incineration in Cerak.

Potential environmental impacts post-mitigation

- Good operation management and worker awareness will reduce fuel consumption and thus GHG emissions during transports.

<u>Impact classification</u>

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the CO_2 emissions during the O&M stage of Option 2 have a global climate change effect, even if of assumed low magnitude in this case. The CO_2 from burning of organic waste in the Incineration Plant is considered to be neutral. The validity of this approach shall be studied during the ESIA stage. The CO_2 from the burning of plastics in the Incineration Plant is expected and cannot be mitigated. Mitigation measures are only applicable for the emission of CO_2 from the transportation routes between the two sites.

A **climate change impact assessment** is recommended to be part of the ESIA.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Transport: Definite WtE: Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Low
Specialist study required?	Yes: - Climate change impact assessment	

→ Option 3

Potential environmental impacts pre-mitigation

Potential impacts are:

- New Vinča site
  - Delivery of residual MSW to the new Vinča site from the transfer stations and from direct delivery. This type of transport replaces the delivery traffic to Vinča site which exists already today. The resulting impact is considered null.

  - The incineration plant will emit GHG caused from the incineration of waste based on fossil (plastic) and organic (wood, food waste, paper cardboard) waste. The effect of carbon dioxide emissions from biogenic sources will be treated as neutral in this E&S Scoping Study. As previously described, the ESIA shall discuss this approach.
- Transport
  - Transport of treatment residues are necessary within the new Vinča site only and thus are considered negligible.

Mitigation measures

- There are no mitigation measures for the abatement of CO2 from the MSW-incineration at new Vinča site

Potential environmental impacts post-mitigation

- Since no mitigation measures are applicable to the Incineration Plant, the post-mitigation impacts have the same significance as those pre-mitigation.
- No impacts are expected from transport.

Impact classification

During construction, temporary emissions of CO_2 will be verified. In an international/global context (which is the only context that has an importance when referring to climate change effects), however, the impact is classified as having negligible significance.

Although locally emitted, the CO_2 emissions during the O&M stage of Option 3 have a global climate change effect, even if of assumed low magnitude in this case. These result only from the Incineration Plant, as the transportation routes will remain the same as at the present state. The CO_2 from burning of organic waste in the Incineration Plant is considered to be neutral. The validity of this approach shall be studied during the ESIA stage. The CO_2 from the burning of plastics in the Incineration Plant is expected and cannot be mitigated. Mitigation measures are not applicable.

A **climate change impact assessment** is recommended to be part of the ESIA.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on air quality		
Factors	**Construction**	**O&M**
Scale	International	International
Duration	Short term	Long term
Magnitude	Low	Low
Certainty	Definite	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Negligible	Low
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Low
Specialist study required?	Yes: - Climate change impact assessment	

6.4.1.4 Surface water

New Vinča site
The waste treatment facilities are proposed to be located in the south-western part of the site. No surface water receptors are present in that area of the site, the closest being the Ošljan stream, distanced more than 700 m to the east, on the opposite side of the landfill. Therefore, the risk of contamination of the surface water is considered to be of low probability.

New Cerak site
No surface water bodies are present in the study area. Therefore, the construction of the CHP (Option 1) or mass burn incinerator (Option 2) is not likely to present a risk to surface water.

Construction phase

Potential environmental impacts pre-mitigation
Impacts on the new Cerak site are not expected to be verified. Potential impacts at the Osjlan stream (new Vinca site) may be caused by:

- Sediment run-off during site clearing, grading and earth-moving activities, caused by heavy rains;
- Run off of septic waste water;
- Run-off of pollutants and spillages e.g. lubricants, fuel, etc. from workshop, fuel station areas and vehicles, especially if washed away during heavy rains;
- Potential seepage of tanks, especially if washed away during heavy rains.

Mitigation measures
By contract, the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Adequate construction management;
- Provide measures for temporary storm water deviation and drainage to control run-off, cause be rainfall, around the construction site;

- Clean and maintain drainage ditches and culvert regularly;
- Ensure adequate slopes of stored excavated material;
- Store the soil material from site clearing in a dedicated area distanced from the surface water bodies in order to prevent any sediment run-off during construction;
- Provide closed or chemical toilettes;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Use double walled tanks;
- Refuel vehicles at destined places;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- Sediment run-off to the Ošljan stream during the site clearing, grading and earth-moving activities, caused by heavy rains will not be fully controllable;
- Septic waste water will be treated;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Tanks will be double walled, preventing uncontrolled seepage.
- Potential changes of surface run-off will be permanent in accordance with the design.

O&M phase

→ Option 1

The MBT facility at the new Vinča site will generate several types of waste which will be:

- combusted (after transformed into RDF) at the new Cerak site;
- recycled (metal); or
- disposed to the new landfill for treatment residues (stabilized organic waste, inert residual waste - see Section 0).

The operation of the proposed CHP Plant at the new Cerak site will generate:

- bottom ash, which will be transported to new Vinča site for treatment and recovery/disposal (see Section 0). It is recommend to consider any potential recycling of the bottom ash (e.g. in the construction industry). If feasible, the remaining ferrous and non-ferrous metals should be separated for their recovery.

- fly ash and FGC residues, which will be transported to the new Vinča site for treatment and disposal (see Section 0).

Potential environmental impact pre-mitigation

- New Vinča site
  The potential impacts on surface water from the MBT plant are:
  - Potential contamination of surface water bodies (Ošljan stream and the Ošljan swamp) by:
    - Leachate from the bunker area, where MSW is stored;
    - Leachate from the treatment areas of MSW in the MBT;
    - Leachate from the bio-filters;
    - Condensate from off air and from within the MBT;
  - Potential contamination of water courses by fuel and consumables spillage at the fuel station and the workshop.
  - Septic waste water from toilets and showers will be collected and shall present no risk for impact.

- New Cerak site
  No impacts on surface water are expected.

Mitigation measures

In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- New Vinča Site
  - Seal the bunker area;
  - Collect the leachate from the bunker area and move it to the WWTP (leachate treatment plant) at the new Vinča site, where it is treated prior to re-use or discharge;
  - Collect and recycle the leachate from the bio-filters;
  - Collect leachate from the other leachate generating areas of the MBT and move it to the WWTP (leachate treatment plant) at the site, where it is treated prior to re-use or discharge; If discharged it will fulfill the required effluent quality standards for surface water discharge;
  - Drain storm water away from not contaminated areas (roofs and other non-waste or parking areas) in separate drainage channels and discharged to the Ošljan stream/swamp or infiltrate it to the ground;
  - Drain storm water from contaminated areas (around the reception area, wheel wash) to the WWTP;
  - Frequently monitor the effluent of the WWTP;
  - Internal roads, waste processing and storage areas, and vehicle washing areas will be paved;
  - Establish wheel washing facilities to prevent spreading of MSW at wheels;
  - Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
  - Store hazardous substances needed for operation of machinery in accordance with the regulations;
  - Refuel vehicles at destined places;

- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP.
  - Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
  - Train workers with regard to clean up of spills;
  - Train workshop and fuel station employees in management of hazardous substances.
- New Cerak Site
  No impacts on surface water are expected and no mitigation measures are as therefore defined.

Potential environmental impacts post-mitigation

- New Vinča site
  - Capture and treatment of leachate to Serbian surface water standards will prevent further degradation of the swamp alluvial belt along the Danube River;
  - Non-contaminated storm water and surface waters are deviated around the landfill body;
  - Spillages at workshops and fuel stations are controlled by paved areas
  - Septic waste water will be treated.
- New Cerak site
  No impacts on surface water are expected.

Impact classification

No impacts on the Cerak site are expected due to the lack of surface water features in the area.

During construction, any eventual impacts delivered to surface water at the new Vinca site will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new facilities according to Serbian and EU norms, it is expected that any potential impacts on surface water will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the Vinča site may become a regional problem. It is thought that the Ošljan stream and swamp dilute any unlikely pollution before it reached the Danube and can be spread further downstream.

A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

Construction, O&M of MSW treatment facilities - Option 1 Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Surface water quality assessment	

→ **Option 2**

Potential environmental impact pre-mitigation
Although leachate and run-off may be generated during construction, no surface water features are expected to be affected at the new Cerak site, as these are not present in the area.

Mitigation measures
No impacts on surface water are expected and no mitigation measures are as therefore defined.

Potential environmental impacts post-mitigation
No impacts on surface water are expected.

Impact classification
No impacts on the Cerak site are expected due to the lack of surface water features in the area.

Construction, O&M of MSW treatment facilities - Option 2 Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	N.A.	N.A.
Duration	N.A.	N.A.
Magnitude	N.A.	N.A.
Certainty	N.A.	N.A.
Direction	N.A.	N.A.
Cumulative?	N.A.	N.A.
Significance	N.A.	N.A.
Mitigation measures applicable?	N.A.	N.A.
Significance of the residual impacts	N.A.	N.A.
Specialist study required?	N.A.	N.A.

→ Option 3

Potential environmental impact pre-mitigation

- Leachate from the bunker area where MSW is stored;
- If a wet flue gas cleaning process is used, waste water occurs from washers.
- Waste water from bottom ash cooling, quenching, etc.
- Leachate from inadequate storage of bottom ash and fly ash;
- Potential contamination of water surfaces (Osjlan stream and swamp) by fuel and consumables spillage at fuel station and workshop.
- Septic waste water from toilets and showers.

Mitigation measures

In accordance with the Output Specifications the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- Seal the bunker area;
- Collect the leachate from the bunker area and move it to the WWTP of the incineration plant, where it is treated prior to re-use or discharge;
- Treat waste water from the flue gas cleaning, flue gas cooling, wet bottom ash receptor, and other wet processes in a WWTP at the incineration plant and recycle the water. If discharged it will fulfill the required effluent quality standards for discharge to the Ošljan stream/swamp (to be assessed during the ESIA stage);
- Frequently monitor the effluent of the WWTP;
- Store fly ash and FGC residues in sealed silos until removal;
- Store bottom ash in the sealed bottom ash cooler until removal;
- Drain storm water away from not contaminated areas (roofs and other non-waste or parking areas) in separate drainage channels and infiltrate it to the ground or discharge to sewer;
- Collect storm water from potentially contaminated areas (around the reception area, wheel wash, truck parking) and pre-treat in oil/water separator units prior to discharge to the WWTP;
- Internal roads, waste processing and storage areas, and vehicle washing areas will be paved;
- Establish wheel washing facilities;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP.
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- All waste water and leachate is treated to required standards, or evaporated in the incineration plant;
- Adequate management of bottom ash, fly ash and FGC residues prevents formation of leachate;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Septic waste water will be treated.

Impact classification

During construction, any eventual impacts delivered to surface water at the new Vinca site will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new facilities according to Serbian and EU norms, it is expected that any potential impacts on surface water will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the Vinca site may become a regional problem. It is thought that the Oslan stream and swamp dilute any unlikely pollution before it reached the Danube and can be spread further downstream.

A **detailed surface water quality assessment** should be undertaken to determine the environmental condition of the surface water recipients (the Ošljan stream and the Ošljan swamp).

Construction, O&M of MSW treatment facilities - Option 3 Impacts on surface water		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Surface water quality assessment	

6.4.1.5 Soil and groundwater

Construction phase

Potential environmental impacts pre-mitigation

Soil and groundwater sources at both sites could be affected by:

- Percolation of septic waste water;

- Percolation of pollutants and spillages e.g. lubricants, fuel etc. from workshop, fuel station areas and vehicles;
- Percolation of potential seepage of tanks;
- Earthworks, excavations, and movement of heavy vehicles will have a negative impact on soil and induce ground disturbance.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Adequate construction management;
- Store excavated soil appropriately, if not transported away;
- Clean and maintain drainage ditches and culvert regularly;
- Provide closed or chemical toilettes;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Provide secondary containment and spill response equipment in case of accident;
- Use double walled tanks;
- Remove contaminated soil in case of accident;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances,

Potential environmental impacts post-mitigation
- Septic waste water will be treated;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Tanks will be double walled, preventing uncontrolled seepage;
- Good construction practice will minimize negative impact on soil and induce ground disturbance.

O&M phase

→ Option 1

Potential environmental impact pre-mitigation

- New Vinča site
  The MBT will be a major contributor to the significant reduction of the volume of municipal waste that requires final disposal, thus preventing the further adverse soil and groundwater impacts in the study area. The soil and groundwater may be potentially impacted due to the operation of the MBT from:
  - Leachate from the bunker area, where MSW is stored;

- Leachate from the specifically the treatment areas of MSW in the MBT;
- Leachate from the bio-filters;
- Condensate from off air and from within the MBT;
- fuel and consumables spillage at fuel station and workshop.
- Septic waste water from toilets and showers.

- New Cerak Site
  The soil and groundwater may be potentially impacted due to the operation of the CHP Plant from:
  - Waste water from bottom ash cooling, quenching, etc.;
  - Leachate from RDF, inadequate storage of bottom ash, fly ash and FGC residues;
  - fuel and consumables spillage at fuel station and workshop;
  - Septic waste water from toilets and showers;
  - If a wet flue gas cleaning process is used, waste water occurs from washers.

Mitigation measures
In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- New Vinča site
  - Develop a site specific O&M manual, taking into account Serbian, EU and IFC/WBG requirements;
  - Seal the bunker area;
  - Collect the leachate from the bunker area and move it to the WWTP (leachate treatment plant) at the new Vinča site, where it is treated prior to re-use or discharge;
  - Collect and recycle the leachate from the bio-filters;
  - Collect leachate from the other leachate generating areas of the MBT and move it to the WWTP at the site, where it is treated prior to re-use or discharge; If discharged it will fulfill the required effluent quality standards for surface water discharge;
  - Drain storm water away from not contaminated areas (roofs and other non-waste or parking areas) in separate drainage channels and discharged to the Ošljan stream/swamp or infiltrate it to the ground;
  - Drain storm water from contaminated areas (around the reception area, wheel wash) to the WWTP;
  - Frequently monitor the effluent of the WWTP;
  - Internal roads, waste processing and storage areas, and vehicle washing areas will be paved;
  - Establish wheel washing facilities to prevent spreading of MSW at wheels;
  - Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
  - Store hazardous substances needed for operation of machinery in accordance with the regulations;
  - Refuel vehicles at destined places;

- Provide toilets and treat septic water in 3 chamber treatment kits, and further in the WWTP.
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

- New Cerak site
  - Treat waste water from the flue gas cleaning, flue gas quenching, wet bottom ash cooling, and other wet processes in a WWTP at the incineration plant and recycle the water. If discharged it will fulfill the required effluent quality standards depending on the destination of discharge (to be assessed during the ESIA stage);
  - Frequently monitor the effluent of the WWTP;
  - Store fly ash and FGC residues in sealed silos until removal;
  - Store bottom ash in the sealed bottom ash cooler until removal;
  - Drain storm water away from contaminated areas in separate drainage channels;
  - Internal roads, waste processing and storage areas will be paved;
  - Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
  - Transport bottom ash, fly ash and FGC residues to the destined landfill area in new Vinca site.
  - Store hazardous substances needed for operation of machinery in accordance with the regulations;
  - Refuel vehicles at destined places;
  - Provide toilets and showers and discharge waste water to the sewer;
  - Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
  - Train workers with regard to clean up of spills;
  - Train maintenance staff, workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation

- New Vinča site
  - Capture and treatment of leachate to Serbian surface water standards will prevent contamination of groundwaters;
  - Spillages at workshops and fuel stations are controlled by paved areas.
  - Septic waste water will be treated.
- New Cerak site
  - All waste water is treated to required standards, or evaporated in the CHP plant;
  - Adequate management of RDF, bottom ash, fly ash and FGC residues prevents formation of leachate;
  - Spillages at workshops and fuel stations are controlled by paved areas;
  - Septic waste water will be treated.

Impact classification

During construction, any eventual impacts delivered to soil and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new facilities according to Serbian and EU norms, it is expected that any potential impacts on soil and groundwater will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the landfill may become a regional problem.

A **groundwater quality assessment** shall be undertaken to indicate the migration pathways and to assess the potential impacts of the PPP project on receptors and the need for groundwater remediation.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on soil and groundwater		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Groundwater quality assessment	

→ Option 2 and Option 3

Potential environmental impact pre-mitigation
The soil and groundwater may be potentially impacted due to the operation of the Incineration Plant at the new Cerak site (Option 2) or the new Vinca site (Option 3) from:

- Leachate from the bunker area, where MSW is stored;
- Waste water from bottom ash cooling, quenching, etc.
- Leachate from inadequate storage of bottom ash, fly ash and FGC residues;
- fuel and consumables spillage at fuel station and workshop.
- Septic waste water from toilets and showers.
- If a wet flue gas cleaning process is used, waste water occurs from washers.

Mitigation measures
In accordance with the Output Specifications, the treatment plants have to comply with EU and Serbian legislation. There are the following mitigation measures:

- Seal the bunker area;
- Collect the leachate from the bunker area and move it to the WWTP of the incineration plant, where it is treated prior to re-use or discharge;
- Treat waste water from the flue gas cleaning, flue gas cooling, wet bottom ash receptor, and other wet processes in a WWTP at the incineration plant and recycle the water. If discharged it will fulfill the required effluent quality standards depending on the destination of discharge (to be assessed during the ESIA stage);
- Store fly ash and FGC residues in sealed silos until removal;
- Store bottom ash in the sealed bottom ash cooler until removal;
- Frequently monitor the effluent of the WWTP;
- Drain storm water away from not contaminated areas (roofs and other non-waste or parking areas) in separate drainage channels and infiltrate it to the ground or discharge to sewer;
- Collect storm water from potentially contaminated areas (around the reception area, wheel wash, truck parking) and pre-treat in oil/water separator units prior to discharge to the WWTP;
- Internal roads, waste processing and storage areas, and vehicle washing areas will be paved;
- Establish wheel washing facilities;
- Establish workshop and fuel station areas on sealed ground and equip them with oil traps;
- Store hazardous substances needed for operation of machinery in accordance with the regulations;
- Refuel vehicles at destined places;
- Provide toilets and showers and discharge waste water to the sewer;
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks;
- Train workers with regard to clean up of spills;
- Train workshop and fuel station employees in management of hazardous substances.

Potential environmental impacts post-mitigation
- All waste water is treated to required standards, or evaporated in the incineration plant;
- Adequate management of bottom ash, fly ash and FGC residues prevents formation of leachate;
- Spillages at workshops and fuel stations are controlled by paved areas;
- Septic waste water will be treated.

Impact classification

During construction, any eventual impacts delivered to soil and groundwater will be temporary. If proper construction site management is applied, the significance of the impacts may be reduced to low.

Considering the obligation of the PPP Contractor to construct the new facilities according to Serbian and EU norms, it is expected that any potential impacts on soil and groundwater will be reduced to a low significance level. None of the existing data suggest that any contamination originating in the landfill may become a regional problem.

A **groundwater quality assessment** shall be undertaken to indicate the migration pathways and to assess the potential impacts of the PPP project on receptors and the need for groundwater remediation.

Construction, O&M of MSW treatment facilities - Options 2 and 3 Impacts on soil and groundwater		
Factors	**Construction**	**Operation**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Possible	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Groundwater quality assessment	

6.4.1.6 Noise and vibrations

This Section investigates the noise and vibration impacts of the treatment facilities. The noise impacts from transportation are assessed within Section 6.4.1.7 below.

Construction phase

Potential environmental impacts pre-mitigation

The impacts occur temporary during the construction phase only. Noise/vibration emissions are caused by:

- Earthmoving and excavations with associated heavy equipment, circulation of vehicles, and in general the construction operations;
- Piling driving, if needed;
- Rock blasting, if needed;
- Operation of other equipment and machinery like concrete mixers, cranes, metal saws, welding, bolting, etc.

- Traffic delivering material and equipment;
- Noise is an important source of nuisance for the construction workers.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Turn off engines during breaks;
- Keep vehicles and equipment in good working order;
- Monitor noise emissions against noise control targets;
- Machines that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment).
- Train drivers in noise prevention behavior;
- Train construction staff on how to mitigate unnecessary noise emissions;

Additionally for the construction in Cerak:
- Limit noisy activities to the least noise-sensitive times of day (weekdays between 7 a.m. and 10 p.m.);
- Establish temporary noise barriers and screens;
- Inform neighbors with several days prior notice of particularly noisy activities during day or night time;
- Limit piling to permitted hours and periods;
- Whenever feasible, schedule different noisy activities to occur at the same time.

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will prevent excessive noise emissions. However, noise emissions cannot be fully prevented.

Relevance to receptors
- New Vinča site: The impact will be temporary and is expected to be further mitigated given the distance to the closest residential receptors (Vinca is the closest village, located 2 km south-east of the WtE facilities). It is expected that, at the time this stage is launched, the Roma community that neighbors the site has been already resettled.
- The new Cerak site: The effect of the generated noise on receptors, being in close vicinity, is very likely.

<u>O&M phase</u>

→ Option 1

Potential environmental impact pre-mitigation

- New Vinča site:

The MBT replaces the interim landfill operation as waste management facility. Thus noise impacts are moved from the interim landfill to the MBT facility. Potential noise and vibration impacts are:

  - Continuous treatment operations in the MBT such as shredding, screening, baling, crushing, milling, sieving, compacting, conveying, etc;
  - Wheeled loaders, organic material turners and other mobile equipment for waste moving and processing
  - Waste delivery vehicles while entering, unloading and exiting;
  - Vehicles transporting away the RDF, while entering, loading and exiting;
  - Noise is an important source of nuisance for the workers.
- New Cerak site:
  Potential noise and vibration impacts are expected deriving from:
  - Continuous operations in the CHP plant coming from craning RDF, combustion and burners, turbine-generator, pumps and fans, belts, pulsars in fabric filters, etc.;
  - RDF delivery vehicles while entering, unloading and exiting;
  - Vehicles transporting away treatment residues (bottom ash, fly ash, FGC residues), while entering, loading and exiting.

Mitigation measures

- New Vinča site:
  The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:
  - Housing of all noise sensitive treatment areas of the MBT plant and equip walls of treatment buildings with noise insulation;
  - Operate enclosed reception area/bunker with fast roller shutter gates for waste vehicle entry/exit;
  - Keep any doors to the outside closed;
  - Monitor noise emissions against noise control targets;
  - Turn off engines during breaks;
  - Keep vehicles and equipment in good working order
  - Use vehicles according to the newest noise standards;
  - Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment);
  - Train drivers in noise prevention behavior;
  - Train landfill staff in matters on how to mitigate unnecessary noise emissions.
- New Cerak site:
  The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:
  - Housing of all noise sensitive areas of the CHP plant and equip walls of CHP buildings with noise insulation;
  - Encapsulate specific equipment such as turbine, generator, fan directly at the equipment and use mufflers and silencers;
  - Place specific equipment such as the turbine generator on special, vibration absorbing foundations;

- Operate enclosed reception area/bunker with fast roller shutter gates for waste vehicle entry/exit;
- Keep any doors to the outside closed;
- Monitor noise emissions against noise control targets;
- Turn off engines during breaks;
- Use vehicles according to the newest noise standards;
- Inform neighbors with several days prior notice of particularly noisy activities during day or night time, e.g. during times of major maintenance;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment);
- Train drivers in noise prevention behavior;
- Train landfill staff in matters on how to mitigate unnecessary noise emissions.
- Use vegetative screens and other noise barriers.

Potential environmental impacts post-mitigation

- Housing of the plants or encapsulation ensures noise levels according to legal requirements;
- Good operation management and worker awareness will prevent excessive noise emissions. However, noise emissions cannot fully be prevented.
- New Vinča site: The impact of the generated noise and vibrations is expected to be mitigated given the distance to the closest residential receptors (Vinca is the closest village, located 2 km south-east of the WtE facilities).
- New Cerak site: The effect of the generated noise and vibrations on receptors, being in close vicinity, is very likely.

Impact classification

The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the facilities at the new Vinca site and at the new Cerak site, the contractor shall respect the dispositions of the applicable law and the PPP contract, which is expected to reduce the significance of the impacts on noise and vibrations to a low significance level. A **predictive noise impact assessment** shall be undertaken during the ESIA stage to confirm this conclusion for the new Cerak site (given the presence of close residential areas). This assessment will necessarily be conducted based on the results of a **background noise assessment.**

Construction, O&M of MSW treatment facilities - Option 1 Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low*
Specialist study required?	Yes (for Cerak): - background noise measurement /assessment; - predictive noise impact assessment.	
*To be confirmed by ESIA noise modelling		

→ Option 2

Potential environmental impact pre-mitigation
The incineration plant at the new Cerak site will replace the MSW management operations at the interim landfill at the new Vinca site. Although impacts are reduced at the Vinča sites, additional impacts will occur to the new Cerak site. Potential noise and vibration impacts are resulting from:

- Waste delivery vehicles while entering, unloading and exiting;
- Continuous operations in the incineration plant coming from craning of MSW, combustion and burners, turbine-generator, pumps and fans, belts, pulsars in fabric filters, etc.;
- Vehicles transporting away treatment residues (bottom ash, fly ash, FGC residues), while entering, loading and exiting.

Mitigation measures
The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:
- Housing of all noise sensitive areas of the incineration plant and equip walls of incineration buildings with noise insulation;
- Encapsulate specific equipment such as turbine, generator, fan directly at the equipment and use mufflers and silencers;
- Place specific equipment such as the turbine generator on special, vibration absorbing foundations;
- Operate enclosed reception area/bunker with fast roller shutter gates for waste vehicle entry/exit;
- Keep any doors to the outside closed;
- Monitor noise emissions against noise control targets;
- Turn off engines during breaks;

- Keep vehicles and equipment in good working order;
- Use vehicles according to the newest noise standards;
- Inform neighbors with several days prior notice of particularly noisy activities during day or night time, e.g. during times of major maintenance;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment);
- Train drivers in noise prevention behavior;
- Train landfill staff in matters on how to mitigate unnecessary noise emissions.
- Use vegetative screens and other noise barriers.

Potential environmental impacts post-mitigation

- Housing of the plants or encapsulation ensures noise levels according to legal requirements;
- Good operation management and worker awareness will prevent excessive noise emissions. However, noise emissions cannot fully be prevented.

Impact classification

The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the facilities at the new Cerak site, the contractor shall respect the dispositions of the applicable law and the PPP contract, which is expected to reduce the significance of the impacts on noise and vibrations to a low significance level. A **predictive noise impact assessment** shall be undertaken during the ESIA stage to confirm this conclusion for the new Cerak site (given the presence of close residential areas). This assessment will necessarily be conducted based on the results of a **background noise assessment.**

Construction, O&M of MSW treatment facilities - Option 2 Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low*
Specialist study required?	Yes: - background noise measurement/ assessment; - predictive noise impact assessment.	
*To be confirmed by ESIA noise modelling		

→ Option 3

Potential environmental impact pre-mitigation

The incineration plant at the new Vinca site replaces the interim landfill in the same location as waste management facility. Thus noise impacts are moved from the existing landfill to the incineration facility at new Vinča site. Potential noise and vibration impacts are:

- Waste delivery vehicles while entering, unloading and exiting;
- Continuous treatment operations in the incineration plant coming from craning MSW, combustion and burners, turbine-generator, pumps and fans, belts, pulsars in fabric filters, etc.;
- Vehicles transporting away treatment residues (bottom ash, fly ash, FGC residues), while entering, loading and exiting.

Mitigation measures

The contractor has to comply with applicable law and the contract and thus mitigate any adverse impacts:

- Develop a site specific O&M manual, taking into account Serbian, EU and IFC/WBG requirements;
- Housing of all noise sensitive areas of the incineration plant and equip walls of incineration buildings with noise insulation;
- Encapsulate specific equipment such as turbine, generator, fan directly at the equipment and use mufflers and silencers;
- Place specific equipment such as the turbine generator on special, vibration absorbing foundations;
- Operate enclosed reception area/bunker with fast roller shutter gates for waste vehicle entry/exit;
- Keep any doors to the outside closed;
- Monitor noise emissions against noise control targets;
- Turn off engines during breaks;
- Keep vehicles and equipment in good working order;

- Use vehicles according to the newest noise standards;
- Under the OHS Section 6.5.2.4 of this report, mitigation measures are recommended for construction workers (demarcation of high noise areas and usage of personal protective equipment);
- Train drivers in noise prevention behavior;
- Train landfill staff in matters on how to mitigate unnecessary noise emissions.

Potential environmental impacts post-mitigation

- Housing of the plants or encapsulation ensures noise levels according to legal requirements;
- Good operation management and worker awareness will prevent excessive noise emissions. However, noise emissions cannot fully be prevented.

Impact classification

The noise and vibrations impacts during construction will be limited in space and time. With good construction site management, these may be reduced to a low significance level.

During O&M of the facilities at the new Vinca site, the contractor shall respect the dispositions of the applicable law and the PPP contract, which is expected to reduce the significance of the impacts on noise and vibrations to a low significance level.

Construction, O&M of MSW treatment facilities - Option 3 Impacts on noise and vibrations		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Medium	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	No	No

6.4.1.7 Traffic and transport

Construction phase

Potential environmental impacts pre-mitigation

The construction of the treatment facilities will require transportation and delivery of materials by trucks along the existing road network. These impacts will be temporary and limited to the period of construction. The following potential impacts are expected:

- Traffic with construction materials to and from the new Vinča site;
- Traffic with construction workers to and from the new Vinča site;
- The existing regional two-lane road (Smederevski put) can be congested in certain periods of the day.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:
- Set up a Traffic Management Plan;
- Determine specific routes for trucks to avoid unexpected traffic;
- Placement of signs and notices along heavily travelled routes;
- Avoid transportation during rush hours;
- Schedule heavy transports to times with little traffic.

Potential environmental impacts post-mitigation
- Good construction management and worker awareness will mitigate traffic impacts.

O&M phase

→ Option 1
Option 1 includes 3 transportation activities (Figure 6-2):
- Delivery of MSW to the MBT plant by PUC, transported from the transfer stations as well as direct deliveries from the closer surrounding around new Vinča site. The MBT plant the existing Vinča waste management in the future and therefore the traffic volume during operation will be similar to the present situation.
- Transportation of RDF between the new Vinča site and the new Cerak site generating new traffic movements. An estimated 304,000 tons/year of RDF (830 tons/day) will be transported from new Vinča site to the CHP plant. It is estimated that 100 to 150 truck trips will be needed on a daily basis.
- Transportation of treatment residues (bottom ash, fly ash, FGC residues) from the new Cerak Site to new Vinča site for treatment and disposal on the landfill for treatment residues. Fly ash and FGC residues are considered hazardous waste, being solidified at new Vinča landfill for treatment residues.

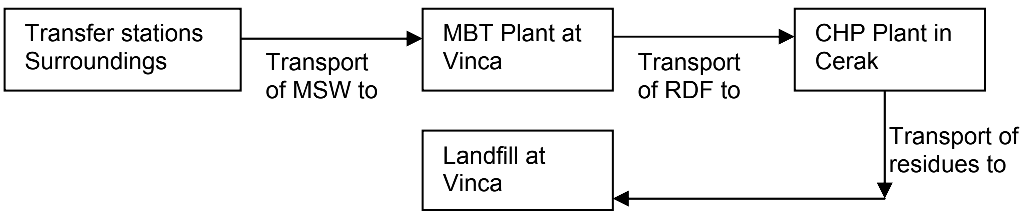

Figure 6-2: Transportation routes for Option 1

The roads most likely to be affected are the two-lane regional roads: state road No. 127, No. 168 and No. 2 and the road from Bubanj Potok to Orlovača (part of the future Belgrade bypass motorway).

Potential environmental impact pre-mitigation
The potential impacts of the increase of volume of heavy transportation traffic may be:

- Increase in traffic jams;
- Exhaust emissions of vehicles transporting RDF, bottom ash, fly ash and FGC residues;
- Dust emissions from RDF, bottom ash, fly ash and FGC residues;
- Noise impacts to the local communities along the route;
- Risks of accidents, which may affect health and environment.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Set up a Traffic Management Plan;
- Implement best transport safety practices;
- Determine specific routes for trucks to avoid unexpected traffic;
- Keep vehicles in good working order;
- Avoid transportation during rush hours;
- Transport RDF in closed containers, in order to prevent wind blown dust;
- Transport bottom ash covered with a blanket or in closed containers, in order to prevent wind blown dust;
- Transport fly ash and FGC residues by silo trucks or any other sealed containers in accordance with regulations for the transport of hazardous substances and mark the trucks appropriately;
- Train drivers in secure driving and behavior in case of accidents, as well as prevention of dust and fuel conservation;
- Train drivers transporting fly ash/FGC residues in transport of hazardous substances.

Potential environmental impacts post-mitigation

- Good operation and logistics management and worker awareness will mitigate traffic impacts;
- Worker awareness will prevent excessive fuel emissions;
- Covered and closed transports prevent dust emissions.

Impact classification
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

A **traffic and transport assessment** should be undertaken as part of the ESIA to consider baseline conditions, the levels of traffic likely to be generated as a result of the proposed facility/ies, the increase of the traffic volume and associated impacts, and to propose mitigation measures.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Regional	Regional
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Likely	Highly likely
Direction	Negative	Negative
Cumulative?	No	No
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Traffic and transport assessment	

→ **Option 2**

In this option, the MSW will be directly transferred from the two Belgrade transfer stations to the new Cerak site (estimated as 500,000 tons/year or 1,370 tons/day). Only small quantities of MSW that won't be used by the Incineration Plant will be directly driven to Vinča site. These transports will replace those arriving at the existing landfill today.

The roads most likely to be affected are the two-lane regional roads: state road No. 127, No. 168 and No. 2 and the road from Bubanj Potok to Orlovača (part of the future Belgrade bypass motorway).

The waste treatment residues from the plant (bottom ash, fly ash, FGC residues) will be transported back to Vinča for disposal (Figure 6-3). Fly ash and FGC residues are considered hazardous waste before being solidified at new Vinča landfill.

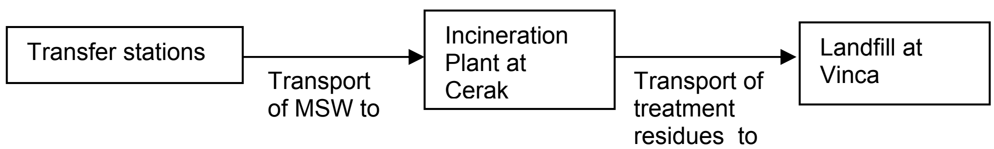

Figure 6-3: Transportation routes for Option 2

Potential environmental impact pre-mitigation

The potential impacts of the increase of volume of heavy transportation traffic may be:

- Increase in traffic jams;
- Exhaust emissions of vehicles transporting bottom ash, fly ash and FGC residues;
- Dust emissions from bottom ash, fly ash and FGC residues;
- Noise impacts to the local communities along the route;
- Risks of accidents, which may affect health and environment.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:

- Set up a Traffic Management Plan;
- Implement best transport safety practices;
- Determine specific routes for trucks to avoid unexpected traffic;
- Keep vehicles in good working order;
- Avoid transportation during rush hours;
- Transport bottom ash covered with a blanket or in closed containers, in order to prevent wind blown dust;
- Transport fly ash and FGC residues by silo trucks or any other sealed containers in accordance with regulations for the transport of hazardous substances and mark the trucks appropriately;
- Train drivers in secure driving and behavior in case of accidents;
- Train drivers transporting fly ash/FGC residues in transport of hazardous substances.

Potential environmental impacts post-mitigation
- Good operation and logistics management and worker awareness will mitigate traffic impacts;
- Worker awareness will prevent excessive fuel emissions;
- Covered and closed transports prevent dust emissions.

Impact classification
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

A **traffic and transport assessment** should be undertaken as part of the ESIA to consider baseline conditions, the levels of traffic likely to be generated as a result of the proposed facility/ies, the increase of the traffic volume and associated impacts, and to propose mitigation measures.

Construction, O&M of MSW treatment facilities - Option 2 Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Regional	Regional
Duration	Short term	Long term
Magnitude	Medium	Medium
Certainty	Likely	Highly likely
Direction	Negative	Negative
Cumulative?	No	No
Significance	Medium	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Low	Low
Specialist study required?	Yes: - Traffic and transport assessment	

→ Option 3

Potential environmental impact pre-mitigation
In Option 3 the MSW mass burn incinerator is installed in the new Vinča site. As the incineration plant will replace the existing Vinča waste management in the future, the traffic volume during operation will be similar to the present situation (Figure 6-4).

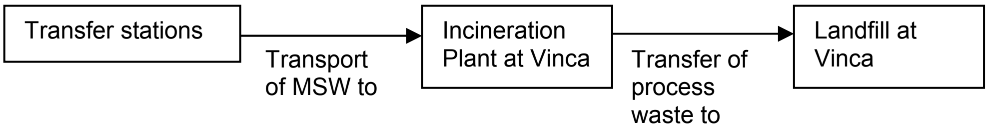

Figure 6-4: Transportation routes for Option 3

Mitigation measures
None. The contractor has no influence on the transportation and delivery practices of MSW by PUC.

Potential environmental impacts post-mitigation
None. See impact pre-mitigation.

<u>Impact classification</u>
The eventual traffic impacts during construction will be limited in space and time. With good traffic/logistics management, these may be reduced to a low significance level.

No additional impacts are expected during the O&M phase.

Construction, O&M of MSW treatment facilities - Option 3 Impacts on traffic and transport		
Factors	**Construction**	**O&M**
Scale	Regional	N.A.
Duration	Short term	N.A.
Magnitude	Medium	N.A.
Certainty	Likely	N.A.
Direction	Negative	N.A.
Cumulative?	No	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

6.4.1.8 Landscape and visual aspects

<u>Construction phase</u>

Potential environmental impact pre-mitigation
During construction heavy machinery and equipment will circulate around and within the site. Piles of excavated material, storage areas, and deposits

of construction material and wastes will be seen. Clouds of dust originated from the machinery movements and earth activities will cause an additional impact in the area.

Mitigation measures

- As soon as the construction activities end, all the construction equipment shall be removed and all the debris shall be collected from the working area.
- To avoid impacts related to the emissions of dust, apply the measures defined under Section 1.1.1.1.

Potential environmental impact post-mitigation

After application of the mitigation measures, the impacts on landscape and visual aspects will be reduced to a level of negligible significance.

<u>O&M phase</u>

→Option 1

Potential environmental impact pre-mitigation

It is assumed, for the pre-mitigation case, that the plants will be build without considering the visual aspects:

- New Vinca Site:
  - Large building complex comprising the MBT plant;
  - Neutral industrial building;
  - Easy visibility, if approaching the site;
- New Cerak Site
  - Large and high building complex (40 to 50m) comprising the CHP
  - Neutral industrial building;
  - Easy visibility;
  - Loss of green area;
  - Significant traffic to and from the site.

Mitigation measures

- **New Vinča Site:**
  - The new MBT is proposed to be constructed in the south-western part of the site at the edge of the valley of the Ošljan stream. Thus it will partially be hidden thanks to the topography;
  - Given the remoteness of the site and its location at the edge of a valley, architectural art is not required;
  - Plant a green belt along the landfill boundaries or the site boundaries as visual screen, composed of grass, shrubs and trees, both deciduous and evergreen;
- **New Cerak Site:**
  The impacts on the landscape from the point of view of the high rise buildings cannot be mitigated. Potential mitigation measures are:
  - Improve view by architectural design;
  - Use colors to make the plant look more pleasant;
  - Plant a green belt along the site boundaries as visual screen, composed of shrubs and trees, both deciduous and evergreen.

Potential environmental impacts post-mitigation

- New Vinča Site:
  - Visual impacts will be mitigated by green belt
  - Give the remoteness of the site from sensitive receptors there are no significant impacts.
- New Cerak Site
  - Visual impacts will be mitigated by architectural design and green belt.
  - The new facility will be close to the settlement of Vidicovac with its high rise buildings and thus be easily visible. It cannot be hidden.
  - It is located in an industrial area.
  - Impacts will directly affect the population around the new Cerak site.

Figure 6-5. Residential buildings whose view may be affected by the WtE facilities in the new Cerak site (Fichtner, September 2015)

Impact classification

The new MBT is proposed to be constructed in the south-western part of the new Vinca site. Given the topography there is a limited visual effect (given the lack of sensitive receptors and the location of the site in a valley).

The new Cerak site is screened from the area along the main road. Construction works could be seen from a larger distance to the west or from the high-rise buildings to the east. The CHP Plant will be seen from the high rise buildings close to the project site. The effects may be mitigated by design and by planting a green barrier.

Construction, O&M of MSW treatment facilities - Option 1 Impacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Medium
Specialist study required?	No	No

→ **Option 2:**

Potential environmental impact pre-mitigation
It is assumed, for the pre-mitigation case, that the plants will be build without considering the visual aspects:

- Large and high building complex (40 to 50m) comprising the incineration plant;
- Neutral industrial building;
- Easy visibility given its large size;
- Loss of green area;
- Significant traffic to and from the site.

Mitigation measures
The new facility will be close to the settlement of Vidicovac with its high rise buildings. It is located in an industrial area. Visibility from high rise buildings cannot be mitigated. Potential mitigation measures are:

- Improve view by architectural design;
- Use colors to make the plant look more pleasant;
- Plant a green belt along the site boundaries as visual screen, composed of shrubs and trees, both deciduous and evergreen.

Potential environmental impacts post-mitigation
- Visual impacts will be mitigated by architectural design and green belt.
- The new facility will be close to the settlement of Vidicovac with its high rise buildings and thus be easily visible. It cannot be hidden.
- It is located in an industrial area.
- Impacts will directly affect the population around the new Cerak site.

Impact classification
The new Cerak site is screened from the area along the main road. Construction works could be seen from a larger distance to the west or from the high-rise buildings to the east. The CHP Plant will be seen from the high

rise buildings close to the project site. The effects may be mitigated by design and by planting a green barrier.

Construction, O&M of MSW treatment facilities - Option 2 Impacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	High
Certainty	Definite	Definite
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Medium
Specialist study required?	No	No

→ **Option 3**

Potential environmental impact pre-mitigation
It is assumed, for the pre-mitigation case, that the plants will be build without considering the visual aspects:

- Large and high building complex (40 to 50m) comprising the incineration plant;
- Neutral industrial building.

Mitigation measures
- The new incineration plant is proposed to be constructed in the south-western part of the site at the edge of the valley of the Ošljan stream. Thus it will partially be hidden thanks to the topography;
- Given the remoteness of the site and its location at the edge of a valley, architectural art is not required;
- Plant a green belt along the site boundaries as visual screen, composed of shrubs and trees, both deciduous and evergreen.

Potential environmental impacts post-mitigation
- Visual impacts will be mitigated by green belt;
- Give the remoteness of the site from sensitive receptors there are no significant impacts.

<u>Impact classification</u>
Given the topography there is a limited visual effect of the construction activities and the Incineration plant (given the lack of sensitive receptors and the location of the site in a valley).

Construction, O&M of MSW treatment facilities - Option 3 Impacts on landscape and visual aspects		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Short term	Long term
Magnitude	Low	High
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	Low	Medium
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Negligible	Low
Specialist study required?	No	No

6.4.2 Impacts on the biological environment

This section analyses the impacts to be delivered on the biological environment at the new Vinča site and at the new Cerak site during the construction and operation of the WtE facilities.

The analysis of impacts includes the direct and indirect impact areas as defined in Section 2.3 of this report.

6.4.2.1 Flora, Fauna and Habitats

Construction phase

Potential environmental impact pre-mitigation
The construction of the new treatment facilities will impact both sites as follows:
- Clearance and loss of (primarily) farmland and green areas;
- To a minor extent loss of habitats such as individual trees, grassland and shrubs;
- Littering, tree and shrub cutting and disturbances beyond the construction area disturbing fauna, flora and habitats.

Mitigation measures
By contract the contractor is to mitigate environmental impacts through good construction practice during the construction phase:
- Loss of farmland and some trees and shrubs cannot be avoided;
- Clearly delimit the temporary working area and the treatment facility area;
- Reinstate temporary working areas;
- Prohibit littering;
- Prohibit leaving the delimited areas with vehicles without prior consent;
- Sensitize workers in environmental issues.

Potential environmental impact post-mitigation

- Increased footprint is not avoidable;
- Plantation of new trees as visual screen will allow the development of new habitats;
- Proper site management will prevent littering, tree and shrub cutting and disturbances beyond the construction area disturbing fauna, flora and habitats.

<u>O&M phase</u>

→ Options 1, 2 and 3

Potential environmental impact pre-mitigation

- New Vinča site: Once operational, the new waste treatment facilities (MBT – Option 1 or mass burn incinerator – Option 3) are not expected to negatively affect the biodiversity in the area.

- New Cerak site: The operation of the waste treatment facility (CHP plant – Option 1 or mass burn incinerator – Option 2) is not expected to negatively affect the biodiversity in the area, given the industrial character of the site and artificial urban habitats in the area.

Mitigation measures

Not applicable.

Potential environmental impact post-mitigation

Not applicable.

<u>Impact classification</u>

Although the construction activities are limited in time, some of the impacts on flora and habitats (losses) will be permanent and cannot be avoided. On the other hand, mitigation measures may be undertaken to reduce the footprint of the activities to the strictly necessary area.

During O&M of the facilities, further impacts on flora and fauna are not expected.

Construction, O&M of MSW treatment facilities - Options 1, 2 and 3 Impacts on flora, fauna and habitats		
Factors	**Construction**	**O&M**
Scale	Local	N.A.
Duration	Short term	N.A.
Magnitude	Medium	N.A.
Certainty	Definite	N.A.
Direction	Negative	N.A.
Cumulative?	Yes	N.A.
Significance	Medium	N.A.
Mitigation measures applicable?	Yes	N.A.
Significance of the residual impacts	Low	N.A.
Specialist study required?	No	N.A.

6.4.3 Impacts on the human environment

6.4.3.1 Other Community Health and Safety Impacts

Community health and safety (CHS) impacts are directly connected to the impacts in the physical environment related to **air emissions**, **noise**, **odour**, **soil**, **surface and ground water** and **transport**. These impacts have been discussed in Section 6.4.1 of this report.

<u>**Construction phase**</u>

Potential CHS impacts pre-mitigation
The construction activities at this stage may increase the community exposure to (other) health, safety and security risks, such as:

- exposure to hazardous materials during construction;
- accidents within the construction site (falls on open trenches, injuries or dead caused by loose heavy material, etc.);
- misbehavior of security forces (abuses of power, disrespect for the local inhabitants, etc.).

Mitigation measures

- Fence the construction site;
- place entrance prohibition and other warning signs at the fence;
- securely store the unused material (especially rolling material such as pipes and other tubes);
- disclose relevant project-related information to enable the stakeholders to understand these risks and potential impacts, as well as its proposed prevention, mitigation and emergency response measures;
- prevent or minimize the potential for community exposure to hazardous materials;

- develop accident prevention/emergency preparedness policy and measures;
- in case security services are contracted, assure that those providing security are not implicated in past abuses, are adequately trained, have an appropriate conduct towards the citizens and other workers, and act within the applicable law.

Potential CHS impacts post-mitigation
By applying the mitigation measures as above defined, the impacts on CHS can be greatly reduced.
O&M phase

Potential CHS impacts pre-mitigation
During the O&M phases of the three project options, additional CHS impacts (besides those related to air emissions, noise, odor, soil and water contamination, and transport) may be delivered during emergency situations.

Emergency situations occurring at any of the project sites (the new Vinča site or the new Cerak site) have the potential to cause negative impacts in the communities and the public and private infrastructure.

Mitigation measures
The operation of the WtE facilities shall not be undertaken without the elaboration of an **Emergency Preparedness and Response Plan**. This obligation is foreseen in the output specifications, and shall be stated in the ESIA and be part of the PPP contract.

Potential CHS impacts post-mitigation
Despite the elaboration and application of an Emergency Preparedness and Response Plan, residual impacts on CHS cannot be completely excluded in case of emergency.

Impact classification

→ Option 1
The impacts to CHS during construction for Option 1 are classified as "likely" due to the proximity of the new Cerak site to roads and residential areas. This is not the case for the new Vinca site, but the impact classification relates to the worse case impacts within the option. If any CHS impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

The O&M of MBT or CHP Plants is not expected to entail an explosion risk, and also fire risks are normally reduced. However, in case these situations do occur, the new Cerak site is greatly exposed to the negative effects (smoke clouds, blasting noise, flying debris) due to its closer proximity to residential areas and roads. Even with design and implementation of an Emergency Preparedness and Response Plan, residual impacts on CHS may be of "medium" significance in an emergency case.

Construction, O&M of MSW treatment facilities - Option 1 Other impacts on CHS		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Likely	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	Very high
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Medium
Specialist study required?	No	No

→ **Option 2**

The impacts to CHS during construction for Option 2 are classified as "likely" due to the proximity of the new Cerak site to roads and residential areas. If any CHS impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

The O&M of incineration plants is not expected to entail an explosion risk, and also fire risks are normally reduced. However, in case these situations do occur, the new Cerak site is greatly exposed to the negative effects (smoke clouds, blasting noise, flying debris) due to its closer proximity to residential areas and roads. Even with design and implementation of an Emergency Preparedness and Response Plan, residual impacts on CHS may be of "medium" significance in an emergency case.

Construction, O&M of MSW treatment facilities - Option 2 Other impacts on CHS		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Likely	Likely
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	Very high
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Medium
Specialist study required?	No	No

→ **Option 3**

The impacts to CHS during construction for Option 3 are classified as as "possible" due to the relative distance to the next settlements and to the fact that the site is not a passage area. However, if any impact is delivered, the magnitude may be very high and the duration may be permanent (severe injuries or chronic disease).

The O&M of Incineration Plants is not expected to entail an explosion risk, and also fire risks are normally reduced. However, in case these situations do occur, the new Vinca site is relatively protected from negative effects on CHS (smoke clouds, blasting noise, flying debris). With design and implementation of an Emergency Preparedness and Response Plan, together with the relative distance to the next settlements, residual impacts on CHS may be of "low" significance in an emergency case.

Construction, O&M of MSW treatment facilities - Option 3 Other impacts on CHS		
Factors	**Construction**	**O&M**
Scale	Local	Local
Duration	Permanent	Permanent
Magnitude	Very high	Very high
Certainty	Possible	Possible
Direction	Negative	Negative
Cumulative?	Yes	Yes
Significance	High	High
Mitigation measures applicable?	Yes	Yes
Significance of the residual impacts	Medium	Low
Specialist study required?	No	No

6.5 Occupational Health & Safety Impacts

The present section lists the potential OHS impacts and risks that are expected from the Project’s construction and operation, including general aspects (working at heights, handling loads, etc.) and aspects specific for waste management projects (exposure to pathogens, chemical hazards, etc.).

According to IFC PS 2, “the client [in this case, the contractor] will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work in a manner consistent with good international industry practice”. Given this, this section presents in addition a suggested mitigation and prevention framework for the identified OHS risks and impacts.

Based on this section, and on the related - ESIA section to be developed in a forthcoming stage, the EPC Contractor shall perform its own OHS risk analysis and include OHS aspects in the Environmental and Social Management System (ESMS), possibly in the form of a separate OHS Management Plan. The details on the EPC Contractor’s obligations shall be defined in the ESIA.

6.5.1 Definition of Occupational Health & Safety

Since 1950, the International Labor Organization (ILO) and the World Health Organization (WHO) have shared a common definition of occupational health. It was adopted by the Joint ILO/WHO Committee on Occupational Health at its first session in 1950 and revised at its twelfth session in 1995. The definition reads:

"Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job."

The main focus in occupational health is on three different objectives:

1. the maintenance and promotion of workers’ health and working capacity;
2. the improvement of working environment and work to become conducive to safety and health and
3. development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings.

The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the undertaking."

Workers safety has to be understood as the practice of an employer using preventative measures to prevent hazards to the employees' personal safety. This practice includes creating plans and procedures for employees and managers in the workplace. In addition, workplace safety involves creating policies and keeping emergency materials available for employee and manager use while at a work site.

6.5.2 Occupational Health & Safety Impacts during Construction and Maintenance

Occupational health & safety impacts during construction and during maintenance phases in the waste management sector are similar to other industrial projects but they are of different nature, likelihood and severity. The most common impacts and risks for construction and maintenance workers are described in the following subchapters together with a description of the extent where it is possible to understand those impacts that need further attention in the evaluation of mitigation measures and to consider them in the later Environmental & Social Impact Assessment.

6.5.2.1 Working at Height

The construction of buildings frequently requires workers to work at height. Fatalities and injuries involving height relating factors account for many accidents each year.

Working at height is generally not defined as working on a ladder, on a scaffold or a roof, only. Working at height is defined as executing a task at an elevated level that could be of course e.g. a scaffold but that could also be working at the edge of a trench. In the present case there are two situations where working at height or at an elevated level might be needed. On one hand, there is the construction of the buildings. On the other hand, the construction of trenches or excavations is also a potential situation where risks related to working at an elevated level could exist.

Falls from elevated levels associated with working on ladders and scaffolds or working at the edge or near excavations are significant sources for fatalities or permanent disabling injuries. It must be considered that a fall from 2 or 3 m height could result in a fatality.

<u>Required Mitigation/Preventive Measures</u>
The IFC Guidelines state that: “Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than two meters; into operating machinery; into water or other

liquid; into hazardous substances; or through an opening in a work surface". Beside the need for fall prevention (for workers such as personal fall arrest systems and use of control zones and safety monitoring systems), a suitable and qualified induction and training by an experienced or certified expert or specialized company in the proper use of the prevention measures is strictly required for each worker appointed for working at height and for workers in charge of securing, marking and labeling covers for openings.

In case of use of scaffolds, it is required that qualified companies or workers will be appointed to erect the scaffold. The scaffold must be subject of a final check by a competent person before the first use.

6.5.2.2 Moving Machinery

A construction site is an ever changing environment; hazards are inherent to this industry and only increase as construction project progresses, as things rise and expand. Construction sites can get quite chaotic with the sheer volume of constantly moving vehicles and shifting people – overhead lifting equipment shifting heavy loads, supply vehicles, dumper trucks everywhere, maneuvering around usually uneven terrain.

Moving machinery poses a risk of accidents with other vehicles, pedestrians and equipment. This could result in significant injuries and fatalities, as well as spills, dust, emissions and noise.

Required Mitigation/Preventive Measures
The risks of accidents between vehicles, equipment and pedestrians could be avoided by keeping them apart from each other, which means that the use of the same course by e.g. vehicles and pedestrians should be avoided wherever possible. Beside this the application of warning signs and mandatory signs (speed limit) is recommended wherever the risk of traffic crossing exists. Regular inspection and maintenance of moving machinery along with induction of workers (and visitors) are mandatory measures to prevent injuries or fatalities

6.5.2.3 Slips, Trips, & Falls

Slips and falls on the same elevation are generally associated with poor maintenance of the construction site:

- Slips occur when a person's foot loses traction with the floor. The most common causes are slippery floor surfaces (e.g. wet or greasy) and inappropriate footwear.
- Tripping occurs when a person unexpectedly catches their foot. In most instances, the objects people trip on are small and unobtrusive, such as cracks in the floor or electrical leads.
- Falls can result from a slip or trip, but many occur during falls from low heights, such as steps, stairs and curbs.

They are resulting from waste debris, loose construction materials, liquid spills, etc. The uncontrolled use of electrical cords and ropes on the ground is a significant source of accidents and injuries. Accidents and injuries could result in sprains, bruises and broken extremities.

Required Mitigation/Preventive Measures
A good housekeeping, site management and personal protective equipment (PPE) such as slip retardant footwear are appropriate and easy measures to prevent any accidents and incidents associated with slips, trips and falls. Provision of appropriate PPE to workers along with regular induction to keep the plant site tidy and clean will support a good housekeeping and prevention of slips, trips and falls as well.

6.5.2.4 Working Noise

Noise is a major hazard within the construction industry. Noise emission is the sound radiated into the work environment by machines or work tasks being undertaken.

Increased noise levels have the potential to affect the health of workers during construction activities. On the one hand, high noise levels could affect the ear and the ability to hear; on the other hand, high noise levels could reduce the sensitivity of a worker to identify dangerous situations or approaching vehicles.

The risk for workers by significant high noise levels could result in injuries, accidents and fatalities.

Required Mitigation/Preventive Measures
The use of low noise equipment and the demarcation of high noise areas is an appropriate measure to inform workers about the need for suitable noise protection measures to prevent themselves against hearing damage. It must be considered that the use of simple ear plugs does not necessarily offer total protection against hearing damage.

It is recommended to undertake regular noise measurement during the construction phase (and as well during operation) to define determine the existing noise levels and consequently to define the convenient need for noise protection gear.

6.5.2.5 Confined Spaces and Excavations

The World Bank EHS Guidelines define Confined Space as: "a wholly or partially enclosed space not designed or intended for human occupancy and in which a hazardous atmosphere could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space. A "permit-required" confined space is one that also contains physical or atmospheric hazards that could trap or engulf the person. Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space”.

Examples of confined spaces that may be present at construction or demolition sites include e.g.: utility vaults, tanks, pipes, and access shafts. Trenches may also be considered a confined space when access or egress is limited.

In the present Project case, the most likely risk for workers is occurring from working in trenches with the risk of collapsing side walls in case that the side walls are insufficiently secured.

The bury of workers in a trench could result in fatalities if emergency procedures are not appropriately implemented and rescue and first aid devices are not available.

A further risk could result from a harmful atmosphere in case of working in the pipes but this risk is unlikely to occur because of the size and diameter of the pipes.

Required Mitigation/Preventive Measures
An appropriate mitigation measure to prevent risk resulting from working in confined spaces is the assessment to avoid such works in general. In case such works cannot be avoided, the application of detailed risk assessment will be required to exclude any possible impacts. Particular mitigation and prevention measures must be described in the risk assessment.

6.5.2.6 Material & Manual Handling

Materials and equipment is being constantly lifted and moved around on a construction site, whether manually or by the use of lifting equipment.

Especially in case of manual lifting and moving around over-exertion and ergonomic injuries and illnesses could result from repetitive motion and wrong manual handling. These impacts are among others, the most common causes of injuries at construction sites.

The most common injuries or illnesses as a result of manual handling are sprains and strains. Other injuries include lacerations and fractures. The typical hazards associated with manual handling are repetitive tasks, heavy lifting, and lifting in awkward places. Poor postures such as bending, stooping and working beyond individual limits also account for a large proportion of back injuries. Factors that increase the risk of injury include the load being too large, difficult to grasp or unstable, the task being too strenuous or involving awkward movements, and the working environment lacking sufficient space, having slippery, uneven or unstable floors, and poor lighting.

Required Mitigation/Preventive Measures
Lifting and moving heavy loads should only be done by using the respective equipment. In case this is not possible, a risk assessment together with a detailed induction of appointed workers will be required to prevent injuries. Introduction of administrative controls into work processes including job rotations and rest or stretch breaks can prevent injuries as well as planning work site layout to reduce to a minimum the need for manual transfer of weighty loads. It is mandatory that only healthy workers and in good physical condition are appointed for such tasks.

6.5.2.7 Electricity

Bad maintenance of electric tools, exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools can pose a serious risk to workers. These constitute the most significant source of electric shocks that could end in a fatality.

Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms.

Required Mitigation/Preventive Measures
Electrical equipment, such as power tools and wires should be used only if they were subject of a technical check before use. Electrical equipment must be free of any damage and suitable for use.
Workers using electrical equipment must receive an induction and training before start of the works and wear appropriate PPE.

6.5.2.8 Uncontrolled Falling or Flying Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools, which can result in injury to the head, eyes, and extremities. The risk aggravates during heavy rain and winds.

Required Mitigation/Preventive Measures
The use of warning signs, fixing of materials with the potential to fall, demarcating traffic ways and wearing the appropriate PPE such as safety glasses, hard hats, face shields and safety shoes are possible prevention measures.

6.5.2.9 Dust

Dusts are tiny solid particles scattered or suspended in the air. The particles are "inorganic" or "organic," depending on the source of the dust. Dust could be harmful for the respiratory organ(s) and could result in respiratory diseases. The amount of dust, the kinds of particles involved and the exposition period influence how serious the lung injury will be.

Earthworks during dry weather conditions pose risks associated with a significant exposure to dust.

Required Mitigation/Preventive Measures
Spraying of water as a way of wetting roads to reduce dust generation and the use of dust masks will be a reasonable preventive measure.

6.5.3 Occupational Health & Safety Impacts during Operation

The most significant occupational health & safety impacts typically associated with workers at waste management facilities according to the World Bank & IFC EHS Guidelines, dated December 2007, occur during the operational phase and include:

- Accidents and injuries;
- Chemical exposure;
- Dust;
- Exposure to pathogens and vectors.

It must be considered that the occupational health & safety impacts described in the previous Sections of this report are not typically limited for the time of construction. These impacts are as well associated while the particular waste management facility is under operation or maintenance activities are ongoing.

In addition to the typical construction related health and safety impacts, risks exist or are likely to occur especially during operation and maintenance activities. These risks are described in the sections below.

It should be considered that health & safety impacts as described previously are applicable independent from the final decision of the investigated Option no. 1, 2 or 3. However, technical mitigation is required if waste will be stored in waste bunkers to prevent the dispersion of spores, vectors and pathogens.

6.5.3.1 Accidents and Injuries

Solid waste workers are particularly prone to accidents involving trucks and other moving equipment, so traffic management systems and traffic controllers are recommended. Accidents include slides from unstable disposal piles, cave-ins of disposal site surfaces, fires, explosions, being caught in processing equipment, and being run over by mobile equipment. Other injuries occur from heavy lifting, contact with sharps, chemical burns, and infectious agents. Smoke, dusts, and bioaerosols can lead to injuries to eyes, ears, and respiratory systems.

Required Mitigation/Preventive Measures
Accidents and injuries are a more or less general term for the possibility of occurring risks.

The avoidance of accidents and injuries can be substantially supported by the implementation of a suitable health & safety management system that must be described in a health & safety management plan (HSMP) for the operation of the solid waste management facility. Special attention should be given if informal workers are still present at the site, as they need to be aware of the H&S measures being implemented on the landfill site.

The HSMP should detail the management arrangements for all operation and maintenance activities. The following details are at last suggested to be included:

- Overview of the project;
- Clearly identified risks associated with the scope of works;
- Site security;
- Traffic management;
- Welfare facilities and provision;
- Arrangements for information, instruction and training including induction;
- Management of hazards on site (gas alarm system, fire alarm and control system);;
- Arrangements for identification of hazards, assessment of risk and production of Method Statements;
- Permit to work system;
- Site rules;
- Arrangements for managing plant and equipment;
- Arrangements for monitoring and auditing etc.;
- Incident & accident investigation;
- List of required PPE

6.5.3.2 Chemical exposure

Chemical hazards encountered at waste management facilities are similar to those at other large industrial facilities, such as toxic and asphyxiating gases. However, the full composition of wastes and their potential hazards is often unknown. Even municipal solid waste often contains hazardous chemicals, such as heavy metals from discarded batteries, lighting fixtures, paints and inks.

Chemical hazards represent the potential for illness or injury due to single acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing or oxidative substances. They also represent a risk of uncontrolled reaction, including the risk of fire and explosion, if incompatible chemicals are inadvertently mixed.

Because the composition is often unknown, the particular health & safety risks together with their likelihood and severity could not be estimated.

Required Mitigation/Preventive Measures
Possible mitigation measures are the ventilation of enclosed processing areas in case of toxic and asphyxiating gases accumulation, separation of chemical substances from the environment, induction of workers with respect to the possible harm resulting from the handling and management of chemicals, working with safety materials data sheets, using appropriate PPE. In any case, more specific prevention and mitigation measures are required based on the content and result of the HSMP.

6.5.3.3 Exposure to pathogens and vectors

Workers can be exposed to pathogens contained in manure and animal excreta found in municipal solid waste from the disposal of sludge, carcasses, diapers, and yard trimmings containing domestic animal waste.

Dumping of municipal solid waste attracts rats, flies, and other insects that can transmit diseases. Processing of municipal solid waste can also generate bioaerosols, suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles.

Required Mitigation/Preventive Measures
Technical mitigation measures as e.g. the use of negative pressure waste bunkers or storage facilities. Other measures encompass the use of appropriate PPE and provision of worker immunization (i.e. for Hepatitis B and tetanus) and health monitoring, fencing of the landfill site, etc.

6.5.3.4 Dust

Processing waste at the landfill site can generate nuisance and hazardous dust, including organic dust.

Required Mitigation/Preventive Measures

Use extraction systems to remove dust from working areas, storage vessels and treat as needed to control particulate emissions.

6.5.4 The HSE Plans

The PPP Contractor will establish its own Health, Safety and Environment Plans (**HSE Plans**) based on the measures preliminarily developed in the present E&S Scoping Report, as well as on those to be defined in the future ESIA.

An **HSE Plan for construction** and an **HSE Plan for operation** are recommended to be developed. These plans shall describe how environmental and social matters will be managed at site, and how the E&S Scoping's/ESIA's requirements will be applied in practice. The plans will detail how the PPP contractor will mitigate construction and operation impacts and will document its response to inspecting, monitoring, verifying, internal auditing and correcting or improving environmental/social/H&S performance. The respective project EPC contractors will be obliged to develop, implement, and maintain OHS management plans in line with the Serbian legal requirements and IFC PS2.

The HSE plans should be a part of the Contractors **Environmental and Social Management System** (ESMS) and should include at least the following sub-plans:

- Project Security Management Plan, including a Code of Conduct for Security Personnel;
- Road Safety Management Plan for construction and for operation, including a Traffic and Transport Management Plan AND AN Emergency Rescue (Response) Plan and Early Warning System;
- Occupational Health and Safety (OHS) Management Plan based on a OHS Risk Assessment;
- Contractor/Key-Subcontractor Management Plan.

Other sub-plans may be identified during the ESIA process.

Further details about the PPP Contractor's obligations regarding environmental management can be consulted in the Output Specifications.

6.6 Social Impacts related to land acquisition and involuntary resettlement

The main key social impacts of the Project have been discussed briefly in the previous Sections whenever linked with the environmental impacts. The social impacts will be explored and addressed in more detail in the ESIA.

In this section a short summary of the impacts related to land acquisition and involuntary resettlement likely to occur before the construction process (see LARR in Annex B for more details), including the potential impact on livelihood of the waste pickers currently operating at the landfill site in Vinča, is provided.

6.6.1 Land Acquisition

In total the extension of the landfill requires the acquisition of 65 ha of land surrounding the existing landfill site north of the village of Vinča in the Grocka municipality. The scope of land acquisition amounts to 64 lots / packages with in some cases several owners and several cadastral plots per package. There are 47 individual owners and 21 groups of private owners (with more than two persons). Additionally there are 4 legal entities owning 11 land lots (out of the 64).[44]

The land is mostly uncultivated bush land, and no use of livestock was identified. A former apple plantation of a state owned company is among the identified land uses.

Potential social impacts pre-mitigation

- A total of 65 ha of land in 64 packages are expropriated for the extension of the landfill.
- The expropriation process has already started but is not yet fully completed due to pending valuation and compensation issues, including court procedures (see LARR in Annex B).

Present situation

- According to the CoB, as a follow up of the complaints the Grocka municipality has turned to court to establish the price. In January 2016 the court's expert recommended a much higher price (1,600 RSD or 12.9 EUR/m^2), and now it remains to be seen if the court will confirm it or will ask for super expertise. The outcome is not yet known.

Measures to bridge gaps between the National Framework and the IFC PS 5:

- Additional compensation mechanisms in order to bridge the gaps between replacement cost and market price should be provided.
- If the decision of the court is in favor of a revaluation by an independent valuer, it is likely that the valuation is closer to the replacement cost as other factors besides past transactions are taken into account[45]. Inconvenient: a court decision may take a long time.
- Additional compensation shall be provided in order to bridge the gaps between replacement cost and market price.

Impact classification

Land acquisition is an impact that occurs only at the New Vinca Landfill site. The required 64 ha of land are presently in the process of being acquired (see Annex B, LARR). No land acquisition is needed at the New Cerak Site.

Land is acquired on the level of Municipality of Grocka (local) for the permanent extension of the landfill. No other area is possible as the landfill is already present. The magnitude of 64 ha is considered to be medium. The impact is definitive and negative for the land owners. Most owners have rejected the compensation offer based on market value (very low due to missing past land-transactions) and would most likely agree to the offer of a replacement cost compensation. At the time of writing the issue is pending at court. The impact is not cumulative. The significance for the project is considered to be low, as the expropriation contracts were signed and only

[44] For details please refer to the LARR in Annex B.

[45] As for example actual land prices in similar areas in the vicinity (where current transactions exist), acceptability of compensation amount by the PAPs, etc.

the valuation is contested, which does not stop the project from being implemented. With the suggested mitigation measure of replacement cost compensation the residual impact will be negligible. The land acquisition procedure is covered in more detail in Annex B (LARR) and will be part of a RAP to be produced and implemented.

PPP Project Impacts on land acquisition	
Factors	
Scale	Local
Duration	Permanent
Magnitude	Medium
Certainty	Definite
Direction	Negative
Cumulative?	No
Significance	Low
Mitigation measures applicable?	Yes, but dependent on court decision, compensation at replacement cost
Significance of the residual impacts	Negligible
Specialist study required?	Yes: - RAP

6.6.2 Involuntary resettlement

The project area at Vinča is isolated from the village Slanci and Veliko Selo resp. in the North and in the South of the village Vinča. The closest houses to the new landfill perimeter are located 800 m away in the northwest direction[46]. This is in compliance with the Regulation on Waste Landfill ("Off. Gazette of RS", no. 92/2010), according to which the minimum distance is 500 m. (SPU 2013 A 7.2.1.). However, there is an informal settlement of mostly Roma on the landfill site, which needs to be relocated. The new Cerak site does not require any resettlement, as the terrain is already property of PUC.

The scope of resettlement in the new Vinča site amounts to 14 households of mostly Roma (66 individuals) who as a rule work as waste pickers / in the waste sorting process, and who live in an informal settlement near to the actual disposal site (inside the extension area). The houses are generally self-constructed, makeshift structures. The heads of the households and/or other household members are employed with PUC.

In order to prepare the resettlement process, a socio-economic census was made by the CoB in cooperation with the Office for Social Services of the Municipality Grocka. The census information is however limited to few data (names of HH members, contract with PUC, address of origin, education,

[46] This distance to the next houses should not be confused with the distance to settlements, which was stated earlier.

health insurance and health problems). The data are partly incomplete - socio-economic/livelihood data and an assets inventory are missing.

Potential social impacts pre-mitigation

- A total of 14 households (66 persons) of mostly Roma Community who are so far employed by PUC and working on the landfill will need to be physically displaced from the disposal site extension area.
- No feasible designs exist that would avoid resettlement of this community; in fact they are very close to a landslide / waste-slide area and neither living nor working conditions are compliant with any standard.
- The National Expropriation Law does not consider illegal settlers eligible for compensation / resettlement; according to IFC PS 5, however, informal settlers are eligible (please refer to the gap analysis in Section 4.7).
- A census was made and the collection of socio-economic data will follow (socio-economic census); and according to the CoB, a RAP is currently under preparation.
- Decisions on resettlement provisions / entitlements are still pending.
- The City is willing to design and undertake the resettlement process in a way consistent with national legislation and IFC PS5, and to prepare a RAP. The RAP is however still pending at the time of writing.

Measures for the Resettlement of Roma Community

- A detailed RAP, including a livelihood restoration component and monitoring plan complicate with national legislation and IFC PS5 has to be established and implemented before the start of physical project activities.
- The census should include socio-economic data and an asset inventory of PAPs and needs to be re-conducted. This has been agreed during a meeting on the 9th of December 2015 in the presence of the City, the Secretariat for Social Affairs and IFC.
- According to the IFC PS 5 the Client will offer displaced communities and persons a compensation for loss of assets at full replacement cost and other assistance to help them improve or (at least) restore their standards of living and livelihoods. In the case of the Project, special attention needs to be paid as the PAPs are from a vulnerable community and the livelihood is linked to the location of the settlement.
- Compensation standards will be transparent and applied consistently to all communities and PAP likely to be displaced (IFC PS 5).
- Where livelihoods of displaced persons are land-based the client will, where feasible, offer the displaced land-based compensation (IFC PS 5).
- Compensation in kind is preferable to compensation in cash (IFC PS 5).
- The client will also provide opportunities to displaced communities and persons to derive appropriate development benefits from the project, e.g. employment opportunities, etc. (IFC PS 5)
- Resettlement should be towards a permanent home and not into temporary solutions (e.g. containers).

- There should be a vulnerability allowance and a support through individually assigned social workers.
- Resettlement should include support to restore and/or improve the livelihood which is presently linked to the waste sector (e.g. self-managed recycling centre, official work clothes, etc.), and which may include also support to shift the activity / sector. Support for children of waste pickers to attend school, grants/vouchers for school books, school clothes, etc. should be taken into consideration by the project to improve the livelihood situation of the affected informal settlers in the waste picking business. Primary beneficiaries would be the 66 resettlers, mostly Roma.
- Given the level of vulnerability of the waste pickers, if the client is not able to mitigate entirely the potential impacts, the concessionaire should actively collaborate by employing as many waste pickers as feasible (given the needs of the new system and the skills required) and/or supporting the client in finding, designing and implementing alternative solutions to restore and/improve their livelihood

Impact classification

The extension of the landfill site at Vinca (new Vinca landfill site) will cause the resettlement of 14 households of an informal settlement (mostly Roma) (see Annex B, LARR).

The resettlement of 14 households is one of the major social impacts of the project. The impact will be of local scale, permanent duration and of medium magnitude, due to the difficulty of finding suitable replacement housing and appropriate livelihood restoration for the Roma households. With the extension of the landfill the impact is unavoidable and negative. The influx of 14 housholds on the resettlement site may constitute a cumulative impact if the site is already overpopulated with resettlers. However, the resettlement site is not yet known. The significance of the impact after resettlement and livelihood restoration is considered to be low. A deatailed RAP (compliant with the IFC PS 5) needs to be prepared.

PPP Project Impacts on involuntary resettlement	
Factors	
Scale	Local
Duration	Permanent
Magnitude	Medium
Certainty	Definitive
Direction	Negative
Cumulative?	No
Significance	Medium
Mitigation measures applicable?	Yes, construction of replacement houses, full livelihood restoration
Significance of the residual impacts	Low
Specialist study required?	Yes: - RAP

6.6.3 Waste Pickers

Until 2015, approximately 150 waste pickers were working on the landfill site to sort the solid waste for recyclables. They were partly employees of PUC, and partly had sub-contracts with 5 waste sorting companies contracted by PUC (former 6-7). In 2015 the contracts with the 5 companies came to an end, and in the following bidding process only one company (Lafarge) was awarded with a contract for a waste sorting plant. Nevertheless, waste pickers (contracted by PUC and some from former companies) remain on the site.

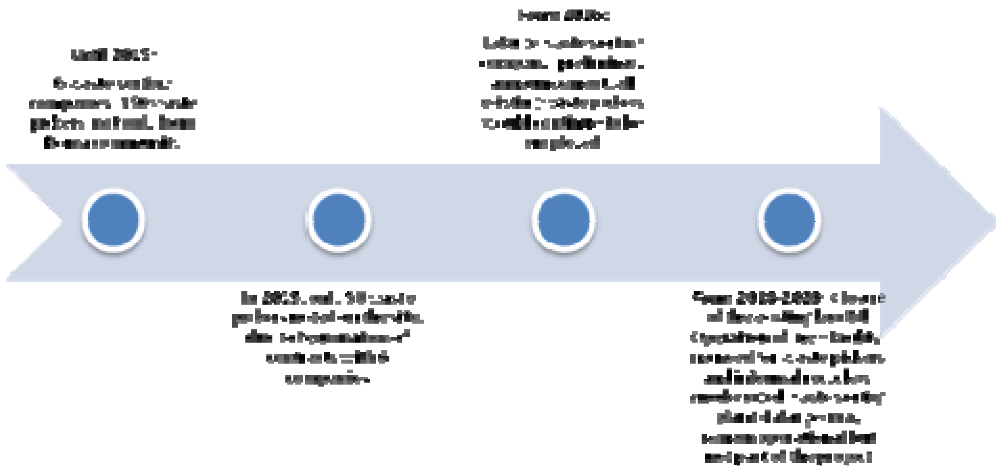

Figure 6-6: Evolution of the employment situation of waste pickers / in the waste sorting process

Future Perspective

The existing landfill is expected to be closed in the end of 2018/beginning of 2019 under the responsibility of the private operator. Until this date the landfill will be operated by PUC. The closure will happen after the new waste management facility (Mass incineration or MBT+CHP) is operational, in combination with a new landfill for incineration and flue gas cleaning residues. A waste sorting process is not included in the project thus the concessionaire is not required to continue the employment contracts with workers and waste pickers.

In terms of employment, there will be a need of maximum 10 sweepers to clean streets and facilities.

Potential social impacts pre-mitigation

- Recent change in operation led to reduction in number of waste pickers on site from 150 to approximately 50.
- The modernization of the landfill will, in the mid-term perspective, end the possibilities of waste-picking on the landfill. There will be no need for labour of waste pickers and formal and informal recyclers after closure of the landfill (=>during operation phase of the project).

- With the modernization of the waste sorting process (presently underway=> shift from 6 companies to Lafarge), more than half of the waste pickers have already quit the landfill site (or are not allowed access anymore).
- The reduction of waste-picker numbers / the shifting from the new Vinča site to other areas of Belgrade is not directly caused by the Project as the waste sorting process (Lafarge) is not connected with the Project.

Present situation:

- The situation is marked by a complex social context, which is exacerbated by the fact that waste pickers (especially if from Roma Community) are not easily integrated into a CoB-operated waste management system; they depend on waste as source of income and livelihood, but their mode of organization and operation is sometimes not compatible with mainstream society. Due to their poverty and general vulnerability status (e.g. low education level, lack of livelihood assets of all sorts, outsider status in the society) they have very few other options. In this context, it is not astonishing that PUC representatives have demonstrated evidence that many of the waste pickers including their employees are for example not used / and sometimes not willing to accept regulated working hours and work hierarchies;
- Also, the waste sorting containers placed by the CoB/PUC were often vandalized and robbed by waste pickers in order to get the recycling materials and sell them to PUC. This has led to the installation of underground containers, which deprive the waste pickers from an important livelihood resource (e.g. cardboard, etc.);
- On the other hand, a project promoting complete self-management of a recycling yard (SWIFT) by Roma communities (including the provision with waste trucks (through UNOPS) had limited success, as the management was quickly running into debts and operations were stopped (see Schwab (2015), communication by PUC). So, also self-managed community recycling centres are not always a successful response to the problem.

Measures for Integration of waste pickers at City level:

- In order to mitigate the loss of livelihood opportunities of waste pickers on the site of the Vinča site, the CoB should adopt an integrated approach that extends beyond the Project, considers the situation of waste pickers in the entire CoB, and increases resilience of the vulnerable communities who depend on this activity.
- In the direct project context, the position of the City (as well as PUC) is to maintain all employees of PUC which are partly residents (e.g. Roma Community to be resettled), as well as non-residents of the landfill. According to PUC the employees would be offered a continuity of their employment contracts and potentially an improvement of their working conditions. However, as a public company PUC's possibilities to employ additional staff are limited by international directives (EU). It would be preferable that newly created positions in the project context (e.g. guards, etc.) could be offered to former staff in order to create new livelihood perspectives if their qualification allows.

- Involve specialized NGOs in the design of livelihood restoration measures and monitoring activities.
- The complex context will ideally require a coordinated, city-wide approach to improve waste picker’s livelihoods including education, legal protection and social integration. However, this cannot be directly attributable to the Project. A livelihood restoration approach will need to be participatory, rights-based and facilitated by professional social workers. It should further combine waste and non-waste livelihood opportunities.
- There are projects that are specialized on this question (e.g. EU support to Roma Employment / UNOPS) which may be taken into consideration when designing livelihood restoration measures.
- Identify any existing program at the national/municipal level dedicated to Roma, waste pickers and those vulnerable that can be used in the framework of the livelihood restoration activities.
- Given the level of vulnerability of the waste pickers, if the client is not able to mitigate entirely the potential impacts, the concessionaire should actively collaborate by employing as many waste pickers as feasible (given the needs of the new system and the skills required) and/or supporting the client in finding, designing and implementing alternative solutions to restore and/improve their livelihood. Therefore, if the impact on livelihood of waste pickers is confirmed, the RAP under preparation by the client should include also the livelihood restoration component related these PAPs and the concessionaire is expected to actively collaborate in the design and implementation of livelihood restoration measures.

Impact classification

The impact on waste pickers is indirect as major changes have already happened prior to the project, with the termination of the contract of waste sorting companies in 2015 and the recent new operation of the waste sorting plant. Nevertheless, the modernization process of the Vinca landfill sets free around 100-150 waste pickers who previously have derived their livelihood from the landfill.

The impact is not only limited to the landfill site but also the waste picker situation at the City level is affected, as waste pickers will have to shift to other areas. The duration is permanent, the magnitude medium as up to 100-150 people are concerned. The impact is definitive and negative but indirect, as the loss of employment is not only attributable to the project. The project cannot create suitable jobs for all waste pickers who have previously worked on the landfill. No cumulative impacts are known. The significance of the impact is consideredc to be medium also the residual impact cannot easily be reduced. Mitigation measures need to be considered at City level.

PPP Project Impacts on waste pickers	
Factors	
Scale	Regional
Duration	Permanent
Magnitude	Medium
Certainty	Definitive
Direction	Negative / Indirect
Cumulative?	No
Significance	Medium
Mitigation measures applicable?	Waste picker integration and education program General Waste Picker integration program on City Level
Significance of the residual impacts	Medium
Specialist study required?	No, but Stakeholder Consultation

6.6.4 Waste Pickers Livelihood Restoration - International good practice

The following chapter reviews selected good practices (challenges and opportunities) of other projects worldwide where waste pickers livelihoods have been restored. The examples are presented to facilitate finding solutions/designing mitigation measures (feasible and also long term) to be proposed to both the CoB and the PPP contractor.

Globally, waste pickers often face deplorable living and working conditions and suffer both extreme poverty and very low social status. They are the lowest paid in the recycling chain, face intimidation and exploitation by middlemen, and rather than receiving support from local authorities, are often harassed (UN Habitat 2010)[47].

Waste pickers from cities on every continent report that privatization of waste management is the most serious threat to their livelihoods. Also of serious concern are solid waste disposal methods that rely on capital-intensive technologies, such as incineration (WB 2016, http://econ.worldbank.org).

There is growing enthusiasm about waste picker inclusion, often as part of ‘integrated solid waste management’ practices. The World Bank and the Inter American Development Bank, for example, have both funded projects to support waste picker integration into formal sector recycling. Advocacy organizations such as WIEGO have called for an intensification of such efforts through access to credit and technology, as well as through partnerships to collect recyclables in underserved communities. These measures have given many waste pickers higher standards of living,

[47] Marta Marello and Ann Helwege (2014): Solid Waste Management and Social Inclusion of Waste Pickers: Opportunities and Challenges; Boston University Global Economic Governance Initiative (GEGI) Working Paper 7.

economic security and a sense of inclusion in society [47]. A recent study undertaken by GIZ has analyzed the enabling conditions for informal sector integration in Solid Waste Management.[48] However, international examples are to be treated cautiously as the situation and involved populations have different social characteristics and cultural backgrounds.

International Examples

Table 6-1 presents a few challenges and opportunities that projects for the integration of waste pickers faced at international level (examples from Egypt, India and Brazil):

Table 6-1: Integration of waste pickers - selected international examples[49]

Challenges	Opportunities
Waste collection systems are often designed in a way that potentially denies the informal sector access to waste as a resource (Global).	The informal sector should be explicitly factored into the design of waste management systems.
Some influential Zabbaleen (Waste Collectors) obtain licenses for waste collection and let others work for them under poor conditions. The trade market is controlled by few middlemen, who make the largest profit (Egypt).	NGO's have emerged in the informal waste sector in recent decades, promoting the interests of informal workers. The first was the Association of Garbage Collectors for Community Development (AGCCD), which was formed in 1983 and launched the first credit program for small and medium enterprise development to introduce recycling of non-organics in an informal neighborhood (Egypt).
Across the country, the workforce carrying out solid waste collection and transport activities consisted primarily of socially excluded communities on the margins of society (India).	In 1990 the Project for the Empowerment of Waste pickers of the Women's University in Pune in Western India started organizing waste pickers around their work issues. Amongst other initiatives, the project issued identity cards to waste pickers and promoted source segregation of waste and its door–to-door collection by waste pickers (India).
Waste picking, along with any work related to garbage or the handling of carcasses and human excreta is traditionally bound to the lowest caste – the 'untouchables'. From the very beginning, women from these castes have been the only ones prepared to soil their hands and they therefore make up the majority of waste pickers. The men, on the other hand, are active in itinerant buying, with access to	Waste picker organizations formed in Delhi, Bangalore and other cities with following principal aims: • to integrate waste pickers into community based, decentralized solid waste management; • to promote the contribution of waste pickers to reductions in municipal waste handling costs, resource recovery, environment conservation, recycling and economic productivity;

[48] German Technical Cooperation (GIZ) (2010): The Waste Experts: Enabling Conditions for Informal Sector Integration in Solid Waste Management. Lessons learned from Brazil, Egypt and India.
[49] Sources include those indicated in note 44 and 45.

Challenges	Opportunities
capital, relatively better work conditions and therefore marginally better status (India).	• to improve work conditions and livelihoods rather than transferring waste pickers into other occupations.
The informal waste sector is socially stratified in a pyramid with scrap collectors (waste pickers and itinerant waste buyers) at the bottom and re-processors at the top. Various actors such as retailers, stockists and wholesalers occupy the strata in between. The majority of retailers are former waste pickers who have managed to assemble some capital and to take up another activity (India).	The National Alliance of Waste Pickers was founded in 2005. The various organizational support efforts collectively led to high levels of integration of informal waste pickers into the solid waste management system in various cities. In Pune, for example, waste pickers have been authorized by the municipal government to provide household waste collection, providing them with direct access to recyclables (India) There are currently 24 officially recognized waste picker organizations in India, with various levels of contractual and non-contractual relations to the formal authorities. They are formed as cooperatives or associations and are integrated in local source segregation schemes at different levels (India).
For decades an informal collection of recycling materials has taken place in two main ways: 1) street waste picking activities by street dwellers using trash bags found on the curb or taken from offices and shops; and 2) waste picking at open dumps in major cities (Brazil).	There is extensive experience of waste pickers organizing and establishing formal relationships with municipal and national governments. After an initial period of mutual mistrust and conflict, various functioning models of cooperation and partnership between waste picker organizations and formal authorities have evolved (Brazil).
Due to the lack of storage space for their material and/or the lack of money to travel home after a working day, street waste pickers were forced to live in improvised cardboard shacks since they could not leave their material unguarded. Therefore, public space was simultaneously being used as a workplace and a home, causing many problems for urban cleansing. Being seen as people who ‘dirtied the city’ with their activity, treated as ‘part of the rubbish’, those working in the streets were frequently expelled from the curbs to beautify the city and their materials were often confiscated (Brazil).	Meanwhile countless cooperatives have been founded nationwide, where waste pickers are formally organized and a strong network of multiple stakeholders has evolved, strengthening the voice of these informal recycling workers as economic actors in solid waste management. This has resulted in the formation of municipal recycling scheme partnerships between many waste pickers’ organizations and local governments. Relations are regulated with specifically designed contracts, covenants and arrangements, always according to local circumstances. In some cities, recycling is formally assigned to cooperatives of informal recyclers and recycling centers, often subsidized by the municipality and sometimes combined with public-private partnerships. In other cases, support comes from federal agencies or

Challenges	Opportunities
	international donors (Brazil).
Waste pickers working at the open dumps were socially 'invisible' as their activity generally takes place out of sight on the periphery of the cities (Brazil).	Source waste separation schemes have been initiated in some cities, either at household level (door-to-door) or with drop-off systems in public areas. The recyclables are collected by the municipality or by private contractors and transported to the waste pickers' recycling centers for further sorting, baling and commercialization. Cooperation between waste pickers' cooperatives or associations and municipalities, local governments and the private industry takes place at various levels, depending on the specific political and legal context. In some cases waste pickers' cooperatives even make arrangements with big waste producers to collect the recyclable part of the waste. In spite of the fact that waste pickers have organized into formalized cooperatives, there is still much to be done before these cooperatives represent protected employment for their associates. Waste picking in Brazil nowadays can therefore be seen as a kind of semi-formal activity (Brazil).
In initiatives to fully integrate informal waste collectors into waste collection enterprises, the drop-out rate was high and waste pickers either lost their income opportunities or returned to individual waste picking activities in poor working conditions. Because of the unsteady nature of informal worker activity in waste management, these workers are sometimes perceived as unreliable service providers for waste collection services (India/Brazil/Egypt).	Informal sector workers can position themselves as regular service providers by organizing themselves in cooperatives and other structures able to provide a regular collection service, independent of the workforce of individual informal sector workers. Cooperatives of waste pickers are most durable when they take into account the specific working habits and conditions of waste pickers but nevertheless create a minimally structured environment for reliable business partnership (India/Brazil/Egypt).

Success Factors

Integrating the informal waste sector depends on many factors. The four major enabling conditions relevant for promoting the integration process are shown in Figure 6-7.

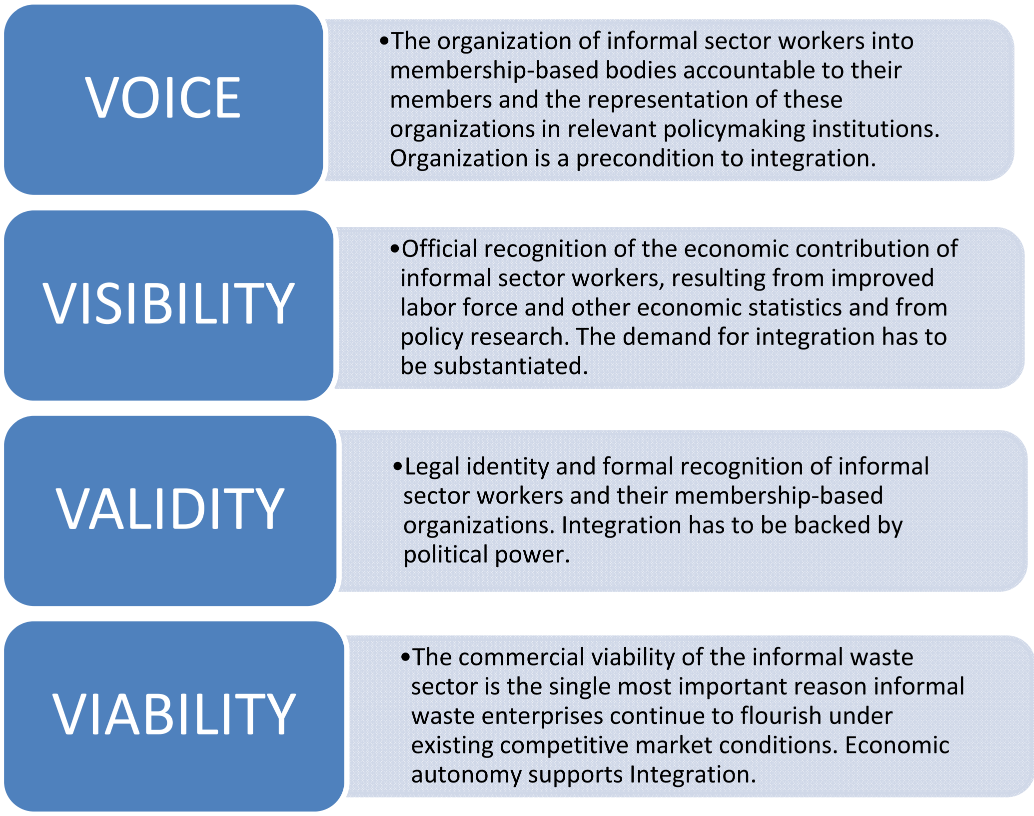

Figure 6-7: Success factors for integration of informal waste pickers

Roles and Responsibilities

The roles and responsibilities of the different actors in the Belgrade WtE project to enhance the livelihoods of Waste Pickers are shown in Figure 6-8.

Figure 6-8: Roles and responsibilities for enhancing the livelihood of the waste pickers in the Belgrade WtE project

Lessons Learned / Recommendations:

- The capacity to structure their activity and comply with regular working hours enhances the informal actors' potential to act as a contracting partner for municipal governments and formal enterprises.
- The creation of self-confidence and trust between informal sector workers is a precondition for organization in cooperatives or small enterprises, an important factor to establish regular relations with the local government and the private sector.
- The entrepreneurial capacities of informal sector workers and organizations are an important factor in the sustainability of informal sector intervention. Long-term trainings / capacity building measures are required, short term management through facilitators / NGOs.
- Involve NGO's as they can create crucial links between the formal and the informal private sector.
- The lack of esteem of the work and social position of waste pickers in the general public should be changed. Information campaigns about recognition of informal waste pickers to enhance their position in general society could be a measure to change this.
- Self-organization models as community recycling yards should be facilitated including management support. Leaving waste pickers to complete self-organization has often resulted in failures. These processes should be accompanied by experienced facilitators / e.g. NGOs or other
- Issue formal work contracts with employees where possible, e.g. by the PPP concessionaire
- Waste pickers who work in public should be legally recognized, get identity cards, uniforms and safety equipment and should be protected by the police against abuse or harassment.
- The municipal police should receive trainings to be able to understand the difficult and complex context and support waste pickers against harassment and abuse.
- In the case of Belgrade / Serbia the integration of Roma Community is especially complex because the demand for integration from the side of waste pickers is assessed to be quite low, also due to a history and vicious circle of discrimination and (self-) exclusion.
- Offer / support driving classes and official driver`s licenses for waste picking transporters (also as qualification to eventually change the sector).
- Providing access to low interest loans to Waste Pickers to improve their means of transportation. Transportation is the single most important factor in their earning ability. Loans for improved vehicles could be repaid quickly from the increased income.
- In addition the City could reach out more to children who are Waste Pickers to attend school. The Ministry of Education should consider allowing and encouraging such children to attend school without registration papers and should, at the same time, assist their parents in obtaining all required legal documents. The City should provide school books and school materials free of charge to poor families to encourage

school attendance. Children should be protected from abuse by other children and teachers. This will help break the cycle of poverty faster than any other single action.

- The City could also reach out to women waste pickers to help them empower their lives. Currently they live under a system of patriarchy, which gives them little decision-making power within the family. Such women should have easier access to family planning and basic education. Assisting waste pickers to have better working conditions is one side of the coin. The other side concerns the conditions in their settlements. Wherever possible, it would be best to legalize existing Roma settlements and assist them in obtaining electricity, water supply, sanitation, domestic solid waste collection, schools, and essential social services. It is recognized that some settlements clearly cannot be improved, primarily because of various difficulties with their locations. The City might consider giving such settlements new locations near the old ones and providing the minimum of infrastructure, such as roads, water supply and sewerage, telephone lines, and electrical lines. They might also be provided access to low interest loans to build better structures.
- City wide efforts are required, which can be only very partly part of PPP Concessionaire’s activities and responsibilities (beyond scope). In order to be successful a professional, long-term social support is required on the entire territory of the CoB. The Concessionaire could however finance trainings of waste pickers and NGO projects to support waste picker integration.

6.7 Summary of impacts

Table 6-2 presents a summary of the significance of the environmental, social and OHS impacts from all project phases, options and components. The evaluation of impacts is made in this E&S Scoping Report in a preliminary way with the objective of providing an overview of the issues which shall be studied in detail during the ESIA, namely by means of specialist studies. These studies are listed in the table. The ToR for these studies (and for the ESIA) will be presented in a later stage.

The table presents the impacts before and after mitigation. The pre-mitigation situation has been assumed in this study as the extreme case where measures normally predicted in the project design and planning are not undertaken (ex.: inclusion of flue gas cleaning systems; provision of PPE to workers; no compensation of PAPs; etc.).

The project transitional period presents a high significance impact for air quality and odours. This is because during this stage no mitigation measures will be undertaken to reduce the impacts caused on these components. Also the emergency measures to be undertaken by the CoB will not address these issues. Several specialist studies are suggested to better address the impacts of this stage during the ESIA process.

During closure and rehabilitation of the existing landfill, no residual high significance impacts are expected. This is because the rehabilitation measures and the closure of the landfill itself will allow the reduction of many of its present environmental and H&S impacts. In particular, the air quality, odours, climate change and visual impacts will be reduced to negligible levels during the monitoring stage. The impacts on surface and groundwater post-mitigation will be of medium significance due to the impossibility of adding a bottom liner to the landfill. The CHS impacts during construction are also classified as of medium significance after mitigation due to the relatively elevated risk of accidents at the construction site in case of trespassing. Also for this stage several specialist studies are suggested.

The new landfill at the new Vinca site, as well as the new WtE facilities will be constructed under strict respect for the applicable law. For this reason, the post-mitigation impacts for all three landfills and three options for the construction and the O&M stages are classified as low and negligible. The exception are the CHS impacts during construction after mitigation. This is due to the relatively elevated risk of accidents at the construction site in case of trespassing.

Even with definition and implementation of mitigation measures, residual impacts on OHS may be of “medium” significance both during construction and O&M of the PPP Project.

The impacts on land acquisition to be verified only at the new Vinca site are deemed to be negligible, in case compensation at replacement cost is received by the affected landowners. Involuntary ressetlement impacts will also be verified at the new Vinca site and these are deemed to be of low significance after resettlement and livelihood restoration. To assess both these matters, a detailed RAP shall be produced and implemented.

The impact on on waste pickers is considered of medium significance, as the the residual impact cannot easily be reduced. Mitigation measures need to be considered at the CoB level.

Table 6-2: Summary of the significance of the environmental, social and OHS impacts of the PPP Project

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the EIA and supplemental ESIA)
		Construction		O&M		
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	
Project Transitional Period (2016-2018)						
Air Quality and odors	--	--	--	High	High	--
Climate Change	--	--	--	Low	Low	--
Surface and Groundwater	--	--	--	High	Medium	Groundwater quality assessment at the end of 2018 ; Surface water quality assessment at the end of 2018 ;
Soil	--	--	--	Medium	Low	Soil contamination assessment
Noise and vibrations	--	--	--	Medium	Low	Noise baiseline measurement Qualitative assessment of bird fauna
Landscape and visual aspects	--	--	--	Low	Low	--
Flora	--	--	--	Medium	Medium	--
Fauna	--	--	--	Medium	Medium	Qualitative assessment of bird fauna
Other CHS Impacts	--	--	--	High	Medium	--
Closure and rehabilitation of the existing Vinča landfill (2019-2023)						
Air Quality and odors	--	Medium	Low	High	Negligible	--
Climate Change	--	Negligible	Negligible	Low	Negligible	--

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the EIA and supplemental ESIA)
		Construction		O&M		
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	
Surface and Groundwater	--	Medium	Low	High	Medium	Groundwater quality assessment; Surface water quality assessment
Soil	--	--	--	Medium	Low	Soil contamination assessment.
Noise and Vibrations	--	Medium	Low	Medium	Low	--
Landscape and Visual aspects	--	Low	Negligible	Low	Negligible	--
Flora, fauna, and habitats	--	--	--	--	--	--
Other CHS Impacts	--	High	Medium	High	Low	--
New landfill at the new Vinča site (2017-2046)						
Air Quality and odors	Interim landfill	Medium	Low	Medium	Low	--
	WtE residues landfill	Medium	Low	Medium	Low	--
	C&D waste landfill	Medium	Low	Medium	Low	--
Climate Change	Interim landfill	Negligible	Negligible	Low	Negligible	--
	WtE residues landfill	Negligible	Negligible	Low	Negligible	--
	C&D waste landfill	Negligible	Negligible	Low	Negligible	--
Surface water	Interim landfill	Medium	Low	High	Low	Surface water quality assessment
	WtE residues landfill	Medium	Low	High	Low	
	C&D waste landfill	Medium	Low	Low	Low	
Soil and Groundwater	Interim landfill	Medium	Low	High	Low	Groundwater quality assessment
	WtE residues landfill	Medium	Low	High	Low	
	C&D waste landfill	Medium	Low	Low	Low	
Noise and Vibrations	Interim landfill	Medium	Low	Medium	Low	Qualitative baseline assessment of bird fauna

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the EIA and supplemental ESIA)
		Construction		O&M		
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	
	WtE residues landfill	Medium	Low	Medium	Low	--
	C&D waste landfill	Medium	Low	Medium	Low	--
Traffic and Transport	Interim landfill	Medium	Low	--	--	--
	WtE residues landfill	Medium	Low	--	--	--
	C&D waste landfill	Medium	Low	--	--	--
Landscape and Visual aspects	Interim landfill	Low	Negligible	Low	Negligible	--
	WtE residues landfill	Low	Negligible	Low	Negligible	--
	C&D waste landfill	Low	Negligible	Low	Negligible	--
Flora, fauna, and habitats	Interim landfill	Medium	Low	Medium	Low	Qualitative baseline assessment of bird fauna
	WtE residues landfill	Medium	Low	Medium	Low	
	C&D waste landfill	Medium	Low	--	--	--
Historical sites	Interim landfill	Medium	Low	--	--	--
	WtE residues landfill	Medium	Low	--	--	--
	C&D waste landfill	Medium	Low	--	--	--
Other CHS Impacts	Interim landfill	High	Medium	High	Low	--
	WtE residues landfill	High	Medium	High	Low	--
	C&D waste landfill	High	Medium	High	Low	--
Construction, Operation and Management of the MSW treatment facilities (2017-2046)						
Air Quality	Option 1	Medium	Low	High	Low	Background air quality assessment Air dispersion calculation
	Option 2	Medium	Low	High	Low	
	Option 3	Medium	Low	High	Low	
Odours	Option 1	--	--	High	Low	--
	Option 2	--	--	High	Low	--
	Option 3	--	--	High	Low	--

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the EIA and supplemental ESIA)
		Construction		O&M		
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	
Climate Change	Option 1	Negligible	Negligible	Low	Low	Climate change impact assessment
	Option 2	Negligible	Negligible	Low	Low	
	Option 3	Negligible	Negligible	Low	Low	
Surface water	Option 1	Medium	Low	High	Low	Surface water quality assessment
	Option 2	--	--	--	--	--
	Option 3	Medium	Low	High	Low	Surface water quality assessment
Soil and Groundwater	Option 1	Medium	Low	High	Low	Groundwater quality assessment
	Option 2	Medium	Low	High	Low	
	Option 3	Medium	Low	High	Low	
Noise and Vibrations	Option 1	Medium	Low	Medium	Low	For Cerak: background noise assessment; predictive noise impact assessment.
	Option 2	Medium	Low	Medium	Low	
	Option 3	Medium	Low	Medium	Low	--
Traffic and Transport	Option 1	Medium	Low	Medium	Low	Traffic and transport assessment
	Option 2	Medium	Low	Medium	Low	
	Option 3	Medium	Low	--	--	--
Landscape and Visual aspects	Option 1	Low	Negligible	High	Medium	--
	Option 2	Low	Negligible	High	Medium	--
	Option 3	Low	Negligible	Medium	Low	--
Flora, fauna, and habitats	Option 1	Medium	Low	--	--	--
	Option 2	Medium	Low	--	--	--
	Option 3	Medium	Low	--	--	--

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the EIA and supplemental ESIA)
		Construction		O&M		
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	
Other CHS Impacts	Option 1	High	Medium	Very high	Medium	--
	Option 2	High	Medium	Very high	Medium	--
	Option 3	High	Medium	High	Low	--
Transversal impacts - Occupational H&S						
OHS impacts	**--**	Very high	Medium	Very high	Medium	**--**

Factor	Sub-component or Option	Significance of the impacts				Specialist studies (within the ESIA)
		Pre-construction				
		Pre-mitigation	Post-mitigation			
Transversal impacts - Social impacts related to land acquisition and involuntary resettlement						
Land Acquisition	--	Low	Negligible			RAP
Involuntary Resettlement	--	Medium	Low			RAP
Waste pickers	--	Medium	Medium			--

7. Public Disclosure and Information, SEP

The first draft of the SEP was prepared in February-March 2016 by the CoB.

So far no systematic activities of Stakeholder Consultation related to the Project have been implemented. However, as the Project has undergone several earlier planning stages a number of activities were carried out from 2011 to date.

- The Local Waste Management Plan was disclosed in the CoB and Municipality of Grocka in 2011 incl. field discussions and public display;
- An EIA for the Local Waste Management Plan was conducted;
- The Urban Plan for Vinca was on public display in April 2015 including plans for the Vinca landfill's extension;
- A Declaration of Public Interest and Expropriation Notification, including expropriation interviews were conducted with land owners at the Vinca landfill's extension area from January to September 2015;
- The Urban Plan for the Cukarica Municipality was on public display in December 2015, including a passage on the Cerak project option;
- There was a TV presentation of the Project by the CoB in November/December 2015;
- Additional coverage by newspapers and other National Media existed but this was not specified.

According to the Draft SEP, "the communication with stakeholders and the community was conducted through various channels – via announcements in the newspapers, through placing announcements on the office information board, via radio or tv.

Depending on the type of announcements/communication the frequency may vary between once-twice a month to on-the-need basis. These announcements mostly relate to project progress information, completion or issues in certain part of the project, sanitary issues, payment for communal services, and other. General announcements are sometimes made in the local and international newspapers (Economist).

Further the CoB established and maintains working relationships with the City's municipalities and national government. The circulation and disclose of information through local authorities is part of their information disclosure procedures, while being responsible for these tasks.

There have been public consultations in the past regarding adoption of the Local Waste Management Plan (with NGOs, National and CoB institutions, companies and citizens), during the adoption of the DPR of the Vinca landfill, and when the Action Plan for Environmental Protection of the CoB was adopted (the project is integral part of it). An EIA was made for the

Vinca landfill and the Local Waste Management Plan and was also on public display before adoption".

The draft SEP includes a plan of actions with deadlines and responsibilities in order to assure the maximum engagement level for all relevant stakeholders (Table 7-1). All communication methods noted (including leaflets, press releases, website notifications, reports, meetings, etc) will be in the local language. The documentation intended for international stakeholders will be prepared in English as well.

A list of dates, location and content of information and disclosure activities is missing in the SEP. Precise records should be presented in tabular form or as an Annex to the final version of the SEP.

A Grievance Mechanism is suggested in the SEP. Stakeholder complaints / suggestions can be made in writing, by email or by telephone to the provided contacts. The CoB keeps a record of citizens who have made written complaints or grievances. Every grievance is considered and dealt by the City as per national and City legislation. All complaints are answered within 30 days from the date of receipt. A copy of the response is filed.

The CoB proposes to upload a grievance form on the website. The operators of the existing landfill and the new regional landfill will be provided with the Inquiry and Complaint Grievance form (a sample form is found in Appendix A of the SEP).

Once collected, the grievances need to be processed and recorded as suggested below:

"All complaints will be recorded in the register of complaints and inquiries and will be acknowledged within seven (7) calendar days. The Company will consider a complaint within 20-30 calendar days of its registration date, based on the complexity of the inquiry/complaint. If desired, the complaints can be left anonymously; however, even in this case, it is recommended to maintain a reliable feedback channel".

The CoB sees "the main objective of the SEP (...) to increase the effectiveness and relationships with all their stakeholders. The SEP presents the general principles, as well as mechanisms and tools which are to be used for engaging the stakeholders throughout the Project lifecycle. This SEP is a living document, which will be revised and updated on an on-going basis during the course of the project's lifecycle."

Table 7-1: Actions planned within the SEP prepared by the CoB

No.	Activity	Requirement	Stakeholders	Timing	Responsibility	Communication/ Media Tool
	t Preparation Phase					
1.1	Notify stakeholders and general public of the public consultation meeting.	Law on Environmental Protection	Affected population, public and private sector enterprises Local and regional Authorities NGOs General public	TBC (To be confirmed)	Company Consultant Contact persons at the City	Information leaflet to be distributed via the Company to contact persons at the City, the Company's website, local mass media
1.2	Undertake public consultation meeting.	Law on Environmental Protection	Affected population, public and private sector enterprises, Local and regional Authorities, NGOs, General public, Women and children specifically		Company Consultant	Premises will be provided by the City Communication and media tool - TBD
1.3	Notify stakeholders and general public of the Project public consultation meeting		Affected population, public and private sector enterprises National, local and regional Authorities NGOs General public	TBC	Company Consultant (TBC) Contact persons at the City	Notifications to be distributed via the Company to contact persons at the City, the Company's website, mass media
1.4	Disseminate information about anticipated construction activities that might affect stakeholders.		Affected population, public and private sector enterprises	TBC (four months prior to construction activities)	Company, in cooperation with local authorities, if required	Notifications on the Company's website, local information boards, local mass media, directly to enterprises and municipal service organizations. Arrange an information board on a proposed landfill site.

No.	Activity	Requirement	Stakeholders	Timing	Responsibility	Communication/ Media Tool
2	**Construction Phase**					
2.1	Keep stakeholders informed on any project or construction-related activities that might affect them.		Affected population, public and private sector enterprises Municipal service organizations	TBC, (sufficiently well in advance and 1 week prior to any activities)	Company, in cooperation with local authorities, if required	Notifications on the Company's website, local information boards, local mass media, directly enterprises and municipal service organizations.
2.2	Notify stakeholders of landfill closures.		Local and national authorities Affected population, public and private sector enterprises	TBC, (sufficiently in advance and at least 2-3 months prior to closure)	Company, in cooperation with local authorities	Notifications on the Company's website, local information boards, local mass media, directly enterprises and municipal service organizations. Notifications via operators and at the dumpsite gates.
2.3	Regularly review, update and disclose the updated SEP, and ensure its timely implementation.		Affected population, public and private sector enterprises National, local and regional Authorities NGOs, General public	On-going, at least bi-annually	Company and the City	Company's website and where necessary
3	**Operation Phase**					
3.1	Regularly review, update and disclose updated SEP, and ensure its timely implementation.		Affected population, public and private sector enterprises National, local and regional Authorities NGOs General public	On-going, at least annually	Company City	Company's website and where necessary
3.2	Organize awareness raising/behavior change training focused on women and children		Women and children in the community General public	On-going, at least quarterly	Company City	Notifications on, local information boards and trainings at Vinca, Zvezdara, Cukarica Municipalities

8. Preliminary comparison of the project options

This Section presents the results of the preliminary comparison of Options 1 to 3. The comparison of the assessed project options is made on the basis of the number and nature of the preliminarily indentified E&S impacts. The basis for the comparison lies on the capacity of the Option under study to avoid, or at least, minimize the impacts on the environmental and social features of the project areas. This section only compares the impacts of the MSW treatment facilities, as the other PPP project components are similar for all 3 options.

This exercise is undertaken based on the existing situation at each of the two project sites and the potential impacts that each alternative may deliver to the human, biological and physical environment. Factors such as presence of human receptors, potentially sensitive environmental features (like shallow acquifers), project-specific impacts (like emission of odours), etc., have been considered.

Features potentially impacted and compared are:

- Air quality impacts;
- GHG emissions (transport of waste and materials);
- Noise impacts (transport of waste and materials);
- Odours
- Surface water quality impacts:
- Soil and groundwater quality impacts;
- Noise and vibrations (emissions from the plants);
- Landscape and visual impacts:
- Flora, fauna and habitats
- Results of stakeholder engagement/public opinion on the project;
- Emergency risks and impacts (especially important for the new Cerak site due to its proximity to a residential area located 120 m from the potentially future mass burn or incinerator).
- Resettlement impacts.

The following scale is used for the comparative assessment of the project options:

- (-): whenever the option shows clear disadvantages for the feature in relation to other options;
- (0): whenever the option does not show clear advantages or disadvantages for the feature in relation to other options;
- (+): whenever the option shows clear advantages for the feature in relation to other options.

The classification of the Project Options based on the scale above described is undertaken as a relative assessment, i.e., based on a comparative approach.

At this stage, no feature was considered more „significant for the decision“ than the others. This means that all factors are weighted equally.

Table 8-1: Preliminary classification of the Project Options based on the impacts delivered and the baseline conditions of the Project sites

Features to be impacted	Option 1	Option 2	Option 3	Justification
Physical environment				
Air Quality	0	0	+	The air quality assessment shall be refined during the ESIA stage, and the following conclusions shall be seen as preliminary. The screening study preliminarily points to a fulfillment of the national and international air quality standards at both sites. It also helps to understand that there is a possibility that the Project will have a negative impact on the concentration of NO_2 in the Vinča site and in the Cerak site, because there is a certain risk that the WBG EHS guidelines recommendation for new projects (that their contribution shall not be more than 25% of the applicable AQS) is not fulfilled. However, a complete analysis including existing background pollutants' concentration shall be undertaken by the PPP contractor during the ESIA stage to confirm this preliminary conclusion. No sensitive receptors are expected to be located downwind of the new Vinča site (Option 3). There are densly populated habitational areas downwind (northwest and east) of the new Cerak site (Options 1 and 2). Option 3 presents the clear advantage of less disturbance of residential receptors.
Climate change (GHG emissions from transport) Noise and vibrations (emissions from transport)	-	0	+	Option 1 implies three transportation routes: one existing route to transport residual MSW between the Belgrade waste transfer stations and the new Vinča site; a new route to transport RDF between the new Vinča site and the new Cerak site; and a third route, also new, to transport treatment residues (bottom ash, fly ash, FGC residues) between the new Cerak site and new Vinča site. No new or cumulative GHG or noise emissions are expected from the existing route. New GHG and noise emissions are expected from the two new routes. Option 2 implies two new transportation routes: transport of residual MSW between the Belgrade waste transfer stations and

Features to be impacted	Option 1	Option 2	Option 3	Justification
				the new Cerak site, replacing the existing transport of residual MSW to the Vinča existing site; and transport of treatment residues (bottom ash, fly ash, FGC residues) between the new Cerak site and new Vinča site. GHG and noise emissions from the transport of residual MSW from the Belgrade transfer stations to the existing Vinča site are replaced by GHG and noise emissions for the transport of residual MSW to new Cerak site and the transport of treatment residues to new Vinča site. Option 3 implies one transportation route, which is practically the same as the one existing presently (transport of residual MSW between the Belgrade waste transfer stations and the new Vinča site). No new or cumulative GHG or noise emissions are expected.
Odours	0	-	0	Options 1 and 3 present no additional risk for odour emissions, as the residual MSW treated in the MBT or Incineration Plant (both providing active odour control) at the new Vinca site is similar to that already present at the existing Vinča site nowadays. Options 1 and 3 will rather reduce the odour emissions at Vinča site in the future. The RDF delivered to the new Cerak site under Option 1 will present no odour. Albeit active odour control measures, Option 2 presents risks for new odour emissions to the neighborhood of the new Cerak site due to the delivery of untreated residual MSW to the site to be burned in the Incineration Plant. On the other hand, under Option 2 odour emissions at new Vinča site are removed. The effect however is negligible due to the distance to the next receptors.
Surface water quality	0	0	0	No process waste water will be generated by the CHP or Incineration Plants. Any other waste water streams from the operation of the MBT/WtE facilities will be treated, except for fecal water, which will be transported to the WWTP or released to the sewer. The construction of the waste treatment facilities of Options 1 and 3 at the new Vinča site is proposed in the south-eastern part of the site. It is as therefore not expected that untreated waste water will affect the distant surface water receptors on the opposite side of the existing landfill. No surface water bodies are present in the new Cerak site. Therefore, the

Features to be impacted	Option 1	Option 2	Option 3	Justification
				construction and operation of the CHP (Option 1) or mass burn incinerator (Option 2) is not likely to present a risk to surface water.
Soil and groundwater quality	0	0	0	All options have the potential for generation of residues which need to be treated and landfilled. Among these are: Bottom ash, which will be transported to new Vinča site for maturation and treatment before being recovered or landfilled o the new landfill Fly ash and FGC residues, which are originally hazardous residues. These will be transported to the new Vinča site for treatment and solidification, thus losing its hazardous character before being landfilled on the new landfill. MBT residues are landfilled on the new landfill at new Vinča site. Considering the obligation of the PPP Contractor to construct the new facilities according to Serbian and EU norms, it is expected that any potential impacts on soil and groundwater will be reduced to a low significance level.
Noise and vibrations (emissions from the plants)	0	0	+	The treatment plants generate a certain level of noise, which however is expected to be controlled to comply with the applicable noise standards. Furthermore, traffic noise will occur from the transportation vehicles which access to and exit the sites, as well as from loading and unloading operations of MSW, RDF, bottom ash, fly ash, FGC residues and consumable deliveries. The new Vinča site is not considered to be a noise sensitive site due to its distance to the next settlements. It is expected that the Roma communities will be resettled by the time the construction of the WtE facilities begin. Furthermore, it needs to be considered that presently residual MSW is delivered to the Vinča site. Thus there will be no change on the traffic and unloading noise levels. On the contrary, at the new Cerak site impacts on noise levels may affect the neighboring living areas. Potential noise emissions from the plant and traffic would be new.
Landscape and visual	0	0	+	Options 1 and 2 imply construction of facilities on an industrial area, but close to several visual receptors (the new Cerak site). The body of the CHP or incineration plant is considerable large and cannot be hidden in the flat area at new Cerak site.

Features to be impacted	Option 1	Option 2	Option 3	Justification
				The treatment facilities of options 1 and 3 build in new Vinča site (MBT plant, Incineration) are equally huge, however the visual impact is expected to be rather limited given the favourable topography and remoteness of the new Vinča site.
Biological environment				
Flora, fauna and habitats	0	0	0	All options imply permanent impacts of similar intensity, as both new project sites will need to be cleared of vegetation.
Human environment				
Results of stakeholder engagement/public opinion on the project	0	0	+	So far no systematic activities of Stakeholder Consultation related to the Project have been implemented. The Urban Plan for Belgrade has been disclosed, and complaints have been registered related to the new Cerak site, but no details of these have been made available. Specific project related public consultation has not been undertaken so far. Some information disclosure activities have been undertaken (details are found in Section 7 of this report). It is unlikely that complaints related to the new Vinča site will be registered, given its distance to the next receptors and relatively „hidden“ location. For this reason, Option 3 is considered to be more favorable from a “public acceptance” point of view.
Emergency risks and impacts (CHS)	0	0	+	Option 1 implies three transportation routes, two of them new, which imply an increased risk of traffic accidents. In addition, Option 1 implies the construction of a CHP Plant close to a residential area. Unlikely major non-routine events may have a potential negative impact on CHS. Option 2 implies 2 new transportation routes, but one route would replace an existing one. Still there will be some increased accident risk, although minor than in Option 1. This Option implies the construction of an Incineration Plant close to a residential area. Unlikely major non-routine events may have a potential negative impact on CHS. Option 3 does not imply any increased traffic accident risks, as the transportation route is an existing one. This Option implies the construction of an Incineration Plant, however it is far from any residential area. Unlikely

Features to be impacted	Option 1	Option 2	Option 3	Justification
				major non-routine events may have a limited negative impact on CHS.
Resettlement impacts	0	0	0	All three options are build on land in the ownership of the city. The resettlement of the Roma population is a general project pre-requisite for all 3 options.

Note: (e) = significant for the decision

The above preliminary comparison of the options based on preliminary impacts comes to the conclusion that:

- Options 1 and 2 have similar numbers of disadvantages
- while Option 3 can gather the advantages to its side.

The new Cerak site is responsible for many of the disadvantages of **Options 1 and 2**:

- the location of the project site is in close proximity (ca. 120 m) to residential areas which
  - makes potential noise, odour and air imissions more significant;
  - causes a more visible visual impact of the treatment plant;
  - causes a higher risk of objections;

Additionally **Option 1** requires substantial more transportation efforts between new Cerak and new Vinča site than the other options, given the spread of the MSW treatment on two sites..

Option 3 shows the most advantages in relation to the other options. This is mainly related to the fact that

- it is located relatively distant from sensitive human receptors,
- in an area where the visual impacts would not be felt and
- that it will be located in close vicinity to the existing waste disposal site, i.e. the MSW transportation routes would remain the same as presently.

9. Assessment of data and information gaps

This Section presents the information gaps that prevent the complete understanding of the existing environmental conditions in both project study areas. These gaps are related to the resources, contamination sources, exposure pathways and receptors, and their closing is a key pre-requisite for an appropriate ESIA for the project.

The main information gaps at the new and existing Vinča sites are the following:

- **Geology/Hydrogeology:** Subsurface conditions in the Vinca sites have been preliminarily identified, the nature and extent of groundwater contamination has not been fully determined;
- **Soil:** The nature and extent of soil contamination in the existing landfill area of influence has been preliminarily investigated; migration of the LFG in soil has not been investigated;
- **Noise:** Background noise levels at the existing site have not been monitored.
- **Surface water:** The nature and extent of surface water (Ošljan stream, the Ošljan swamp, and the Danube River) contamination has been partly determined, with the key data missing in respect to biological conditions and sediment contamination;
- **Ambient air quality:** Dispersion of airborne dust downwind from the existing landfill active face has not been monitored. The other existing air quality data do not have the necessary spatial nor temporal representativeness.
- **Flora, fauna and habitats:** Habitat survey and mapping has been partly determined, without encompassing the nearby water habitats (the Ošljan swamp and the Danube River); the potential ecological value of the study area for birds, given the proximity of the Danube River, has not been determined.
- **Population:** Demographic and Socio-Economic Data of residents at the access road and vicinity of the landfill are not available.
- **Stakeholder Engagement:** A draft Stakeholder Engagement Plan was prepared by the City, but should be substantiated and updated as a working document (as commented in the SEP Draft) and subsequently needs to be updated, implemented and monitored.
- **RAP:** RAP needs to be prepared including proper socio-economic survey of affected households and implemented. PIU should employ environmental and social project team in order to guarantee timely preparation and implementation. External RAP audit is recommended.
- **Waste-Pickers:** Socio-Economic Data and Livelihood Situation of Waste-Pickers active at the landfill site are not available (social survey required)

The main information gaps at the new Cerak site are the following:

- **Soil and groundwater:** Background condition of soil and groundwater at the district heating plant site (including the project site) have been preliminarilydetermined;
- **Noise**: Background noise levels at key representational receptors have not been determined;
- **Traffic and transport:** Traffic conditions along the preferable route between the new Cerak site and the new Vinča site have not been determined.
- **Air Quality:** The existing air quality data do not have the necessary spatial nor temporal representativeness.
- **Population:** Demographic and socio-economic data of affected residential areas at the new Cerak site are not available.
- **Stakeholder Engagement:** A draft Stakeholder Engagement Plan was prepared by the City, but should be substantiated and updated as a working document (as commented in the SEP Draft) and subsequently needs to be updated, implemented and monitored.

10. Future work: ESIA

This Section provides information on the national EIA requirements in comparison to the international ESIA requirements, as a complement to the gap analysis presented in Section 4.7. The detailed ToR for the ESIA to be elaborated for the Project will be made available in a later stage.

10.1 National EIA Requirements

When compared to the requirements of international institutions (e.g. IFC PS), the scope of a Serbian EIA is less stringent in respect to the social impact assessment. A formal socio-economic impact assessment is not required under the national legislation. However, local national legislation does require assessment of effects where impacts are associated with human health or changes in population (migration). In addition, the national legislation requires assessment of the potential accidents and emergency response, which has a lot in common with the community health and safety requirements of the international standards. The occupational health and safety issues are not considered in the national EIA. Nevertheless, the acronyms EIA and ESIA should be used to distinguish between the Serbian regulatory process and the assessment being prepared to an international standard.

The topics mandatory in the national EIA are the following:

1. Information on Developer
2. Project Location
3. Project Description
4. Evaluation of Alternatives
5. Environmental Baseline Settings
6. Impact Assessment
7. Potential Accidents and Emergency Response
8. Mitigation Measures
9. Environmental Monitoring
10. Non-Technical Summary
11. Information on Technical Deficiencies or Lack of Information
12. Consultant Team

The detailed content of an EIA is defined by specific Regulation[50].

10.2 EIA Timeline

The formal EIA procedure in Serbia comprises the phases of (1) Screening, (2) Scoping and (3) EIA approval. The competent authority is required to issue the Screening Decision not later than 30 days after submission of the Screening Report. Once the Scoping Report is submitted, the authority has

[50] Regulation on Content of the Environmental Impact Assessment (Off. Journal of RS, No. 69/2005)

to issue the Scoping Decision not later than 38 days. After the submission of the EIA Report, the Consent Decision cannot be issued earlier than 110 days.

It should be noted that the authority is allowed to carry out the Screening and the Scoping procedures at the same time. For instance, after submission of the Screening Report, the authority can directly issue the Scoping Decision (instead of the Screening Decision), thus reducing the administrative duration of the process. This has become a common practice for authorities on both the state and the local level.

After the Scoping Decision is issued, the Project Developer is due to submit the EIA Report in the period of 1 year. Once the EIA Report is formally approved, the Developer shall commence the realisation of the project in the next 2 years. Otherwise, subject to decision of the competent authority, the formal EIA procedure might need to be renewed.

An overview of the formal procedure is illustrated in Figure 10-1.

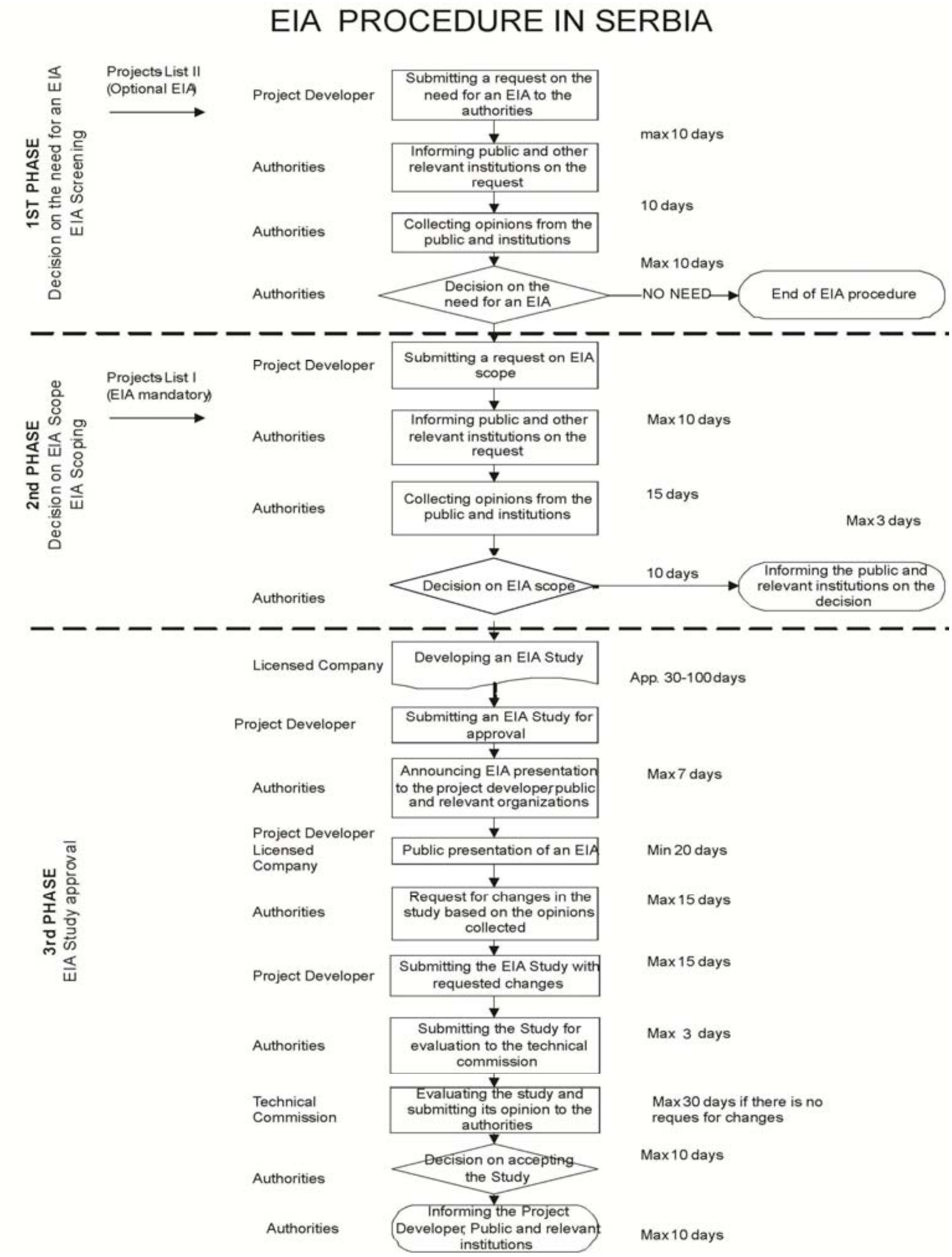

Figure 10-1: Timeline of the national EIA procedure

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12. Annexes

12.1 Annex A: Screening Air Dispersion Calculation

(please see separate document)

12.2 Annex B: Land Acquisition and Resettlement Review

(please see separate document)

12.3 Annex C: List of Site Visits and Meetings

12.3.1 List of Site Visits

- Site Visit to the Vinča landfill: Roma community living areas, landslide area, waste pickers working site (walk over).

- Site Visit to the Cerak site: District Heating Plant, available terrain for new project infrastructure, existing settlements / multi storey buildings in less than 500 m distance.

12.3.2 List of Meetings

Date	Persons met	Organization	Issues discussed
8th September, 24th November and 9th December 2015.	Mr. Filip Abramović and Ms. Snežana Bondižić	Directorate for Waste Management from the CoB	Resettlement needs and process; Waste picker's situation; Socio-economic survey undertaken by the City of the Roma community at the new Vinča site; SEP.
8th September and 9th December 2015	Ms. Nataša Stanisavljević and Jovana Vazura	Secretariat for Social Affairs CoB	Resettlement Planning procedure, Census
9th September 2015	Ms. Jovana Benović	Secretariat of Property CoB	Land acquisition methodology and procedure
9th September 2015	No name (Replacement).	Public Defender's Office CoB	Land Acquisition Process.
10th September and November 2015	Mirjana Nikolić	Grocka Municipality Land Office	Detailed review of the steps undertaken so far for the land acquisition process to extend the Vinča landfill Status of the expropriation process
November 2015	Milena Marjanovic, responsible for valuation of land	Municipal Tax Authority	Clarification of the valuation methodology
10th December 2015	Dejan Tomic Executive Director of Recycling, Mihajlo Janjic, Director of Department for Landfilling and Recycling	PUC Gradska Cistoca	Waste Picker's situation, employment status and perspectives

12.4 Annex D: Map of the 2014 site investigation works

The following map presents the sampling locations of soil, groundwater and surface water during the investigation undertaken in July 2014 as part of the Strategic Environmental Impact Assessment of the DPR. The investigation was carried out by "Zaštita na radu i zaštita životne sredine Beograd" A.D. The investigation results are provided in the respective chapters of this Report (groundwater in Table 5-1, surface water in Table 5-4 and Table 5-5, and soil in Table 5-6).