Bilkent Ankara Entegre Sağlık Hizmetleri
Yatırım ve İşletme A.Ş.
Selanik Cad. No: 82/1
Kızılay – ANKARA / TÜRKİYE
☎: +90 (312) 418-1020
🖷: +90 (312) 418-1020

ANKARA BILKENT INTEGRATED HEALTH CAMPUS PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT (FINAL DRAFT)

MARCH, 2013

2U1K
Mühendislik ve Danışmanlık A.Ş.
BeştepeMahallesiDumlupınarBulvarı
Armada İşMerkezi No: 6-A/18 Kat: 12
BağımsızBölüm: 1211
Yenimahalle - ANKARA / TÜRKİYE
☎: +90 (312) 295-6248
🖷: +90 (312) 295-6200

2U1K Mühendislik ve Danışmanlık A.Ş.

ANKARA BİLKENT
INTEGRATED HEALTH CAMPUS PROJECT

ESIA REPORT
(FINAL DRAFT)

Project No.: 12/005

March 2013

RaporAdı Report Title		BilkentIHCP ESIA Report (Draft)		
RevizyonNumarası Revision Number		0	1	
Tarih Date		12.03.2013	28.03.2013	
Hazırlayan Prepared by	**İsim** Name	TufanHüyük (Environmental Engineer)	TufanHüyük (Environmental Engineer)	
	İmza Signature			
	İsim Name	Elçin Kaya (Sociologist)	Elçin Kaya (Sociologist)	
	İmza Signature			
	İsim Name	DündarEmre Kaya (Environmental Engineer)	DündarEmre Kaya (Environmental Engineer)	
	İmza Signature			
	İsim Name	GönülErtürer (Environmental Engineer)	GönülErtürer (Environmental Engineer)	
	İmza Signature			
TeknikKontrol Technical Control	**İsim** Name	Günal Özenirler (Environmental Engineer M.Sc.)	Günal Özenirler (Environmental Engineer M.Sc.)	
	İmza Signature			

TABLE OF CONTENTS

Page

1 NON-TECHNICAL SUMMARY 9

2 OPERATIONAL FRAMEWORK 13

2.1 INTERNATIONAL LEGISLATION 13

2.2 TURKISH LEGISLATION 15

2.3 HEALTH CAMPUS AND PPP LEGISLATION 16

2.4 LENDER GUIDELINES 18

2.5 GAPS BETWEEN TURKISH LEGISLATION AND INTERNATIONAL GUIDELINES 20

2.6 SPONSOR'S ENVIRONMENTAL AND SOCIAL RISK ASSESSMENT CAPACITIES 21

3 PROJECT DESCRIPTION 22

3.1 PROJECT LOCATION 22

3.2 PROJECT JUSTIFICATION 22

3.3 PROPOSED PROJECT 29

3.4 ZONE OF INFLUENCE AND ASSOCIATED FACILITIES 37

4 DESCRIPTION OF THE EXISTING ENVIRONMENT 41

4.1 AIR 43

4.2 WATER 44

4.3 ECOLOGICAL FEATURES 44

4.4 CLIMATE 45

4.5 SEISMICITY AND GEOHAZARDS 46

4.6 SETTLEMENTS 47

4.7 ARCHAEOLOGICAL FEATURES 50

4.8 TRAFFIC 50

4.9 BASELINE STUDIES 52

5 POTENTIAL IMPACTS 61

5.1 CONSTRUCTION PHASE 61

5.2 OPERATIONAL PHASE 67

6 ANALYSIS OF ALTERNATIVES 71

6.1 SITE ALTERNATIVES 71

6.2 TECHNOLOGY ALTERNATIVES 72

7 CHARACTERIZATION OF IMPACTS AND ISSUES 73

7.1 CONSTRUCTION PHASE 73

7.2 OPERATIONAL PHASE 84

8 MITIGATION AND MANAGEMENT OF IMPACTS AND ISSUES 97

9 ENVIRONMENTAL AND SOCIAL OPPORTUNITIES FOR PROJECT ENHANCEMENT 109

10 ACTION PLANS AND MANAGEMENT SYSTEMS 110

LIST OF APPENDICES

Appendix-A Health Campuses in Ankara

Appendix-B General Layout

Appendix-C Ecological Survey Report

Appendix-D Sampling Locations

Appendix-E Soil Quality Analysis Report

Appendix-F Air Quality Analysis Report

Appendix-G Noise Measurement Report

Appendix-H Groundwater Analysis Report

Appendix-I Inventory of Affected People

Appendix-J Environmental and Social Management and Monitoring Plan

Appendix-K Waste Management Plan

Appendix-L Traffic Management Plan

LIST OF TABLES

Page

Table 2-1.Specific Objectives of IFC PS1 and PR 1 and PR 10 of EBRD 19

Table 3-1.Population of Çankaya 22

Table 3-2.Current Capacity of Bilkent Region 25

Table 3-3. Current Capacity of Hospitals which will be closed and renewed. 28

Table 3-4. Information about the labor camp. 34

Table 3-5. Discharge Characteristics of the Wastewater Treatment Plant and Relevant National and EU Discharge Standards 39

Table 4-1. Air Quality Data of Bahcelievler and Dikmen, Ankara 43

Table 4-2. Meteorological Data for Ankara 45

Table 4-3. Population of Settlement Areas nearby the Project Site 47

Table 4-4. Occupational Figures of the Universiteler Quarter. 48

Table 4-5. Existing social and economic facilities in the Universiteler neighbourhood. 48

Table 4-6. Vulnerable groups in the Universiteler neighbourhood 48

Table 4-7. Occupational Figures Related to Beytepe Quarter 49

Table 4-8. Existing social and economic facilities in the Beytepe Quarter; 49

Table 4-9. Vulnerable groups in the Beytepe Quarter 50

Table 7-1. Machinery to be Used in Excavation Works 73

Table 7-2. Emission Factors 74

Table 7-3. Dust Emissions 75

Table 7-4. Engine Power of Construction Machinery 76

Table 7-5. Exhaust Emissions from Construction Machinery 76

Table 7-6. Change of Settleable Dust Concentration (mg/m²-hour) with Distance 77

Table 7-7. Change of Suspended Dust Concentration (µg/m³) with Distance 78

Table 7-8. Machinery to be Used in Excavation Works 81

Table 7-9. Change of Sound Level with respect to Distance 82

Table 7-10. Air Emissions and Stack Properties of Turbines 85

Table 7-11. Air Emissions and Stack Properties Motor 85

Table 7-12. Ground Level Concentrations Calculated by Modeling Studies 86

Table 7-13.Severity Index and Values 91

Table 7-14.Probability Index and Values 92

Table 7-15. Impact Assessment 93

Table 8-1.Mitigation Measures and Residual Risk Assessment 98

LIST OF FIGURES

Page

Figure 3-1.Project Location 23

Figure 3-2.Project Location 24

Figure 3-3.Simplified General Layout 30

Figure 3-4.Organizational Structure 32

Figure 3-5.Process Flow Diagram of Concrete Batching Plant 33

Figure 3-6.Sample View of a Concrete Batching Plant 34

Figure 4-1.Project Site 41

Figure 4-2.A View from the Project Site-1 42

Figure 4-3.A View from the Project Site-2 42

Figure 4-4. Air Quality Monitoring Stations near the Project Site 43

Figure 4-5.Graphical Representation of Daily Air Quality Data of Bahcelievler 44

Figure 4-6.Earthquake Map of Ankara Province 46

Figure 4-7.Traffic Demand Distribution based on the Project Site Directions 51

Figure 6-1.Location of New Subway Station 71

Figure 7-1.Excavated Soil Storage Area within the Project Site 75

Figure 7-2.Settleable Dust Dispersion Profile 77

Figure 7-3.Suspended Dust Dispersion Profile 78

Figure 7-4.Buffer Zone for Dust Emissions 79

Figure 7-5. Equivalent Sound Level vs Distance 83

Figure 7-6. Hourly GLC Dispersion of NO_2 for Scenario 6 87

Figure 7-7. Annual GLC Dispersion of NO_2 for Scenario 6 88

Figure 7-8.Impact Assessment Matrix 92

ABBREVIATIONS

µg	Microgram
2U1K	2U1K Engineering and Consultancy Inc.
dBA	A-weighted sound level
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EN	European Norm
EP	Equator Principles
ESIA	Environmental and Social Impact Assessment
EU	European Union
HSE	Health, Safety and Environment
HSS	Health System strengthening
HTTP	Health Transformation Program
IFC	International Finance Corporation
IHC	Integrated Health Campus
JV	Joint Venture of IC İÇTAŞ Holding and DİA Holding
L_{eq}	Equivalent noise level
L_{noon}	Noontime noise level
MoEU	Ministry of Environment and Urbanization
MPN	Most Probable Number
°C	Degrees Celcius
OG	Official Gazette
PIP	Pollution Indicator Parameter
PM	Particulate matter
PM_{10}	Particulate matter with diameter less than or equal to 10 micron
PR	Performance Requirement
PS	Performance Standard
RAMEN	Regulation on Assessment and Management of Environmental Noise
RCSPSPPS	Regulation on Control of Soil Pollution and Sites Polluted by Point Sources
RV	Reference Value
STL	Short-Term Limit
TPH	Total Petroleum Hydrocarbons
TS	Turkish Standard
UCB	UniCredit Bank AG
UTM	Universal Transverse Mercator
WPCR	Water Pollution Control Regulation

1 NON-TECHNICAL SUMMARY

Project Company and Lenders

Bilkent Ankara Entegre Sağlık Hizmetleri Yatırım ve İşletme Anonim Şirketi (the Project Company), established by a consortium consisting of Dia Holding FZCO and İC İçtaş İnşaat Sanayi A.Ş. (the Consortium), has been awarded the contract for the construction and operation of the Ankara Bilkent Integrated Health Campus Project (the Project).

UniCredit Bank AG (UCB) is acting as the financial advisor to the Project. The financing of the Project is likely to be sourced from a number of lenders, including multilaterals, export credit agencies and commercial lenders (collectively the Lenders). The Project Company is currently negotiating with the Overseas Private Investment Corporation (OPIC) as the major lender.

Project Idea and Rationale

Integrated health campuses are healthcare facilities hosting a number of specialized hospital departments and health service areas, as well as research and development laboratories and centers, techno parks, social facilities, housing and parking lots.

The concept of 'Health campuses' was an outcome of the Ministry of Health (MoH)'s reconstruction process, initiated in 2003 in order to offer access to high quality health services to citizens. Bilkent IHC will serve one of the 29 health regions, defined as a result of the classification of 81 provinces. Health regions have been set up to solve health problems within their respective region. The MoH is planning to build 30 health campuses of different sizes in 22 cities to serve the 29 regions.

Ankara has two Health Regions, and Bilkent is the 11th Health Region of Turkey. Bilkent Region serves 4.513.150 people in Ankara. It covers the Evren, Şereflikoçhisar, Nallıhan, Güdül, Beypazarı, Polatlı, Çamlıdere, Kızılcahamam, Haymana, Bala, Ayaş, Kazan, Gölbaşı, Mamak, Sincan, Etimesgut and Çankaya districts of Ankara. Additionally to the population of Ankara, Bilkent serves the nearby provinces of Çankırı (P: 179.067), Karabük (P: 227.610), Kastamonu (P: 361.222), Zonguldak (P: 619.703), Bartın (P: 187.758) and Bolu (P: 271.208). In the 11th region, there are 42 hospitals with a total bed capacity of 6.325.

The main objectives of health campuses include regional development in the field of health care, improving service quality, providing cost-effective health care services with an adequate number and quality of beds, as well as a specialized health team forin the service regions.

Brief Project Description

The Project comprises of an integrated health campus with a total capacity of 3.662 beds. It will comprise a general hospital, woman's hospital, children's hospital, cardiovascular surgery hospital, oncology hospital, neurological sciences and orthopedic hospital, physical therapy and rehabilitation hospital, forensic hospital and burns unit. In addition to these units, a 100-bed clinic hotel is planned in the context of the Project.

The Project is structured as a 28.5 year design-build-finance-operate and transfer model, with a 42 month-construction phase and 25 year operating period.

The Project Company will be responsible for the provision of support services in the facilities, including imaging, laboratory and other clinical equipment support services, as well as sterilization and disinfection, rehabilitation, linen, housekeeping, security, catering, extraordinary repair and maintenance, common utilities management, grounds and gardens maintenance, cleaning, hospital management information system (hardware) application and operation, portering, reception, helpdesk, pest control, car parking and waste management services.

There will be a dual management system at the campus in which the MoH will assign doctors, nurses and other health staff to the campus, while the Ministry of Justice (MoJ) will only be responsible for the section of the forensic hospital where prisoners with mental problems will stay.

Bilkent IHCP is a large urban development, which is located in a plot of 120 ha in the middle of an urban area. The Project Site is located near the Çankaya district of Ankara province in Turkey. The Project Site is close to the three important universities of Turkey, namely Middle East Technical University (METU), Bilkent University and Hacettepe University, neighboring a rehabilitation facility for the Turkish Armed Forces to the south, the Directorate of Religious Affairs and State Council to the north and the Ministry of Food, Agriculture and Livestock (MoFAL) at the northwest. The vacant land to the west of the Project Site is the property of the Directorate of Atatürk, Orman Çiftliği.

A tri-generation plant with an installed capacity of c.a. 20 MW will be installed, and used to produce the necessary electricity, heating and cooling for the health campus in the operational phase. There will also be a water treatment system which will supply water to the laboratories and laundry.

During the construction of the Project, 7000 workers will be employed at peak times. A labor camp will be established within the Project Site. All necessary facilities, e.g. dormitories, dining hall, first aid center etc., will be constructed in the camp site.

ESIA Status

The Bilkent IHC Project is exempt from the official EIA procedure applicable in Turkey. However, concrete plant(s) with the capacity of 100 m^3/hr and above are subject to the preparation of Project Introduction File (PIF) in accordance with the EIA Regulation of Turkey (Annex – II of the Regulation), which became effective upon publication in the Official Gazette dated July 17, 2008; No: 26939. A tri-generation plant that generates electricity, heating and cooling, using the same energy source, will also be installed in the context of the Project. The installed capacity of this plant will be c.a. 20 MW, and hence, it is listed in Annex-II as well. Therefore, a Project Introduction File will be prepared for the concrete batching plant and tri-generation plant, and submitted to the Ankara Provincial Directorate of Environment and Urbanization.

Although the Project is legally exempt from the requirement to conduct an official EIA Process as mentioned above, an Environmental and Social Impact Assessment (ESIA) study is required by the lenders. In this respect, the Project Company hired 2U1K Engineering and Consultancy Inc. (2U1K) to conduct the ESIA study for the proposed Project. ESIA studies will be based on the latest design data in accordance with the pertinent international regulations and guidelines, including a comprehensive assessment of certain environmental and social issues.

OPIC, as the potential major lender, considers the Project as a unique urban development and classifies it as a Category-A Project with significant environmental and social impacts. This is because of the refurbishment of the Atatürk Training and Research Hospital, and pertinent potential impacts of construction. This type of Project is new to Turkey and it could create unforeseen impacts. The ESIA Report is therefore structured accordingly to take into account the possible negative impacts of an urban development arising from the establishment of a health complex in Ankara.

Major Impacts and Proposed Mitigation Measures

In the construction phase of the Project, dust and noise will pose adverse impacts and nuisance in the neighboring governmental institutions. In addition, different types of waste (e.g. hazardous waste, waste oil, medical waste and waste batteries) may result in soil contamination.

In order to minimize dust emissions, dust suppression with water will be employed on the in-site roads. Furthermore, noise curtains will be installed in order to reduce noise affecting the surroundings, especially the Atatürk Training and Research Hospital. Necessary measures, stipulated in the relevant legislation, will be taken to eliminate or minimize the adverse impacts of different kinds of waste. These include the construction of sealed areas

for temporary storage, separate storage and appropriate labeling and also transferring to landfill or disposal with licensed firms.

In the operational phase, other than impacts due to waste generation, there might be impacts on traffic, life and fire safety and epidemics. It is anticipated however that planned road developments by the metropolitan municipality will decrease the already-high traffic load in the main arterial route, i.e. the Eskişehir Highway. Furthermore, there are design considerations to maximize fire safety. The risk of incidence of epidemics will be minimized by installing separate ventilation units in surgery and intensive care units and high-efficiency particulate air filters.

2 OPERATIONAL FRAMEWORK

An ESIA has been carried out taking into account relevant international and national legislation as well as the lenders' guidelines. The main pieces of legislation and guidelines are briefly described in the following sections which are not meant to be an exhaustive list and should be updated through the course of project implementation as there may arise significant amendments to legislation or lenders principles applicable to the Project.

2.1 International Legislation

Construction and operation of the proposed Project will be in line with the relevant directives and regulations of the EU. In this regard, the main legislation that will be followed is EC Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, as amended by EC Directive 97/11/EC, 2003/35/EC and 2009/31/EC.

The other EU directives that will be taken into consideration throughout the whole project lifetime are described as follows:

- ***Directive on Industrial Emissions (IED) (2010/751/EU)*** - regarding minimizing pollution from various industrial sources throughout the European Union. The IED Directive that repeals the IPPC Directive is based on several principles, namely (i) an integrated approach, (ii) best available techniques (BAT), (iii) flexibility and (iv) public participation.

  1. In the **integrated approach**, the whole environmental performance of the Project, covering, for example, emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure, must be taken into account.

  2. The **BAT Reference Documents** (the so-called **BREFs)** are prepared for several establishments. Besides the BAT for respective facilities, these documents also introduce the achievable emission values. BREFs do not set legal limits but they are meant to be guidelines for governments. Therefore, they should be taken into consideration in order to eliminate any future liability due to new legislation that comes into force.

  3. The **Flexibility** principle allows licensing authorities to take several such aspects as technical characteristics of the installation, geographical location and local environmental conditions into account when they determine permit conditions.

  4. **Public participation** is required to ensure that the public has a right to participate in the decision-making process, and to be informed of its consequences by being informed mainly of the permitting process, permits and the results of monitoring.

- ***Directive on Waste (2006/12/EC)*** sets the general principles of waste management that should be followed for handling of waste types listed in Annex-I of the Directive.

- ***Directive on Ambient Air Quality and Cleaner air for Europe (2008/50/EC)*** sets the general principles and standards to combat emissions of pollutants at source and to identify and implement the most effective emission reduction measures, at the local, national and Community level, to protect human health and the environment as a whole.
- ***Water Framework Directive (2000/60/EC)*** sets the main principles for sound management of Europe's water resources. It aims to reach good status throughout Europe by adopting river basin management plans.
- ***Directive on Assessment and Management of Environmental Noise (2002/49/EC)*** provides a basis for handling noise problems. The directive mainly includes strategies for (i) monitoring of noise problems (i.e. preparation of strategic noise maps), (ii) informing and consulting the public about noise exposure, (iii) addressing local noise issues for the preparation of action plans for noise reduction, and (iv) development of a long-term EU strategy.
- Directives governing health sector implementation include the following:
    - EU Council Directive 2010/32/EU of 10 May 2010, implementing the Framework Agreement on prevention of sharp injuries in the hospital and healthcare sector, concluded by the European Hospital and Healthcare Employers' Association (HOSPEEM) and European Federation of Public Service Union (EPSU);
    - Directive 2002/98/EC of the European Parliament and Council, of 27 January 2003, setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components, and amending Directive 2001/83/EC;
    - Directive 2004/23/EC of the European Parliament and Council of 31 March 2004 on setting standards of quality and safety for the donation, procurement, testing, processing, preservation, storage and distribution of human tissues and cells, as well as two technical directives 2006/17/EC and 2006/86/EC providing the detailed requirements of the EUTCD;
    - EU directives on pharmaceuticals, including Directive 65/65/EEC1, Directive 75/318/EEC, Directive 75/319/EEC, Directive 93/41/EEC, Directive 93/42/EEC, Directive 2001/20/EC, Directive 2001/83/EC, and Directive 2005/28/EC; and
    - Directive 2011/24/EU of the European Parliament and Council of 9 March 2011 on the application of patients' rights to cross-border healthcare. The directive applies to individual patients who decide to seek healthcare in a Member State other than the Member State of affiliation. It does not apply

to the following: services in the field of long-term care; allocation of and access to organs for the purpose of organ transplants; public vaccination programs against infectious diseases.

2.2 Turkish Legislation

The principal legislation related to the Project is the Environment Law of August 1983 (amended with the Law dated April 26, 2006; No: 5491). This Law has a number of associated regulations.

Article 10 of the "Environment Law" requires an EIA report for investment projects which may create adverse environmental effects as a result of their planned activities. The types of projects for which an EIA report is required and the specific topics that should be covered for different cases are described in the "EIA Regulation" issued by the former Ministry of Environment and Forestry, currently Ministry of Environment and Urbanization (MoEU). This article is in conformity with the pertinent international legislation and guidelines, such as those of the World Bank as well as those of EU. As mentioned in Chapter 1 of the ESIA Report, the Project is exempted from the provisions of Turkish EIA Regulation. Therefore an official EIA process was not carried out for the Project. However, since the concrete batching plant (with a capacity over 100 m^3/hour) and the tri-generation plant (with an installed capacity of c.a. 20 MW) are subject to EIA, separate official EIA processes (i.e., preparation of PIFs and their approval by the Provincial Directorate of the Environment and Urbanization) will be undertaken for the concrete batching plant and the tri-generation plant.

Besides the EIA Regulation, other regulations related to HSE aspects and social issues mainly include the following:

- Environmental Law No. 6831 and relevant regulations;
- Law on Conservation of Cultural and Natural Assets No. 2863 (as amended with the Law numbered 5226) and relevant regulations;
- Labor Law No. 4857 and relevant regulations;
- Regulation on General Principles of Waste Management (OG dated 05.07.2008; No: 26927);
- Medical Waste Control Regulation (OG dated 22.07.2005; No: 25883) (amended by the regulation issued in the OG dated 03.12.2011; No: 28131);
- Water Pollution Control Regulation (OG dated 31.12.2004; No:25687) (amended by the regulation issued in the OG dated 30.03.2010; No: 27537);
- Hazardous Waste Control Regulation (OG dated 14.03.2005; No: 25755) (amended by the regulation issued in the OG dated 30.10.2010; No: 27744);

- Waste Oil Control Regulation (OG dated 30.07.2008; No: 26952) (amended by the regulation issued in the OG dated 30.03.2010; No: 27537;
- Solid Waste Control Regulation (OG dated 14.03.1991; No: 20814) (amended by the regulation issued in the OG dated 05.04.2005; No: 25777);
- Landfill Regulation (OG dated 26.03.2010; No: 27533);
- Regulation on the Assessment and Management of Air Quality (OG dated 06.06.2008; No: 26898);
- Regulation on the Assessment and Management of Environmental Noise (OG dated 07.03.2008; No: 26809);
- Regulation on Soil Pollution Control and Point Source Polluted Areas (OG dated 08.06.2010; No: 27605);
- Regulation on the Control of the Excavation of Soil, Construction and Debris Wastes (OG dated 18.03.2004; No: 25406); and
- Regulation on Occupational Health and Safety (OG dated 09.12.2003; No: 25311).

2.3 Health Campus and PPP Legislation

The MoH has prepared additional laws for implementation of the HTP since 2003. These are as follows:

- Law no. 4924 on Employing Contracted Health Personnel in the Places Experiencing Difficulty in Staff Supply and Amending Some Laws and Decree Laws (2003)
- Law no. 5258 on Family Medicine Pilot Implementation (2004)
- Law no. 5413 on Employing Contracted Health Personnel in the Places Experiencing Difficulty in Staff Supply and Amending Some Laws and Decree Laws, Amending the Health Services Basic Law and Decree Law on the Organization and Tasks of the Ministry of Health (2005)
- Law no. 5283 on the Transfer of Health Units of the Some Public Institutions and Agencies to the Ministry of Health (2005)
- Law no. 5371 on Amending the Health Services Basic Law, Law on the Compensation and Working Principles of the Health Personnel, Civil Servants Law and Law on Practicing Medicine and Decree Law on the Organization and Tasks of the Ministry of Health (2005)
- Law no. 5510 on Social Insurances and Universal Health Insurance (2006)
- Law no. 5489 on Social Insurances and Universal Health Insurance (2006)
- Law no. 5624 on Blood and Blood Products (2007)
- Law no. 5634 on Amending the Law on Nursing (2007)

- Law no. 5947 on the Full-time Working of University Staff and Health Personnel and Amending Some Laws (2010)
- Law no. 6288 on the Amendment of The Value Added Tax Law, And The Law on The Conduct of Certain Investments and Services Within The Framework of The Build-Operate-Transfer Model, And The Public Procurement Law (2012).

The last law which was introduced by the MoH was directly related to the establishment of health campuses. The MoH has launched a number of tenders for the construction of integrated health campus projects under the PPP model in various cities in Turkey based on the Law and the Regulation. Among others, the tender processes for Ankara Bilkent Integrated Health Campus, Ankara Etlik Integrated Health Campus and Elazığ Integrated Health Campus projects have been completed and the contractors were awarded. The Turkish Medical Association filed lawsuits with the Council of State among others, for the annulment of the tender process for each Health Campus Project and the Council of States decided to give "stay order" to health campus projects. This recent law was allowing Sponsors to use old hospital buildings as commercial areas. Council of States decided that, under the said tender, the contractor may not be granted with the right to commercially operate the areas which do not have any connection with the health facility concept.

For solving this legal issue, the MoH introduced a new law on the 9th of March 2013. This new law is named as "The Construction of New Healthcare Premises Against Lease and The Renovation of Existing Healthcare Premises Against Operation of Non-Medical Services And Functional Areas of Activity". With this law, it was decided to transfer old hospital building to the Public Hospitals Institution of the MoH instead of Sponsors.

According to new law;

(1) All kinds of necessary facilities - hospitals, health education facilities, health campuses, social equipment and other facilities - will be established by the MoH and its affiliated institutions. To cover the expenses of these facilities the MoH and its affiliated institutions can benefit from the;

a) Financial contribution of the budget of the MoH and its institutions;

b) The incomes of the working capital; and

c) The immovable state-owned property of these institutions or by taking into account the point of view of the Ministry of Finance also from the immovable property belonging to the Treasury.

(2) The Ministry can demand that the immovable property of the public institutions and facilities will be distributed to itself. Research, projects and financial measures concerning construction works could be entrusted to other institutions competent for these issues that are legal entities.

(3) The MoH has the right to order the demolition of buildings currently used for Health services if considered appropriate after an evaluation of the buildings' functionality by a commission established by the Ministry.

As stated above, Turkish Medical Association filed lawsuits with the Council of State. In this respect, sociologists of the ESIA team conducted a consultation with the Lawyer of Turkish Medical Association (Ms. Ozgur Erbas) to learn their concerns and issues which leaded to the opening of a court case against the MoH for suspension of the health campus projects in Turkey. Ms. Erbas expressed negative issues or claims related to the Project listed below:

- PPP model is privatization of health services. State have to protect all citizen's life right and health is the biggest requirement of human being;
- Patients should not be customers of hospitals and healthcare should be a public service;
- Healthcare services should be accessible, free and equal;
- Currently, the MoH is protecting the competition of commercial actors;
- Tender process of the Project are not transparent;
- Turkey does not have a legal infrastructure for sustainable neo-liberalism; and
- The MoH has enough budget to build hospitals, it does not need to have private sector for building new facilities.

2.4 Lender Guidelines

The IFC Environmental and Social Performance Standards (PSs) are the primary reference in addressing Project impacts and defining relevant mitigation measures. These PSs are listed as follows:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts;
- PS 2: Labour and Working Conditions;
- PS 3: Resource Efficiency and Pollution Prevention;
- PS 4: Community Health, Safety and Security;
- PS 5: Land Acquisition and Involuntary Resettlement;
- PS 6: Biodiversity Conservation & Sustainable Management of Living Resources; and
- PS 8: Cultural Heritage.

OPIC considers the Project a Category A project given the unique urban development characteristics, for which environmental impacts cannot be predicted. Category A requires a comprehensive environmental and/or social impact assessment, identification and assessment of the potential future environmental and social impacts associated with the proposed project, identification of potential improvement opportunities, and recommendations on measures needed to avoid, or where avoidance is not possible, minimize and mitigate, adverse impacts. Hence, the ESIA report is structured accordingly. IFC guidelines considered in the study are:

- IFC General EHS Guidelines, dated April 30, 2007;
- IFC EHS Guidelines for Health Care Facilities, dated April 30, 2007.

In addition to the PSs, the Project Company should be aware of the pertinent Equator Principles[1], which were developed in alignment with the PSs. These PSs that should be considered by the Project Company during project implementation are listed below:

- Principle 1: "Review and Categorization"
- Principle 2:"Social and Environmental Assessment"
- Principle 3: "Applicable Social and Environmental Assessment"
- Principle 4: "Action Plan and Management System"
- Principle 5: "Consultation and Disclosure"
- Principle 6: "Grievance Mechanism"

Specific objectives of EBRD and IFC regulations are given Table 2-1 below.

Table 2-1. Specific Objectives of IFC PS1 and PR 1 and PR 10 of EBRD

Objectives of IFC (PS 1)	**Environmental and Social Appraisal and Management of EBRD (PR 1)**
• To identify and assess social and environmental impacts, both adverse and beneficial, in the project area of influence; • To avoid, or where avoidance is not possible, minimise, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment; • To ensure that affected communities are	• To identify and assess environmental and social impacts and issues, both adverse and beneficial, associated with the project. • To adopt measures to avoid, or where avoidance is not possible, minimize, mitigate, or offset/compensate for adverse impacts on workers, affected communities, and the environment.

[1]*There is a total of 10 EPs. While EPs 1-6 are covered by IFC PSs and need to be adopted by the Project Owner, EPs 7-10 particularly concern the EPFIs.*

Objectives of IFC (PS 1)	Environmental and Social Appraisal and Management of EBRD (PR 1)
appropriately engaged on issues that could potentially affect them; • To promote improved social and environmental performance for companies through the effective use of management systems.	• To identify and, where feasible, adopt opportunities to improve environmental and social performance. • To promote improved environmental and social performance through a dynamic process of performance monitoring and evaluation.

2.5 Gaps between Turkish Legislation and International Guidelines

In accordance with Turkey's accession process to the EU, efforts are being made to revise Turkish Environmental Legislation to achieve compliance with EU Environmental Directives. However, national legislation still has deficiencies or discrepancies in certain topics when compared to the requirements of international finance institutions.

The most prominent topic which requires further elaboration in Turkish Environmental Legislation is "Social Impact Assessment (SIA)". Additional studies and measures are required on this topic for internationally-financed projects to achieve alignment with international standards. For example, implementation of detailed socio-economic surveys at Project Sites and the establishment of a Grievance Mechanism are not stipulated by Turkish Environmental Legislation, but are required by international standards.

All these requirements will be considered and fulfilled within the scope of the Project.

According to Turkish EIA legislation, a "Public Participation Meeting" is a requirement, yet there is not sufficient detail on how to conduct and mitigate impacts. Therefore, there is no legal reference to details of social impact assessment in any Turkish law or regulation.

Another important gap in Turkish EIA legislation is that according to Turkish Laws, only physically-displaced people are considered to be "project affected people". Thus, possible losses of other affected persons using the project area, or of economically displaced people, are not recognized, and there are no provisions to mitigate the adverse effects of the projects on these people.

Economic and social impact assessment of involuntary resettlement is clearly required under Turkish Regulations and EBRD-IFC guidelines. There are two families and a dairy farm business on the project site who use MoFAL's old Public housings. These two families stay in there as an occupier but dairy farm was established with the advice of MoFAL. However the displacement of households in Public Housing is not counted as "resettlement" because the land rights belong to the Turkish Government. Nevertheless, the impact on the residents was mitigated according to best practice as per IFC PS5 regulations and the Sponsor has started negotiation with these families for job opportunities of the Project as compensation.

2.6 Sponsor's Environmental and Social Risk Assessment Capacities

As mentioned before, the Project Company is the Sponsor of this PPP project. It is a joint venture of companies which have already been certified for management systems, environmental management and occupational health and safety, i.e. ISO 9001, 14001 and 18001, respectively. The Project Company will set up the same management systems to ensure that sound management, environmental and OHS systems are employed during all phases of the Project.

3 PROJECT DESCRIPTION

A detailed description of the proposed "Ankara Bilkent Integrated Health Campus Project"(the Project) is presented in this chapter of the ESIA Report.

3.1 Project Location

The Project Area is located near Bilkent, in the Beytepe and Universiteler neighbourhood of the Çankaya District of Ankara province in Turkey. Ankara is the capital of Turkey and its second largest city. According to the Turkish Statistical Institute's 2012 data, the population of the city is around 4.9 Million. Ankara is located in the central Anatolia region. It is an important crossroads for trade, strategically located at the centre of Turkey's highway and railway networks, and it serves as the marketing centre for the surrounding agricultural area.

A location map of the Project Site is given in Figure 3-1, while a satellite image of the Project Site is given in Figure 3-2. As can be seen from this image, the Project Site is in the vicinity of three major Turkish universities: the Middle East Technical University (METU), Bilkent University and Hacettepe University. The Project Site neighbours a rehabilitation facility for the Turkish Armed Forces to the south, the Directorate of Religious Affairs and State Council to the north and the Ministry of Food, Agriculture and Livestock to the northwest. The vacant land to the west of the Project Site is the property of the Directorate of Atatürk, Orman Çiftliği.

Table 3-1 below presents the current population of Ankara Province and Çankaya District.

Table 3-1. Population of Çankaya

Settlement	Total	Male	Female
Ankara	4965,542	2,474,456	2,491,086
Çankaya	831,229	391,129	422,210

3.2 Project Justification

3.2.1 Health Transformation Program (HTP) and Health Campus Projects in Turkey

Turkey has been implementing World Bank's Health System Strengthening (HSS) Program since 2003. This Program aims;

- Expanding health insurance Coverage
- Improving Access to health services
- Building institutional capacity to sustain the HSS reforms.

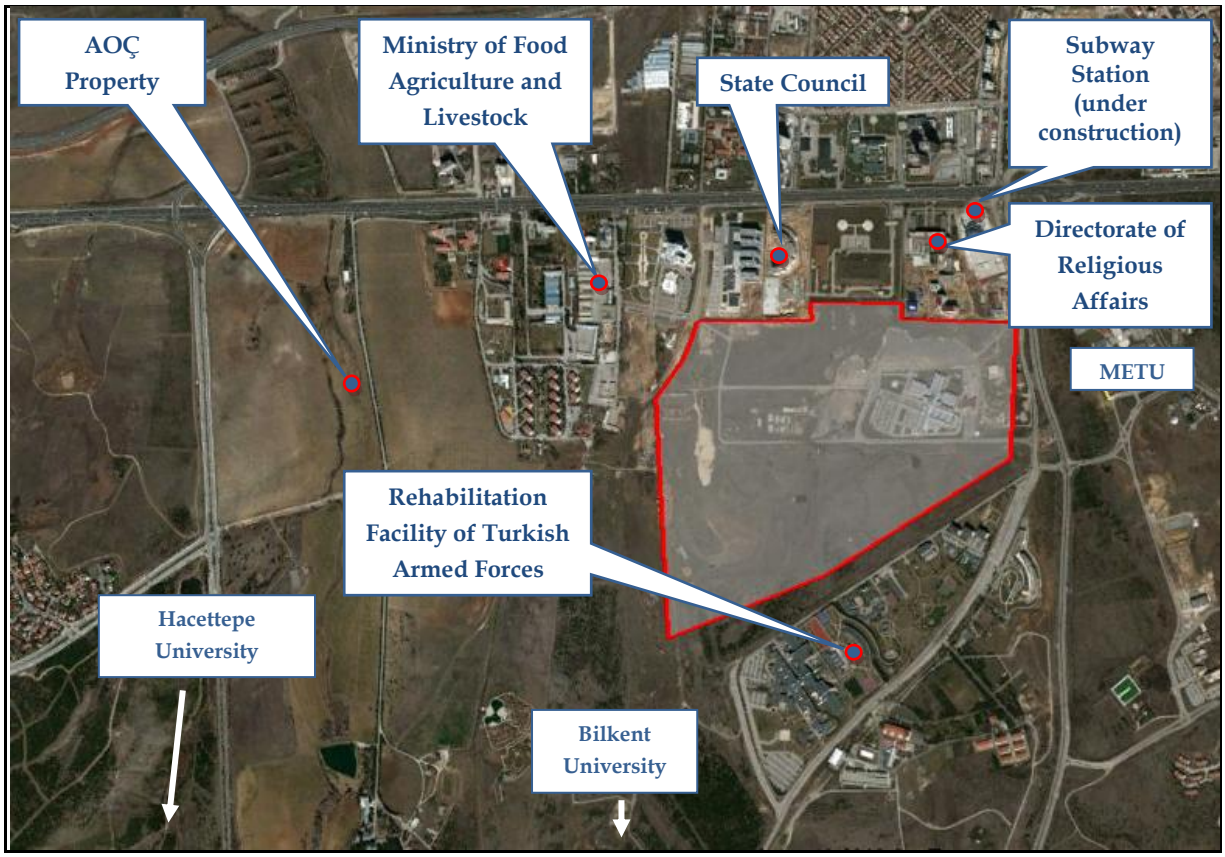
Source: Official website of TR General Directorate of Highways

Figure 3-1. Project Location

In the scope of HSS Program, the MoH initiated a process of reconstruction in 2003 in accordance with HSS. There were multiple social insurance schemes covering public, private workers, self-employed people and a social assistance program covering health insurance for poor and vulnerable people (the Green Card Program). With the HTP, the followings were performed:

- MoH combined all different health insurance schemes under one umbrella (2006);
- Hospitals of social insurance agencies were transferred to the MoH;
- Green Card health insurance were expanded to include pharmaceuticals and outpatient benefits and the coverage of Green Card has been widened for low-income groups;
- 112 Emergency healthcare services are delivered not only in cities but also in villages;
- The numbers of stations are increased and the ambulances are equipped with the state of-art technology;
- Primary care services, particularly preventive health care and mother-child health care services, are strengthened; and Family Medicine implementation has been introduced to the country; and
- PPP unit was established for investments in health sector.

The Health Campus Project is one of the products that have been developed in connection with this reconstruction process. Firstly the MoH classified the 81 provinces into 29 health zones on the basis of transportation facilities, labour force, conditions of health facilities and capacity of health services. The objective with the zoning is to solve all the health problems of patients in each zone. The MoH is planning to build 30 health campuses of various sizes in 22 cities to serve the 29 health zones.



Source: GoogleEarth.

Figure 3-2. Project Location

Hospitals in the Ankara Bilkent Region do not have enough space to respond to the changing and evolving technology and medical devices and equipment, except for the Atatürk Training and Research Hospital, which was established in 2002. Additionally, the operating rooms, intensive care facilities, emergency rooms, laboratories, imaging centres and outpatient services of state hospitals in Bilkent Region are not compliance with applicable standards. Thereby, the need has arisen to establish new health care facilities with sufficient space for accommodating high technology medical equipment that will provide qualified health services. Repair and maintenance of existing hospitals are not physically practical, nor cost-effective.

Table 3-2 below shows the number and bed capacity of hospitals in the Bilkent Region. The number of university hospitals is less than state and private hospitals, but 50% bed capacity of the 11th region belongs to university hospitals. The 11th region serves approximately 4 million people in Ankara, and additionally to the Ankara population, the 11th region serves 8 million people in central Anatolia, (Ankara and the nearby cities), and in the wider area this population rises to 13 million people (Ankara, nearby cities, other cities of Turkey and foreign patients).

Table 3-2. Current Capacity of Bilkent Region

Source of Hospital	Number of Hospitals	Capacity of Bed	Percentage (%)
State	13	1,758	28
Private	23	1,662	26
University	6	2,905	46
Total	**42**	**6,325**	**100**

3.2.2 Need for Health Campuses

Existing hospitals do not respond to the need for increased efficiency in health care services and to the changing needs of society. Moreover, they fail to provide health workers with efficient working conditions.

Integrated health campuses are healthcare facilities hosting a number of specialized hospital departments and health service areas, as well as research and development laboratories and centers, techno parks, social facilities, housing and parking lots **[1]**.

The MoH regards integrated health campuses as an essential part of the Turkish healthcare system for the following reasons:

- To increase access to a wide range of healthcare services for the whole country,
- To contribute to the regional development of healthcare,
- To improve the efficiency and quality of healthcare services,
- To ensure cost-effective healthcare service delivery,

- To achieve adequate quantity and higher quality of patient beds,
- To provide regions with comprehensive healthcare services by specialized teams,
- To put new technologies for diagnosis and treatment into practice,
- To adopt and establish new concepts in curative services such as day-surgery and day-hospital, and
- To obtain a better workforce and service quality for healthcare services **[1]**.

Ankara Bilkent Integrated Health Campus forms part of a wider Public-Private Partnership (PPP) program in Turkey, involving the development of approximately 30 new healthcare facilities with a total capacity of over 26,000 beds and total investment cost in excess of USD 10 billion. The PPP program is designed to encourage development of modern healthcare facilities and the provision of world-class healthcare services. PPP will help to raise the quality of these services. The private sector will finance the design, construction and supplementary facilities of the Project, and the MoH will be responsible for providing doctors and nurses.

Currently, there are at least 16 projects in MoH's pipeline. Five projects are in the contractual phase and another five projects in the final bid phase [1]. One of the health campuses that will be built in Ankara is Bilkent, which is in the southwestern part of Ankara city center (see the map showing both projects in Appendix-A).

The General Directorate of Treatment Services of the MoH is responsible for designing health care facilities. After the abandonment of 4 old hospitals and the renewal of the Atatürk Training and Research Hospital, Bilkent IHC will be the central healthcare facility in the 11th region, and state hospitals (newly constructed and existing hospitals) will surround it as satellites. According to this design, the campus will comprise a central health facility which will provide service in different branches. According to this design the 11th region will have a Bilkent Campus and 4 hospitals with a 4.700 bed capacity altogether. The patients will not be charged additional prices after the health campus becomes operational.

3.2.3 Strategic Importance of the Campus

The MoH positions Ankara as the capital city of medical services in Turkey and in the Anatolian Region. The total number of potential patients in Ankara is high due to the high population of the city. Citizens in the surrounding provinces travel to Ankara due to its central location and the lack of healthcare facilities in their hometowns. However, given the spatial constraints and poor conditions of the existing facilities, primarily due to their age, existing hospitals in Ankara are currently unable to meet patients' needs and to provide the expected quality of service **[1]**.

There are 34 hospitals, 224 health units, 58 sub-units, 112 emergency stations, 3 oral and dental health centers, 32 units for maternal and child health and family planning centers, 3 public health centers and 9 Tuberculosis dispensaries run by MoH in Ankara **[1]**.

The existing hospitals are old and outdated (e.g., the Numune Training and Research Hospital, the largest hospital in terms of number of beds, is 131 years old) **[1]**.

Continual repairs are necessary, yet improvements carried out do not actually increase the quality of service provided, leading to an inefficient use of public resources. For instance, the total number of beds in the hospitals run by MoH in Ankara is 8,924, of which only 640 beds serve as intensive care beds (7.2%) vs. the MoH's goal of 10%. Besides spatial constraints, it is not possible to create new intensive care units as the current health facilities in Ankara are too outdated to be renovated or improved **[1]**.

Further to the above, occupancy rates have substantially risen throughout the province of Ankara from 72% on average in 2006 to 82% on average in 2008. High occupancy rates lead to a decrease in the quality of services provided, due to understaffing and increased waiting times. Given the increasing population and requirements for higher quality of services, new healthcare facilities are needed in Ankara **[1]**.

With its 3,662 beds and modern facilities designed according to medical needs, Ankara Bilkent Integrated Health Campus will contribute to fulfilling the Government's target to replace outdated hospitals in Ankara. This will require that 13 existing hospitals with a total bed capacity of 6,450 beds (covering an area of 550,000 m^2) will be closed as and when Etlik Integrated Health Campus (3,566 beds) and Bilkent Ankara Integrated Health Campus (3,662 beds) become operational **[1]**.

When every hospital run by the MoH is individually reviewed by occupation rates, it is obvious that the occupation rate is above 100% in most policlinics (emergency observation and dialysis beds are excluded). In hospitals where policlinic bed occupation ratios are generally around 100%, delays in hospitalization of patients have an adverse impact on medical treatment processes. Moreover, the closed area per bed is 77.95m^2 on average and this is still extremely below world standards in many of the hospitals**[1]**.

In the light of the above discussion, health facilities in Ankara are highly in adequate for providing health care services. Therefore facilities located less crowded part/s of the city, and providing higher quality services, are necessary. In this regard, the MoH is planning to close; Ankara Numune Training and Research Hospital, Ankara Physical Therapy and Rehabilitation Training and Research Hospital, Ankara Gazi State Hospital, Turkey Yuksek Ihtisas Training and Research Hospital, and renewal of Atatürk Training and Research

Hospital. Establishment year of these hospitals, locations, number of doctors and nurses, bed capacities, number of daily patients and service branches are given in Table 3-3.

Table 3-3. Current Capacity of Hospitals which will be closed and renewed.

Name	Year	Location	Number of Doctors	Number of Nurses	Bed Capacity	Patient Number	Branches
Gazi State Hospital	1943	Yenimahalle	65	105	170	1800	Emergency, Acupuncture, Brain Surgery, Dermatology, Children's, Internal Medicine, Dentistry, Infection, Physiotherapy, General Surgery, Chest Diseases, Woman, Cardiology, Ear, Nose And Throat, Neurology, Orthopedic, Plastic Surgery, Psychiatric, Oncology.
Numune Training and Research Hospital	1881	Altındağ	935	500	1046	4500	Emergency, General Surgery, Neurosurgery, Eye, Chest Diseases, Woman, Cardiology, Ear, Nose and Throat, Orthopedic, Plastic Surgery, Psychiatric, Urology, Burn Unit.
Yüksek İhtisas Training and Research Hospital	1964	Sıhhiye	279	449	442	3000	Emergenc Cardiovascular Surgery, Cardiology, Gastroenterology, Urology Pediatric Cardiology, Education and Treatment of Tobacco Dependence, Gastroenterology

Name	Year	Location	Number of Doctors	Number of Nurses	Bed Capacity	Patient Number	Branches
							Surgery, Clinic Nephrology Dental Clinic
Ankara Physical Therapy and Rehabilitation Training and Research Hospital	1968	Sıhhiye	93	102	270	200	Physical Therapy and Rehabilitation
Atatürk Training and Research Hospital	2004	Çankaya	521	512	541	6500	Brain surgery, General surgery, Eye, Woman, Heart and vascular surgery, Ear, nose and throat, Orthopedic and traumatology, Plastic surgery, Urology, Emergency, Dentistry, Child, Dermatology Infection, Physical Therapy and Rehabilitation, Gastroenterology, Chest diseases, Haematology Internal medicine, Cardiology, Neurology, Psychiatric, Oncology.

3.3 Proposed Project

The proposed project is a very large urban development including a health complex with 3662 beds, which is composed of the following hospitals:

- a 562-bed general hospital;
- a 564-bed woman's hospital;

- a 580-bed children's hospital;
- a 441-bed cardiovascular surgery hospital;
- a 588-bed oncology hospital;
- a 507-bed orthopedics hospital;
- a 300-bed rehabilitation hospital;
- a 20-bed burn center;
- a 100-bed forensic hospital; and
- Health Directorate building of MoH (administrative offices).

In addition to these units, a 100-bed clinic hotel and two heliports (one on the ground and one on the roof) are planned in the context of the Project. Around 50,000 people are predicted to use the campus. Thus, an 11,000-lot car park will be built in the campus. Figure 3.3 shows the general layout of the Bilkent IHC Project in rather simplified pattern.

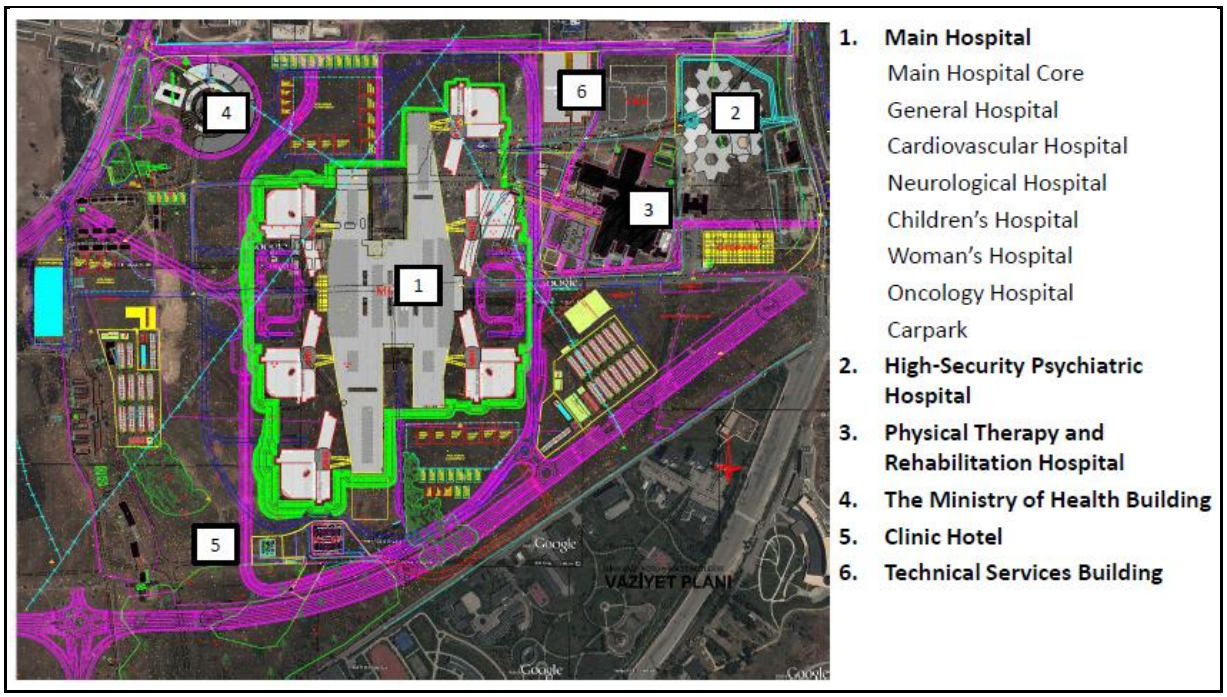


Figure 3-3. Simplified General Layout

The Project Company will be responsible for the provision of support services, which are divided into categories as (i) non-volume and (ii) volume services. Non-volume services are those services that are not dependent upon the occupancy rate of the hospital, consumption and/or level of utilization. Non-Volume Services include maintenance-related services such as building and land services, extraordinary maintenance and repair services, housekeeping, security, car parking services etc.

Volume services are defined as those services that are impacted by the occupancy rate of the hospital and/or consumption. The MoH provides a 70% occupancy guarantee for these services. Volume Services are further categorized into two sub categories as:

- Volume Clinical Support Services, which are medical support services including laboratory, imaging and rehabilitation services; and,
- Volume Support Services, which are support services including linen & laundry, catering services and waste management.

An organogram showing services to be carried out by the Project Company, e.g. Special-Purpose Vehicle (SPV), in the operational phase is given in Figure 3-5.

Currently, there are some pre-construction activities carried out in the site. In this context, prefabricated construction site office has been erected.

3.3.1 Concrete Batching Plant

Three concrete batching plants will be established at the site, and used only during the construction phase of the Project. Each concrete batching plant will have 120 m^3/h of capacity. Hence, the total capacity of the plants will be 360 m^3/h.

Ready-mixed concrete will comprise 75% aggregate material (gravel etc.), 10% cement and 15% water by volume.

Necessary aggregate material will be purchased from the nearby quarries. The concrete production process which will be implemented at the plant is explained as follows:

- Aggregate material will be stored in a bunker;
- A Granulometric curve will be used to determine the amount of aggregate needed for a required type of concrete;
- The required amount of aggregate material will be transferred to a feed bunker via conveyor belts;
- The aggregate will be homogeneously mixed with pre-determined amounts of cement and fly ash;
- Water and chemical substances (plasticizer, solidifying agents for either rapid or slow solidification of concrete) will be added;
- Mixed material will be poured to trans-mixers which will carry concrete to the application area.

A process flow diagram of the concrete batching plant is given in Figure 3-5.

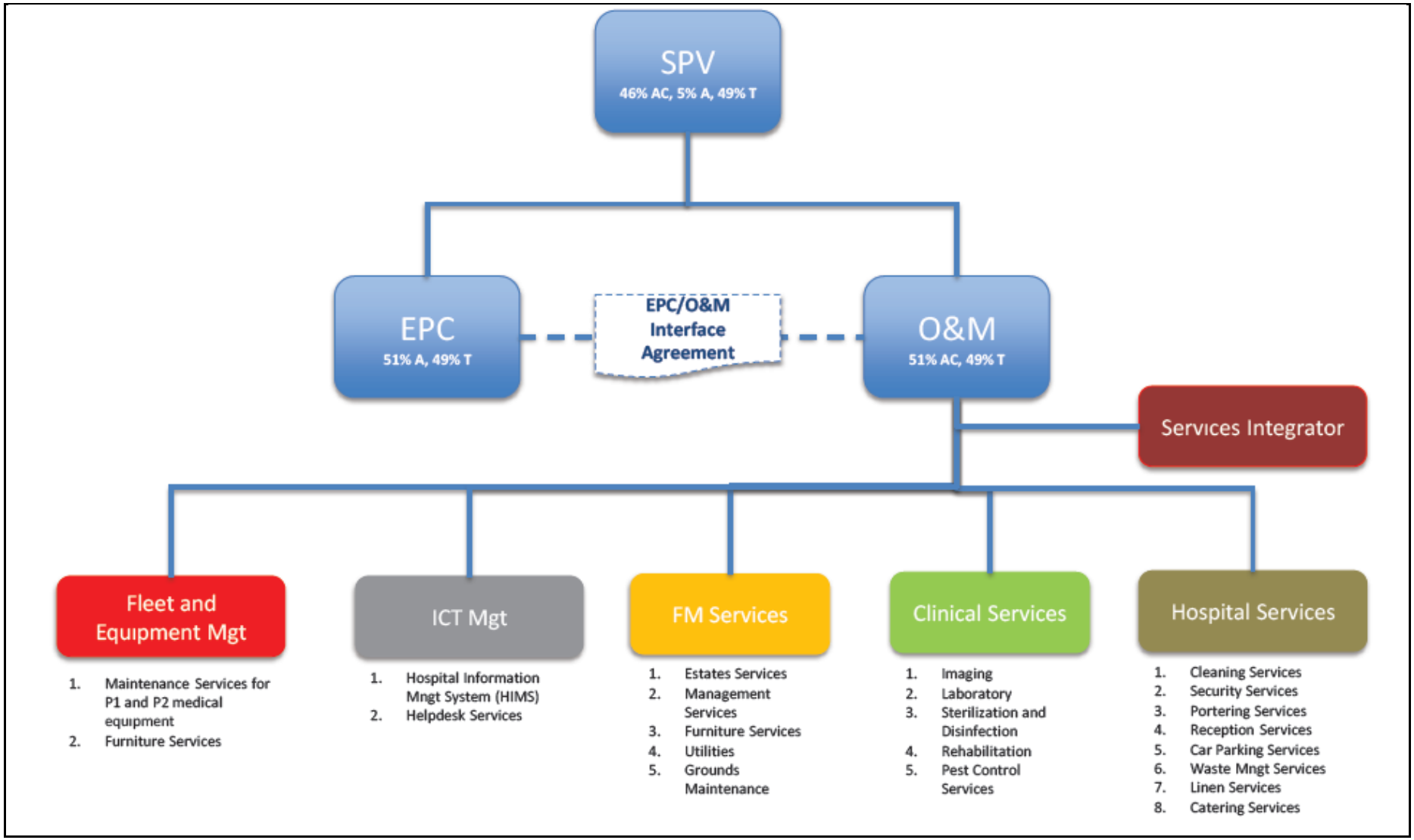


Figure 3-4. Organizational Structure

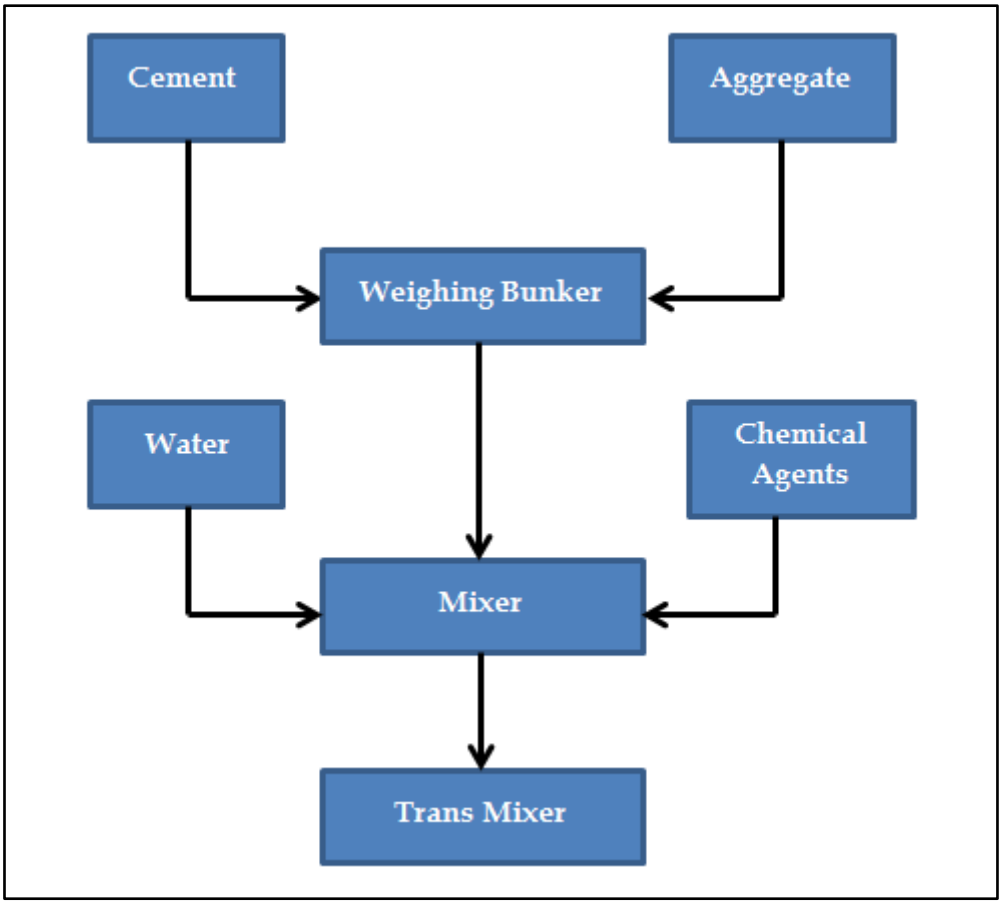


Figure 3-5. Process Flow Diagram of Concrete Batching Plant

An aggregate weighing conveyor is placed under the aggregate bunker. It is composed of three pulleys of 89 mm diameter, placed at 400 mm intervals. The driving drum is coated with 10 mm-thick rubber. The weighing conveyor is 800 mm wide and 10 mm thick.

Aggregate material is taken to the pre-loading bunker prior to the mixer. This is in order to make the aggregate ready for mixing, to decrease idle time of the mixer and energy consumption, and to increase efficiency. There will be 5 mm-thick sheet metal coating inside the bunker to protect against corrosion from the aggregate material. The cement weighing bunker will have a capacity of 1500 kg, and will be suitable for engaging four helix loaders. The water weighing bunker will have a capacity of 800-1000 kg. The water inlet to the bunker is controlled by an electro pneumatic ball valve.

An example of the concrete batching plant is given in Figure 3-6 below.

Source: qunfeng-machine.en.made-in-china.com

Figure 3-6. Sample View of a Concrete Batching Plant

3.3.2 Construction Labor Camp

As can be seen from the General Layout given in Appendix-B, a labor camp site is located at the southwestern corner of the site. Since the camp site is constructed within the Project Site, land acquisition will not be necessary. Hence, there will be no resettlement. In the labor camp, there will be dormitories for workers, technicians/foremen and engineers. There will also be a dining hall, worship area (i.e. mosque), first aid center, market and laundry. All the primary needs of the construction staff will be met in the camp site, and there will be limited interaction with the surrounding communities. Details about facilities in the labor camp are presented in Table 3-4.

Table 3-4. Information about the labor camp.

Facility	Quantity	Area (m²)	Capacity	Total Capacity	Total Area (m²)
Workers' Domitory	22	1,138	288	6,336	25,036
Engineers' Dormiory	2	800	36	36	1,600
Technicians/Foremen's Dormitory	2	727	108	108	1,454
Engineer/Foremen Canteen	2	127	100	100	254
Administration and HSE Offices, First Aid Center and Doctor Offices	2	252	-	-	504

Facility	Quantity	Area (m²)	Capacity	Total Capacity	Total Area (m²)
Laundry	2	80	-	-	160
Mosque	2	210	-	-	420
Market	2	60	-	-	120
Utility Center	2	350	-	-	700
Kitchen and Dining Hall	1 1	2,600 1,200	-	-	5,200
Workers' Canteen	1	600	-	-	1,200
				Total	**39,448**

In line with the IFC/EBRD's Guidance on Worker's Accommodation, services and utilities that will be available in the labor camp will include but are not limited to the following:

- Daily room, bathroom and toilet cleaning to provide hygienic conditions for the construction staff;
- Necessary air conditioning and hot water will be supplied to dormitories. Room temperatures will be at least 20 °C in cold weather;
- Providing at least 150 L/cap-day of water. Drinking water will be supplied from the market in big bottles filled with spring water;
- Wastewater collected from the labor camp will be conveyed to the municipal sewerage network;
- Every worker will be provided with a separate bed and linen, pillow and cover, which will be washed regularly;
- Rooms in the worker dormitory will be shared by at most eight people;
- Staff will be provided with necessary furniture in the rooms (e.g. chairs, desks and private lockers);
- There will be toilets and bathrooms in the dormitories which will be shared by at most 15 people;
- In line with the recommendations of the World Health Organization on safe food, cooks will prepare food in the kitchen, where necessary sanitary conditions will be established;
- People in the kitchen will handle food with clean hands and necessary hygienic materials such as bonnet;
- Raw foods will be stored in separate containers and fridges to ensure freshness;
- An adequate number of first aid kits will be placed in dormitories and other areas in the labor camp;
- Security staff will control access to the labor camp.

The labor camp will be constructed by a specialized firm i.e. Treysan, a subsidiary of Dia Holding, VefaPrefabrik or Dorçe. The camp will be managed by Dia Holding. Dia Holding is currently managing 2500 and 3000-person camps in Azerbaijan.

Labor camp facilities will be temporary. Site reinstatement will be made after camp facilities are removed at the end of the construction phase. Dismantled facilities will be transported to another construction location of a different project.

3.3.3 Utility Centers

A tri-generation system with installed capacity of c.a. 20 MW will be used to provide power as well as heating and cooling. In this system, waste heat in the exhaust gas produced due to combustion of natural gas will be used to produce steam. Steam will be fed directly to the point of use, to hot water heat exchangers or to absorption-cooling groups. With the steam to be fed to absorption-cooling groups, a part of the cooling demand of the campus is planned to be supplied.

Two heat exchangers, one as spare, will be used in order to satisfy the hot water demand of the campus. Hot water produced will be pumped to buildings in the campus with frequency-controlled transfer pumps.

There will also be a water treatment system to produce water that will be used in laboratories and laundries for generating steam and clean steam. The water treatment system will comprise water softening, preliminary filtration and reverse osmosis systems. The system will include a feed pump, high-pressure pump, sand filter, activated carbon filters, dosage pumps, UV filters and control equipment. The size of the system will be determined according to results of chemical analysis of the feed water.

3.3.4 Traffic Arrangements

The transportation system planned in the architectural project designs has been assessed by examining the available transportation infrastructure and the transportation system foreseen in the project. Traffic arrangements within the scope of the Project can be described under two topics as (i) primary transportation system and (ii) parking lot system.

Main features of the primary transportation system are described as follows.

- Vehicle and pedestrian entrance to the hospital has been planned from a single point, and in order to prevent any density at that point, the vehicle and pedestrian entrance-exit spots have been distributed in 4 directions. Each polyclinic has its own vehicle and pedestrian entrances.
- The entrances provided from the east and west are the emergency vehicle entrance and pedestrian entrance spots. These spots have, at the same time, been designed as main entrances to the underground parking lot.

- Emergency vehicle and pedestrian entrance is provided from the entrance spot to the north.
- The entrance point to the south is the logistics entrance.
- The eastern main entrance and the south logistics entrance are to be provided through the 50 m road separated from the Bilkent Boulevard by the Techno-city Intersection.
- The western main entrance to the Project Site will be provided over the 35 m road.
- A road is planned to connect the 35 m road on the west of the site and Beytepe Village Road on the east to each other directly. It is planned locate the road close to the Eskişehir Highway, where intensive demand is anticipated, and to reach the emergency entrance through this road within a short time.
- Commercial areas have been planned to be available around the project site. No architectural projects are currently available for the commercial area.
- In the architectural project, a parking lot area of 284,940 m has been allocated inside the hospital building.
- The internal parking lot has not been clarified yet: design calculations still continue. Parking area per vehicle is to cover an area of 30 m², providing space to serve an estimated number of 9,498 vehicles in total.
- In order to provide access to the parking lots in each building, entrance-exit points have been designed close to that building. The policlinics affiliated with the main hospital also have their own vehicle and pedestrian entrances.
- The project designs include no pedestrian roads around the building.

3.4 Zone of Influence and Associated Facilities

Risks and impacts will be analyzed in the context of the ZoI. According to the IFC Guidance Notes, ZoI encompasses, as appropriate: (i) the primary project site(s) and related facilities that the client (including its subcontractors) develops or controls; (ii) associated facilities that are not funded as part of the project (funding may be provided separately by the client or by third parties including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project; (iii) areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the ESIA is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

In the light of the above discussion, the ZoI includes associated facilities of the Project such as primarily the Atatürk Training and Research Hospital and other institutions in the immediate surroundings. The ZoI also includes the concrete batching plant and the municipal wastewater treatment plant, landfill and debris dump site for Project-related wastes.

Information regarding municipal infrastructure is given as follows:

Wastewater Treatment Infrastructure

Metropolitan wastewater treatment plant is Tatlar Wastewater Treatment Plant, and located around 25 km to the west of the Project Site. Conceptual design and tender documents of the wastewater treatment plant were prepared between October 1988 and January 1990. Final design was completed in October 1992, and construction of the first stage started in the same year. The wastewater treatment plant was designed as three-stage. Planning of stages are given below:

- Stage 1: Equivalent population of 3,920,000 in the year 2002;
- Stage 2: Extension to serve total equivalent population of 4,833,000;
- Stage 3: Extension to serve total equivalent population of 6,228,300 and addition of units for removal of nitrogen and phosphorus.

The treatment plant was put into operation in 1997. In the current situation, 900,000 m^3/day of wastewater is treated. Activated sludge process is implemented in the treatment plant. Main treatment units are given as follows:

- Coarse and fine screens;
- Aerated grit chamber;
- Drum screens for removal of sand, oil and foam;
- Primary sedimentation tanks;
- Aeration tanks;
- Secondary sedimentation tanks.

Wastewater is discharge to Ankara Creek, which eventually joins Sakarya River. Sarıyar Dam is located downstream of the plant on Sakarya River. Sarıyar Dam has a hydroelectric power plant and used for irrigation and recreational use as well. For this reason, euthrophication control (i.e. removal of nutrients) is necessary for such plants pursuant to the Water Pollution Control Regulation. The wastewater treatment plant is planned to perform tertiary treatment for removal of nitrogen and phosphorus. Aeration tanks in Stage 3 include anoxic zones to carry out denitrification. Phosphorus removal was planned to be carried out by chemical coagulation with addition of $FeCl_3$.

Discharge characteristics of the plant are presented along with relevant national and EU standards in Table 3.5.

Table 3-5. Discharge Characteristics of the Wastewater Treatment Plant and Relevant National and EU Discharge Standards

Parameter	Discharge Characteristics of the Tatlar Wastewater Treatment Plant	Water Pollution Control Regulation (for equivalent population over 100,000)*	Urban Wastewater Treatment Regulation	EU Urban Wastewater Treatment Directive (91/271/EEC)
pH	6.5-8.5	6-9	-	
Chemical Oxygen Demand	3-8 mg/L	90 mg/L	125 mg/L (75% treatment efficiency)	
Biochemical Oxygen Demand	-	35 mg/L	25 mg/L (70-90% treatment efficiency)	
Dissolved Oxygen	5.0-7.5 mg/L	-	35 mg/L (90% treatment efficiency)	
Suspended Solids	5-15 mg/L	45 mg/L	-	
Total Coliform	1000 MPN/100 mL	-	-	
Total Nitrogen	0.1-1.0 mg/L	-	10 mg/L (70-80% treatment efficiency)	
Total Phosphorus	0.005-0.1 mg/L	-	1 mg/L (80% treatment efficiency)	

** 24-hour composite sample.*

As can be seen from the Table 3-5, wastewater treatment plant was designed to meet stringent discharge criteria regarding tertiary treatment of nutrients, i.e. nitrogen and phosphorus.

After being processed in thickener, sludge is transferred to anaerobic sludge stabilization unit where biogas is generated. Biogas is converted to electricity. According to information obtained from the plant director, 70% of the electricity demand of the plant is supplied from the electricity generated from biogas.

Although the plant occupies full capacity of Stage 1, construction of Stage 2 has not been started yet. Instead of realizing Stage 2 of this plant, the metropolitan municipality is planning to construct and operate another wastewater treatment plant in the city center, around 4 km to the northeast of the Project Site. Construction of this new treatment plant will start in 2013, and is intended to be completed in a time period shorter than two years.

Domestic wastewater and storm water will be collected separately, and discharged to the municipal sewerage network.

Solid Waste, Hazardous Waste and Medical Waste Management Infrastructure

A solid waste management company, ITC, will construct and operate a medical waste incineration plant at one of the two landfills of Ankara, Çadırtepe Landfill, located to the

northwest of the city, and around 40 km to the Project Site. According to information obtained from an authorized person from ITC, daily medical waste generation in Ankara is 30 ton, and it is currently landfilled into a separate lot in the landfill. Incineration plant is planned to be erected in nine months. This plant is designed as two-stage. At the first stage, capacity will be 50,000 ton/year. At the second stage, the capacity will be doubled, and total capacity will be 100,000 ton/year. Second stage is planned to be erected at the end of the third year. Price of medical waste collection will be determined by the Local Environmental Committee annually.

Besides medical waste, solid wastes and hazardous wastes will also be taken to the same area since ITC is also planning to erect a hazardous waste landfill at Çadırtepe.

4 DESCRIPTION OF THE EXISTING ENVIRONMENT

The Project Site covers the Atatürk Training and Research Hospital, old Living Neighbourhood/Quarters and empty buildings of MoFAL (see Figure 4-1). Photos from the Project Site are given in Figures 4-2 and 4-3.

Source: GoogleEarth.

Figure 4-1. Project Site

The empty buildings of the MoFAL will be demolished before construction. Atatürk Training and Research Hospital will also be refurbished at the end of construction.

The baseline characteristics of the important environmental elements are provided under respective subtitles below.

Date / Time	:	29.03.2012 / 13:30	**Datum and System**	:	ED50 - UTM Zone:36
Latitude	:	479721	**Longitude**	:	4416680
Direction	:	Southwest	**Taken by**	:	Günal ÖZENİRLER

Figure 4-2.A View from the Project Site-1

Date / Time	:	29.03.2012 / 14:19	**Datum and System**	:	ED50 - UTM Zone:36
Latitude	:	478943	**Longitude**	:	4416879
Direction	:	Southwest	**Taken by**	:	Günal ÖZENİRLER

Figure 4-3.A View from the Project Site-2

4.1 Air

The Ministry of Environment and Urbanization (MoEU) has been operating the National Air Quality Monitoring Network in which air quality data (i.e. PM_{10}, $PM_{2.5}$, SO_2, NO_2, NO_X, O_3), temperature, wind direction, wind speed, relative humidity and pressure) are gathered from the stations located throughout Turkey since 2009. In Ankara, there are eight meteorological stations, and as can be seen from the figure below, the two stations closest to the Project Site are Bahcelievler and Dikmen.

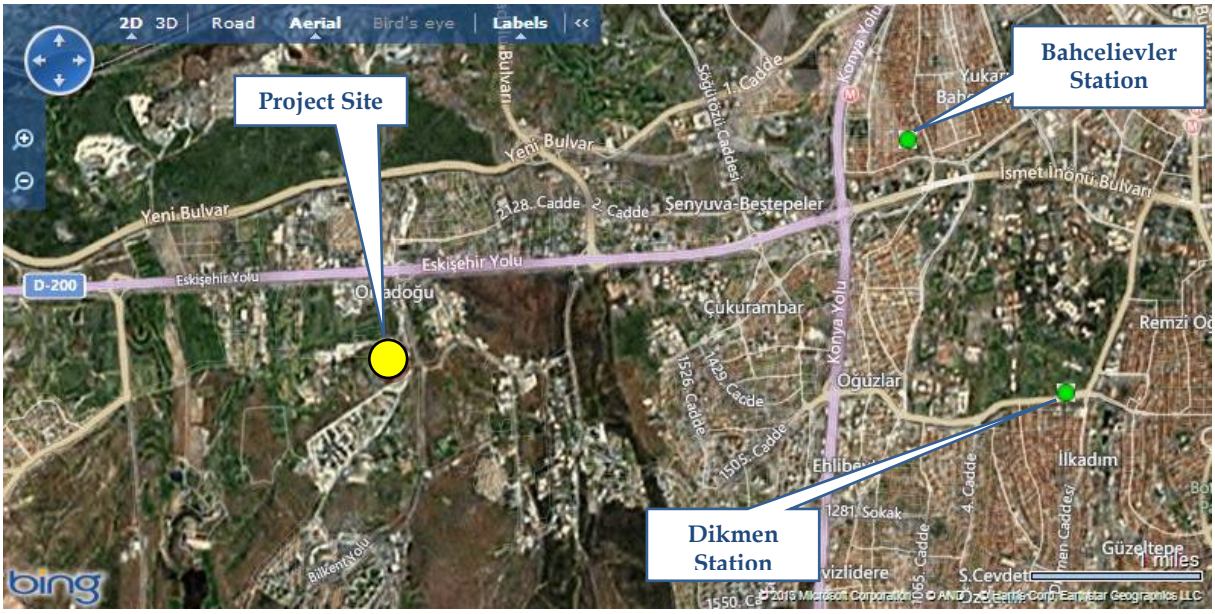


Figure 4-4. Air Quality Monitoring Stations near the Project Site

Air quality data measured at the Air Quality Measurement Stations of the MoEU at Bahcelievler and Dikmen in 2012 are presented in hourly and daily basis below.

Table 4-1. Air Quality Data of Bahcelievler and Dikmen, Ankara

Parameter	Average (µg/m³)		Maximum (µg/m³) (Hourly/Daily)				Limit Value
	Bahcelievler	Dikmen	Bahcelievler		Dikmen		
PM_{10}	65	84	632	245	1067	343	78*
SO_2	39	11	525	267	187	54	150*
NO	26	36	907	283	838	370	-
NO_2	36	45	191	111	213	101	68*
NO_X	64	84	1095	394	1049	463	-

** Limit values given for the year 2012 in Table 2.2 in Annex-2 to the Regulation on Control of Industrial Air Pollution.*

Comparing these values to the limit values of ambient air quality given in the above table, air quality values in Bahcelievler are under legal limits for PM_{10}, SO_2 and NO_2, except for slight exceedance of PM_{10} in Dikmen. There are no limit values for ambient NO and NO_X in the Regulation on Control of Industrial Air Pollution.

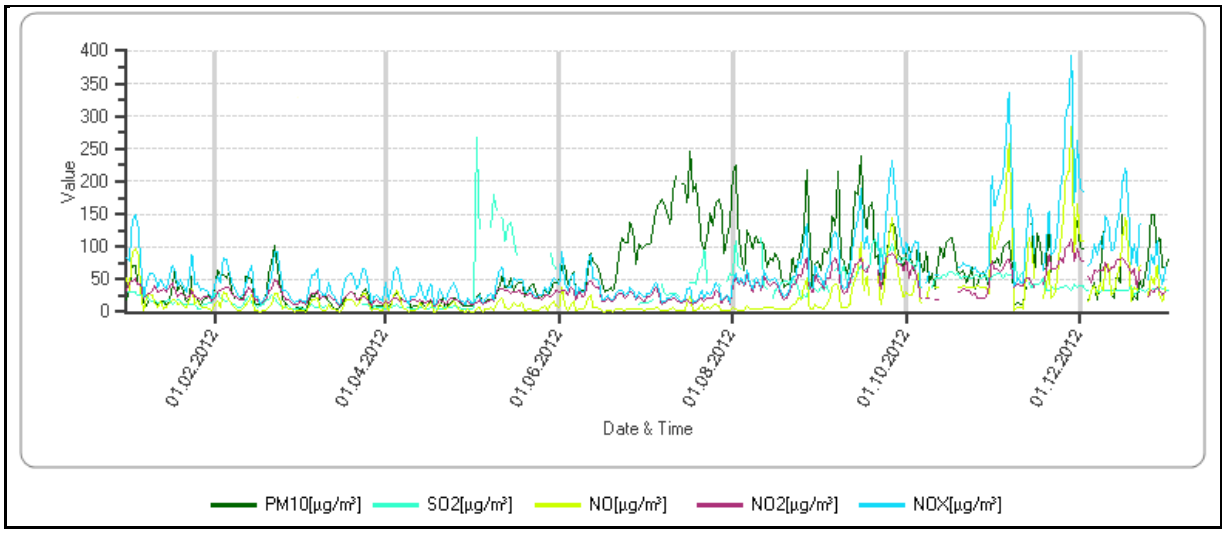


Figure 4-5. Graphical Representation of Daily Air Quality Data of Bahcelievler

As can be seen from Figure 4-5, PM_{10} concentration in Ankara is high during summer due to dry weather conditions.

Besides data gathered from the MoEU Network, onsite air quality data were collected through baseline measurements conducted at the closest sensitive receptors (see Section 4.9.2).

4.2 Water

Since the Project Site has long been under urban interventions, the site no longer presents a natural appearance. During the site survey conducted at the Project Site, no natural surface watercourse was observed, which can be explained with the fact that the site is in the middle of an urban development.

4.3 Ecological Features

The Project Site has already been occupied by certain developments and is under the impact of human activities. The Site is surrounded by the rest of the city, and hence, it is not possible to talk about a natural habitat in the vicinity.

There are some plant communities observed on the Site, representing the dominant structure, i.e. steppe, in the central Anatolia region where Ankara is located.

From an ecological point of view, Ankara province where the Project Site is located demonstrates features of Iran-Turanian and European-Siberian Floristic regions. Due to urbanization for long years, the region has lost its natural habitat properties. Therefore, it is isolated from the undamaged areas that biodiversity inhabit in the vicinity of Ankara.

It was observed that construction debris had been dumped on the site. Construction debris is poor in mineral and contains humic materials suitable for growth of perennial plants, which has caused growth of annual r-strategist plants, i.e. plants with high development rate. These plants are known to quickly respond to environmental impact, and to recover in a short time.

An ecological survey was made by Alper Ertürk, ecologist, on the site to identify flora and fauna structure in the site. An Ecological Survey Report is presented in Appendix-C.

4.4 Climate

Terrestrial climate prevails in the central Anatolia with cold winters with precipitation and hot and dry summers. Since central Anatolia is surrounded by mountain ranges in each direction, a marine effect cannot be observed in the region, hence, climate is not humid, except for the northern part of the province which is a transitional area between a terrestrial and Black Sea climate. According to long-term meteorological data recorded at Ankara Meteorological Station between 1970 and 2011, average temperature is 12 °C while average maximum and minimum temperatures are 30.3 °C in July and -3.0 °C in January, respectively. The average insolation time in the city is 6.6 days. The average number of days with precipitation is 8.7 whereas the annual average of monthly total precipitation is 33.4 kg/m^2. Long-term meteorological data are presented on monthly basis in Table 4-2.

Table 4-2. Meteorological Data for Ankara

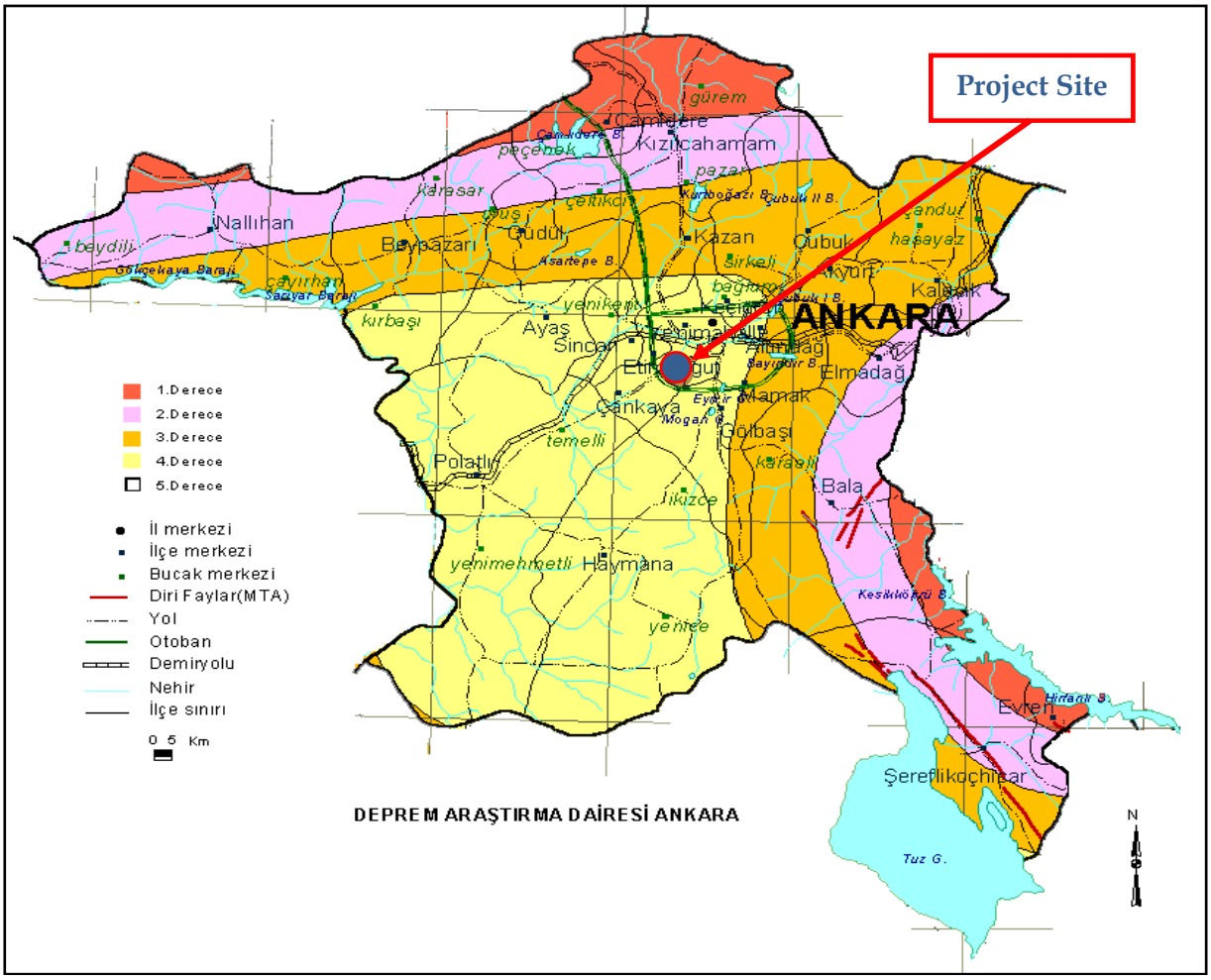
Meteorological Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temperature (°C)	0.3	2.1	6.2	11.3	16.1	20.2	23.6	23.3	18.7	13.0	6.7	2.3
Average max. temperature (°C)	4.3	6.7	11.9	17.1	22.2	26.6	30.3	30.2	26.0	19.7	12.4	6.2
Average min. temperature (°C)	-3.0	-2.0	1.1	5.7	9.7	13.1	16.1	16.1	12.0	7.4	2.2	-1.0
Average insolation time (hour)	2.4	3.5	5.3	6.3	8.4	10.3	11.3	10.5	9.2	6.4	4.2	2.2
Average number of days with precipitation	11.1	10.4	10.6	12.3	12.5	8.9	3.9	3.0	3.8	7.5	8.8	11.0
Monthly total amount of precipitation (kg/m^2)	39.2	33.4	36.7	50.0	50.3	35.3	15.5	12.0	17.5	33.2	35.4	42.5

[URL-1]: Official website of the General Directorate of State Meteorological Works.

4.5 Seismicity and Geohazards

Ankara is a zone crisscrossed by plains and lowlands formed by the branches of Kizilirmak and Sakarya rivers passing through to the northwest of the Central Anatolia. It is possible to see forest areas lying next to steppes and moorlands. Mountains that are a branch of a range of North Anatolia mountains mark the northern border of the province and pass through lowlands which are actually the continuation of the Central Anatolian plains.

The Project Site is not on a very rough terrain, with mild inclination towards south. Furthermore, as can be seen from the earthquake map of Ankara (see Figure 4-6) prepared by Earthquake Research Department of the General Directorate of Disaster Affairs, Ankara lies in a fourth-degree (degree one being the most and degree five being the least risky) earthquake zone (see fair yellow zone including Cankaya in the map given in Figure 4-6). In the map, degree one (red zone) indicates the most risky areas while degree five (white) shows the areas with least danger (there are no fifth-degree zones in Ankara).



Source: Earthquake Research Department of the General Directorate of Disaster Affairs

Figure 4-6. Earthquake Map of Ankara Province

4.6 Settlements

As it was mentioned above, the Project Site is near the three most important universities of Turkey, namely the Middle East Technical University (METU), Bilkent University and Hacettepe University, neighboring the rehabilitation facility for the Turkish Armed Forces to the south, the Directorate of Religious Affairs and State Council to the north and the Ministry of Food, Agriculture and Livestock to the northwest. The vacant land to the west of the Project Site is the property of the Directorate of Atatürk, Orman Çiftligi.

In terms of the BILKENT IHC Project, Project Affected People (PAPs) are defined as the communities, households and individuals who live in close proximity to the project construction site and in the areas that may be affected during the construction and/or operation stage. PAPs can be defined at settlement level as there are two defined Quarters around the project site, shown in Table.4-3.

Table 4-3. Population of Settlement Areas nearby the Project Site

Settlement Areas	Population
Beytepe Quarter/Neighbourhood	4,000
Üniversiteler Quarter/ Neighbourhood	35,000
Total	39,000

Universiteler Quarter

A community level survey has been conducted with the nearest settlement area to the project, with Ms. Ayfer Kızılkan, the mukhtar (i.e., *the local administrator of the quarter elected by the residents*) of Universiteler Quarter. Information has been taken on general demographic, economic and social issues about the neighbourhood along with community level impacts, concerns and opportunities of the project.

In Universiteler Quarter, according to information obtained from the mukhtar; 5,000 households are living in the neighbourhood with a population of 35,000 which has remained stable for the last five years. There is not in or out migration.

This neighbourhood has residents who have a high economic level, such as parliamentarians and bureaucrats. The rate of economic development is very high. The occupational status of the residents of the neighbourhood is given in Table 4-4.

Job opportunities in the neighbourhood have not changed in the last five years and average income is 5,000 TL. The main environmental problem in the neighbourhood is narrow and rough roads. Neighbourhood residents have expectations about road repairs from the

Project. The main social problem in the neighbourhood is a lack of social activities for women. Socioeconomic figures of the quarter and the vulnerable groups of the quarter are given in Tables 4.5 and 4.6, respectively.

Table 4-4. Occupational Figures of the Universiteler Quarter.

Status	Percentage (%)
Employee	14.29
Self-employed	21.43
Officer	14.29
Unemployed	7.14
Retired	8.57
Student	34.29

Table 4-5. Existing social and economic facilities in the Universiteler neighbourhood.

Existing Facilities in Universiteler Quarter	Numbers of Facilities
Primary school	2
Cottage hospital	0
Hospital	1
Gendarme	0
Shop	2
Post office	1
Cafe	10
Restaurant	10
Tourist facilities	1
High school	3
Financial centre (bank, ATM)	10

Table 4-6. Vulnerable groups in the Universiteler neighbourhood

Vulnerable groups	Yes	No	Number of People
People who live with the assistance of others		✓	
Female households	✓		300
Physically handicapped people	✓		5
Mentally handicapped people	✓		5

Beytepe Quarter

According to information which was obtained from the mukhtar; 1,000 households are living in the neighbourhood with a population of 4,000 which has not been remained stable for the last five years. There is not in or out migration. However, the quarter has been divided and new quarters have generated administratively due to extensive service area.

Beytepe Quarter used to be a village and main income used to be agriculture. After 1960s Ministry of Agriculture expropriated their land and transferred Ministry to this area and Bilkent University was built within the boundaries of Village in 1984. Currently this neighbourhood has residents who are middle class, such as self-employed who has real estate income. Economic development speed is fast due to increasing prices of land and buildings. Occupational status of the residents of the neighbourhood is given in Table 4-7.

Table 4-7. Occupational Figures Related to Beytepe Quarter

Status	Percentage (%)
Employee	30
Self-employed	30
Officer	10
Unemployed	10
Retired	10
Student	10

Job opportunities in the neighbourhood did not change in the last five years and average income is 2,500 TL.

Table 4-8. Existing social and economic facilities in the Beytepe Quarter;

Existing Facilities in Beytepe Quarter	Numbers of Facilities
Primary school	1
Cottage hospital	1
Hospital	0
Gendarme	1
Shop	0
Post office	0
Café	2
Restaurant	3
Tourist facilities	0
High school	0
Financial center (bank, ATM)	0

Main environmental problem of the neighbourhood is zoning/reconstruction permit, they do not have reconstruction permit and in parallel with this problem infrastructure systems of the Quarter are not developing. Residents of the quarter still use coal for heating. Main social problem of the Beytepe is transportation. They have limited access opportunities for transportation. In addition to social problems of the community, vulnerable groups of the impacted population was questioned, who might require special measures (i.e. the elderly, the disabled, widows living alone, children, etc.) and possible precautions that may be taken for these groups. Vulnerable groups of the quarter can be seen in Table 4.9.

Table 4-9. Vulnerable groups in the Beytepe Quarter

Vulnerable groups	Yes	No	Number of People
People who live with the assistance of others	✓		10-15
Female households	✓		30
Physically handicapped people	✓		3
Mentally handicapped people	✓		3

Additionally to community level survey project a "Public Participation in Environmental Impact Assessment Meeting" was conducted on 26/03/2013 at 14:00 in theatre of Kentpark shopping mall. An announcement was published 10 days before the date of the meeting. The national (Gunes) newspapers were used for the announcement which advertised the date of meeting, time, place, and subject of the meeting. Sixteen people attended the meeting including, mukhtars, i.e. village head - the greatest local administrator in a village elected by residents of village, of Beytepe and Universiteler Quarters, residents of these Quarters, SPV, ESIA team, MoH and the authorities of SPV. Leaflets were distributed to the participants, information has given about the investment, presentations were made by the company officials and ESIA team. Ideas and suggestions were taken about the project.

The major concern about the Project was traffic load. Existing roads are not working sufficiently. PAPs suggested alternative roads to the campus area. SPV mentioned that the technical team of the Project is negotiating this issue with the Metropolitan Municipality.

The second issue raised at the meeting was job opportunities. The Mukhtar of Beytepe Quarter mentioned that unemployment is one of their quarter's problems. He assumed that project should hire local people.

4.7 Archaeological Features

According to baseline site observations in the Project Site, there are no historical/cultural assets within the site and no findings implying the existence of cultural assets. Hence, the ESIA team concluded that there will be no need to conduct an archaeological survey.

4.8 Traffic

A traffic assessment study has been carried out by the design team to describe the existing traffic conditions in the surrounding arterial routes. The study focused on an estimation of demand that the Project Site will receive from the surroundings. For this purpose, the populations of the surrounding districts have been examined and the demand percentage for the Bilkent IHC in the Cankaya district has been calculated based on the population sizes. In order to determine the vehicle densities coming to the project site from the east and west of the Eskisehir Road (i.e. the boulevard passing from the north of the site), and south of the

Bilkent Boulevard (in a south-north direction on the east of the site), three main arrival directions have been established.

Figure 4-7. Traffic Demand Distribution based on the Project Site Directions

Based on an assessment of the influence area and the distribution of the traffic in the roads in the immediate surroundings, it is accepted that those coming to the campus from the eastern direction have the highest share by a ratio of 55%. Accordingly, demand is anticipated from the Altındag, Kecioren and Mamak districts intensively, by a share of 55%, and from the Etimesgut, Sincan and Yenimahalle districts on the western part by 40%.

According to consultations with the Transportation Coordination Center (UKOME) of Ankara Metropolitan Municipality, the metropolitan municipality is planning to construct a new parallel road to the north of Eskişehir Highway.

Also, another road is planned to connect the eastern gate of the campus (see Appendix-B) in order to bypass Eskişehir Highway. In addition to these two developments that will reduce traffic congestion in Eskişehir Highway, there are also planning for new roads that will connect the campus to newly developing settlement areas in the west of the city. These road developments are considered to reduce traffic congestion in Eskişehir Highway which may become worse due to other commercial developments along this highway other than the health campus.

It should be also noted that the new subway project of the metropolitan municipality (see Section 6.1) will include a station near the health campus. This is believed to make visitors' access to the campus easier while helping reduce the additional traffic load expected due to the Project.

According to an interview with an authorized person from the metropolitan municipality, the municipality is currently implementing a project with Gazi University to prepare the Main Transportation Plan for Ankara. This project considers future developments in the city including the two health campuses. In the context of this project, questionnaires are being conducted with 35,000 households. This plan is aimed to figure needs of the transportation infrastructure and recommend necessary investments and arrangements to have a proper transportation system in the city.

4.9 Baseline Studies

In the context of the ESIA study, baseline conditions of the Project site were assessed and observations were recorded with photos of locations of the planned project units.

In order to describe baseline soil pollution, soil samples were taken from seven locations suspected for contamination. For background soil characteristics, soil sample was also taken from one point with no suspicion of contamination. Sampling locations were determined during the field study, and samples were taken from points close to surface with the use of a hand auger.

In addition to determination of baseline soil pollution, samplings and analyzes for air quality were carried out at the closest sensitive receptors (four locations) in order to determine particulate matter (PM_{10}) concentration. Background PM_{10} was also measured at the envisaged concrete batching plant location.

Mid-day, evening and night-time noise levels were measured to determine background noise levels at the closest sensitive receptors, which were determined during field study considering building areas in the vicinity.

In addition to soil analysis and noise measurements, groundwater sample was taken from a borehole. The satellite image showing sampling locations is presented in Appendix-D.

4.9.1 Soil Pollution

For the purpose of determination of baseline soil pollution, sampling points are presented in Table 4-10.

Table 4-10. Locations where soil samples were taken

No	Description	Coordination (UTM Datum ED 50)	
		East	North
1	Sampling Point-1	479308	4417208
2	Sampling Point-2	479396	4417186
3	Sampling Point-3	479184	4417052
4	Sampling Point-4	478998	4416991
5	Sampling Point-5 (Reference Point)	478694	4416905
6	Sampling Point-6	479092	4416591
7	Sampling Point-7	479202	4416750
8	Sampling Point-8	479365	4416840

Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin, Antimony, Selenium, Vanadium and Zinc were analyzed in soil samples taken from the locations given in Table 4-4. These parameters are selected by due diligence experts of 2U1K, based on site observations, among those parameters in Table 2 of Annex-2 of the Regulation on Control of Soil Pollution and Sites Polluted by Point Sources (RCSPSPPS) as pollution indicator parameters for hospital services. Analysis results are given in Table 4-11. Analysis report is given in Appendix-E.

Table 4-11. Results of Analysis for Soil Samples

Parameter/Location	Sampling Point-1	Sampling Point-2	Sampling Point-3	Sampling Point-4	Sampling Point-5	Sampling Point-6	Sampling Point-7	Sampling Point-8
Arsenic (mg/kg)	13.9	15.1	19.6	13.4	13.5	12.7	14.9	14.5
Cadmium (mg/kg)	0.37	0.2	0.50	< 0.1	0.2	0.28	0.26	0.54
Chromium (mg/kg)	44.4	47.9	55.5	40.8	39.7	38.4	48.0	51.0
Copper (mg/kg)	21.4	20.0	24.3	16.5	16.9	18.0	19.5	25.0
Nickel (mg/kg)	37.4	42.3	51.3	34.7	34.4	33.6	38.6	42.2
Lead (mg/kg)	10.4	9.0	11.0	9.6	9.5	10.7	10.8	12.4
Tin (mg/kg)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Antimony (mg/kg) *	-	-	-	-	-	-	-	-
Selenium (mg/kg)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vanadium (mg/kg) *	-	-	-	-	-	-	-	-
Zinc (mg/kg)	29.8	33.5	36.7	27.8	35.7	25.5	32	37.4

* Analysis studies are in progress.

The values in Table 4-5 are the Reference Values (RV) of the Bilkent IHCP site pursuant to the RCSPSPPS. According to this regulation, RV is "*pollution indicator parameter (PIP) or value of target pollutant measured for comparison with PIP of the site at Phase I Site Assessment and target pollutant concentration values (TPCV) at Phase-II Site Assessment of soil, surface water and groundwater samples taken from areas that are considered unpolluted due to a point source or human activity, in the vicinity of the suspicious site*". Pursuant to the RCSPSPPS, "*in case sufficient or*

exact results are not obtained or site is suspicious for pollution as a result of Phase-I assessment, soil/surface-groundwater/gas samples are taken from site assumed to have been polluted by a point source or human activity, and PIP given in Table 1 and 2 in Annex-2 are measured. These measurements are named as 'measurement results (MR)', and maximum value is named as MR_{max}. MR_{max} is compared with the RV".

On a suspicious location, MV and RV are compared and a deviation level from RV is calculated. The deviation level is used to determine whether the site has been affected by an activity at a point and thus, to figure out the method to follow.

$$\text{Deviation} = \frac{MV_{max}}{RV}$$

This assessment is made according to the basic framework given in Table 4-12. In this regard, the site is designated as a "Site for which follow-up is required" if ratio of MV_{max} to RV is equal to or less than 1. If the deviation level is between 1 and 25, the site is subject to Phase-II assessment and designated as "Site for which follow-up is required". If the deviation level is larger than 25, it is considered that there is high pollution and danger, and hence, the site is designated as "Polluted Site" which has to be remediated within time allowed by the Ministry. When more than one PIP is going to be measured at site, the deviation level, which indicates the worst case is taken into consideration.

Table 4-12. Site Pollution Assessment on RD Basis

Criteria (Deviation = MV_{max}/RV)	Assessment
< 1	Site for which follow-up is not required
> 1	Site which is subject to Phase-II assessment and follow-up is required for
> 25	Polluted Site which is required to be remediated within time allowed by the Ministry

Source: Table 1 in Annex-9 of the RCSPSPPS (Site Pollution Assessment on RD Basis)

Measured PIP values are compared with RV as stipulated in Annex-9 to the RCSPSPPS. As a result of this comparison, the Provincial Directorate of Environment and Urbanization may designate the site as:

a) Site for which follow-up is not required; or

b) Site subject to Phase-II assessment, site for which follow-up is required; or

c) Site for which remediation is required, polluted site.

These measurements are considered as reference values for the site. In other words, they represent the unpolluted condition of the site. These values are intended to be compared with the samples that might be necessary to be taken in case of a suspect for pollution in the future.

4.9.2 Air Quality

Locations of air quality (PM_{10}) measurements carried out on April 25 and 26, 2012 at the Project site and the closest receptors are given in Table 4-13. The Analysis Report is presented in Appendix-F.

Table 4-13. PM_{10} Measurement Locations

No	Name of Measurement Location	Coordinates (UTM Datum ED 50)	
		East	North
1	Area of Concrete Plant	479396	4417186
2	State Council-Directorate of Religious Affairs	479036	4417283
3	Ministry of Food, Agriculture and Livestock Lodgings	478452	4416970
4	Military Lodgings	479779	4416684
5	Atatürk Hospital	479611	4417140

PM_{10} measurements were carried out according to the gravimetric method pursuant to TS EN 12341. Comparison of measurements carried out at the closest receptors with the Short-Term Limit Values (STLV) given in Annex-2 of the Regulation on Control of Air Pollution Originating from Industry (RCAPOIE) is presented in Table 4-14.

Table 4-14. Comparison of PM_{10} Measurement Results with Limit Values

No	Description	Measurement Result µg/m³	Limit Value µg/m³
1	Area of Concrete Plant	79.4	3,000
2	State Council-Directorate of Religious Affairs	52.6	140
3	Ministry of Food, Agriculture and Livestock Lodgings	77.9	
4	Military Lodgings	79.1	
5	Atatürk Hospital	52.6	

As seen in Table 4-14, the results of measurements carried out at all locations comply with the limit values stipulated in the RCAPOIE. Limit values stipulated in the RCAPOIE must be complied with at sensitive receptors during construction activities.

4.9.3 Noise Measurement

Locations of background noise measurements on April 25 and 26, 2012 at the Project Site and the closest sensitive receptors are given in Table 4-15, while measurement results are given as equivalent noise level (L_{eq}) in Table 4-16. An Analysis Report is given in Appendix-G.

Table 4-15. Noise Measurement Locations

No	Name of Measurement Location	Coordinates (UTM Datum ED 50)	
		East	North
1	Area of Concrete Plant	479396	4417186
2	State Council-Directorate of Religious Affairs	479036	4417283
3	Ministry of Food, Agriculture and Livestock Lodgings	478452	4416970
4	Military Lodgings	479779	4416684
5	Atatürk Hospital	479611	4417140

Table 4-16. Results of Background Noise Measurements

Measurement Location No.	Daytime Period (07:00-19:00) Measurement Result	Evening Period (19:00-23:00) Measurement Result	Night Period (23:00-07:00) Measurement Result
1	49.4dBA	47.6dBA	39.0dBA
2	49.1dBA	47.8dBA	38.4dBA
3	41.5dBA	41.6dBA	38.2dBA
4	50.7dBA	53.5dBA	44.9dBA
5	49.5dBA	46.3dBA	38.8dBA

"Environmental Noise Limit Values" for Construction Sites" given in Table 5 in Annex-II of the Regulation on Assessment and Management of Environmental Noise (RAMEN) are taken into consideration in construction phase of the project. These limit values are given in Table 4-17.

Table 4-17. Environmental Noise Limit Values for Construction Sites

Type of Activity (construction, demolition and repair)	L_{noon} (dBA)
Building	70
Road	75
Other sources	70

Source: Article 27 RAMEN

The limit values given in Table-5 of RAMEN only cover the daytime period (07:00-19:00) as per the wording, "*Construction activities performed within the housing areas and its surrounding may not be maintained out of the daytime period and during the night period*" pursuant to Article 23 of the said regulation. However, works may be conducted during the evening (19:00-23:00) and night (23:00-07:00) time slots as per the wording in Clause ç of the said article, "*Construction activities of the projects such as dams, bridges, tunnels, highways, urban main roads, and public housing, all of which require public interest, as well as construction activities to hinder the*

traffic during the daytime period in the city center may be conducted, provided that there is no work during the daytime period; the limit values obtained by subtracting 5 dBA for the evening and 10 dBA for the night from the daytime values included in Table-5 of Annex-VII are met, and upon the resolution by the Provincial Local Environmental Committee".

In this context, the noise levels resulting from the construction site activities during the construction stage of the project must meet 70 dBA limit value during the daytime period, 65 dBA limit value during the evening, and 60 dBA limit value during the night provided that permit is obtained from the Local Environmental Committee ("MahalliÇevreKurulu"), in the sensitive receptive environments.

However, pursuant to Clause b of Article 22 of the RAMEN, the environmental noise level resulting from the activities that may affect usages sensitive to noise and transmitted to usages sensitive to noise may not exceed the background noise level in L_{eq} noise indicator type no higher than 5 dBA. In case the given limit values cannot be met in the sensitive receptive environments due to the noise resulting from the construction site activities during the construction operations, the measurements for the background noise levels are repeated in the sensitive receptive environments first, and background noise levels of the sensitive receptive environments are checked to determine whether they have increased by more than 5 dBA (Leq). In case the background noise level is increased by more than 5 dBA due to the construction activities, due precautions must be taken in order to reduce the noise level in the sensitive receptive environments.

Furthermore, buildings in the campus should be designed to fulfill limit values of 35 dBA and 40 dBA (L_{eq}) for closed window and open window, respectively, given "Limit Values for Interior Noise Level" in Table 9 in Annex-VII of RAMEN.

4.9.4 Groundwater Sampling and Analysis

A groundwater sample was taken from a point for which coordinates are given below.

Table 4-18. Groundwater Sampling Location

Sampling Location	Coordinate (UTM Datum ED 50)	
	East	North
Bore Hole No. 1	478946	4417053

The parameters specified in Table 1 (Quality Criteria According to the Classes of Intracratonic Water Resources) of Water Pollution Control Regulation (WPCR) were analyzed in groundwater. Analysis results and criteria related to Water Quality Classes (Table 1 of WPCR) are provided in Table 4-19. An Analysis Report is presented in Appendix-H.

Table 4-19. Groundwater Analysis Results

Parameter-Unit	Analysis Result	WPCR Table-1 Water Quality Classes			
		I	II-	III	IV
pH	7.35	**6.5-8.5**	6.5-8.5	6.0-9.0	6.0-9.0
Temperature (ºC) ***	17.3	**25**	25	30	>30
Dissolved Oxygen (mg/L)	6.05	8	**6**	3	< 3
Oxygen Saturation (%)	75.2	**90**	70	40	< 40
Total Dissolved Solids (mg/L)	2,710	500	1,500	**5,000**	> 5,000
Fecal Coliform (EMS/100 mL) *1	4	**10**	200	2,000	> 2,000
Total Coliform (EMS/100 mL) *1	11	**100**	20,000	100,000	>
Chemical Oxygen Need (mg/L)	19	**25**	50	70	> 70
Biochemical Oxygen Need (mg/L)	6	4	**8**	20	> 20
Chromium +6 (µg/L)	< 20	below detection limit	20	50	> 50
Color (Pt-Co)	10	5	**50**	300	> 300
Oil-Grease (mg/L)	< 10	0.02	0.3	0.5	> 0.5
Phenol (mg/L)	< 0.001	**0.002**	0.01	0.1	> 0.1
Fluoride (µg/L)	< 100	**1,000**	1,500	2,000	> 2,000
Chloride (mg/L)	300	25	200	**400**	> 400
Sulphate (mg/L)	410	200	200	400	**> 400**
Sulfur (µg/L)	< 100	2	2	10	> 10
Total Kjeldahl Nitrogen (mg/L)	1,6	0.5	1.5	**5**	> 5
Ammonium Nitrogen (mg/L)	< 0,1	**0.2**	1	2	> 2
Nitrate Nitrogen (mg/L)	1,9	**5**	10	20	> 20
Nitrite Nitrogen (mg/L)	0,005	0.002	**0.01**	0.05	> 0.05
Total Phosphorus (mg/L)	0,16	0.02	**0.16**	0.65	> 0.65
Free Chlorine (µg/L)	< 20	10	10	50	> 50
Boron (µg/L)	< 300	**1,000**	1,000	1,000	> 1,000
Mercury (µg/L)	< 1	0.1	0.5	2	> 2
Cadmium (µg/L)	< 3	**3**	5	10	> 10
Copper (µg/L)	< 10	**20**	50	200	> 200
Chromium (total) (µg/L)	25	20	**50**	200	> 200
Zinc (µg/L)	< 10	**200**	500	2,000	> 2,000
Nickel (µg/L)	< 20	**20**	50	200	> 200
Manganese (µg/L)	< 10	**100**	500	3,000	> 3,000
Sodium (mg/L)	1.390	125	125	250	**>250**

Parameter-Unit	Analysis Result	WPCR Table-1 Water Quality Classes			
		I	II-	III	IV
Cobalt (µg/L)	< 10	**10**	20	200	> 200
Lead (µg/L)	< 50	**10**	20	50	> 50
Iron (µg/L)	43	**300**	1,000	5,000	> 5,000
Selenium (µg/L)	10	**10**	10	20	> 20
Arsenic (µg/L)	18	**20**	50	100	> 100
Aluminum (mg/L)	0.46	0.3	0.3	**1**	> 1
Barium (µg/L)	< 500	**1,000**	2,000	2,000	> 2,000
Total Organic Carbon (mg/L) *2	45	5	8	12	**>12**
Detergents (MBAS) (mg/L) *1	< 0.025	**0.05**	0.2	1	> 1.5
Mineral Oil and Derivatives (mg/L)	0.016	**0.02**	0.1	0.5	> 0.5
Total Pesticide (mg/L) *2	0.014	0.001	0.01	**0.1**	> 0.1
Cyanide (µg/L) *1	< 10	**10**	50	100	> 100

Groundwater classes (YAS) are summarized below pursuant to Article 12 of WPCR.

- Class YAS I (high quality groundwater) represents water that can be used as potable water and in food industry. The groundwater falling under this class is suitable for any purpose of use. Class YAS I waters can be used as potable water after an appropriate disinfection process if necessary. Groundwater meeting the quality parameters pertaining to the "Class I surface waters" are regarded as Class YAS I waters, provided only that ventilation and necessary oxygen are supplied.
- Class YAS II (medium quality groundwater) represents water that can be used as potable water after a purification process. Such waters can be used as agricultural water and water for livestock or cooling water in industry without need for any purification process. The waters meeting the quality parameters pertaining to Class II are regarded as Class YAS II waters. However, it is not required to meet the limits set for iron, ammonium, manganese and dissolved oxygen in waters falling under this class.
- Class YAS III (low quality groundwater) represents water that cannot meet the quality parameters defined in the aforementioned clauses. The usage areas of such waters are determined by the purification level in terms of economics, technology, and health.

According to the analysis results performed under WPCR Table-1 in the YAS sample taken from the Project Site, YAS sample was evaluated as YAS III pursuant to the analysis results of parameters such as Total Dissolved Solids, Chloride, Sulfate, Total Kjeldahl Nitrogen, Aluminum, Total Pesticide, Sodium, and Total Organic Carbon.

A number of 25 boreholes were drilled in the scope geological surveys. The deepest borehole is 40 m deep, and groundwater was not observed in the site.

5 POTENTIAL IMPACTS

In this chapter of the ESIA report, potential impacts that were mentioned before in the ESIA Scoping Report are included. Impacts are presented in two main groups, i.e. environmental and social, regarding PS 2 to 4 for both phases of the Project. Impacts are also given with their extent, i.e. local, national or trans-boundary. Considering the other large developments of the same type, i.e. Etlik IHCP, the Project's impacts that may add up to those due to the other project are also assessed in cumulative approach.

5.1 Construction Phase

5.1.1 Potential Environmental Impacts

Issues concerning potential environmental impacts during construction phase are given as follows.

5.1.1.1 Air Quality

The major sources of potential impacts on air quality during the construction phase of the Project are the generation of dust from the demolition of existing buildings, earthworks, movement of vehicles on unpaved surfaces, and the release of engine emissions from construction equipment and vehicles at the construction sites and labor camps. Dust rising from earthworks including drilling and vehicle movement could be significant particularly during dry weather conditions, and may cause problems to nearby houses, public areas and institutions (e.g. the Directorate of Religious Affairs and MoFAL).

The exhausts from construction equipment, diesel-fueled units and vehicles will also result in release of exhaust gases such as nitrogen oxides (NO_X), sulfur dioxide (SO_2) and carbon monoxide (CO).

Air emissions generated during construction phase of the Project will be estimated in Chapter 7, together with an assessment of the potential effects on sensitive receptors.

5.1.1.2 Water Quality

During the construction phase of the Project, drinking and potable water will be required by construction staff and for the cleaning of construction equipment. In addition, water will be used in construction activities such as dust suppression and concrete preparation. The number of construction workers will vary during the construction phase, and it will be 7000 at peak.

As a result of water usage, domestic wastewater will be generated by construction staff. Wastewater will also be generated in construction activities (e.g. concrete batching). Domestic and concrete batching wastewater may cause soil contamination when it is not

properly managed. Groundwater contamination is not expected since no groundwater was observed during geotechnical surveys. Quantification of wastewater is given in Chapter 7.

5.1.1.3 Topography, Geology and Soil

During construction works of the Project, the quality and stability of the soils on the site may be affected by earthworks (including dumping of construction and demolition debris, leveling of site and installation of stormwater drainage channels and services), discharge of silty water from concrete batching and accidental leakage of chemicals.

Assessment of soil contamination due to such factors is included in Chapter 7 referring to baseline site conditions, which were determined through baseline soil analyzes.

5.1.1.4 Solid Wastes

Solid waste expected to be produced at the construction sites and labor camp site during the construction phase of the Project can be classified as (i) domestic solid waste, (ii) construction wastes, (iii) packaging wastes and (iv) excavated material. Domestic solid wastes and packaging wastes will be produced by the construction staff at both the labor camp sites and the construction sites. Construction wastes, to be produced as a result of construction works of the Project, are expected as cables, copper, empty containers of various size, steel etc. Excavation debris due to leveling will also be generated during this period.

Dumping of solid wastes in an uncontrolled way will result in soil contamination. Uncontrolled storage or dumping of solid waste will also attract insects and cause bad odor in the environment. Groundwater contamination is not expected since no groundwater was observed during geotechnical surveys.

5.1.1.5 Hazardous Wastes

Hazardous wastes expected to be generated in the construction phase of the Project are oily rags, used air and oil filters, waste fluorescents and used cartridges etc. These hazardous wastes might cause soil and water contamination if they are not properly collected, stored and disposed of. Groundwater contamination is not expected since no groundwater was observed during geotechnical surveys.

5.1.1.6 Medical Waste

Medical waste will be generated in emergency response cases and vaccination in infirmary to be established in the site. Medical waste has hazardous and infectious content, and causes extremely adverse impacts in worker and public health (e.g. many diseases) as well as soil when it is not handled properly.

5.1.1.7 *Waste Oil*

Waste oil is expected to be produced as a result of maintenance and repair of construction machinery. Waste oil may cause soil contamination if it is discharged or spilled on unpaved ground or directly on soil surface.

5.1.1.8 *Waste Vegetative Oil*

Waste vegetative oil is expected to be produced in cooking meals at the site. Waste vegetative oil may clog sewage pipes by accumulation in time.

5.1.1.9 *Waste Batteries and Accumulators*

Waste batteries will be generated when used batteries of electronic devices, e.g. walkie talkie, are replaced. Waste accumulators may also be produced when used accumulators of the vehicles are replaced. Waste batteries and accumulators may cause significant soil contamination with hazardous materials such as lead, mercury, cadmium and nickel that is toxic to biological elements in the soil.

5.1.1.10 *Worn-out Tyres*

Worn-out tyres may be generated when tyres of vehicles are replaced. They are also regarded as a type of hazardous waste, and may result in soil contamination.

5.1.2 Potential Social Impacts

Issues concerning potential social impacts during construction phase are discussed below.

5.1.2.1 *Community Health and Safety*

Regarding PS4 of IFC, the most important issues directly associated with community health and safety during the construction phase are noise and traffic in addition to ambient air quality (increased dust emission) which is discussed in the environmental part.

Apart from construction noise and traffic, noteworthy issues are public safety regarding construction activities. Deep trenches, instable backfilled areas and piles of construction debris may pose a risk to public safety in case of walking through the construction site, thereby unattended walking through the site will not be allowed during the construction phase.

5.1.2.2 *Noise and Vibration*

The construction phase has the potential to create noise through the use of equipment and increased road traffic, while vibration may be caused by the drilling activities. Noise and vibration may cause temporary nuisance to the neighboring Atatürk Training and Research

Hospital, and people living in the surrounding settlements and working in the nearby institutions. This is further assessed in Chapter 7.

5.1.2.3 Traffic

The construction phase will include transportation of construction staff and construction equipment and materials. Transportation will mainly be carried out by using existing roads. Therefore, an increase in local traffic to some extent is expected. A Traffic Management Plan (TMP) is developed in the ESIA Report as an annex that can be further improved and implemented during the construction works by the Project Company and/or its contractors.

5.1.2.4 Socio-Economic

There are two families and one business in the project area which are needed to be resettled at the construction phase. They currently occupy the old buildings of MoFAL.

The socio-economic survey has been conducted with the land users of 2 households and one business in total. In this respect, face-to-face interviews have been conducted with 3 affected people. Both families have vulnerabilities. One household head is handicapped and other household head is an immigrant from Afghanistan. They both expect to be hired by the project and to live in the houses which are going to be abandoned for as long as possible. SPV is continuing negotiations on recruitment from those two families to compensate their loss. The level of impact of the households can be seen in the inventories presented in Appendix-I.

The Atatürk Training and Research Hospital still exists on the project area and it will be refurbished during the end of the construction period. The hospital building will be a rehabilitation hospital as a part of Campus.

The Project Company also has started consultations with the institutions. The nearest institution to the construction site is the Atatürk Training and Research Hospital. It will be renovated and will remain in the campus after construction. The ESIA Team consulted with the Deputy Chief Physician Mustafa Yüce who has been working at the hospital since November, 2012.

Atatürk Training and Research Hospital was built in 2005 with a 485-bed capacity, and served for training as well as health care services. The Yıldırım Beyazıt Medicine Faculty used Atatürk Hospital as a training centre for medicine students.

The hospital is providing service to the general public, bureaucrats, politicians and foreign war wounded as a protocol hospital. According to the deputy chief, transportation facilities

are not sufficient for visitors. 10,000 people including patients and their families visit the hospital daily.

The Deputy Chief Physician mentioned that a Public Private Partnership will be beneficial for doctors as currently doctors are also responsible for administrative works such as cleaning, security etc. This creates a waste of time for doctors who are already overloaded with their health care duties. According to the Deputy Chief Physician, transportation to Atatürk Hospital is the biggest problem. They expect the Project to solve these issues. He assumes that locating all health services in a single center will be beneficial to increase time efficiency and eliminate wasted time in health care services.

The Deputy Chief Physician mentioned that doctors have some concerns as to which hospitals will move to Bilkent Integrated Health Campus and whether The Ministry of Health will be responsible for the management of the hospital. He also suggested that patients should be informed about how to reach the health services as the Health campus will have a has complex structure. Service personnel and warning signboards should be used to guide patients.

Construction activities are expected to result in temporary nuisance, especially to local people living in settlements close to the Project Site, basically due to noise and dust, as well as to decreased delivery of health services and traffic rush due to increased vehicle movement.

A community level survey has been conducted with the nearest settlement area to the project, with Ayfer Kızılkan, the mukhtar of Üniversiteler Quarter. Information has been taken on general demographic, economic and social issues about the neighbourhood along with community level impacts, concerns and opportunities of the project.

Awareness about the project of Üniversiteler Quarter

The community has some information about the Project. They heard approximately two years ago, after pre-construction works had started on the Project site. Mukhtar mentioned that the community is informed that some hospitals in the city centre are going to be transferred to a new campus area, yet this information is not sufficient and community needs to be informed about which hospitals are going to be moved to campus.

Generally the community has positive expectations about the Project. Mukhtar assumed that the elderly population in the region has increased. The nearest hospital is Atatürk Training and Research Hospital and it does not provide service in all branches. The health campus project will create competition in the health sector and it will provide improvement in health services.

The community feels that with the new campus, health care facilities will be closer and loss of time for reaching healthcare facilities will be resolved, however they have negative expectations about the traffic. Roads in the neighbourhood need to be repaired and they do not have sufficient lighting on the roads. According to the mukhtar the Project should create a positive influence on the transportation activities. In the construction and operation process bus services should be increased and a subway should start to operate. The Mukhtar emphasized that they have a quiet neighbourhood and they are concerned about the deterioration of this situation. They have no concerns on education activities due to noise because construction area is far away from settlement areas.

Awareness about the project of Beytepe Quarter

Community has information about the Project. They heard the Project approximately three years ago as a rumour. Mukhtar mentioned that community needs more information about the Project. He underlined that community should be informed about the job opportunities of the Project.

Generally community has positive expectations about the Project due to expectation about economic improvement and accessing health facilities easily.

They have concerns about noise, dust and traffic and also Mukhtar mention that worker's camp in construction period can create some social problems. He recommended that all security measurements should be prepared carefully and all needs of construction workers including social facilities should be provided in the camp area.

In construction and operation process bus services should be increased and subway should start to operation for blocking traffic load.

He recommended that capacity of Medical Hotel should be raised. Patients of Atatürk Training and Research Hospital have problems for long term treatments. Their hospital attendees do not have enough places to stay in. A building should be established for accompanying people of patients for long term treatments and it should serve to low income groups.

Mukhtar also assumed that 3 hospitals are going to be closed within the scope of the Project. The Health Campus should have a service for transportation for people who use these hospitals.

5.1.2.5 Occupational Health and Safety

During the construction phase, a maximum of 7,000 workers will be employed. A camp site will be established for the accommodation of workers. As stated in PS2 of IFC, construction accommodation can impact the local community in terms of placing additional pressure on infrastructure, such as, roads, water supply and sewerage systems and waste disposal systems. Such infrastructural impacts are assessed in respective sections of the ESIA Report. Additional impacts can relate to community health and increased incidence of disease and crime.

Risks associated with occupational health and safety issues include but are not limited to working at height, working with chemical and hazardous substances, working in places with high dust and noise emissions.

5.2 Operational Phase

5.2.1 Potential Environmental Impacts

Issues concerning environmental impacts during the operational phase are discussed below.

5.2.1.1 Air Quality

During operation of the health campus, a trig-eneration plant with a natural gas-fed boiler will be used. There will also be emergency diesel generators. Hence, there will be NO_X and CO emissions due to combustion of natural gas.

Potential impacts of such facilities in the campus on the ambient air quality are assessed in Chapter 7.

5.2.1.2 Water Quality

Wastewater that will be generated during operational phase will include domestic wastewater from toilets and baths. In addition to this, there will be wastewater from laboratories with hazardous, infectious and radioactive content. This portion of wastewater causes severe damage in the environment when discharged to the receiving bodies without proper treatment. Furthermore, whether the capacity of the existing sewage infrastructure can handle this additional stream is another issue of concern.

5.2.1.3 Topography, Geology and Soil

There will be no further impact on the topographical and geological structure of the site. Waste management practices are of primary concern in terms of soil contamination, especially considering temporary storage of chemicals and waste at the site. An assessment of waste management practices is carried out in this regard, and presented in chapters 7 and 8.

5.2.1.4 Solid Wastes

Solid waste expected to be produced during the operational phase of the Project can be classified as (i) domestic solid waste and (ii) packaging wastes.

Domestic solid wastes and packaging wastes will be produced by the patients, hospital staff and visitors. The estimated amount of solid wastes to be generated during the operational phase as well as details of recommended waste management practices such as collection, handling and disposal are presented in chapter 7 and 8.

5.2.1.5 Hazardous Wastes

Hazardous wastes that will be generated during the operational phase will comprise of empty containers of chemicals, used cartridges, fluorescent lamps and oily rags or equipment resulting from maintenance works.

5.2.1.6 Medical Wastes

Medical waste will include the followings:

- Microbiological laboratory wastes;
- Waste blood samples and objects contaminated with blood;
- Used surgery clothes;
- Dialysis wastes (wastewater and equipment);
- Air filters containing bacteria and viruses;
- Carcasses of subject animals;
- Injector needles;
- Broken glasses and similar objects.

Medical waste has hazardous and infectious content, and causes extremely adverse impacts on worker and public health (e.g. many diseases) as well as soil when it is not handled properly.

5.2.1.7 Waste Oil

Waste oil is expected to be produced as a result of maintenance and repair works for trigeneration plant and other equipment. Waste oil may cause soil contamination if it is discharged or spilled to soil.

5.2.1.8 Waste Vegetative Oil

Waste vegetable oil will be collected from cooking oil at the health campus. Waste vegetable oil may clog sewage pipes through accumulation in time.

5.2.1.9 Waste Batteries and Accumulators

Waste batteries will be generated when used batteries of several medical devices, remote controllers etc. are replaced. Waste accumulators may also be produced when used accumulators of the vehicles are replaced. Waste batteries and accumulators may cause significant soil contamination with such hazardous materials as lead, mercury, cadmium and nickel that is toxic to biological elements.

5.2.1.10 Worn-out Tyres

Worn-out tyres may be generated when tyres of vehicles are changed. They are also regarded as a type of hazardous waste, and may result in soil contamination.

5.2.2 Potential Social Impacts

Issues concerning social impacts during operational phase are given as follows.

5.2.2.1 Epidemics

In such a large health campus environment, spread of airborne diseases may be a significant problem for such a large health center which will be visited by 50,000 people daily. It may be due to improper waste management practices, especially in medical waste management, air conditioning systems and poor sterilization efforts in overall campus including primarily medical treatment and operation.

5.2.2.2 Radiation Safety

Working with x-ray imaging devices such as röntgen and MR might result in adverse health impacts for the staff. Replacement of devices is a critical issue in terms of radiation safety.

5.2.2.3 Noise and Vibration

There will not be a source of continuous and disturbing noise and vibration in the operational phase. Noise sources such as generators and boilers will be located within buildings for isolation. There will also be occasional noise due to helicopter movement.

5.2.2.4 *Traffic*

In the operational phase of the Project, traffic load near the campus will increase due to transportation of patients, visitors and other people visiting the campus by private cars in addition to public transportation.

5.2.2.5 *Socio-Economic*

Positive Socio-economic impacts are expected to arise once the Project becomes operational. Such as accessing healthcare facilities and the job opportunities, 10,000 people are going to work in operation process. Project should create a positive influence on the transportation activities. In the construction and operation process increased transportation services are expected.

Firstly, it is expected that there will be economic loss for existing restaurants and shops as well as pharmacies in the Atatürk Training and Research Hospital due to new commercial facility to be built in the context of the Project.

Secondly, with regard to the centralization of the health services health campus will create cumulative socio-economic impacts. Given that some hospitals are going to be abandoned, accessibility to health services from diverse districts may be associated with negative impacts on health care beneficiaries, the majority of which is comprised of the middle and lower economic segments of society. Currently, hospitals are easily accessible in all districts.

Impacts are also likely to be observed on employees of hospitals which are planned to be abandoned and it will be mitigated by opportunities in the new campus.

5.2.2.6 *Life and Fire Safety*

Life and fire safety is one of the primary concerns in the design process. Therefore, detailed studies for fire safety arrangements have been carried out. Issues and necessary mitigation actions regarding fire safety are discussed in Chapter 8.

6 ANALYSIS OF ALTERNATIVES

6.1 Site Alternatives

About 76.7ha of the land where the Project will be realized is the property of the Treasury, and was allocated to the Ministry of Health upon designation as "health campus area" in the "1/25,000-scaled 2023 Master Plan of Ankara the Capital". A 120ha area is in forest register, i.e. owned by the Ministry of Forestry and Hydraulic Works, and the MoH obtained consent from the former Ministry of Environment and Forestry to use the site for a period of 49 years **[6]**.

For such a large urban development, there is a need for a large piece of land at or close to the city center, yet site alternatives within the city are insufficient for Ankara. The Project Site is advantageous in that respect - a property of the Treasury which partly houses another hospital and a very large plot for such a major development. The Project Site is also away from the crowded parts of the city. Considering also the ease of public transportation, the site is located very close to a station along the new subway line, and this also makes the site advantageous besides its other advantages in terms of public transportation thanks to its location close to a main artery of the city. The subway line, i.e. the M2 Subway Line of Ankara, is expected to be operational as of 2014. There will be a station along this line, close to the campus (see Figure 6-1).

Source: GoogleEarth.

Figure 6-1. Location of New Subway Station

Hence, considering another site with similar properties will be used for the other health campus project in Etlik, no alternative sites have been evaluated for the Project.

6.2 Technology Alternatives

6.2.1 Medical Technologies

The Project Company intends to build a health campus, which is superior to previous health facilities in terms of energy efficiency. The health campus will also utilize high-tech medical devices for time efficiency in provision of health services. In other words, more patients will be served in a facility with almost the same bed capacity as the total of those to be closed. Examples of such high-tech devices are as follows:

- Robotic pharmaceutical preparation system;
- Da Vinci Robot (urology, women's health);
- MR device and accessories (intraoperative) 1.5 and 3 Tesla;
- Magnetic Navigated Coronary Angiography System;
- Magnetic Navigated Coronary Angiography System;
- Baby food preparation robot.

In addition to these devices, proton therapy will also be used in the health campus. Proton therapy is an advanced treatment for cancer. It is more effective as compared to conventional x-ray therapy methods. In proton therapy, higher doses can safely be used since less damage is caused to healthy tissues and vital organs with less side effects.

6.2.2 Energy Efficiency

Many energy-efficient systems will be employed in the health campus. These systems firstly include the tri-generation plant. In this system, electricity, heat and cooling are produced simultaneously using natural gas as fuel. Traditional gas turbines typically operate at an efficiency of 35% whereas tri-generation systems operate up to 85% by converting 45% of the source energy to electricity, and 40% to heating and cooling. Heat and line losses typically take up 13% and 2%.

In addition to this, blower and exhaust fans as well as circulation pumps and pumps used in a part of the cooling system will be frequency-controlled to save energy. Use of frequency-controlled pumps will decrease annual total energy consumption by 25%.

7 CHARACTERIZATION OF IMPACTS AND ISSUES

In this chapter of the ESIA report environmental and social impacts expected to occur during the construction and operational phases are characterized and quantified. For some aspects, quantitative impact appraisal cannot provide adequate information and this hence needs to be supported with qualitative assessment. For such cases an impact assessment matrix has been used.

It should also be noted that construction and hence operation of the Project is likely to be simultaneous with the other large health campus, i.e. Etlik IHC (see the map in Appendix-A). Therefore, environmental and social impacts of both projects in both phases are also discussed in cumulative assessment point of view.

7.1 Construction Phase

7.1.1 Environmental Impacts

Characterization of potential environmental impacts during construction phase is given as follows.

7.1.1.1 Air Quality

As it was mentioned above in Chapter 5, the major sources of potential impacts on air quality during the construction phase of the Project are the generation of dust from the demolition of existing buildings, earthworks, movement of vehicles on unpaved surfaces, and the release of engine emissions from construction equipment and vehicles at the construction sites and the camp site.

The existing Atatürk Training and Research Hospital will be refurbished. The buildings will remain but there will be modifications inside the buildings. Dust emission during these works will be insignificant and these modification works will not be simultaneous with excavation works. Hence, dust emission from these modifications were omitted.

During site preparation, 3,700,000 m^3 of excavation is planned to be made. 426,530 m^3 of this amount will be temporarily stored at the site to be used in backfilling. 123,288 m^3 of total excavated soil will be vegetal top soil, and it will also be temporarily stored at the site for future use in landscaping. The remaining amount of excavated material is estimated to be 3,150,182m^3, and it will be carried to landfill. The amount of soil to be used in backfilling is 760,000 m^3. Machinery that will be used in excavation works are given in Table 7-1 below.

Table 7-1. Machinery to be Used in Excavation Works

Machine	Number
Excavator with min. 3 m^3-bucket	15
Trucks	150
Dozer	1

Machine	Number
Loaders	2
Graders	2
Roller Compactor	1

The following emission factors have been used to calculate dust emissions from excavation, loading, transport and unloading (see Table 7-2). These emission factors were stipulated by the former Ministry of Environment and Forestry especially for mining activities.

Table 7-2. Emission Factors

Activity	Uncontrolled	Controlled
Excavation	0.025 kg/ton	0.0125 kg/ton
Loading	0.010 kg/ton	0.005 kg/ton
Transportation	0.7 kg/km-hour	0.35 kg/km-hour
Unloading	0.010 kg/ton	0.005 kg/ton
Storage	5.8 kg/ton-ha-day	

In dust emission calculations density of soil is assumed as 1.6 ton/m^3. Considering that excavation will last 170 days, and 24 hours of working a day, the hourly amount of material to be going to landfill will be (3,150,182 m^3 / 170 days/ 24 hours/day=) 772 m^3. Assuming soil density is 1.6 ton/m^3, hourly amount will be 1235 ton.

The total amount of soil to be stored for later use in backfilling and landscaping (vegetal top soil) will be ((426,530+123,288) m^3 / 170 days/ 24 hours/day=) 134.8 m^3, which is 215.6 ton/hour.

For excavated material or debris that will go to the landfill, emissions only from excavation and loading are taken into account while that from transportation until trucks leave the site is omitted.

Trucks carrying debris to the temporary storage area in the Project Site can carry 14 m^3 of soil. Hence, the daily number of trucks to make rounds between excavation area and debris storage site will be (134.8 m^3 / 14 m^3/round =) 9.63 ~10 rounds. Considering that excavated material will be deposited in the southwestern corner of the site (see Figure 7-1) and taking the average distance from excavation site to the storage site as 500 m, a round trip will be 1 km. Sample calculation for uncontrolled case will be 0.7 kg/km-hour x 1 km/round x 10 round/day x 1 day/24 hours = 0.29 kg/hour.

Figure 7-1. Excavated Soil Storage Area within the Project Site

Dust emissions expected to arise from excavated soil handling have been calculated, and results are presented below.

Table 7-3. Dust Emissions

Activity	Debris going to landfill (kg/hour)		Debris stored for backfilling (kg/hour)	
	Uncontrolled	Controlled	Uncontrolled	Controlled
Excavation	1.28	0.64	0.23	0.16
Loading	0.51	0.26	0.09	0.04
Transportation	-	-	0.29	0.15
Unloading	-	-	0.09	0.04

Emissions from construction machinery, i.e. trucks and other heavy machines, are calculated using Exhaust Emission Factors for Non-road Engine Modeling - Compression-Ignition (Report No. NR-009A) of United States Environmental Protection Agency (EPA).

EPA emission factors, which are given according to engine power of the machines, are used to estimate NO_X, HC and CO and PM concentrations. Engine power of machines and corresponding exhaust emission coefficients are given in Table 7-4.

Table 7-4. Engine Power of Construction Machinery

Machine	Approximate Engine Power (HP)	Emission Coefficients (g/HP-hour)			
		HC	CO	NOX	PM
Excavator	260	0.4	1.0	4.5	0.4
Trucks	350	0.3	1.0	4.5	0.4
Loader	195	0.4	1.0	4.5	0.4
Dozer	90	0.4	1.0	4.5	0.4
Grader	90	0.4	1.0	4.5	0.4
Roller Compactor	190	0.4	1.0	4.5	0.4

Considering a daily working time of 16 hours, exhaust emissions are calculated using these coefficients, and presented in Table 7-5. It is assumed that the number of trucks that will be at the site at the same time for loading materials to be carried to landfill is 5, and hence, total number of trucks will be 25 with those 20 carrying materials to the temporary storage site. For other machines, numbers of vehicles given in Table 7-1 are used.

Table 7-5. Exhaust Emissions from Construction Machinery

Machine	Number of Machines	Engine Power (HP)	Emissions (kg/hour)			
			HC	CO	NOX	PM
Excavator	15	260	1,56	3,90	17,55	1,56
Trucks	30	350	3,15	10,50	47,25	4,20
Loader	1	195	0,08	0,20	0,88	0,08
Dozer	2	90	0,07	0,18	0,81	0,07
Grader	2	90	0,07	0,18	0,81	0,07
Roller Compactor	1	190	0,08	0,19	0,86	0,08

Particulate matter emissions from construction machines will be considered together with dust emissions from soil works. Total dust emission in the uncontrolled case is 2.49 kg/hour. Adding total PM emission of 6.06 kg/hour from machines, total emission will be 8.55 kg/hour, which exceeds the limit value of 1.0 kg/hour in the Regulation on Control of Industrial Air Pollution. Hence, it is required to carry out modeling study to predict dispersion of dust emission.

A Gaussian dispersion model was used to model dispersion of dust to be generated during soil handling and site leveling activities. Here it is assumed that all activities are carried at the same point and continuous within a daily working period of 24 hours.

In this model, it is considered that 80% of the total dust is settleable dust while 20% is suspended dust. Change of settleable dust concentrations with respect to distance are given in Table 7-6 and Figure 7-2 while change of suspended dust concentration with respect to distance is given in Table 7-7 and Figure 7-3.

Table 7-6. Change of Settleable Dust Concentration (mg/m²-hour) with Distance

Direction	100 m	200 m	300 m	400 m	500 m	600 m	700 m	800 m	900 m	1000 m
N	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
NNE	638,4	183,3	85,1	49,0	31,9	22,5	16,7	12,9	10,3	8,4
NE	638,4	183,3	85,1	49,0	31,9	22,5	16,7	12,9	10,3	8,4
ENE	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
E	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
ESE	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
SE	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
SSE	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
S	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
SSW	1274,1	366,2	169,9	98,0	63,8	45,0	33,4	25,8	20,6	16,8
SW	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
WSW	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
W	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
WNW	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
NW	956,6	274,8	127,5	73,5	47,9	33,7	25,1	19,4	15,4	12,6
NNW	638,4	366,2	85,1	49,0	31,9	22,5	16,7	12,9	10,3	8,4

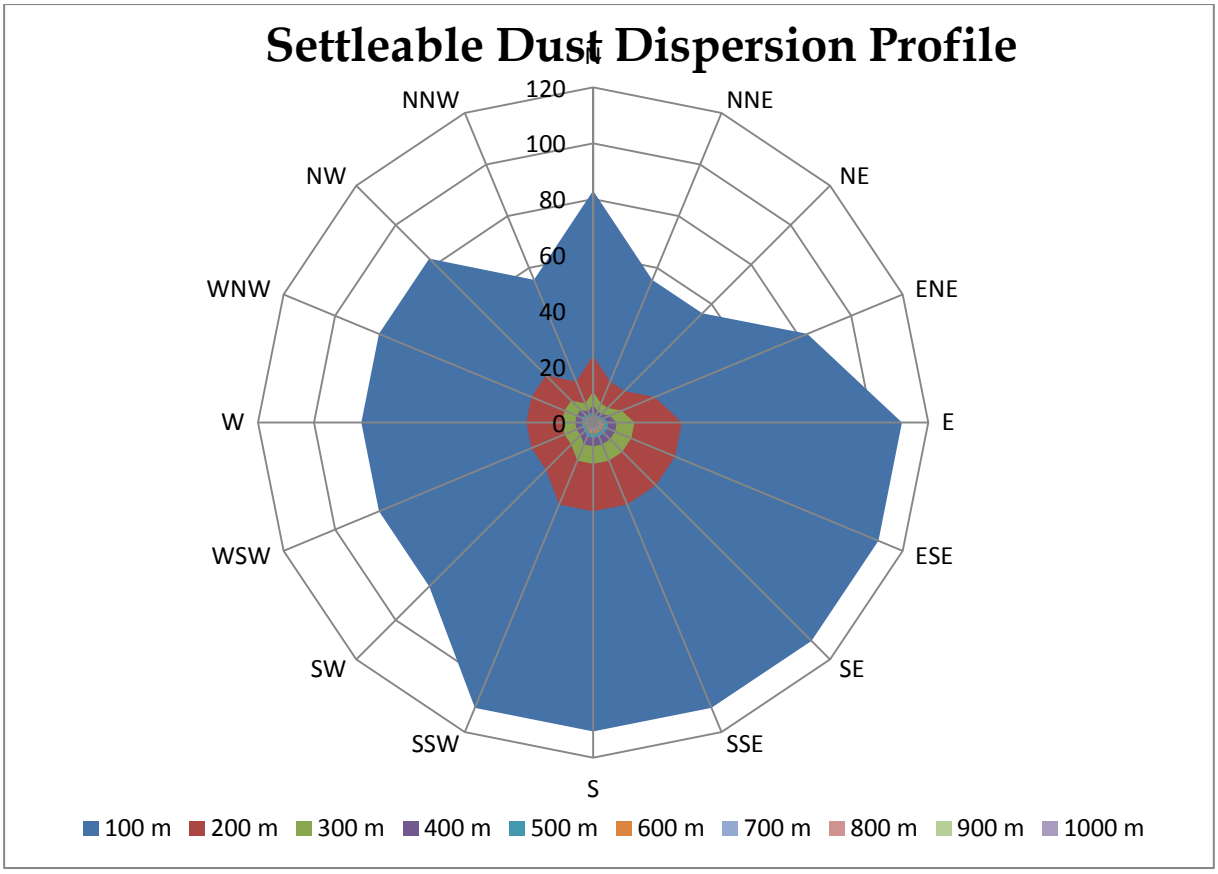


Figure 7-2. Settleable Dust Dispersion Profile

Table 7-7. Change of Suspended Dust Concentration (µg/m³) with Distance

Direction	100 m	200 m	300 m	400 m	500 m	600 m	700 m	800 m	900 m	1000 m
N	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
NNE	55,3	15,9	7,4	4,3	2,8	2,0	1,5	1,1	0,9	0,7
NE	55,3	15,9	7,4	4,3	2,8	2,0	1,5	1,1	0,9	0,7
ENE	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
E	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
ESE	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
SE	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
SSE	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
S	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
SSW	110,6	31,8	14,8	8,5	5,5	3,9	2,9	2,2	1,8	1,5
SW	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
WSW	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
W	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
WNW	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
NW	83,0	23,9	11,1	6,4	4,2	2,9	2,2	1,7	1,3	1,1
NNW	55,3	15,9	7,4	4,3	2,8	2,0	1,5	1,1	0,9	0,7

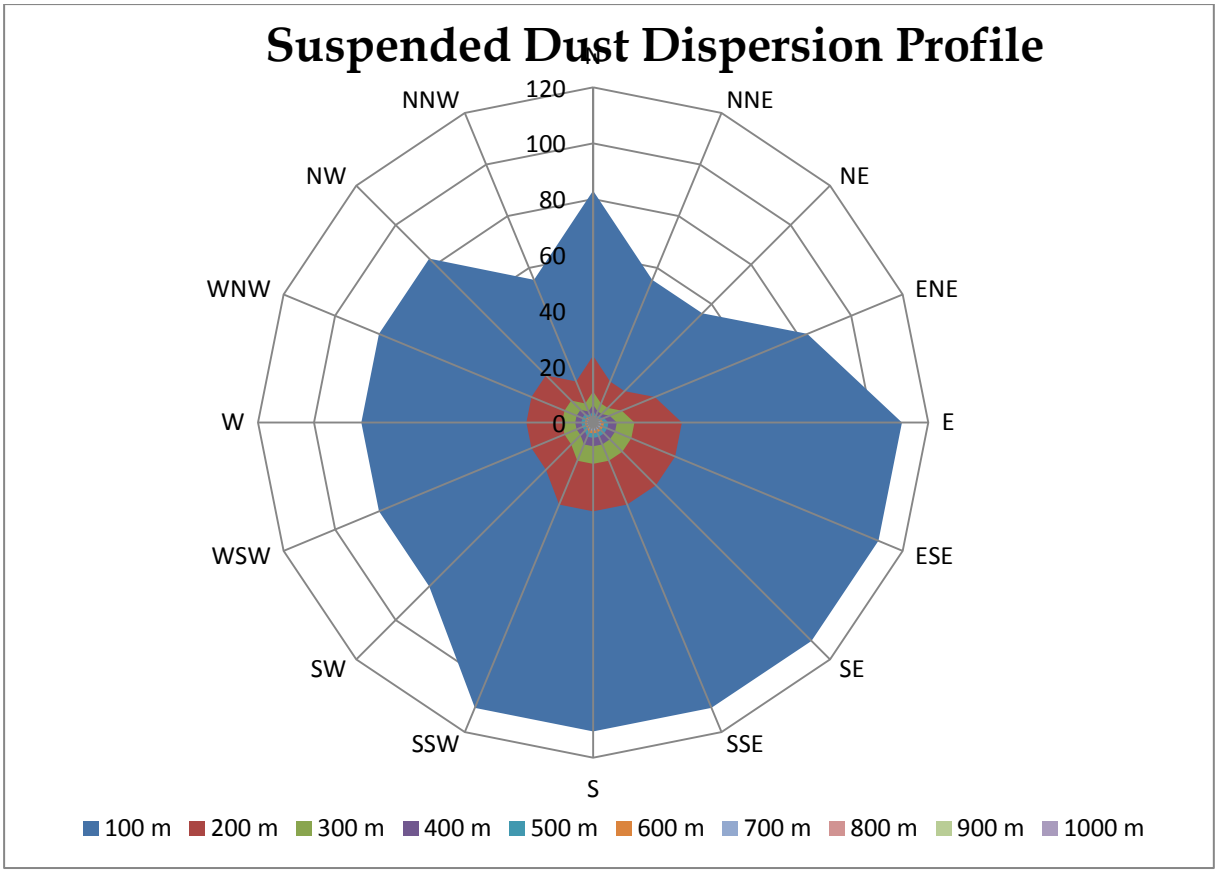


Figure 7-3. Suspended Dust Dispersion Profile

The respective limit values given in the Regulation on Control of Industrial Air Pollution for settleable and suspended dust concentrations are 300 mg/m²-day and 100 µg/m³, respectively. On the other hand, daily and annual suspended dust (PM_{10}) limit values of EU are 50 µg/m³and 40 µg/m³. Settleable and suspended dust concentrations are well below the corresponding limit values at distances 200 m and 100 m. During construction of the health campus, the most important sensitive receptor will be the Atatürk Training and Research Hospital. Figure 7-4 below shows the approximate buffer zone for dust emissions drawn considering the critical distance of 200 m. A minimal number of vehicles should be used in this area, and necessary dust suppression measures should be in place in excavations carried out in this zone.

Figure 7-4. Buffer Zone for Dust Emissions

Here it should be noted that the dust dispersion model used in the ESIA produces rough estimates. This model is actually a tool to check whether or not there is a need to run a more sophisticated model to obtain more accurate results. Since the model results show dust concentration expected at the sensitive receptors are under legal limits, there is no need to carry out a sophisticated model such as ISCST3.

Referring to the map given in Appendix-A, Etlik IHCP is located far enough from the Project Site not to result in a cumulative air quality impact in interactive or additive manner.

7.1.1.2 Water Quality

As mentioned above, domestic wastewater will be generated from personnel as well as silty water due to construction activities such as concrete preparation. The number of

construction workers will vary during construction phase, and it will be 7000 at peak. Assuming a daily water use of 150 L/cap-day, in the worst-case scenario, water consumption will be 1050 m^3/day at peak. Assuming also that all the water consumed by personnel will be converted to wastewater, that amount will be discharged to the sewerage line that passes underneath the site.

In addition to domestic wastewater generated as a result of personnel use, silty water will be generated at the concrete batching plant.

7.1.1.3 Topography, Geology and Soil

As stated above, the quality and stability of the soils on site may be affected by earthworks (including dumping of construction and demolition debris, leveling of the site and installation of storm water drainage channels and services), discharge of silty water from concrete batching and accidental leakage of chemicals to be used. However, the resulting impact on soil quality cannot be readily quantifiable. Impact appraisal will be based on a quantitative assessment considering severity and likeliness of the residual impact after taking necessary mitigation measures.

7.1.1.4 Solid Wastes

Domestic solid waste will be generated by the construction staff. Considering the worst-case scenario with peak number of 7000 workers, the daily amount of domestic solid waste generated will be around 8000 kg assuming rate of waste generation as 1.15 kg/cap-day. Besides domestic solid wastes, there will be packaging and recyclable wastes, e.g. steel, plastic and wood, from construction and demolition of existing buildings. However, the quantity of such wastes is not known.

Debris from demolished buildings and excavated material from site leveling activities will also be generated.

7.1.1.5 Hazardous Wastes

Quantification of hazardous waste including waste oil, waste vegetative oil, waste batteries and accumulators and worn-out tyres is not possible at this stage since there are no typical figures for that. Moreover, since there are many licensed collection and intermediate storage companies in Ankara, hazardous waste management is not expected to be a significant issue.

7.1.2 Social Impacts

Characterization of potential social impacts during construction phase is given as follows.

- Bilkent IHCP workers may be perceived as a threat to settlements security and/or culture/privacy.
- In-migration of workers may be perceived as an economic opportunity.

- Bilkent IHCP specialized workers may be perceived by some PAPs as helping the community to learn new skills and enable cultural exchange.
- The camp site may be perceived as an opportunity or threat by different neighbourhoods.
- Busier and slower traffic may affect neighbourhood areas.
- Construction process and vehicles may be viewed as a potential danger.
- Influenced stakeholders in Çankaya may expect economic regeneration with a positive cycle of employment, investment, infrastructure development.
- House and land prices may increase due to of population. It can improve micro-economy.
- Social harmony may disrupt due to differences in culture/behaviours between outside workers and PAPs.
- Cultural heritage and sites might be at risk from construction works and changes to roads/surrounding environment.

7.1.2.1 Noise and Vibration

Noise that will be generated by construction machinery and equipment is calculated using their sound power levels, which are given in Table 7-8.

Table 7-8. Machinery to be Used in Excavation Works

Machine	Number of Vehicles	Sound Power (dBA) (L_P)*
Excavator	15	108
Trucks	30	102
Loader	1	112
Dozer	2	93
Grader	2	107
Roller Compactor	1	95

** Source: http://www.nottinghamcity.gov.uk*

Trucks will make rounds between the site and the landfill while trucks carrying backfilling material will make rounds within the site between excavation area and the backfill material storage site. As it is the case for the construction stage dust emission calculations, it is assumed that number of trucks that will be at the site for loading materials to be carried to landfill is 5, and hence, total number of trucks will be 25 with those 20 carrying materials to the temporary storage site.

Total sound power from multiple machinery is calculated using the formula below:

$$10\ \mathrm{Log}\sum_{i=1}^{n} 10^{Lpi/10}$$

Using this formula, total sound power level of all machines to be used in excavation is calculated as122.27dBA.

The next step is to calculate the change of sound power level with distance from source. This is to predict sound level reaching the sensitive receptors. For this purpose the following formula is used:

$$L_{eq} = L_{Wt} + 10\log\frac{Q}{4\pi r^2}$$

where

Leq: Equivalent sound level;

Lwt: Sound power level;

Q: Directional Coefficient (taken as 2);

r: Distance from source.

Equivalent sound level with respect to distance is presented in Table 7-9 and Figure 7-5. Atmospheric absorbance and geographical barriers are omitted to consider the worst-case.

Table 7-9. Change of Sound Level with respect to Distance

Distance (m)	Equivalent Sound Level (L_{eq})
0	122,27
50	80,31
100	74,29
200	68,27
300	64,75
400	62,25
500	60,31
600	58,73
700	57,39
800	56,23
900	55,21
1000	**54,29**
1250	52,35
1500	50,77
1750	49,43
2000	48,27
2500	46,33
2750	45,50
3000	**44,75**
3250	44,05
3500	43,41

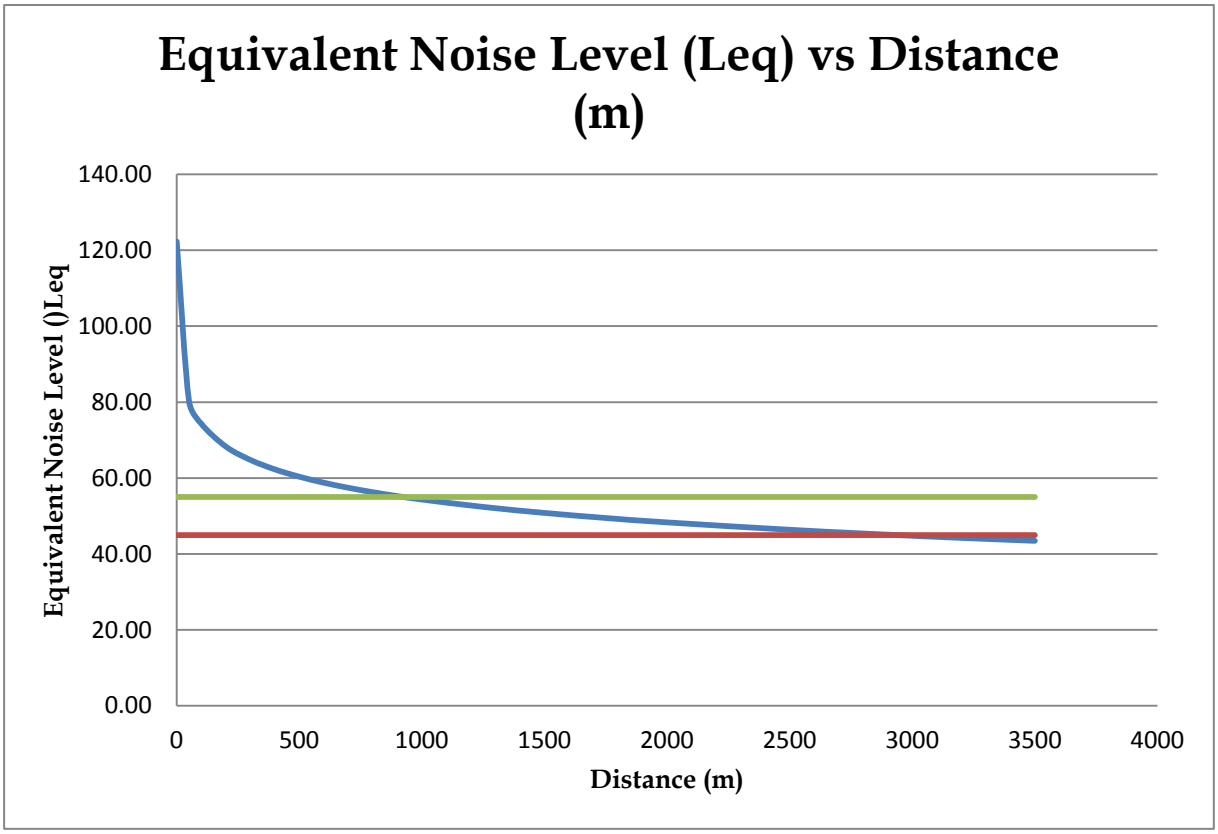


Figure 7-5. Equivalent Sound Level vs Distance

Limit values for day-time, evening and night-time environmental noise given in Appendix VII of the RAMEN are 70 dBA, 65 dBA and 60 dBA for construction sites. IFC limit values on noise according to EHS Guidelines on Environmental Noise Management, are 55 dBA for day-time (07:00-22:00) and 45 dBA for night-time. Construction will continue during night-time as well upon obtaining necessary permit from the Local Environmental Committee. As a result, the noise limit that needs to be met is 45 dBA around the construction site. As can be seen from Table 7-9 and Figure 7-5, equivalent noise level drops below 45 dBA at 3000 m from the construction site. Hence, there may be nuisance due to construction noise at Atatürk Training and Research Hospital and the nearby public institutions.

On the other hand, noise and vibration impacts due to construction activities in both project sites will be local. In other words, only immediate surroundings will be affected. Therefore, Etlik IHC construction will not add to the noise impact of the Project due to its location.

7.1.2.2 Traffic

In the construction phase, the major impact of the Project on the local traffic will be due to the movement of trucks bringing construction material into site and taking excavated material and demolition debris from the site.

In addition to the surroundings of the Project Site, an increase in traffic load might also be seen near the excavated material disposal area. A dump site has been designated for both disposal of excavated material from both of the health campus projects. Trucks carrying excavated material will use different main arteries. Thus, the other project is not expected to add up to impacts on traffic.

7.1.2.3 Socio-Economic

Construction activities are expected to result in temporary nuisance, especially from noise and dust, to local people living in settlements close to the Project Site. Other impacts include reduced delivery of health services, and traffic jams due to increased vehicle movement.

7.2 Operational Phase

7.2.1 Environmental Impacts

Characterization of potential environmental impacts during the operational phase is given as follows.

7.2.1.1 Air Quality

There will be NO_X and CO emissions due to combustion of natural gas at the tri-generation plant. According to the diagram provided in Annex 4 of Turkish Regulation on Control of Industrial Air Pollution, the minimum stack height has been calculated as 14 m depending on the surrounding topographical conditions, stack diameter, flow rate and pollutant specific coefficients. This minimum stack height has been questioned in the air quality modeling study in order to find out the real stack height which will be needed to be erected for compliance of the ground level concentration limit values of pollutants stipulated in the Turkish Regulation on Air Quality Assessment and Management.

In context of the air quality modeling study, three alternative configuration including turbines and motors were considered. Alternative 1 includes four turbine units with a capacity of 5.67 MWe each whereas Alternative 2 comprises three units of 7.5 MWe each. Additionally, instead of turbine, natural gas fired motor is taken as Alternative 3 for trigeneration plant. For the motor option, five units with a capacity of 4.3 MWe are planned to be used for trigeneration plant. Design data for turbine and motor units are presented in Table 7.10 and Table 7.11, respectively.

2U1K uses their licensed AERMOD model, developed by USEPA and one of the most developed computer models estimating hourly, daily and yearly GLC's on the basis of the real time values. Model comprises the calculations of different dispersion models for different sources (point, volume, line) from isolated stacks to fugitive pollutants. Additionally, it considers conditions like aerodynamic waves and turbulence.

Table 7-10. Air Emissions and Stack Properties of Turbines

Parameter	Value Turbine 5.67 MWe	Value Turbine 7.5 MWe	Limit Value
NO_2	300 mg/Nm³ (dry, 15% O_2) 21 kg/h	50 mg/Nm³ (dry, 15% O_2) 3.5 kg/h	300 mg/Nm³ (dry, 15% O_2)
O_2	14.4%	14.4%	-
H_2O	6.6%	6.6%	-
Stack Gas Flow Rate	70236 Nm³/h (dry)	70236 Nm³/h (dry)	-
Stack Gas Exit Temperature	110°C	110°C	-
Stack Gas Exit Velocity	11 m/s	11 m/s	-
Stack Internal Diameter	1.6 m	1.6 m	-
Stack Height	19 m	14 m	-

Table 7-11. Air Emissions and Stack Properties Motor

Parameter	Value	Limit Value
NO_2	500 mg/Nm³ (dry, 5% O_2) 5.6 kg/h	500 mg/Nm³ (dry, 5% O_2)
O_2	8 %	-
H_2O	8.2 %	-
Stack Gas Flow Rate	41570 Nm³/h (dry)	-
Stack Gas Exit Temperature	120°C	-
Stack Gas Exit Velocity	14 m/s	-
Stack Internal Diameter	0.8 m	-
Stack Height	19 m	-

The scope of modeling study that estimates NO2 GLC in ambient air by the help of mathematical calculations is comprised of following items:

- 7 km x 7 km "Dispersion Area" for analyzed source is determined.
- A rectangular grid system for the determined dispersion area is prepared with a grid system of 125 m x 125 m and information on latitude, longitude and elevation is obtained.
- Information about the pollutant sources in the dispersion area is obtained.
- Hourly meteorological data (in Bilkent case, it was the Meteorological Station of Ankara) of a representative year is obtained (Long-term meteorological for last ten-years and five-years hourly wind data (in between 2006 and 2011) were evaluated for selection of representative year. As a result of this study, wind data of 2010 was selected as most appropriate year for air quality modeling study of the Bilkent IHC).
- Hourly, daily and annual average GLC values of pollutants in the ambient air are estimated by being run of the model after transferring the information stated in the above steps.

In the scope of air quality modeling studies, seven different scenarios (including design data for turbine and motor options), by changing stack height and number of units in the plant as

well as emission rates, have been studied in order that the GLC values are in compliance with the limit values. Composition of each scenario and GLC values calculated by modeling studies are presented in Table 7.12.

Table 7-12. Ground Level Concentrations Calculated by Modeling Studies

Scenario	Parameter	Period	Ground Level Concentration (µg/m³)	Limit Value (µg/m³)
Scenario 1: Design Data (Stack Height: 19 m Number of units: 4 NO_x emission: 300 mg/Nm³)	NO_2	Hourly	363.8 (x: 0479062.50, y: 4416187.50) (99.79 percentile)	200
		Daily	229.9. (x: 0479062.50, y: 4415187.50)	-
		Annual	54.6 (x: 0479062.50, y: 4415187.50)	40
Scenario 2 (Stack Height: 19 m Number of units: 3 NO_x emission: 300 mg/Nm³)	NO_2	Hourly	279.9 (x: 0479062.50, y: 4416187.50) (99.79 percentile)	200
		Daily	173.7 (x: 0479062.50, y: 4415187.50)	-
		Annual	41.4 (x: 0479062.50, y: 4415187.50)	40
Scenario 3 (Stack Height: 40 m Number of units: 4 NO_x emission: 300 mg/Nm³)	NO_2	Hourly	307.5 (x: 0477812.50, y: 4415187.50) (99.79 percentile)	200
		Daily	84.8 (x: 0477687.50, y: 4415187.50)	-
		Annual	14.9 (x: 0478937.50, y: 4416062.50)	40
Scenario 4 (Stack Height: 40 m Number of units: 3 NOx emission: 300 mg/Nm3)	NO_2	Hourly	230.2 (x: 0477812.50, y: 4415187.50) (99.79 percentile)	200
		Daily	64.2 (x: 0477687.50, y: 4415187.50)	-
		Annual	11.1 (x: 0478937.50, y: 4416062.50)	40
Scenario 5 (Stack Height: 40 m Number of units: 3 NOx emission: 250 mg/Nm3)	NO_2	Hourly	193.8 (x: 0477812.50, y: 4415187.50) (99.79 percentile)	200
		Daily	54.0 (x: 0477687.50, y: 4415187.50)	-
		Annual	9.4 (x: 0478937.50, y: 4416062.50)	40
Scenario 6 (Stack Height: 14 m Number of units: 3 NOx emission: 50 mg/Nm3)	NO_2	Hourly	84.7 (x: 479062.50, y: 4416187.50) (99.79 percentile)	200
		Daily	49.1 (x:0479062.50, y: 4416187.50)	-
		Annual	11.8 (x: 0479062.50, y: 4416187.50)	40

Scenario 7 (Stack Height: 19 m Number of units: 3 NOx emission: 300 mg/Nm3)	NO_2	Hourly	319.8 (x: 0478437.50, y: 4415562.50) (99.79 percentile)	200
		Daily	178.9 (x:0479062.50, y: 4416187.50)	-
		Annual	50.4 (x: 0479062.50, y: 4416187.50)	40

As seen in Table-3, hourly and annual NO_2 limit values are only complied by Scenario 5 and Scenario 6. According to the modeling results, in order to be in compliance with the associated air quality limit values for NO_2 parameter, the number of units in the trigeneration plant should not be higher than three and stack height should be at least 40 m for 5.67 MWe turbine option whereas 14 m for 7.5 MWe turbine (see Scenario 5 in Table-2). Additionally, during winter period, average background NO_2 concentration in Ankara is about 150 $\mu g/m^3$. In order to do not exceed 200 mg/Nm^3, it is suggested to use turbines which have low NO_2 emission rates (50 mg/Nm^3) as given in Scenario 6. Hourly and annual dispersion of NO_2 GLC simulated for Scenario 6 are presented in Figure 7.6 and Figure 7.7.

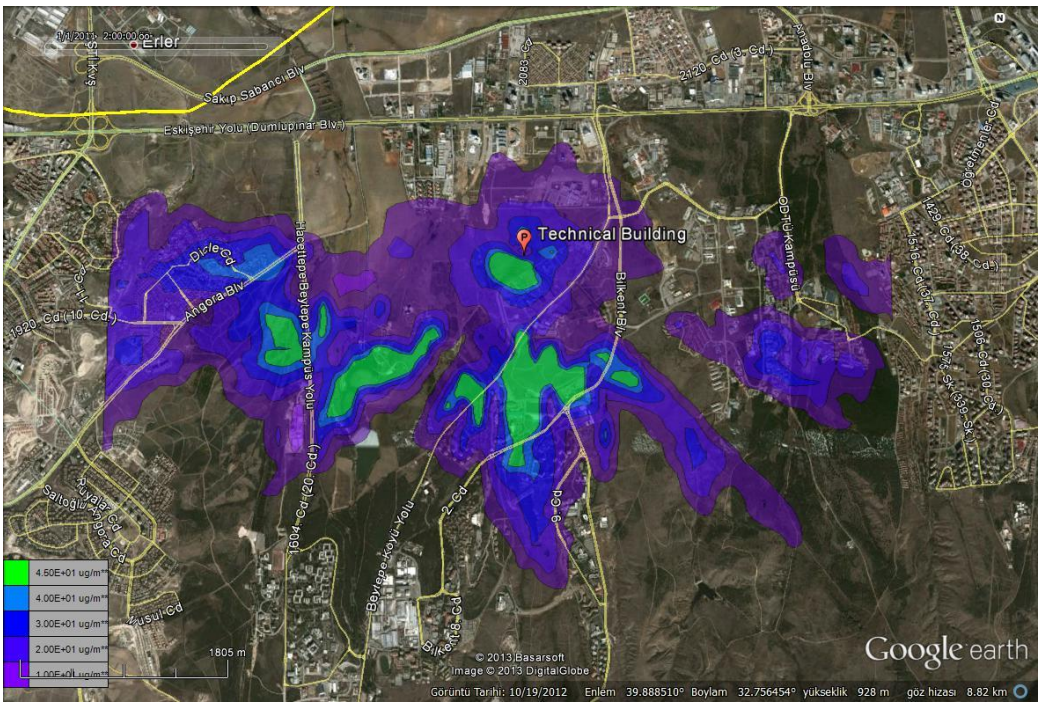


Figure 7-6. Hourly GLC Dispersion of NO_2 for Scenario 6

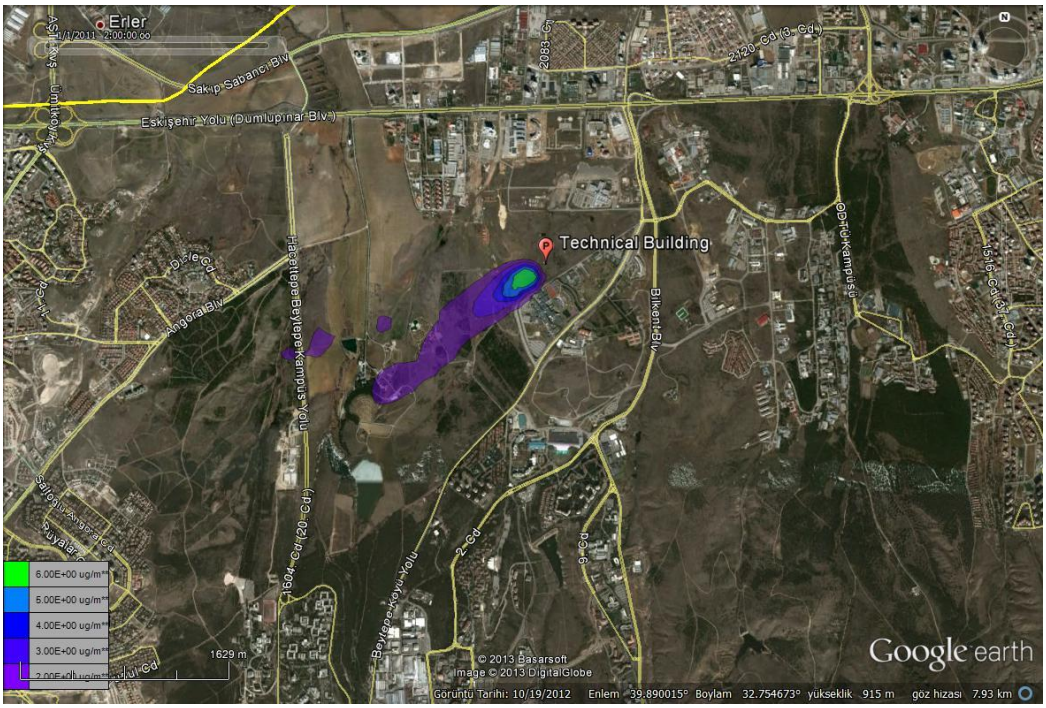


Figure 7-7. Annual GLC Dispersion of NO_2 for Scenario 6

The proposed trigeneration plant will have a stack height above 19 m with a diameter of 1.6 m and stack gas temperature of 110°C. Adequate number of units will be installed in the plant in order to generate the required electricity for running the integrated health campus operations. Installed power capacity of plant is planned to be c.a. 20 MW. Detailed design will be completed in the following months but the environmental assessment conducted by the ESIA team draw a minimum acceptable line for design in terms of environmental constraints and hence the design team has to conduct their remaining studies in line with environmental limits and considerations.

CO_2 Emissions

Natural gas will be used in trigeneration plant for power and steam generation. Estimated fuel amount for each unit used in trigeneration plant is about 2,254 Nm^3/h which corresponds to 4 metric tons/hour CO_2 emission. In the light of this data, yearly CO_2 emission for three units is estimated as 105,120 metric tons. CO_2 emission calculations are performed in accordance with emission rate given by EPA (www.epa.gov/cleanenergy/energy-resources/refs.html).

7.2.1.2 Water Quality

Water will be consumed in toilets and cleaning activities in buildings. A separate fire extinguishing system has been designed. Water use can be divided into three groups as (i) patient use, (ii) visitor use and (iii) water use for cleaning. Water use per bed is estimated as

600 L/day. Hence, daily total water use in the campus will be (3662 beds x 600 L/bed-day =) 2,197,200 L/day ~2,200 m^3/day. This is equivalent to 25.43 L/sec.

Assuming that water used will be completely converted to wastewater, the amount of wastewater to be generated will be equal to the amount used, i.e. 25.43 L/sec. The Project Company takes this flow rate as well as other future flow into consideration, and will design the infrastructure accordingly.

As the total capacity of the existing 14 hospitals will be transferred to the new health campus, the amount of wastewater discharged to the sewerage system will be almost the same. However, in this case discharge of wastewater will be from a single point rather than from multiple points.

7.2.1.3 Topography, Geology and Soil

As it was stated in the previous chapter, no significant impact is expected on soil quality, provided that good waste management practices are implemented at the site. Necessary management requirements are discussed in the next chapter of the Report.

7.2.1.4 Solid Wastes

There are no statistical data on the amount of solid waste generated at hospitals. There is also no information on current solid waste generation at the hospitals to be closed. On the other hand, calculation of the amount of solid waste to be generated may not be necessary. According to data of the Turkish Statistical Institute for the year 2010, average solid waste generation rate is 1.14 kg/cap-day in Turkey. In the health campus, there will be around 50,000 daily visitors and outpatients in addition to 3,662 inpatients at full occupancy situation. Based on this, average solid waste generation in the health campus is assumed as 0.2 kg/cap-day, which results in total solid waste generation of around 10.7 tons/day.

The same situation as the wastewater discharge applies here as well. The total amount of solid waste will be approximately the same as the total of those hospitals to be replaced but waste generation will be at single point. However, solid wastes will still be going to the same landfill operated by the only authority in Ankara, the metropolitan municipality.

From a cumulative assessment point of view, the existing condition will continue since both hospitals are replacing respective ones with almost the same total capacity. Thereby, no cumulative impacts are of concern.

7.2.1.5 Hazardous Wastes

There will be a limited amount of hazardous wastes such as empty containers of chemicals, used cartridges, fluorescent lamps, used batteries and oily rags or equipment resulting from maintenance works as well as other types which are waste oil, waste vegetative oil, waste

batteries and accumulators and worn-out tyres. The amount of hazardous waste will depend on the frequency of maintenance activities and also the need for repair works. Therefore, it is not possible at this stage to quantify hazardous wastes.

7.2.1.6 Medical Wastes

According to data from the Turkish Statistical Institute for 2010, the amount of medical waste for inpatients and outpatients is 5.32 kg/cap and 0.2 kg/cap, respectively. Condensing of medical waste generation at one point rather than hospitals in discrete locations is not expected to affect the current waste management system since the responsible party to collect medical waste is Ankara Metropolitan Municipality. In other words, the same institution will serve for only one location rather than multiple locations.

7.2.2 Potential Social Impacts

Characterization of potential social impacts during operational phase is given as follows.

7.2.2.1 Noise and Vibration

There will not be a source of continuous and disturbing noise and vibration during the operational phase. Such noise sources as generators and boilers will be located within buildings for isolation. Also, there will be occasional noise due to helicopter movement.

Since the tri-generation plant will be located indoors with isolated inner walls, noise reaching sensitive receptors will be insignificant.

7.2.2.2 Traffic

A traffic assessment study has been carried out by the design team to describe the existing traffic conditions in the surrounding arteries. The results of the survey were used to identify necessary traffic arrangements. Besides these arrangements, the metropolitan municipality's project to connect Eskişehir Highway to Konya Highway will decrease traffic congestion.

7.2.2.3 Socio-Economic

Socio-economic impacts that are expected to arise once the Project becomes operational will be determined as a result of the social impact assessment study as a part the ESIA. At this stage, in the first look, it might be expected that there will be economic loss for existing restaurants and shops in the nearby Kent Park and CEPA malls as well as pharmacies due to the new commercial facility to be built in the context of the Project. However, since there will be a huge circulation of additional people at the new health campus area during the day time, those two malls in close vicinity to the area may benefit from this circulation in a positive way.

Busier and slower traffic from the campus may affect neighborhood areas.

The Project will create economic regeneration with a positive cycle of employment, investment, and infrastructure development.

Health tourism may increase in the region.

There will be 7000 workers in construction phase while 10.000 employees including SPV, subcontractors and employees of the MoH will work during operational phase. It will create job opportunity in local area.

7.2.2.4 Life and Fire Safety

Life and fire safety is one of the primary concerns in the design process. In this respect, issues such as location of fuel tanks, fire hoses and water reels are of great importance for immediate and sufficient response in a fire case.

7.2.3 Impact Assessment Matrix

So far, impact appraisal has been made using quantitative data to the extent possible, yet this information is insufficient and primarily restricted to air and water quality and noise. Greater use can be made of qualitative risk assessment whereby the impacts are rated as 'low', 'medium' or 'high' according to two parameters – the severity of the impact (consequence) and the likelihood of its occurrence. The severity depends on the nature and size of the activity/aspect and the environmental and social sensitivity/value of resources/receptors, while the likelihood depends upon the nature of the activity/aspect and the control/mitigation measures in place.

Severity of impact is evaluated according to the criteria given in Table 7-13 below.

Table 7-13. Severity Index and Values

Severity Index	Value	Description
Positive	+	Beneficial impact – enhances the environment.
None	0	Negligible impact.
Slight	1	Slight impact – Local environmental damage. Within the plant premises and negligible financial severity.
Minor	2	Minor impact – Sufficiently large damage to cause impact on the environment. Single exceedance of statutory or prescribed criterion. Single complaint. No permanent effect on the environment.
Localized	3	Localized impact – Limited discharges of known toxicity. Repeated breaches of statutory or prescribed limit. Affecting neighborhood. Spontaneous recovery of limited damage within short time frame.
Major	4	Major impact – Severe environmental damage. Extended breaches of statutory or prescribed limits.
Massive	5	Massive impact – Persistent severe environmental damage or severe nuisance extending over a large area. In terms of commercial or recreational use or nature conservation, a major economic loss for the host country. Constant, high exceedance of statutory or prescribed limits.

Table 7-14 below presents the index and values that are used to estimate likelihood of occurrence of impacts.

An impact assessment matrix given in Figure 7-8 can be used to combine these two assessment criteria and to determine significance of impacts. This matrix is based on the widely used risk assessment matrix for qualitative risk assessment studies. Impacts rated as low (green) are considered to be acceptable and relatively limited mitigation measures are deemed necessary. Impacts rated as moderate (yellow) and high (red) require control measures to reduce them to acceptable levels.

Table 7-14. Probability Index and Values

Category Index	Value	Description
Very Unlikely	1	The impact is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.
Unlikely	2	The impact is unlikely to but may occur at some time under normal operating conditions.
Likely	3	The impact is likely to occur at some time under normal operating conditions.
Very Likely	4	The impact is very likely to occur under normal operational conditions.
Certain	5	The impact will occur under normal operating conditions.

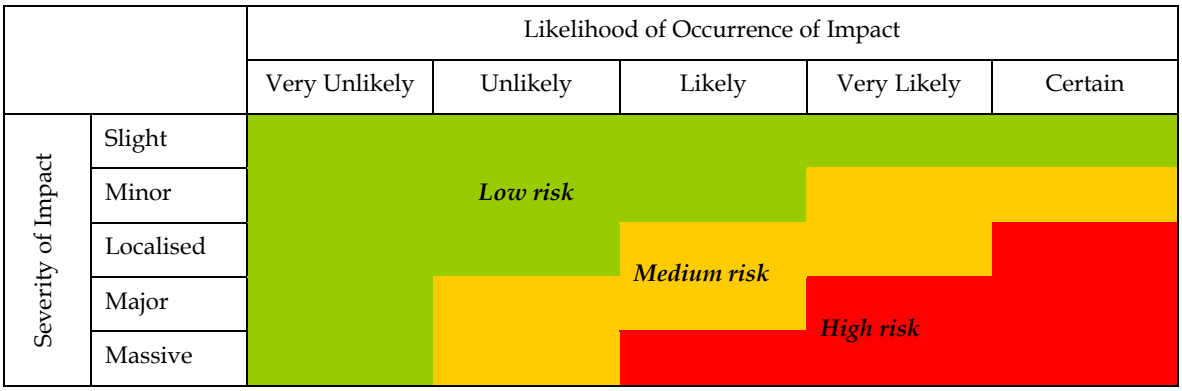


Figure 7-8. Impact Assessment Matrix

Impact classes can be defined as follows.

High (or Major) Impact: No alternative is feasible and no further mitigation is possible. Compensation or offset measures must be provided.

Moderate Impact: The residual impact has been subjected to all feasible cost effective mitigation and hence is reduced to a level that is as low as reasonably practicable. This will receive ongoing attention during detailed design and will be monitored during project implementation.

Low (or Minor) Impact: This impact can be controlled using good practice management measures.

Subsequent to the assessment of identified impacts during construction and operation, mitigation measures for each impact will be defined in order to avoid or minimize these impacts. Residual impacts, i.e. the net impacts after mitigation, if applicable, are defined and assessed using the Impact Assessment Matrix. Monitoring schedule is recommended to observe if necessary mitigation measures are taken as well as residual impacts are within the acceptable level defined by both national legislation and international standards.

Assessment of environmental and social impacts regarding severity and probability indices is presented in Table 7-15 below.

Table 7-15. Impact Assessment

Impact Reference	Impact Description	Impact Assessment (Severity /Probability if Negative)	
Construction Phase			
Environmental			
Air Quality	1. Increase in ambient dust concentration due to: - Site preparation and excavation - Concrete batching - Transportation of construction machinery on unpaved surfaces 2. Gas generation due to engine emissions of various construction machinery	Negative / Localized + Certain	High Risk
		Negative / Localized + Very Likely	Medium Risk
Water Quality	Soil contamination due to improper handling and discharge of wastewater resulting from: - Personnel (domestic wastewater) - Concrete batching and other construction activities (wash water)	Negative / Localized + Very Likely	Medium Risk
		Negative / Localized + Very Likely	Medium Risk
Topography, Geology and Soil	- Change of quality and stability of soil due to earth works - Discharge of silty water from concrete batching and accidental leakage of chemicals	Negative /Slight+ Very Likely	Medium Risk
		Negative /Localised+ Very Likely	Medium Risk
Solid Wastes	Soil contamination as well as attraction of insects and bad odor due to improper handling and disposal of solid wastes resulting from: - Construction camps - Excavation wastes from construction activities	Negative /Localised + Very Likely	Medium Risk
		Negative /Slight+ Very Likely	Medium Risk

Impact Reference	Impact Description	Impact Assessment (Severity /Probability if Negative)	
Hazardous Wastes	Soil contamination due to improper handling and disposal of hazardous wastes such as waste oil, waste batteries and accumulators	Negative /Major+ Very Likely	High Risk
Medical Waste	Soil contamination as well as risk to public health due to improper handling and disposal of medical wastes	Negative /Major+ Very Likely	High Risk
Waste Oil	Soil contamination if it is discharged or spilled.	Negative /Major+ Very Likely	High Risk
Waste Vegetative Oil	Clogging sewage pipes through accumulation in time	Negative /Major+ Very Likely	High Risk
Waste Batteries and Accumulators	Significant soil contamination with such hazardous materials as lead, mercury, cadmium and nickel that is toxic to biological elements.	Negative /Major+ Very Likely	High Risk
Worn-out tyres	Soil contamination	Negative /Localised + Likely	Medium Risk
Social			
Noise and Vibration	Temporary nuisance to - neighboring hospitals and; - nearby settlements and institutions	Negative /Localised+ Unlikely	Low Risk
Traffic	Increase in local traffic due to transport of - construction materials into site and; - excavated material out of site.	Negative /Localised+ Likely	Medium Risk
Health	Transportation during construction could expose workers and local people to the risk of injuries or accidents	Negative/Localised+ Unlikely	Low Risk
Wealth & local economy	Local economies may be negatively impacted by the Project. The cost and price of local produce may be increased/decreased by changes associated with the Project.	Negative/Localised+ Likely	Medium Risk
House and Land	Changes in land availability may positively or negatively impact house or land prices.	Negative/Localised+ Likely	Medium Risk
Social harmony	Social conflict or degradation can be a Negative Impact Outsiders may positively influence the society in general	Negative /Localised+ Very Likely	Medium Risk

Impact Reference	Impact Description	Impact Assessment (Severity /Probability if Negative)	
Access to decision making	Lack of accessing decision-making processes	Negative /Localised+ Unlikely	Medium Risk
Operational Phase			
Environmental			
Air Quality*	NOX and CO emissions from tri-generation plant.	Negative/ Localized + Unlikely	Low Risk
Water Quality	- When not properly treated, wastewater discharge causes soil contamination with hazardous and radioactive content in addition to microbial contamination. - Additional load to existing infrastructure	Negative /Localized + Likely	Medium Risk
Solid Wastes	Soil contamination as well as attraction of insects and bad odor due to improper handling and disposal.	Negative /Localized + Likely	Medium Risk
Hazardous Wastes	When not properly handled - Adverse impacts on workers and public health (diseases); - Contamination of soil.	Negative /Major+ Very Likely	High Risk
Medical Waste	Adverse impacts on workers' and public health (e.g. many diseases) as well as on soil when it is not handled properly.	Negative /Major+ Very Likely	High Risk
Waste Oil	Soil contamination if it is discharged or spilled.	Negative /Major+ Very Likely	High Risk
Waste Vegetative Oil	Clogging sewage pipes through accumulation in time	Negative /Major+ Very Likely	High Risk
Waste Batteries and Accumulators	Significant soil contamination with such hazardous materials as lead, mercury, cadmium and nickel that is toxic to biological elements.	Negative /Major+ Very Likely	High Risk

Impact Reference	Impact Description	Impact Assessment (Severity /Probability if Negative)	
Worn-out tyres	Soil contamination	Negative /Localised + Likely	Medium Risk
Social			
Noise and Vibration	Nuisance due to tri-generation plant	Negative /Localised+ Unlikely	Low Risk
Traffic	Traffic congestion in the nearby roads and nodes	Negative /Localised+ Certain	High Risk
Life and Fire Safety	- Severe injuries and loss of lives - Damage in property and failure in health services	Negative/Localised+Certain	High Risk
Radiation Safety	Health impacts for staff working with x-ray imaging devices	Negative/Localised+Very Likely	Medium Risk
Epidemics	Spread of airborne disease from patients with infectious diseases.	Negative/Major+Very Likely	High Risk
Wealth & local economy	Local economies may be negatively impacted by the Project. The cost and price of local produce may be increase/decrease by changes associated with the Project.	Negative/Localised+ Likely	Medium Risk
Health	Having a health campus nearby can improve aware of health issues, or more likely to seek treatment	Positive/Localised+ Likely	
Social harmony	Social conflict or degradation of could be a Negative Impact Campus will have 10,000 employees on operation process.	Negative /Localised + Very Likely	Medium Risk

** Impacts in air quality in operational phase will be assessed when air quality modeling study for trigeneration plant is finished.*

8 MITIGATION AND MANAGEMENT OF IMPACTS AND ISSUES

Proposed mitigation measures for eliminating or minimizing Project's environmental and social impacts are presented in this section. Residual impacts that may be observed provided that the recommended mitigation actions are taken are assessed using the impact assessment matrix (see Table 8-1).

Table 8-1. Mitigation Measures and Residual Risk Assessment

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Environmental						
Air Quality	1. Dust generation	Localized + Certain	1. Work sites shall be watered under warm, dry and windy weather conditions. Material shall be loaded and unloaded without slueing; 30 km/hour speed limit shall be set on non-paved roads. Top of the trucks will be covered while carrying the excavation materials. Dust suppression system will be installed in the concrete-batching plant. 2. Exhaust emissions of the heavy machinery shall regularly be measured, controlled and recorded by authorized institutions.	In spite of the mitigation measures, low level dust and gaseous pollutants are expected especially around service roads	Localised+ Very Unlikely	Low Risk
	2. Gaseous pollutant generation	Localized + Very Likely			Localised+ Very Unlikely	Low Risk
Water Quality	Soil contamination due to improper handling and discharge of wastewater resulting from: - Personnel (domestic wastewater) - Concrete batching and other construction activities (wash water)	Localized + Very Likely	1. Domestic wastewater from personnel should be discharged to municipal sewerage network passing near the site. Connections to line should be made in coordination with ASKİ. 2. Concrete batching wastewater should be taken to a sedimentation tank to reduce suspended solids content. Settled solids should be carried to landfill with other excavated material. Supernatant should be used in watering roads for dust suppression.	With no discharge of domestic and concrete batching wastewater to land, no contamination of groundwater is expected.	Localised+ Very Unlikely	Low Risk
		Localized + Very Likely			Localised+ Very Unlikely	Low Risk
Topography, Geology and Soil	- Change of quality and stability of soil due to	Slight+ Very Likely	1. Vegetal top soil should be separately stored. Top of vegetal top soil should be grassed to keep in good condition and prevent losses. It should be used for	Minor spills of construction chemicals and subsequent soil	Slight+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
	earth works - Discharge of silty water from concrete batching and accidental leakage of chemicals	Localised+ Very Likely	landscaping later. Formation of unstable soil piles should be avoided during construction. 2. Silty water should be taken to a sedimentation tank as proposed for water quality control. Construction chemicals tanks should be placed in secondary containments with volume of 110% of the tank volume.	contamination may be observed.	Localised+ Very Unlikely	Low Risk
Solid Wastes	Soil contamination as well as attraction of insects and bad odor due to improper handling and disposal of solid wastes resulting from: - Construction camps - Excavation wastes from construction activities	Localised + Very Likely	1. Solid wastes including waste packages of construction material to be produced in construction camps should be collected in separate leak-proof containers. Containers should be kept closed all the time. Solid wastes will be collected by Çankaya Municipality. 2. 3,700,000 m^3 of excavated material will be carried to the landfill while 426,530 m^3 of it will be temporarily stored in the site for use in backfilling and 123,288 m^3 (i.e. vegetal top soil) will be stored for future use in landscaping. Top of vegetal top soil will be grassed to prevent losses and maintain good quality. After demolition works, metropolitan municipality will bring mobile separation equipment, and segregate different types of wastes such as steel, concrete, sand, vegetal soil. Metropolitan municipality will carry these wastes to related disposal or recovery facilities.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
		Slight+ Very Likely			Slight+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Hazardous Wastes	Soil contamination due to improper handling and disposal of hazardous wastes such as waste oil, waste batteries and accumulators	Major+ Very Likely	Hazardous wastes should be stored in concrete-sealed temporary storage areas surrounded with fences and covered to be protected from precipitation. Hazardous wastes should be categorized according to their types defined in the Regulation on General Principles of Waste Management. Different types of hazardous wastes should be kept in separate closed containers labeled as the name and six-digit code of the waste. Hazardous wastes should be stored in the site no longer than six months. Hazardous wastes should be collected by licensed collection companies.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Medical Waste	Soil contamination as well as risk on public health due to improper handling and disposal of medical wastes	Major+ Very Likely	Medical waste generated at infirmary should be kept in medical waste bags and taken to the closest health institution by the doctor employed in the construction site. Medical waste will be collected by licensed vehicles of Ankara Metropolitan Municipality.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Waste Oil	Soil contamination if it is discharged or spilled.	Major+ Very Likely	Waste oil should be temporarily stored in the hazardous waste temporary storage area under the same conditions as other hazardous wastes. Waste oil should be collected by licensed companies.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Waste Vegetative Oil	Clogging sewage pipes through accumulation in time	Major+ Very Likely	Waste vegetative oil should be kept in corrosion-proof containers, and given to contract collectors with license.	No residual impact is expected.	Major+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Waste Batteries and Accumulators	Significant soil contamination with such hazardous materials as lead, mercury, cadmium and nickel that is toxic to biological elements.	Major+ Very Likely	Waste batteries should be collected in waste battery boxes that should be placed in camp site.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Worn-out tyres	Soil contamination	Localised + Likely	Tyres of vehicles should only be changed in authorized service companies.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Social**						
Noise and Vibration	Temporary nuisance to - neighboring hospitals and; - nearby settlements and institutions	Localised+ Certain	Noise curtains should be constructed between the construction site and closest sensitive receptors e.g. Atatürk Training and Research Hospital. Maintenance of construction machinery should be regularly made.	Proposed mitigation will ensure no increase in predicted noise level.	Localised+ Unlikely	Low Risk
Traffic	Increase in local traffic due to transport of construction materials into site and excavated material out of site.	Localised+ Very Likely	Construction and excavated material flow into and out of the site should be made from the streets with low traffic such as the southern and western streets. Morning and evening rush hours on week days should be avoided. Any stipulation of UKOME should also be taken into consideration.	Minor traffic congestion due to movement of trucks carrying debris is expected.	Localised+ Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Health	Construction transport could expose workers and local people to the risk of injuries or accidents	Localised+ Unlikely	Bilkent IHCP Health, Safety and Security Plan should be prepared which includes: • Safeguards/security around construction; • Safety training for PAPs.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Wealth & local economy	Local economies may be negatively impacted by the Project. The cost and price of local produce may be increased/decreased by changes associated with the Project.	Localised+ Likely	Bilkent IHCP development to be included in a broader economic regeneration programme for the Wider Project Area (Regional Govt.) To include Bilkent IHCP employment & other stakeholder initiatives.	No residual impact is expected.	Localised+ Unlikely	Low Risk
House and Land	Changes in land availability may positively or negatively impact house or land prices.	Localised+ Likely	Regional Government to consider cumulative impacts of all regions.	No residual impact is expected.	Localised+ Unlikely	Low Risk
Social harmony	Social conflict or degradation of could be a Negative Impact or "outsiders" may positively influence society.	Localised+ Very Likely	Bilkent IHCP to include socio-cultural training and code of conduct in Employee Induction and Training Plan for construction workers.	No residual impact is expected.	Localised+ Unlikely	Low Risk
Cultural Heritage and Sites	Might be at risk from construction works, changes to roads/surrounding environment.	Minor+ Likely	In case any cultural asset is found relevant museum directorate should be informed.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Operational Phase						
Environmental						
Air Quality*	Poor air quality due to NO_x and CO emissions from tri-generation plant.	Localized + Unlikely	Environmental technologies such as low-NOx burners will be used for minimization of NOx.	Not applicable	Localised+ Very Unlikely	Low Risk
Water Quality	- When not properly treated, wastewater discharge causes soil contamination with hazardous and radioactive content in addition microbial contamination. - Additional load to existing infrastructure	Localized + Very Likely	In order to reduce the load to the sewage infrastructure, grey water from hotel will be treated for use in irrigation. Site runoff will be collected in a pond which acts as an equalization basin before discharges to municipal network.	Not applicable	Localised+ Very Unlikely	Low Risk
Solid Wastes	Soil contamination as well as attraction of insects and bad odor due to improper handling and disposal.	Localised + Very Likely	Solid wastes from hospitals, medical hotel and administrative building will be stored in closed containers for different types of wastes (e.g. domestic solid wastes, packaging wastes, waste batteries). Domestic solid wastes should be stored in a temporary storage area until municipalities collect them.	Not applicable	Localised+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Hazardous Wastes	When not properly handled - Adverse impacts on workers and public health (diseases); - Contamination of soil.	Major+ Very Likely	Hazardous wastes except for medical wastes should be temporarily stored in the same way described for the construction stage.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Medical Waste	Adverse impacts in worker and public health (e.g. many diseases) as well as soil when it is not handled properly.	Major+ Very Likely	Medical wastes should be stored in a medical waste temporary storage area for no longer than 48 hours. Storage time can be one week provided that temperature inside storage area is below 4°C. Volume of the storage area should be sufficient for keeping 2-day waste. Inner walls of the area should be lined with impermeable material that does not retain microorganisms and contaminants, and is easily disinfectable. Medical waste will be collected by licensed vehicles of Ankara Metropolitan Municipality.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Waste Oil	Soil contamination if it is discharged or spilled.	Major+ Very Likely	Waste oil should be temporarily stored in the hazardous waste temporary storage area under the same conditions as other hazardous wastes. Waste oil should be collected by licensed companies.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Waste Vegetative Oil	Clogging sewage pipes through accumulation in time	Major+ Very Likely	Waste vegetative oil should be kept in corrosion-proof containers, and given to contract collectors with license.	No residual impact is expected.	Major+ Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Waste Batteries and Accumulators	Significant soil contamination with such hazardous materials as lead, mercury, cadmium and nickel that is toxic to biological elements.	Major+ Very Likely	Waste batteries should be collected in waste battery boxes that should be placed in camp site.	No residual impact is expected.	Major+ Very Unlikely	Low Risk
Worn-out tyres	Soil contamination	Localised + Likely	Tyres of vehicles should only be changed in authorized service companies.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Social**						
Noise and Vibration	Nuisance due to tri-generation plant	Localised+ Unlikely	Inner walls of tri-generation plant should be lined with noise-insulation material.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Traffic	Traffic congestion in the nearby roads and nodes	Localised+ Certain	Traffic arrangements considered for the design team; Construction of new connection roads parallel to the main artery, Eskişehir Highway. Outpatients and visitors will use ring buses to go to the campus. New subway line including a station near the campus. Future investments or arrangements that will be realized according to results of the Main Transport Plan, currently prepared by the metropolitan municipality, will ensure good traffic conditions around the campus.	Minor congestion in traffic may be observed.	Localised+ Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Life and Fire Safety	- Severe injuries and loss of lives - Damage in property and failure in health services	Localised+ Certain	In one-way fire escape routes, maximum distance without sprinkler will be 15 m while it will be 25 m with sprinkler. In two-way routes, distances will be 30 and 60 m, respectively. In dead ends, distances will be arranged as 15 m and 20 m, respectively. Addition of fire ladders and extra gates to fire ladders, removing objects blocking escape routes. Arrangement of spaces of 300 to 3000 m² to allow horizontal evacuation of patients in beds in compliance with the pertinent legislation. Placing adequate escape signs (direction plates), illumination of signs and routes, designing ladders as follows: • Min. width of flight of ladders: 122 cm; • Min width of step: 25 cm; • Min. height of step: 17.5 cm; • Distance between stairheads; 300 cm. Installing smoke control system. Installing pressurization system to feed fresh air. Placing fire hoses and mobile fire extinguishers inside buildings.	Slight residual impacts in property	Localised+ Unlikely	Low Risk
Epidemics	Spread of airborne disease from patients with infectious diseases.	Major+Very Likely	Ventilation systems will be separate in surgery rooms and intensive care units, and high-efficiency particulate air filters will be used to retain airborne bacterial and viral organisms.	No spread of airborne diseases are expected.	Major+Very Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Radiation Safety	Health impacts for staff working with x-ray imaging devices	Medium Risk	Replacement of x-ray equipment with radiation danger will be carried out by authorized and trained staff of the vendors of those devices. Necessary protective material will be used by the staff. Radioactive waste will be handled in compliance with the relevant legislation of Turkish Atomic Energy Authority. Health staff working with such devices will undergo periodic checks.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Health	Construction transport could expose workers and local people to the risk of injuries or accidents	Low Risk	Bilkent IHCP Health, Safety and Security Plan should be applied.	No residual impact is expected.	Localised+ Very Unlikely	Low Risk
Wealth & local economy	Local economies may be negatively impacted by the Project. The cost and price of local produce may be increased/decreased by changes associated with the Project.	Medium Risk	Regional Government to consider an economic regeneration programme for the Wider Project Area. Bilkent IHCP to understand/ compliment Regional Govt. economic regeneration programme (Corporate Social Responsibility Strategy);	No residual impact is expected.	Localised+ Unlikely	Low Risk
House and Land	Changes in land availability may positively or negatively impact house or land prices.	Medium Risk	Regional Government to consider cumulative impacts of all regions	No residual impact is expected.	Localised+ Unlikely	Low Risk
Social harmony	Social conflict or degradation of could be a Negative Impact society.	High Risk	Bilkent IHCP to include socio-cultural training and code of conduct in Employee Induction and Training Plan for health care employees of campus.	No residual impact is expected.	Localised+ Unlikely	Low Risk

Impact Reference	Impact Type	Severity	Proposed Mitigation	Residual Impact	Residual Severity	
Access to decision making	The ability of individuals to influence communities' decision-making processes and protect their interests may be negatively impacted by the Project.	Medium Risk	Effective Public Consultation to include stakeholder engagement strategy. The grievance mechanism will allow submitting complaints personally as well as via post or electronic mail. The project team will confirm receipt of a complaint within 7 days and find a solution within 15 days, confirming this in writing to the complainant. Project website is available, information about telephone line, e mail and address of the Project is available for any grievance. Communication Manager: Emre Kitapçı Adress: Universiteler Mah. 1604. Cad. No: 9 Bilkent/Ankara Çankaya - Ankara/TÜRKİYE Tel: +90 (312) 220 40 44 Fax: +90 (312) 220 40 48	No residual impact is expected.	Localised+ Unlikely	Low Risk

** Impacts and residual impacts in air quality in operational phase will be assessed when air quality modeling study for tri-generation plant is finished.*

***Public consultations within the scope of Social Impact Assessment study of the Project have not started yet, some impacts of the Project cannot be predicted at the moment and they may occur after the public consultations. Healthful indicators of impacts and mitigation measurements for estimated and unforeseen impacts will take its final shape after public consultations.*

9 ENVIRONMENTAL AND SOCIAL OPPORTUNITIES FOR PROJECT ENHANCEMENT

The health campus is a large urban development and therefore, habitat interactions are limited. However, realization of a good landscape in the Project by creating large green areas with a planned pond for catching runoff may establish habitats for various species in the Project Site.

Also, as mentioned before, the Project will bring about many innovations with regards to existing hospitals in Turkey. A tri-generation plant which is more efficient than conventional heating and cooling systems will be used. Furthermore, the health campus will also utilize solar power for hot water production and grey water treatment system to produce irrigation water for green areas.

10 ACTION PLANS AND MANAGEMENT SYSTEMS

An "Environmental and Social Management and Monitoring Plan (ESMMP)" has been prepared for the construction and operational phases of the Project. The ESMMP presents the relevant mitigation measures for environmental and social impacts along with proposed monitoring to check effectiveness of mitigation measures. It also defines parties responsible for monitoring environmental issues.

ESMMP (see Appendix-J) is supported with the following sub-plans:

- Waste Management Plan, which defines all types of wastes to be generated throughout the lifetime of the Project, presents guidelines for proper waste management practices such as transferring, keeping records and monitoring (see Appendix-K);
- Traffic Management Plan, defines responsibilities and procedures to be followed for a sound traffic management on and off the site (see Appendix-L).

The MoH and the Project Company are responsible for establishing an Environmental and Social Management System (ESMS) and implement the ESMMP and supporting sub-plans. 2U1K Engineering and Consultancy as the consultant of the Project Company will support the Project Company during the establishment of such ESMS for the realization of the Project. In this respect, general framework of such ESMS is outlined in the ESMMP in the Appendix-J of the ESIA Report.

REFERENCES

[1]: Ankara Bilkent Integrated Health Campus Project Preliminary Information Memorandum, Unicredit, 2012.

[URL-1] Official website of the General Directorate of State Meteorological Works (www.mgm.gov.tr).