

8.0 MATERIAL RESOURCES AND WASTE MANAGEMENT

8.1 Scope

The potential impacts from the use of material resources and generated wastes during construction and operation of the Project are discussed in this chapter. A description of the material resources that will be required for the construction and operation of the Project is provided. The waste management baseline conditions have been identified and the types of wastes that will be generated by the Project during construction and operation phases have been identified. The assessment indicates that energy efficiency will be an important consideration in terms of the use of material resources during the operation phase. Furthermore, the following potential issues related to waste management were identified:

- Potential impacts to the environment related to inadequate solid and liquid waste management (excluding medical waste) during construction and operation phases
- Potential health and safety impacts to the patients, workers and employees at the IHC related to inadequate medical waste management during operation
- Potential EHS impacts to the community related to inadequate waste disposal practices specifically from medical waste during operation

8.2 Material Resources

Approximately 200,000 m³ C30/C37 type ready-mixed concrete, 400,000 tons of aggregate, 21,000 tons of iron and 3,800 m² steel carcasses will be needed for the Project. The materials will be procured by the construction contractor and at this stage their sources are not known except that there will be a concrete batching plant (with a capacity of 120 m³/h) within the Project area. The construction material required for the Project will be transported to the site via roads from suppliers. Given the size of the construction sector in Elazığ, it is expected that all materials cannot be supplied from the existing marketplace. No borrow areas or quarries will be operated by the contractor. Therefore, there should be no adverse impacts from the extraction of raw materials or production of finished materials that will be attributable directly to the Project.

Besides the delivery of materials, various types of vehicles and machinery will be used during construction phase. These are identified in *Chapter 2: Project Description* and will all be sourced locally to the extent possible from existing suppliers.

During the detailed design and procurement stage, the contractor will be responsible for identifying sources for all materials and equipment and will be required to consider environmental impacts in selecting materials to be used for the Project. This will include using less harmful materials where possible, considering the carbon footprint of alternative materials and considering the impacts of extraction, processing and transport. In particular, the contractor will be required to:

- source materials from locations as close as possible to the Project site so as to minimize the impact of transport;
- use recycled materials and materials certified as being from “green” or lower carbon sources where practicable;
- source aggregates and materials from quarries, borrow pits, crushing plants and asphalt plants operating with valid environmental and other permits and licenses and where the

sites are managed in full compliance with all applicable environmental standards and specifications.

There will be drinking and potable water usage by construction workers and during construction activities. A 150 lt/day per capita was selected (Turkish Statistical Institute, water consumption data) resulting in a daily water requirement of 300 m³/day (assuming the maximum number of workers is 2,000 at the site during the construction phase of the Project). In addition, water will be used for dust suppression activities, spraying concrete, adding water to backfill material, equipment cleaning and site clean-up. The construction activity water requirement can be taken as 60-70% of the construction worker requirement based on case studies (Wrap UK, 2011). This would mean an additional 210 m³/day water consumption for construction activities. The total daily water requirement for the construction activities would be 510 m³/day.

During the operation phase, there will be water uses related to general domestic and sanitary use (including laundry), food preparation processes, sterilizers and autoclaves, X-ray equipment (water used in the processing of prints), and water used for gardens. A daily water consumption value per capita per bed was identified to vary between 1.25 m³/day (Altin *et al.*, 1999) and 1.60 m³/day (data for large hospitals in the United States (U.S. Energy Information Administration, 2007)). Using the figures provided above, the water consumption of the IHC is predicted to vary between 1,297 and 1,661 m³/day.

The domestic water will be provided from the existing water supply line of the municipality. The water supply increase during the construction and operation of the IHC Project can be considered negligible on the water supply requirements for the region. Bottled water will be procured to meet potable water demands of the staff. In addition, three underground wells will be drilled in the Project area to supply water during construction phase. It should be noted that the great majority of water (90-95%) supplied by the municipality is abstracted from wells drilled by DSI in Elazig.

The electricity, heating and cooling needs of the facility will be supplied from the trigeneration system and boiler that will be installed inside the technical building in the IHC during operation. The trigeneration system and boiler will use natural gas. Data for large hospitals in the U.S. (U.S. Energy Information Administration, 2007) indicates that the yearly electricity consumption is 250 kWh/m². Considering that building area is 203,000 m², the yearly electricity consumption of the IHC would be 50,750,000 kWh. The natural gas will be used for heating and for producing warm water.

The energy and natural gas requirements will therefore be high for the IHC operation. Efficiency opportunities and associated tasks to achieve energy savings will need to be considered in the design and operation of the IHC Project. The IHC Project will need to identify opportunities in the following themes:

- Design of sustainable hospitals (green buildings-green hospital design)
- Best practices and training
- Codes and standards
- Selection of HVAC design and technology
- Electrical system design
- Lighting
- Medical equipment and process loads
- Economic and operational issues

A number of the above mentioned considerations has been requested by MoH to be part of the health campus design as indicated in the bid documentation.

8.3 Waste Management

The waste generation including the medical wastes in the existing healthcare service, on-going disposal practices and review of the waste disposal facilities in Elazig province are presented in this section. Information on baseline conditions and wastes that will be generated during the construction and operation of the Elazig IHC has been identified using the following sources:

- Elazig Environmental Status Report (2014)
- Elazig Development Council, Environmental Sector Report, available at: [\(http://www.elazigkalkinmakurultayi.com/sektor-raporlari/\)](http://www.elazigkalkinmakurultayi.com/sektor-raporlari/)
- Elazig Municipality Strategic Plan for 2015-2019
- Literature Survey (including medical waste studies conducted in Turkey)
- Face-to-face meeting with Elazig Municipality, Director of Environmental Protection

Waste storage, transport and disposal practices during the construction and operation phases of the Project are required to be in full compliance with the regulatory framework. The Turkish regulations that govern the wastes that will be generated during construction and operation of the Project are as follows:

- Waste Management Regulation(Official Gazette (OG) Date/ Number: 02.04.2015/29314
- Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)
- Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755) (will be repealed on 02.04.2016 and continue to be covered under the Waste Management Regulation)
- Packaging Waste Control Regulation (OG Date/Number: 24.08.2011/28035)
- Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)
- Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)
- Regulation on Control of Excavated Soil, Construction and Demolition Wastes (OG Date/ Number: 18.03.2004/25406)
- Regulation on Control of End of Life Tires (OG Date/Number: 31.08.2004/28817)
- Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)
- Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)
- Urban Wastewater Treatment Regulation (OG Date/Number 08.01.2006/26047)
- Regulation on Environmental Permits and Licenses (OG Date/Number: 10.09.2014/29115)
- Communiqué on Road Transportation of Wastes (OG Date/Number: 18.01.2013/28532)
- Regulation on Road Transportation of Hazardous Materials (OG Date/Number: 24.10.2013/28801)
- Regulation on Control of Waste Electrical and Electronic Equipment (OG Date/Number: 22.05.2012/28300)
- Regulation on Wastes Generated from Radioactive Substances Use (OG Date/Number: 02.09.2004/25571)
- Radioactive Waste Management Regulation (OG Date/Number: 09.03.2013/28582)
- Communiqué on Recycling of Certain Non-hazardous Wastes (OG Date/Number: 17.06.2011/27967)

In addition to the Turkish regulations, waste management practices for the Project will also need to abide with the following EBRD and IFC Guidelines:

- EBRD Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal
- IFC General EHS Guidelines
- IFC EHS Guidelines for Health Care Facilities

The Turkish regulatory framework requirements and the conditions set in the IFC and EBRD guidance documents provide inherent mitigation measures against the impacts resulting from waste generation. These conditions were reviewed and discussed in Section 8.7.

8.3.1 Overview of Waste Generation in Elazig Province

Wastes that are generated in the Elazig province include solid waste, domestic wastewater excavation waste, hazardous waste (including medical waste), packaging waste, waste mineral oil, waste batteries and accumulators, waste vegetable oil, end-of-life tires and electrical and electronic waste. The types of wastes together with the volume and rates (to the extent information is available) and disposal locations are discussed below.

Solid waste: According to the Elazig Environmental Status Report (2014), an average of 600 tons of domestic waste is brought daily to the Elazig Solid Waste Disposal Facility for landfilling which has been operational since 2009.

Domestic wastewater: The domestic wastewater generated in the central district of Elazig province is treated in the Elazig Municipality wastewater treatment plant (WWTP) which has physical treatment, biological treatment and sludge removal units (startup date of 1994). Wastewater that is treated in the WWTP also includes domestic wastewater generated and collected from the Mollakendi, Yazikonak, Akcakiraz and Yurtbasi municipalities. Elazig Municipality WWTP has a capacity of 69,984 m³/day. Details about the WWTP are provided in Section 8.3.2.

Excavation wastes: Management of construction and excavation wastes generated in the municipal area is within the responsibility of Elazig Municipality. There is an excavated waste storage area of Elazig Municipality which is located at the outskirts of Meryem mountain, approximately 14.5 km away from the Project area. No information on the amount of excavation wastes yearly generated could be obtained. As reported by Elazig Municipality, Director of Environmental Protection, there is a plan to establish a new excavation waste disposal area near Dogukent neighborhood.

Hazardous wastes: According to the Elazig Environmental Status Report (2014), the amount of hazardous waste generated in Elazig was 744,287 tons for solid state and 55,277 liters in liquid state in 2013. These wastes are either sent to recycling or disposal facilities that have necessary licenses in accordance with the relevant regulations.

Medical wastes: There is a medical waste sterilization facility with a capacity of 1,970 tons/year in Elazig. The medical waste sterilization facility belongs to the Elazig Municipality and it is currently being operated by ERA Environmental Technologies A.S. who has been granted an environmental permit and license by MEUP on 20.06.2013. According to the Elazig Environmental Status Report (2014), 396 tons of medical waste was generated within the Elazig province in 2013. Details about the facility are provided in Section 8.3.2.

Packaging wastes: The packaging wastes generated within Elazig are collected and separated by the Elazig Municipality and also by a private company, namely, Elkay Waste Recycling LTD Sti., which has been granted a license for collecting and separating packaging waste on 07.06.2013. According to the Elazig Environmental Status Report (2014), based on the information retrieved from the Packaging Waste Information System administered by MEUP, a total of 5,853,463 kg packaging waste was collected in Elazig in 2013.

Waste mineral oil: According to the Elazig Environmental Status Report (2014), a total of 115,389 tons of waste oil was collected in Elazig in 2013.

Waste batteries and accumulators: According to the Elazig Environmental Status Report (2014), a total of 149,130 kg waste accumulators and 573 kg of waste batteries were collected in Elazig in 2013.

Waste vegetable oil: According to the Elazig Environmental Status Report (2014), a total of 11,865 tons and 280 liters of waste vegetable oil was collected in Elazig in 2013.

End-of-life tires: According to the Elazig Environmental Status Report (2014), the amount of recycled end-of-life tires was 1,160 tons while a total of 13,860 tons of end-of-life tires were sent to disposal in Elazig in 2013.

Waste electrical and electronic material: According to the Elazig Environmental Status Report (2014), 29 kg of waste electrical and electronic material was disposed of in Elazig in 2013.

8.3.2 Waste Disposal and Treatment

There are four main waste treatment facilities for the management of the waste stream generated in the Elazig province and its vicinity. These facilities are as follows:

- Elazig solid waste disposal facility (under the responsibility of Elazig Municipality)
- Medical waste sterilization facility (under the responsibility of Elazig Municipality)
- Licensed recycling and hazardous waste treatment facilities
- Wastewater treatment plant (under the responsibility of Elazig Municipality)

Elazig Solid Waste Disposal Facility (Landfill)

A large part of the wastes to be generated during construction and operation phases will be managed in Elazig solid waste disposal facility (Figure 8-1) which is operated by the Elazig Municipality since 2009. The facility is located on a 131.8 ha area between Disidi-Coteli-Ucagac villages within the administrative borders of the central district. The process flowchart of the facility is provided in Figure 8-2.



Figure 8-1: Elazig solid waste disposal facility

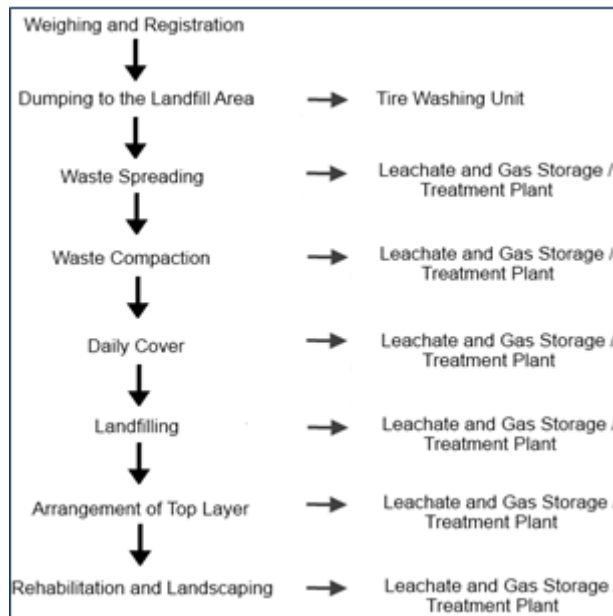


Figure 8-2: The process flowchart of Elazig solid waste disposal facility (landfill)

As reported by the Elazig Municipality, Director of Environmental Protection, the landfill was not operated in an appropriate way and the recent practice at the site is mainly comprised of uncontrolled disposal of wastes. There are plans to improve the site operations through the construction of a second lot. The capacity of the second lot has been planned based on 400 ton/day calculations which will have a five year economic lifespan. According to the Elazig Municipality Strategic Plan for 2015-2019, the second lot of the disposal facility will become operational at the end of 2015.

Medical Waste Sterilization Facility

Medical waste which is collected from hospitals and other healthcare facilities are sterilized in the medical waste sterilization facility which is owned by Elazig Municipality and currently being operated by ERA Environmental Technologies A.S. who has been granted an environmental permit and license by MEUP on 20.06.2013. The facility is located in Saricubuk village of Elazig central district at an approximate distance of 12.5 km to the Project area. The capacity of the sterilization

facility is 1,970 tons/year. As indicated by the Elazig Municipality, Director of Environmental Protection, the capacity of the sterilization facility can be increased after two years to have a capacity of 5,000 tons/year. The photographs of the medical waste sterilization facility are provided below:

Photo 1: Overview of the facility



Photo 2: View from inside the facility



(Source: <http://www.eracevre.com/index.php/projeler/biten-projeler/elazig-tibbi-atik-sterilizasyon-tesisi>)

Licensed Third Party Waste Management Facilities

The licensed third party waste management facilities in Elazig province have been reviewed from the MEUP website and are listed in Table 8-1. Wastes during the construction and operation of the Project will be managed at the appropriate facility not only according to their class and type but also according to the status (validity) of the facility permit.

Table 8-1: Licensed waste management (recycling/disposal) facilities located in Elazig and neighboring provinces

No	Name of Waste Facility	Location	Distance to IHC (~km)	Permit Type	Permit Expiry Date
1	Elazig Altınova Çimento San. Tic.- A.Ş.Elazig Altınova Cement San. Tic. A.Ş.	Elazig Center	3.5	Noise Control, Air Emissions, Waste Incineration/Co-incineration, Reuse of Non-hazardous Materials	09.01.2018
2	Elkay Atık Toplama ve Geri Dönüşüm OR.ÜR İN.N.P.M.G.S.T.LTD.Ş -Elkay Waste Recycling	Elazig Center	3	Package Waste Collection and Separation	<u>07.06.2018</u>
3	ERA Çevre Teknolojileri Anonim Şirketi (Elazig Belediyesi Tıbbi Atık Sterilizasyon Tesisi)- ERA Environment Technologies (Elazig Municipality Medical Waste Sterilization Facility)	Elazig Center (Sarıçubuk Village)	12	Medical Waste Sterilization	20.06.2018
4	Doğa Geri Dönüşüm- Doğa Recycling (Sevinç Örs)	Elazig Center	7	Package Waste Collection and Separation	09.04.2019
5	Çevkasan Kağıt San. Amb.Ltd. Şti.	Malatya	100	Package Waste Collection and Separation	11.09.2017
6	Erol Oto Tamir Ve Bakım Servisi	Malatya	100	End of life vehicles temporary storage	16.11.2017
7	Tokgöl Otomotiv Nakliyat Petrol Gıda İnşaat Tekstil Sanayi Ticaret Ltd.Şti.	Malatya	90	End of life vehicles temporary storage	17.11.2017
8	Maya Malatya Atık Ayrışt.Dön.Depo.Bertar Af Hiz.San.Tic.Ltd.Şti Malatya Şubesi	Malatya	94	Package Waste Collection and Separation	13.06.2018

No	Name of Waste Facility	Location	Distance to IHC (~km)	Permit Type	Permit Expiry Date
9	Kentiyol Çevre Yapı İnşaat Madencilik Hizmet Taahhüt Üretim Pazarlama San. Tic. Ltd.Şti	Malatya	80	Medical Waste Sterilization	28.09.2017
10	Emeksizler Hurda Maden İnşaat Nak. İmalat San. Tic. Ltd. Şti.	Malatya	100	Package Waste Collection, Separation and Recovery	29.08.2018
11	Zafer Oto Tamircisi	Malatya	100	End of life vehicles temporary storage	16.10.2019
12	Hünyan Mühendislik-Yakup Karagöz	Bingöl	110	Hazardous Waste Recovery	16.08.2017
13	Aslanlı Otelcilik Tur.İnş.Mim.Müh.Hizm.Gıda.Tar.Hayv. Bio.Pet.Ürün.San.Ve.Tic.Ltd.Şti.	Diyarbakır	115	Waste Oil Recovery	14.11.2018
14	Çevsan Atık Geri Dönsis.San.Tic.Ltd. Şti.	Diyarbakır	110	Package Waste Collection and Separation	12.05.2019
15	Diyar Atık Geri Dönüşüm Tem. Hizm. İnş. Taş. Müh. San. Tic. Ltd Şti.	Diyarbakır	110	Package Waste Collection, Separation and Recovery	18.07.2019

Source: MEUP Website

Elazig Wastewater Treatment Plant

Elazig Municipality WWTP is located on the 17th km of Elazig-Bingol State Highway (Figure 8-3) to the south of the Project area at an approximate distance of 12 km.



Figure 8-3: The location of Elazig Municipality WWTP

The WWTP has been operational since 1994. The design of the WWTP has been made considering the 2020 population projections. The flowchart of the Elazig WWTP is illustrated in Figure 8-4. The WWTP is constructed on 94,000 m² area. The existing capacity of the WWTP is 69,984 m³/day. The amount of treated wastewater was 55,000 m³/day in 2013. According to Elazig Environmental Status report (2014) and based on the information obtained from the Elazig Municipality, Director of Environmental Protection, the capacity and the efficiency of the WWTP are inadequate. In addition, it was also reported by the Elazig Municipality, Director of Environmental Protection that there are separate collection channels for storm water at some locations; however, the water collected in these channels end up in the WWTP which leads to overloading of the design treatment capacity of the WWTP. In order to tackle with these problems, there are plans to improve the quality of wastewater treatment operations in Elazig province. As reported by Elazig

Municipality, Director of Environmental Protection, the existing capacity of the WWTP will be increased to 120,000 m³/day with the addition of a modular treatment system with 50,000 m³/day treatment capacity.

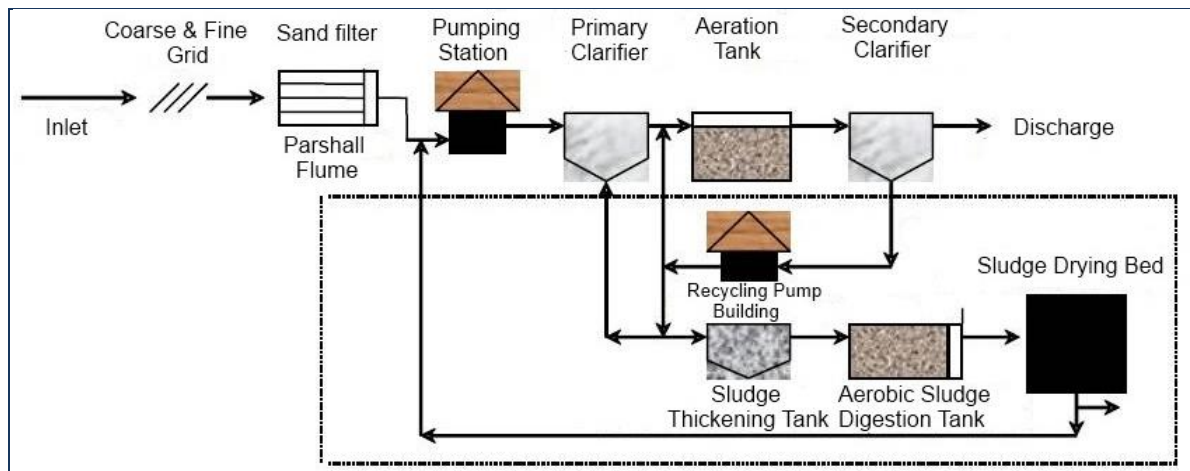


Figure 8-4: The flowchart of Elazig Municipality WWTP (Tepe and Obek, 2006)

According to Elazig Environmental Status Report (2014), the wastewater entering the Elazig Municipality WWTP is treated according to the requirements set in the Water Pollution Control Regulation, Table 21.4: Sector: Domestic Wastewater (Class 4: Population > 100,000 and Biological Oxygen Demand > 6000 Kg/day). A total of 6.4 ton sludge is generated in the WWTP daily which is transported directly to Elazig solid waste disposal facility.

According to Elazig Environmental Status Report (2014), the treated wastewater from the WWTP is discharged to Keban Dam reservoir via the nearby Kehli stream. It should be noted that the quality of the WWTP discharge was investigated in several scientific studies. In the study conducted by Unlu and Tunc (2007), water samples were collected from several locations before and after the confluence where the stream water and water discharged from the WWPT merged. It was demonstrated that high quality stream water drastically deteriorated after the point where WWPT discharge entered the stream. It was also observed that eutrophication was clearly visible in the areas where Kehli stream flows into Keban Dam reservoir which, in turn, implies that the biological treatment of the wastewater is not carried out efficiently. Elazig Municipality, Director of Environmental Protection reported that an advanced biological treatment plant is planned to be constructed in three years in Elazig province.

8.4 Waste Generation and Management during the Construction Phase

The types of wastes that will be generated during construction phase include domestic waste and wastewater, packaging waste, excavation waste, medical waste, hazardous waste, medical waste and special waste. The list of these wastes, proposed management practices and relevant risks related to the load on existing management facilities are given in Table 8-2.

Domestic Waste and Domestic Wastewater: 1.12 kg/day per capita was selected for domestic waste generation (TSI data of average solid waste generation in Turkey) resulting in 2,240 kg/day (assuming the maximum number of workers is 2,000 at the site). Domestic waste will be stored in waste containers and will be collected by the Elazig Municipality garbage trucks. Size and the number of containers as well as the locations of the containers should be considered for proper and

effective waste collection on-site during construction activities. As discussed in detail in Section 8.2 above, assuming that all the water consumed is converted into wastewater, total daily domestic wastewater generation during the construction phase of the Project is estimated to be 510 m³/day which will be within the treatment capacity of the Elazığ Municipality WWTP. ELZ A.S. will obtain a wastewater connection permit since the domestic wastewater will be discharged into the existing municipality sewer lines.

Packaging Waste: Packaging waste such as paper and cardboard, metal, plastic and glass materials will be collected separately in dedicated waste bins. The bins will be located at certain points of site and periodically collected by the authorized packaging waste recycling company. Accordingly, the packaging waste materials will be recycled and recovered.

Excavation Wastes: It is anticipated that approximately 820,000 m³ of excavated material will be generated and 200,000 m³ will be used as cut and fill material during construction. 620,000 m³ excavation wastes will require off-site disposal. Excavation wastes will be transported to the designated excavation waste disposal area of Elazığ Municipality. This practice is already on going by transferring excavation waste to the designated disposal area. As reported by ELZ A.S., approximately 201,000 m³ of soil has been excavated to date. 127,000 m³ of the excavated soil has been transferred to the excavation waste disposal area designated by the Elazığ Municipality while the remaining amount of 74,000 m³ is being stored temporarily within the Project area to be used as fill material.

Medical Wastes: Medical waste will be generated at trace amounts during construction phase due to minor cuts and first aid activities from the polyclinic on-site.

Hazardous Wastes: Hazardous waste will include contaminated/oily fabrics and filters, contaminated packaging material, paint residue, used chemicals and similar. The hazardous waste will be separately collected in dedicated containers on-site and will be stored at the dedicated area which will be placed on concrete ground. All hazardous waste containers will be labeled with the waste codes and waste types. Hazardous wastes will be sent to the licensed hazardous waste recycling and/or disposal facilities according to their waste types and the facility license type.

Special Wastes: Each special waste will be managed according to the relevant Regulation such as:

- Waste Mineral Oils will be collected in red colored metal drums and will be delivered to the licensed facilities.
- Waste Vegetable Oils will be collected by the licensed recycling facility. The necessary containers are provided by the facilities.
- Waste batteries will be separately collected in battery box. The box will be collected by TAP (the authorized waste battery collector for TAP) to recycle at the licensed recycling facility.
- Waste accumulators will be delivered to the supplier. No need to store the waste accumulators on-site.
- Fluorescent lamps will be collected by the licensed hazardous waste transportation company and delivered to IZAYDAS.
- Waste Electronic and Electrical Equipment (WEEE) will be sent to the licensed facilities.

Table 8-2: Waste characteristics and disposal methods during construction activities

Waste Class	Waste Type	Waste Code	Characteristics	Governing Regulation	Proposed Management	Disposal Method	Risks
Domestic Waste	Solid Wastes	20 03 01	Non-hazardous-household waste from the camp sites (estimated as 2,240 kg/day)	Waste Management Regulation (OG Date/Number: 02.04.2015/29314)	Impermeable and sealed waste containers	Elazig Solid Waste Disposal Facility	Low Risk. Facility already in use and has adequate capacity to receive waste.
	Domestic Wastewater	20 03 01	Generated by workers at the campsites and during construction activities (estimated as 510 m ³ /day)	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Direct discharge into the nearby municipal wastewater collection line	Elazig WWTP	Low Risk. Number of workers represents a small increase in the wastewater being generated in the region and for treatment at the WWTP.
Excavation Waste	Excavated material-non contaminated	17 05 04	Non contaminated natural soil material due to levelling and excavation for foundations (estimated to be 620,000 m ³)	Regulation on Control of Excavated Soil, Construction and Demolition Wastes (OG Date/Number: 18.03.2004/25406)	Temporary piling on ground within construction site with care against dust generation and surface runoff	Excavation waste disposal area designated by Elazig Municipality.	Low Risk. There is a designated area by the municipality for the disposal of excavation waste.
Packaging waste	Recyclable metal and glass waste	15 01 04 (metal) 15 01 07 (glass)	Non-hazardous - Generated from packaging of products brought to the site that will include certain plastic materials, textile waste Nonhazardous-Metal wastes shall be disposed separately for reuse and recycling.	Packaging Waste Control Regulation (OG Date/Number: 24.08.2011/28035) Communiqué on Recycling of Certain Non-hazardous Wastes (OG Date/Number: 17.06.2011/27967)	Impermeable and sealed waste containers	Elazig Solid Waste Disposal Facility or other licensed facilities for packaging waste collection listed in Table 8-1.	Low Risk. Packaging waste transport and disposal/recycling are common practices that are well regulated by MEUP and there are several facilities in the region to collect the packaging waste.
Special Wastes	Waste oils	13 01 ... 13 02 ... Code to be defined based on type of waste oil	Hazardous materials- Generated from upkeep and use of construction equipment	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	Waste oils will be segregated and stored based on the waste oil category.	Licensed waste oil recycling facilities listed in Table 8-1 or outside the region.	Low Risk. Waste oil collection, transport and disposal/recycling are common practices that are well regulated by MEUP.

Waste Class	Waste Type	Waste Code	Characteristics	Governing Regulation	Proposed Management	Disposal Method	Risks
	Waste Batteries Waste Accumulators	20 01 33* 16 06 01*	Generated from construction equipment used at the site	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	Stored in special containers and areas as in line with the regulations. Waste batteries to be delivered to TAP and waste accumulators to dealers.	Elazig Solid Waste Disposal Facility temporary waste batteries collection unit.	Low Risk since this is an established practice and the waste batteries and accumulators will not represent a large increase in the existing waste stream.
Hazardous wastes	Pharmaceutical waste, liquid fuel, chemical substances, antifreeze, vehicle/engine filters, oiled textile, old filters, polluted soil, etc.		Hazardous wastes can mainly be generated during maintenance of vehicles.	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	Hazardous wastes will be separated from other types of wastes generated on the site and stored based on the waste code. Wastes shall be temporarily stored for a maximum of 6 months on the site on a designated area and labeled with special signs. These areas will have an impermeable surface and be covered in case of any spills or leakage of hazardous wastes.	Licensed waste recycling and disposal facilities including the ones listed in Table 8-1 in the province as well as those outside the region (e.g., IZAYDAS).	Low Risk. Hazardous waste collection, transport and disposal are common practices that are well regulated by MEUP.
	Excavated material - in case the soil quality investigation program ongoing at the site reveals contaminated soil	17 05 03*	Contaminated natural soil material due to levelling and excavation for foundations	Waste Management Regulation (OG Date/Number: 02.04.2015/29314)	Temporary piling on ground within construction site with care against dust generation and surface runoff and surface soil contamination. Needs to directly truck the material off-site without temporary storage.	Elazig Solid Waste Disposal Facility, if levels of contamination in the leached solution pass the leachate test given in Hazardous Waste Control Regulation (HWCR). Izaydas Izmit Facility Class I, if levels of contamination in the leached solution fail the leachate test given in HWCR.	Low Risk. Either of these solutions is feasible and complies with the regulatory framework.
Medical Waste	Infectious waste, pathological waste, sharps waste	18 01 ...* 18 02 ...*	Generated from infirmary during construction	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	Stored in special containers and areas in line with the regulations. Medical waste to be collected by dedicated Elazig Municipality trucks.	Medical waste sterilization facility owned by Elazig Municipality	Low Risk since the medical waste sterilization unit is operational and has sufficient capacity.

8.5 Waste Generation and Management during the Operation Phase

The waste categories that will be generated during the operation phase include medical wastes, hazardous and non-hazardous wastes, domestic wastes and wastewater. Specific waste categories, expected amounts of waste to be generated, relevant waste codes and potential disposal locations have been assessed in this section. Of specific importance for the operation phase, focus has been given to the healthcare waste (including medical waste, some types of hazardous wastes and other types of waste such as radioactive waste).

One of the critical aspects is the estimation of medical waste amount to be generated during the operation of the IHC and the suitability of the existing waste management facilities to handle these wastes. As mentioned previously, Elazig Municipality has a medical waste sterilization facility in the province where the medical waste collected from hospitals, healthcare units and facilities is sterilized. It has a reported treatment capacity of 1,970 tons per year. In order to identify the amount of healthcare waste to be generated during the operation of the IHC, literature survey was conducted to determine waste generation ratios per bed.

Daily amount of medical waste per bed calculated according to the information collected from medical institutions was covered in the research by Ege and Budak (2012) for several provinces in Turkey as presented in Table 8-3. It was indicated in the research that there are many factors that have an impact on daily medical waste amount per bed including the economical structure of the provinces, technical infrastructure of medical institutions, bed occupancy rates, hospital's field of activity and bed capacities of the private branch hospitals leading to different amount of wastes among various provinces. As can be seen in Table 8-3, the medical waste generation differs between provinces.

Table 8-3: Medical waste generation in Turkey (kg/bed per day)

Reference	kg/bed per day
Turkey average (Demir <i>et al.</i> , 2002)	0.66
Edirne (Uysal and Tinmaz, 2004)	0.28
Kırklareli (Uysal and Tinmaz, 2004)	0.49
Tekirdağ (Uysal and Tinmaz, 2004)	0.82
Konya (Evirgen, 2007)	1.08
Istanbul (Birpınar, 2008)	0.63
Bursa (Varınca <i>et al.</i> , 2009)	1.15
Adana (Ege and Budak, 2012)	0.85

Source: (Ege and Budak, 2012)

No detailed specific studies were encountered for the Elazig province in the literature. Due to this reason, the data provided in the research of Ege and Budak (2012) was considered and the value of 0.85 kg/bed per day was selected to calculate the medical waste that will be generated during the operational phase of the Project. Accordingly, the total amount of medical waste generation for Elazig IHC was calculated as 882 kg/day (i.e., 1,038 beds x 0.85 kg/bed per day) which approximately corresponds to an annual medical waste generation of 322 tons. Note that the total figure is based on the assumption that Elazig IHC will operate with full capacity (i.e., 100% bed occupancy throughout a year). As mentioned previously, there is a medical waste facility in Elazig with 1,970 tons/year treatment capacity. According to the Elazig Environmental Status Report (2014), 396 tons of medical waste was generated within the Elazig province in 2013. With the additional 322 tons of medical waste generated at the IHC, it can be concluded that capacity of the

medical waste sterilization facility is sufficient to handle the medical waste generated during the operation of Elazig IHC.

In accordance with the IFC EHS Guidelines for Health Care Facilities, the healthcare wastes are categorized into infectious wastes (including pathological waste), sharps, pharmaceutical waste, genotoxic/cytotoxic waste, chemical waste, radioactive waste, waste with high content of heavy metals, pressurized containers and general healthcare waste. Each of these classifications has a separate waste code and suitable disposal method in accordance with the Turkish regulations. Based on the above mentioned information and the information on the distribution percentages of different types of medical waste obtained from World Health Organization (1999), medical and domestic waste generation during IHC operation have been estimated as provided in Table 8-4.

Table 8-4: IHC Project medical and domestic waste generation rates

Waste type	Waste amount per bed	Percentage (%)	Waste Amount (kg/day)
Medical waste	0.85*	100	882
- infectious		37.5	331
- pathologic		37.5	331
- pharmaceutical		5	44
- sharps		5	44
- genotoxic/cytotoxic waste		2	18
- chemical waste		10	88
- high levels of metal content		2	18
- pressurized containers		1	9
Domestic waste	2.35*	100	2,439
- Non-recyclable		95	2,317
- Metal (recyclable)		2.5	61
- Plastics (recyclable)		2.5	61

* Ege and Budak, 2012

Considering that approximately 600 tons of solid waste is brought daily to the solid waste disposal facility by Elazig Municipality, additional 2.4 tons of solid waste generated daily in the IHC during its operation is not expected to lead to a significant overload on the capacity of the existing solid waste disposal facility. Moreover, according to the Elazig Municipality Strategic Plan for 2015-2019, the second lot of the disposal facility will become operational at the end of 2015 which suggests that the capacity of the disposal facility will be enhanced. As mentioned earlier, the second lot will be designed based on 400 tons/day capacity. As explained in Section 8.2, maximum wastewater generation of the IHC during its operation is expected to be 1,661 m³/day. Considering that the existing capacity of the Elazig municipality WWTP is 69,984 m³/day and the amount of treated wastewater is 55,000 m³/day, the IHC wastewater load will result in an additional 3% increase in the existing flow rate (i.e., 55,000 m³/day). This figure will be within the treatment capacity of the Elazig Municipality WWTP. However, as explained previously, WWTP treatment facility is not operating efficiently and the capacity of WWTP will be increased accordingly.

Table 8-5 below (developed based on the information provided in IFC EHS Guidelines for Health Care Waste) provides guidelines for the wastes anticipated to be generated during the IHC operation based on the classification made together with waste codes, best practice disposal methods as defined in the mentioned IFC guideline and the likely disposal method that will be used for the Project.

Table 8-5: Wastes anticipated to be generated during the operation of the IHC and the management options

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
MEDICAL WASTE	Infectious waste: Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts.	18 01 03* 18 02 02*	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	Waste Segregation Strategy: Yellow or red colored bag / container, marked “infectious” with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. Treatment: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving.	331 kg/day	Elazig Municipality	Low Risk. The municipality has its own medical waste sterilization unit with sufficient capacity.
	Pathologic waste: Includes pathological and anatomical material (e.g. tissues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	18 01 02*		Anatomical waste should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator).	331 kg/day		
	Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	18 01 01* 18 02 01*		Waste Segregation Strategy: Yellow or red color code, marked “Sharps”. Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labeled “infectious waste”. Treatment: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) - Following incineration, residues should be landfilled. -Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. -Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment	44 kg/day		

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
HAZARDOUS WASTE	<p>Pharmaceutical waste: Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).</p>	18 01 06*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	<p>Waste Segregation Strategy: Brown bag / container. Leak-proof plastic bag or container. Treatment: Sanitary landfill; Encapsulation; Discharge to sewer; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator); Safe burial on hospital premises as a last resort.</p> <p>Small quantities: Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do not exceed one percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps.</p> <p>Large quantities: Incineration at temperatures exceeding 1200°C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal</p>	44 kg/day	Licensed Waste Transportation Company / Hazardous and Medical Waste Incineration Facility; IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<p>Genotoxic / cytotoxic waste: Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.</p>	18 01 08*		<p>Waste Segregation Strategy: See above for “infectious waste”. Cytotoxic waste should be labeled “Cytotoxic waste”.</p> <p>Treatment: Return expired drugs to supplier; Chemical degradation; Encapsulation; Inertization; Incineration (Rotary kiln, pyrolytic incinerator);</p> <ul style="list-style-type: none"> - Cytotoxic waste should not be landfilled or discharged to sewer systems. - Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste disposal. Open burning of waste is not acceptable. - Chemical degradation may be used for certain cytotoxic drugs - Encapsulation and inertization should be a last resort waste disposal option. 	18 kg/day	Licensed Waste Transportation Company / Hazardous and Medical Waste Incineration Facility: - IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	Chemical waste: Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and non-halogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	18 01 06*		Waste Segregation Strategy: Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects.- Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems.- Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling.- Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.	88 kg/day	Licensed Waste Transportation Company / Hazardous and Medical Waste Incineration Facility: - IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Waste with high content of heavy metals: Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).			Waste Segregation Strategy: Waste containing heavy metals should be separated from general health care waste. Treatment: Safe storage site designed for final disposal of hazardous waste. - Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.	18 kg/day	Licensed Hazardous Waste Transportation Company / IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Pressurized containers: Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.			Waste Segregation Strategy: Pressurized containers should be separated from general health care waste. Treatment: Recycling and reuse; Crushing followed by landfill - Incineration is not an option due to explosion risks - Halogenated agents in liquid form should be disposed of as chemical waste, as above.	9 kg/day	Licensed Hazardous Waste Transportation Company / IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
RADIOACTIVE WASTE	Radioactive waste: Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.		Regulation on Wastes Generated from Radioactive Substances Use (OG Date/Number: 02.09.2004/25571) Radioactive Waste Management Regulation (OG Date/Number: 09.03.2013/28582)	Waste Segregation Strategy: Lead box, labeled with the radioactive symbol. Treatment: Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency (IAEA (2003), Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003).		Inform TAEK (Turkish Atomic Energy Authority)	Low Risk. These wastes will be handled by TAEK.
SPECIAL WASTE	Fluorescent Lamp	20 01 21*		Waste Segregation Strategy: Separately collect in cardboard boxes to avoid being broken. Disposal: Crushing in dedicated drums		Licensed Hazardous Waste Transportation Company / IZAYDAS	Low Risk. Special waste collection, transport and recycling /disposal are common practice that is well regulated by MEUP and by the related licensed facilities.
	Waste mineral oils	13 01 ..* 13 02 ..*	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	Waste Segregation Strategy: Red-colored metal drums with "Waste Oil" label. Recycling of 1 st category waste mineral oils; Energy recovery as fuel supplement in cement kilns of 2 nd category waste oils; disposal in incineration plants of 3 rd category waste oils.		Licensed Waste Transportation Company / Licensed Waste Oil Recycling Facilities listed in Table 8-1 or other Hazardous Licensed Facilities	
	Waste vegetable oils	20 01 25	Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)	Waste Segregation Strategy: Collect in plastic drums Treatment: Recycling to produce biodiesel fuel.		Licensed Waste Transportation Company / Licensed Recycling Facility	
	Waste accumulators	16 06 01*	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	Waste Segregation Strategy: Separately store in hazardous waste storage area up to 90 days on-site. Treatment: Recycling of the plastic, lead and acid solutions.		Licensed Waste Transportation Company / Give waste accumulators back to the supplier.	

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	Waste batteries	20 01 33*		Waste Segregation Strategy: Separately collect in battery box. Treatment: Recycling		Licensed Waste Transportation Company / Give the waste batteries to TAP.	
DOMESTIC WASTE	General health care waste (including food waste)	20 03 01	Waste Management Regulation (OG Date/Number: 02.04.2015/29314)	Waste Segregation Strategy: Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). Treatment: Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling.	2,439 kg/day	Elazig Municipality/ Solid Waste Disposal Facility	Low Risk. Facility already in use and has sufficient capacity to receive waste.
	Domestic wastewater	20 03 01	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Direct discharge into the nearby municipal wastewater collection line via permitted collection to the infrastructure. -Should be separately collected and not be mixed with medical wastewater.	1,661 m ³ /day	Elazig Municipality WWTP	Low Risk. Facility already in use and has adequate capacity to receive waste.
PACKAGING WASTE	Metal, Glass or Plastic packaging waste: Generated from packaging of products brought to the site that will include certain plastic, glass and metal.	15 01 04 (metal)	Packaging Waste Control Regulation (OG Date/Number: 24.08.2011/28035)	Impermeable and sealed waste containers Waste Segregation Strategy: Separately collect in containers. Disposal: RDF production or disposal		Licensed Packaging Waste Collection Company / Licensed Packaging Recycling Facilities listed in Table 8-1 or other Waste Recycling Companies	Low Risk. Facilities already in use and has adequate capacity to receive waste
		15 01 07 (glass)					
		15 01 02 (plastic)					
		15 01 10* (Contaminated)					
NON-HAZARDOUS WASTE	Metal Scrap	20 01 40	Communiqué on Recycling of Certain Non-hazardous Wastes (OG Date/Number: 17.06.2011/27967)	Stored in dedicated impermeable base area		Licensed Waste Transportation Company / Licensed recycling facility	Low Risk. Non-hazardous waste collection, transport and recycling are common practice that is well regulated by MEUP and by the related licensed facilities.
	Wood scrap	17 02 01					
	Plastic scrap	17 02 03					

IFC Guidelines indicated that often the wastewater from healthcare facilities has a quality similar to urban wastewater. However, contaminated wastewater may result from discharges from medical wards and operating theaters (e.g. body fluids and excreta, anatomical waste), laboratories (e.g. microbiological cultures, stocks of infectious agents), pharmaceutical and chemical stores; cleaning activities (e.g. waste storage rooms), and x-ray development facilities. Wastewater may also result from treatment disposal technologies and techniques, including autoclaving, microwave irradiation, chemical disinfection, and incineration (e.g. treatment of flue gas using wet scrubbers which may contain suspended solids, mercury, other heavy metals, chlorides, and sulfates).

There will be no separate WWTP within the IHC; however, as reported by ELZ A.S., wastewater from departments within the IHC will be collected via different piping systems and discharged directly into the sewer system, except for the wastewater that is contaminated with radioactive substances (i.e. from nuclear medicine department) which will be collected separately and/or subject to neutralization prior to being discharged into the sewer system. It is important to note that several conditions are set for liquid wastes contaminated with radioactive substances in the Regulation on Wastes Generated from Radioactive Substances Use (Official Gazette date/no: 02.09.2004/25571) related to discharging this type of wastewater into the sewer system. These conditions as given below will need to be met during the operation phase:

- Liquid wastes that remain within the limit values set forth in the regulation can be discharged by diluting into the sewer system from a sink having a standard radioactive substance mark and this sink shall not be used for work other than radioactive studies.
- Liquid wastes containing radioactive substances above the limits set forth in the regulation are kept in waste holding systems whose projects are approved by the Turkish Atomic Energy Authority (TAEK). After being kept in holding systems, the liquid wastes can be discharged into the sewer system if they remain within the limit values set forth in the regulation.
- All radioisotopes in liquids (that are to be released into the sewer system) should be soluble and dispersible. If the liquid waste contains solid particles or precipitates that are not soluble, the liquid waste should be filtrated prior to discharging into the sewer system.
- Acidic solutions containing radioisotopes should be neutralized prior to discharging into the sewer system.
- If the liquid waste having radioactivity contains hazardous substances or other chemical substances, permits should be obtained by the license owner (described as the institutions that obtained a license from the TAEK for keeping and using radioactive substances as per the Radiation Safety Regulation – it is expected that the responsibility will lie with MoH) from authorities as per the Environmental Law and relevant legislation before discharging into the sewer system.

As per the aforementioned regulation, if the liquid wastes contain radioactivity higher than the limit values covered in above requirements, these wastes are not allowed to be discharged into the environment and application is required to be made to the TAEK by the license owner related to procedures to be applied for such wastes.

8.6 Potential Impacts

Non-compliance with storage, transport and final disposal according to the Turkish regulatory framework constitutes a major impact. The existing Turkish regulatory framework has been set to be in line with the existing EU Waste Legislative framework. The previous discussions indicate that the Turkish regulatory framework is in place for assigning specific waste codes to each of the waste stream to be generated in the construction and operation phases. Furthermore, the waste disposal infrastructure for domestic, medical, hazardous and wastewater streams are available and operational in Elazığ as well as outside its provincial borders. The impacts of the generated wastes can be considered negligible if the IHC Project complies with the applicable regulations during construction and operation including disposal of the waste stream in licensed facilities given in Table 8-1.

Construction Phase

Solid wastes likely to be generated during construction will include excavation waste, contaminated soils, sanitary and domestic wastes from site offices and kitchens and clean-up materials from accidental spills. If not handled and disposed of in an appropriate manner, the generation of these wastes can give rise to major impacts. All wastes during construction can be managed in line with the waste management plan (WMP) given in Annex I; and the regulatory framework which will render the impact of solid wastes negligible with the exception of the excavated soil.

Excavated soil has the potential to cause local nuisance due to dust generation during construction phase which will require disposal in a licensed excavated soil and construction debris disposal facility. Excavation has already started at the Project area as mentioned previously and the majority of the already excavated materials have been transferred to the designated excavated material storage area of Elazığ Municipality as shown in section 2.7.4. of *Chapter 2: Project Description*. The Project area is approximately 14.5 km away from the designated area.

Excavated soil which may be contaminated at the site has a major potential for pollution of land, surface water and groundwater if it is not segregated from the clean excavated soil, transported and disposed of properly, as hazardous waste. The soil investigation study conducted at the Project site did not show any sign of contamination. Therefore, there will be no impacts related with the presence of contaminated soils.

Any oil and/or chemical spills during maintenance activities at the workshops during construction may create health and safety impacts as well as environmental impacts. Related impacts may vary from minor to major significance depending on the amount of spills, the environment where the spill has occurred and the response time to the incident. Clean-up materials such as spill kits should be managed as hazardous waste and disposed of appropriately.

Domestic solid waste, especially the organic part from foods, attracts vermin and other disease carriers. Also if not managed properly, the solid wastes may generate irritant odor in and around the Project area. The domestic waste will need to be appropriately collected, stored and disposed of in accordance with the regulatory framework.

If not managed properly, special waste such as waste mineral oils, waste vegetable oils, battery and accumulators, waste electronic and electronic equipment, can also give rise to adverse impacts to

human and environmental health. These wastes must be managed appropriately during construction in line with the regulations and disposed in licensed facilities.

Domestic wastewater generated during construction phase, if not managed properly, may affect the environment adversely. The wastewater discharge will need to be connected to a nearby wastewater collection line to be treated by the Elazig Municipality WWTP. The daily wastewater discharge is expected to be 510 m³ which will be within the treatment capacity of the Elazig Municipality WWTP. However, it should be noted that the WWTP is not working efficiently and the capacity of the WWTP will be increased as reported by authority officials.

Operation Phase

Healthcare wastes (particularly medical wastes) may cause extremely adverse impacts on human and environmental health if not managed properly. Table 8-4 shows that there will be a substantial amount of medical waste which will be generated during operation. The amount of healthcare waste that will be expected to be generated is 882 kg/day with the breakdown in categories given in Table 8-5. Elazig Municipality has a Medical Waste Sterilization Unit where the medical waste which is collected by the Elazig Municipality from hospitals, healthcare units and facilities is sterilized. It has a reported treatment capacity of 1,970 tons/year which is not fully utilized presently. The IHC is not expected to create medical waste treatment overload on the sterilization unit of the facility. The other types of health care wastes (other than medical wastes) will be managed according to Turkish Environmental Legislation at the licensed facilities. Table 8-1 shows that there are licensed facilities in the region and these can be used for disposal of healthcare waste stream that will be generated by the IHC. Therefore, the healthcare wastes can be disposed of properly without any adverse impact.

Domestic wastewater generated in healthcare facilities will contain a variety of pathogens, organic pollutants, nitrogen, phosphorous and suspended solids due to its sewage content. If not managed properly, discharge of untreated domestic wastewater can have major impact on the water supplies and the local population. Proper management during operation phase is an essential step to protect public and environmental health. Water consumption of the IHC is predicted to be 1,661 m³/day. All the water consumed is assumed to be converted into wastewater and will be discharged into municipality sewer lines. The treatment capacity of the Elazig Municipality WWTP is 69,984 m³/day. The existing wastewater flow coming into the Elazig Municipality WWTP is 55,000 m³/day and the IHC wastewater load will represent less than 3% maximum increase in the existing flow rate indicating that this will still be within the treatment capacity of the WWTP. In addition, considering that there are planned improvements to increase the capacity and treatment efficiency of the WWTP, the wastewater generated during the operation of the IHC is expected to be treated by the Elazig Municipality WWTP.

It should be noted that contaminated wastewater may result from discharges from medical wards and operating theaters, pharmaceutical and chemical stores; cleaning activities (e.g. waste storage rooms), and x-ray development facilities. Wastewater may also result from treatment disposal technologies and techniques, including autoclaving, microwave irradiation, chemical disinfection, and incineration (e.g. treatment of flue gas using wet scrubbers which may contain suspended solids, mercury, other heavy metals, chlorides and sulfates). These waste streams will need to be collected separately, otherwise there will be a major impact if the domestic wastewater stream is

contaminated with this wastewater and the legal wastewater limits are not met for discharging into the municipal wastewater collection lines.

If not managed properly, special waste such as waste mineral oils, waste vegetable oils, battery and accumulators, waste electronic and electronic equipment, can also give rise to adverse impacts to human and environmental health. These wastes must be managed appropriately during operation in line with the regulations and disposed in licensed facilities.

The domestic waste that will be generated in the hospital is expected to be 2.4 tons/day which is a negligible increase in the average of 600 tons/day being collected and disposed of by the Elazig Municipality.

Hazardous waste has the potential for pollution of land, surface water and groundwater as other waste classes; however, the consequences of inadequate management of hazardous waste are more serious than pollution by other waste classes. Direct contact with toxic components or uptake of those components such as heavy metals through the food chain may cause significant impacts to human and environmental health. The hazardous wastes that have been identified need to be disposed at the appropriate licensed facilities. There will be negligible risk in disposing of the hazardous wastes generated during the operational phase of the IHC. There will be a dedicated waste storage building in the Project area. There are adequate disposal facilities in the region that are licensed and operational.

The previous discussions indicate that the Turkish regulatory framework is in place for assigning specific waste codes to each of the waste stream to be generated in the construction and operation phases. Furthermore, the waste disposal infrastructure for domestic, medical, hazardous and wastewater streams are available and operational in Elazig province as well as outside the province boundaries. The impacts related to regulatory non-compliance and improper disposal with Turkish, EU Regulatory framework and IFC EHS guidelines can be considered negligible for disposal and treatment aspects. However, the management of these wastes needs to be performed adequately to ensure that the stages of temporary storage and management within the facilities do not cause adverse impacts which may range between minor to major impacts if these wastes are not managed properly. These are discussed in the following section.

8.7 Mitigation Measures

The following mitigation measures will be implemented related to waste management both during construction and operation phases:

- All the waste will be collected, segregated, labeled and stored on site according to the Waste Management Plan (WMP) as provided in Annex I that has been developed for the Project. The WMP addresses waste minimization, segregation, labeling, storage, transportation and recycling/disposal to meet the national and international standards.
- All types of waste must be segregated according to their category and will be disposed of at relevant licensed facilities in accordance with regulatory requirements.
- Record keeping about waste generation, storage and transportation to third party waste management facilities will be maintained according to the details given in WMP.
- Periodic inspections will be conducted in the waste recycling/disposal facilities to ensure proper disposal practices are implemented.

- Domestic wastewater will be discharged to municipality infrastructure and the necessary permits and protocols will be maintained for connection to the municipal sewer system.

In addition to the above, the following mitigation measures will be specific to construction phase:

- The excavation waste will be disposed in line with Regulation on Control of the Excavated Soil, Construction and Demolition Wastes.
- Contaminated soils, if generated any, will be disposed of in line with the Regulation on Soil Pollution Control and Point Source Contaminated Sites.

In addition to the above, the following mitigation measures will be specific to operation phase:

- The waste management practices given in the IFC EHS guidelines for Health Care Facilities will be implemented.
- The IHC will establish, operate and maintain a Healthcare Waste Management System adequate for the scale and type of activities and identified hazards.
- Procedures and mechanisms will need to be in place for the separate collection of urine, feces, blood, and vomit from patients treated with genotoxic drugs to avoid their entry into the wastewater stream.
- Necessary measures will be taken for liquid wastes contaminated with radioactive substances as per the Regulation on Wastes Generated from Radioactive Substances Use related to discharging this type of wastewater into the sewer system.
- TAEK should be informed about the radioactive waste generation and the radioactive waste management options should be identified before implementing any practice with TAEK.

8.8 Residual Impacts

The residual impact as a result of waste generation is estimated to be negligible when the WMP and the mitigation measures that are described above are fully implemented throughout the lifetime of the project.

8.9 Summary of Analysis Outcome

Approximately 200,000 m³ C30/C37 type ready-mixed concrete, 400,000 tons of aggregate, 21,000 tons of iron and 3,800 m² steel carcasses will be needed for the Project. The materials will be procured by the construction contractor and at this stage their sources are not known except that there will be a concrete batching plant (with a capacity of 120 m³/h) during the construction phase. Given the size of the construction sector in Elazığ, it is expected that all materials cannot be supplied from the existing marketplace. No borrow areas or quarries will be operated by the contractor. Therefore, there should be no adverse impacts from the extraction of raw materials or production of finished materials that will be attributable directly to the Project.

There will be drinking and potable water usage by construction workers and during construction activities. The total daily water requirement for the construction activities would be 510 m³/day. During the operation phase, there will be water uses related to general domestic and sanitary use (including laundry), food preparation processes, sterilizers and autoclaves, X-ray equipment (water used in the processing of prints), and water used for gardens. The water consumption of the IHC is predicted to vary between 1,297 and 1,661 m³/day. The domestic water will be provided from the existing water supply line of the municipality. The water supply increase during the construction

and operation of the IHC Project can be considered negligible on the water supply requirements for the region.

The electricity, heating and cooling needs of the facility will be supplied from the trigeneration system and boilers that will be installed inside the technical building in the IHC during operation. The trigeneration system and boilers will use natural gas. The yearly electricity consumption of the IHC is predicted to be 50,750,000 kWh. The energy and natural gas requirements will therefore be high for the IHC operation. Efficiency opportunities and associated tasks to achieve energy savings will need to be considered in the design and operation of the IHC Project.

There are four main waste treatment facilities for the management of the waste stream generated in the Elazig province and its vicinity. These facilities are as follows:

- Elazig solid waste disposal facility (under the responsibility of Elazig Municipality)
- Medical waste sterilization facility (under the responsibility of Elazig Municipality)
- Licensed recycling and hazardous waste treatment facilities
- Wastewater treatment plant (under the responsibility of Elazig Municipality)

The capacity of the medical waste sterilization facility was noted to be sufficient to handle the medical waste generated during the operation of Elazig IHC. Considering that approximately 600 tons of solid waste is brought daily to the solid waste disposal facility by Elazig Municipality, additional 2.4 tons of solid waste generated daily in the IHC during its operation is not expected to lead to a significant overload on the capacity of the existing solid waste disposal facility.

Maximum wastewater generation of the IHC during its operation is expected to be 1,661 m³/day. Considering that the existing capacity of the Elazig municipality WWTP is 69,984 m³/day and the amount of treated wastewater is 55,000 m³/day, the IHC wastewater load will result in an additional 3% increase in the existing flow rate (i.e., 55,000 m³/day). This figure will be within the treatment capacity of the Elazig Municipality WWTP. On the other hand, Elazig Municipality WWTP is not operating efficiently and there are plans by Elazig Municipality to improve the quality of wastewater treatment operations and to increase the existing capacity of WWTP. There will be no separate WWTP within the IHC; however, as reported by ELZ A.S., wastewater from departments within the IHC will be collected via different piping systems and discharged directly into the sewer system, except for the wastewater that is contaminated with radioactive substances (i.e. from nuclear medicine department) which will be collected separately and/or subject to neutralization prior to being discharged into the sewer system

A waste management plan covering both construction and operation phases for Elazig IHC has been developed within the scope of the ESIA study. In addition, a Healthcare Waste Management System will also be established and implemented during the operation phase of the IHC.

The waste generation and management review indicate that the Turkish regulatory framework is in place for assigning specific waste codes to each of the waste stream to be generated in the construction and operation phases. Furthermore, the waste disposal infrastructure for domestic, medical, hazardous and wastewater streams are available and operational in Elazig as well as outside its provincial borders. The impacts of the generated wastes can be considered negligible if the IHC Project complies with the applicable regulations during construction and operation including disposal of the waste stream in licensed facilities.