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KOCAELİ INTEGRATED HEALTH CAMPUS PROJECT

Environmental and Social Assessment - Final

Submitted to:
Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş.

REPORT

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Executive Summary

Introduction

Health Services Transformation Program has been initiated by MoH in 2003 with the purpose of extending the access to health services and increasing the number of health personnel per capita. Under the scope of this program 29 health regions were defined for 81 provinces. The aim for defining the health regions were to provide high quality health services to the citizens in these regions. The MoH is planning to build 30 health campuses with different bed capacities in 22 cities within this program.

Being one of these campuses, the purpose of the Kocaeli Integrated Health Campus Project (IHC) is to improve the quality of healthcare services and the number of beds by constructing a new healthcare facility in Kocaeli. When completed, the Project will provide high-quality healthcare services for the residents of Kocaeli and the surrounding settlements.

The Kocaeli Integrated Health Campus Project is located in the Kocaeli Province, İzmit District, and Gündoğdu Quarter. Access to the Project site is provided via the Trans European Motorway ("TEM") O4 section. The project site is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area".

Project Location and surroundings

Kocaeli Integrated Health Campus will be constructed over a 353,381 m² land consisting of several hospitals with a total enclosed area of 353,382 m² and bed capacity of 1,180. The health campus is going to include 3 hospitals which are: the Main Hospital, the Physical Therapy and Rehabilitation Hospital and the High Security Forensic Rehabilitation Hospital. The Main Hospital includes a General Hospital, a Women & Paediatric Hospital, a Cardiovascular Hospital and an Oncology Hospital.

The findings of the scoping and screening phase of the Project and potential environmental and social impacts and risks of the projects were identified during that phase The project is categorised as B in accordance with IFC Sustainability Framework, EBRD Environmental and Social Policy and OPIC Environmental and Social Statement. Some of the findings are:

- There are no identified cultural heritage and biodiversity concerns within the Project Area of influence
- The Project is located in the vicinity of already existing infrastructure facilities
- The Project is away from the densely populated areas

Moreover, some of identified impacts and risks are: its being site specific, readily identifiable and largely reversible (see Section 1.3)

Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. retained Golder Associates Turkey Ltd. Şti. (“Golder”) to prepare the Environmental and Social Assessment (“ESA”) for the Kocaeli Integrated Health Campus Project (“Project”) in compliance with the national and international requirements.

Land use

The approximately 35.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area".

The area was used in the past for military purposes and the Cephanelik Mesire Alanı urban park is located south of the Project Area. There is no housing and no ongoing industrial or agricultural activity at the project site. There has been occasional grazing at the project site.

Environmental and Social Assessment

An ESA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; and includes the process of mitigating and managing adverse environmental and social impacts throughout project implementation.

ESA takes into account the natural environment, community health and safety, and social aspects in an integrated way.

The overall objectives for an ESA will include:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the Project’s area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;
- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and Grievance Mechanism against the Applicable Standards;
- Description of the management, mitigation, monitoring and compensation measures, including the ESMS, the ESMP, and the thematic action or management plans (e.g. corrective action plan, resettlement action plan);
- Cumulative impact assessment;
- Assessment of associated facilities.

Environmental and Social Assessment as presented in this report was performed for key issues for each Environmental and Social component. The assessment methodology consists of five main steps:

- Identification of Project activities that could contribute to environmental or social change;
- Evaluation of the potential effects;
- Description of mitigations for significant potential effects;
- Analysis and characterization of residual effects; and
- As necessary, identification of monitoring to evaluate and track performance.

The ESA used the following tools and procedures to analyse and address potential effects: conditions;

- Predictive tools (calculations, models) and methods to quantitatively and qualitatively describe future environmental and socioeconomic conditions;
- Quantitative and qualitative information on the existing baseline environmental and socioeconomic of potential effects, including reference to management objectives, baseline conditions and the views of the proponent and stakeholders; and
- Characterization of potential residual effects after mitigation and their consequences for people and the environment.

Detailed information on the assessment methodology is presented in Appendix J and Section 1.4.

Assessment of Alternatives

No analyses of alternatives with respect to location have been performed.The project land where the Project will be realized is the property of the Treasury, and was allocated to the Ministry of Health upon designation as a "Health Campus Area. The designated location has advantages of being close to already developed areas with civil infrastructure and access possibilities from immediate or regional surroundings.

The area was used in the past for military purposes and the “Cephanelik Mesire Alanı Recreatonal Park” is located in the south of the Project Area. The process for the official confirmation of the protection status of the military remains has been initiated. The Kocaeli Regional Directorate of Cultural Heritage (“RDoCH”) has stated in the official communication (Appendix O) that the project can be executed in the defined area in accordance with the provisions listed in the RDoCH’s response. The excavation works have to be conducted under the supervision of the Museum Directorate.

The Project will utilize highly advanced medical devices and facilities and will meet the health requirements of Kocaeli province and its nearby surroundings.

A portion of the power for the project during operation will be supplied through a trigeneration plant. The selected gas turbines for the trigenaration plant will be supporting the efficient use of energy resources for the project.

Stakeholder Engagement

A specific Stakeholder Engagement Plan has been prepared for the project. The overall objectives of the Stakeholder Engagement Plan are:

- Continuously informing the local community about the Project related development activities;
- Ensuring that the local community is informed about the hazards associated with construction, operation activities of the Project and mitigation measures implemented to reduce impacts where possible;
- Minimizing potential disputes between Contractor’s and Subcontractors’ and the local community;
- Incorporating local knowledge during the entire Project life cycle, by taking into account bottom up information and feedback provided by local communities; and

- Timely and effectively responding to community concerns regarding the issues such as employment of the local workforce reserve in the construction and operation phases, disruption to daily activities, safety issues, disturbances due to noise or dust, and other environmental and social issues.

A Grievance Mechanism has been set up for communities and individuals to formally communicate their concerns, complaints and grievances to the company and facilitate resolutions that are mutually acceptable by the parties.

The identified project stakeholder categories are;

- Governmental authorities at the national, regional and local levels;
- Multi-national and international organizations;
- Non-commercial, non-governmental and public organizations at the national, regional and local levels,
- Interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce, hospitals, schools and others (i.e., labour, youth, religious, businesses, etc.);
- Patients and patient families;
- Local communities;
- Local businesses and potential Project contractors and suppliers;
- Project, contractor and subcontractor employees; and
- Media,
- Directly affected community members (living nearby the Project area, patients, hospital employees, visitors etc.)

The SEP is a working document and will be revised during the development of the Project.

, A public consultation meeting was conducted in Kocaeli on 30th of May, 2015.

The main output of these activities can be summarised as;

- Provision of workforce and need for local procurement;
- Potential increase in real estate prices;
- Accommodation requirements for employees coming from outside quarters;

Public Consultation Meeting

Baseline Data Collection

As a key step in the ESA process; various studies have been conducted to collect information on the existing environmental and social baseline conditions. A part from the desktop and relevant literature review the following activities were performed for the collection of information on social and environmental baseline condition.

- For social baseline qualitative baseline information was collected through key informant interviews, community level interviews and focus group discussions;
- Air, soil and water quality measurement campaigns were conducted;
- Ambient noise measurements were done at selected points in the project area and surroundings;
- Traffic count study was done on the possible approach routes to the project area;
- Site visit was performed for identification of biodiversity concerns,

Baseline Data Collection Activities

IMPACT ASSESSMENT RESULTS

Main features of Current Situation	Potential impacts	Mitigation Measures
Geology and Seismology		
The project area is in 1st degree earthquake zone.	Changes in the local morphology due to the earthworks and excavation during construction. Impacts of seismologic activities on the facilities.	Compliance of design with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454).
Soils		
Brownfield area used in the past for military purposes. The "Cephanelik Mesire Alanı" (uncontrolled picnic area) is located at the south of the Project Area. The Project Area is mainly covered with bare soil but weeds and also remaining buildings from the previous military activities are present.	The top soil and lower soil removal. Occupation of land, increase of artificial land use and discharge of wastewater. Potential contamination of soil as a result of accidental spills, storage of hazardous material and waste at site.	Removed topsoil will be stored in an appropriate area in the Project Area, to be used for landscaping after the construction. Prevention of leaks and spills. Spill response arrangements.
Hydrogeology and Groundwater Quality		
The regional groundwater level is considerably deep and observed after 55 m.	Hydrogeological change and potential groundwater pollution due to uncontrolled release of contaminants onto the ground.	Prevention of leaks and spills.
Hydrology and Surface Water Quality		
There are no streams or any other natural surface water bodies at the Project Area except the tributary of the Bıçkı Creek at 150 m west of the Project Area, inside the "Cephanelik Mesire Alanı" (uncontrolled picnic area). The water classification for the tributary of the Bıçkı Creek is	Surface water pollution. Sediment pollution.	Engineering and design practices will be in place for the collection and disposal of wastewater from all sources during construction and operation of the project. The disposal of radioactive effluents during operation will be in line with the

Main features of Current Situation	Potential impacts	Mitigation Measures
Class II - Slightly Contaminated Water.		IFC/EBRD requirements defined for healthcare facilities.
Air Quality		
PM_{10}, settled dust and SO_2 measurement values are in compliance with Project standards. NO_2 measurement results are slightly in exceedance of the annual limit value due to the traffic emissions from of O4 highway.	Calculations on the estimated amount of air emissions during construction indicate no significant contribution to the ambient air quality. Air dispersion modelling shows that there will be only incremental addition of air pollutions to the ambient air quality pollutant levels.	Measures will be in place to minimise the air emissions during construction. Monitoring systems will be in place for the air emissions from the facility to be in compliance with regulatory requirements applicable to the project. A programme will be in place for the monitoring of NO_2 levels where the background NO_2 levels are in exceedance of limit values.
Noise		
Ambient noise levels are in compliant with the standards with the exception of location in the vicinity of the O4 highway.	Noise modelling shows the construction activities will not create additional noise values higher than the regulatory limit. As compared to the construction phase model results, operation phase noise level in the surroundings will be much lower and no exceedances in relation applicable standards are expected for the ambient noise levels.	Engineering controls. Limited construction works during night and weekends.
Traffic		
TEM highway passes through the north of the land and the Project area is connected to the north through the bridge using Zübeyde Hanım road and Başbuğ Street	During construction phase impacts will be mainly associated with the increased road traffic. The land traffic in the operation phase will be generated by the transportation of personnel, patients and visitors to Kocaeli IHC.	Scheduling of traffic to avoid peak hours on local roads. Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. Adopting traffic control and operations devices and emphasizing safety aspects among project drivers. Regular maintenance of vehicles should be undertaken to ensure that vehicles are safe and emissions and noise are minimized.

Main features of Current Situation	Potential impacts	Mitigation Measures
Biological Components		
No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed in the area.	The presence of the facilities will cause a loss of potential habitat for flora and fauna species within the project footprint during operation.	Project footprint will be minimized to the smallest extent possible in order to meet and support the Project works and activities. Inadvertent disturbance to the adjacent vegetated areas will be avoided through clear demarcation of the Project Site boundaries.
Social Components		
The project site is bounded by densely populated urbanised residential area. There is a public recreation centre (Cephanelik Mesire Alanı) close to the project site. There is one educational facility, Hacı Bektaş Veli Middle School, very close to the project site. Though public transportation network is fairly developed in Kocaeli and İzmit direct access by public transportation to IHC area is only by bus. Other infrastructure; electricity network, communication, water and wastewater is available in the surroundings There is already a management system for the disposal of medical wastes in Kocaeli.	*The need of workforce that can be considered a positive impact. **Increased traffic and transportation requirements. ***Community health and safety concerns in relation to Project construction and operation.	***A continuous stakeholder engagement process and grievance mechanism will be in place • to exchange information on the project with the local community and other stakeholder and • to record and respond any complaints and concerns raised by the local community members and other stakeholders *Maximising of local employment and procurement in order to increase the positive socio-economic impact of the project on the local community. *, ***Coordination with the local community for the arrangements of accommodation and establishment of the construction camps. ***Local waste management authorities will be contacted to ensure the allocation of existing municipality resources and structures for the construction waste management. **A detailed traffic study will be performed to identify the best transportation routes with minimum impact on the existing traffic load and suggesting measures to improve the accessibility to Izmit IHC during operation.

Main features of Current Situation	Potential impacts	Mitigation Measures
		***Coordination with the local authorities to confirm the utilisation of existing medical waste disposal facility for the operational medical wastes.

Environmental and Social Management System

The Environmental and Social Management System (ESMS) is required to ensure that the Project:

- complies with all applicable Turkish legislation as well as relevant IFI guidelines provided in the ESA;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in the ESA for the minimization of potential environmental and social impacts;
- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generates local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement programme.

The minimum requirements of an ESMS have been defined and will be established for the project in order to mitigate the risks associated with;

- Environmental aspects
- Labour Issues
- Community Health & Safety aspects
- Stakeholder management and social aspects
- Provision of healthcare services
- Waste Management
- Operation of Forensic Hospital
- Patient Data Security
- Dual management of the Facility

A basic framework of ESMS has been described at this stage of the Project for the general management issues and will be further developed as the project progresses. .

Conclusion

As a result of the Environmental and Social Assessment Study the following conclusions have been driven:

1) A detailed traffic study is required to identify the best transportation routes with minimum impact on the existing traffic load and suggesting measures to improve the accessibility to Izmit IHC during operation if necessary in coordination with local authorities.

2) The community health and safety concerns are valid especially in relation the Forensic Hospital. Continuous liaison is necessary with the local community members to manage the associated risks.

3) Continuous stakeholder engagement is necessary to manage the social risks of the project.

4) The project will develop an Environmental and Social Management System in line with the minimum requirements that are defined as part of the ESA study.

ACRNYMS AND ABBREVIATIONS

µg	Microgram
AoI	Area of Influence
CCHP	Combined Cooling Heat and Power
CO	Carbon monoxide
CO_2	Carbon dioxide
CRA	Community Relation Assistant
CRO	Community Relation Officer
dBA	A-weighted decibels
DPSIR	Drivers-Pressures-State-Impact-Response
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
EEA	European Environmental Agency
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EPA	Environmental Protection Agency
EPFI	Equator Principles Financial Institutions
EPs	Equator Principles
ER	Environmental Representative
ESAP	Environmental and Social Action Plan
ESA	Environmental and Social Assessment
ESHS	Environmental Social Health and Safety
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EU	European Union
GHGs	Greenhouse gases
GIIP	Good International Industry Practice
Golder	Golder Associates Turkey Ltd. Şti
GPLV	Generic Pollutant Limit Value
ha	Hectar
HCF	Healthcare Facilities
HP	Horse Power

hPa	Hecto Pascal
hr	Hour
HSE	Health, Safety and Environment
IBA	Important Bird area
ICU	Intensive Care Units
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	key biodiversity area
kg	Kilogram
kVA	Kilovolt Ampere
L	Liter
L&FS	Life and Fire Safety
L&FS	Life and Fire Safety
LDRP	Labour, Delivery, Recovery and Past-partum
Leq	Equivalent continuous sound level
LSA	Local Study Area
LV	Low voltage
m	Meter
mg	Milligram
ml	Milliliter
mm	Millimetre
MoEU	Ministry of Environment and Urbanization
MoH	Ministry of Health
MoJ	Ministry of Justice
MTA	Directorate of Mineral Research and Exploration
MV	Medium voltage
NGOs	Non-governmental organizations
NICU	New-born Intensive Care
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
O.G.	Official Gazette
OECD	Organization for Economic Co-operation and Development
PDF	Project Description File
PDoEU	Provincial Directorate of Environment and Urbanization

PM	Particulate matter
PM_{10}	Particulate matter with diameter less than or equal to 10 micron
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PRs	Performance Requirements
PS	Performance Standard
QA/QC	Quality Assurance/Quality Control
RSA	Regional Study Area
s	Second
SA	Study Area
SO_2	Sulphur dioxide
SPV	Special Purpose Vehicle
SSA	Social Study Area
ToC	Table of Contents
TOX	Total organic halogens
TPH	Total petroleum hydrocarbons
TÜİK	Türkiye İstatistik Kurumu (Turkish Statistical Institute)
VEC	Valued environmental components
WHO	World Health Organization

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APPENDICES

1.0 INTRODUCTION

1.1 Background and objectives

Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. ("Client") retained Golder Associates Turkey Ltd. Şti. ("Golder") to prepare the Environmental and Social Assessment ("ESA") for the Kocaeli Integrated Health Campus Project ("Project") in compliance with the national and international requirements.

Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. is a subsidiary of Gama-Türkerler and GE Joint Venture which is called "SPV".

This document represents the ESA report for the Kocaeli Integrated Health Campus Project. Before the preparation of this document a separate Scoping document was prepared in April 2015.

The Project is legally exempt from the requirement of an official Environmental Impact Assessment ("EIA") Process. However, concrete plant(s) with the capacity of 100 m^3/hr and above and the Trigeneration plant with the power capacity of 20 MWt and higher, are subject to the preparation of the Project Description File ("PDF") in accordance with the Regulation on Environmental Impact Assessment (dated: November 25, 2014, Official Gazette No: 29186, Annex – II Article 18 and Article 44 of the Regulation, respectively).

A Trigeneration plant will be installed as a part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt. The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the project is not subject to the preparation of PDF for the Trigeneration Plant.

There will be one concrete plant constructed under the scope of the Project. The capacity of the concrete plant will be 90m^3/hr. In that case; there will not be a requirement for preparing a PDF since the capacity of concrete plant will be only 90 m3/h.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m3/hr, referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary for the concrete plants.

Although the overall Project is legally exempt from the requirement of an official EIA Process, an ESA study is required by the lenders which 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 is required by the International Finance Institutions which are EBRD, OPIC and EDC.

The Kocaeli Integrated Health Campus ("IHC") Project is based on a Public-Private Partnership ("PPP") investment-finance model. The construction period (investment) is 3 years, and the Project operation period is about 25 years. After 25 years of operation IHC will be transferred to the MoH. There will be a dual management system between the Ministry of Health ("MoH") and the Project Company in the campus. Under this system, The MoH will assign doctors, nurses and other clinical staff to the campus.

In the feasibility study conducted by the MoH, there is no information on the closure and capacity decrease of other hospitals located in Kocaeli. An official response has been requested from MoH on the potential closure or capacity decrease of other hospitals. As stated in the Healthcare Facilities Planning Guide of the MoH, reconstruction of the old building of the Kocaeli State Hospital and the restoration of the old building of the Seka State Hospital is planned. However, there is no information about the timeline of those activities in the guideline.

The objectives of the ESA report are:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the project's area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;

- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and grievance mechanism against the Applicable Standards;
- Description of the management, mitigation, monitoring and compensation measures, including the ESMS, the ESMP, and the thematic action or management plans (e.g. corrective action plan, resettlement action plan);
- Cumulative impact assessment (as required by the Applicable Standards);
- Assessment of associated facilities.

Main components of the assessment include:

- the potential environmental and social impacts of the Project throughout the full life cycle;
- a public consultation to ensure that local communities and other key stakeholders are informed of the Project and have an opportunity to express their opinions concerning the Project;
- proposed mitigation activities to minimize adverse environmental impacts;
- the nature and significance of residual impacts (those adverse impacts that occur after mitigation has been applied) and ongoing monitoring and management plans to address them;
- the nature and significance of cumulative impacts.

1.2 Project Rationale

The purpose of the Kocaeli Integrated Health Campus Project is to improve the quality of healthcare services and the number of beds by constructing a new healthcare facility in Kocaeli. When completed, the Project will provide high-quality healthcare services for the residents of Kocaeli and the surrounding settlements.

In parallel with the growing population of Kocaeli Province, the need for healthcare services increases. The majority of the population (93%) lives in the province of Kocaeli. Besides, since there is a university in the province, thousands of students come to Kocaeli every year for education.

Health Services Transformation Program has been initiated by the MoH in 2003 for the purposes such as extending the access to health services and increasing the number of health personnel per capita. Under the scope of this program 29 health regions were defined for 81 provinces. The aim for defining the health regions were to provide high quality health services to the citizens in these regions. The MoH is planning to build 30 health campuses with different bed capacities in 22 cities with this program[1].

The province of Kocaeli is within the 16th Health Region of Turkey with the Düzce and Sakarya provinces. Kocaeli is defined as the centre of the region because of the current health personnel number, health facilities, health services capacities, more transportation possibilities and the population.

At the time the health planning guideline was published in June, 2011; there were 22 hospitals (10 belong to the MoH, 11 Private Hospitals and 1 University Hospital) located in the Kocaeli Province with a bed capacity of 3,367. Based on this data, Kocaeli has a bed capacity ratio of 21 beds for 10,000 inhabitants. After the implementation of the planned projects, the current bed capacity of the MoH will increase from 847 to 2,818 and the bed capacity ratio of the Kocaeli province will become 30 beds for 10,000 individuals.

When considering the infant and maternal mortality rate, which are one of the most important development indicators, the Kocaeli Province have rates better than the country average on infant mortality and worse on maternal mortality. Although the low infant mortality rate may give a positive image of the situation, it should be considered that the numbers are significantly higher than in other European Union ("EU") countries. The

[1] MoH, Planning Guide for Facilities Providing Inpatient Healthcare, June 2011

most effective mitigation measure to improve these numbers is the development of health services in the region.

Although the number of beds per 10,000 people has increased over the years, Turkey has the lowest number compared to EU and EU-candidate countries (See Table and Figure 1). The hospitals in the Kocaeli province are inadequate in terms of the quality of services and number of beds. The bed occupancy rate in the Kocaeli Province increased considerably in the recent years. According to the data of the Public Hospitals Association, the bed occupancy rate in the Ministerial hospitals in the Kocaeli Province was 67% in 2013 on average (See Figure 2) and 85% in the first 6 months of 2014.

According to the health data for 2013 by the Turkish Statistical Institute, there are 25 hospitals in the Kocaeli Province. Of these, 9 hospitals are administered by the MoH, one is a university hospital and 15 are private hospitals. The total bed capacity in the Kocaeli Province is 4053. Of these, 2250 are in the Ministerial hospitals.

The present Ministerial hospitals are generally very old. As an example, the Kocaeli State Hospital which is the oldest hospital in Kocaeli Province, was constructed in 1945 and İzmit Seka State Hospital was constructed in 1946. The province is in need for new hospitals and new polyclinics. The current situation does not permit the expansion of services such as new polyclinics in the existing hospital buildings which are fully occupied.

This means that the majority of the health services are provided by the public hospitals. In order to close this gap and in the light of above discussion, existing health facilities in Kocaeli Province are inadequate for providing health care services, hence facilities located in less crowded part of the city, and providing higher quality services are necessary which justify the need for new investments for healthcare facilities for the Kocaeli Province.

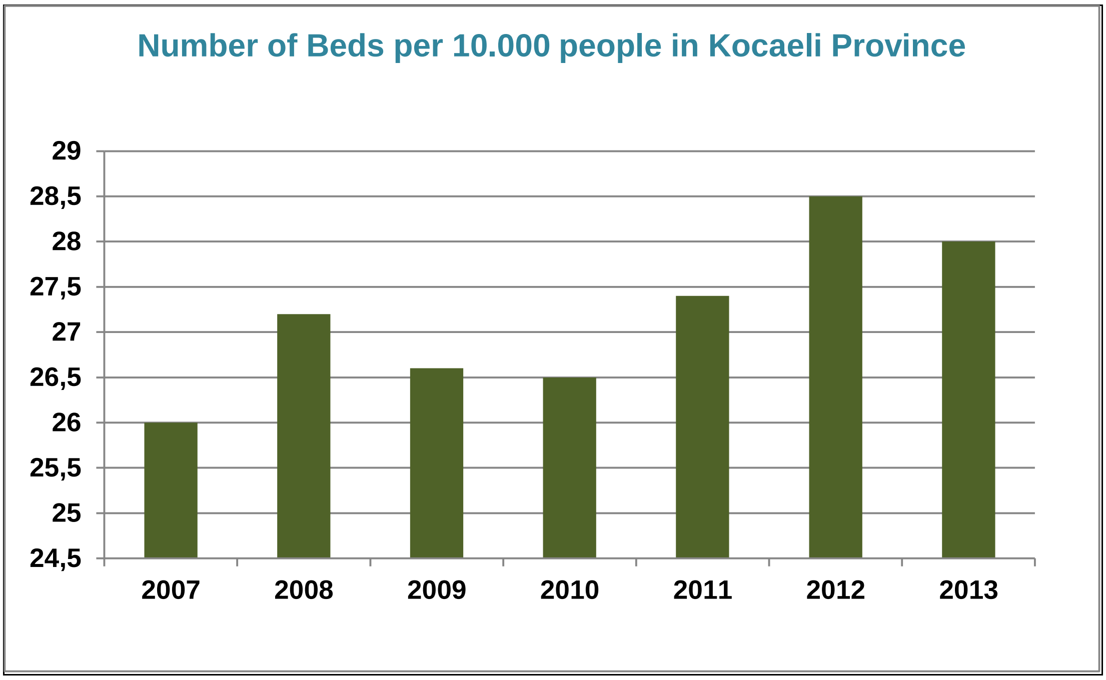


Figure 1: Number of Beds per 10,000 People in Kocaeli Province (2007-2013)[2]

[2] Turkish Statistical Institute, 2015

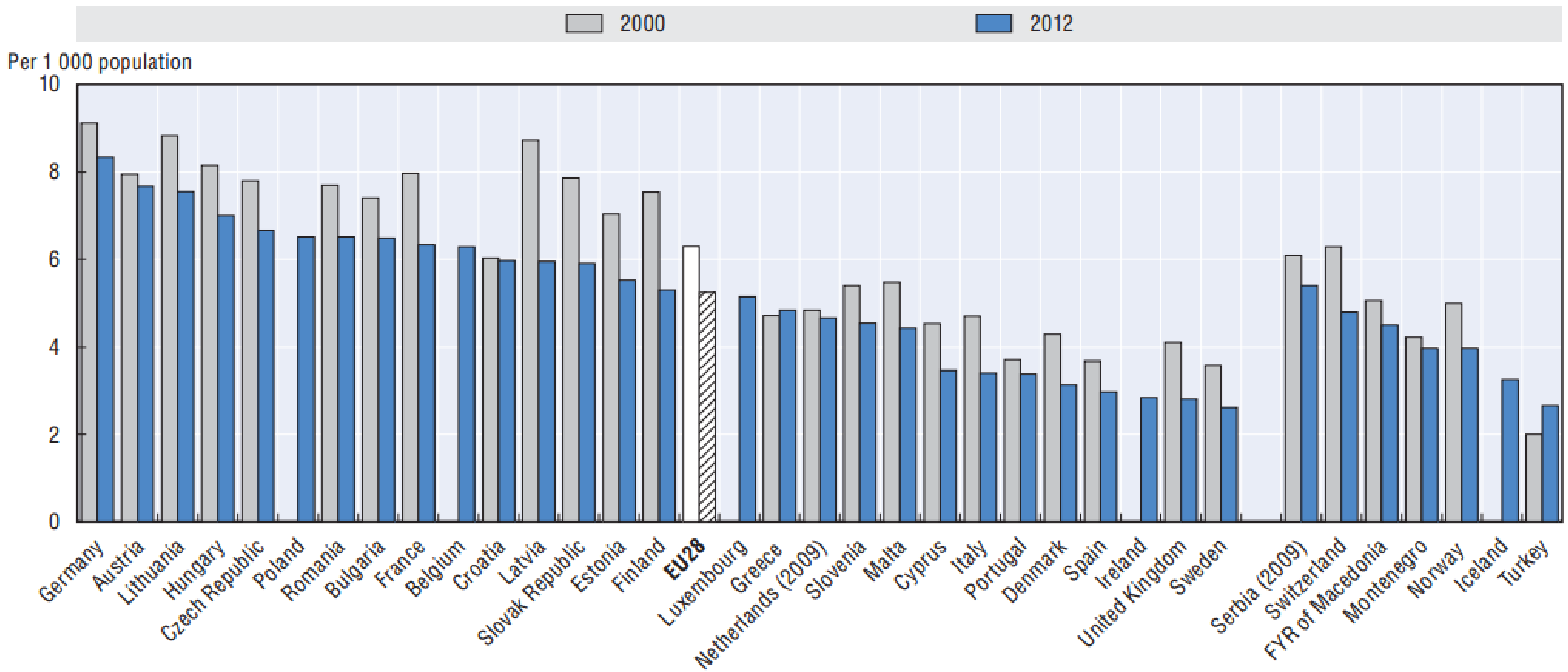


Figure 2: Hospital Beds in EU and EU-Candidate countries per 1,000 population between the years 2000 and 2012 (if 2012 data is not available, the latest available data is considered)[3]

[3] OECD Health Statistics 2014, http://dx.doi.org/10.1787/health-data-en; Eurostat Statistics Database; WHO Europe Health for All Database

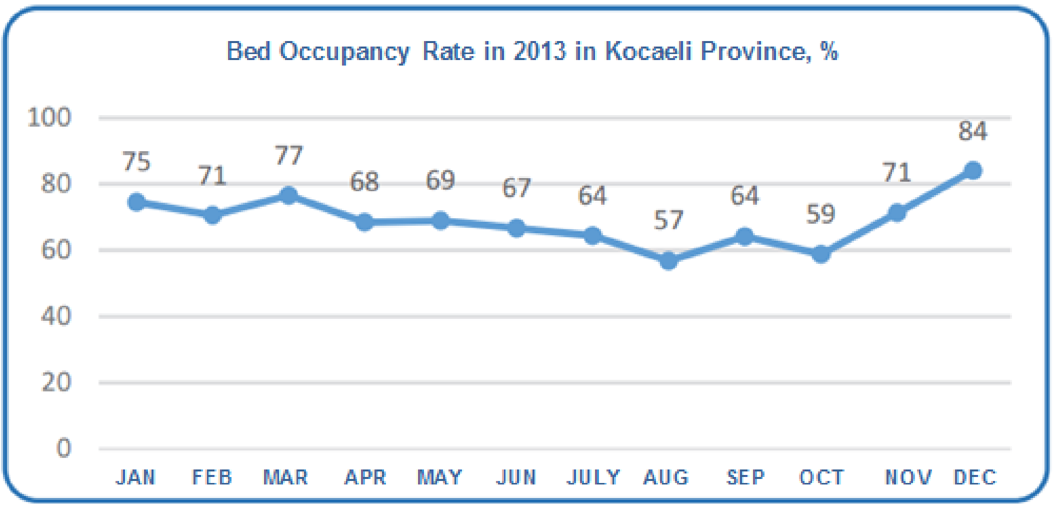


Figure 3: Bed Occupancy Rate (%) in Kocaeli Province in the year 2013[4]

According to the personnel distribution table obtained from the Provincial Directorate of Health which indicates the quotas of the staff needed for healthcare organizations, there is a need for practitioners, nurses and midwives in the health facilities of the Kocaeli Province. The specialities that need additional physicians are especially Dermatological and Venereal Diseases, Cardiology, Child's Mental Health and Diseases and Nuclear Medicine. In these specialities the present requirement for staffing is covered only by 50% and below (according to the personnel distribution table). The World Health Organization ("WHO") emphasises that the number of health workers is important in order to decrease the infant and maternal mortality. While the number of health workers is sufficient for available medical centres, in accordance with the personnel distribution table, new medical centres are required to employ new health workers.

Some health indicators for Kocaeli Province according to the Health Statistics Yearbook-2013 of the MoH are given in Table 1 and Table 2.

Table 1: Number of Health Personnel in Kocaeli Province[5]

	Number of Personnel
Specialist Physician	1584
Practitioner	787
Physician Assistant	358
Total Number of Physicians	2729
Dentist	463
Pharmacist	475
Nurse	3.090
Midwife	1134
Other Health Personnel	2679

Table 2: Health Indicators for Kocaeli Province[6]

[4] Public Hospitals Association Report, 2014

[5] Health Statistics Yearbook, 2013, Ministry of Health

[6] Health Statistics Yearbook, 2013, Ministry of Health

	Kocaeli
Number of Hospitals	25
Number of Beds	4053
Number of Beds per 10.000 people	24,2
Qualified Bed Number	2463
Number of Beds in Intensive Care Units (ICU)	550
Number of Family Practice Centre	465
Population per Family Doctor	3605
Number of Emergency Service Units (112)	27
Population per Emergency Service Units	62.082
Number of Ambulances (112)	56
Population per ambulance	29,932

According to the 2009 data on haemodialysis patients and treatment facilities across the province 1129 patients were treated. Of these, 295 patients were treated at dialysis centres of the MoH; 802 were treated in private hospitals; and 32 in the university hospital. There were 3.43 patients per dialysis machine in the Kocaeli Province. According to the European Renal Association and European Society of Nephrology, for effective and beneficial treatment, patients should take dialyses 3 days per week, each session lasting for 4 hours. As a result, the maximum patient number per machine should be 5. Therefore, it can be concluded that 3.43 for the Kocaeli Province is a good rate.

When the above issues are considered, it is obvious that the Kocaeli Integrated Health Campus Project should be constructed urgently. Helping decrease the patient load of existing public hospitals will help increase the quality of health services, to improve the efficiency and quality of health services, to achieve the adequate quantity and higher quality of patient beds and, to provide regions with comprehensive healthcare services.

1.3 Project categorisation

The requirements from IFC, EBRD and OPIC regarding the Environmental and Social Assessment process and outcomes differ depending on the category of the project. Projects are categorized as follows:

Table 3: Project Categorisation

Category	Description of the Project		
	IFC	EBRD	OPIC
Category A	Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented	Project that could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorisation, cannot readily be identified or assessed, and which, therefore, require a formalised and participatory environmental and social impact assessment process.	Project that are likely to have significant adverse environmental and/or social impacts that are irreversible, sensitive, diverse, or unprecedented.
Category B	Projects with potential limited adverse environmental and social risks and/or impacts those are few in number, generally site-specific,	Projects with potential adverse future environmental and/or social impacts that are typically site-specific, and/or readily identified and addressed	Project that are likely to have limited adverse environmental and/or social impacts that are few in number, generally site-specific, largely reversible

Category	Description of the Project		
	IFC	EBRD	OPIC
	largely reversible and readily addressed through mitigation measures.	through mitigation measures.	and readily addressed through mitigation measures.

With the findings of the ESA process for the Project it can be concluded that:

- There are no registered cultural heritage and biodiversity concerns within the direct Project Area of Influence.
- The Kocaeli Project is located in the vicinity of already developed public infrastructure including traffic infrastructure and hazardous/medical waste handling facilities
- The Kocaeli Project is away from densely populated areas.
- The Project land is a brownfield owned by the Turkish Under-secretariat of Treasury and has been allocated specifically to this project.
- The Kocaeli Project will not result in the closure of any other health service facilities in the province of Kocaeli or elsewhere.

The potential environmental and social impacts and risks of the project were identified based on the project screening information presented in the scoping report and the additional information collected during the ESA phase. These impacts and risks are:

- Site specific
- Readily identifiable and
- Can be readily addressed by standard industry practice mitigation measures (as also detailed in the following sections).
- Largely reversible

Thus, the project is determined to be category B

1.4 Key steps in the ESA process

1.4.1 Screening & Scoping

Golder prepared a Scoping Report in April 2015 for the Project. The purpose of the Scoping Report was to identify the key environmental and social issues associated with the Project and requiring detailed evaluation as part of the ESA process, to establish the most appropriate approach to the assessment and the categorisation of the project.

The Scoping Report was based on the review of the characteristics of the Project and the associated releases to the environment and a walkover survey of the site and of the surrounding area carried out in March 2015. Major potential environmental and social issues associated with the Project are identified together with the requirement for additional studies on specific issues during that phase. Some further potential impacts, as some of them have been identified after the scoping stage, during the ESA process are considered in detail, specific studies are perfumed (such as primary baseline data collection modelling and consultation) and all potential impacts are reported in the individual assessment sections

1.4.2 Baseline data collection

Baseline information has been obtained from the Project specific social and environmental baseline studies that have been carried out as part of this ESA, utilising both desktop and field-based approaches. These studies have been compiled through specifically commissioned surveys, collated from a range of sources including publicly available information and through consultation. Relevant information used to support the assessment process is referenced in the relevant sections.

1.4.3 Stakeholders engagement

EBRD and IFC recommend that the project sponsor consults with the relevant stakeholders at least twice:

a) during scoping and before the terms of reference for the ESA are finalized, and

b) once a draft ESA report is prepared. The ESA report must be made accessible to the public once completed, however it is recommended to consult and inform local stakeholders in earlier phases of the process.

As part of the scoping phase, preliminary engagement activities during the site visit were performed, whereas additional consultations with local people have been implemented during the ESA process.

Detailed information is provided about the Stakeholder Engagement in Section 6.0 of this report.

1.4.4 Impact assessment

Impact assessment was performed for main issues for each Environmental and Social component (discipline). The common impact assessment methodology consists of five main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of **residual effects**; and
- as necessary, identification of monitoring to evaluate and track performance.

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components Details of the process is presented in APPENDIX J

1.4.5 Identification of mitigation measures

Mitigation measures were identified through the application of the mitigation hierarchy of avoid, minimize, or, where residual impacts remain, compensate/offset providing the framework for developing a checklist of mitigations measures for risks and adverse environmental and social impacts. This approach implies that priority have been given to preventive actions mainly related to Project design, location and implementation rather than curative interventions that handle adverse outcomes after the emergence of the anticipated problems.

Realistic and affordable (cost-effective) mitigating measures have been proposed to prevent, reduce or minimise environmental impacts to acceptable levels and address other issues such as the need for e.g. worker health and safety improvements, community engagement, institutional involvement.

Given the fact that changes would be possible in the course of the development of the Project, mitigation measures have been designed to adapt to the changes readily through an adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the Project's lifecycle. With this flexibility of the proposed mitigation measures sufficiently considered, it would prevent any unnecessary delay due to further assessment.

1.4.6 Uncertainties

This ESA is prepared based on the Project information provided by the Client (refer to Section 4.0). Like most ESAs, the current ESA faced a number of challenges in terms of retrieving baseline information, the level of accuracy of predicting impacts, and developing appropriate mitigation. Furthermore, even with a firm Project design and an unchanging environment, predictions are by definition uncertain.

In order to facilitate decision-making, then areas of uncertainty, data gaps and deficiencies, during further stages of Project development have been highlighted within the ESA report. In order to address the uncertainties, monitoring will be undertaken by the Client to understand whether the identified mitigation measures are sufficient or there is a need for any refinements.

1.4.7 Study Limitations

The ESA uses available and convenient information provided by the SPV.

With regard to the environmental and social baseline data collection; there has been no significant limitations in relation to the site surveys and literature studies.

Regarding to the project description contents, there has been some limitations connected with the MoH. Before beginning of the ESA studies, correspondences were sent by SPV to the MoH on information requests to the closure of the existing hospitals in that region. However, those information requests have not yet been responded.

1.4.8 Environmental and Social Management System

The general framework for the environmental and social management system to be developed and implemented by the Project through the project lifecycle has been defined in Section 10.0.

1.4.9 Environmental and Social Action Plan

The Environmental and Social Action Plan (ESAP) has included in APPENDIX N.

1.5 Outline of the ESA report

This document is the ESA report for Kocaeli Integrated Health Campus Project in compliance with the national and international requirements.

This document presents the following sections:

- Introduction (Section 1),
- Guidelines and Procedures according to EBRD and IFC (Section 2),
- Regulatory and Policy Framework (Section 3),
- Project Description (Section 4),
- Analysis of Alternatives (Section 5),
- Stakeholder Engagement (Section 6),
- Impact Screening and Definition of the Valued Environmental and Social Components (Section 7),
- Environmental and Socio-Economic Baseline (Section 8),
- Impact Assessment (Section 9),
- Environmental and Social Management System (Section 10),
- Environmental and Social Action Plan (Section 11) and
- Conclusions (Section 12).

2.0 GUIDELINES AND PROCEDURES ACCORDING TO EBRD AND IFC

The present ESA has been structured in accordance with the Performance Requirements ("PR") of EBRD, Performance Standards ("PS") of IFC.

The IFC Performance Standards and EBRD Performance Requirements that are triggered by the project summarised in the below table with reference to the chapter where the compliance with these requirements are assessed.

Table 4: Compliance Table Summary

Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
Environmental and social assessment Take into account all applicable laws and regulations to the project including the laws implementing host country obligations under international law	PR 1	PS 1	3-Regulatory and Policy Framework
Environmental and social assessment/ Examination of technically and financially feasible alternatives, including the non-project alternative	PR 1	PS 1	5- Alternatives Assessment
Environmental and social assessment/ Document the rationale for selecting the alternative	PR 1	PS 1	5- Alternatives Assessment
Resource efficiency/ Identify opportunities and alternatives for resource efficiency relating to the project in accordance with GIP	PR 3	PS 3	5- Alternatives Assessment
Stakeholder Engagement Stakeholder engagement is conducted to provide local communities that are directly affected by the project and other relevant stakeholders.	P10	PS 1	6-Stakeholder Engagement
Stakeholder Engagement Stakeholders are identified, stakeholder engagement plan is prepared, consultation meeting is conducted, and grievance mechanism is described.	PR 10	PS 1	6-Stakeholder Engagement
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1	7- Impact Assessment Methodology
Environmental and social assessment/ The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1	7- Impact Assessment Methodology
Identification of Risks and Impacts Environmental and social risks and impacts is identified in the context of the project's area of influence.	PR 1	PS 1	7- Impact Assessment Methodology
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an	PR 1	PS 1	8-Environmental and Social Baseline

Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
accurate project description (all components) and appropriate baseline data			
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1	9- Impact Assessment
Environmental and social assessment/ The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1	9- Impact Assessment
Identification of Risks and Impacts Environmental and social risks and impacts are identified in the context of the project's area of influence.	PR 1	PS 1	9- Impact Assessment
Mitigation Define mitigation measures in line with mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment.	PR1	PS 1	9- Impact Assessment
Biodiversity Conservation Identify and characterise, the potential direct and indirect project-related risks and impacts on biodiversity.	PR 6	PS 6	9- Impact Assessment
Land Acquisition and Involuntary Resettlement and Economic Displacement Avoid or minimize physical and/or economic displacement, when displacement cannot be avoided, displaced communities and persons will be offered compensation	PR5	PS5	9- Impact Assessment
Environmental and Social Policy/ Establish and manage mitigation and performance improvement measures and actions that address the risks and impacts	PR 1	PS 1	10-Environmental and Social Management System
Organisational capacity and commitment/ Establish, maintain and strengthen an organizational structure that defines roles, responsibilities and authority	PR 1	PS 1	10-Environmental and Social Management System
Organisational capacity and commitment/ Designate specific personnel, including management representatives with clear lines of responsibility and authority	PR 1	PS 1	10-Environmental and Social Management System
Community Health and Safety Risks and adverse impacts to the health and safety of the potentially affected communities are identified and assessed and protection, prevention and mitigation measures are defined	PR 4	PS4	10-Environmental and Social Management System

Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
Labour and Working Conditions Minimum standards are defined for ensuring labour and working conditions to be in compliance with project requirements	PR2	PS2	10-Environmental and Social Management System
Occupational Health and Safety Minimum standards are defined for ensuring occupational health and safety to be in compliance with project requirements	PR2	PS2	10-Environmental and Social Management System
Health Services Consider the impacts on employees, patients and the immediate community	Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal	Environmental, Health, and Safety Guidelines; HEALTH CARE FACILITIES	10-Environmental and Social Management System
Cumulative Impacts Cumulative impacts of the project are considered during impact assessment process in combination with impacts from other past, existing and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location.	PR 1	PS 1	11-Cumulative Impact Assessment
Cumulative Impacts Potential adverse project impacts on existing ambient conditions are addressed The project-related impacts and issues associated with resource use, and the generation of waste and emissions are assessed in the context of project location and local environmental conditions	PR 3	PS 3	11-Cumulative Impact Assessment

In order to support the reader in the analytical process, a self-explanatory and systematic tool for addressing the relevant requirements or standards is reported as a Conformance Table at the beginning of each main section of the ESA and is meant to communicate essential information about the ESA compliances to stakeholders and authority in an efficient, easy-to-read format.

The Conformance Table contains the short description of the themes discussed in the related section and specific PRs and PSs that address the Equator Principles. A case in point is shown in the following:

Conformance Table – [Reference Section to the ESA]		
Theme/Sub-Theme	**EBRD PRs**	**IFC PSs**
Release of pollutants	PR 3	PS 3
Identification of potential hazards to workers	PR 2	PS 2
[…]		

3.0 REGULATORY AND POLICY FRAMEWORK

Conformance Table – Regulatory and Policy Framework

Theme/Sub-Theme	EBRD PRs	IFC PSs
Environmental and social assessment Take into account all applicable laws and regulations to the project including the laws implementing host country obligations under international law	PR 1	PS 1

A Trigeneration plant will be installed as a part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt. The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the project is not subject to the preparation of PDF for the Trigeneration Plant.

There will be one concrete plant constructed under the scope of the Project. The capacity of concrete plant will be 90m^3/hr. In that case; there will not be a requirement for preparing a PDF since the capacity of concrete plant will be only 90 m3/h.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m3/hr, referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary for the concrete plants.

Hospitals and healthcare facilities having capacity higher than 20 beds are included in Annex- 2 and the trigeneration plants having capacity more than 1 MWt thermal power are included in Annex-2 of the Regulation on Environmental Permits and Licenses (dated: September 10, 2014, Official Gazette No: 29115). Hence, Environmental Permit for operation phase will be received from the Ministry of Environment and Urbanization (“MoEU”).

Although the overall Project is legally exempt from the requirement of an official EIA Process, an ESA study is required by the lenders which 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 is required by the International Finance Institutions which are EBRD, OPIC and EDC.

In addition, concrete plants with the capacity of 10 m^3/hr and above are included in Annex-2 of this regulation. Hence, Environmental Permit should be received from the Provincial Directorate of Environment and Urbanization. However, according to Clause 17 of the regulation, temporary facilities operated less than 1 year should apply to the Provincial Directorate for permit exemption.

The regulatory framework for the project is composed of the applicable requirements of (details of which are provided in APPENDIX K);

- Current National Environmental and Social Legislation
- International Conventions and Agreements
- Current European Union Environmental and Social legislation
- Requirements of Equator Principles

The Equator Principles are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, EPFIs). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

- EBRD Performance Requirements

  The 2014 Environmental and Social Policy of the EBRD is a document which details the commitments of the agreement establishing the Bank particularly for the "promotion of environmentally sound and sustainable development". These Performance requirements include;

  - PR1 - Assessment and management of environmental and social impacts and issues
  - PR2 - Labour and working condition
  - PR3 - Resource efficiency, pollution prevention and control
  - PR4 – Health and safety
  - PR5 - Land acquisition, involuntary resettlement and economic displacement
  - PR6 - Biodiversity conservation and sustainable management of living resources
  - PR7 - Indigenous peoples
  - PR8 - Cultural heritage
  - PR9 - Financial intermediaries
  - PR10 - Information disclosure and stakeholder engagement

- IFC Standards and Guidelines

  IFC 2012 Performance Standards (IFC 2012 PS) have been considered the main reference as they are the most recent environmental and social standards issued by an International Financial Institution. IFC 2012 PS comprises 8 documents:

  - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
  - Performance Standard 2: Labour and Working Conditions
  - Performance Standard 3: Resource Efficiency and Pollution Prevention
  - Performance Standard 4: Community Health, Safety, and Security
  - Performance Standard 5: Land Acquisition and Involuntary Resettlement
  - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
  - Performance Standard 7: Indigenous Peoples
  - Performance Standard 8: Cultural Heritage

- IFC EHS Guidelines

  The Environmental, Health, and Safety ("EHS") Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice ("GIIP"). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

- IFC EHS Guidelines for Healthcare Facilities

  - Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

  - Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal, 2009

- EIB Requirements

The 2013 Environmental and Social Practices handbook of the EIB is a document which provides advice on planning and managing the environmental and social appraisal and monitoring. It describes the steps for determining the scope of the environmental and social review process throughout the project cycle that the EIB shall carry out for all projects in all regions. It also explains the role of highly specialised units or individuals who collectively ensure that the Bank’s activities respond to the highest possible standards.

4.0 PROJECT DESCRIPTION

4.1 Project Area

4.1.1 Project Location

The Kocaeli Integrated Health Campus Project is located in the Kocaeli Province, İzmit District, Gündoğdu Quarter. Access to the Project site is provided via the Trans European Motorway (“TEM”)-O4 section.

Kocaeli Province is surrounded by the İstanbul, Yalova, Bursa and Sakarya Provinces. Kocaeli is the third largest province in terms of population in the Marmara Region. İzmit has the highest population in the Province (Refer to APPENDIX H).

The Project Site is located among the Tavşantepe, Bekirdere, Gündoğdu and Yeşilova quarters southeast of the Malta quarter and the northeast of the 28 Haziran quarters. The Project Site is located in a developed area close to existing transportation infrastructures.

The nearest residential area to the Project Site is Tavşantepe quarter with a 25 m distance. The Yeşilova quarter is located approximately 90 m northeast of the Project Area as presented in Figure 4. The current populations of the surrounding quarters are given in (Refer to APPENDIX H).

4.1.2 Land use

The approximately 35.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area". The previous owner of the Site was Undersecretiat of Treasury.

The area was used in the past for military purposes and the Cephanelik Mesire Alanı urban park is located south of the Project Area. The process for the official confirmation of the protection status of the military remains has been started. The Kocaeli Regional Directorate of Cultural Heritage (“RDoCH”) has stated in the official communication (APPENDIX O) that the project can be executed in the defined area in accordance with the provisions listed in the RDoCH’s response. The excavation works have to be conducted under the supervision of the Museum Directorate.

There is no housing, ongoing industrial or agricultural activity at the project site at the present time, while this report is being prepared. There has been occasional grazing in the project site.

The O4 highway passes through the North of the Project Area and the Campus is connected to the North side of the city through the Zübeyde Bridge.

The Google Earth view of the Project site and layout of the Project are given in Figure 4 and Figure 5. The Site Photographs are provided in APPENDIX B.

Figure 4: Google Earth View of the Project Area

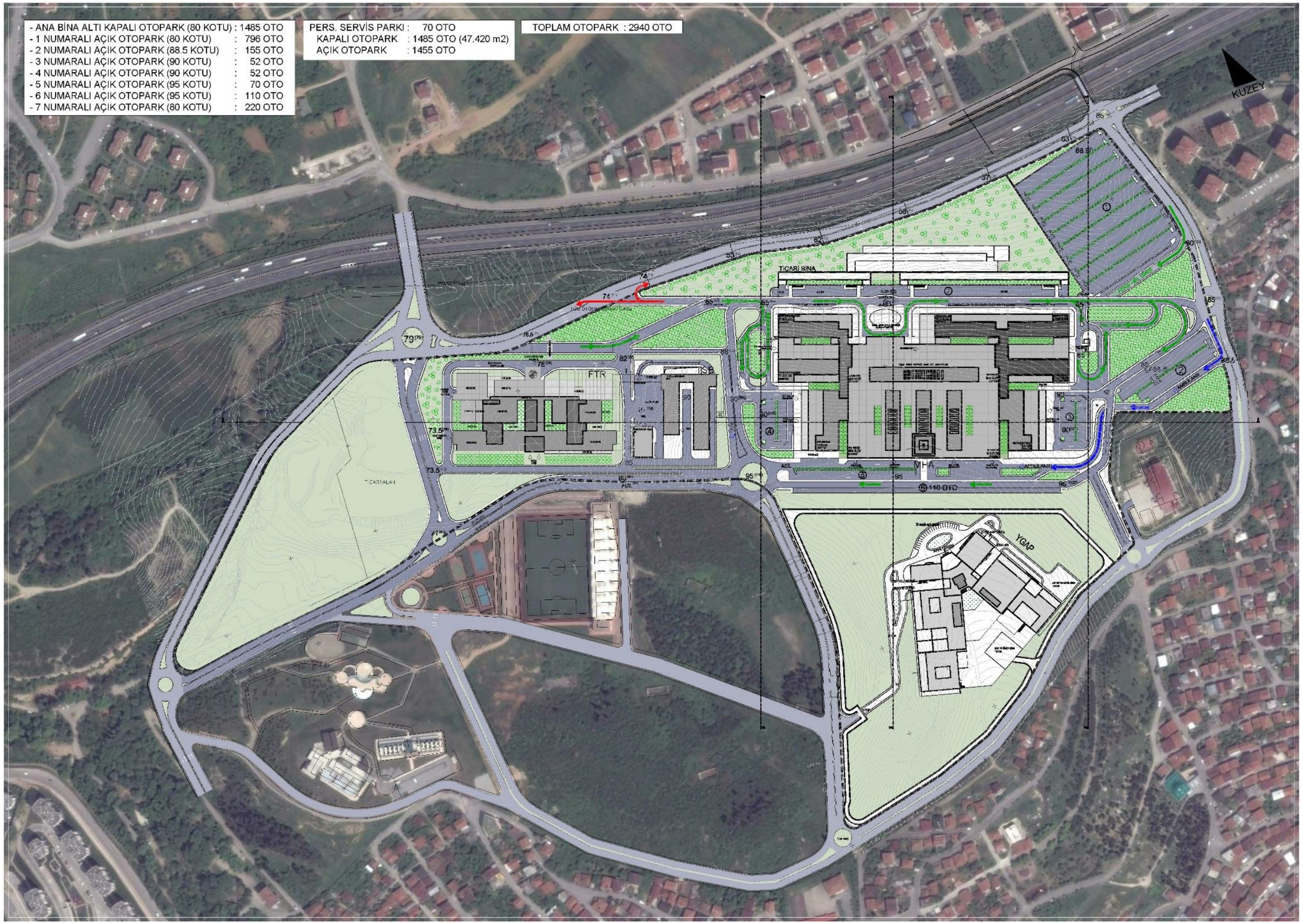


Figure 5: Preliminary Site Layout of Kocaeli Integrated Health Campus Project

4.2 Project components

Kocaeli Integrated Health Campus will be constructed over a 353,381 m² land consisting of several hospitals with a total enclosed area of 353,382 m² and bed capacity of 1,180. The health campus is going to include 3 hospitals which are: the Main Hospital, the Physical Therapy and Rehabilitation Hospital and the High Security Forensic Rehabilitation Hospital. The Main Hospital includes a General Hospital, a Women & Paediatric Hospital, a Cardiovascular Hospital and an Oncology Hospital. The bed capacities and the closed construction areas of each hospital unit above are given in Table 5 and .Table 6 show the car parking capacity of the main hospitals.

Table 5: Bed Capacity of the Kocaeli Integrated Health Campus based on project information available at this stage

Hospital	Bed Capacity
Main Hospital	
General Hospital	494
Women & Paediatrics Hospital	246
Cardiovascular Hospital	124
Oncology Hospital	116
Physical Therapy and Rehabilitation Hospital	100
High Security Forensic Rehabilitation Hospital	100
Total Number of Beds	**1180**

Table 6: Closed Construction Areas (m2) of Project Components based on project information available at this stage

Project Component	Closed Construction Areas (m^2)
Main Hospital	252,210
Main Hospital Diagnostics and Beds	164,010
Main Hospital Closed Car parks	88,200
Physical Therapy and Rehabilitation Hospital	38,586
Rehabilitation Hospital Diagnostics and Beds	29,586
Rehabilitation Hospital Closed Car parks	9,000
High Security Forensic Rehabilitation Hospital	33,902
Forensic Rehabilitation Hospital Diagnostics and Beds	24,902
Forensic Rehabilitation Hospital Closed Car parks	9,000
Technical Services Building	10,950
TOTAL CLOSED CONSTRUCTION AREA	**335,648**
TOTAL AREA OF LAND	**353,381.89**

Table 7: Car Parking Lots

Hospital	Car Parking Lots
Main Hospital	2,940
Physical Therapy and Rehabilitation Hospital	100
High Security Forensic Rehabilitation Hospital	100
Total Car Parking Capacity	**3,140**

The Project, which will have 335,648 m^2 of closed area, will meet the future health requirements of the Kocaeli Province and its nearby provinces. When the new campus will start to operate at full capacity it is predicted to provide healthcare services to approximately 2.5 million people and over 8,000 people (polyclinics and emergency) per day in modern conditions.

The following facilities are going to be present in Kocaeli Integrated Health Campus:

Main Hospital Units	**General Hospital Units**	**Cardiovascular Hospital Units**	**Women and Paediatrics Hospital Units**	**Oncology Hospital Units**	**Forensic Hospital Units**	**Rehabilitation Hospital Units**
12 Burns 50 Surgery 8 Angiography 70 Angiography Pre-Operation 123 Angiography Post-Operation 42 Emergency Observation 14 Emergency Green Code Exam 16 Emergency Yellow Code Exam 6 Triage 2 Cardio-Pulmonary Resuscitation (“CPR”) 10 Trauma 2 Trauma Isolation	432 ACUTE[7] 42 ICU 120 Clinics 28 Haemodialysis Centre 2 Haemodialysis Centre Private 8 Prison Service	96 ACUTE 14 ICU 14 Transplant 24 Clinics	144 ACUTE 28 ICU 26 Labour, Delivery, Recovery and Past-partum (“LDRP”) 48 New-born Intensive Care (“NICU”) 72 Clinics	96 ACUTE 14 ICU 6 Iodine Treatment 24 Clinics 28 Chemotherapy 2 Chemotherapy Private	100 ACUT	100 ACUT 20 Clinics

[7] Acute care is a branch of secondary health care where a patient receives active but short-term treatment for a severe injury or episode of illness, an urgent medical condition, or during recovery from surgery. In medical terms, care for acute health conditions is the opposite from chronic care, or longer term care.

Main Hospital Units	General Hospital Units	Cardiovascular Hospital Units	Women and Paediatrics Hospital Units	Oncology Hospital Units	Forensic Hospital Units	Rehabilitation Hospital Units
8 Day Surgery						

-
-
-
-

4.2.1 Trigeneration Plant

The Project is to produce part of its own power through a Trigeneration plant. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt (15.8 + 2.5). The remaining electricity shall be obtained from the national electricity grid. As it is to be a Trigeneration plant, the wasted energy from the production of electricity shall be recaptured and used to supply some of the both the heating and cooling needs of the Project during the operational phase. The remaining heating needs will be met through the use of boilers.

The emissions from the Trigeneration plant will comply with the Turkish, EU and IFC requirements.

The Trigeneration system is to use natural gas supplied by the city network. In case of shortage, generators and boilers will be fed by diesel tanks that will be located on site. It is envisaged that the fuel tanks will be located next to both technical buildings. The total amount of stored diesel will be designed to suffice the IHC's needs for three days. The exact location and arrangement of the diesel storage tanks is still to be confirmed. These tanks will be attached to the backup generators.

The Proposed Design for the proposed system generates simultaneously Power and Thermal (Hot Water/Steam and Chilled Water) based on a topping cycle. In a topping cycle, energy from the fuel generates shaft or electric power first, and thermal energy from exiting stream is recovered for other applications, in this case steam, hot water and chilled water production.

It is envisaged that the Combined Cooling Heat and Power ("CCHP") system consists of as follows:

- Prime Mover: The prime Movers are reciprocating spark ignition engines, fuelled by natural gas.
- Electricity-Generating System: The electricity generating system consists of generators (alternator system) that are coupled to the prime movers, transformers coupled to a generator to convert low voltage ("LV") to a medium voltage ("MV"), and circuit breakers and switches to stop the flow of current when there is a fault and to turn on or off the electrical current.
- Heat Recovery System: The heat recovery system is subdivided into two systems:
  - Exhaust Gas System: Heat from engine exhaust gas is partially salvaged by using a heat recovery silencer. This heat is used to produce steam.
  - Cooling System: Engines have two cooling systems, one at low temperature and another at high temperature. Heat from the high-temperature cooling system can be salvaged to produce hot water.

- Chilled Water Production System: By Absorption Water Chiller Plants, the system produces chilled water. The absorption plants use the steam produce for the Exhaust Gas System as heat supply.

4.3 Construction phase

The construction period (investment) of the Kocaeli Integrated Health Campus Project is planned to be 3 years.

It is predicted the approximately 2,368 people will be employed during the construction of the health campus at peak time (see below men*month graphic).

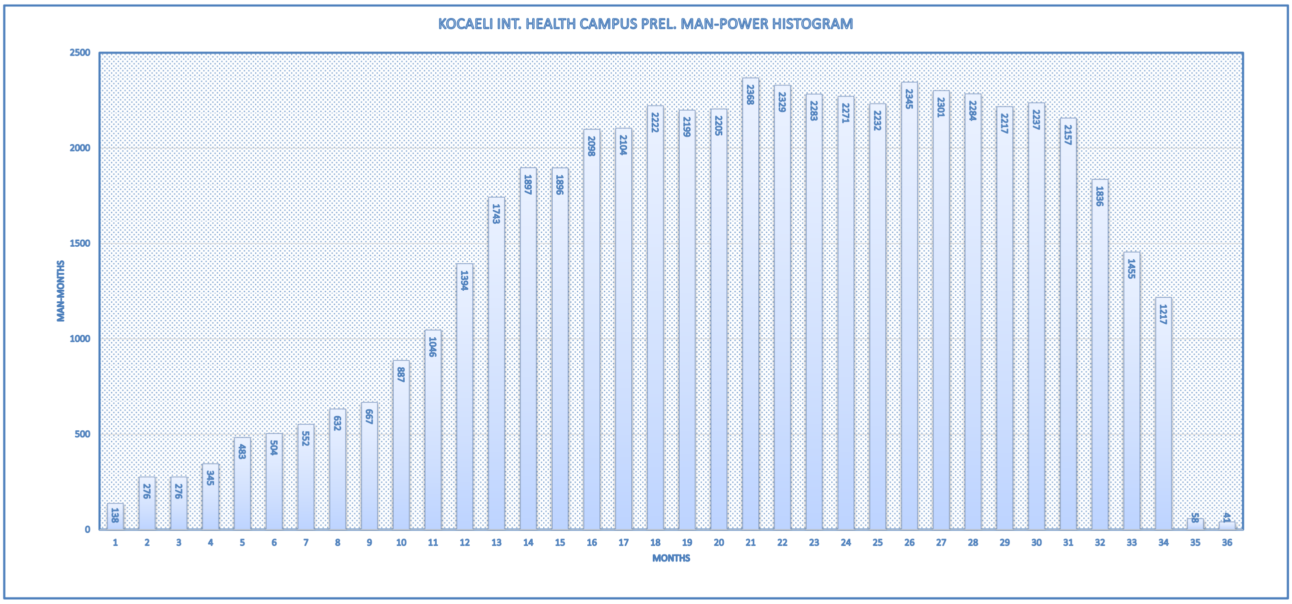


Figure 6: Preliminary Man-Power Histogram

The amount of soil to be excavated during the construction is given in Table 8. The soil to be excavated will be disposed of to appropriate disposal sites. The assessment of disposal sites is presented in 5.2.3.

Table 8: Estimated Excavation Quantities (m³)

	Excavation Quantities (m³)
Main Hospital	1,288,967
Rehabilitation Hospital	499,765
Forensic Hospital	396,789
Technical Buildings	22,657
Pedestrian Area and Roads etc.	500,000
TOTAL	**2,708,179**

The construction equipment will possibly use diesel fuel which may lead to the emission of particulate matter (PM_{10}), oxides of nitrogen (NO_x) and sulphur dioxide (SO_2). Construction traffic may lead to a temporary increase in local air pollutants also in the areas surrounding the construction activities.

Land transport to the construction site will be through the TEM (O4) highway to İstanbul located at the northern site of the project. The existing connection road need to be maintained and/or short distance new access roads may need to be constructed to ensure the access of equipment and vehicles to site. There will be service roads inside the project area. This roads will be planned as much as possible to be used as during operation phase in order to reduce the excavation waste.

There will be a construction camp to be established for construction workers. The accommodation blocks will not include kitchen, laundry and social areas. There will be individual block for these services.

4.4 Operation phase

The number of the administration personnel planned for the operation phase of the Kocaeli Integrated Health Campus Project is estimated to be 2630 in the light of the existing information available at this stage. The details of their employment are given in Table 9 below. There will be 228 specialist physicians and practitioners, 383 nurses and midwives, and 500 auxiliary health personnel. The MoH will be the responsible party for the recruitment and management of health employees.

There is going to be a designated management system at the campus where the MoH will assign special 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 be accommodated.

Forensic Hospital

The operation of forensic hospital needs specific engineering design and management considerations to mitigate potential environmental and social risks such as: community health and safety risks associated the accommodation of the prisoners with mental problems, management system challenges; the Ministry of Justice (“MoJ”) will only be responsible for the section of the forensic hospital where prisoners with mental problems will be accommodated, management of security systems and services and treatment of prisoners with mental problems. In order to mitigate these risks the following measures will be in place:

- There will be security systems to eliminate the unauthorized entry and exit to the premises of the hospital.
- There will be a stakeholder engagement and grievance mechanism system in place to ensure the information exchange between the community members in the neighbourhood, record and respond the concerns of these people.
- There will be communication mechanisms in place with community heads. The emergency response plan will include informing them in case of a security breech at the hospital.
- The hospital will be designed to accommodate 100 patients with mental problems. The hospital design will ensure the patient welfare and the security by allocating separate clinics for different gender types, open-air areas for patients and personnel, security provisions in line with security zoning, ensuring patient privacy when deciding on surveillance system design and similar.
- There will be close coordination and communication among Kocaeli IHC management, Ministry of Health, Ministry of Justice and Ministry of Interior for the operation of forensic hospital and provision of security forces

The Regulation on the Associationf of Private Hospitals (dated: 27.03.2002, Official Gazette No: 24708) is taken into consideration during the operation of forensic hospital.

Table 9: Estimated Number of Personnel to be employed during the Operation Phase

	Number of Personnel

Laundry	26
Cafeteria	148
Laboratory	50
Imaging	100
Sterilization	22
Rehabilitation	112
Waste Management	8
Cleaning- Room Cleaning	469
Hospital Information Management System (“HBYS”)	58
Security	165
Patient Guidance	222
Other Medical Support Services	17
Building and Land Services	44
Common Services	16
Furnishing	8
Garden Care Services	21
Disinfection	9
Parking Lot	24
Specialist physicians and practitioners	228
Nurses and midwives	383
Auxiliary health personnel	500
TOTAL	**2630**

4.5 Waste Management

The details of the waste management are presented in APPENDIX B. Summary of specific items are given in the following sections.

4.5.1 Water Use and Wastewater

The water supply for construction activities will be from municipality network. Maximum daily amount of water to be used will be 525 m^3/day.

The primary and the only source of water for operation phase consumption will be the municipality network. In the case of groundwater consumption the water physico-chemical and microbiological quality will be ensured to be in line with national and WHO (World Health Organization) standards through appropriate treatment and monitoring.

The domestic wastewater during construction will be collected by the municipality sewage network. Maximum daily amount of domestic wastewater will be approximately 525 m^3/day (assuming worst case of; the supplied amount of water is converted to wastewater at a ratio of 1/1).

During operation phase, wastewater from departments will be collected via different piping systems and discharged directly into the municipality sewer system, except for the wastewater that is contaminated with radioactive substances (i.e. from nuclear medicine department) which will be collected separately and/or subject to neutralization prior to being discharged into the sewer system. It is important to note that several conditions are set for liquid wastes contaminated with radioactive substances in the Regulation on Wastes

Generated upon Usage of Radioactive Substances (OG date/no: 02.09.2004/25571) related to discharging this type of wastewater into the sewer system.

4.5.2 Medical Wastes

Medical wastes are the most important type of wastes which will be created during the operation of the project. Medical wastes are classified into three main groups according to the Regulation for Medical Waste Control:

- Infectious waste
- Sharps
- Pathologic waste

The main strategy of waste management of medical wastes is to separate all medical wastes from other hazardous wastes (such as chemical wastes or radioactive wastes) and non-hazardous general waste. However, to provide a minimum level of safety to staff and patients, each type of medical wastes would be collected separately. Waste management methods used for each type of medical waste in operation phase of the project is summarized below:

Table 10 Medical Waste Management Methods of the Hospital Project[8]

Type of Medical Waste	Contents	Segregation Options	Disposal Options
Infectious Waste	Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. issues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	Yellow or red colored bag / container, marked “infectious” with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved	Izmit Belediyesi and/or licensed medical waste sterilization/disposal plants
Sharps	Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	Yellow or red color code, marked “Sharps”. Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labelled “infectious waste”	İzmit Municipality and/or licensed medical waste sterilization/disposal plants

[8] IFC EHS Guidelines for Health Care Facilities, 2007

Type of Medical Waste	Contents	Segregation Options	Disposal Options
Pharmaceutical Waste	Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).	Brown bag / container. Leak-proof plastic bag or container.	İzmit Municipality and/or licensed medical waste sterilization/disposal plants

Main points in medical waste management activities are given in APPENDIX B. A detailed Waste Management Plan will be prepared in the operation phase of the project, which specifies separate collection and storage, equipment and vehicles used in waste storage and transportation activities, waste types and quantities, frequency of collection, temporary storage systems, cleaning and disinfection of collecting equipment, measures and actions during accidents, responsible staff etc., according to the Regulation on Control of Medical Wastes.

4.6 General Facility Design Issues

The design of the health care facility will ensure the following general principles are followed;

- Provision of adequate separation of clean/sterilized and dirty/contaminated materials and people flows
- Provision of adequate disinfection/sterilization procedures and facilities
- Provision of adequate space for the storage of recyclable materials (e.g., cardboard and plastic) for pickup
- Provision of ventilation and air conditioning systems that provide isolation and protection from airborne infections
- Water system is designed to provide adequate supplies of potable water to reduce risks of exposure to *Legionella* and other water borne pathogens
- Provision of adequate hazardous materials and waste storage and handling areas
- Provision of treatment and exhaust systems for hazardous and infectious agents
- Use of easily cleaned building materials that do not support microbial growth, are slip-resistant, non-toxic and non-allergenic and that do not include VOC-emitting paints and sealants

<u>Waste Management</u>

Health care waste management system will be in place that includes the following elements:

- Source reduction measures (e.g., product/material substitution to avoid products containing hazardous materials that require products to be disposed as hazardous wastes; use of physical rather than chemical practices where such practices do not affect disinfection or patient safety)
- Waste toxicity reduction measures (e.g., product/material substitution for equipment containing mercury, PVCs, VOCs, PBT compounds and products that contain substances known to be carcinogenic, mutagenic or teratogenic)
- Use of efficient stock management practices and monitoring (for chemical and pharmaceutical stocks)
- Safe equipment re-use procedures (e.g., reuse of sharps following sterilization and disinfection)

- Adequate waste segregation strategies that specifically address mercury, cadmium, thallium, arsenic and lead; biomedical wastes, and aerosol cans and PVCs (to avoid disposal via incineration, if incineration will be used)
- Adequate on-site handling transport and storage procedures that specifically address limits on storage periods, mercury, cytotoxic waste and radioactive waste.
- Dangerous goods transport guidelines, including adequacy of packaging, labelling and transport vehicles
- Treatment and disposal technologies for infectious wastes, sharps, pharmaceutical wastes, genotoxic/cytotoxic wastes, chemical wastes, radioactive wastes, wastes with high concentrations of heavy metals, pressurized containers and general health care wastes (e.g., food wastes, paper, plastics)
- The details of the waste management plan is presented in APPENDIX B.

Air Emissions

- Control measures will be in place for exhaust gases from HVAC systems and fugitive emissions from waste storage areas, medical research areas and isolation wards

Wastewater

- There will be procedures and mechanisms for separate collection of urine, faeces, blood and vomit from patients treated with genotoxic drugs
- There will be prevention of large quantities of pharmaceuticals, and all antibiotics and cytotoxic drugs from discharge to municipal sewer systems
- There will be engineered controls for removal of pharmaceutical active ingredients

4.7 Occupational Health and Safety

Following occupational health and safety measures will be included in the design and panning of the facility;

- Exposure control plan for blood borne pathogens
- Staff and visitors informed on infections control policies and procedures
- Immunize staff, as necessary
- Use and adequate supplies of gloves, masks, gowns and other personal protection gear
- Adequate facilities for hand washing
- Procedures and facilities for handling contaminated laundry
- Adequate sharp management procedures
- Policies regarding animals on the property
- Procedures to reduce exposure to waste anaesthetic gases
- Comprehensive plan for reducing exposure to radiation
- Adequate fire and life safety measures, including smoke alarms and sprinkler systems, training in evacuation procedures, and fire prevention, emergency response and evacuation plans
- Occupational health and safety related to personnel of forensic hospital unit.

4.8 Accreditation

The project will obtain an accreditation based on a quality evaluation of the technical competence of the institution's resources and organization by an internationally recognized accreditation organization (such as Joint Commission International).

4.9 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project site and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed. After 25 years of operation, the IHC will be transferred to the MoH.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The impacts during decommissioning phase are likely to be similar to the construction phase.

5.0 ANALYSIS OF ALTERNATIVES

Conformance Table - Analysis of Alternatives

Theme/Sub-Theme	EBRD PRs	IFC PSs
Environmental and social assessment/ Examination of technically and financially feasible alternatives, including the non-project alternative	PR 1	PS 1
Environmental and social assessment/ Document the rationale for selecting the alternative	PR 1	PS 1
Resource efficiency/ Identify opportunities and alternatives for resource efficiency relating to the project in accordance with GIP	PR 3	PS 3

The Project is planned to achieve compliance with the regulatory requirements and Health Services Transformation Program has been initiated by Turkish MoH in 2003. For the purpose of analysis of alternatives for the project is assessed focusing on the following topics:

- No-project option
- Technological selection
- Location selection

5.1 No project option

The "No project option" implies that Project will not be realized (i.e. the no go alternative) no construction activities will occur and therefore there will be no positive and negative environmental and social risks connected to the Project. Furthermore no socio-economic benefits would accrue to the nearby communities and the government.

The positive local, regional and national socio-economic effects of the Project will occur over a long period of 25 years (operations), with the potential to extend benefits past that time due to Project improvements. Planning has emphasized integration of the Project with the nearby communities and Authorities, with mutual benefits for all parties.

The Project was planned to meet the demand in terms of health facilities and beds availability. A development activity in an area inevitably involves its alteration from the environmental point of view. However, to manage this alteration, an analysis of the Project also considered all the socio-economic elements in question in addition to ensuring the maximum protection of environment by use of latest, state-of-the-art technologies.

Failure to implement the proposed Project would involve the following:

- loss of opportunity to increase bed capacity and provision of health services with better quality in the project area;
- loss of opportunity to create direct employment for hundreds of workers, including health workers and non-health workers;
- loss of opportunity to create a new investment for the health care system
- failure to rationalize the use of health facilities in the project area.

Expanding the patient demands by extending the existing hospital facilities may as well be an option however would have the following limitations and risks:

- existing facilities are in the populated areas with limited capacity of land extension
- existing facilities would need refurbishment in addition to extension
- during the extension of the existing facilities there may be disruptions to the health services provided to the patients
- there is no forensic hospital at the current condition in Kocaeli and surroundings

5.2 Technological selection

5.2.1 Medical Services and Technologies

The Project will utilize highly advanced medical devices and facilities and will meet the health requirements of Kocaeli province and its nearby provinces. . When the new campus will start to operate at full capacity it is predicted to provide healthcare services to approximately 2.5 million people and over 8,000 people (polyclinics and emergency) per day in modern conditions with 228 specialist physicians and practitioners, 383 nurses and midwives, and 500 auxiliary health personnel.

Example of relevant high-tech devices and technologies chosen are listed in Section 4.0.

5.2.2 Energy Efficiency

The Project is to produce part of its own power through a Trigeneration plant. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt (15.8 + 2.5). Traditional gas turbines typically operate at an efficiency of 35% whereas trigeneration systems operate up to 85% by converting 45% of the source energy to electricity, 40% to heating and cooling.

The remaining electricity shall be obtained from the national electricity grid. As it is to be a Trigeneration plant, the wasted energy from the production of electricity shall be recaptured and used to supply some of the both the heating and cooling needs of the Project during the operational phase. The remaining heating needs will be met through the use of boilers.

In addition the in-design planning has incorporated the design of a system generating simultaneously Power and Thermal (Hot Water/Steam and Chilled Water) based on a topping cycle instead of alternative thermodynamic cycles.

The energy technologies selected as described above will guarantee increased efficiency throughout the Project life by recovering productions.

5.2.3 Soil disposal during construction

Alternatives analyses have been conducted for the site selection of disposal of excavated material.

There are seven disposal locations for excavated materials in Kocaeli. These are;

- İzaydaş Karaabdulbaki Rehabilitation Area (20 km from the Project area),
- Kent Konut Doğantepe Rehabilitation Area (13 km from the Project area),
- 3A Recycling, Rehabilitation and Refilling Area (55 km from the Project area),
- İzaydaş Körfez Y. Sultan Rehabilitation Area (6 km from the Project area),
- İzaydaş Pelitli Rehabilitation and Refilling Area (60 km from the Project area),
- Kandıra Municipality Sarısu Rehabilitation and Refilling Area (55 km from the Project area),
- M. Erenkaya Recreation Area (25 km from the Project area).

İzaydaş Körfez and Kent Konut Doğantepe Rehabilitation areas were identified as suitable for disposal of excavated material, with other areas ruled out on the basis of potential environmental impacts (e.g. interference with natural habitats). These areas were assessed based on a number of criteria including distance, availability of dumping volumes, traffic and infrastructure facilities. The assessment identified that İzaydaş Körfez is the best option due to the closeness and availability. This choice will result in a lower impact on the surrounding area (i.e., reduction of noise and air emissions to the receptors) and reduced transport movements across the area, leading to a lower impact on the local transportation movements.

5.3 Location selection

No analyses of alternatives with respect to location have been performed. As a matter of fact should be considered that approximately about approximately 35.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area".

For such a large urban development, there is a need for a large piece of land at or close to the city centre, yet site alternatives within the city are insufficient in Kocaeli. The Project Site is advantageous in that respect that is also away from the crowded parts of the city. This site is considered further advantageous due to the fact that it is located in a developed area close to existing urban infrastructures such as transportation and waste handling.

6.0 STAKEHOLDER ENGAGEMENT

Conformance Table - Stakeholder Engagement

Theme/Sub-Theme	**EBRD PRs**	**IFC PSs**
Stakeholder Engagement Stakeholder engagement is conducted to provide local communities that are directly affected by the project and other relevant stakeholders.	P10	PS 1
Stakeholder Engagement Stakeholders are identified, stakeholder engagement plan is prepared, consultation meeting is conducted, grievance mechanism is described.	PR 10	PS 1

6.1 Stakeholder engagement plan

Detailed information realted to Stakeholder Engagement and its process is provided in Appendix E.

6.2 Stakeholder management activities realised

During the baseline data collection activities for Kocaeli IHC, following local authorities have been contacted to request various information on the Project Area and existing baseline conditions.

- Ministry of Health, Health Investments Directorate
- Ministry of Culture and Tourism, Kocaeli Regional Directorate of Protection of Cultural Heritage

Considering the social context and the nature of the project and in addition to the secondary data the qualitative primary baseline information has been collected at district and quarter level by using four different means of site data collection. During the socioeconomic baseline data collection, following consultation activities were conducted with the project stakeholders between 12th and 15th of April, 2015:

Key informant interviews with various stakeholders;

Interviews have been performed with the following groups of stakeholder using customized in-depth questionnaires (See APPENDIX C).

- Kocaeli Provincial Directorate of Health
- Development Directorate and Planning Directorate of Kocaeli Municipality
- District Health Directorate of İzmit
- Kocaeli Turkish Medical Association
- Directorate of Hospitals Association
- İzmit District Municipality

In-depth interviews focused on economic activities

In depth interviews have been carried out with stakeholders engaged with economical activities in the local study area. The most important group under this category are the Tavşantepe and Yeşilova Quarter.

The stakeholders contacted in Tavşantepe and Yeşilova quarter are;

- Tradesmen of Gündoğdu and Yeşilova quarter
- Authorities of Hacı Bektaş Veli and Yarbay Refik Cesur Secondary School
- Women Social Wellnes Center
-

Community level interviews with quarter people,

Information on the socioeconomic status at local study area has been collected through interviews with the following local stakeholders using community level questionnaires(see APPENDIX C).

- Tavşantepe Quarter Mukhtar
- Yeşilova Quarter Mukhtar
- Gündoğdu Quarter Mukhtar
- 28 Haziran Quarter Mukhtar
- Bekirdere Quarter Muhtarı
- Malta Quarter Mukhtar

During the interviews the concerns of the stakeholders on the potential impacts of the project have also been collected.

Focus groups

Focus group meetings where the attending stakeholder can interactively engage to the meeting, have also been conducted with the following groups. (See questionnaire for focus group discussions in APPENDIX C.):

-
- Yeşilova Quarter men
- Yeşilova Quarter dolmuş[9] drivers

Engagement with the project sponsor

SPV has been requested through a filling a specific questionnaire to provide information on the recruitment policy and the social and environmental management plans to be prepared to minimize the impacts of the project. (see APPENDIX C)

A Public Consultation Meeting has been conducted in Kocaeli, Tavşantepe on 30th of May, 2015 at Tavşantepe city hall. This place was easily accessible by the local people and communities. Announcements were made for the meeting in the areas, which were most likely to be affected by the Project and public notices with agenda, date, and time of the meeting was announced. Photos of the meeting are shown in APPENDIX F.

The number of the participation to the meeting was sufficient. In general, local stakeholders are aware of public benefit of the project and significant contribution to national economy.

The stakeholder groups that attended the meeting are:

- İzmit Municipality (1 representatives)
- NGOs (20 representatives)
- Hacı Bektaş Veli Primary School (4 representatives)
- Local Public (15 representatives)
- Local Media (1 representative)
- Project Employees (2 representatives)
- ESA consultant (2 representatives)

The points that were discussed during the meeting were:

- Project information,
- Construction period,
- Environmental and social studies that were conducted for the project,

No specific concern for public on community members. The opinions and issues that have been raised during the answer and question session are:

- Are there any relation between the Project and future planned urban renewal?
- Is there any possibility to hire the unqualified personnel from the quarter?

The main outputs of those meetings are provided in Section 6.3

[9] Private public transportation means similar to bus services by individual minivan drivers

6.3 Summary of stakeholder input

The stakeholder input collected during the socio-economic baseline data collection survey can be summarized as;

- Tavşantepe Yeşilova and Gündoğdu quarter residents consider the overall project impacts as tolerable with the fact that there will be a health care facility in accessible distance to the quarter and the real estate value in the quarter will increase.
- The PPP model for the construction and operation of the project is not known by the community members and this creates concern on the affordability of the provided health care services.
- During the interviews conducted to local public a general concern has been raised on the adequacy of existing transportation means to serve the need of the construction and operation of Kocaeli IHC. One other alternative to the Integrated Health Campus would have been improving the preventive health care services in Kocaeli Province.
- The population in Tavşantepe neighboured is 15000 and the household number is 600 as stated by the Mukhtar. The Romany community of 1000 people, residing on seasonal basis in the quarter, can be added to these figures. In accordance with the verbal communiciation between SPV and the Kocaeli Municipality, there will not be urban transformation within the place where roman community lives.

7.0 IMPACT ASSESSMENT METHODOLOGY

Conformance Table - Impact screening and definition of the valued environmental and social components

Theme/Sub-Theme	**EBRD PRs**	**IFC PSs**
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1
Environmental and social assessment/ The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1
Identification of Risks and Impacts Environmental and social risks and impacts is identified in the context of the project's area of influence.	PR 1	PS 1

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

The framework is based on the identification of the following elements:

- **Drivers**: project actions which can interfere significantly with the environment as primary generative elements of the environmental pressures;
- **Pressures** (impact factors): forms of direct or indirect interference produced by the project actions on the environment, able to influence the environmental state or quality;

- **State** (sensitivity): sum of the conditions which characterize the present quality and/or trends of a specific environmental and social component and/or of its resources';
- **Impacts**: changes undergone by the environmental state or quality because of the different pressures generated by the drivers;
- **Responses** (mitigation measures): actions adopted in order to improve the environmental conditions or to reduce pressures and negative impacts.

The overall impact analysis methodology has been developed by Golder based on its experience in the field of the environmental and social impact assessment; the methodology includes the following phases:

- definition of the current state or quality of the different environmental and social components potentially impacted based on the results of the baseline studies;
- identification of the impacts potentially affecting the environmental and social components in the different phases of the project (construction, operation and decommissioning/closure);
- definition and assessment of the effects of the planned mitigation measures.

Impact assessment was performed for main issues for each Environmental and Social component (discipline). The common impact assessment methodology consists of five main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of **residual effects**; and
- as necessary, identification of monitoring to evaluate and track performance.

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms; however the final methodology will be the result of consultation with the client and the relevant stakeholders. The details of the impact assessment methodology is presented in APPENDIX J.

7.1 Identification of area of influence

The area of influence is defined by IFC performance standard 1 as "The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent."

The Area of Influence is defined for each environmental and social component. The baseline data collection and impact assessment is focused on the geographical extends of the area of influence for each individual component and referred as Study Area in the context of the Impact Assessment Methodology.

The area of influence of the project would also include;

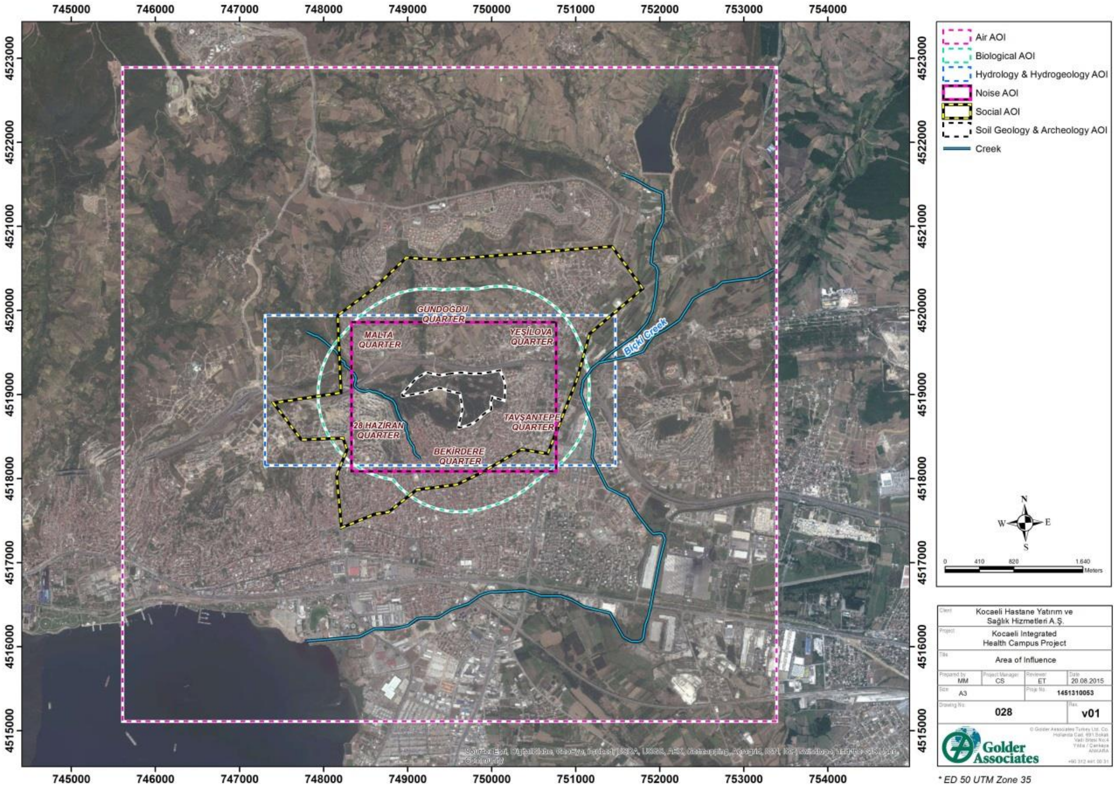
- Project area occupied by the project facilities
- New and existing transportation routes to be used for construction and operation
- Dumping sites for construction debris
- Waste and waste water disposal facilities to be used during operation and construction

The following drawing presents the AoI set as study area for baseline data collection to be used during impact assessment for environmental and social components.

Though the actual waste disposal facilities, dumping sites and transportation routes are not specifically included in any of the AoIs drawing below; they are included in the assessment and impacts associated with these facilities are discussed in relevant sections accordingly.

Considering the dispersion of air quality impacts, the area of influence, where the air quality impacts are to be assessed, will be extended in relation to the results of any applicable dispersion study to be conducted.

When available, literate information is also collected and presented at a national level and regional level to support the description of the baseline conditions.



Please note that :

Noise and air quality AoI is set by the modelling boundaries

Social components AoI approximates the nearest settlement boundaries however specific social impacts of a broader region including Kocaeli Municipality are also addressed in relevant sections.

Though the natural protected areas are not included in this drawing they are discussed in relevant sections.

Figure 7 Area of Influence (Study Area) for different components

8.0 ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

Conformance Table - Impact screening and definition of the valued environmental and social components

Theme/Sub-Theme	EBRD PRs	IFC PSs
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1

The physical, biological and socioeconomic baseline data has been collected through literature and site surveys as detailed in the appropriate subsections below.

The baseline site data collection was performed through January and April 2015 being in line with the project execution plan. The data collection period would not cover a specific season however the data collection team has considered that the period would establish a baseline condition that would be appropriate for a sound impact assessment. The team has also considered recording any observed seasonality sensitivities of the baseline components during data collection activities and plan additional data collection surveys if required. The findings of the site data collection does not point out a necessity to collect additional baseline data in other seasons of the year except for ambient NO_2 levels that are measured to be higher than national and international standards over the sampling period. Recommendations are provided for the additional monitoring of NO_2 in Section 8.3.5.2.

8.1 Physical components

The study area and methods for the collection of baseline information on physical components are for the each subcomponent and presented in the subsequent sections below. The regional baseline characteristics collected through desktop review presented in APPENDIX H.

8.1.1 Geology Geomorphology and Seismology

Study area for this component is presented in Figure 7. Geology and geomorphology baseline conditions have been assessed through desktop studies and literature data review. Main source reviewed is “the Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015”.

Baseline conditions of seismology component have been assessed from desktop studies and literature data review.

Main sources reviewed are listed below:

- Bozkurt, E., 2000, “Neotectoncis of Turkey - a synthesis”, Geodinamica Acta, 14, 3-30;
- The Seismic Hazard Assessment Report for Kocaeli Integrated Health Campus Project, December 2014;
- Republic Of Turkey - Prime Ministry, Disaster & Emergency Management Authority, Department Of Earthquake;
- The Map of Turkey Seismic Zones published by Prime Ministry; Disaster & Emergency Management Authority; Department of Earthquake.

8.1.1.1 Baseline

A geological and geotechnical investigation was carried out in the Project Area to determine its geological characteristics and geotechnical parameters. It included field works and laboratory test.

The field studies were conducted by GeoDestek Geoengineering & Consultancy Services between December 13th, 2014 and January 9th, 2015 based on the ASTM standards. Twenty-one boreholes with 701 m of total depth were drilled by auger and rotary drilling methods. The depths of the boreholes varied between 17 m and 47 m below ground level. In addition to the 21 boreholes, 6 test pits were excavated with a JCB 3X backhoe in the Project Area and the depths of test pits varied between 1 and 3 m. Borehole logs and geological cross-sections are given in APPENDIX G. The findings of the Site Investigation and Geotechnical Evaluation Report are given in the paragraphs below.

The dominant formation within the Project Area is clayey limestone with different weathering degrees. Local clay and claystone layers were also encountered in the area. Total core recovery and rock quality designation values exhibit an increasing trend as a function of depth from ground surface in the overall sense; however some irregularities exist.

The unit is observed to possess visible discontinuity planes that are close to and cross each other. The degree of weathering of clayey limestone ranges from slightly to highly and partly completely weathered; the degree of strength ranges from strong to weak but in general is medium strong, and fractures are evaluated to be ranging from "crushed" to "closed".

The claystone degree of weathering ranges from moderately to completely weathered. The degree of strength varies from very weak to weak and fractures are evaluated from “moderate” to “crushed”.

Clay layers are encountered at the surface of some boreholes and their thickness is 4.5 m to 8.0 m. Clay layers are generally described as very stiff to hard; contain calcareous concretion, a minor amount of silt and a minor amount of gravel; gravels are of calcareous origin, fine to coarse grained.

The lithology obtained from borehole and test pit logs and presented in the Site Investigation and Geotechnical Evaluation Report is summarized in APPENDIX L.By any means, the examination of the area reveals the irregular shape and topography of the plot, the original was an extension of land, shaped like a pincer, from east to west around 1,200 m long, and with a variable width between 155 and 300 m. The topography is remarkably rough, with very close contour lines in some places, slopes higher than50 m with 45% gradients. The terrain is shaped by three hills, two on the northern side of the site, and the third one on the south-eastern side. The total slope between the lowest and highest points of the site has a difference, in altitude, of over 100 meters in a maximum distance of under 600 m.

Project Area is located in 1st degree earthquake zone according national classification criteria for earthquake zoning.

Based on the characteristics described above, geology and geomorphology are a component with a medium sensitivity.

8.1.2 Soil and Subsoil Characteristics

Study area for this component is presented in Figure 7.

Soil baseline conditions have been assessed from desktop studies, literature data review and also baseline studies including soil sampling.

- Main sources reviewed are listed below:
  - Kocaeli Provincial Environmental Status Report, 2012;
  - Kocaeli Provincial Environmental Status Report, 2013;
  - “Technical Instructions for the Classification Standards of the Soil and the Land Use” prepared by the Ministry of Food, Agriculture and Livestock;
  - Soil Groups, Land Use and Land Use Capability Classification Maps published by the Ministry of Food, Agriculture and Livestock;

- Relationships between boron and arsenic elements in nature, 2008;
- Regulation on Soil Pollution Control and Point Source Contaminated Sites“ (“Soil Regulation”) originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704 stating that the binding articles became effective as of 08 June 2015.

- Soil sampling:
  - Observations were made during the site walk over to identify any visual indications of contamination or potential contamination sources;
  - Soil samples (and duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm);
  - During sampling, the collected samples were observed for any visual and olfactory signs of contamination;
  - During sampling the photographs were taken at each soil sampling location;
  - The samples were stored in a sealed glass jar and preserved in cooler boxes at around 4°C for shipping to the laboratory;
  - After the samples were collected, the locations were recorded using a hand-held GPS instrument;
  - Prior to commencing sampling at each location, the sampling equipment (gloves, shovel etc.) were decontaminated or replaced with the new one in accordance with Golder’s in-house procedure (Golder Procedure 10_Proc-04 - Decontamination of Equipment) in order to prevent cross contamination of the samples.

8.1.2.1 Baseline

The Project Area is considered as a Brownfield and was used in the past for military purposes. The “Cephanelik Mesire Alanı” (uncontrolled picnic area) is located in the south of the Project Area. The Project Area is mainly covered with bare soil but weeds and also remaining buildings from the previous military activities are present.

A geotechnical investigation (mentioned before) was carried out at the Project Area. According to the investigation results the bedrock within the Project Area is clayey limestone with different weathering degrees. Local clay and claystone layers were also encountered in the area. Topsoil and artificial fill above the bedrock has a thickness varying between 0.30-0.90 m and 0.40-1.00, respectively.

The “Land Use Profile” and “Soil Group Classification” for the Project Area, assigned by the Ministry of Food, Agriculture and Livestock is “Other (Bare Rock and Rubble & Residential Area”(Figure 8, Figure 9). This is due to the fact that the area is considered to be covered by bare rock and the top soil cover is not considered of significant thickness for agricultural use. Per the legislation, this classification does not have a designated “Land Use Capability” classification.

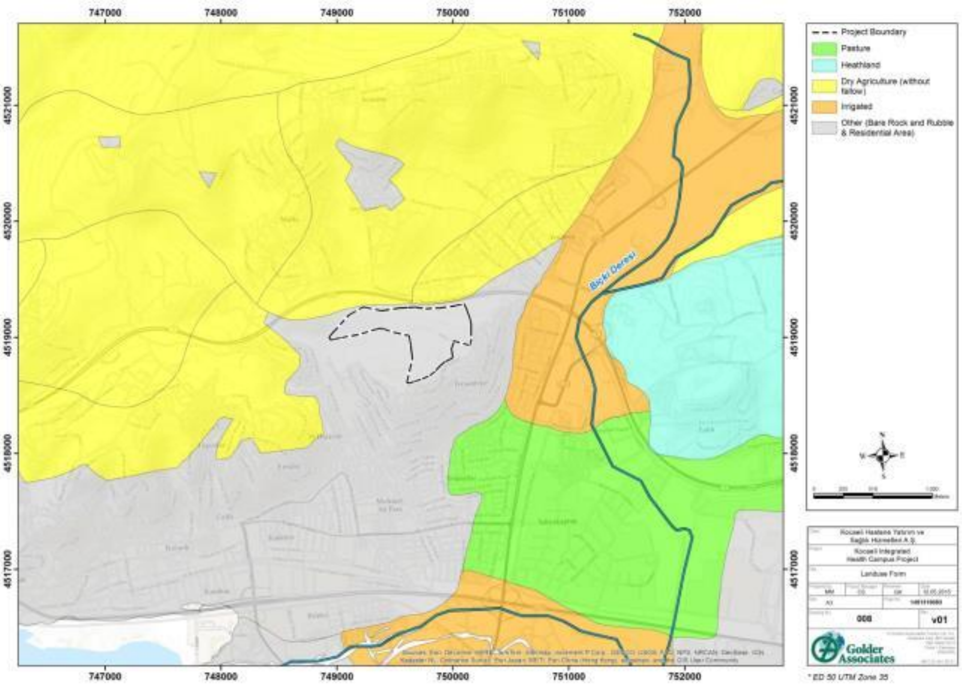


Figure 8: Land Use Profile of the Project Area

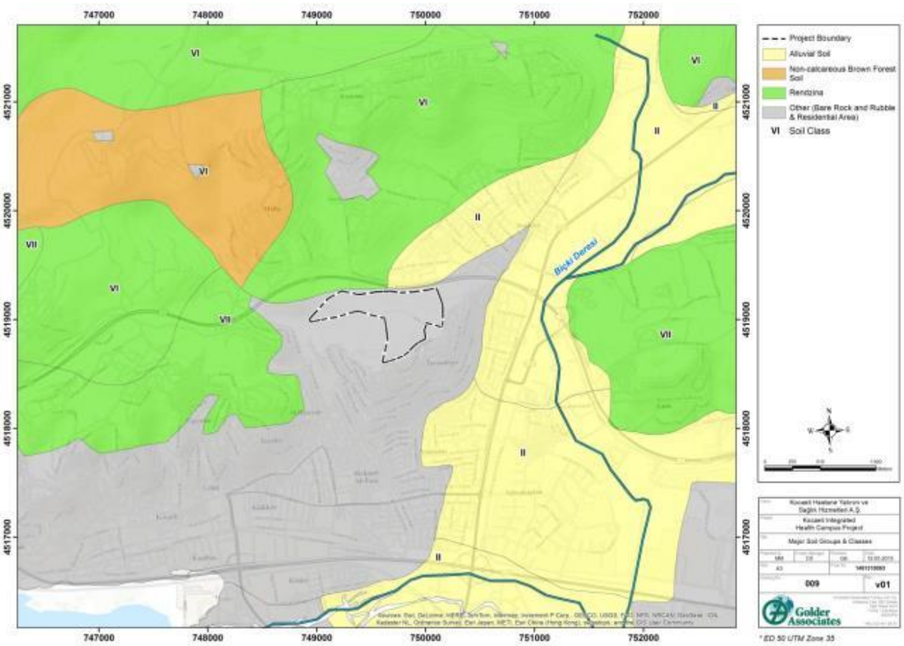


Figure 9: Soil Groups and Land Use Capability Classification of the Project Area

No visual indications of contamination or potential contamination sources were observed at the Project Area during the site visit conducted on 3 - 4 February 2015. In the light of this observation, in order to describe the baseline soil quality, 3 soil samples (and 1 duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm) during the site visit. The soil sampling locations and the relevant sample information (coordinates, names, sampling date and time) and the comparison of the soil chemical analysis results to the Turkish Regulatory Limits are given APPENDIX L.

All samples have concentration of Arsenic exceeding the Regulation Limit. There are trace concentrations of TPC and TOX in all samples. The Arsenic exceedance does not necessarily indicate a Site impact. Naturally occurring soil in the region is known to have elevated Arsenic concentrations[10].

The results of the chemical analyses performed on the soil samples do not show significant soil impact on the Site. Some presences may not be due to natural causes but to anthropogenic influence as the Project Area is located within an industrially developed province.

Based on the characteristics described above, soil and subsoil characteristics are a component with a low sensitivity.

8.1.3 Hydrology and Surface Water Quality

Study area for this component is presented in Figure 7.

Hydrology and surface water quality baseline conditions have been assessed from desktop studies, literature data review and also baseline studies including surface water sampling.

- Main sources reviewed are listed below:
  - Kocaeli Provincial Environmental Status Report, 2013;
  - The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015;
  - Regulation on Surface Water Quality" originally published in the Official Gazette number 28483, dated 30 November 2012 and amended in the Official Gazette number 29327, dated 15 April 2015.
- Surface water sampling:
  - A desktop study was carried out to identify water bodies in the 1,000 m buffer around the project footprint;
  - Grab surface water samples were collected from the identified water bodies;
  - During sampling the collected samples were observed for any visual and olfactory signs of contamination;
  - During sampling the photographs were taken at the each surface water sampling location;
  - The samples were stored in a sealed plastic/glass jar and preserved in cooler boxes at around 4°C for shipping to the chemical analysis laboratory;
  - After the samples were collected the locations were recorded using a hand-held GPS instrument;
  - The surface water samples that would be analysed for the coliform parameters were directly transported to the laboratory with in the 6 hours period to avoid any disturbance;
  - Prior to commencing sampling at each location the gloves were replaced with the new ones and the bottles were washed with water from the sampling water body in order to prevent cross contamination of the samples.

8.1.3.1 Baseline

No streams or any other natural surface water bodies were observed during the Site visit at the Project Area. However, the tributary of the Bıçkı Creek was observed 150 m west of the Project Area, inside the "Cephanelik Mesire Alanı" (uncontrolled picnic area).

[10] Relationships between boron and arsenic elements in nature, 2008

By any means, the examination of the area reveals the irregular shape and topography of the plot, the original was an extension of land, shaped like a pincer, from east to west around 1,200 m long, and with a variable width between 155 and 300 m. The topography is remarkably rough, with very close contour lines in some places, slopes higher than50 m with 45% gradients. The terrain is shaped by three hills, two on the northern side of the site, and the third one on the south-eastern side. The total slope between the lowest and highest points of the site has a difference, in altitude, of over 100 meters in a maximum distance of under 600 m.

During the construction, it is planned to excavate the entire Project Area to depths varying between 1.36 m to 38.4 m.

In order to describe the baseline surface quality, one surface water sample was collected from the tributary of the Bıçkı Creek during the site visit conducted on 3 - 4 February 2015. (See APPENDIX L for details).

The assessment of surface water in Turkey is based on the “Regulation on Surface Water Quality” originally published in the Official Gazette number 28483, dated 30 November 2012 and amended in the Official Gazette number 29327, dated 15 April 2015. Table 5 in the Appendix 5 of the Regulation on Surface Water Quality gives the limit concentration values for the water quality classes. The summary of the definitions of the classes are given below. The results of the analyses were compared with the values stated in the Regulation on Surface Water Quality and are given inAppendix L.

- Class I – High Quality Water:
  - Surface water with high potential for drinking water use;
  - Suitable for recreational purposes (dermal contact, including swimming);
  - Suitable for trout farming;
  - Suitable for animal husbandry and farming.
- Class II – Slightly Contaminated Water:
  - Surface water with a potential for drinking water use;
  - Suitable for recreational purposes;
  - Suitable for fish farming except for trout farming;
  - Suitable for irrigation, provided the irrigation water quality criteria are met.
- Class III – Contaminated Water:
  - Can be used for industrial water supply with proper treatment except for industries such as food, textile etc. that require high-quality water.
- Class IV – Heavily Contaminated Water:
  - Lower quality water where the quality parameters do not meet the Class III criteria and can be used only upon treatment to achieve higher quality classification criteria.

The concentrations of the parameters analysed in the sample collected from the tributary of the Bıçkı Creek (SK-1) are below the Class I Surface Water limits, except for electrical conductivity and total kjeldahl nitrogen as N. The resulting water classification for the sample collected from the tributary of the Bıçkı Creek is Class II - Slightly Contaminated Water. Such slight contamination has been considered as a result of the anthropogenic activities in the surroundings of the creek.

Based on the characteristics described above, hydrology and surface water quality characteristics are a component with a low sensitivity.

8.1.4 Hydrogeology and Groundwater Quality

Study area for this component is presented in Figure 7. The hydrogeology and groundwater quality baseline conditions have been assessed from desktop studies and literature data review.

- Main sources reviewed are listed below:
  - Kocaeli Provincial Environmental Status Report, 2013;
  - The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015;
  - Bozkurt, Ali and Kurtuluş, Cengiz, “Groundwater quality in Körfez Municipality (Kocaeli), northwest of Turkey”, Journal of Food, Agriculture & Environment Vol.6 (3&4): 551-553, 2008.

8.1.4.1 Baseline

A geotechnical investigation (mentioned before) had been carried out at the Project Area. Twenty-one boreholes with 701 m of total depth were drilled by auger and rotary drilling methods. According to the Site Investigation and Geotechnical Evaluation Report, groundwater was encountered in the 20 borings (except BH-77), drilled down to depths varying from 17 m to 47 m.

Measurements were made at all boreholes right after completion of drilling, and at regular intervals after completion. Several sets of measurements were taken after the boreholes were completed and 50 mm diameter PVC pipes were placed in the borehole. Since the PVC pipe was not perforated, openings were made using hand sawed slots over the entire length, approximately at 1 m spacing. The final groundwater measurements were made using a whistle water level meter. The groundwater table measurements are summarized in APPENDIX L. The groundwater table is observed around 55ms.

In order to determine the chemical properties of groundwater, samples were retrieved at BH-01 and BH-17 by the GeoDestek Geoengineering & Consultancy Services. Chemical tests were performed to determine pH, conductivity, magnesium, total hardness, total alkalinity, chloride, sulphate, ammonium, permanganate index values. The measurement standards and the results are given in APPENDIX L.

Based on the characteristics described above, hydrogeology and groundwater quality characteristics are a component with a low sensitivity.

8.1.5 Meteorology and Climatology

This section presents the baseline data collection methods and summary of the Meteorological and Climatic Features of the study area. No impact assessment is conducted for this component; however the data are used for the impact assessment conducted for other components.

Data concerning wind, temperature and rainfall recorded by Kocaeli Meteorological Station, for the 1961-2014 periods, were used for determining general meteorological and climatic conditions of the project area and surroundings. The Kocaeli Meteorological Station, a body of General Directorate of Meteorology (“MGM”), is situated in İzmit District which is approximately 10 km away from the Project Site.

8.1.5.1 Baseline

Kocaeli Province has a humid subtropical climate (Köppen climate classification, Cfa), with considerable maritime and continental influences. Summers are hot and very humid, and the average maximum temperature is around 29 °C in July and August, although temperatures do usually exceed 30 °C in June, July, August and even September. Winters are cool and damp, and the lowest average minimum temperature is around 3 °C in January. Precipitation is high and fairly evenly distributed the year round; it is heaviest in autumn, winter, spring. Snowfall is quite common between the months of December and March, snowing for a week or two.

Kocaeli climate can be considered as a transition between the Mediterranean and the Black Sea climate. Summers are hot and slightly rainy; winters are mostly rainy and sometimes snowy and cold. Occasionally sweltering heat experienced in the gulf coast in the summer time. The maximum temperature experienced in the İzmit District is 41.6 °C (11 July 1970), and the minimum is -8.7°C (4 February 1960). The average annual temperature is around 14.8°C. The average annual rainfall is 800 mm. Wind direction is from the north and northeast in the winter and from the northeast in the summer.

8.1.6 Air Quality

8.1.6.1 Study area

Study area for this component is presented in Figure 7.

Set of results of emission measurements, ambient air quality measurements and quality assessment studies, which were conducted by various parties in the region in the last 2 months, were summarized here for determination of the existing air quality.

Methodologies used for the ambient air quality measurements are listed below:

- Particulate matter sampling was conducted according to the gravimetrical method in compliance with EPA 40 CFR Part 50 National Ambient Air Quality Standards for Particulate Matter as recommended by World Bank and Ministry of Environment and Urbanization.
- Settled dust measurements were conducted by using the BS: 1747 Air Quality Measurements Methods Chapter 5, Settled Dust by 4 Directions.
- The SO_2&NO_2 diffusion tubes were analysed at the Gradko U.K. laboratory by UV Spectrophotometry and Ion Chromatography for NO_2 and SO_2, respectively.

8.1.6.2 Baseline

There are two sources of potential impacts on air quality during the construction phase. These are:

- The excavation works and movement of vehicles and
- The release of engine emissions from the construction equipment and vehicles.

Dust produced during the excavations could be important during the dry weather conditions and may cause negative effects to nearby settlements, public areas and institutions. The exhaust from construction equipment and vehicles may cause nitrogen oxide (NO_x) and sulphur dioxide (SO_2).

Ambient Air Quality

The existing ambient air quality has been evaluated at and around the Project Site for dust and nitrogen oxide (NO_2) and sulphur dioxide (SO_2).

The ambient air quality measurements were conducted by an accredited firm named Disten for Project. Settled dust and first campaign of (4 of the total 12) SO_2&NO_2 diffusion tubes measurements were conducted between February 16 and April 16, 2015 and PM_{10} measurements were conducted between February 16 and 17, 2015. Rest of 8 diffusion tube measurements were conducted between March 26 and May 26, 2015.

As a total within the ESA studies, the field measurements listed below were conducted to support the baseline data:

- 24 hour PM_{10} measurements at 4 locations.
- Settled dust measurements at 4 locations.
- SO_2&NO_2 measurements at 12 locations.

The coordinates and locations of the measurement points are shown in below figure.

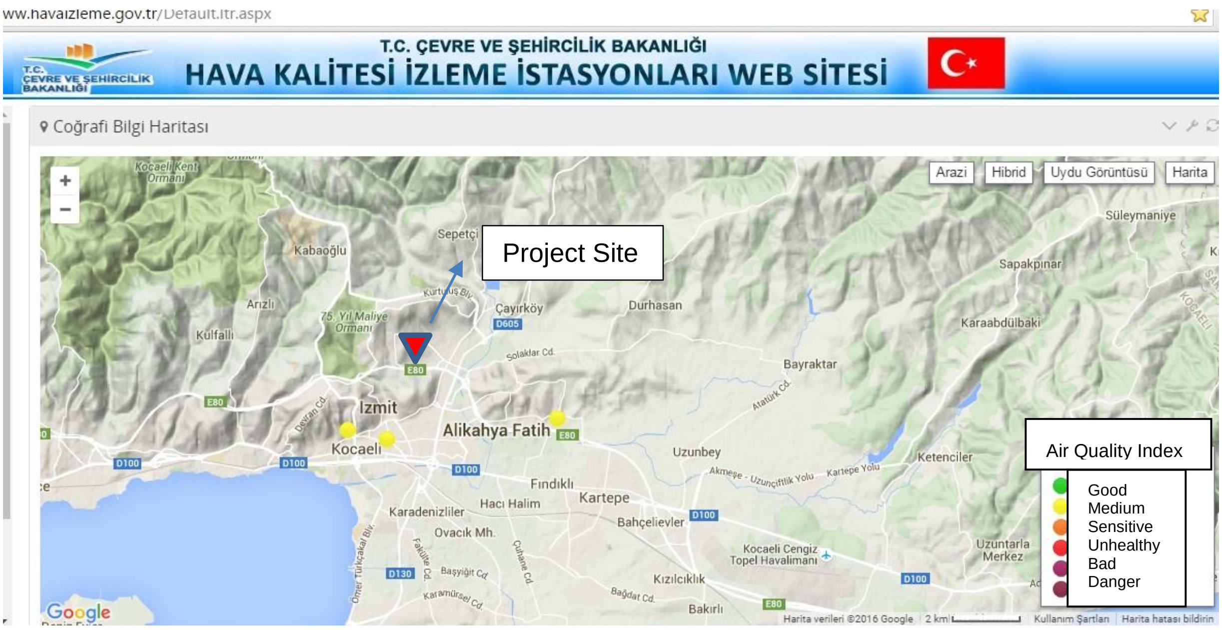
Figure 10: Measurement Locations

Measurement results with respect to the relevant Turkish and International standards limits for ambient air quality are summarized in APPENDIX L.

As seen from the measurement summary tables, PM_{10}, settled dust and SO_2 measurement values comply with limit values of both national and international standards. On the other hand, NO_2 measurement results slightly exceed the annual limit value due to the heavy traffic load duty of (O4) highway close to the project site.

National Air Quality Monitoring Network, which is operated by the Ministry of Environment and Urbanization, has monitored air quality data[11] in order to assess the "air quality index" of the region. There are 70 stations in Marmara Region. 11 of them are located in Kocaeli. The locations of those stations are shown in below figure.

[11] PM10, SO2&NO2, NOx, O3, CO parameters.



According to the National Air Quality Monitoring Network, the air quality in Kocaeli is “medium” condition.[12]

The closest stations to the Project Site is Kocaeli Kandıra[13] which has a good air quality index. The average O3 measurement values for last 2 months at the station is shown below table. As seen from the below table, all values are comply with both European and IFC limit values.

Date	O3 (µg/m³)	Date	O3 (µg/m³)	Date	O3 (µg/m³)	Limit Values (µg/m³)
01.02.2016	71	01.03.2016	59	30.03.2016	70	
02.02.2016	57	02.03.2016	75	31.03.2016	89	
03.02.2016	64	03.03.2016	78	01.04.2016	93	
04.02.2016	69	04.03.2016	80	02.04.2016	81	
05.02.2016	63	05.03.2016	55	03.04.2016	75	
06.02.2016	76	06.03.2016	74	04.04.2016	66	
07.02.2016	49	07.03.2016	80	05.04.2016	75	
08.02.2016	58	08.03.2016	91	06.04.2016	76	120 (for EBRD)[14]
09.02.2016	57	09.03.2016	94	07.04.2016	81	100 (for IFC)[15]
10.02.2016	68	10.03.2016	67	08.04.2016	60	
11.02.2016	76	11.03.2016	62	09.04.2016	48	
12.02.2016	64	12.03.2016	95	10.04.2016	73	
13.02.2016	63	13.03.2016	86	11.04.2016	64	
14.02.2016	70	14.03.2016	78	12.04.2016	55	
15.02.2016	65	15.03.2016	75	13.04.2016	56	
16.02.2016	65	16.03.2016	78	14.04.2016	84	

[12] http://index.havaizleme.gov.tr/Index/Station/118

[13] http://www.havaizleme.gov.tr/Default.ltr.aspx

[14] http://ec.europa.eu/environment/air/quality/standards.htm & http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.12188&MevzuatIliski=0&sourceXmlSearch=hava%20kalitesi

[15] http://www.ifc.org/wps/wcm/connect/532ff4804886583ab4d6f66a6515bb18/1-1%2BAir%2BEmissions%2Band%2BAmbient%2BAir%2BQuality.pdf?MOD=AJPERES

Date	O3 (μg/m^3)	Date	O3 (μg/m^3)	Date	O3 (μg/m^3)	Limit Values (μg/m^3)
17.02.2016	52	17.03.2016	74	15.04.2016	72	
18.02.2016	54	18.03.2016	69	16.04.2016	88	
19.02.2016	73	19.03.2016	67			
20.02.2016	69	20.03.2016	67			
21.02.2016	67	21.03.2016	82			
22.02.2016	69	22.03.2016	85			
23.02.2016	66	23.03.2016	70			
24.02.2016	63	24.03.2016	69			
25.02.2016	59	25.03.2016	62			
26.02.2016	43	26.03.2016	74			
27.02.2016	59	27.03.2016	76			
28.02.2016	71	28.03.2016	82			
29.02.2016	54	29.03.2016	77			

During the ESA studies, PM2.5 measurements did not conducted. PM10 (24 hr) measurements reflect the particulate matter situation of the Project Site. However, the special experiment conducted in South Korea by Dr. Sarath K. Guttikunda[16] the following convertion table could be used[17]:

Measured PM10 AQI	5	10	15	20	25	30	35	40	45	50	55	60	65	100
Deducted PM2.5 AQI	9	26	40	54	61	68	76	83	92	99	116	132	149	175

According to the table, PM2.5 values (with range) at the baseline PM10 measurement locations are summarised in below table:

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results (μg/m^3)	Measurement Results (PM2.5) (μg/m^3)[18]
PM10-1 (μg/m^3)	749937-4518668	16.02.2015-17.02.2015	19.2	40-54
PM10-2 (μg/m^3)	750106-4519068	16.02.2015-17.02.2015	19.0	40-54
PM10-3 (μg/m^3)	749566-4519064	16.02.2015-17.02.2015	18.5	40-54
PM10-4 (μg/m^3)	749762-4519044	16.02.2015-17.02.2015	18.4	40-54

As seen from the table, estimated PM 2.5 values are in compliance with the interim target of IFC which is 75 μg/m^3.

Based on the characteristics described above, air quality characteristics are a component with a medium sensitivity.

8.1.7 Noise and Vibration

Study area for this component is presented in Figure 7.

[16] http://www.dri.edu/directory/4902-sarath-guttikunda

[17] http://aqicn.org/experiments/south-korea-pm25-air-quality/

[18] The first interim target limit value of pm2.5 for IFC is 75 μg/m3

During the baseline studies, baseline noise measurements were conducted at 8 points inside and around the project area. These points are selected based on their potential sensitivity to noise impacts created during construction an operation.

Information on the location of measurement points is presented in APPENDIX L and below.

Table 11: Noise measurement points

Location No	Duration of the Measurement[19]	UTM ED 50 Zone 39		Justification for selection
		X	Y	
N(15)-1	15 minutes	749341	4519233	Close distance to roads that would be used during construction and operation. Noise levels might be increased at this location with the increased traffic load.
N(15)-2	15 minutes	749906	4519173	Close distance to houses and roads that would be used during construction and operation. Noise levels might be increased at this location with the increased traffic load.
N(15)-3	15 minutes	750015	4518841	Project area
N(15)-4	15 minutes	748833	4518974	Recreational area
N(24)-1	24 hours	749937	4518668	Close distance to school
N(24)-2	24 hours	750106	4519068	Close distance to houses and roads that would be used during construction and operation. Noise levels might be increased at this location with the increased traffic load.
N(24)-3	24 hours	749566	4519064	Project Area Close distance to roads that would be used during construction and operation. Noise levels might be increased at this location with the increased traffic load.
N(24)-4	24 hours	749762	4519044	Project Area Close distance to roads that would be used during construction and operation. Noise levels might be increased at this location with the increased traffic load.

[19] 21. Noise baseline measurements were 24-hour and 15-minute Leq values in line with the methodologies of Ministry of Environment and Urbanisation ad EPA, USA. 15 miniute measurement interval is defined in line with the national and ISO 1996-2 requiremnets considering the measruement location characteristics. 24 hr measurements are taken at selected locations to validate the 15 minutes measurment results. The results are found to be in corrolation and used for comparison with national and IFC noise limits.

Figure 11: Locations of baseline noise measurements points

The following methodology was applied:

- All measurements are in the direction of project area.
- The standards used are TS 9315 ISO1996-1 Definition of Acoustic-Environmental Noise, Measurement and Assessment Section 1: Standard of Basic Quantities and Assessment Procedures and ISO 1996-2:2007 Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels
- The measurements are done at 1/3 octave band. The frequency values between 63 Hz and 8000 Hz are recorded.

The measurements were done in front of the receptor with minimum 3.5 m distance, in the direction of project area and at 1.5 m height from the ground with 90 degree angle.

Noise measurements were conducted using a Svan 957 device with HP filter.

8.1.7.1 Baseline

The measurement points and the results of the measurements are presented in APPENDIX L

The Project Site itself is classified within “noise sensitive areas where education, culture and health facilities and recreation areas are densely located” in Turkish limits. As it is seen in APPENDIX L, day time noise levels are between 44.7 – 57.1 dBA and lower than 60 dBA according to 15 minutes measurements; however according to the 24 hour measurements, day time noise levels are vary between 61.8 – 71.9 dBA which are higher than the limit. Evening and night time measurements are between 61.2 – 72.0 dBA and 57.6 – 72.2 dBA respectively and these results are above the Turkish limits of 55 dBA and 50 dBA given in Table 12.

Table 12: Turkish Ambient Noise Standards

Receptor Areas	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Noise sensitive areas where education, culture and health facilities and recreation areas are densely located	65	60	55
Areas where commercial buildings and noise sensitive areas are located but residential houses are densely located	65	60	55
Areas where commercial buildings and noise sensitive areas are located but business buildings are densely located	68	63	58
Industrial areas	70	65	60

Source: Regulation on Assessment and Management of Environmental Noise

The Project Site is classified within "residential areas" in IFC limits. The baseline measurements indicated that day time noise levels are between 44.7 – 57.1 dBA and except the result in N(15)-3, measured noise levels are above 55 dBA (IFC day time limit) according to 15 minutes measurements. Day time and night time baseline measurements according to 24 hours measurements vary between 61.2 – 72 dBA and 57.7 – 72 dBA respectively and these results are higher than the IFC standards of 55 dBA and 45 dBA, given in Table 13.

Table 13: Ambient Noise Standards in IFC General EHS Guidelines

Receptor	One Hour LAeq (dBA)	
	Day time 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The main noise source observed on N(15)-1, N(15)-2, N(24-2), N(24)-3 and N(24)-4 points is vehicle movements on the main road at north border of the project area. N(15)-3 and N(15)-4 are inside the border of the project area and noise levels of these points are lower than the other results.

Based on the characteristics described above, noise and vibration characteristics, component is defined to be with medium sensitivity.

8.1.8 Traffic and Infrastructure

Traffic baseline data is collected to be used in the traffic impact assessment.

Sources that were used during the baseline data collection are:

- Available information in the literature
- Special traffic study were conducted by SPV
- Special traffic study were conducted by Golder

In current situation, there is no settlement area on the Project area, O4 highway passes through the north of the land and the Project area is connected to the north through the bridge using Zübeyde Hanım road and Başbuğ street (See APPENDIX A).

The Study Area for the traffic and infrastructure is defined as roads approaching to the project site and the surrounding area including the nearby settlement areas. Study area for this component is presented in Figure 7.

8.1.8.1 Methodology

The traffic study has been made in order to assess the traffic impact of Project to the current infrastructure and traffic. The scope of the study is:

- Research and observation of existing transportation, infrastructure and traffic condition on Project site.
- Determination of the traffic load of Project
- Projection of traffic volume in the future
- Geometric analysis of the car parking.
- Recommendations on the improvements on the transportation infrastructure

On February 05th, 2015, a specific study was conducted to assess the vehicular traffic at two roads (Zübeyde Hanım road (Route 1) and Okan street besides the Hacı Bektaş Veli Secondary School (Route 2). Information about actual traffic flow data based on the vehicle category (light vehicle or heavy vehicle) was collected; the number of average hourly passages was counted on roadways. The two different locations indicated in the figure below were investigated.

The study was conducted between 12:30 and 13:30.

Figure 12: Traffic routes

8.1.8.2 Baseline

The literature data reviewed for the recorded vehicle movements on the O4 highway. Turkish Highway Directorate records the traffic movement on the main roads and the recorded traffic loads on these sections are shown in the following figure.

Figure 13: Vehicle Movements on O-4 Highway

Where:

Average number of vehicles recorded per day on O-4 highway	
30231	Light vehicle
17940	Heavy vehicle
48171	Total

Route 1 and 2 which are shown in above traffic routes (Figure 12) are single-lane, paved roads in good condition. During the construction and operation period of the Project the existing roads will be used.

Based on the specific study conducted on February 05st, 2015 the traffic flow of study area is estimated as 18 heavy vehicles and 120 light vehicles per hour for the route 1, 12 heavy vehicles and 63 light vehicle per hour for the route 2.

Based on the characteristics described above, traffic and infrastructure are a component with a medium sensitivity.

8.1.9 Conclusions

The following poınts can be concluded on the physical environmental characteristics of the project area;

- The dominant formation within the Project Area is clayey limestone with different weathering degrees.
- Project site is in 1st earthquake zone
- The results of the chemical analyses performed on the soil samples do not show significant soil impact on the Site. Some presences may not be due to natural causes but to anthropogenic influence as the Project Area is located within an industrially developed province.
- The concentrations of the parameters analysed in the sample collected from the tributary of the Bıçkı Creek (SK-1) are below the Class I Surface Water limits, except for electrical conductivity and total kjeldahl nitrogen as N. The resulting water classification for the sample collected from the tributary of the Bıçkı Creek is Class II - Slightly Contaminated Water.
- A geotechnical investigation (mentioned before) had been carried out at the Project Area. Twenty-one boreholes with 701 m of total depth were drilled by auger and rotary drilling methods. According to the Site Investigation and Geotechnical Evaluation Report, groundwater was encountered in the 20 borings (except BH-77), drilled down to depths varying from 17 m to 47 m.

- PM_{10}, settled dust and SO_2 measurement values comply with limit values of both national and WHO standards. On the other hand, NO2 measurement results are slightly exceeds the yearly targeted limit value due to the heavy duty of O4 highway. Monthly monitoring of ambient NO2 levels will provide a robust description of the baseline conditions for the ambient levels of NO2 in air in the project area of influence.
- The baseline measurements indicated that day time noise levels are between 44.7 – 57.1 dBA and except the result in N(15)-3, measured noise levels are above 55 dBA (IFC day time limit) according to 15 minutes measurements. Day time and night time baseline measurements according to 24 hours measurements vary between 61.2 – 72 dBA and 57.7 – 72 dBA respectively and these results are higher than the IFC standards of 55 dBA and 45 dBA
- Traffic routes providing connection to the Project Site are single-lane, paved roads in good condition. During the construction and operation period of the Project the existing roads will be used.

8.2 Biological components

Study area for this component is presented in Figure 7.

A **literature research** was performed focused on the broader Study Area in order to document species and habitat types potentially present in the study area. Scientific literature and “grey” literature were considered in order to give an overview of the vegetation occurring in the area. The literature survey output is presented in APPENDIX H:

A **field survey** was conducted on March 27th (2015) in the study area in order to confirm the habitats and identify the presence of flora and fauna species with particular regard for characteristic, exotic, threatened or protected species. Analysis of flora species assemblages helped to confirm the habitat classification and the potential for hosting fauna species. A list of flora species was created from these field surveys and their global and national conservation status Studies on fauna were supported by literature research and incidental field observations during the field survey. APPENDIX L includes the findings of the field survey.

8.2.1 Baseline

8.2.1.1 Terrestrial Flora and Vegetation

Studies on terrestrial flora and vegetation are supported by literature research and incidental field observations during the field survey that took place in March 27th (2015).

No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed or in the LSA. The species present are influenced by anthropogenic disturbances (grazing, discharge of construction waste, pollution, reforestation with exotic species).

The area surrounding the site is heavily urbanized and the residual green areas are used as urban parks and recreational areas. Some exotic and ornamental species were planted and are now established in the area especially along roads and main paths. Grazing also occur in the area. The East side of the footprint in particular is affected by discharge of construction waste.

Based on the characteristics described above, this component is estimated to have a low sensitivity in the Study Area.

8.2.1.2 Terrestrial Fauna

Studies on fauna are supported by literature research and incidental field observations during the field survey that took place in March 27th (2015).

No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed or are expected to be present in the LSA. The only threatened species potentially present is the common tortoise (*Testudo graeca)* listed as vulnerable (VU) by IUCN. Numerous species potentially present in the region are also listed in Appendix II and III of Bern Convention and Appendix I, II or II of M.A.K. decisions.

It should be noted that populations or individuals of the fauna species that could occur in or visit the Study Area are already impacted by anthropogenic disturbances such as urbanization, human presence, discharge of construction waste, grazing and agriculture. Therefore the presence of sensitive species in the Study Area is considered highly improbable.

Based on the characteristics described above, this component is estimated to have a low sensitivity in the Study Area.

8.2.1.3 Habitats and Biodiversity

The habitat types present in the Study Area were mapped based on satellite imagery and based on the data collected during the site survey performed on March 27th 2015. The area of each habitat type was calculated and is presented in Table 14 and Figure 15.

The following habitat types were identified in the LSA:

- seminatural Euxinic vegetation;
- Mediterranean maquis;
- park/garden;
- agriculture;
- urbanized.

Table 14: area in hectare and percentage of each habitat type in the LSA

Habitat Type	(ha)	(%)
seminatural Euxinic vegetation	35.54	5
Mediterranean maquis	67.23	10
park/garden	36.07	5
agriculture	118.27	18
urbanized	417.22	62
Total	*674.33*	*100*

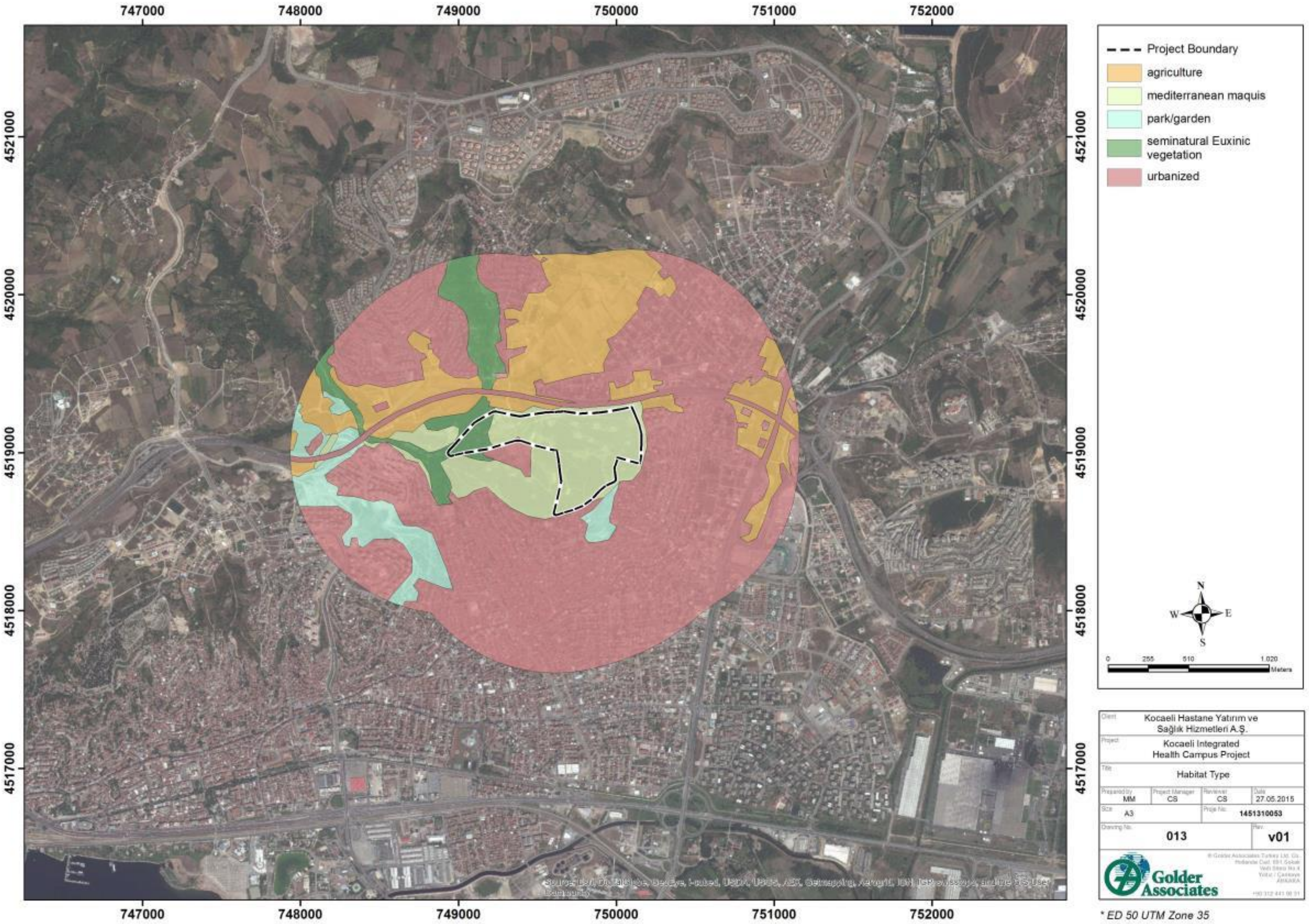


Figure 14: Habitat types mapped within the LSA

Figure 15: seminatural Euxinic vegetation (top left), Mediterranean maquis (top right), urban park area (bottom left), dumping of construction material in a degraded area (bottom right)

The Study Area is located in a densely populated area, and most of its extension in occupied by urban areas (62% of the LSA).

In the Biçki River valley bottom, in presence of deeper and more humid soil, the natural vegetation remaining is identified as "Seminatural Euxinic broadleaf deciduous forests" (5% of the Study Area). These areas are integrated in a urban park and are extensively used by local for recreational activities, planted trees and maintained green areas coexist with natural relict vegetation in different zones.

Mediterranean shrubland dominates the western part of the LSA uphill (10% of the Study Area). This type of habitat is probably the result of degradation of former Mediterranean forest by logging, overgrazing, and disturbance by major fires.

Agricultural areas (18% of the LSA), as well as a urban park and gardens (5% of the Study Area) are also present in the Area.

At present the main anthropogenic disturbances that impact on the natural Mediterranean vegetation are disposal of construction waste and moderate grazing (horses were observed in the area), while recreational activities and the presence of a manicured urban park are the main disturbances on Euxinic vegetation. The area was also used in the past for military purposes and some strategic constructions are still visible. However, it represent one of the few green areas with relict natural vegetation left in a heavily urbanize part of Izmit.

Based on the characteristics described above, this component is estimated to have a medium sensitivity in the LSA.

8.2.2 Protected areas

One protected area was identified in a within a buffer of 20 km from the Project. **Beskayalar Nature Park** (1,154 ha) is located **17 km** South of the Project area. Nature Parks are areas that contain characteristic vegetation and wildlife features and are particularly suitable for recreational activities. The area of Beskayalar has a great scientific and educational importance because of its characteristic forest vegetation surrounding the Sicakdere and Kirazdere rivers valleys. Wolves, bears, jackals, foxes, pigs, rabbits and squirrels inhabit the area.

In addition to this protected area, the presence of two areas identified for their biodiversity value as **Key Biodiversity areas (KBA)** and **Important Bird Area (IBA)** should also be mentioned since they can be considered “priority biodiversity features” (EBRD 2014). These areas are described below.

The Key Biodiversity Area **Kocaeli Hills** is located **2 km** North West of the project. Key biodiversity areas are places of international importance for the conservation of biodiversity.

Sapanca Lake (4,700 ha) located **15 km** south east of the site is considered a Wetlands of International Importance (Ramsar) and an Important Bird Area (IBA). This freshwater lake (max. depth 61 m), formerly connected to the Sea of Marmara and fed by the Sakarya river, is important for wintering wildfowl such as Red-crested Pochard (*Netta rufina*), Common Pochard (*Aythya ferina*), Pygmy Cormorant (*Microcarbo pygmaeus*) and Common Coot *(Fulica atra).* Arable land, fruit orchards and extensive *Populus* plantations surround the lake. Narrow reedbeds (*Phragmites*) fringe most of its shores; only at the eastern end does substantial marsh vegetation occur. Lake water is abstracted for industrial use. The conservation status of this area is considered as very unfavourable according to IBA monitoring in 2013.

Based on the characteristics described above, this component is estimated to have a high sensitivity.

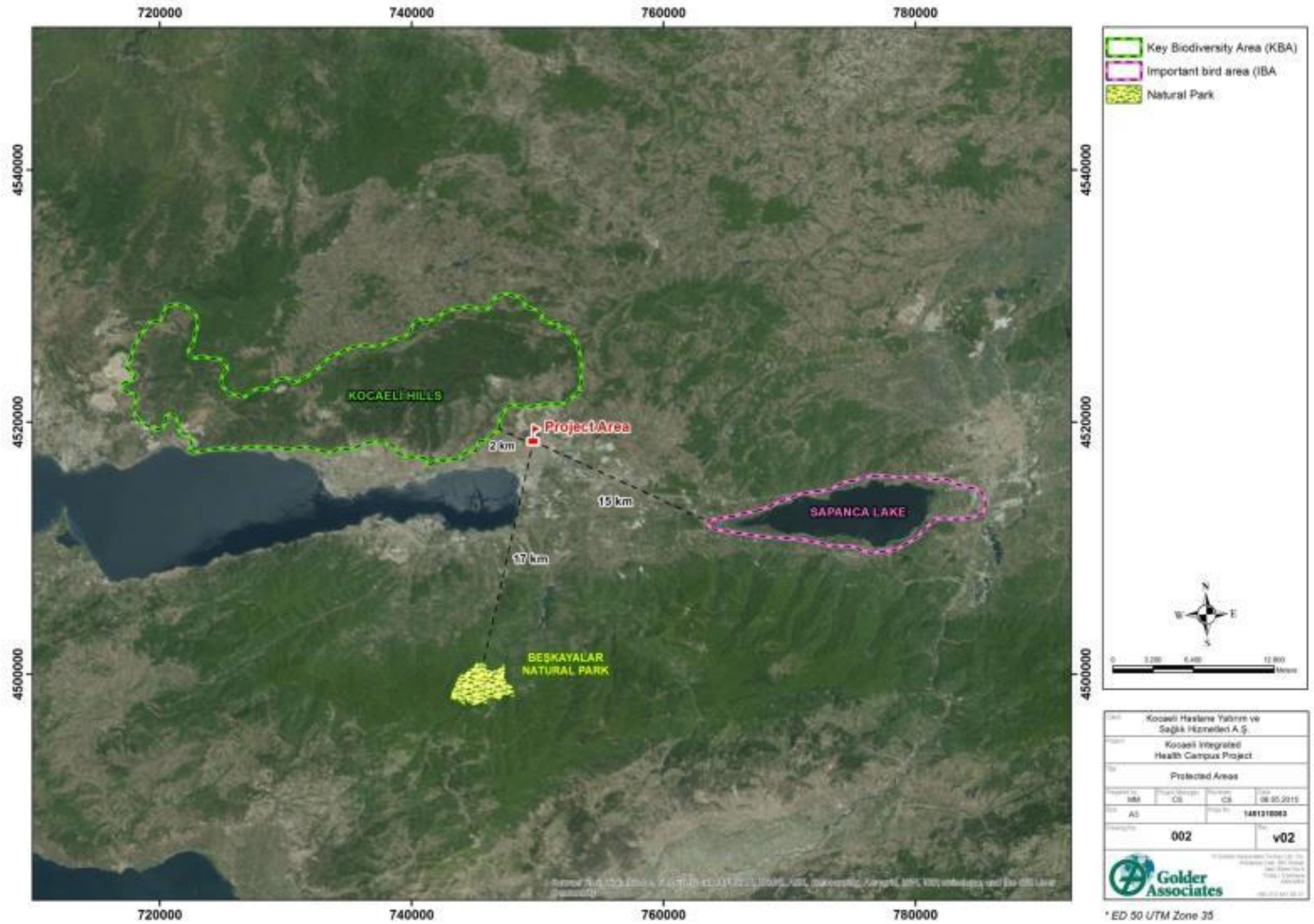


Figure 16: Protected Areas

8.2.3 Conclusions

- No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range flora and fauna species (IFC 2012) were observed or in the Study Area. The species present are influenced by anthropogenic disturbances (grazing, discharge of construction waste, pollution, reforestation with exotic species).The only threatened species potentially present is the common tortoise (*Testudo graeca)* listed as vulnerable (VU) by IUCN. Numerous species potentially present in the region are also listed in Appendix II and III of Bern Convention and Appendix I, II or II of M.A.K. decisions.

- It should be noted that populations or individuals of the fauna species that could occur in or visit the Study Area are already impacted by anthropogenic disturbances such as urbanization, human presence, discharge of construction waste, grazing and agriculture. Therefore the presence of sensitive species in the Study Area is considered highly improbable.

- At present the main anthropogenic disturbances that impact on the natural Mediterranean vegetation are disposal of construction waste and moderate grazing (horses were observed in the area), while recreational activities and the presence of a manicured urban park are the main disturbances on Euxinic vegetation. The area was also used in the past for military purposes and some strategic constructions are still visible. However, it represent one of the few green areas with relict natural vegetation left in a heavily urbanize part of Izmit.

- **Sapanca Lake** (4,700 ha) located **15 km** south east of the site is considered a Wetlands of International Importance (Ramsar) and an Important Bird Area (IBA). This freshwater lake (max. depth 61 m), formerly connected to the Sea of Marmara and fed by the Sakarya river, is important for wintering wildfowl such as Red-crested Pochard (*Netta rufina*), Common Pochard (*Aythya ferina*), Pygmy Cormorant (*Microcarbo pygmaeus*) and Common Coot *(Fulica atra).* Arable land, fruit orchards and extensive *Populus* plantations surround the lake. Narrow reedbeds (*Phragmites*) fringe most of its shores; only at the eastern end does substantial marsh vegetation occur. Lake water is abstracted for industrial use. The conservation status of this area is considered as very unfavourable according to IBA monitoring in 2013.

8.3 Social Components

The study area for social components is decided based on administrative units, considering that statistical information is usually aggregated and presented according to these boundaries. Study area for this component is presented in Figure 7.

In the case of the present project information has been collected on an area that extends to Greater Kocaeli with a specific focus on the neighbouring settlements around the project site for primary data collection and is determined as follows:

- Greater İzmit Municipality area
- Yeşilyurt Quarter
- Tavşantepe Quarter
- Malta Quarter
- Gündoğdu Quarter
- Bekirdere Quarter
- 28 Haziran Quarter

When available, information is also collected at a national level, to allow comparisons between the local context and the overall situation in Turkey.

The first degree impacted and second degree impacted quarters are identified before the data collection studies have started in the light of the planned project activities.

The first degree impact areas are marked with red and the second degree impact areas are marked with blue. Yeşilyurt and Tavşantepe neighbours is are close the transportation route to the project area therefore estimated to be directly impacted by the project activities and identified as first degree impact area. Figure 17

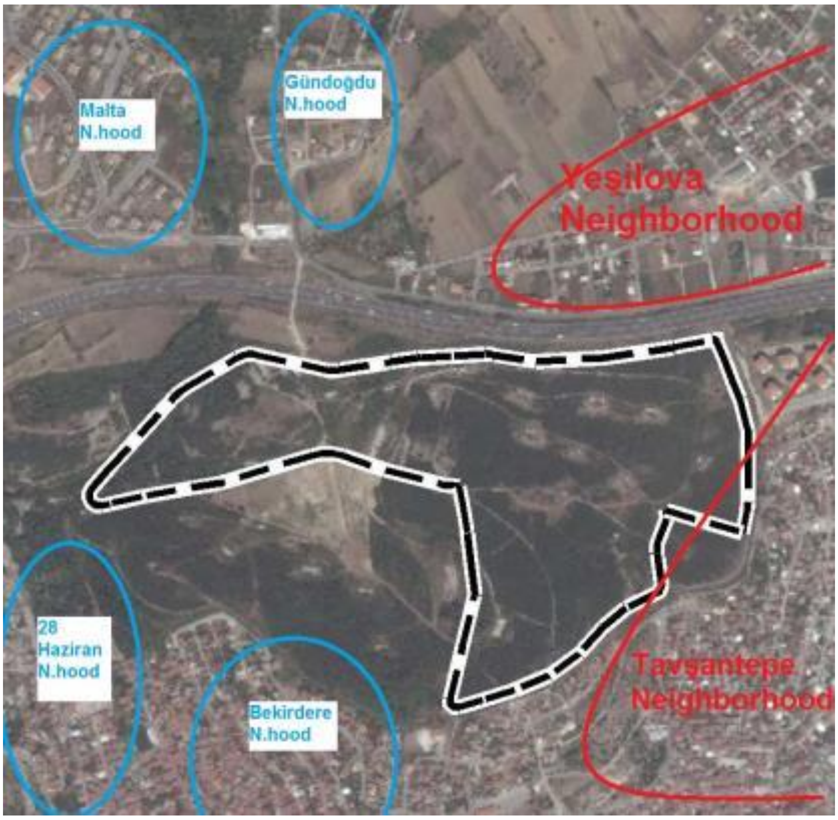


Figure 17: First degree and second degree impacted quarters

When available, information is also collected at a national level, to allow comparisons between the local context and the overall situation in Turkey.

A portion of baseline socioeconomic data was collected through desktop, as significant amount of literature secondary socio-economic data on the study area can be found through these means.

In particular most of the information was found through;

- Turkish Statistical Databases, http://www.tuik.gov.tr
- Kocaeli Chamber of Commerce records, www.koto.org.tr and
- Kocaeli Municipality records, http://www.kocaeli.bel.tr

Desktop research is primarily focused at gathering hard data and statistics that are then validated through the collection of qualitative information from field studies.

Considering the social context and the nature of the project and in addition to the secondary data the qualitative primary baseline information has been collected at district and quarter level by using four different means of site data collection. During the socioeconomic baseline data collection, following consultation activities were conducted with the project stakeholders between 12th and 15th of April, 2015:

<u>Key informant interviews with various stakeholders;</u>

Interviews have been performed with the following groups of stakeholder using customized in-depth questionnaires (See APPENDIX C).

- Kocaeli Provincial Directorate of Health
- Development Directorate and Planning Directorate of Kocaeli Municipality
- District Health Directorate of İzmit
- Kocaeli Turkish Medical Association
- Directorate of Hospitals Association
- İzmit District Municipality

In-depth interviews focused on economic activities

In depth interviews have been carried out with stakeholders engaged with economical activities in the local study area. The most important group under this category are the Tavşantepe and Yeşilova Quarter.

The stakeholders contacted in Tavşantepe and Yeşilova quarter are;

- Tradesmen of Gündoğdu and Yeşilova quarter
- Authorities of Hacı Bektaş Veli and Yarbay Refik Cesur Secondary School
- Women Social Wellnes Center
-

Community level interviews with quarter people,

Information on the socioeconomic status at local study area has been collected through interviews with the following local stakeholders using community level questionnaires (see APPENDIX C).

- Tavşantepe Quarter Mukhtar
- Yeşilova Quarter Mukhtar
- Gündoğdu Quarter Mukhtar
- 28 Haziran Quarter Mukhtar
- Bekirdere Quarter Mukhtar
- Malta Quarter Mukhtar

During the interviews the concerns of the stakeholders on the potential impacts of the project have also been collected.

Focus groups

Focus group meetings where the attending stakeholder can interactively engage to the meeting, have also been conducted with the following groups. (See questionnaire for focus group discussions in APPENDIX C.):

-
- Yeşilova Quarter men
- Yeşilova Quarter dolmuş[20] drivers

Engagement with the project sponsor

[20] Private public transportation means similar to bus services by individual minivan drivers

SPV has been requested through a filling a specific questionnaire to provide information on the recruitment policy and the social and environmental management plans to be prepared to minimize the impacts of the project. (see APPENDIX C)

8.3.1 Socio-economic conditions and employment issues

Kocaeli is the second biggest industrial metropole after İstanbul in Turkey by providing significant contribution Turkish Industrial Production and has held this position for the last 20 years.

Kocaeli holds the second place in importing and third place for exporting among the provinces in Turkey. Kocaeli is a developed industrial province and is being developed with Organised Industrial Zones, Free Zone and Technopark projects have been chosen as a production base by international automotive companies. .However the employment rate is 10,1 % which is above national unemployment rate of 9,7 % by 2013.(TÜİK, 2013).

Only 3% percent of the local economy is based on agricultural activities. The agricultural lands are fully dedicated to industrial activities.

There are 12 districts in the province. The central district has the highest population.(Kocaeli Municipality, 2015) as seen in Appendix L

The IHC project area is surrounded by Tavşantepe, Yeşilova, Gündoğdu, Malta, 28 Haziran ve Berkirdere Quarters (Figure 17).

Tavşantepe Quarter

Tavşantepe is the most populated of these quarters as seen in APPENDIX L..

The population in Tavşantepe neighboured is 15000 and the household number is 600 as stated by the Mukhtar. The Romany community of 1000 people, residing on seasonal basis in the quarter, can be added to these figures. There is a Romany community living at shanty houses and there will not be urban transformation for the place where roman community lives.

Figure 18: Romany community housing close to project area

The population distribution among age groups is presented in APPENDIX L. As seen in this table the majority of the population is under 35 years of age.

Mukhtar stated that the community living in the quarter can be considered to be in low socioeconomic income group. Approximately half of the population is elementary school graduate and 10% of the population has university education.

There are 150 handicapped in the quarter that can be considered as vulnerable groups.

There are four mosques and one Cem Evi (house of the religious ritual and gathering for Alevis*).*

Average household income is 1400 TRL. Mukhtar listed the following types of workforce available in the quarter that can be recruited during construction of the project.

- Cook/catering
- General construction
- Road repairmen workers
- Logger
- Security personnel
- Heavy vehicle operator
- Heavy vehicle driver
- Stones man
- Administrative office personnel
- Driver

Yeşilova Quarter

Mukhtar stated that the population is 17000 and number of households in the quarter is 2700. 1000 of this population is below 18 years of age. In the last four years the new residential areas have been developed in the quarter and the population has increased. The agricultural and rural land in the quarter has been transformed to urbanised land in the last 20 years with the extension of the province towards Yeşilova as a result of the population migration to Kocaeli from different parts of the country.

There are 10 handicapped and 8 single and household leader women in the quarter that can be considered as vulnerable groups. . Mukthar also stated that that 60% of the hoses are owned by the residents and 40% of the houses are rented by the residents.

There is limited agricultural and animal husbandry activities in the region mainly far away from the project area. Some of the families use the woodland around the project area for the supply of firewood though the woodland does not have large potential for such kind of a supply.

There is private owned land between the project site and the highway with 70 wall nut, 20 hazelnut and 15 fruit trees.

8.3.1.1 Conclusions

The presented baseline data for socioeconomic conditions and employment issues point out that;

- The project site is bounded by densely populated urbanised residential area.
- There is a Romany community residing at shanty houses seasonally in Tavşantepe quarter in the close vicinity of the project area. According to the communiciations between SPV and Kocaeli Municipality, the place that roman community lives will not be included for municipality development plans.
- The sensitivity of the socio-economic and employment context is reported to be medium.

8.3.2 Social Services and Facilities

8.3.2.1 Social Services

The project site is located very close to a recreation/picnic area. There is a stadium and a social facility for women close to the project site in Figure 19.

Other public services available in the quarters around the project site are provided in Table 15.

Figure 19: Social facilities around the project site

Table 15: Social services in the quarters around the project site

Services	Yes	No

Transportation	X	
Public Health Service	X	
Elementary School	X	
Middle School	X	
High School		X
Mosque	X	
Cemetery	X	

8.3.2.2 Education

The literacy rate in Kocaeli is 95.5% which is slightly higher than national average of 94.2%. (TUIK,2010). (See APPENDIX L).

The schooling rate at elementary school level is 99.57 which is in line with national average. The schooling rate at middle school is 86.18% which is higher than national average of %76.65. (TUIK, 2014).

The school types and numbers together with the student and teacher numbers are presented in APPENDIX L.

Yarbay Refik Cesur Middle School in Yeşilova and Haci Bektaş Veli Middle School in Tavşantepe are the two schools close to the project site among the educational facilities around the project site. These schools are visited for consultation purposes during the socio-economic baseline surveys since these schools will be the most sensitive facilities to the potential project impacts.

Figure 20: The schools in closes distance to the project site

8.3.2.3 Health Services

A detail baseline information on the existing health facilities are given in section 1.2.

8.3.2.4 Conclusions

- There is a public recreation centre (Cephanelik Mesire Alanı) close to the project site.

- There is one educational facility, Hacı Bektaş Veli Middle School, close to the project site.
- The sensitivity of social services context is reported to be medium.

8.3.3 Infrastructure

8.3.3.1 Transportation

Kocaeli is strategically located on the important road, marine and railway routes combining Europe to Asia . The province is situated close to big metropoles and has connection to Blacksea and Marmara Sea. These location characteristics have become important factors on the development of the Province as an industrial, logistics centre and transportation hub. Kocaeli is situated on the main highways and railways connecting İstanbul to Ankara. İstanbul Ataturk İnternational Airport is 90kms and Sabiha Gökçen Airport is 50kms away from the city centre. There is also one local/domestic airport; Cengiz Topel in the city.

The transportation system in Kocaeli Province is composed of public transportation system and the highway and road network.

The public transportation system has the following service components:

- Maritime services
- Bus services
- Dolmuş services

Access to project area from various locations in Kocaeli by using the public transportation is only possible via a combination of these systems.

The closest maritime services port is İzmit Port as seen in Figure 21. There is a station of Ankara-İstanbul High Speed rail way at the same location.

Figure 21: Maritime Services in Kocaeli Province- İzmit Port (showing the Ankara-İstanbul High Speed Railway Train Station)

It is possible to reach the Kocaeli IHC by public bus services through the route below .

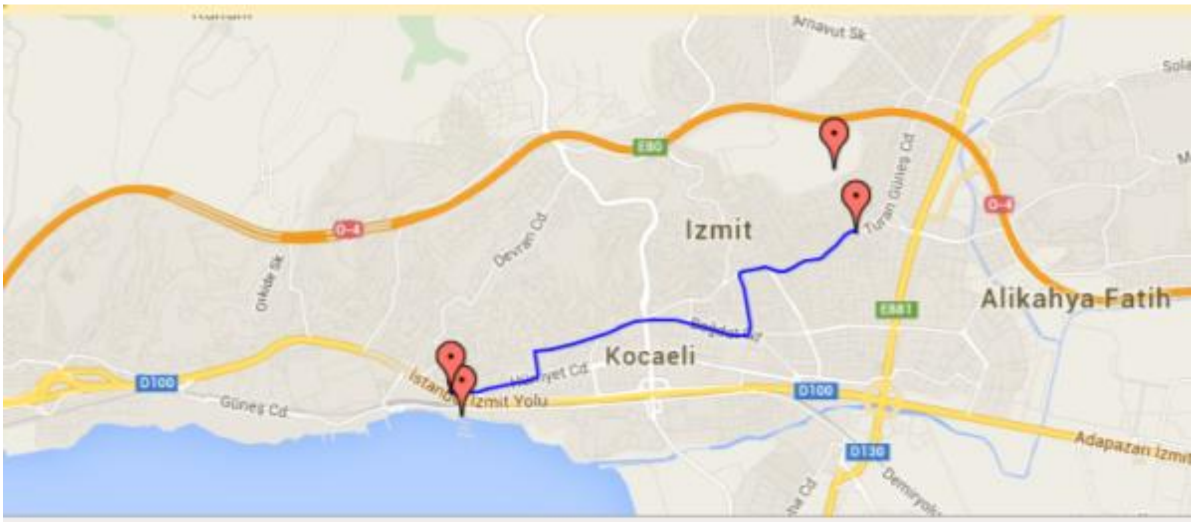


Figure 22: Bus services from İzmit Port and Train Station to -project site

There is the central intercity bus terminal close to Kocaeli IHC from where transportation is possible by bus to the vicinity of Kocaeli IHC.

Figure 23: Kocaeli Bus Terminal close to project area

8.3.3.2 Other Infrastructure

The waste management system in Kocaeli municipality area has the following components;

- Collection at source and transportation of waste to the transfer stations which is under the responsibility of the district authorities.
- Transportation of waste from the transfer station to the final disposal area by the municipal authority.

There are two waste disposal facility serving Kocaeli Municipality area both operated by İZAYDAŞ (İzmit Municipality Waste Treatment, Collection and Incineration Company) :

- Çiçektepe Mevkii Landfill Area for domestic wastes, non-hazardous industrial wastes, waste sludges
- Solaklar Köyü Mevkii Area

The medical waste produced by any facility in the city of Kocaeli is transported to İZAYDAŞ Medical Waste Sterilisation Facility licenced by Kocaeli Municipality.

As per the situation in quarters around the project area Table 16 summarizes the general infrastructure conditions.

Table 16: Status of public infrastructure in the quarters around the project site

Infrastructure	Yes	No
Drinking and consumption water	X	
Electricity	X	
Waste disposal	X	
Shopping facilities	X	
Transportation	X	
Internet	X	
Telephone	X	

8.3.3.3 Conclusions

In the light of the baseline information presented above on infrastructure following conclusions can be drawn;

- Access to project site is at the moment possible by combination of public transportation means.
- Other infrastructure; electricity network, communication, water and wastewater is available in Project site and surroundings
- There is already a management system for the disposal of medical wastes in Kocaeli.
- The sensitivity of infrastructure component is reported to be medium..

8.3.4 Land use

The approximately 35.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area".

The area was used in the past for military purposes and the Cephanelik Mesire Alanı urban park is located south of the Project Area. There is no ongoing industrial or agricultural activity at the project site. There has been occasional grazing in the project site.

At the present time, while this report is being prepared, there is no housing on the Project Area.

The O4 highway passes through the North of the Project Area and the Campus is connected to the North side of the city through the Zübeyde Bridge. The previous owner of the Site was Undersecretiat of Treasury.

The process for the official confirmation of the protection of the military remains has started. The Kocaeli Regional Directorate of Cultural Heritage (“RDoCH”) has stated in the official communication (APPENDIX O) that the project can be executed in the area defined in the official communication but in accordance with the provisions listed in the RDoCH’s response. The excavation and has to be conducted under the supervision of the Museum Directorate.

The Google Earth view of the Project site and layout of the Project are given in Figure 4 and Figure 5. The Site Photographs are provided in APPENDIX B.

The sensitivity land use context is reported to be low.

8.3.5 Cultural Heritage

Study area for this component is presented in Figure 7.

In order to collect baseline data on possible archaeological or immovable cultural assets within the project area, the following studies were conducted;

- desktop studies
- field works, and
- meetings with related public authorities.

The details of the data collection and field work are presented in APPENDIX L.

8.3.5.1 Baseline Study Results

The field work was conducted on 06.03.2015. As the result of desktop studies and field works no cultural assets were encountered within the project area. Based on the inventories of the relevant preservation board and the literature survey, no archaeological site has been identified in the vicinity of the project area.

On the other hand, “old military armoury buildings” were observed within the project area. According to the Kocaeli Regional Board for Cultural Assets these buildings are not registered as cultural assets. However, with the decision 1920[21] dated 17.02.2015 of the preservation board, it was decided to initiate the registration process for these buildings. All excavation and earthworks have to be conducted under the supervision of Archaeology and Ethnography Museum of Kocaeli.

Figure 24: Old Armoury – Military Buildings

Due to inactive military buildings and vegetation in the area, a full observation of the area was not possible. Therefore, in case of an encounter with a cultural asset during any physical intervention such as scalping, foundation excavation etc. in the Project area, it is recommended to cease all activities and inform the Kocaeli Archaeology and Ethnography Museum[22] as dictated by **“Article 4: Obligation to Inform of Law on Protection of Cultural and Natural Assets, Law No. 2863,”**.

8.3.5.2 Conclusions

The following conclusions can be drawn in the light of the collected baseline information in the area;

- No movable or immovable cultural assets have been identified within the project area.
- The closes archaeological site to the project area is at 920 m west of the Project area.

[21] Annex: Decision 1920 of Kocaeli Board for Preservation of Cultural Assets dated 17.03.2015.

[22] Kozluk mahallesi.İzmit Kocaeli 41200 Phone:0 262 321 22 74

- According to the Kocaeli Regional Preservation Board for Cultural Assets, old military buildings were not registered as cultural assets. Construction works would be conducted in coordination with the Board of Cultural Assets

9.0 IMPACT ASSESSMENT

Conformance Table - Impact screening and definition of the valued environmental and social components

Theme/Sub-Theme	EBRD PRs	IFC PSs
Environmental and social assessment/ Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1
Environmental and social assessment/ The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1
Identification of Risks and Impacts Environmental and social risks and impacts are identified in the context of the project's area of influence.	PR 1	PS 1
Mitigation Define mitigation measures in line with mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment.	PR1	PS 1
Biodiversity Conservation Identify and characterise, the potential direct and indirect project-related risks and impacts on biodiversity.	PR 6	PS 6
Land Acquisition and Involuntary Resettlement and Economic Displacement Avoid or minimize physical and/or economic displacement, when displacement cannot be avoided, displaced communities and persons will be offered compensation	PR5	PS5
Cultural Heritage Cultural heritage sites are identified through consultation, literature survey and site studies, protection measures are identified	PR 8	PS 8

9.1 Physical components

9.1.1 Geology and Geomorphology

9.1.1.1 Impact Analysis

9.1.1.1.1 Construction phase

Due to the nature of limestone karstic cavities can be encountered at the Project Area. Site soils are not identified as collapsible so a relevant problem is not foreseen in the Project Area[23].

[23] The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015

The major geo-hazard, expected during all phases of the Project, would be an earthquake. The earthquake zoning map of Kocaeli Province according to the Map of Turkey Seismic Zones is given in Section 8.2. Based on the seismic zone classification of Turkey, Kocaeli Province is in the 1th and 2nd degree seismic zone[24]. The Project Area is located in the 1st degree seismic zone which is the most active zone in Turkey where numerous historical earthquakes were recorded.

In the event of earthquakes, during the all phases of the Project, significant impact on the community and the workers' health and safety, such as accidents, fire etc., may arise. Additionally, an earthquake may cause adverse impacts on the environment, such as spills, leaks and erosion.

During the construction operations in the Project Area, the project design and engineering will comply with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454). The Regulation requires certain parameters to be determined prior to the construction. These parameters, determined via the geological and geotechnical investigations for the Project Area are:

- Building significance coefficient (I): 1.5
- Soil Type: B
- Local soil class: Z2
  - Ground spectrum periods: TA= 0.15 TB= 0.40
- Effective ground acceleration coefficient (Ao): 0.40 (1st degree earthquake zone)

The Project design and construction operations will take into account the above mentioned parameters and also other specific regulatory requirements related to construction and seismic design at 1st degree earthquake zone.

The impact is mainly related to the changes inflicted on the current morphology of the area due to the earthworks and excavations, and for the site preparation (scarified, excavated, filled with proper material, and flattened) and the construction of the buildings' foundations.

9.1.1.1.2 Commissioning and operational phase

As a result of the impact screening no impacts on the geology and the geomorphological components are expected during the commissioning and operational phases.

9.1.1.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project site and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The impacts during decommissioning phase are likely to be similar to the construction phase. The same considerations described for geology and geomorphology during the construction phase would be applicable to the decommissioning phase as well.

9.1.1.2 Mitigation measures

The mitigation measures, for the impacts on the geology and geomorphology are listed below for the construction and the commissioning/operational phases.

- Measures incorporated in the Project Design:
  - The Projects design and construction operations will take into account the parameters, for design at a 1st Degree Earthquake Zone, mentioned in Section 9.1.1.1.1;

---

[24] The Map of Turkey Seismic Zones published by Prime Ministry; Disaster & Emergency Management Authority; Department of Earthquake

- The Projects design and construction operations will take into account all relevant regulatory requirements for construction and seismic design at a 1st Degree Earthquake Zone;
- The Projects design and construction operations will take into account the Seismic Hazard Assessment Report for Kocaeli Integrated Health Campus Project, December 2014;
- The foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized.

- General mitigation measures:
  - The flattening and excavation operation will be minimized to the extent possible in order to limit the morphological disturbances;
  - Part of the removed material might be re-used as fill at the Project Area, provided that it presents the suitable geotechnical characteristics, in order to limit the use of raw material.

9.1.1.3 Residual Impacts

The residual impacts on the geology and seismology component after the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 17: Residual impacts on geology and seismology components

Construction phase	Commissioning and operational phase
negligible	negligible

9.1.1.4 Monitoring

No specific monitoring activities are required for this component.

9.1.2 Soil and subsoil characteristics

9.1.2.1 Impact Analysis

9.1.2.1.1 Construction phase

During the construction phase, impacts on the soil and subsoil characteristics component will be mainly associated to top soil and lower soil removal, pollutant emissions to the soil and the occupation of land.

The **project actions** related to the abovementioned impact factors are surface levelling and grading, rock fragmentation, temporary stockpiling of material, transport of construction material, construction of the facilities and disposal of waste deriving from construction (including excavated soil).

In the construction phase, activities related to civil engineering will involve excavation and removal of top and lower soil. It is planned that the entire Project Area would be excavated at varying depths between 1.36 m to 38.4 m during the construction. The main impact will be due to the soil removal for the dismantling and lowering of the natural areas prior to the construction of new facilities.

Potential pollutant emissions to the top soil can be caused by; pollution from vehicles such as oil spills, accidental spill of any chemicals or hazardous materials that might be used during the construction, pollution caused by temporary storage of hazardous materials and/or wastes, emissions from truck traffic and transport of construction materials and excavated materials. Hazardous waste would include small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill clean-up materials from oil and fuel spills. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly conducted, could induce a release of pollutants into the ground. Also, accidental leakages from machinery and vehicles, potentially polluted water that is not properly collected or managed can also pollute the top soil/soil.

A temporary occupation of land during the construction activities will be necessary for the camp area and to stock excavation or construction material. The planned camp and temporary stockpiling areas will be located within the boundaries of the Project Area. The construction of new roads is not planned; instead existing infrastructures will be used with the enlargement of the roads.

9.1.2.1.2 Commissioning and operational phase

During the commissioning and operational phases, impacts will be mainly associated to occupation of land, pollutant emissions to the top soil and increase of artificial land use.

The **project actions** related to the abovementioned impact factors are temporary storage and disposal of waste (including medical and radioactive wastes), presence of fuel storage tanks and operations of the facilities. Details of medical and radioactive waste management are provided in Appendix B.

The presence of buildings and facilities will increase the artificial surfaces, as the structures are planned to be constructed on undeveloped land. Occupation of land will occur due to the construction of new infrastructure and road enlargement.

Impacts on soil/topsoil might arise from pollution due to accidental leakages of hazardous materials/products from equipment or chemicals and hazardous wastes/materials storage areas. There will be diesel/fuel storage tanks located in the Project Area. The generators and boilers will be fed by these tanks in case of any shortage. The total amount of the stored diesel/fuel will be designed to suffice the IHC’s needs for three days. The pollutant emissions in the soil can also be caused by the leakage from the diesel/fuel storage tanks if the tanks are not properly constructed or maintained or damaged by geo-hazards.

9.1.2.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project site and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The site is expected to be restored for its future use. The impacts during the decommissioning phase are likely to be similar to the construction phase and the same considerations described for soil and subsoil during the construction phase would be applicable to the decommissioning phase as well.

The transfer of construction and excavated materials by trucks will cause emission of dust and pollutants on soil. The dust emissions will be increased during the demolition of the buildings, surface levelling, grading and temporary stockpiling of the material.

At the end of the decommissioning phase, the soil restoration in the areas, once occupied by buildings and infrastructures might have an overall positive impact on the component.

9.1.2.2 Mitigation measures

The mitigation measures are listed in the following for the construction and the commissioning/operational phases.

- Measures incorporated in the Project Design:
  - The foundations’ footprints and depths have been properly dimensioned, hence the excavations and the consequent physical-mechanical disturbances will be minimized;
  - The Project will comply with relevant legal and project safety requirements to avoid leakages from hazardous chemicals and liquids storage facilities on-site;
  - The areas, where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);

  - The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.

- Specific mitigation measures for soil:
  - If soil contamination is suspected during construction related excavation, a detailed assessment should be conducted in order to determine if there are any contaminants sources present within the site or in the near vicinity and the provisions of "Regulation on Soil Pollution Control and Point Source Contaminated Sites" originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704, and became effective as of 08 June 2015, should be implemented;
  - In case that results of a soil assessment show the compliance with site-specific soil quality limits set by the regulation, materials coming from levelling activities could be excavated, transported, and used in the construction of embankments and/or backfill, after an assessment of physical properties;
  - If the soil is contaminated, it is recommended to work with the local regulatory agencies to select solutions for treatment or disposal, follow the provision of the abovementioned regulation and in general to follow a standard practice:
    - avoid or minimize temporary stockpiling of contaminated soils or hazardous material;
    - if temporary stockpiling is necessary:
      - isolate the stockpile with impermeable liner or tarps;
      - install a berm around the stockpile to prevent runoff, from leaving the area;
      - do not stockpile in or near storm drains or water bodies or unconfined aquifer zones with high groundwater elevation.
    - if some construction areas will be located onto vegetated and uncontaminated land, the topsoil will be temporarily removed and properly stockpiled to be returned to the stripped area upon completion of the works;
    - In order to reduce loss of top soil due to project actions during the construction phase, removed topsoil could be stored in an appropriate area in the Project Area, to be used for landscaping after the construction (As required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406);
    - if some vegetated/uncontaminated land is expected to be permanently removed (e.g. onto the new buildings' footprints), the topsoil should be properly stored (As required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406) and re-used for reclamation of nearby artificial sites.

- General mitigation measures:
  - Construction site will be minimized to the smallest extent possible in order to meet Project's works and activities;
  - Excavations and soil/subsoil abstractions will be minimized as possible in order to meet the building design and construction requirements;
  - Part of the removed/excavated material might be re-used for fillings when it presents the proper geotechnical characteristics in order to limit the use of raw material;
  - Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;

- Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
- Impervious (concrete etc.) surfaces will be designated for the refuelling of the machinery/vehicles;
- Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil;
- Although the connection road from the Project Area exists and is paved; it is assumed that during the construction phase the road could be extended and could be partially unpaved. Concerning potential emission of dust and generation of pollution in top soil due to settled dust and traffic emissions, during the construction phase, mitigations measures could consist in the following:
  - Vehicle restrictions to limit the speed, weight, or number of vehicles;
  - Surface improvement, such as paving or adding gravel to the surface;
  - Surface treatment, such as watering.

9.1.2.3 Residual Impacts

9.1.2.3.1 Construction phase

The residual impacts on the soil component after the application of the above mentioned mitigation measures are (See APPENDIX J for details).;

Table 18: Residual impacts on soil component

Construction phase	Commissioning and operational phase
Low to negligible	Low to negligible

9.1.2.4 Monitoring

Following monitoring activities are foreseen for ensuring the implementation and effectiveness of the proposed mitigation measures:

- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training programs for spill response will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Soil quality monitoring:
  - Monitoring sites would be selected among areas in which critical actions or activities are planned;
  - Monitoring frequency will be high during construction to plan corrective actions at the initial stage of pollution;
  - During the operational phase monitoring would be conducted if deemed necessary.

- Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of hazardous and medical wastes are in line with the industry practices and regulatory requirements.

9.1.3 Hydrology and Surface Water Quality

9.1.3.1 Impact Analysis

9.1.3.1.1 Construction phase

Impacts on the hydrology and surface water quality component during the construction phase are related to hydrological change, surface water pollution and surface water run-off (**impact factors:)**.

Impacts could be due to the increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil), suspended sediments in surface water run-off and construction of the facilities. **(project actions)**

During the construction phase; drinking and potable water for the usage by workers would be provided from the city water network or external sources. In addition to these, there will be water needs for the construction activities such as dust suppression and concrete preparation. Construction of a groundwater well and groundwater abstraction for the Project is not planned.

The wastewater generation during the construction phase will consist of the domestic wastewater from the construction camp and wastewater from the construction works. During the construction phase, domestic wastewater would be collected in impermeable septic tanks and disposed according to the provisions of the Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) Article 32 and other relevant regulations. Domestic wastewater would be collected in leak-proof septic tanks and the septic tanks would be emptied periodically by a vacuum truck and disposed of to the wastewater sewage system.

The wastewater generation and water requirements during the construction are provided in APPENDIX B.

The surface runoff patterns in the Project Area would be impacted by the Project with the changes in the characteristics of the surface and the topography.

The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly conducted, could induce a release of pollutants onto the ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During the construction, such pollution can migrate with surface water run-off and reach the surface water body close to the Project Area.

Even though there are no plans to construct a groundwater well, drilling at a depth below the water table or dewatering or increase of water demand during the construction and operational phases could have potential impacts on the local hydrology. The impact related to artificial drainage systems has also been considered, as well as the potential pollution due to an inefficient management of water and wastewater.

9.1.3.1.2 Commissioning and operational phase

Impacts on this component during the commissioning and operational phases will be same as the construction phase and are related to hydrological change, surface water pollution and surface water run-off (**impact factors).**

Impacts could be due to increase of water needs, wastewater generation and disposal of waste deriving from construction (including medical and radioactive wastes (**project actions).**

Abovementioned three project actions for the operational phase are same as the construction phase. The main difference is the generation of medical and radioactive wastes during the operation phase.

The increase of water needs and waste water generation is detailed in the previous section (construction phase). The only difference is that, there would be a storm water (rain water) collection system constructed at the Project Area separate from the domestic wastewater network, once the hospital is commissioned. The storm water will be collected to reservoirs where it would be stored, filtered and reused for irrigation.(See APPENDIX B)

Medical and radioactive wastes and medical waste water would be generated during the commissioning and operational phase. The generation of these wastes could cause pollution if they are not managed, stored and discharged or disposed of properly in accordance with the legislation and the IFC requirements.(See APPENDIX B)

IFC requirements for Process Wastewater (medical wastewater) from Healthcare Facilities are as follows:

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

There will not be an incineration plant within the scope of the Project. The waste water will be generated during the operation of the project as detailed in Appendix B.

If wastewater is to be discharged to sanitary sewage treatment systems, the healthcare facilities would:

- ensure that the wastewater characteristics comply with
  - all applicable permits (regulations on surface water and groundwater pollution control, waste management, etc.)
  - as well as the requirements set forth by the receiving facility and,
- ensure that the municipal facility is capable of handling the type of effluent discharged, as discussed in the General EHS Guidelines of IFC.

9.1.3.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project site and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

Decommissioning phase activities are likely to be very similar to the construction phase. Absence of infrastructures could have a positive impact if the natural state of the land is recovered; however this is not likely as the area will probably continue to be used for other purposes.

9.1.3.2 Mitigation measures

The mitigation measures are listed for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
  - The Project will comply with safety requirements to avoid leakages from hazardous chemicals and liquids stored on-site;
  - At the construction areas without cover, ground will be seeded and the areas with highest slopes will be terraced to prevent erosion and sediment transport with surface run-off water;
  - The areas where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);

- The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.

- General mitigation measures:
  - During the construction phase, the surface drainage and site runoff, particularly heavy rain will be properly managed;
  - During the operational phase, the grids of the drainage system will be controlled and cleaned on a periodical basis, in order to prevent possible blockages during rain events;
  - Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
  - Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
  - Impermeable surfaces (concrete etc.)will be designate for the refuelling of the machinery/vehicles;
  - Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
  - Training on spill response, use of containment and clean-up equipment will be provided;
  - Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil.

9.1.3.3 Residual Impacts

The residual impacts on the hydrology component after the application of the above mentioned mitigation measures are (See APPENDIX J for details).;

Table 19: Residual impacts on hydrology component

Construction phase	Commissioning and operational phase
negligible	negligible

9.1.3.4 Monitoring

Following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- Design checks to ensure the measures listed above are in place will be undertaken;
- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Monitoring actions to verify compliance of wastewater with regulatory requirements will be required. A monitoring plan will be set-up to verify the contents of wastewater; samples will be collected per the regulation;
- Monitoring and resource management plan will be prepared to prevent impacts on water and wastewater due to additional waste water production and usage water needs. Plans will be prepared for minimizing the use of water during construction and operation and for minimizing the natural resource consumption;

- Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of hazardous and medical/radioactive wastes are in line with the industry practices and regulatory requirements.

9.1.4 Hydrogeology and Groundwater Quality

9.1.4.1 Impact Analysis

9.1.4.1.1 Construction phase

Impacts on this component, during the construction phase are related to the hydrogeological change and groundwater pollution (**impact factors).**

Impacts could be due to the following: increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil) and construction of the facilities(**project actions)**.

During the construction phase; drinking and potable water for the usage by workers would be provided from the city water network or external sources. In addition to these, there will be water needs for the construction activities such as dust suppression and concrete preparation. Construction of a groundwater well and groundwater abstraction for the Project is not planned.

Even though there are no plans to construct a groundwater well, drilling at a depth below the water table or dewatering or increase of water demand during the construction and operational phases could have potential impacts on the local hydrogeology.

During the construction phase, groundwater pollution is a potential impact, considering the presence of groundwater at the Site. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly managed could induce a release of pollutants onto the ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During construction, pollution may reach groundwater. No particularly hazardous material is predicted to be used during construction; accidental spills of pollutants from machinery/vehicles would reach groundwater only if the spilled material is in large quantities and the material is spilled over a period of time.

Contact with groundwater is expected since groundwater was encountered in the borings based on the Site Investigation and Geotechnical Evaluation Report. It is planned that the entire Project Area would be excavated at varying depths between 1.36 m to 38.4 m during the construction. Groundwater flow into the excavated areas during construction is possible.

In case groundwater inflow to excavated areas is encountered, groundwater should be discharged from working area; treatment, storage and disposal should be done according to regulation requirements after necessary analyses have been performed.

9.1.4.1.2 Commissioning and operational phase

Impacts on this component during the commissioning and operational phases will be same as the construction phase and are related to the hydrogeological change and groundwater pollution (**impact factors).**

Impacts could be due to the increase of water needs, wastewater generation and disposal of waste deriving from operation (including medical and radioactive wastes) **(project actions)**

The increase in water demand and waste water generation, and the actions to be taken are detailed in the previous section (construction phase).

Medical and radioactive wastes and medical waste water would be generated during the commissioning and operational phase. The generation of these wastes could cause pollution if they are not managed, stored and discharged or disposed of properly in accordance with the legislation and the IFC requirements.

IFC requirements for Process Wastewater (medical wastewater) from Healthcare Facilities are described in Section 9.1.3.1.2.

9.1.4.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project Area and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning of infrastructures could have a positive impact if the natural state of the land is recovered; however this is not likely as the area will probably continue to be used for other purposes.

9.1.4.2 Mitigation measures

The mitigation measures are listed for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
  - The Project will comply with safety requirements to avoid leakages from hazardous chemicals and liquids stored on-site;
  - The areas where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
  - The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.
- General mitigation measures:
  - Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
  - Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
  - Impermeable surfaces (concrete etc.)will be designate for the refuelling of the machinery/vehicles;
  - Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
  - Training on spill response, use of containment and clean-up equipment will be provided;
  - Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil.

9.1.4.3 Residual Impacts

The residual impacts on the hydrogeology component after the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 20: Residual impacts on the hydrogeology component

Construction phase	Commissioning and operational phase
negligible	negligible

9.1.4.4 Monitoring

Following monitoring activities are foreseen for ensuring the implementation and effectiveness of the proposed mitigation measures:

- Design checks to ensure the measures listed above are in place will be undertaken;
- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Monitoring actions to verify compliance of wastewater with regulatory requirements will be required. A monitoring plan will be set-up to verify the contents of wastewater; samples will be collected per the regulation;
- Monitoring and resource management plan will be prepared to prevent impacts on water and wastewater due to additional waste water production and usage water needs. Plans will be prepared for minimizing the use of water during construction and operation and for minimizing the natural resource consumption;
- Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of hazardous and medical/radioactive wastes are in line with the industry practices and regulatory requirements.

9.1.5 Meteorology and Climatology

9.1.5.1 Impact Analysis

9.1.5.1.1 Commissioning and operational phase

This section presents the assessment of the impacts that the project is envisioned to generate on meteorological and climatic characteristics by the emission of greenhouse gases during the operation phase.

Greenhouse gases (GHGs) include atmospheric gases that absorb and emit radiation in the thermal infrared spectrum, thus causing a warming effect on earth (greenhouse effect).

The greenhouse effect is primarily from CO_2 and water vapour, along with other trace gases in the atmosphere. A number of gases are typically considered as anthropogenic GHGs, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons (e.g., CF compounds), and sulphur hexafluoride. Changes in the atmospheric concentration of GHGs may affect the energy balance between the land, the seas, the atmosphere, and space. A measure of such changes in the energy available to the system from a gas is termed “radiative forcing”, and, holding everything else constant, atmospheric increase of a GHG produces positive radiative forcing.

GHGs can contribute to the greenhouse effect both directly and indirectly. A “direct” contribution is from a gas that is itself a greenhouse gas, while indirect radiative forcing occurs when the original gas undergoes chemical transformations in the atmosphere to produce other greenhouse gases, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects processes that alter the atmospheric radiative balance of the earth.

Effects of GHG emissions are generally not relevant on a local scale, except in cases of massive uncontrolled or fugitive emissions, but are rather global in nature as the various gases are rapidly dispersed in the atmosphere where they reside for varying periods of time, from months to thousands of years, and they continue to exert their effects.

Global Warming Potential (GWP) is the index that has been developed to compare different GHGs on a common reporting basis. CO_2 is used as the reference gas to compare the ability of a particular gas to trap atmospheric heat relative to CO_2. GWP is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kg of a substance relative to 1 kg of the reference gas (i.e., GWP is weight-based, not volume-based). Thus, GHG emissions are commonly reported as CO_2 equivalents (e.g., tonnes of CO_2eq, where a tonne is 1000 kg). Since GWP is a time-integrated factor, the GWP for a particular gas is dependent upon the time period selected. A 100-year GWP is the standard that has been broadly adopted (see table below).

Table 21: Global Warming Potentials (100 Year Time Horizon, 1996 Intergovernmental Panel on Climate Change - IPCC)

Gas	GWP
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous oxide (N_2O)	310
HFC-23	11,700
HFC-32	2,800
HFC-125	1,300
HFC-134	3,800
HFC-236	6,300
CF_4	6,500
C_2F_6	9,200
C_4F_{10}	7,000
C_6F_{14}	7,400
SF_6	23,900

There is a Turkish Regulation on the Monitoring of Greenhouse Gases (RMGG) (Official Gazette date/no: 25.04.2012/28274) was released.

This regulation defines the monitoring, reporting and verification procedures for GHG emitted from facilities and activities listed in Annex-I of this regulation.

The main source of GHG in the project will be combustion of fossil fuels during construction and operation phases.

The regulation excludes the combustion emissions from vehicles. Based on the fuel consumption of the vehicles, there may be indirectly and insignificant emission source from the vehicles

The regulation includes combustion activities with a 20 MWt and higher capacities. During the operation phase there will be trigeneration unit operation combusting natural gas to produce heat for the consumption of the project facilities. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt (15.8 + 2.5) which is below 20 MW.

Nevertheless a calculation for GHG production for trigeneration and boiler operation (being the only major sources of GHG emission for the project) has been provided indicatively for CO2 using Intergovernmental Panel on Climate Change (IPCC) emission factors. The unit and boilers will be operated on natural gas. Below calculation is presented for the worst case scenario of natural gas combustion (under the assumption of trigeneration and boilers are operated at the same time).

It is estimated that total daily natural gas consumption for both trigeneration unit and boilers will be 20,397 kg/day:

- Default Emission Factor for natural gas: 56,100 kg natural gas/TJ
- Fuel Consumption = 0. 897 TJ/day

- CO_2 Emissions = (0.897 TJ/day x 56,100 kg/TJ x 365) / 1,000 = 17,959 ton/year of CO_2 (the contribution of other GHG gases to amount will be trivial)

This calculated figure is below 25,000 tons of CO_2 equivalent above which IFC Performance Standard 3 states a need to quantify the direct and indirect emissions annually.

9.1.6 Air Quality

9.1.6.1 Impact Analysis

Air quality emission and dispersion modelling tools have been used for the impact analysis.

Ozone emissions are not included in the modelling studies since the ozone is not a direct emission possible during the project activities. Ozone is a chemical that would be formed in air under certain conditional of meteorology and existence of other chemicals such us VOC. These conditions are not known and thus the amount of ozone to be formed in air as a result of project activities are not known and not included in modelling studies. However considering the project characteristics and the long term ozone level measured in the region (Refer to 8.1.6.1) it can be concluded the impact of project activities on the ambient ozone levels will be trvial and will not need further analysis.

9.1.6.1.1 Construction phase

During the construction phase impacts will be mainly associated to emission of air pollutants and dust.

The **project actions** related to the abovementioned impact factor are surface levelling and grading, temporary stockpiling of the material, disposal of grading material, transport of construction material.

Construction activities will affect air quality mainly through emissions of dust from the excavation and storage of soil, vehicles traffic on unpaved roads, the emission of particulate from vehicle exhausts and the emission of particulate from stationary sources like power generators. Emissions of gaseous pollutants, particularly NO2 and SO2, will be mostly related to the vehicle and machinery exhausts and emissions from stationary sources like power generators. Type and number of engineering vehicles, horse power and the emission factors were provided by the Project. Emission values from engineering vehicles have been calculated by using the Exhaust Emission Factors for Non-road Engine Modelling (Report No. NR-009A) of United States Environmental Protection Agency (EPA). In addition a modelling study has been performed as detailed in APPENDIX M for the dust emissions from excavation and rock fragmentation activities. Air pollutant diffusion graphs are produced and presented in APPENDIX M.

Contribution of ambient PM_{10} and settled dust measurements to the model results were studied. PM_{10} was simulated annually and daily separately. Ambient PM10 air quality measurements were conducted for 24 hours. Therefore, 24 hour PM10 measurements are converted to the annual values by using the England Environmental Agency Annex-F. Converted measurement results are shown in below table.

Table 22: Converted Concentrations

Measurement No:	Concentration (24 hour), (µg/m³)	Concentration (annual), (µg/m³)
PM10-1 (µg/m³)	19.2	16.2 ((19.2/0,59)*0,5)
PM10-2 (µg/m³)	19.0	16.1 ((19.0/0,59)*0,5)
PM10-3 (µg/m³)	18.5	15.6 ((18.5/0,59)*0,5)
PM10-4 (µg/m³)	18.4	15.5 ((18.4/0,59)*0,5)

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

Table 23: Cumulative Values of PM10 and Settled dust

Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
PM10-1 (µg/m^3)	Controlled daily	2.64	19.2	21.84	90 (µg/m^3)
	Uncontrolled daily	5.22		24.42	
PM10-2 (µg/m^3)	Controlled daily	1.34	19.0	20.34	
	Uncontrolled daily	2.67		21.67	
PM10-3 (µg/m^3)	Controlled daily	1.33	18.5	19.83	
	Uncontrolled daily	2.63		21.13	
PM10-4 (µg/m^3)	Controlled daily	1.31	18.4	19.71	
	Uncontrolled daily	2.60		21.0	
PM10-1 (µg/m^3)	Controlled annual	0.36	16.2	16.56	56 (µg/m^3)
	Uncontrolled annual	0.70		16.90	
PM10-2 (µg/m^3)	Controlled annual	0.14	16.1	16,24	
	Uncontrolled annual	0.27		16.37	
PM10-3 (µg/m^3)	Controlled annual	0.19	15.6	15.79	
	Uncontrolled annual	0.38		15.98	
PM10-4 (µg/m^3)	Controlled annual	0.21	15.5	15.71	
	Uncontrolled annual	0.41		15.91	
SD-2 (mg/m^2-day)	Controlled settled dust	3.31	69.97	73.28	390 (mg/m^2-day)
	Uncontrolled settled dust	6.60		76.57	
SD-3 (mg/m^2-day)	Controlled settled dust	6.86	66.65	73.51	
	Uncontrolled settled dust	13.54		80.19	

As seen from above table, cumulative values for both controlled and uncontrolled situations are below the limit values.

9.1.6.1.2 Commissioning and operational phase

In order to evaluate impacts on air quality due to the project during the commissioning and operational phase in comparison to existing ambient air quality conditions and to set the most suitable stack heights for combustion releases, an air dispersion model has been developed.

The Project is already located at nearby the highway. In relataion to the impact of increase in traffic emissions during operation following poinst could be considered:

- The road is a divided highway, which means that the direction of the traffic flow is both from east – west and west – east. Thus, the hospital can be accessed from both directions which will divert the traffic increase into both directions rather than concentrating to one traffic flow direction,
- There has already been public transportation services to the Project area which would be a limiting factor on traffic increase,
- Emission sources from traffic vehicles are not point source.

Considering these issues, the impact of the traffic increase on the current air quality around the project site will be incremental.

The exact number, speed and type of the vehicles to be accessing to the hospital together with the access freaquency are not certai and will be changing. This will be a significant limitation for exact quantification of the traffic emissions during operation of the hospital.

In the light of the above mentioned, the air emissions from traffic increase during the operation of the hospital are not included into the air quality emission and dispersion modelling.

Nevertheless, there will also be monthly air quality monitoring at sensitive receptors during the operation phase. In case of any exceedance of limit values, as a stakeholder the Metropolitan Municipality will be informed and SPV will coordinate with the Municipality to increase the public transportation numbers or additional services

Regarding air pollutants measured within the impact zone of the Project, those used as impact descriptors are represented by nitrogen oxides ("NO_2"), sulphur dioxide (“SO_2”).

Air dispersion modelling has been conducted using AERMOD. For each pollutant, concentration values at ground level were calculated needed to make comparisons with the expected air quality standards. The details of the modelling and pollutant diffusion graphics are provided in APPENDIX M.

In order to assess the cumulative impacts, contribution of background SO_2&NO_2 measurements to the model results were studied. SO2 and NO2 were simulated annually and daily separately. Ambient SO_2&NO_2 air quality measurements were conducted for two periods.

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

Table 24: Annual Cumulative Values of SO2 and NO2

Measurement No:	AERMOD Conc.		Background Measurements		Cumulative Value		Limit Values	
	SO2	NO2	SO2	NO2	SO2	NO2	SO2	NO2
P-1 (µg/m^3)	1,49	0,97	-	-	-	-	20	40
P-2 (µg/m^3)	0,72	0,46	2.85	48.42	3.57	48.88		
P-3 (µg/m^3)	2,18	1,52	1.65	23.98	3.83	25.5		
P-4 (µg/m^3)	1,86	1,24	1.65	43.01	3.51	44.25		
P-5 (µg/m^3)	1,94	1,31	3.34	41.69	5.28	43.0		
P-6 (µg/m^3)	2,04	1,35	3.40	36.64	5.44	37.99		
P-7 (µg/m^3)	0,98	0,63	4.63	63.50	5.61	64,13		
P-8 (µg/m^3)	0,31	0,20	6.56	63.36	6.87	63.56		
P-9 (µg/m^3)	0,98	0,64	3.91	30.72	4.89	31.36		
P-10 (µg/m^3)	1,36	0,88	5.12	61.51	6.48	62.39		
P-11 (µg/m^3)	2,51	1,72	1.51	19.76	4.02	21.48		
P-12 (µg/m^3)	0,11	0,07	1.69	12.28	1.8	12.35		

As seen from above table, cumulative values for SO_2 concentration results are below the applicable limit values. Besides, cumulative NO_2 values do not comply with both Turkish and IFC standards. It is recommended that ambient air quality should be monitored in a monthly basis in order to assess the contribution of the Project to the ambient air quality

9.1.6.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Impacts during decommissioning phase are likely to be similar to construction and the same considerations describe during construction are applicable here as well.

9.1.6.2 Mitigation measures

The following mitigation measures are considered relevant during construction phase to mitigate dust dispersion during construction activities:

- wetting and covering powdery materials transported on trucks;
- reduce trucks and vehicle speed;
- washing facilities, such as hose-pipes and ample water supply, should be provided at site exits, including mechanical wheel spinners where practicable;
- if necessary, all vehicles should be washed down before existing the construction site;
- periodic wetting of the stockpiled material to maintain the humidity percentage at about 5%;
- periodic wetting of the construction areas;
- use of working machinery with low emissions; and good levels of maintenance;
- vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways;
- use of diesel with low sulphur content;

- periodic maintenance of machinery with combustion engine.
- Fragmentation areas will be moistened before any fragmentation activity will occur.
- There will not be any fragmentation after 18:00 of the day.
- Fragmentation areas will be controlled twice for avoiding any incidents at the area before the rock fragmentation activity.
- The nearest settlement areas will informed before rock fragmentation activities

Regarding the Project area, during the operational stage the only emission source is the exhaust gas from the vehicles and emissions from natural gas during operating phase under the scope of the project.

All measures given in the Regulations on the Control of Industrial Air Pollution, published on 03.07.2009 in Official Gazette No.27277, shall be taken in order to minimize dust emission during the construction period.

During the operation phase, the emissions related to heating purposes would be controlled periodically and it would be complied with the emission standards.

A programme will be in place for the monitoring of NO_2 levels at the points where air dispersion modelling shows exceedances.

9.1.6.3 Residual Impacts

The residual impacts on the air quality component after the application of the above mentioned mitigation measures are (See APPENDIX J for details).;

Table 25: Residual impacts on air quality component

Construction phase	Commissioning and operational phase
negligible	negligible

9.1.6.4 Monitoring

Periodic dust (PM10 and settled dust) monitoring should be conducted at the closest settlement, during construction stage and will be compared with the Regulation on the Control of Industrial Air Pollution.

A monitoring programme of NO_2, SO_2, emissions from the trigeneration and the boiler stacks will be in place.

A monitoring programme of NO_2, SO_2 at the residential area before construction and during the commissioning and operational phase will be in place.

Exhaust emissions from construction and transportation vehicles should be periodically monitored along with the requirements in the Regulation on Control of Exhaust Gas Emission both in construction and operation period of the project.

9.1.7 Noise and Vibration

Noise to be generated during the construction stage of the Project is local and temporary and it will finish at the end of construction. The noise to be generated during Project operation may be expected to be caused by the emergency generators, helicopter movement and ambulance movement.

Effect of vibration is not expected to go beyond the construction site considering the machinery and equipment to be used in construction.

Impact factor that could possibly affect this component during the construction phase and operational phase is the emission of noise.

9.1.7.1 Impact Analysis

9.1.7.1.1 Construction phase

Construction activities will affect the ambient noise levels mainly through emissions of noise from the construction equipment and vehicles traffic.

Exact number of construction machinery cannot be estimated at this phase of the project. For the purpose of assessment for the worst case, maximum amount of machinery and equipment is located in the project area and this scenario is modelled where all noise sources are working at the same time. The noise modelling details are given in APPENDIX M.

Based on the modelling results, the highest noise level in the residential region is about 62 dBA at east of the project area as show in , APPENDIX M. This result complies with the 70 dBA limit of Turkish Legislation for construction activities. The actual noise levels at Project Site is expected to be lower than the calculated value since all equipment/machinery will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.

As described under the baseline results in Section 8.1.7 and APPENDIX L N(24)-2 is the nearest measurement location to the point where the highest noise level is calculated. Day time noise levels measured at this location are 64.8 dBA (09:00 – 17:00) and 63.8 dBA (07:00 - 22:00). Hence, calculated noise level is not greater than the baseline level and will not create additional noise higher than the regulatory limit.

9.1.7.1.2 Commissioning and operational phase

Only project unit having possibility to create noise is the trigeneration plant with an estimated maximum installed capacity of 2.5 MWt, described in Section 4.2.1. Estimated noise level of the trigeneration plant is 92 dBA according to the library of SoundPLAN Essential 3.0 software[25]. As compared to the construction phase model results, operation phase noise level will in the surroundings be much lower and no exceedances in relation applicable standards are expected in the ambient noise levels.

The noise to be generated during Project operation is expected to be caused by the emergency generators, helicopter movement and ambulance movements, in case of an emergency situation and the

The Regulation on Assessment and Management of Environmental Noise provides noise limits for health areas as presented in Table 12 and ambient noise level standards in IFC General EHS Guidelines is given in Table 13. As it is observed in Section 8.1.7, baseline results are mostly higher than these limits and it can be concluded that any long term noise effect to the baseline will not be observed in the residential areas because of above mentioned project activities.

During the public participation and disclosure meeting, there were no complaints raised on the possible helicopter sound. The other way round, lots of participants stated that there should be helicopter services during the operation phase.

9.1.7.1.3 Decommissioning/Closure phase

Exact decommissioning time and details of the work are not known at this phase of the project. It is assumed that decommissioning phase of the project will not generate higher noise levels than calculated noise levels in the construction phase of the project. Similar machinery with construction phase will be used in decommissioning activities; therefore the noise impact of the decommissioning will be similar to impact of construction phase.

9.1.7.2 Mitigation measures

During the construction stage, provisions of the “Regulation on Assessment and Management of Environmental Noise” and “Regulations on Work Health and Safety" will be followed with the purpose of protecting health of employees with respect to noise. Accordingly:

[25] Power Stations (Generator Turbine Room)

- appropriate personal protective equipment and materials such as helmet, ear protector or ear plug will be provided to protect workers from noise.
- There would not be any construction activities during the night time.

The following control measures recommended by IFC will be applied where possible:

- selection of equipment with lower sound power levels;
- installing silencers for fans;
- installing suitable mufflers on engine exhausts and compressor components;
- installing acoustic enclosures for equipment casing radiating noise;
- installing vibration isolation for mechanical equipment;
- limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- reducing project traffic routing through community areas wherever possible; and
- developing a mechanism to record and respond to complaints.

In addition, regular maintenance will be made for the construction equipment to ensure decreasing the possible high noise levels generated by the equipment.

No additional mitigation measures are proposed during the operation phase.

9.1.7.3 Residual Impacts

The residual impacts on the noise component after the application of the above mentioned mitigation measures are (See APPENDIX J for details).;

Table 26: Residual impacts on noise component

Construction phase	Commissioning and operational phase
negligible	negligible

9.1.7.4 Monitoring

A monitoring programme of noise at the residential area during construction and the commissioning and operational phase will be in place.

9.1.8 Traffic and Infrastructure

9.1.8.1 Impact Analysis

9.1.8.1.1 Construction phase

During construction phase impacts will be mainly associated to the impact factor; increased road traffic.

The project actions related to the abovementioned impact factor are the surface levelling and grading, the transport of construction material, the construction of the facilities and the disposal of waste deriving from construction.

The activities related to the construction phase will require the movement of trucks entering and leaving the project area for the transportation of machinery, equipment, construction material (e.g., concrete, building materials) and staff.

The expected traffic increasing on the access roads to the project area will be of 40 trucks per day for 24 months. Another key factor to take into account is the size of containers and the maximum size of abnormal loads that will access the site via the existing access roads. Although the exact number of abnormal loads is not known at the writing time, it is assumed that they will be kept to a minimum as far as reasonably practicable and therefore their impacts are judged to be of minor significance.

The traffic road increasing could cause the boost of crashes and the congestion of the access roads especially closeness to the adjacent intersections. It is assumed that the routes which will be used for the road passages will mainly use O4 highway and Zübeyde Hanım road.

Furthermore the road traffic increasing could lead to accidental wildlife losses, especially reptiles crushing.

The trucks and vehicles for the transportation of machinery, equipment, material and staff will leads to the potential for nuisance to nearby settlements due to the increase of air pollution (e.g. emissions of particulate matter, nitrogen oxides). Moreover, the new flows of trucks and vehicles will cause the increase of noise along the access roads to the project area.

9.1.8.1.2 Commissioning and operational phase

During commissioning and operational phases impacts will be mainly associated with the impact factor increased road traffic.

The operation of the Project will generate solid waste which will be collected by a licenced waste carrier for disposal. It has conservatively been estimated that approximately 25 vehicles per month will transport the waste generated during operational phase.

Kocaeli IHC will be located at the north of the Kocaeli city. It is surrounded in the north by the O4 highway with no direct connection to the Project area. The highway separates the Project area from the northern quarters. The connection point of the Project area is the highway bridge over the O4 highway.

In general commissioning and operational activities could have an impact on traffic and infrastructures similar to the construction phase in relation to increased traffic load associated to patient and visitor vehicles, ambulances to and from the hospital and similar. The traffic road increasing could cause increase in traffic incidents, the congestion of the access roads and their adjacent intersections, road safety interference, air pollution and noise.

9.1.8.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

9.1.8.2 Mitigation measures

The mitigation measures listed in the following will be effective for both the construction and the commissioning/operational phases:

- Scheduling of traffic to avoid peak hours on local roads;
- Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public;
- Adopting traffic control and operations devices (e.g. add traffic signals to reduce speed limit, flashing arrow signs, add deceleration/acceleration lanes, improve sight distance) to guide drivers clearly and safely along the access roads to the project area. Effective traffic control increases safety and capacity and reduces stress for drivers;
- Reducing and make safely the pedestrian road crossing;
- Emphasizing safety aspects among project drivers, specifically ensure drivers respect speed limits through built areas and urban centres;
- Regular maintenance of vehicles should be undertaken to ensure that vehicles are safe and emissions and noise are minimized;

- Ensure contractors regularly maintain vehicles to minimize potentially serious accidents caused by for example, brake failure commonly associated with loaded construction trucks. Fuel systems of the vehicles that will be used within the scope of the project shall be controlled permanently and should comply with the national and international good practices.
- Further mitigation measures are discussed in Section 11.5.3.1

The fuel system of the vehicles shall be controlled permanently and it shall be complied with the provision of the Regulation on the Control of Exhaust Gas Emission published on 04.04.2009 in Official Gazette No. 27190.

9.1.8.3 Residual Impacts

The residual impacts on the traffic component after taking into account the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 27: Residual impacts on traffic component

Construction phase	Commissioning and operational phase
negligible	low

9.1.8.4 Monitoring

Monitoring activities are required to verify the effectiveness of the mitigation measures proposed. They are listed below and are provided in the ESMP with frequency and timing:

- Investigation of the incidents and accidents and use of lesson's learned to improve traffic mitigations.
- Driver education monitoring to ensure it takes place.
- Comments and/or complaints received from ongoing consultations or from grievances to improve traffic mitigations.
- Feedback from local stakeholders regarding to any perceived changes in noise impacts and air quality changes linked to heavy traffic.

Monitoring should in particular be designed to identify failure or ineffectiveness of mitigation measures in terms of road safety and nuisance prevention.

9.2 Biological components

9.2.1 Terrestrial Flora and Vegetation

9.2.1.1 Impact Analysis Results

The vegetation present in the LSA was assessed as a low sensitivity component, considering that most of the areas are urbanized or disturbed by anthropogenic activities, in addition no endemic or protected flora species were found in the area.

Impact factors that could possibly affect the presence of terrestrial flora species during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere.

Impact factors that could possibly affect the presence of terrestrial flora species during the operational phase are:

- occupation of land;
- pollutant and dust emission in the atmosphere.

9.2.1.1.1 Construction phase

The vegetation present within the footprint will be cleared for the construction of the facilities. This direct impact on vegetation will be important but localized and concentrated in a short time. The impact is considered reversible since, since if left to itself in the long term the area will likely be recolonized by natural vegetation.

Activities like Rock fragmentation and surface levelling and grading during site preparation, temporary stockpiling of resulting material, transportation of soil and construction materials will cause emission of dust and pollutant (mainly NOx e CO2) in the air. Dust and pollutant will then precipitate on the surrounding area. Although local and reversible in the short term, this impact is likely to affect the surrounding vegetation with a medium intensity, in absence of any mitigation measures.

In particular dust emission, could impact vegetation directly by covering leaf surface and indirectly through effects via the soil (Farmer A.M., 1993). Dust can block stomata of leaf surface, affect the photosynthesis, respiration, transpiration, and may cause leaf injury symptoms. As a result of that the productivity of the plants could decline, with the consequent reduction in vegetation growth, abundance and species loss.

The 10% of the excavated material will be reused on site and about 90% will be disposed of in İzaydaş region.

9.2.1.1.2 Commissioning and operational phase

The presence of the facilities will cause a loss of potential habitat for flora species within the project footprint during operation. The impact will be limited to the facilities since the surrounding areas temporary occupied by stockpiles, yards etc. will be restored after construction.

Dust and air pollution deriving from road traffic and operation of the facility, including the gas Trigeneration plant and the backup generators, could impact the terrestrial flora present in the surrounding area. In this phase the intensity of this impact factor is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital.

9.2.1.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact terrestrial flora. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to natural vegetation, this phase is expected to have an overall positive impact on terrestrial flora.

9.2.1.2 Mitigation measures

The mitigation measures here listed will be effective both for the construction and the operational phase:

- Project footprint will be minimized to the smallest extent possible in order to meet and support the Project works and activities;
- inadvertent disturbance to the adjacent vegetated areas should be avoided through clear demarcation of the Project Site boundaries, particularly in forest and shrub land habitat types;
- dust control measures will be implemented along roads, in areas of excavation and earthworks and for stockpiles and spoil heaps, as described in Section 9.1.6;
- progressive reclamation of areas cleared during construction but not occupied by facilities will occur, with the goal of producing a stable vegetative cover to minimize erosion from air and water and to produce visual and ecological advantages;
- for re-vegetation; grass and ornamental plants could be used in locations such as office and main buildings, while trees and plants present in the local natural vegetation should be considered especially

for locations distant from main paths. Species known for their potentiality to become invasive will not be used.

9.2.1.3 Residual Impacts

The residual impacts on the flora and vegetation component after the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 28: Residual impacts on flora and vegetation

Construction phase	Commissioning and operational phase
low to negligible	negligible

9.2.1.4 Monitoring

Periodic surveys will be performed during construction to ensure that:

- areas characterized by natural vegetation around the construction site are not inadvertently impacted by equipment, temporary disposal of construction material or soil erosion due to nearby cleaned areas;
- progressive reclamation of areas cleared during construction but not subjected to the placement of facilities is performed and it is coherent with the plan.

9.2.2 Terrestrial Fauna

9.2.2.1 Impact Analysis Results

According to the baseline study this component has a low sensitivity. Populations or individuals of the fauna species that could occur in or visit the LSA are already impacted by anthropogenic disturbances, therefore the stable presence of sensitive species in the LSA is considered improbable. In addition, no Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) are expected in the LSA.

Impact factors that could possibly affect the presence of terrestrial fauna species during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations;

Impact factors that could possibly affect the presence of terrestrial fauna species during the operational phase a are:

- occupation of land;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

9.2.2.1.1 Construction phase

The local fauna will be directly or indirectly impacted by the vegetation clearing and top soil disturbance activities performed during site preparation. In particular, species characterized by low mobility are not able to move ahead of construction (e.g. insects, amphibians, tortoise). The removal of vegetation will also involve the destruction of suitable habitats for many fauna species.

Emission of dust and pollutant (mainly NOx e CO2) in the air and its consequent fell to the ground could affect vegetation communities and therefore indirectly also the fauna species that depend on them for food and refuge.

The emission of noise is expected to be of particular high intensity during construction, especially in correspondence of Rock fragmentation activities, although limited in time. All construction activities such as operation of diesel engines, transportation of construction materials etc. are also expected to produce noises. The emission of noise could impact local fauna, and in particular sensitive taxa like birds, especially during nesting season. Most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, in the order of 70 dBA. However sudden and discontinuous loud noises will scare away many fauna species from the area surrounding the construction site. The impact is expected to reversible in the short time, since fauna species will likely to return once the noises end.

9.2.2.1.2 Commissioning and operational phase

Previous fauna habitats will by occupied by the project facility and infrastructures during the operational phase. Moreover impacts such as dust, air pollution and noise emission could affect local fauna also outside the immediate project footprint.

In particular, dust and air pollution during the operation of the project could derive mainly from road traffic and operation of the facility, including the gas Trigeneration plant and the backup generators. During this phase the intensity of this impact factor is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital

Noise emission deriving from operational activities, including road traffic, operation of the facilities could have an impact on terrestrial fauna. However, considering the expected noise levels and the fact that most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, the impact is expected to be of relatively low intensity.

9.2.2.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact terrestrial fauna. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to its natural state, this phase is expected to have an overall positive impact on terrestrial fauna.

9.2.2.2 Mitigation measures

The mitigations described in the flora assessment to minimize impacts to natural vegetation, will also indirectly have a positive effect on fauna, by protecting fauna habitat (e.g. minimization of the footprint to the smallest extent possible, dust control measures, avoid inadvertent disturbance to the adjacent vegetated areas, progressive reclamation of areas cleared during construction but not subject to the placement of facilities).

In addition, during construction an ecologist appointed by the contractor in charge of construction will briefly survey areas with natural vegetation prior to Rock fragmentation and vegetation clearing. The survey will focus on nesting species that fall into protection categories and on fauna species with limited mobility that cannot move ahead of construction (e.g. tortoise). If any of these species is noted, specific mitigation measures will be implemented to ensure that all applicable regulations are complied with (e.g. translocation of the individual/nest to nearby undisturbed similar site).

Awareness will be developed among employees and contractor working on site about the protected species potentially present in the area, in order to ensure a constant monitoring and promote reporting of incidental fauna species observations.

Moreover, instructions will be given to employees and contractors in order to prevent harming fauna species that might be present. In particular, BERN Convention conservation measures and provisions of 6th article, specified in Appendix II, will be considered and remembered to contractors during the construction:

“In respect of specially protected fauna species (Article 6), following acts are strictly forbidden:

- all forms of deliberate capture and keeping and deliberate killing;
- the deliberate damage to or destruction of breeding or resting sites;

- the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention;
- the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty".

9.2.2.3 Residual Impacts

The residual impacts on the fauna component after the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 29: Residual impacts on fauna component

Construction phase	Commissioning and operational phase
negligible	negligible

9.2.2.4 Monitoring

No specific monitoring activity is considered necessary for terrestrial fauna.

9.2.3 Habitats and Biodiversity

9.2.3.1 Impact Analysis Results

The LSA is located in a densely populated area, and most of its extension is occupied by urban areas (62% of the LSA). An urban park and gardens and some agricultural areas are also present. Semi-natural vegetation consist of Mediterranean shrubland in the western part of the LSA uphill (10% of the LSA) and Euxinic broadleaf deciduous forests" in valleys (5% of the LSA). The habitats and biodiversity are impacted by the anthropogenic disturbances, however, considering the overall condition and its importance in a heavily urbanize area the component is considered as medium sensibility.

Impact factors that could possibly affect the presence of terrestrial habitat types during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations;
- introduction of alien species;

Impact factors that could possibly affect the presence of terrestrial habitat types during the operational phase are:

- occupation of land;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

9.2.3.1.1 Construction phase

The habitat present within the project footprint will be directly impacted by vegetation clearing and disturbance of terrestrial top soil. Habitat present in the buffer area outside the project footprint could also be impacted by emission of dust and pollutant and indirectly by emission of noise (through changes in fauna communities). Another potential impact is the accidental introduction of invasive alien species, and in particular of flora species. Soil disturbance and reduced forest cover facilitate invasion by exotic (non-native) species. During construction, temporary stockpiling of the material and movement of top soil could create favourable condition for the spreading of exotic plant species. This species tent to have an advantage in disturbed ecosystem, and if they penetrate in a habitat they can potentially change it functionality and species composition.

9.2.3.1.2 Commissioning and operational phase

During the operational phase, part of the areas disturbed within the footprint will be restored and re- vegetated, however some areas will be occupied by project facilities for the long term.

Dust and air pollution during the operation of the project is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital.

Noise emission during operation of the facilities could have an impact on terrestrial habitats, particularly in regards to fauna and bird habitats. However, considering the expected noise levels and the fact that most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, the impact is expected to be of relatively low intensity.

9.2.3.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact habitat and biodiversity. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to its natural state, this phase is expected to have an overall positive impact on the component.

9.2.3.2 Mitigation measures

Mitigations measures described in the previous assessments for terrestrial flora and fauna, will directly or indirectly contribute to mitigate the impacts on habitats as well.

In addition, during the construction phase, the presence and diffusion of invasive flora species will be regularly monitored during construction with particular attention to temporary disturbed areas and during the first stages of reclamation.

In case the diffusion of invasive species is observed, an eradication program will be put in place.

9.2.3.3 Residual Impacts

The residual impacts on the habitat component after the application of the abovementioned mitigation measures are (See APPENDIX J for details).;

Table 30: Residual impacts on habitat component

Construction phase	**Commissioning and operational phase**
low to negligible	low to negligible

9.2.3.4 Monitoring

The presence and diffusion of invasive exotic flora species will be monitored in disturbed area/s annually by an ecologist appointed by the contractor in charge of construction during the construction phase and during the first 2 years during the operational phase. Findings of the monitoring and incidental observation will be included in an annual report, in order to identified possible critical situation. If necessary, additional mitigation measures will be put in place.

9.2.4 Protected areas

The closest protected area is Beskayalar Natural Park located at 17 km from the LSA.

In addition the KBA Kocaeli Hills, located 2 km North West of the project and the IBA Sapanca Lake located 15 km south east of the site are also present.

Considering the location, characteristics and sensitivity of the protected area and of the priority biodiversity features and the potential impacts of the project actions, no impact is expected on this component as a result of the Project since these areas are located outside the LSA.

9.3 Social Components

9.3.1 Socio-economic conditions and employment issues

9.3.1.1 Impact Analysis results

9.3.1.1.1 Construction phase

Based on the qualitative analysis of the Project actions, impacts on the socio-economic conditions will be mainly due to the need of workers, primarily during the construction phase and to a lesser extent during the operation phase thus resulting influx of people to the project area and surroundings. The main reasons, impacts and management influx are dicscussed below

The project construction is planned to last three years. The project will be executed by Special Purpose Vehicle (SPV) established jointly by GAMA Holding A.Ş. and Türkerler A.Ş.

The number of employees during construction will be changing over the construction period. The minimum number of employees will be 156 and maximum number of employees at peak level will be 2500. The manpower histogram over the construction period is provided in Figure 25

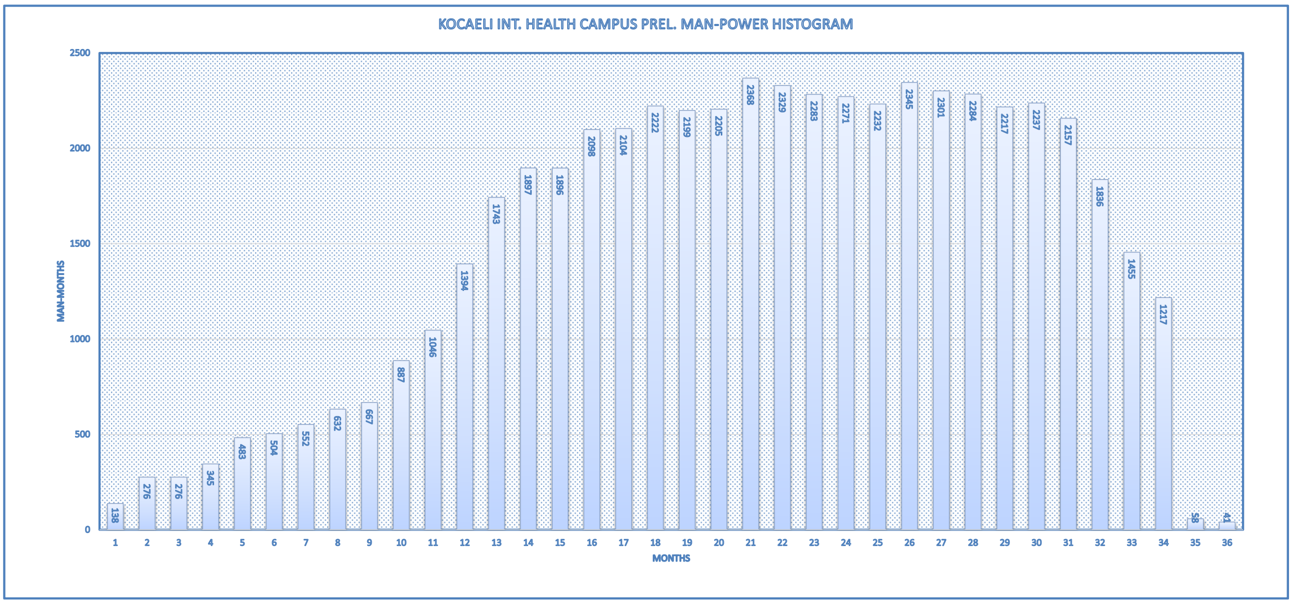


Figure 25: Manpower Histogram for construction phase

As part of the construction schedule there will be ongoing construction activities in the total project area for three years which will create potential impacts at quarter. These impacts would be related to;

- Provision of workforce and need for local procurement;
- Increase in real estate prices;
- Accommodation requirements for workers coming from outside the quarters;
- Dust and noise emissions;

Provision of workforce and need for local procurement

The need of workers during the construction phase, which will peak at about 2500 as mentioned above, will lead both to positive and negative impacts on the socio-economic context of the quarter. It is expected that part of the works will need to arrive from other areas of the Region, therefore leading to additional population living temporarily in the quarter during the construction phase though significant portion of the additional population will be accommodated in the construction camp.

In particular the need of workforce can be considered a positive impact, because it brings work opportunities to the local and regional population. In addition the presence of workers and of a new facility will imply a use of goods and services, partly purchased locally, therefore leading to increased expenditures within the local economy.

There will be a need for the accommodating of the employees residing in outside of the close quarter. SPV will establish a construction camp for the accommodation of the employees.

The need of workforce and the consequent immigration of workers can also lead to negative impacts on the social context. The presence of additional population in the area can cause an increased use of existing infrastructures, such as water, wastewater, roads, education and health facilities, which may not be able or designed to sustain such use levels. In addition, an increase in the population implies a need of more housing, which may not be readily available, due to the technical times needed from the construction market to build additional houses, leading to a housing deficit in the short term. In addition the presence of a large construction project and of a new facility can create in the local population expectations of job opportunities that might not be fulfilled locally by the company, leading to frustration and resentment in the local population.

The noise and the dust created by the construction activities may create negative impact on the fruit and nut trees privately owned at the boundary of the site with the highway.

9.3.1.1.2 Operational phase

Operation of the Project facilities will create potential impacts that would be related to;

- Provision of workforce and need for local procurement;
- Increase in real estate prices;

In particular the need of workforce can be considered a positive impact, because it brings work opportunities to the local and regional population. In addition the presence of workers and of a new facility will imply a use of goods and services, partly purchased locally, therefore leading to increased expenditures within the local economy.

The number of the administration personnel planned for the operation phase of the Kocaeli Integrated Health Campus Project is estimated to be 2,159 in light of the existing information available at this stage. The details of the employment are given in 4.4.

It is expected that part of the employees (especially the unskilled and semiskilled) will be employed locally. Some part of the employees will come from outside of the Region, therefore leading to additional population living in the quarters during the operation phase.

The increase in the real estate prices estimated to happen with the start of the project is expected to continue during the operation phase

9.3.1.1.3 Decommissioning phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

9.3.1.2 Mitigation measures

The following mitigation measures will be in place in order to minimise the socio-economic and employment impacts originated by the project;

- Referring to Section 6.0 a continuous stakeholder engagement process and grievance mechanism will be in place
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders on the migration (influx) to the area as a result of project activities.
- Maximising of local employment and procurement in order to increase the positive socio-economic impact of the project on the local community
- Construction site will be fenced in order to avoid possible interactions of school
- The school management will always be informed about the construction activities
- Coordination with the local community for the arrangements of accommodation and establishment of the construction camps
- Provide guidance to the migration population during operation for accommodation and living arrangements through human resources policy and plans
- Preparation of the plans for
  - Construction Camp Management
  - Human Resources Management
  - Grievance Mechanism including employees

9.3.1.3 Residual impacts

If the above mentioned mitigation measures are adopted, they can play an important role in reducing negative consequences of the Project on the socio-economic context, particularly during the construction phase, which will be the most impacting. Moreover the Project can benefit the local economy both by offering job opportunities and by maximizing beneficial effects on the local economy. In addition adopting clear and transparent hiring procedures and continuous engagement with the local community on the construction planning will benefit the company’s reputation among individuals and the local community, improving the general profile and relationships with the local community.

The Romany community will not be resettled due to the proposed Project. The construction activities and design have been conducted in order to avoid any resettlement activities.

The following will apply to residual impacts with the adoption of mitigation measures;

Direction: negative

Duration (D): medium-short

Geographic extent (G): regional

Intensity (I): low

Probability of occurrence (P): low

Sensitivity (S): medium

The overall residual impact is considered to be negligible.

9.3.1.4 Monitoring

The activities for the monitoring of the residual impacts on socioeconomic conditions and employment are;

- The monitoring activities listed for the management of noise and dust emissions during constrıction are valid for this component;
- Monitoring of the implementation of management plans. Examples of monitoring parameters are but not limited;
  - Recorded and responded grievances and complaints
  - Local employment ratio
  - Percentage of procurement from local resources in the total procurement figures

9.3.2 Social Services and Facilities

9.3.2.1 Impact Analysis results

9.3.2.1.1 Construction phase

There are two educational facilities close to the project site as stated in section 8.3.2.2. The traffic increase during construction on the highway will create noise nuisance at Yarbay Refik Cesur School.

Hacı Bektaş Veli School is at the boundary of the project area and there will be noise and dust nuisances to the school attendees created by the construction activities. The construction activities will pose safety and health risks to the attending students which is further discussed in section 10.5.3. There will not be any entrance or exit of construction equipments from the school direction. School direction has not been used as an access road to the Project site.

9.3.2.1.2 Operation phase

The operation of a forensic hospital very close to a school may pose health and safety concerns regarding the attendees of the school which is further discussed in section 10.5.3.

The operation of the Kocaeli IHC project is expected to create positive impact in the region in terms increased quality of health services and the increased number of population having easy access to health services. The expected positive impacts of Kocaeli IHC on the local and regional community has been discussed in section 1.2

The opinions of the community members expressed during interviews and focus group discussions confirmed these expectations.

One specific positive remark has been made by the representatives of Women Social Center stating that the developed transportation network as result of the project will increase the accessibility to the Social Center as well.

9.3.2.2 Mitigation measures

Mitigation measures for the community health safety are provided in section 10.5.3. and valid for the minimisation of health and safety impacts on the attendees of Hacı Bektaş Veli School. Following general mitigation measure will also be in place;

- Referring to Section 6.0 a continuous stakeholder engagement process and grievance mechanism will be in place
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders

9.3.2.3 Residual impacts

The following will apply to residual impacts with the adoption of mitigation measures;

Direction: negative

Duration (D): medium-short

Geographic extent (G): regional

Intensity (I): low

Probability of occurrence (P): low

Sensitivity (S): medium

The overall residual impact is considered to be negligible.

9.3.2.4 Monitoring

Following general monitoring activities will be in place;

- Monitoring of the implementation of grievance mechanism with recorded and responded grievances and complaints

9.3.3 Infrastructure

9.3.3.1 Impact Analysis results

9.3.3.1.1 Construction Phase

During the consultation with the community members Yeşilova Mukhtar pointed out that the only feasible transportation route would be Yeşilova quarter as shown in Figure 26. This route passes very close to Yarbay Refik Cesur school and Bazaar which would create community health and safety concerns which is further discussed in Section 10.5.3.

Figure 26: Transportation route through Yeşilova quarter during construction

New impact areas can be created with the identification of other transportation routes.

Concerns has also been raised on the adequacy of the existing transportation routes to meet the accessibility requirements of project during construction phase.

The existing public waste collection infrastructure can be used to handle the construction wastes.

9.3.3.1.2 Operation Phase

Collection and disposal facilities and the transportation will be main infrastructures that will be in use during the operation of the IHC. The existing public waste collection and disposal infrastructure can be used to handle the operation wastes. The Project will need to have the agreements in place with the licenced waste collection and disposal facilities in the Municipality area. (See 8.3.3.2)

The IHC is close to O4 highway and there is possibility to connect the project area to the existing transportation infrastructure. (See 8.1.8). These routes are single-lane, paved roads in good condition. SPV is planning to use these roads during the operation period of the Project.

As pointed out during meetings during the meetings, interviews and focus group discussion that;

- The existing transportation routes need to be extended to ensure the accessibility Kocaeli IHC from different areas of Kocaeli.
- Exiting public transportation bus and dolmuş routes need to be extended.
- Since Kocaeli IHC is close to recreational and social service area parking space availability may be a concern.

SPV has conducted a traffic study to assess the existing transportation routes to ensure the access to the Project Site as presented in APPENDIX A.

9.3.3.1.3 Decommissioning phase

Transportation of patients from the close vicinity will be provided due to the maintenance and repair of the infrastructure.

9.3.3.2 Mitigation measures

The following mitigation measures will be in place to minimize the impacts of the project on the infrastructure;

- The transportation routes for the construction phase will be determined through ;
  - evaluating the conditions of the road whether being able to handle the v-construction vehicles loads and the traffic loads
  - selecting the routes with minimum social impacts and if required defining additional mitigation measures
  - coordination with the local authorities and community leaders.
- Local waste management authorities will be contacted to ensure the allocation of existing municipality resources and structures for the construction waste management
- A detailed traffic study will be performed to identify the best transportation routes with minimum impact on the existing traffic load and suggesting measures to improve the accessibility to Kocaeli IHC during operation.
- Local authorities will be contacted during construction to confirm the utilisation of existing medical waste disposal facility for the operational medical wastes.

9.3.3.3 Residual impacts

If the above mentioned mitigation measures are adopted, they can play an important role in reducing negative consequences of the Project on the existing infrastructure, particularly on waste handling and transportation. Moreover the Project can benefit from continuous engagement with the local community on the transportation planning and increase the company’s reputation among individuals and the local community, contributing to the management of traffic related community health and safety issues, identifying sustainable transportation routes for construction and operation., The defining and confirmation of the waste disposal routes and arrangements with local authorities in a timely manner will contribute to the management of community health and safety issues arising from the disposal of construction and operation wastes especially medical wastes.

The following will apply to residual impacts with the adoption of mitigation measures;

Direction: negative

Duration (D): medium-long

Geographic extent (G): local

Intensity (I): low

Probability of occurrence (P): certain

Sensitivity (S): medium

The overall residual impact is considered to be low.

9.3.3.4 Monitoring

Monitoring plans that need to be produced at this stage would be reviewed under the authority of related ministries and grievance mechanisms. In order to establish of these plans, the list of environmental and social necessities need to be prepared. After, plans would be prepared are listed below:

- Environmental and Social Management Plan
- Camp Site Management Plan
- Occupational Health and Safety Management Plan
- Stakeholder Engagement Plan and Grievance Mechanism
- Construction Traffic Management Plan.

The applicability of these plan will be audited by independence third parties in 2 3 years.

The overall objective of the SEP is to explain how the SPV is planning to engage with stakeholders through the course of the Project.

Auditing of infrastructure works would be covered under the authority of related great or district municipality.

9.3.4 Cultural Heritage

The field work was conducted on 06.03.2015. As the result of desktop studies and field works no cultural assets were encountered within the project area. Based on the inventories of the relevant preservation board and the literature survey, no archaeological site has been identified in the vicinity of the project area.

On the other hand, "old military armoury buildings" were observed within the project area. According to the Kocaeli Regional Board for Cultural Assets these buildings are not registered as cultural assets (See Appendix O). However, with the decision 1920[26] dated 17.02.2015 of the preservation board, it was decided to initiate the registration process for these buildings. All excavation and earthworks have to be conducted under the supervision of Archaeology and Ethnography Museum of Kocaeli.

The closes archaeological site to the project area is at 920 m west of the Project area.

According to the Kocaeli Regional Preservation Board for Cultural Assets, old military buildings were not registered as cultural assets. Construction works would be conducted in company with the Board of Cultural Assets

[26] Annex: Decision 1920 of Kocaeli Board for Preservation of Cultural Assets dated 17.03.2015.

10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

Conformance Table – Environmental and Social Management System (ESMS)

Theme/Sub-Theme	**EBRD PRs**	**IFC PSs**
Environmental and Social Management Systems/ Establish and maintain a Social and Environmental Management System	PR 1	PS 1
Environmental and Social Policy/ Establish and manage mitigation and performance improvement measures and actions that address the risks and impacts	PR 1	PS 1
Organisational capacity and commitment/ Establish, maintain and strengthen an organizational structure that defines roles, responsibilities and authority	PR 1	PS 1
Organisational capacity and commitment/ Designate specific personnel, including management representatives with clear lines of responsibility and authority	PR 1	PS 1
Community Health and Safety Risks and adverse impacts to the health and safety of the potentially affected communities are identified and assessed and protection, prevention and mitigation measures are defined	PR 4	PS4
Labour and Working Conditions Minimum standards are defined for ensuring labour and working conditions to be in compliance with project requirements	PR2	PS2
Occupational Health and Safety Minimum standards are defined for ensuring occupational health and safety to be in compliance with project requirements	PR2	PS2
Health Services Consider the impacts on employees, patients and the immediate community	Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal	Environmental, Health, and Safety Guidelines; HEALTH CARE FACILITIES

10.1 Environmental and Social Management System Structure

The Environmental and Social Management System (ESMS) will ensure that the Project:

- complies with all applicable Turkish legislation as well as relevant IFI guidelines provided in the ESA;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in the ESA for the minimization of potential environmental and social impacts;
- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generate local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement programme.

The ESMS addresses more in detail the following environmental and social aspects;

- Environmental aspects;
- Labour Issues and public Health & Safety aspects;
- Stakeholder management and social aspects.

The ESMS included here is intended to describe the framework for the general management issues. This ESMS will be further developed as the project progresses.

10.2 Overall Environmental and Social Management System

The following mechanisms will be in place for the implementation of the ESMS.

10.2.1 Organization - Roles and Responsibilities

The **Project Management** will ensure that:

- the Project will be executed in line the Environmental and Social Policy of the Project itself;
- the required resources are in place to implement the environmental and social mitigation measures identified in the ESA.

The Health Safety and Environment ("HSE") Engineer(s)/HSE Manager will supervise the overall environmental and social management activities associated with the Project at all phases of the Project. HSE Engineer(s) will be appointed in the beginning of pre-construction activities.

The role of the HSE Engineer(s)/HSE Manager will be to:

- supervise the implementation of the environmental and social mitigation measures identified in the ESA;
- ensure the ESMS and the associated management plans and procedures are further developed and detailed during the course of the project lifecycle;
- coordinate with Community Relations Officer the monitoring the stakeholder engagement activities being performed in line with the stakeholders programme and the public complaints are recorded and addressed.

The Community Relation Officer ("CRO)" is appointed for the overall implementation of the social management activities of the Project. He/she reports to the Management and is responsible for the implementation and operation of the SEP and in this respect acts as an interface between Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş., contractors, subcontractors and stakeholders. The CRO is responsible for implementing and organizing engagement activities described in this plan. The CRO is also responsible for monitoring the Plan implementation and for proposing corrective actions and reports to the Management. The CRO is furthermore responsible for:

- ensuring that this procedure is up to date and appropriate to the nature and scale of the Project;
- proposing to Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. management, if necessary, amendments and/or updates to this procedure and issuing revisions;

Community Relation Assistant ("CRA"): if deemed necessary, Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. will appoint one or more Community Relations Assistant(s), which will support the CRO in daily activities and duties. The CRA might be particularly important during the construction phase, as this is when Stakeholder Engagement related activities will peak. The CRA should be preferably employed from the local community, as this can ensure that he/she already has an established relationship with the community.

10.2.2 Risk Assessment and Risk Register

In order to identify and manage the project risks, a risk assessment study will be conducted in the beginning of the construction / pre-construction works and will be repeated at the beginning of each phase. The findings of this study will be taken into consideration and a detailed risk register will be prepared identifying the potential environmental, health & safety and social risks associated with the individual work items. The project has prepared an HSE risk assessment as presented in APPENDIX İ. This will be a living document and be updated during the course of the project.

10.2.3 Training and Awareness

The project will ensure that:

- All personnel, including contractor's personnel, will receive a level of environmental and social training appropriate to their job functions.
- A training programme will be in place to include as a minimum but not limited to:
  - awareness of Project policies;
  - regulatory framework and conformance to the ESMP;
  - the potential environmental impacts associated with their jobs;
  - occupational health and safety;
  - requirements of operational policies;
  - spill response and emergency response programs;
  - risk assessment.

10.2.4 Communication of Environmental and Social Issues

The system to communicate internally and externally regarding environmental and social issues are included in the stakeholder engagement activities.

10.2.5 Document and Record Controls

A document and record keeping procedure will be established to maintain the summary of all environmental and social activities and results. The records will include mitigation, monitoring and reporting needs, such as sampling, analytical data, incident reports, communications, etc.; and performance, training, communications and audits. These documents will be readily accessible for review and audit.

10.2.6 Corrective Actions

Procedures will be established to investigate any non-conformance with the requirements and necessary adjustment to correct and prevent further occurrence.

10.2.7 Inspections and Audits

A system will be established to conduct periodic audits of the environmental and social management plans, their effectiveness, implementation and maintenance.

10.2.8 Budget

Budgets will be established to meet the needs and requirements of the ESMS for the life of the Project. A refined budget will be established annually to address the tasks to achieve the requirements to address environmental and social management.

10.3 Environmental and Social Management Plan

10.3.1 Management Mechanism

A Site HSE Manager for the Project will be appointed in the beginning of the pre-construction activities to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

10.3.2 Construction Phase

10.3.2.1 Contractor's Environmental and Social Management

Responsibilities of Contractors

The Contractor shall:

- comply with the relevant environmental requirements detailed herein and any other relevant local legislation;
- implement and demonstrate compliance with these requirements at all times;
- address the requirements of those applicable standards in the form of a Specific Project Work Instructions;
- prepare a construction ESMS in line with this ESMS (and associated management plans) and ESA and submit to the approval of Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. before the start of construction;
- ensure the subcontractors are aware and in compliance with the requirements of the ESA.

Personnel and Resources

The Contractor shall appoint an Environmental Representative ("ER"). The ER shall as a minimum:

- supervise the implementation of the Contractor ESMS;
- ensure that the all the Contractor workforce is communicated on the ESMS requirements;
- implement a training programme for the workforce;
- ensure a routine auditing and inspection programme is in place;
- the Contractor's appointed ER is responsible for internal environmental site audits and inspections;
- the ER shall be competent in understanding:
  - the Contract requirements;
  - contents of the risk register;
  - Contractor's ESMS and Policies;
  - relevant environmental management procedures; and
  - legal and other requirements.

Training and Communication

- A project site induction on Project environmental and social requirements shall be delivered to all Contractor employees.
- The Contractor's personnel shall receive environmental training appropriate to the environmental risks of the jobs/tasks they are delivering.

Inspection and Audits

Non-conformances and hazards identified by the Contractor during inspections shall be documented, addressed with appropriate corrective and preventive actions and communicated to Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. in timely manner.

Event Management

All Contractors shall report environmental events, near-misses and potential hazards within an agreed timeframe. The definition of the environmental events shall be documented and communicated to the

Contractor's personnel. Environmental events shall include, as a minimum, actual events or near misses resulting in:

- a breach of legal & other requirements;
- environmental damage (e.g. over clearing);
- environmental pollution / contamination;
- impacts on flora, fauna, waters, heritage sites and atmosphere;
- unapproved discharge to air, land and water; and
- public complaints.

Corrective and preventive actions shall address the root causes of the event, and reduce the probability of event recurrence. Corrective and preventive actions shall:

- include the review and/ or revision of the risk register, relevant procedures and documentation;
- assess the effectiveness of corrective and preventative actions as part of the event investigation process, particularly for repeat events. The risk register shall be reviewed as part of this process.

Emergency Response

The Contractor shall:

- identify the events with a potential of significant environmental impacts and prepare appropriate response plans for the mitigation of such impacts. As a minimum the emergency response plan shall address events and impacts of:
  - major hydrocarbon and chemical spills,
  - natural hazards,
  - fire;
- provide adequate equipment and materials to effectively manage emergencies;
- demonstrate that such plans are or will be effective through personnel training and testing of the plan;
- develop post emergency plans which include a review of the effectiveness of the plan, its implementation, and the need for revisions.

Progress Tracking and Reporting

The Contractor shall:

- provide progress updates to Project Management on a weekly basis, as a minimum, which shall comply with reporting requirements as such:
  - environmental training topics and % employee attendance;
  - copies of ESM meeting minutes;
  - inspection / audit findings in the reporting period;
  - progress against completion of corrective actions;
- report the following items for the previous month, on the first day of each month:
  - performance against defined objectives and targets for management of significant risks;
  - amount of waste oil removed from the Site;

- amount of contaminated soil generated and disposed;
- amount and type of wastes generated and disposed;
- area of land cleared;
- visual water quality and depth to water level (where required);
- volumes of wastewater generated;
- any other reporting to local authorities.

- provide all environmental related documentation as requested.

Record Keeping

The Contractor shall:

- keep all the records and other relevant documentation to demonstrate compliance to Project requirements for the duration of the Contract;
- make records available during inspections and audits by Project Management.

10.3.3 Operation Phase

The appointed construction site HSE Manager during the construction of the Project will preferably continue for the operation phases. If not, a new HSE Manager will be appointed in the beginning of the operations to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

The HSE Manager will be the point of contact for Project internal and external stakeholders.

In addition to the overall management system requirements described in Section 10.0, the Project will develop additional operational plan and procedures as part of the environmental management system. These will include the following, but not limited to;

- Environmental Risk Identification and Assessment Procedure
- Compliance Management Procedure
- Waste Management Procedure
- Traffic Management Procedure
- Environmental Emission and Discharge monitoring procedure
- Hazardous Material Handling Procedure
- Resource Consumption and Resource Efficiency Monitoring Procedure

10.4 Social Management Plan

10.4.1 Management Mechanism

A Community Relation Officer (CRO will be appointed at the beginning of the pre-construction activities to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

10.4.2 Stakeholder Identification

Stakeholders are individuals or groups who can affect, or are affected by, or have a legitimate interest in the Project results and performance. Some stakeholders are obvious, such as government authorities responsible for permitting and local communities adjacent to the Project. However, stakeholder identification intends to include other groups, organisations and individuals that may not appear to be directly involved. Health professionals and educators, for example, may be directly involved in the Project development, and are also familiar with the existing community and socio-economic dynamics and can help improve the quality of impact analysis. Such consultation also helps ensure that mitigation and social investment are coordinated with existing initiatives. Expanding stakeholder identification beyond government and local residents increases the likelihood that a wide representation of interests and opinions will be considered in the development of the Project.

In the case of the present Project stakeholders will be recorded in the following categories:

- governmental authorities at the national, regional and local levels;
- multi-national and international organizations (i.e., EBRD,, World Bank Group, bilateral donors, etc.);
- non-commercial, non-governmental and public organizations at the international, national, regional and local levels,
- interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce and others (i.e., labour, youth, religious, businesses, etc.);
- local communities;
- local businesses and potential Project contractors and suppliers;
- project, contractor and subcontractor employees; and
- media.

10.4.3 Stakeholder Engagement

A Stakeholder Engagement Program has been planned with the following main objectives:

- continuously informing the local community about the Project-related development activities;
- ensuring that the local community is informed about the hazards associated with construction, operation activities of the Project and mitigation measures implemented by Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. to reduce impacts where possible;
- minimizing potential disputes between Contractor's and Subcontractors' and the local community;
- incorporating local knowledge during the entire Project life cycle, by taking into account bottom up information and feedback provided by local communities; and
- timely and effectively responding to community concerns regarding the issues such as employment of the local workforce reserve in the construction and operation phases, disruption to daily activities, safety issues, disturbances due to noise or dust, and other environmental and social issues.

10.4.4 Grievance Mechanism

The purpose of establishing the Grievance Mechanism is to provide indications on the procedure to be followed for the management of grievances that could arise due to construction and operation activities of the Project. The Grievance Mechanism is part of a broader framework represented by the Stakeholder Engagement, which sets the guiding principles and provides implementation tools to build strong relations with local communities. In this sense the Grievance Mechanism is a key tool that allows the company to identify problems and to discover solutions together with the affected communities. The Grievance Mechanism aims at demonstrating responsiveness to stakeholder needs and to facilitate a trustworthy and constructive relationship with the stakeholders, by developing appropriate mitigation strategies.

The principles underlying the Grievance Mechanism are the following:

- transparency in grievance receipt and registration system;
- accessibility and culturally appropriateness, ensuring ease of access to community members;

- predictability based on a clear and known procedure, with time frames for each stage; clarity on the types of process and outcome it can (and cannot) offer; and means of monitoring the implementation of any outcome, maintained through effective disclosure of the mechanism;
- equitability ensuring fairness among aggrieved parties;
- confidentiality: all grievances received will be treated confidentially and will not be shared outside the company. Submissions will not be used in any way to intimidate the person or organization submitting the complaint.
- The Community Relation Officer and Community Relation Assistant (mentioned in Section 10.2.1) will be responsible of grievance mechanism. This mechanism have also been covered the patients, health employees and contracted workers.

The objectives of the Grievance Process will be to:

- provide affected people with ways and means of stating their complaints during the course of the project;
- establish a transparent and mutually respectful relation with communities;
- ensure that corrective actions are identified and taken;
- verify that affected people are satisfied with the corrective actions taken;
- avoid the need for judicial operation sanctions.

Girevance Mechansim has been an ongoing process which will be carried out during both construction and operation period.

10.4.5 Monitoring and Reporting

The outcomes of the grievance mechanism procedures will be regularly reported both internally and externally.

In order to increase success of the grievance mechanism, all management staff must be aware of role and objectives of the procedure, to ensure that effective support is given to the CRO in the identification and implementation of grievance resolution actions. It is therefore key that management and general staff is regularly informed on the grievance mechanism outcomes and performances.

With regards to internal reporting, the CRO will be responsible for liaising with management on a regular and on need basis, to inform on general progress of grievance mechanism and to seek for advice when needed.

10.5 Labour Issues and Health & Safety Management Plan

10.5.1 Labour Conditions

Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş. will prepare a Labour and Health & Safety Management Plan that will ensure the compliance with applicable Turkish legislation, Equator Principles, IFC and EBRD Guidelines and standards.

A labour / human resources management system will be established to manage labour rights, security and health issues. An employee grievance mechanism will be established during construction and operation phases. The employees will be informed on the grievance mechanism during recruitment.

Considering the present project characteristics and the information collected through impact assessment process following points will be considered and included as a minimum into the management system to be developed;

- The SPV (Kocaeli Hastane Yatırım ve Sağlık Hizmetleri A.Ş.) will promote equality of treatment and prohibit harassment in the workplace

- Employment decisions, such as recruitment, dismissal, promotion, will be transparent and will not be made (directly or indirectly) on the basis of personal characteristics such as sex, race, nationality, etc, but rather on the ability to do the job.
- Be in coordination with the local health authorities and association on developing the recruitment process
- The employees will be provided with a written contract. The contracts as a minimum will include information on terms and conditions of employment, including the period of employment, wages, hours of work, overtime arrangements, procedures for termination of the contract and any benefits. The contract will be in the native language of the employee and it will be clear and understandable to the employee. A copy of contract will be given to the employee.
- The copies of relevant human resources policies and any collective agreements will be readily available to workers
- Include provisions in the employee contracts to detailing the employment arrangements after the operation by PPP model has been completed and the management is handed over to public authorities. This will enable to minimize any potential negative impacts on employee rights and benefits during the hand over process.
- There will not be forced labour and employees will be free to terminate their employment in accordance with national law
- The SPV management has not issued the subcontracts, yet. During the contracting process the existing corporate procedures of Gama A.Ş. and Türkerler A.Ş. will be referred to.
- The Health and Safety requirements and provisions will be included in the sub-contracts and employee contracts.
- The employees will be informed on the operation of PPP projects during recruitment process.
- The recruitment process will be transparent and will not have any discriminating
- Follow minimum age for employment of young persons in national legislation, and keep records of dates of birth verified by official documentation
- Young people will not be employed in hazardous work as defined by Turkish national legislation.
- SPV has a strict policy on not employing child workers.
- SPV and subcontractors must document and communicate terms of employment to workers, usually in the form of a written contract of employment
- In case of large redundancies a retrenchment plan will be prepared by the SPV.

In relation to the specific requirement for the accommodation provided in the construction camps following measures will, as a minimum, be in place;

- Policies and procedures on the quality and management of the accommodation and provision of basic services (either provided directly or by third parties) shall be established in line with IFC, EBRD WA GN[27] and implemented.
- Basic services requirements refer to minimum space, supply of water, adequate sewage and garbage disposal system, appropriate protection against heat, cold, damp, noise, fire and disease-carrying animals, adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting, and dedicated medical services.

[27] Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

- Good standards in living facilities will be ensured in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents as well as to maintain a good level of morale. Living facilities have to be built using adequate materials and always have to be kept in good repair, clean and free from rubbish and other refuse. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Accommodation facilities will be provided with adequate heating, cooling and ventilation systems;
  - Facilities will be provided with both natural and artificial lighting (e.g. window surfaces of 5%-10% of flooring surface)
  - Workers will be guaranteed access to an adequate amount of free potable water for drinking and personal hygiene uses. Drinking water must meet national drinking water standards and its quality must be regularly monitored.
  - Wastewater, sewage water and other waste materials will be disposed of according to national legislation.
- The location of facilities is important to prevent exposure to wind, fire, flood and other natural hazards. Worker's accommodation has to be unaffected by the environmental or operational impacts of the worksite (for example noise, emissions of dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to worksite.
- Rooms and dormitory facilities will be designed and built so that workers can rest properly and maintain good standards of hygiene. Rooms/dormitories will be kept clean and in good conditions, exposure to noise and odour must be minimized. Room/dormitory design should strive to offer workers a maximum of privacy and all facilities must be single sex. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Rooms/dormitories are kept in good condition and cleaned at regular intervals
  - With regards to density, minimal floor space must be of 4-5.5 m2 per worker, with a minimum ceiling height of 2.1 m.
  - Each worker is provided with comfortable mattress, pillow, cover and clean bedding which are washed frequently.
  - Workers must be able to maintain a good standard of personal hygiene and contamination or spread of disease must be prevented through the use of adequate equipment and procedures. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Sanitary and toilet facilities will be built in materials that are easily cleanable, and are cleaned frequently and kept in working conditions
  - An adequate number of sanitary and toilet facilities will be provided (at a minimum 1 unit for 15 people) and conveniently located in the same building as rooms and dormitories.
  - An adequate number of hand-wash and shower facilities will be provided (at minimum 1 unit for 15 people) and conveniently located in the same building as rooms and dormitories;
- Good standards of hygiene will be maintained in canteen/dining and cooking facilities. If caterers are contracted to manage kitchens and canteens, they must take into account and implement the same standards. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Canteens will have a reasonable amount of space (minimum 1.5 m2 per person) and will be adequately furnished;
  - Kitchens will be designed, built and equipped so to maintain an adequate personal hygiene and to permit food hygiene practices, including protection against contamination.

- Safe and nutritious food will be provided to workers, in order to guarantee their wellbeing and productivity. The WHO 5 keys to safer food or an equivalent process will be implemented. Food served to workers will contain an appropriate level of nutritional value and will take into account religious/cultural backgrounds and needs.
- Access to adequate medical facilities and services is provided to workers; an adequate emergency response system must be put into place. See also Workers' Health Management Plan on Communicable Diseases.
- Basic leisure and social facilities will be provided to workers, in order to increase workers' welfare and to reduce the impacts of the presence of workers in the surrounding facilities. Basic collective social/rest spaces will be provided (e.g. multipurpose halls, TV rooms, etc.). In addition the contractor should consider providing recreational/sport facilities. Communication systems such as internet connection will be provided at an affordable or free cost.
- Security will be guaranteed to workers and their property (personal belongings) on site, in line with indications in the Security Management Plan.
- The accommodation services will be provided in a manner consistent with the principles of non-discrimination and equal opportunity. Workers' accommodation arrangements should not restrict workers' freedom of movement or of association. Workers' gender, religious, cultural and social backgrounds must be respected. Workers must be made aware of their rights and obligations and must be provided with a copy of the internal accommodation rules, procedures and sanction mechanism.
- Workers must be made aware of the Worker's Grievance Mechanism and know that any concern or complaint regarding accommodation may be submitted through the Worker's Grievance Mechanism.
- During the workers' accommodation design and planning process the Annex Checklist provided in the IFC and EBRD Guiding Notes on Workers' Accommodation must be followed to ensure that the document's requirements are met.

10.5.2 Occupational Health and Safety

A health and safety management system employing site and work specific health & safety procedures and instructions will be established. The procedures will include but not be limited to the following issues:

- General Health & Safety Procedures
- Specific Health & Safety procedures for hospital structures
- Personal Protective Equipment Usage
- Working at Height
- Fall Protection
- Working in Confined Space
- Hot Works
- Electrical Works
- Portable Appliances
- Lock Out Tag Out
- Procedures Related to Working Environment and Industrial Hygiene (noise, vibration, heat, etc)

10.5.3 Community Health And Safety

The community may be exposed to potential risks of health and safety associated with hazards created though the project activities and equipment, vehicles and infrastructure allocated for project use.

The section 9.0 on the assessment of potential impacts of the project on the environmental and social components provides a detailed discussion on the prevention and control of impacts on human health and the environment due to the release of pollution.

As an overarching attempt to control and minimise the community health and safety impacts SPV will;

- Cooperate with the project stakeholders through the engagement process detailed in the Stakeholder Engagement Plan while defining and implementation of the mitigation measures for the control of risks and impacts created by the project on the community health and safety.
- Prepare and accident and incident investigation procedure. This procedure will include the investigation process for the potential accidental events, injuries or diseases that may occur during the lifecycle of the project as a result of project related facilities. This procedure will also define the process for documenting the findings of the investigation and adopting measures for the prevention of reoccurrence.
- Inform and consult community members on specific project activities such as crossings, fragmentation and similar, they will be informed on the health and safety precautions and procedures through consultation meetings.
- Make sure all contractors and subcontractors will be informed on the requirements for ensuring community health and safety.
- Recruit or subcontracted security personnel in order to ensure the security of the working areas.
- A Grievance Mechanism will be in place as detailed in Stakeholder Engagement for communities and individuals to formally communicate their concerns, complaints and grievances and facilitate resolutions that are mutually acceptable by the parties.

More specifically in line with the location and characteristics of the present project the following community health and safety risks are identified;

- Transportation related safety risks
- Waste management related health risks
- Management of camp and construction and communicable diseases
- Health risks induced through provision of health care services
- Infrastructure, building, and equipment design and safety

10.5.3.1 Transportation related safety risks

During both construction and operation of the project the transportation activities and thus the traffic load will be increased around Tavşantepe, Yeşilova quarter and other settlements around the transportation routes.

A specific traffic study Appendix A has been prepared at the regional and project level for the definition of the best suitable traffic routes and the requirements of connections from existing roads to the project area.

An individual Traffic Management Plan will be prepared for construction and if required, operation phase of the project.

The Traffic Management Plan will include the measures for the minimisation of the transportation related safety risks. Nevertheless following mitigation measures as a minimum will be included in this Management Plan and will be implemented by SPV.

- Increased safety awareness among Tavşantepe, Yeşilova quarter and other nearby settlement areas especially on the routes of transportation to the project area will reduce risk of accidents. Therefore, an awareness training will be delivered to community members including the adults and children in nearby settlement area along the transportation routes for increasing the awareness on the project induced hazards (i.e. increased traffic, construction areas and similar).

- Community members will be informed and consulted for the location of the crossing points; they will be informed on the health and safety precautions and procedures through consultation meetings.
- Roads and intersections subject to intense construction traffic will be provided with additional mitigation measures such as traffic control, speed reduction systems, warning signals and informing drives on such hotspots.
- Transport during night-time will be avoided to the extent possible in order to prevent road accidents.

10.5.3.2 Waste management related health risks

- Wastes created during the construction and operation of the project would create health risks to the employees and community if not collected and disposed properly. An individual waste management plan has been prepared for the project and presented in Appendix B. As a minimum;
- All wastes will be segregated and recycling procedures will be set up;
- Domestic solid wastes will be disposed through licensed domestic solid waste disposal contractors identified through communication with the local authorities;
- Hazardous solid wastes will be disposed through licensed hazardous solid waste disposal contractors identified through communication with the local authorities;
- Medical wastes will be disposed through licensed medical waste disposal contractors identified through communication with the local authorities;
- Temporary site waste storage areas will be identified and arranged in compliance with local regulations.

10.5.3.3 Management of Camp and Construction Site

A construction camp will be established to accommodate the workers during construction. An individual Camp and Construction Camp Management will be prepared to include the mitigation measures for the minimisation of health and safety risks on the community through the operation of camp site.

As minimum following measures will be in place during the operation of the camp sites;

- In order to avoid risks of accidents due to presence of construction site and construction activities, there will be fencing and additional warning signals to avoid trespassing. In addition local population will be informed about construction activities taking place through stakeholder engagement.
- Medical surveillance will be performed among its workers and ensure medical examinations are done for workers performing health critical activities (i.e. canteen workers and such).
- İzmit District Health Directorate and other relevant health authorities in the area will be liaised to agree on appropriate strategies and plans to mitigate the transmission of communicable diseases in settlements surrounding campsite.
- Campsites will be provided with health facilities equipped to deal with emergency procedures and routine medical operations.
- Workers will be subject to legal health screening before employment contracts are signed and if necessary will be provided with required immunisation treatments; all health information will be dealt with confidentially. They will be given health awareness trainings at routine intervals.

10.5.3.4 Infrastructure, building, and equipment design and safety

Based on the seismic zone classification of Turkey, Kocaeli Province is in the 1th and 2nd degree seismic zone. The Project Area is located in the 1st degree seismic zone. (Refer to Section 8.1.2). This would increase the earthquake risk on the project area.

Project design and engineering should cautiously comply with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454). The parameters determined from geological and geotechnical investigations for the Project Area based on this regulation are:

- Building significance coefficient (I): 1.5
- Soil Type: B
- Local soil class: Z_2
  - Ground spectrum periods: T_A= 0.15 T_B= 0.40
- Effective ground acceleration coefficient (A_o): 0.40 (1st degree earthquake zone)

Other risks related natural hazards are addressed in Section 9.1.

The design, construction and operation of the structural components of the project will in compliance with national legislation and other applicable standards.

Before Kocaeli IHC is taken into operation a third part fire and safety audit/inspection will conducted by certified and competent experts.

10.5.3.5 Health risks induced through provision of health care services

During the operation of Kocaeli IHC there will production of medical and radioactive wastes.

If these wastes are not properly managed, they can pose significant health risks to the community. A specific waste management plan including medical/clinical wastes and radioactive wastes is presented in Appendix B

Operation of Kocaeli IHC will be in compliance with requirements of all the relevant regulations as described in section 3.0 and appropriate quality control and management systems will be implemented which would ensure the management of health and safety risks that would be imposed to patients, employees and community.

SPV will consider the assurance of emergency access to the IHC when developing the access routes to IHC and defining the emergency response and preparedness plan. As a minimum, there will be two possible access routes defined in case one of these routes is blocked or inaccessible in case of an emergency.

10.6 Treatment of Patients

An important consideration for the health services sector is the responsible and fair treatment of patients. In that respect to minimize the risks of malpractice, negligence and reputational damage the following issues should be ensured through the proper management mechanisms;

- Develop a comprehensive policy on governance and ethics covering all areas of risk (such as endorsement of drugs, non-discrimination of patients etc
- Ensure skills development of workers;
- Develop a comprehensive policy on governance and ethics covering all areas of risk (such as endorsement of drugs, non-discrimination of patients etc.);
- Develop a policy to address the concerns of the patient base
- Ensure state of equipment (age, level of maintenance, calibration) is fit for the services to be provided;
- Ensure the required capacity of the health care facility to provide services for the projected volume of patients;
- Develop a comprehensive system ensuring patient confidentiality.

10.6.1 Dual Management

Kocaeli IHC project has been executed as Pubic Private Partnership[28]. Though the SPV is the project sponsor and developing the project; during the operation phase there will be shared management responsibilities between the SPV (Project Company) and the Ministry of Health (Administration) defined by the Agreement between these parties. Dual management of Kocaeli IHC will result in shared responsibilities among these parties to ensure the above principles and requirements are in place.

The key points defined by this agreement relevant to the operation of the Kocaeli IHC are;

Each party agrees to co operate, at its own expense, with the other party in the fulfilment of the purposes and intent of this Agreement. Nevertheless, neither party shall be under any obligation to perform any of the other's obligations under this Agreement.

The Project Company shall perform its duties under this Agreement which include the designing and construction of the Facilities, the provision of the Services and the carrying out of the Commercial Activities, at its own cost and risk without recourse to the Administration except as otherwise expressly provided in this Agreement.

The Project Company have full regard for the safety of all persons on the Site (whether on the basis of a lawful right or not) in execution of the Operations under the Agreement, and keep the Site, the Works and the Facilities in an orderly state from the Site Delivery Date, appropriate in accordance with the provisions of Prudent Tradesman, to avoid any jeopardy to such persons, and take any kind of measures to prevent such jeopardy. Moreover, the Project Company shall comply, and shall procure that any of the Subcontractors comply, with any provisions relating to health and safety during the design and construction of the Works and the provision of the Services and performance of the Commercial Activities applicable to this Agreement under Turkish law.

The Project Company has no other medical or administrative liability other than those hereunder and in scope of the Schedules hereto.

The Project Company, unless the Administration gives its prior written consent, in no way whatsoever, carry out any work, procedure, design amendment or other modification in violation of the designs approved by the Administration.

Liabilities of Administration will include "carry out the supervision of the construction of the Hospital Facilities by itself or through an independent supervisor."

The Administration is responsible for procuring any kind of services which physicians, nurses and other personnel employed by the Administration are required to provide, including Clinical Services, and for their employment and payment of their remunerations and personal rights.

The Project Company shall in no way be responsible for the procurement of Clinical Services and their results. The Parties mutually agree upon interpretation of Schedule 14 (*Service Requirements*) in compliance with the principle which stipulates that the Project Company shall not be responsible for Clinical Services.

The Project Company shall not be responsible for providing Clinical Services or other services which must be provided by physicians, nurses or administrative personnel affiliated to the Administration, or consequences of such services.

The Project Company is obliged to provide the following Services:

a. Clinical Support Services:

- Laboratory Services,

[28] Public–private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies.

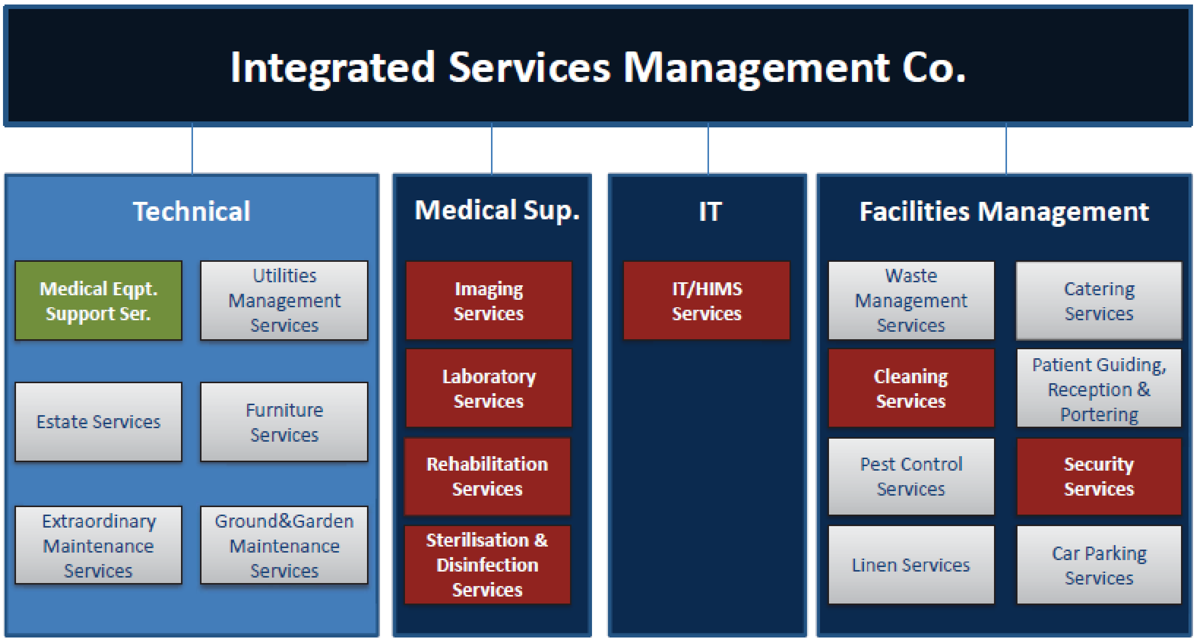
- Imaging Services,
- Sterilisation and Disinfection Services,
- Rehabilitation Services,
- Other Clinical Equipment Support Services.

b. Support Services:

- Estates Services,
- Extraordinary Maintenance (Life Cycle Replacement),
- Utilities Management Service,
- Furniture Service,
- Grounds and Gardens Maintenance Services,
- Cleaning Services,
- Hospital Information Management System (HIMS) Implementation and Operation Service,
- Security Services,
- Patient Guiding and Accompaniment / Reception/ Help Desk / Portering Services,
- Pest Control Services,
- Car Parking Services,
- Waste Management Services,
- Linen Services,
- Catering Services.

10.6.2 Patient Data Security

The following diagram presents the services to be provided by the SPV in the Kocaeli IHC.



During the execution of these services patient private data will be processed through the Hospital Information Management System (HIMS) Implementation and Operation Service to be provided by the SPV.

SPV will provide the continuity for the conformance of the offered HIMS services to the following rules and regulations;

- Conformance of national/internationally accepted communication, classification and medical informatics standards and/or norms.
- Conformance with the requirements defined in the rules, law and legislations of MoH.

In order to ensure the security of patient private data the HIMS will have the following features;

- HIMS should have full/comprehensive security infrastructure to prevent unauthorized access to the system. Since a lot of users' access different kinds of data in the system, the system must control their authority of changing or adding data to the system.
- The data security and reliability at user and operation levels should be provided within the whole system.
- Authorisation levels to access to the patient data will be defined by the SPV and the Ministry of Health.

Moreover; patient data security will also be protected by;

Contractual obligation (between SPV and Ministry of Health)

Legislative obligation

In case of any lack of local legislation, the related EU directives (like 95/46/EC Data Protection Directive) will be followed by the SPV.

The main objectives of SPV with regards to forensic unit are:

- To avoid or minimize the risk and impacts on the halth and safety of the local community during the all phases of the project in all circumstances
- To ensure that the safeguarding of personnel is carried out in a legitimate manner that avoids or minimize risks to the community's safety and security

- To protect and promote the health and safety of workers by ensuring healthy and safe working conditions and impelenting e health and safety management systems

SPV will ensure the community's and workers safety by;

- Ensuring infrastructure and equipment safety
- Incorporate the health and safety considerations into the design, construction, operation and decommissioning of the project.
- Preventing and minimasing the potential for community exposure to hazardous material safety
- Preventing the community exposure disease safety
- Asses the emergency preparedness and response
- Identify, and monitor the traffic and road safety

SPV will follow the all requirements included in IFC Performans Standar 4 and EBRD Performance Requirement 4 as well as the local requirements provided below:

- Law about Private Security Services, Law No: 5188
- Turkish Private Security Standards, TS 12782, TS 15602

SPV will assess risks to, employees or contractors to provide security to safeguard its own personel and property, within and outside the project site posed by its security arrangements. In making such arrangements, the SPV will be guided by the principles of proportionality, good international practices in terms of hiring, rules of conduct, training, equipping and monitoring of such personnel, and applicable law (below requirements). The SPV will make reasonable inquiries to satisfy itself that those providing security are not implicated in past abuses, will train them adequately in the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community, and require them to act within the applicable law. The SPV will not sanction any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. A grievance mechanism will also allow the affected community to express concerns about the security arrangements and acts of security personnel.

If government security personnel are deployed to provide security services for SPV, It will assess risks arising from such use, communicate its intent that the security personnel act in a manner consistent with above paragraph, and encourage the relevant public authorities to disclose the security arrangements for the hospital to the public, subject to overriding security concerns.

10.6.3 Forensic Hospital Services

The operation of the forensic hospital services will have the following challenges that would need specific engineering design and management considerations to mitigate the associated environmental and social risks ;

- Community health and safety risks associated the accommodation of the prisoners with mental problems accommodated in the unit;
- Management system challenges; there is going to be a designated management system at the campus where the MoH will assign special 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 be accommodated.
- Management of security systems and services

- Treatment of prisoners with mental problems

In order to mitigate these risks the following measures will be in place;

- There will be security systems to eliminate the unauthorized entry and exit to the premises of the hospital. The systems would include;
  - Security forces
  - Building design with special security considerations; security zoning, high security, medium security and medical clinics
  - Security fencing ; a combination of walls, plants, doors and fences as appropriate with the security zoning
  - Electronic (Closed Circuit Television and similar) surveillance system
  - There will be Gendarme (10 personnel); outdoor security (they will not have an authorisation to enter the forensic hospital unit)
  - There will be 48 guardians (16 x 3 shifts); for prisoners (appointed by MoJ and unarmed)
  - There will be 48 private security guards (16 x 3 shifts); for check points and visitor information guidance. (they will not have an authorisation to interfere to the patients)
- There will be a stakeholder engagement and grievance mechanism system in place to ensure the information exchange between the community members in the quarter, record and respond the concerns of these people.
- There will be communication mechanisms in place with Hacı Bektaş Veli School at parents and school official level. The emergency response plan will include informing the school officials in case of a security breech at the hospital.
- The hospital will be designed to accommodate 100 patients with mental problems. The hospital design will ensure the patient welfare and the security by allocating separate clinics for different gender types, open-air areas for patients and personnel, security provisions in line with security zoning, ensuring patient privacy when deciding on surveillance system design and similar.
- There will be close coordination and communication among Kocaeli IHC management, Ministry of Health, Ministry of Justice and Ministry of Interior for the operation of forensic hospital and provision of security forces.
- The Forensic Building location has been developed according to the ground´s sharp features limitations, high slopes and to a maximum achievable distance from the School. The forensic building have been longitudinally and transversely organized in relation to the geographic counter-lines (izoiphs curves), and the design team placed the building to a maximum distance from the existing School despite the existing high slopes in the plot

11.0 CUMULATIVE IMPACTS

Conformance Table – Environmental and Social Management System (ESMS)		
Theme/Sub-Theme	**EBRD PRs**	**IFC PSs**
Cumulative Impacts Cumulative impacts of the project are considered during impact assessment process in combination with impacts from other past, existing and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location.	PR 1	PS 1

Conformance Table – Environmental and Social Management System (ESMS)

Cumulative Impacts Potential adverse project impacts on existing ambient conditions are addressed The project-related impacts and issues associated with resource use, and the generation of waste and emissions are assessed in the context of project location and local environmental conditions	PR 3	PS 3

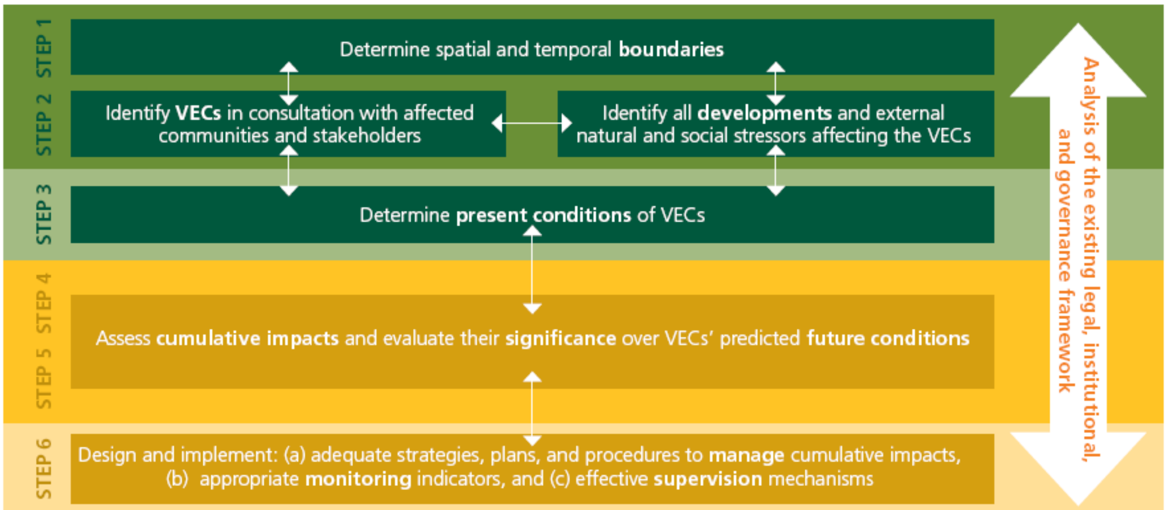
Cumulative impacts are defined as *"… those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones."* (IFC Good Practice Handbook: Cumulative Impact Assessment and Management).

Cumulative impacts can result from various types of interaction among different impact factors:

1. Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example the concurrent presence of the emission of noise and emission of dust during construction at the same location;
2. Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
3. Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example we can consider the emission of dust from the construction of the Project and the concurrent construction of a new road or industrial development at the same location.

In the context of the Kocaeli IHC ESA, the cumulative impacts mentioned at points 1 and 2 above have been accounted for in Chapter 9.0 addressing the potential impacts on the identified Valued Environmental and Social Components (VECs)[29]; this chapter describes the potential impacts identified in point 3 above.

The process followed for the assessment is consistent with the framework provided by IFC and illustrated in the figure below, as described in the following paragraphs.



[29] In the context of the discussion of cumulative impact assessments in this report Valued Ecosystem Components would correpsond to environmental and Socail Components as described in Section 7.2 of this report.

a) Spatial and temporal boundaries

The analysis of projects with potential cumulative impacts has been extended within the Social components Study Area that extends to neighbouring settlements to the Project Area including İzmit District. The projects considered were the projects likely to have a construction phase overlapping with the Kocaeli IHC project.

b) Valued environmental components identification

The VECs considered are the same considered for the Kocaeli IHC, as described in Section and analysed in detail in Section 8.0 and 9.0.

c) Present condition of the VECs

The present conditions of the VECs has been analysed in the course of the baseline studies, whose results are described in Section 8.0. The Area of Influence (AoI) considered is sufficient to determine the present conditions in the areas where there is potential interaction between the Kocaeli IHC project and the other projects considered.

d) Significance of the Cumulative Impacts

The analysis of the potential cumulative effects has been carried out based on limited information collected from the relevant authorities, and public information and in particular without the knowledge of the construction timeline.

e) Definition of the mitigation strategy

The mitigation strategy has been identified at a preliminary level, given the lack of specific information available on the various projects considered, and it is based on further studies to be conducted during the pre-construction of the Kocaeli IHC. In general the strategy has the objective to follow the mitigation hierarchy of avoid, mitigate and compensate, and it is based on the coordination of activities between Kocaeli IHC or organizations and the authorities in charge of the other projects.

Tavşantepe Urban Transformation Project Area

In the recent years, sections of Kocaeli is included in the scope of Urban Transformation Project (UTP). This project has been started and there is residential areas established in the allocated area. With the execution of the further steps of the project there may be overlapping construction impacts. However there is not accurate information on planning details of the project.

With the Urban Transportation Project and Kocaeli IHC there will be an increase in the reals estate prices in the area.

It has been observed during the public interviews and focus group meetings that the potential resettlement of Romany settlement by Tavşantepe UTP has been raising concerns on potential resettlement issues by Kocaeli IHC especially at the shanty houses at the project area border. (Refer to Section 9.4) The Romany community will not be resettled due to the proposed Project. The construction activities and design have been conducted in order to avoid any resettlement activities

Influx of informal businesses

With the Kocaeli IHC in operation an influx of informal businesses such as food carts, flower shops, pharmacies, medical appliances shops. These would be considered as potential impacts of the project; providing new business and employment opportunities to the local population.

12.0 CONCLUSIONS

The ESA for the project has been conducted following a series of phases including:

- Scoping
- Stakeholder engagement

- Alternative analysis
- Baseline
- Impact assessment
- Definition of Environmental and Social Management System

The ESA complies with the relevant Turkish regulation and it is aligned with the 2012 IFC Performance Standards and Guidance Notes and EBRD Environmental and Social Policy, 2014 and guidelines. The various activities have been carried out by a working group including Turkish and International experts in environmental and social disciplines.

The general methodology for the impact assessment is based on the definition of Valued Environmental and Social Components (VECs), that are aspects of the physical, biological and social environment that are considered worthy of protection by the relevant legislation or by international standards, and of Assessment Endpoints (AE), that are specific and measurable aspects of the VECs that allow for the assessment of impacts (both positive and negative).

The process of assessing impacts has been based on the following steps:

- The identification of Project Components, as individual elements of the Project that are characterized by similar features and construction, operation and decommissioning procedures;
- The identification of Impact Factors, or factors that can change the environmental and social quality of the VECs like air emissions, water discharge etc.,
- The definition of the sensitivity of the VECs to the Impact Factors identified, based on the environmental and social data collected during baseline;
- The definition of the Impacts as a result of the interaction between Impact Factors and Sensitivity of the VECs for each of the identified Assessment Endpoints.

Each of the project components has been associated to one or more impact factor for each of the phases of construction, operation and decommissioning. Given the nature of the Project, most of the impact factors are going to be present only during the construction phase, while during the operation phase waste management, operation of forensic hospital are likely to generate some risks.

Impacts have been assessed considering the correct application of a set of standard mitigation measures that are drawn from good industry practice. Additional site or issue specific mitigation measures have been identified to address areas where high residual impacts are likely to occur, in order to ensure the impacts after additional mitigation measure are kept at an acceptable level.

Impacts have been assessed separately for the three phases of construction-commissioning, operation and decommissioning, as the nature and extent of the impacts in the three phases is substantially different.

As a result of the Environmental and Social Assessment Study the following conclusion have been driven:

1) There is a requirement for the defining additional transportation route and public transportation alternatives to increase access to Kocaeli IHC. Liaison with public authorities and community members are essential during this process. Existing Traffic Study will need to be revisited to include updated in the transportation routes.
2) The community health and safety concerns are valid especially in relation to the Forensic Hospital. Continuous liaison is necessary with local community members to manage the associated risks specifically with Hacı Bektaş Veli School parents, school attendees and officials.
3) Continuous stakeholder engagement is necessary manage the social risks of the project.
4) The project will develop an Environmental and Social Management System in line with the minimum requirements that are defined as part of the ESA study.

The mitigation measures to be in place for the minimisation of environmental and social impacts of the project is detailed in appropriate sections of the report.

The requirements of an Environmental and Social Management System is also provided as part of the Environmental and Social Impact Study focusing on

- Environmental and Social Management System Structure
- Environmental and Social Management Plan
- Labour Issues and Health & Safety Management Plan
  - Labour Conditions
  - Occupational Health and Safety
  - Community Health And Safety
- Treatment of Patients
  - Dual Management
  - Patient Data Security
  - Forensic Hospital Services

Report Signature Page

GOLDER ASSOCIATES (TURKEY) LTD. ŞTI

Caner Şahin Project Manager	Sibel Gülen Project Director

CS/SG

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APPENDIX A

Traffic Study

APPENDIX B

Waste Management Plan

APPENDIX C

Forms and Questionnaires-Socioeconomic Survey

APPENDIX D

Site Photos

APPENDIX E

Stakeholder Engagement Plan

APPENDIX F

Public Consultation Meeting

APPENDIX G

Lab Results and Borehole and Testpits Logs

APPENDIX H

Regional Physical and Biological Baseline Characteristics

Regional Geology

Geology and geomorphology baseline conditions have been assessed from desktop studies and literature data review. Main sources reviewed are listed below:

- Özcan, Z., Okay, A.I., Özcan, E., Hakyemez, A. and Özkan-Altıner, S., 2012, “Late Cretaceous-Eocene geological evolution of the Pontides based on the new stratigraphic and paleontologic data between the Black Sea coast and Bursa (NW Turkey)”, Turkish Journal of Earth Sciences, 21, 933-960;
- ÇAKIR, Ş., 2000, “Demirciler-Sadıklar-Gündoğdu-Tütünçiftlik (Kocaeli) Bölgesinin Jeolojisi”, Kocaeli University, Graduate School of Natural and Applied Sciences, Geological Engineering, PhD Thesis (unpublished);
- Karaağaç,S., Karakaş, A., Çorük Ö., 2013, “Engineering geologic assessment of the rock slide occurred in east of Izmit –Tavsantepe”, Uygulamalı Yer Bilimleri Dergisi 1, page 1-9.;

- The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015;
- Geological Maps prepared by General Directorate of Mineral Research and Exploration.

The strands of the North Anatolian Fault, a post-Oligocene right-lateral strike-slip fault, divide the Northwest Region of Turkey into three parts: the Kocaeli Peninsula north of the main strand of the North Anatolian Fault, the Armutlu Peninsula bounded by the strands of the North Anatolian Fault and the area between İznik Lake and Bursa. The Project Area is located on the Kocaeli Peninsula (Figure 27).

The Upper Cretaceous–Eocene stratigraphy in the Kocaeli Peninsula is relatively well known. In the north, along the Black Sea coast, the Upper Cretaceous begins with a volcanic-volcanogenic series, the Yemişliçay Group, which lies uncomfortably over the Triassic and older sedimentary rocks. The Yemişliçay Group consists of basaltic and andesitic tuffs, agglomerates, lava flows, volcanogenic sandstones and shales with a thickness of over 500 metres. Gedik et al. (2005a) described a Late Santonian–Campanian fauna of planktonic foraminifera and nanofossils from the volcanogenic series. The Yemişliçay Group is overlain by 50 to 80 m of pelagic limestones of the Akveren Formation. The age of the Akveren Formation in the northern part of the Kocaeli Peninsula is Late Campanian to Middle Palaeocene (Selandian) (Gedik et al. 2005a). Around Şile the Akveren Formation passes up into the 5 – 350 m thick shales and marls of the Late Palaeocene (Thanetian)–Early Eocene (Ilerdian) Atbaşı Formation (Gedik et al. 2005b). The Atbaşı Formation is overlain by a turbiditic sequence of sandstone, shale and marl with olistostrome horizons. The blocks in the olistostromes are predominantly limestones of the Akveren Formation (Baykal & Önalan 1979; Gedik et al. 2005b). The olistostromal unit is uncomfortably overlain by shallow marine sandstone, marl and nummulitic limestone of early Lutetian age (SBZ 13, Yunuslubayır Formation, Özcan et al. 2007). Continuous deposition from the Campanian to Early Eocene is observed all along the southern Black Sea coast, represented by the Campanian–Maastrichtian Akveren, Palaeocene Atbaşı and Lower Eocene Kusuri formations (Görür 1997; Tüysüz 1999; Hippolyte et al. 2010)[30].

[30] Özcan, Z., Okay, A.I., Özcan, E., Hakyemez, A. and Özkan-Altıner, S., 2012, "Late Cretaceous-Eocene geological evolution of the Pontides based on the new stratigraphic and paleontologic data between the Black Sea coast and Bursa (NW Turkey)", Turkish Journal of Earth Sciences, 21, 933-960.

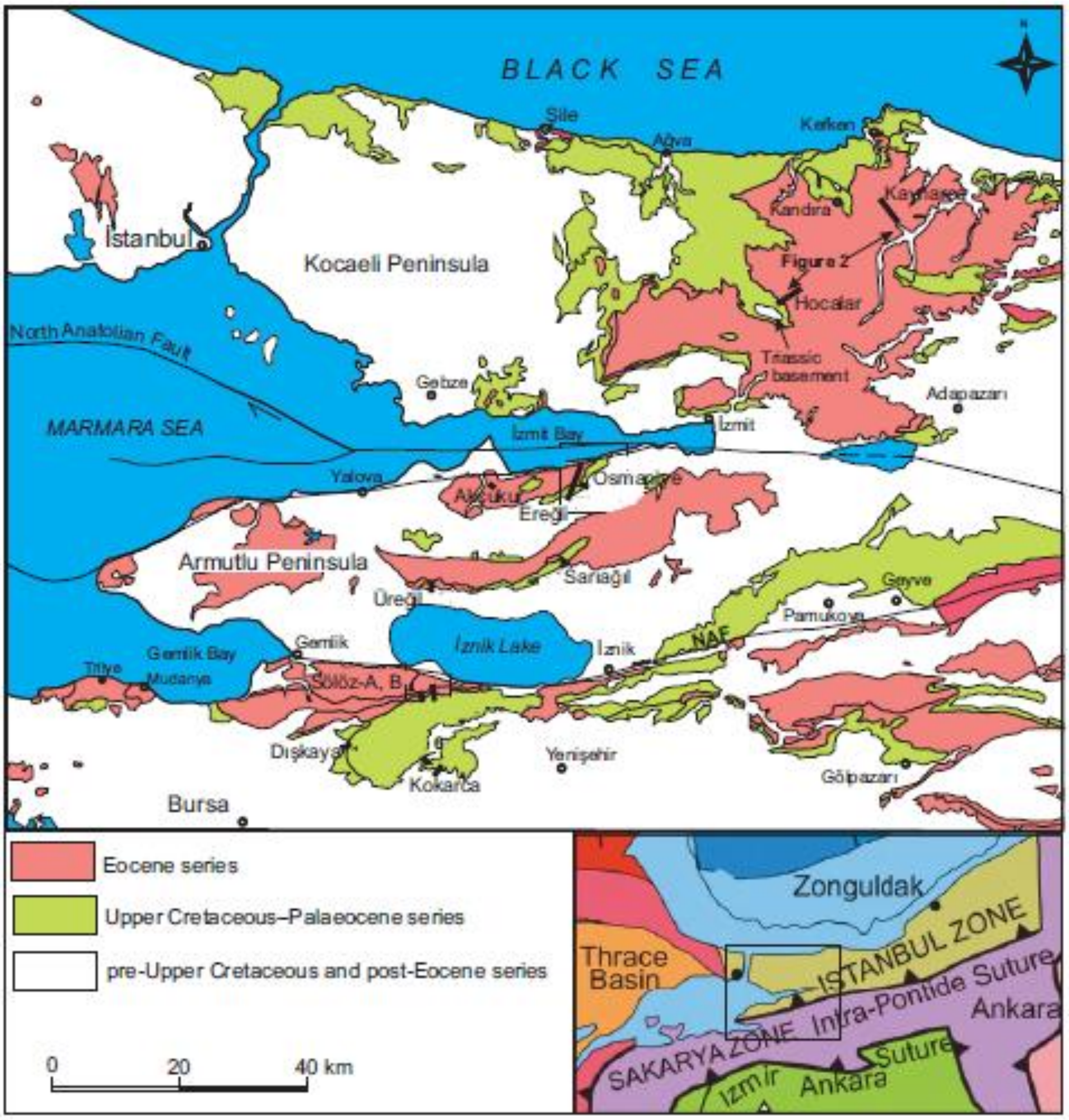

Figure 27: The Cretaceous, Palaeocene and Eocene outcrops in northwest Turkey[31]

The volcanic and volcanoclastic rocks of the Yemişliçay Group, widespread along the Black Sea coast, become thinner towards the south and are absent in the Kocaeli Peninsula south of 41°N, where the Upper Cretaceous section starts locally with a sequence of sandstone, pebbly sandstone and conglomerate with clastics derived from the Palaeozoic rocks (Gedik et al. 2005c). This Teksen Formation lies with an angular unconformity over the Palaeozoic and Triassic series (Baykal 1943; Gedik et al. 2005c); its age is constrained to the Santonian–Campanian interval. However, in many locations the Teksen Formation is also absent and the Upper Cretaceous sequence starts with the Akveren Formation. The Hocalar section measured in the Kocaeli Peninsula is located in one such area, where the Triassic conglomerate and sandstone are directly overlain by the Akveren Formation with no intervening Teksen and Yemişliçay formations (Gedik et al. 2005c) (Figure 28)[32].

[31] Özcan, Z., Okay, A.I., Özcan, E., Hakyemez, A. and Özkan-Altıner, S., 2012, "Late Cretaceous-Eocene geological evolution of the Pontides based on the new stratigraphic and paleontologic data between the Black Sea coast and Bursa (NW Turkey)", Turkish Journal of Earth Sciences, 21, 933-960.

[32] Özcan, Z., Okay, A.I., Özcan, E., Hakyemez, A. and Özkan-Altıner, S., 2012, "Late Cretaceous-Eocene geological evolution of the Pontides based on the new stratigraphic and paleontologic data between the Black Sea coast and Bursa (NW Turkey)", Turkish Journal of Earth Sciences, 21, 933-960.

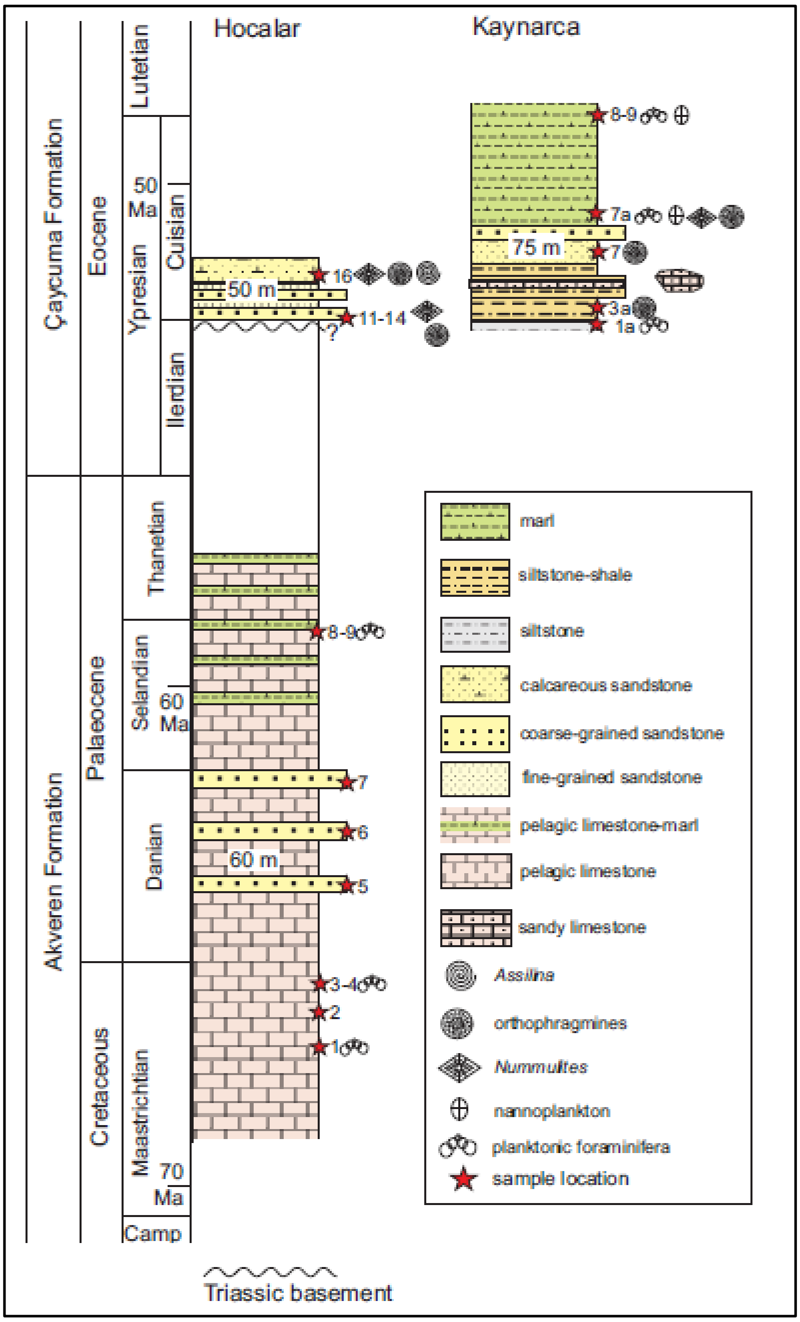

Figure 28: The stratigraphy of the Upper Cretaceous–Eocene sequence in the Hocalar and Kaynarca sections from the Kocaeli Peninsula[33,34]

The close vicinity of the Project Area (area of Demirciler-Sadıklar-Gündoğdu-Tütünçiftlik) was studied in detail by Çakır in 2000[35]. The foundation of the study area is represented by the Lower Triassic aged İzmit Formation, consisting of conglomerate, sandstone and mudstone. The Peksimet, Akveren and Atbaşı Formations overlie on the foundation with angular unconformity, respectively. The Peksimet Formation is represented by Upper Cretaceous sandstone and conglomerates. The Akveren Formation consists of Upper

[33] Özcan, Z., Okay, A.I., Özcan, E., Hakyemez, A. and Özkan-Altıner, S., 2012, "Late Cretaceous-Eocene geological evolution of the Pontides based on the new stratigraphic and paleontologic data between the Black Sea coast and Bursa (NW Turkey)", Turkish Journal of Earth Sciences, 21, 933-960.

[34] For the location of the sections see Figure 1.

[35] ÇAKIR, Ş., 2000, "Demirciler-Sadıklar-Gündoğdu-Tütünçiftlik (Kocaeli) Bölgesinin Jeolojisi", Kocaeli University, Graduate School of Natural and Applied Sciences, Geological Engineering, PhD Thesis (unpublished)

Cretaceous-Medium Eocene aged clayey limestone and marl deposits. The Atbaşı Formation consists of mudstones and sandstones[36]. The detailed geological map of the area studied by Çakır (2000) (in close vicinity of the Project Area) is given in Figure 29.

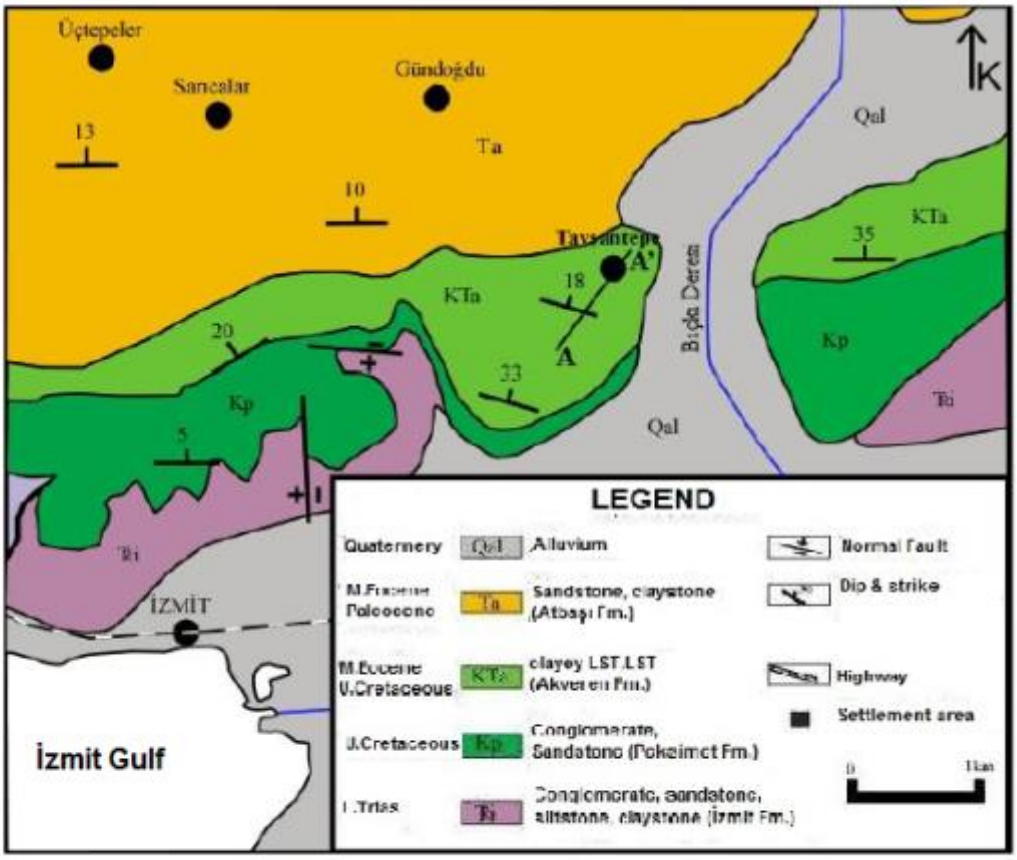

Figure 29: The Geological map of the area studied by Çakır (2000)37

Regional Seismology

Turkey is one of the most seismically active regions in the world. As a result, it has a long history of large earthquakes that have killed many thousands of people and caused economic devastation, including the Kocaeli (M = 7.4) and Düzce (M = 7.2) events of 17 August and 12 November 1999, near İstanbul. It is located within the 'Mediterranean Earthquake Belt', whose complex deformation results from the continental collision between the African and Eurasian plates (Bozkurt, 2001).

The neo-tectonics of Turkey is governed by three major elements: (1) the Aegean–Cyprean Arc, a convergent plate boundary where the African Plate to the south subducts beneath the Anatolian Plate to the north; (2) the dextral North Anatolian Fault Zone; and (3) the sinistral East Anatolian Fault Zone. The latter two are intra-continental strike-slip faults along which the Anatolian Plate, a wedge of amalgamated fragments of crust, moves westward away from the collision zone between the Arabian and the Eurasian plates at a rate of ~20 mm year–1 . This activity is the result of interactions between the northward moving African and Arabian plates and the relatively stable Eurasian Plate. The two strike-slip faults meet and form a continental triple junction to the east of Karlıova in north-eastern Turkey (Figure 30) (Bozkurt, 2001).

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[36] Karaağaç,S., Karakaş, A., Çorük Ö., 2013, "Engineering geologic assessment of the rock slide occurred in east of Izmit –Tavsantepe", Uygulamalı Yer Bilimleri Dergisi 1, page 1-9.

[37] Karaağaç,S., Karakaş, A., Çorük Ö., 2013, "Engineering geologic assessment of the rock slide occurred in east of Izmit –Tavsantepe", Uygulamalı Yer Bilimleri Dergisi 1, page 1-9.

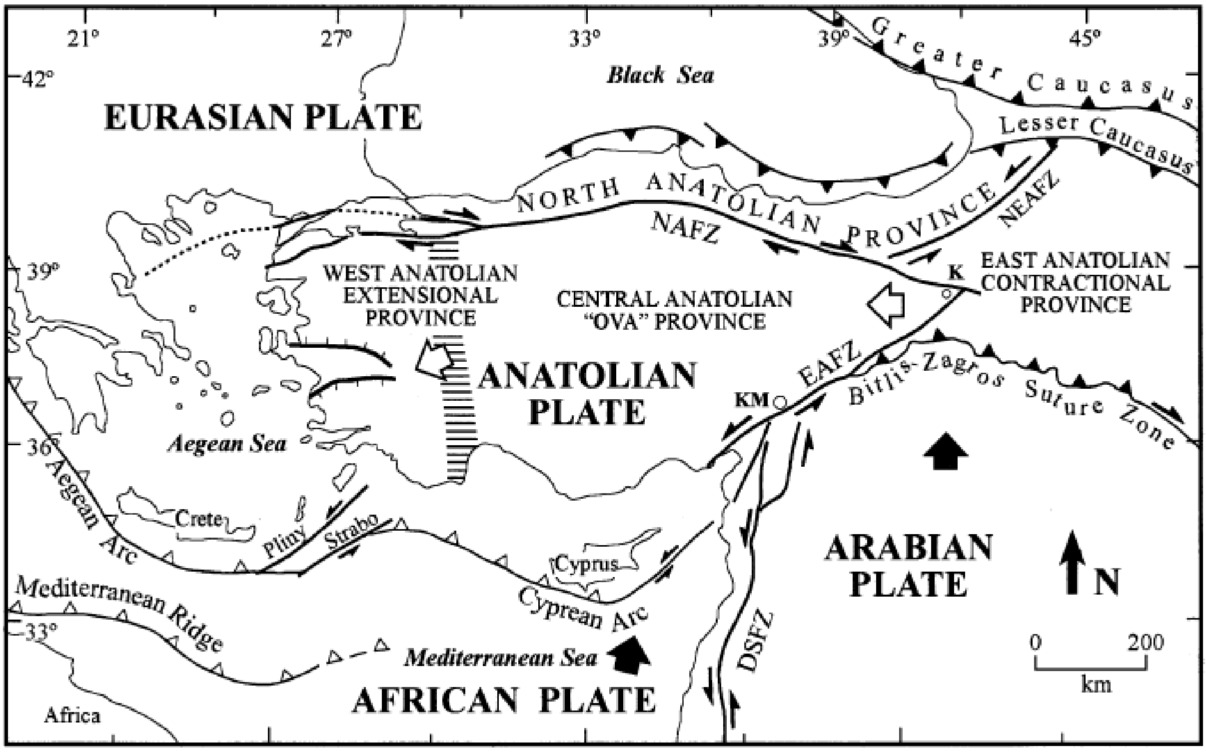


Figure 30: Simplified tectonic map of Turkey showing major neotectonic structures and neotectonic provinces [38,39]

The North Anatolian Fault Zone (NAFZ) is one of the best-known strike-slip faults in the world because of its remarkable seismic activity, extremely well developed surface expression and importance for the tectonics of the eastern Mediterranean region. To the east, the NAFZ forms a typical triple-junction and joins with the sinistral East Anatolian Fault Zone (EAFZ) at Karlıova. The NAFZ is an approximately 1500 km-long, broad arc-shaped, dextral strike-slip fault system that extends from eastern Turkey in the east to Greece in the west. It is predominantly a single zone of a few hundred metres to 40 km wide. Along much of its length, this fault zone consists of a few shorter sub-parallel fault strands that sometimes display an anastomosing pattern. This fault zone forms the part of the boundary between the Eurasian Plate to the north and Anatolian Plate to the south, being sub-parallel to the Black Sea coast. This fault zone is also characterized by several second-order faults that splay from it into the Anatolian Plate (Figure 30, Figure 31) (Bozkurt, 2001).

During the past 60 years, NAFZ has produced earthquakes along different sections in a manner that is atypical of long faults. Beginning with the 1939 Erzincan earthquake (M = 7.9 to 8.0) which produced about 350 km of ground rupture, the NAFZ ruptured in relation to nine moderate to large earthquakes (M > 6.7), and formed more than 1000 km of surface rupture along the fault. Most of the earthquakes occurred sequentially in a westward progression. These include the 26 December 1939 Erzincan (M = 7.9 to 8.0), the 20 December 1942 Erbaa-Niksar (M = 7.1), the 26 November 1943 Tosya (M = 7.6), the 1 February 1944 Bolu–Gerede (M = 7.3), the 26 May 1957 Abant (M = 7.0), the 22 July 1967 Mudurnu valley (M = 7.1), the 13 March 1992 Erzincan (M = 6.8), the 17 August 1999 Kocaeli (M = 7.4), and the 12 November 1999 Düzce earthquakes. The analyses and distribution of historical earthquakes reveal that among the two westernmost branches of the NAFZ, it is the northern strand that is the most active one and has generated more large earthquakes (Bozkurt, 2001).

[38] Bozkurt, E., 2001, "Neotectoncis of Turkey - a synthesis", Geodinamica Acta, 14, 3-30

[39] K – Karlıova, KM – Kahramanmaras¸, DSFZ – Dead Sea Fault Zone, EAFZ – East Anatolian Fault Zone, NAFZ – North Anatolian Fault Zone, NEAFZ – Northeast Anatolian Fault Zone. Heavy lines with half arrows are strike-slip faults with arrows showing relative movement sense. Heavy lines with filled triangles shows major fold and thrust belt: small triangles indicate direction of vergence. Heavy lines with open triangles indicate an active subduction zone, its polarity indicated by the tip of small triangles. The heavy lines with hachures show normal faults: hachures indicate down-thrown side. Bold filled arrows indicate relative movement direction of African and Arabian plates; open arrows, relative motion of Anatolian Plate. Short arrows show the sense of plate motion, half arrows the relative motion senses on strike-slip Faults. The hatched area shows the transition zone between the western Anatolian extensional province and the central Anatolian 'ova' province from Sqengör et al. (Bozkurt, 2001)

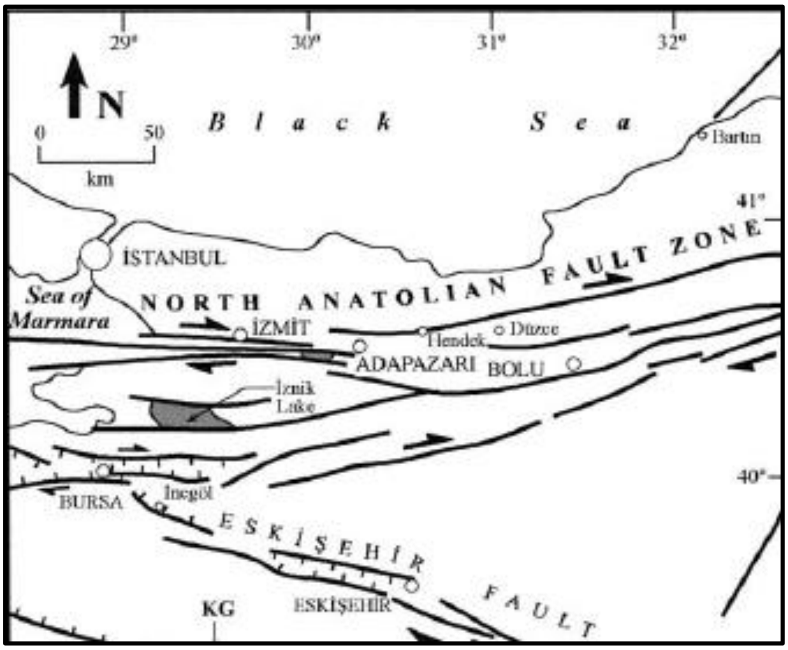


Figure 31: Simplified map showing major structural elements of Kocaeli Region[40]

The Earthquake Zoning Map of Turkey was prepared by the Ministry of Public Works and Settlement considering the latest knowledge, approved by the Government of Turkey and published in 1996. The earthquake zones were determined by using the acceleration contour map that was prepared using the probabilistic method. “Regulation on the Buildings to be Constructed on Earthquake Zones (Date: 06.03.2007 O.G. No: 26454)" refers to this map for the calculation of acceleration values that will affect the construction. The earthquake zones of Turkey were classified as fallow due to expected acceleration values[41];

- 1st degree earthquake zone : more than 0.4g
- 2nd degree earthquake zone : between 0.3g - 0.4g
- 3rd degree earthquake zone : between 0.2g - 0.3g
- 4th degree earthquake zone : between 0.2g - 0.1g
- 5th degree earthquake zone : less than 0.1g

The earthquake zoning map of Kocaeli Province according to the Map of Turkey Seismic Zones is given in Figure 32. Based on the seismic zone classification of Turkey, Kocaeli Province is in the 1th and 2nd degree seismic zone. The Project Area is located in the 1st degree seismic zone.

[40] Modified from Bozkurt, 200, (Heavy lines with half arrows are strike-slip faults with arrows showing relative movement sense. Heavy lines with hachures show normal faults: hachures indicate down-thrown side)

[41] g: gravity(981 cm/s*s)

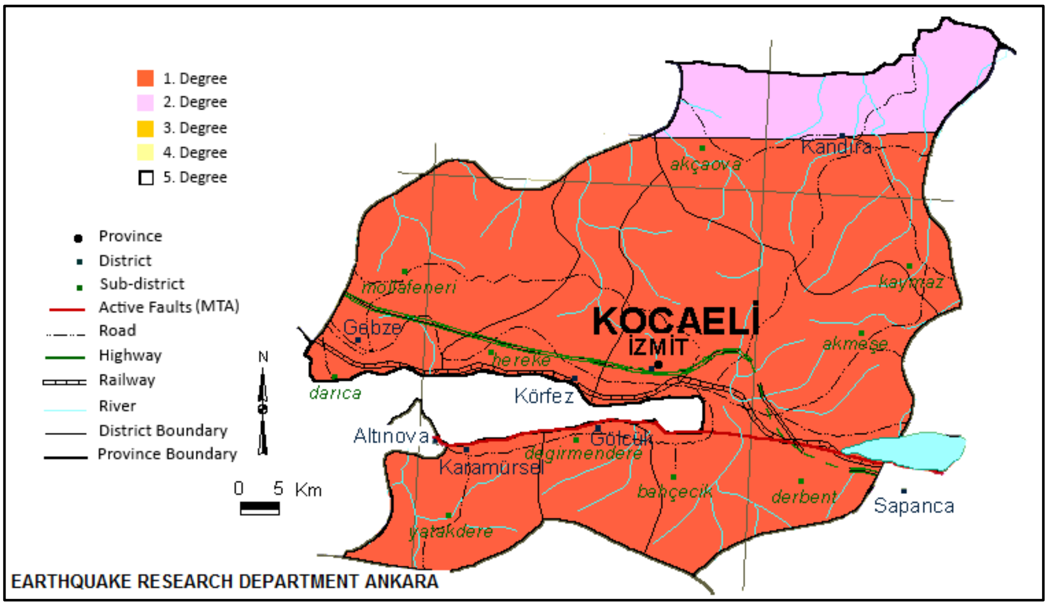


Figure 32: The Earthquake Zoning Map of Kocaeli Province

The activity of faults in Kocaeli Region is shown by numerous historical earthquakes. The Seismic Hazard Assessment Report was prepared for the Project Area by GeoDestek Geoengineering & Consultancy Services. The scope of this assessment includes probabilistic and deterministic seismic hazard assessments for the Kocaeli Integrated Health Campus Project Area. The major events that have 100 km or less epicentre distance to the Project Area during the instrumental period (20th and 21st century) were listed in the Seismic hazard assessment report. A total number of 30 events were identified having magnitudes greater than or equal to 5.0 Table 31.

Table 31: Earthquakes during the instrumental period having epicentre distances closer than 100 km to the Project Area (M>=5.0)[42]

No.	Date	Latitude (°)	Longitude (°)	Focal Depth (km)	M	R_{epi} (km)
1	17.08.1999	40.76	29.95	17	7.5	3.0
2	20.06.1943	40.85	30.51	10	6.4	47
3	18.09.1963	40.77	29.12	40	6.2	71
4	22.07.1967	40.67	30.69	33	6.2	63
5	26.05.1957	40.76	30.81	10	5.9	72
6	13.09.1999	40.75	30.08	10	5.9	11
7	30.07.1967	40.72	30.52	18	5.7	48
8	11.11.1999	40.75	30.25	7.0	5.7	25
9	21.08.1907	40.70	30.10	15	5.6	15
10	29.05.1923	41.00	30.00	25	5.6	24
11	20.06.1943	40.84	30.73	10	5.6	65
12	31.08.1999	40.76	29.93	4.0	5.6	4.0
13	26.05.1957	40.60	30.74	40	5.5	69
14	22.07.1967	40.70	30.80	6.0	5.5	72
15	26.12.1957	40.83	29.72	10	5.4	21
16	22.07.1967	40.72	30.51	35	5.4	47
17	23.08.2000	40.78	30.76	11	5.4	68

[42] The Seismic Hazard Assessment Report for Kocaeli Integrated Health Campus Project, December 2014

No.	Date	Latitude (°)	Longitude (°)	Focal Depth (km)	M	R_{epi} (km)
18	09.08.1939	39.91	29.81	60	5.3	98
19	21.10.1983	40.14	29.35	12	5.3	88
20	17.08.1999	40.78	29.93	10	5.3	2.0
21	06.01.1956	41.00	30.20	10	5.2	31
22	29.05.1957	40.83	30.77	20	5.2	69
23	22.07.1967	40.66	30.62	26	5.2	57
24	22.07.1967	40.73	30.53	10	5.1	49
25	22.07.1967	40.79	30.42	4.0	5.0	39
26	17.08.1999	40.64	30.62	9.0	5.0	58
27	17.08.1999	40.78	30.06	11	5.0	9.0
28	17.08.1999	40.64	30.67	21	5.0	62
29	19.08.1999	40.63	29.14	12	5.0	71
30	29.09.1999	40.74	29.33	12	5.0	53

The 20th and 21st Century Earthquakes in Turkey (M>=5.0) based on their magnitude are presented in Figure 33.

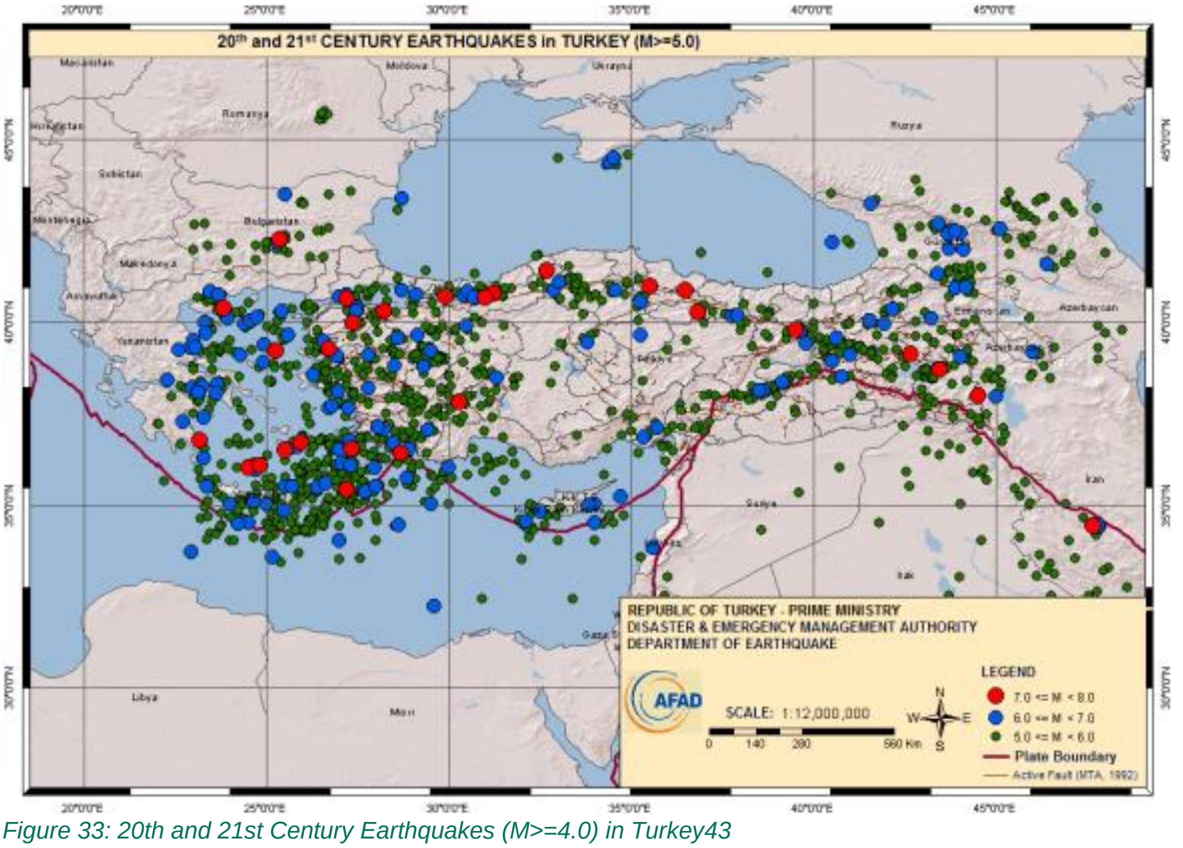


Figure 33: 20th and 21st Century Earthquakes (M>=4.0) in Turkey43

[43] Republic Of Turkey - Prime Ministry, Disaster & Emergency Management Authority, Department Of Earthquake

Regional Soil

According to the 2013 land use data of the Kocaeli Province, 37% of the total area of the Province is agricultural land, 35% forest-classified land, 27% settlements and 1% roads and other areas. The total land use area of the Kocaeli Province is 341.847 ha.

For the İzmit District, 27.99% of the total land use area is agricultural land whereas 27.68% are forest-classified and 36.81% are non-agricultural land. The total area per land use type and the percentage values for the Kocaeli Province and the Izmit District are presented in Table 32.

As presented in Figure 34, forest-classified land is mainly located along the northern boundary of the Kocaeli Province. In the centre of the province, dry agricultural fields are dominant. The heathlands are along the coastal parts.

The Land Use Capability Classification was defined by the Ministry of Food, Agriculture and Livestock. There are eight classifications for the land use capability. The soils in Kocaeli are mostly Class VII; however Class IV soil is also encountered in the northern parts of the province (Figure 34).

Table 32: Land Use Classification for Kocaeli Province and İzmit District

Type	Kocaeli[44]		İzmit[45]	
	Total Area (ha)	Percentage (%)	Total Area (ha)	Percentage (%)
Agricultural Land	104,556	31	13,556	27.99
Meadow-Pasture	11,859	3	3,643	7.52
Forest	147,429	43	13,409	27.68
Non-agricultural Land	78,003	23	17,828	36.81
Total	**341,847**	**100**	**48,436**	**100**

The soil groups in Kocaeli Province are presented in Figure 35. As seen therein the non-calcareous brown forest-classified soil is the dominant soil type. Rendzina soil covers relatively large areas compared to the other types, mainly in the city centre.

[44] Kocaeli Provincial Environmental Status Report, 2013

[45] Kocaeli Provincial Environmental Status Report, 2012

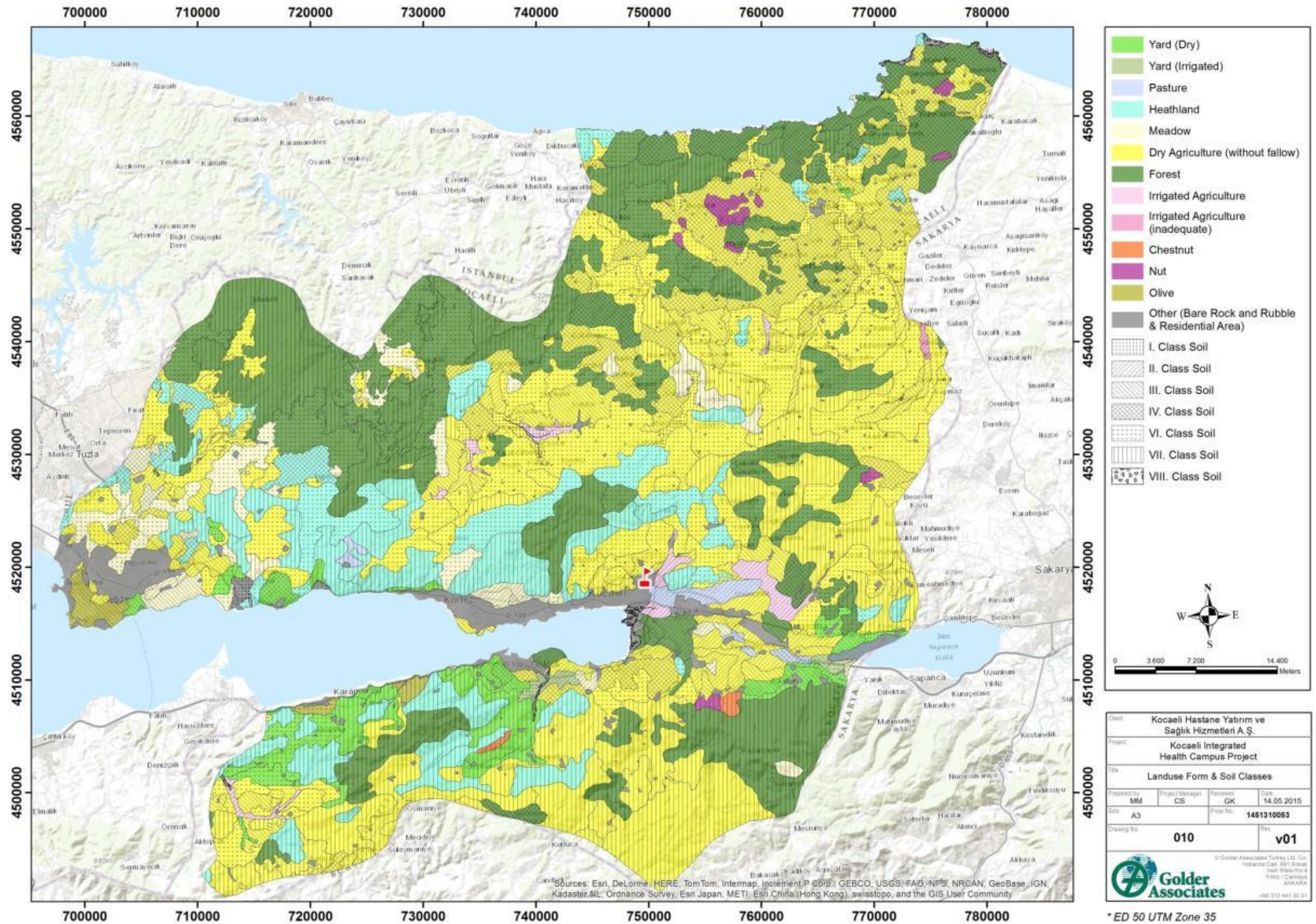


Figure 34: Land Use and Land Use Capability Classification for Kocaeli Province

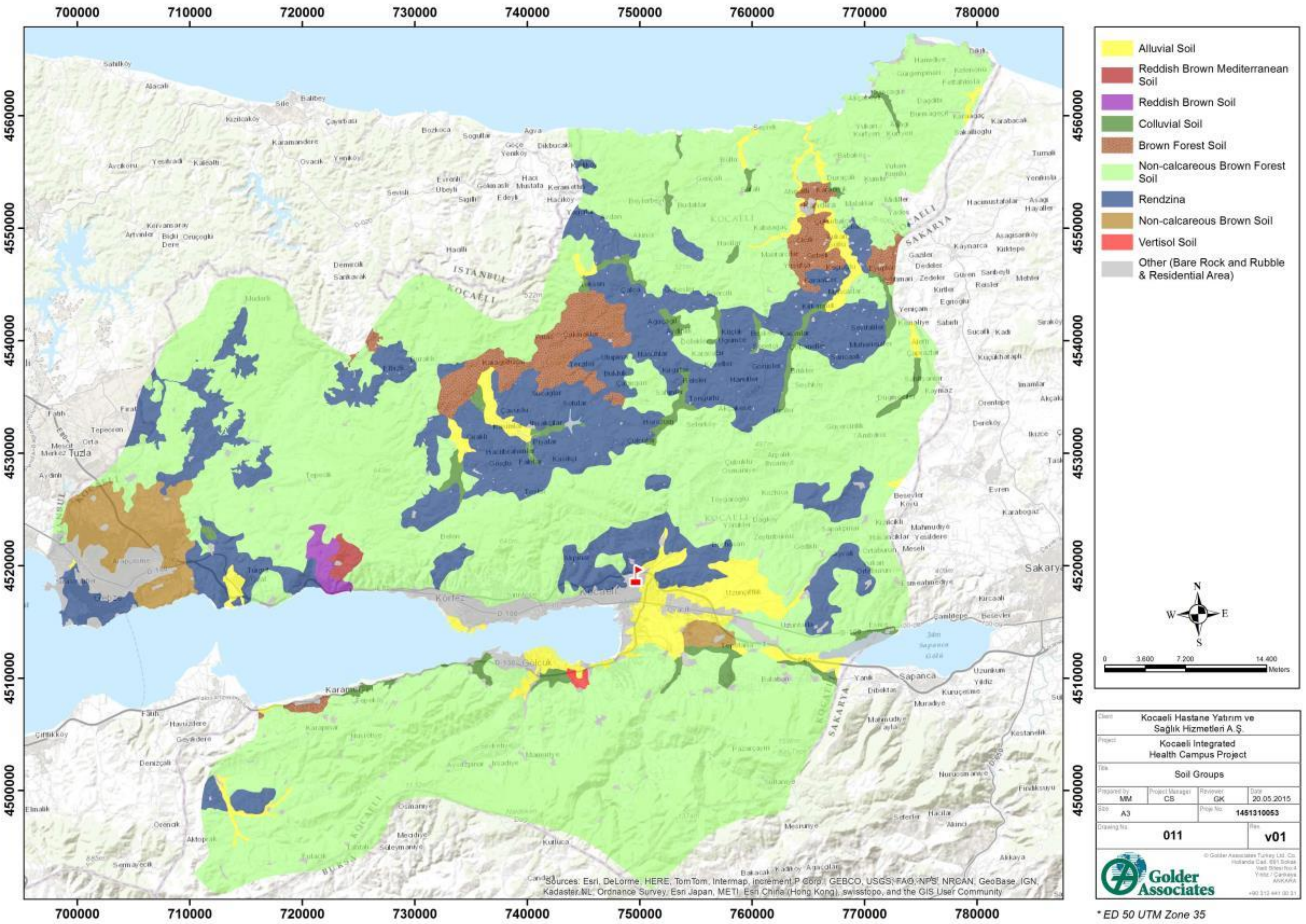


Figure 35: Soil Groups in Kocaeli Province

Regional Hydrology and Surface Water Quality

The Kocaeli Province is entirely within the territory of the Marmara Basin. This basin covers almost all of the Marmara Region except for the Meriç, Susurluk and Sakarya Basins. There is no major river located inside the boundaries of the Kocaeli Province,in the Marmara Basin. However, Kocaeli Peninsula has lots of brooks and creeks. Some of these are discharged to the Black Sea and the others are discharged to the İzmit Gulf or other parts of the Marmara Sea. The flows in these streams are usually irregular. They flood during the rainy seasons, while they are usually dry in the summer. The major water bodies which discharge to the Black Sea are Kocadere and Dana Brook and Sarısu and Kaynarca Creeks.

The water resources and the catchment area of the water bodies which discharge to the Black Sea are located mainly south of the region. The flows in these streams are mostly ephimeral. Floods are observed during heavy rain, while most streams are usually dry in the summer. The major water bodies which discharge to the Black Sea are Kocadere and Dana Brook and Sarısu and Kaynarca Creeks.

Some of the rivers which discharge to the Sea of Marmara come from the north of the Gulf of Izmit and some from the south. One of the major rivers, which discharge to the Sea of Marmara from the north of the Gulf is Tavşanlı (Dilovası) River. The length of the Tavşanlı (Dilovası) River is 12 km. The other major rivers, which discharge to the Sea of Marmara and come from the north of the Gulf of Izmit, are; Çayırova, Hatip, Ağadere, Derboğazı, Erenler, Kanlıbağ, Aydınlıkdere, Memelidere and Bekirdere.

The rivers which discharge to the Sea of Marmara and come from the south of the Gulf of Izmit, are generally arise from Samanlı Mountain and they flow through the low plains of the northern slopes of the mountain. A major river among these is the Serindere which is fed by rain water and the flow rate of Serindere rises to its maximum during rainy seasons. The other important river, which arises from the Samanlı Mountain, is Yalakdere. The total surface reserve of Yalakdere is 72 hm^3/year (Table 33)[46].

Among the water bodies, Bıçkıdere which is located 900 m east of the Project Area is the closest one to the Project Area. Seymendere which is located 2.7 km north; Değirmendere which is located 3 km west and Gedikler and Cuhahane Rivers which are located approximately 2 km east are the main rivers in the close vicinity of the Project Area (Figure 36).

Table 33: Surface Water Reserves in Kocaeli Province[47]

Name of the Water Body	Reserve (hm^3/year)
Bıçkıdere	18
Çınarlıdere	15
Kirazdere	195
Kumcağızdere	22
Parganlıdere	10
Sarısudere	10
Sazdere	5
Seymenlidere	10
Tavşanlı(dil)dere	34
Yalakdere	72
imponderable (from Basin)	1100
Surface Water (total average reserve)	**1491**

[46] Kocaeli Provincial Environmental Status Report, 2013

[47] Kocaeli Provincial Environmental Status Report, 2013

One of the water resources of the Kocaeli Province is Sapanca Lake. Sapanca Lake is located 15 km south-west of the Project Area. The approximate area of the Sapanca Lake is 47 km^2 and its reservoir is 129.5 hm^3/year. The coast of the lake is 39 km long of which 13 km stay in the boundaries of the Kocaeli Province. The second major water resource of the Kocaeli Province is Kirazlıdere (Yuvacık) Dam. The dam was constructed to meet drinking, domestic and industrial water needs of Kocaeli Province until the year of 2020[48].

Additionally, there are 7 pond and 3 flood detention dam constructed by State Hydraulic Works ("SHW") for flood control and irrigation purposes. The details of them are given in Table 34. Among the ponds in the region, the one that is in the close vicinity of the Project Area are the Bıçkıdere Pond, which is located 3 km northeast of the Project Area (Figure 36).

Table 34: The current ponds in the Kocaeli Province[49]

Ponds in the Kocaeli Province	Purpose	Feeder	Location (District)
Bıçkıdere Pond	Irrigation and Flood Protection	Bıçkıdere	İzmit
Bayraktar Pond	Irrigation and Flood Protection	Gediklidere	İzmit
Kurtdere Pond	Irrigation and Flood Protection	Kurtdere	İzmit
Şahinler Pond	Irrigation and Flood Protection	Davuldere	İzmit
Şeytantepe Pond	Irrigation and Flood Protection	Şeytandere	İzmit
Arıklar Pond	Irrigation	Karaağaçdere	Kandıra
Kızderbent Pond	Irrigation	Çınarlıdere	Karamürsel

The surface water bodies at the close vicinity of the Project Area are presented in Figure 36.

[48] Kocaeli Provincial Environmental Status Report, 2013

[49] Kocaeli Provincial Environmental Status Report, 2013

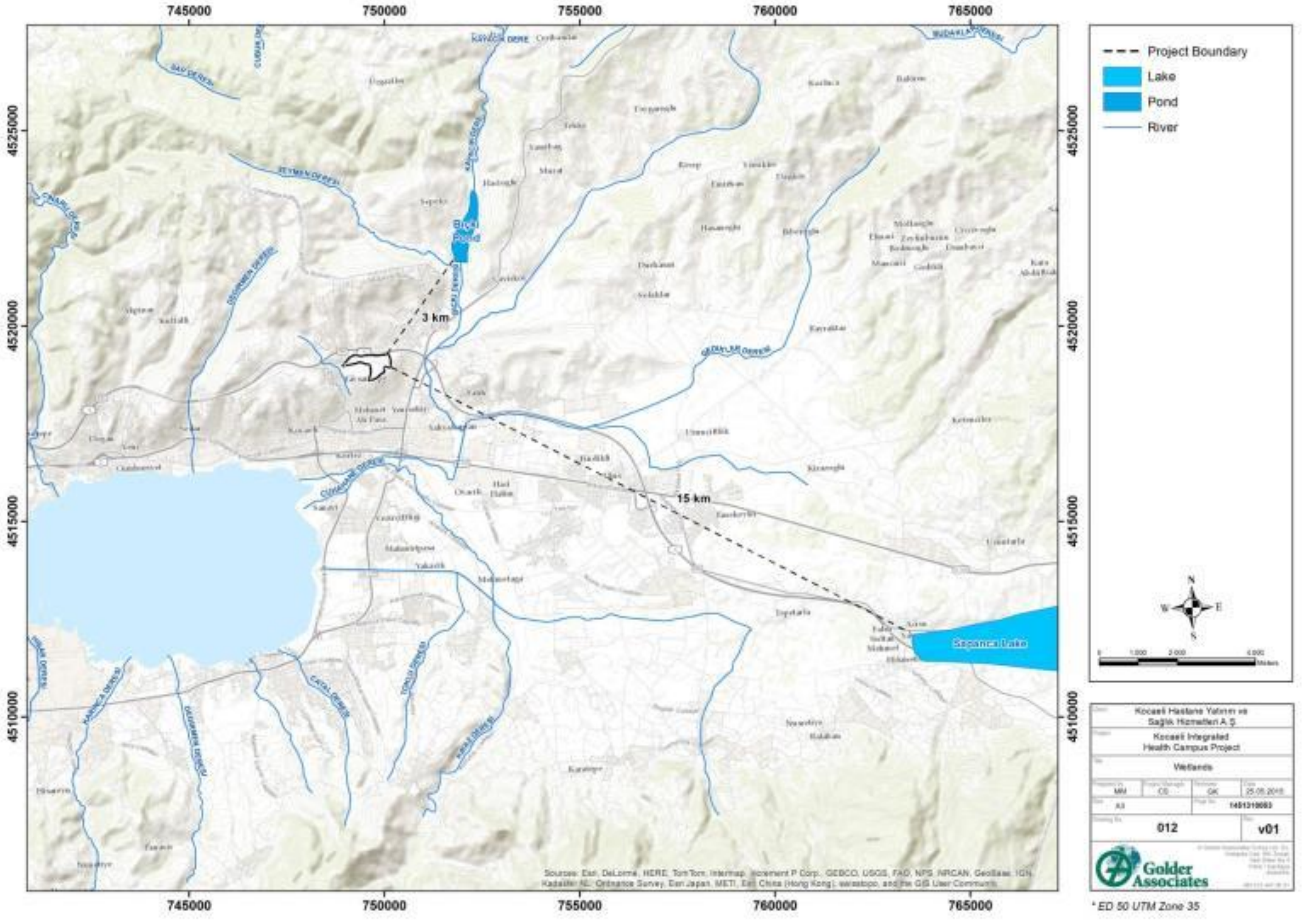


Figure 36: Water bodies at the close vicinity of the Project Area

Regional Hydrogeology and Groundwater Quality

The plains located inside the boundaries of the Kocaeli Province have been considered as rich reservoirs in terms of groundwater. Total groundwater reserves of the Kocaeli Province are 74 hm^3/year[50].

Table 35: Groundwater Reserves in Kocaeli Province[51]

İzmit - Gölcük - Sapanca Plains	
Total Plain Area	242 km^2
Total Drainage Area	1120 km^2
İzmit Plain GW Reserve	37 hm^3/year (consumption)
Gölcük Plain GW Reserve	6.5 hm^3/year (consumption)
Sapanca Plain GW Reserve	20.5 hm^3/year (consumption)
Total GW Reserve of the İzmit-Gölcük-Sapanca Plains	64 hm^3/year (consumption)
Tütünçiftlik - Yarımca-Derince Plain	
Total Plain Area	26.1 km^2
Total Drainage Area	55 km^2
GW Reserve	4.5 hm^3/year (consumption)
Gebze - Dil Plain	
Total Plain Area	4.0 km^2
Total Drainage Area	130 km^2
GW Reserve	2.5 hm^3/year (consumption)
Gebze - Çayırova Plain	
Total Plain Area	15 km^2
Total Drainage Area	51 km^2
GW Reserve	3.0 hm^3/year (consumption)
Total GW Reserve of the Kocaeli Province	**74 hm^3/year (consumption)**

Groundwater quality in the region have been assessed and published as “Groundwater quality in Körfez Municipality (Kocaeli), northwest of Turkey” by Ali Bozkurt and Cengiz Kurtuluş in 2008. The community wells in the rural areas of Körfez Municipality of Izmit-Kocaeli, north of Turkey, were tested in 2007 to determine any pollution from iron, sulphate, fluoride, organic matter and coliform bacteria. Other quality parameters such as pH, hardness, dissolved oxygen (DO), conductivity and nitrate were also tested for 22 water supplies. The test results showed that the well water quality parameter levels below the respective Turkish and health-based guideline values[52];

- pH values of the water samples ranged between 6.61 and 7.9 indicating that the well waters are acidic and do not pose any health risk;
- The hardness of the well waters tested soft;
- The amount of sulphate (SO_4) was detected very low;
- Nitrate and ammonia were not detected in the water samples collected from the wells;

[50] Kocaeli Provincial Environmental Status Report, 2013

[51] Kocaeli Provincial Environmental Status Report, 2013

[52] Bozkurt, Ali and Kurtuluş, Cengiz, “Groundwater quality in Körfez Municipality (Kocaeli), northwest of Turkey”, Journal of Food, Agriculture & Environment Vol.6 (3&4): 551-553, 2008

- Iron was detected in most of the water samples at levels not exceeding the recommended limit;
- Total coliforms were tested to measure the microbial quality of the groundwater. The water samples from the wells tested positive for total coliforms;
- Fluoride was detected in all water samples at concentrations less than the recommended health based guideline value.

Table 36: Summary of the Measurement from wells in the Körfez[53]

Parameter	Lowest Value Measured	Highest Value Measured	Allowable Standard*
DO (mg/L)	0.08	4.2	Non-established
pH	6.61	7.92	6.5-9.5
Conductivity (µS/cm)	189	442	1000 at 25°
Hardness (mg/L)	11	43	-
Organic matter (mg/L)	0.4	3.3	-
Nitrite (NO_2) (mg/L)	0	0	5.0
Ammonia (NH_3) (mg/L)	0	0	0.0
Iron (Fe) (mg/L)	0	0.53	1.0
Sulphate (SO_4) (mg/L)	20.2	24.1	400
Fluoride (F) (mg/L)	0	0.53	1.5

* TSE 266, 2005. Turkish Standard Organization and WHO 2000. The World Health Report: Making a difference. World Health Organisation, Geneva.

General Climatic Conditions

In Kocaeli, the lowest temperature was recorded as 3.3ºC in January and the highest temperature was recorded as 29.5ºC in July. Annual average temperature is 14.8ºC.

Monthly minimum, average and maximum temperature values obtained from data recorded in 1961-2014 period in Kocaeli Meteorological Station are presented in below table.

Table 37: Kocaeli Meteorological Station - Normal Temperature Values (1961-2014)

Months	Maximum(*C)	Average (*C)	Minimum (*C)
January	9.7	6.2	3.3
February	10.6	6.7	3.5
March	13.3	8.6	5
April	18.5	13.1	8.9
May	23.3	17.6	13
June	27.6	21.8	16.9
July	29.5	23.8	19.2
August	29.5	23.6	19.3

[53] Bozkurt, Ali and Kurtuluş, Cengiz, “Groundwater quality in Körfez Municipality (Kocaeli), northwest of Turkey”, Journal of Food, Agriculture & Environment Vol.6 (3&4): 551-553, 2008

September	26.1	20.3	16.1
October	20.8	16	12.6
November	16.2	11.9	8.6
December	11.8	8.4	5.5

As indicated in the table above, average temperature varies between 6.2ºC (January) and 23.8ºC (July). Annual average temperature is 14.8ºC. The coldest months are December, January and February while the hottest one is July and August (29.5ºC).

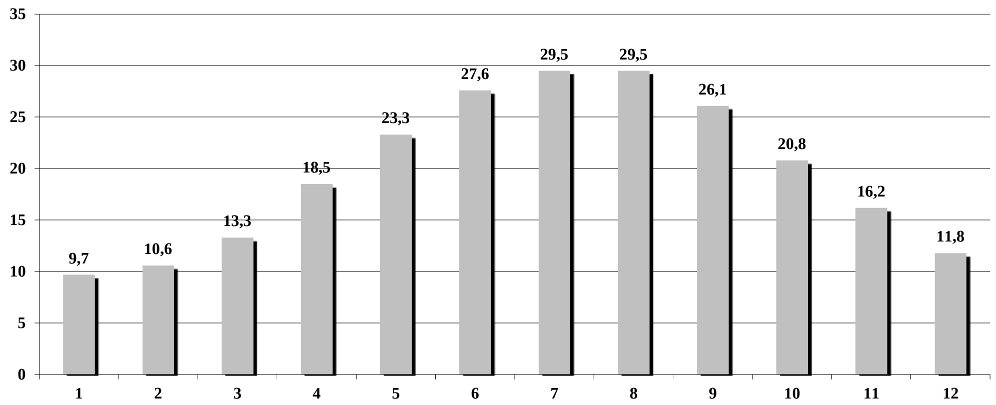


Figure 37: Maximum Temperature Recorded at Kocaeli Meteorological Station

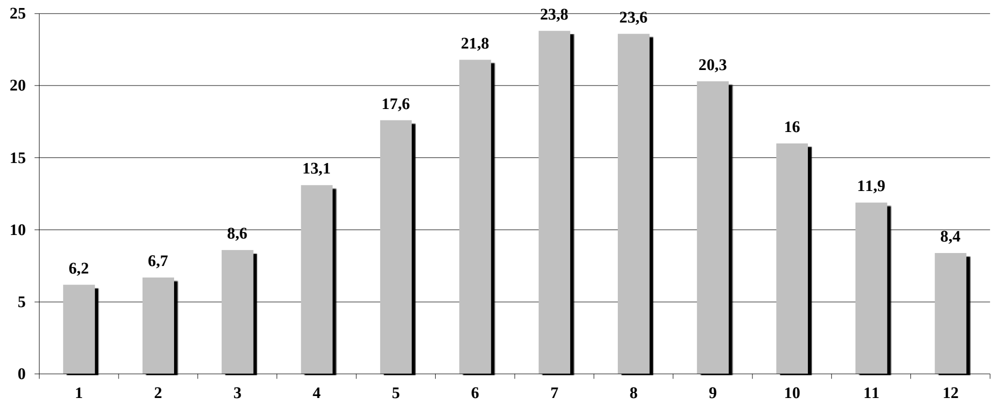


Figure 38: Average Temperature Recorded at Kocaeli Meteorological Station

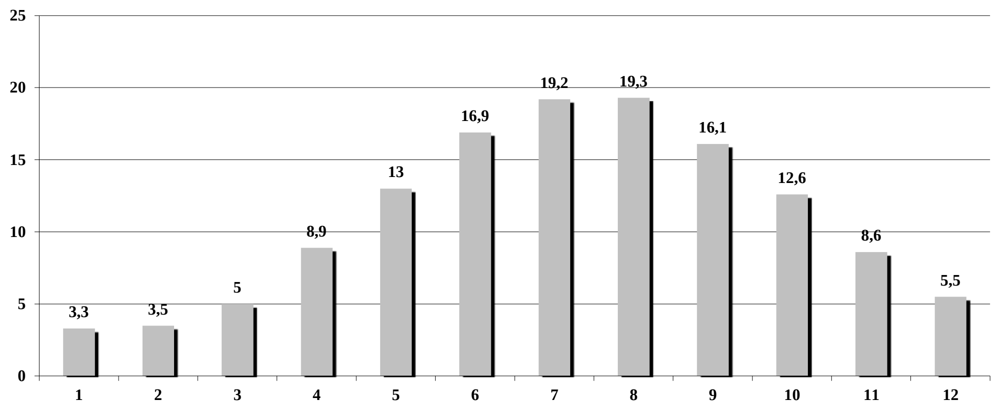


Figure 39: Minimum Temperature Recorded at Kocaeli Meteorological Station

Precipitation and Evaporation Regime

Distribution, quantity and type of precipitation are important since these factors affect pollutants' wet deposit quantities. In the assessments, precipitation data recorded by Kocaeli Meteorological Station between 1960 and 2014 was used. Precipitation normal, precipitation changes and average and daily maximum precipitation values by seasons are presented below.

As indicated in the table below, annual average amount of precipitation at the area is 807.3 mm. Maximum amount of precipitation was observed on August (125.8 mm) while minimum amount was observed on July (37.8 mm).

Table 38: Kocaeli Meteorological Station Precipitation Normals (1961-2014)

Months	**Average Total Precipitation (mm)**	**Daily Maximum Precipitation (mm)**
January	90.8	88
February	71.7	48.1
March	72.9	47.5
April	53.9	42
May	45.5	70.9
June	50.6	98.1
July	37.8	89.1
August	45.5	125.8
September	53.6	91.2
October	89.6	117.3
November	83.9	60.4
December	111.5	70
Annual	**807.3**	**948.4**

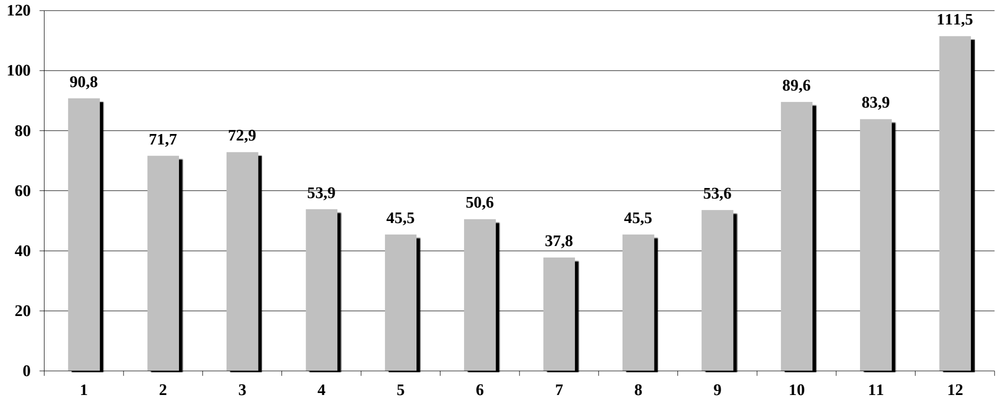


Figure 40: Total Average Precipitation recorded at Kocaeli Meteorological Station

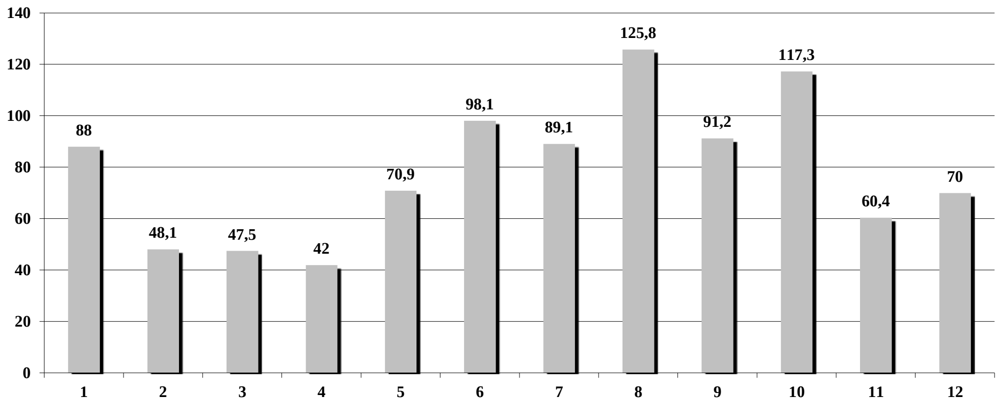


Figure 41: Daily Maximum Precipitation recorded at Kocaeli Meteorological Station

Relative Humidity

Average relative humidity values recorded at Kocaeli Meteorological Station between 1961 and 2014 are presented in the table and figure below. According to the information, annual average relative humidity is 71.1 % for the Kocaeli Meteorological Station.

Table 39: Kocaeli Meteorological Station Relative Humidity Values

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average Relative Humidity	75,5	73,3	71,8	68,8	68,7	65,8	66,9	68,9	70,3	74,9	74,6	74,4

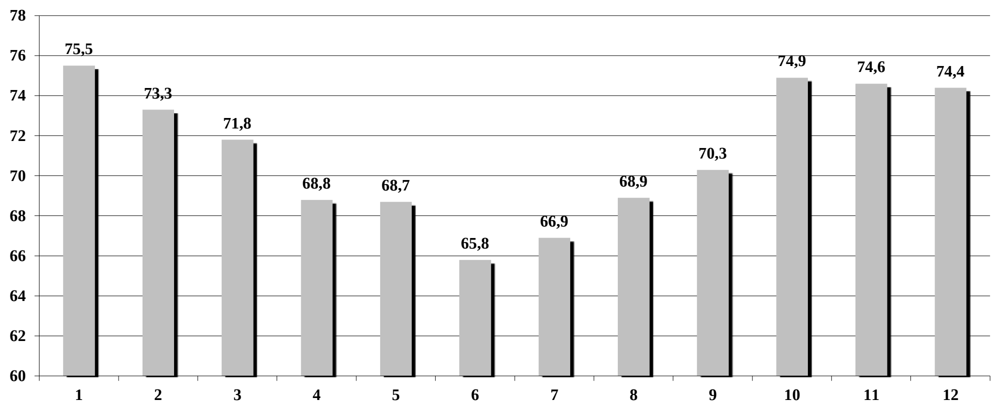


Figure 42: Kocaeli Meteorological Station Average Relative Humidity Changes by Months

Local Pressure

Annual average pressure recorded at Kocaeli Meteorological Station in between 1961 and 2014 is 1006 hPa. The highest pressure was observed on December with 1035 hPa. and the lowest pressure value was observed on January with 975.6 hPa. Average, highest and lowest values are presented in the table and figure below.

Table 40: Local Pressure Values measured at Kocaeli Meteorological Station (hPa) (1960-2014)

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Annual**
Average Local Pressure	1009,7	1008,2	1007,1	1004,6	1004,8	1004,1	1003,1	1003,7	1006,6	1009,2	1009,5	1009,2	**1006**
Maximum Local Pressure	1033,9	1026,9	1028,6	1023,9	1016,3	1015,3	1013,9	1013,7	1019	1022,5	1025,5	1035	**1022**
Minimum Local Pressure	975,6	984,5	983,2	983,1	991,4	989,3	991,9	992	991,4	991,8	982,3	984,8	**986**

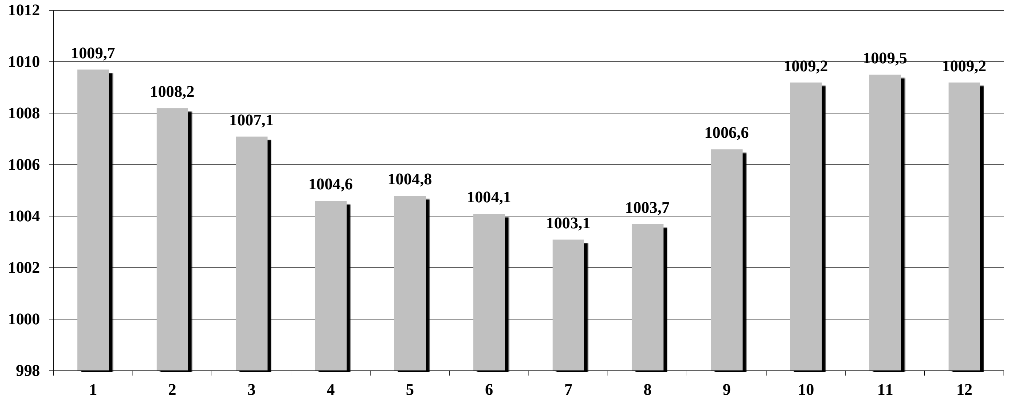


Figure 43: Kocaeli Meteorological Station Local Average Pressure Changes by Months

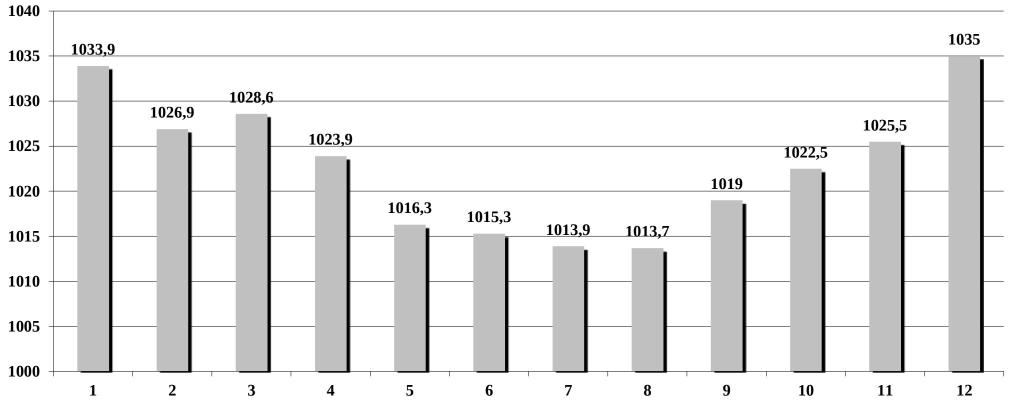


Figure 44: Kocaeli Meteorological Station Local Maximum Pressure Changes by Months

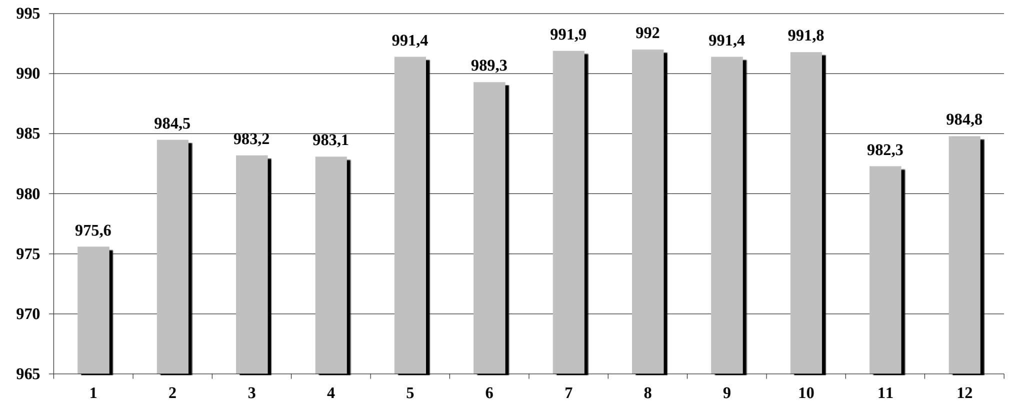


Figure 45: Kocaeli Meteorological Station Local Minimum Pressure Changes by Months

Distribution of the Counted Days in the Area

Counted day distribution values for additional weather parameters of the region are also obtained from data recorded between 1961 and 2014. Average number of snowy days is 17.2 and maximum snow depth is 74 cm and it was observed on January

Maximum foggy days are observed on November with a 3.3 average days; maximum hails was recorded on March and May with a 0.2 average days, maximum frosty days was observed on January with a 4.2 average days and maximum amount of thunderstorm was observed on December with a 1.4 average days.

Table 41: Counted Days and Annual Average Values (1960-2014)

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Number of Snow Days	5,7	5,1	2,8	0,2							0,8	2,6	**17.2**
Number of Snow Cover Days	3,6	3,4	1,1	0							0	0,9	**9**
Maximum Snow Depth (cm)	33	74	25	4							1	22	**74**
Number of Foggy Days	1,9	1,8	1,8	1,2	1,1	0,1	0,2	0,3	0,9	2,1	3,3	2,5	**17.2**
Number of Hail Days		0,1	0,2	0,1	0,1	0,2	0,1	0		0	0	0,1	**0.9**
Number of Frosty Days	4,2	3,3	2,4	0,3							0,8	2,5	**13.5**
Number of Thunder Stormy Days	1	1,3	0,8	1	0,6	0,4	0,2	0,2	0,5	0,4	1	1,4	**8.8**

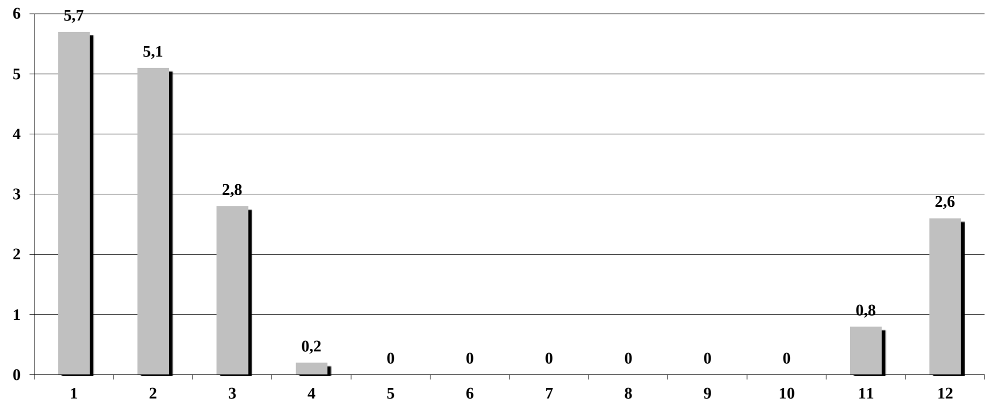


Figure 46: Kocaeli Meteorological Station. Distribution of Monthly Snow Days

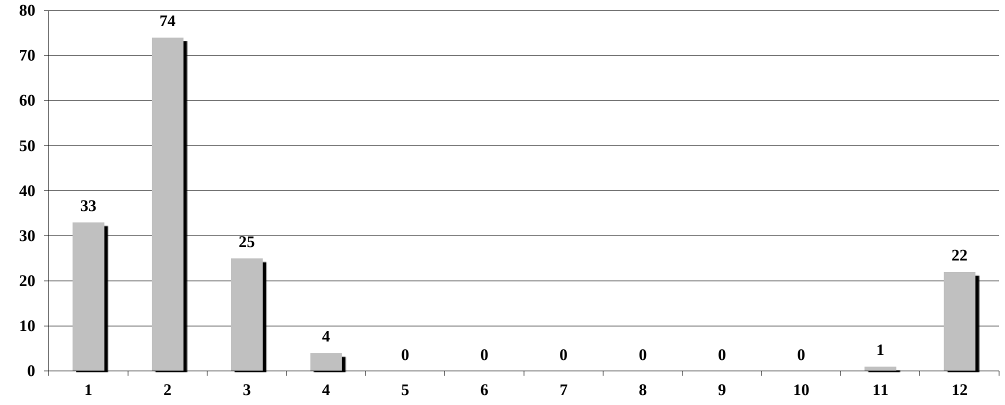


Figure 47: Kocaeli Meteorological Station. Distribution of Monthly Depth of Snow

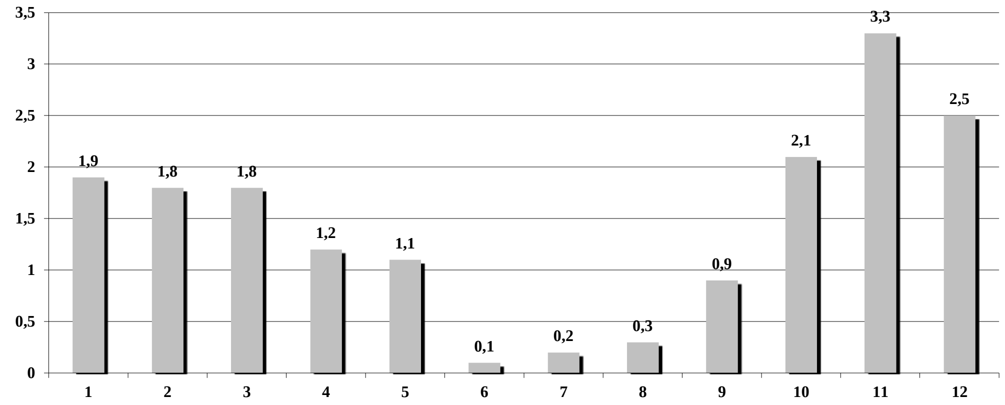


Figure 48: Kocaeli Meteorological Station. Distribution of Monthly Foggy Days

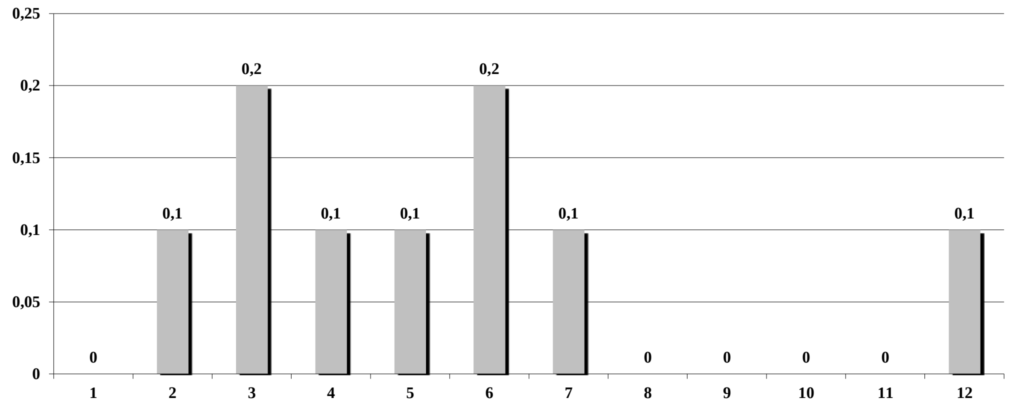


Figure 49: Kocaeli Meteorological Station. Distribution of Monthly Hail Days

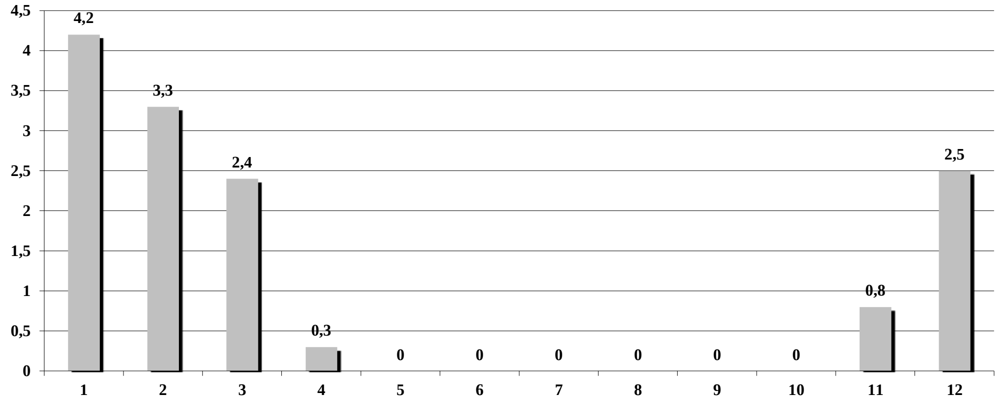


Figure 50: Kocaeli Meteorological Station. Distribution of Monthly Frosty Days

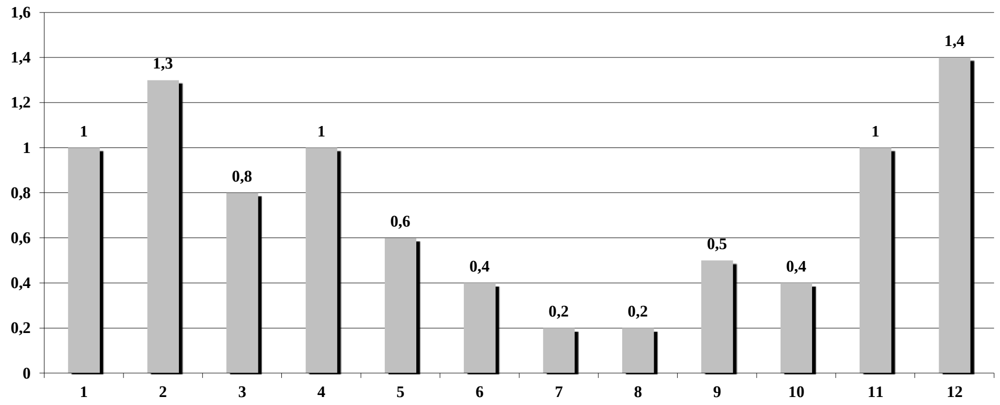


Figure 51: Kocaeli Meteorological Station. Distribution of Monthly Thunder-stormy Days

Wind

In order to determine the meteorological and climatic characteristics of the Project area, data representing the annual, seasonal and monthly wind direction are presented in the following sections.

Wind Directions: Annual, Seasonal and Monthly

According to the Kocaeli Meteorological Station 1961-2014 data, numbers of wind directions (monthly) were used to determine seasonal and annual numbers corresponding to wind directions. The monthly wind roses, the seasonal wind roses and the annual wind rose are shown in the figures below. According to these data, SE (south of east) is the dominant wind direction at Kocaeli Station in the year.

Table 42: Monthly number of winds at Kocaeli Meteorological Station

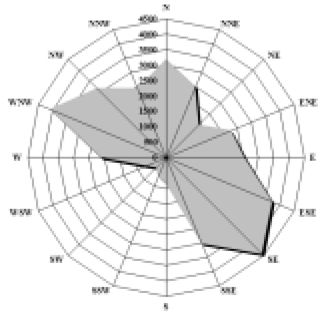
Number of Winds (Monthly)

Direction	January	February	March	April	May	June	July	August	September	October	November	December
N	3188	3021	3427	2507	2954	3223	4480	4064	3317	3168	2747	3397
NNE	2491	2541	2576	2069	2469	2661	3302	3556	3097	3137	2279	2268
NE	1504	1629	1610	1542	1673	2038	2598	2638	2214	2061	1782	1672
ENE	2282	2255	2622	2140	2461	2725	3188	3092	3037	3281	2645	2602
E	2563	2269	2517	2295	2706	2485	2642	2732	2688	2946	2564	2513
ESE	3737	3060	3306	3240	3380	3265	3260	3461	3346	3576	3301	3724
SE	4418	3669	3701	3660	4305	4212	4483	4311	4388	3994	3758	4108
SSE	3012	2900	3001	3077	3409	3401	3367	3455	3034	2923	2873	3103
S	845	894	942	900	1074	1100	1311	1154	992	798	919	779
SSW	661	620	727	708	783	756	795	789	678	510	674	703
SW	447	407	441	554	588	674	471	407	438	436	542	457
WSW	703	716	873	1051	1252	1131	842	887	753	728	810	909
W	2112	2118	2411	2921	2614	2260	1570	1400	1649	1520	1735	1982
WNW	4079	3892	4691	5411	4410	3029	1989	1906	2356	3030	3885	4070
NW	3169	2583	2861	2564	2307	1941	1609	1564	1767	2074	2544	2782
NNW	2424	2228	2465	2058	1687	1729	1936	1512	1503	1977	2485	2746

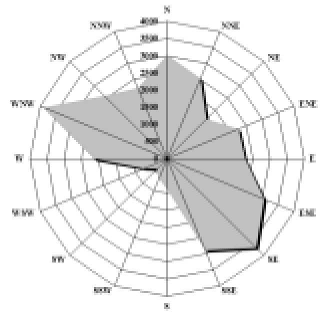
Table 43: Seasonal and Annual numbers of wind in Kocaeli Meteorological Station

Number of Winds (Seasonal and Annual)

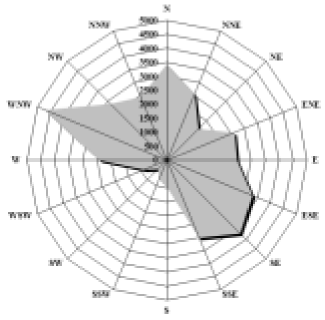
Direction	Winter	Spring	Summer	Fall	Annual
N	9606	8888	11767	9232	39493
NNE	7300	7114	9519	8513	32446
NE	4805	4825	7274	6057	22961
ENE	7139	7223	9005	8963	32330
E	7345	7518	7859	8198	30920
ESE	10521	9926	9986	10223	40656
SE	12195	11666	13006	12140	49007
SSE	9015	9487	10223	8830	37555
S	2518	2916	3565	2709	11708
SSW	1984	2218	2340	1862	8404
SW	1311	1583	1552	1416	5862
WSW	2328	3176	2860	2291	10655
W	6212	7946	5230	4904	24292
WNW	12041	14512	6924	9271	42478
NW	8534	7732	5114	6385	27765
NNW	7398	6210	5177	5965	24750



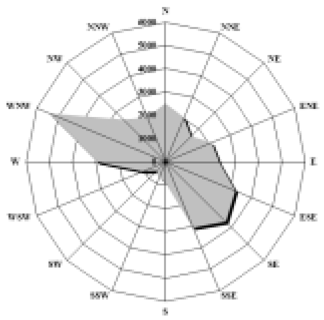
January



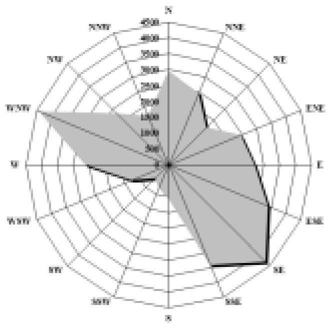
February



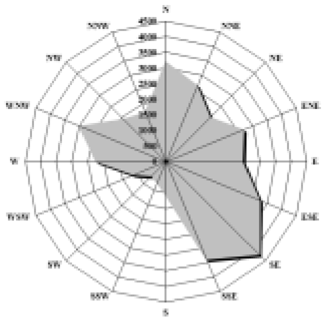
March



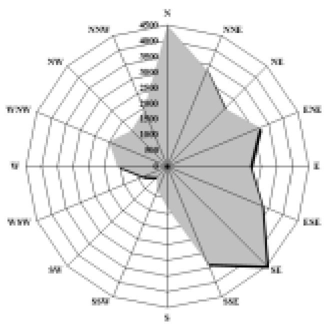
April



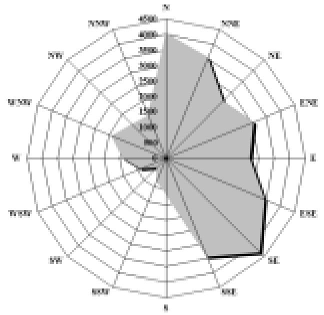
May



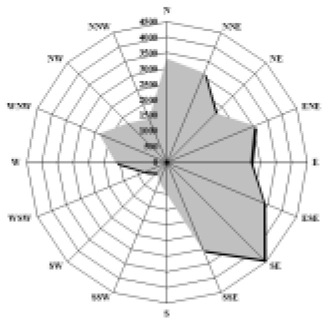
June



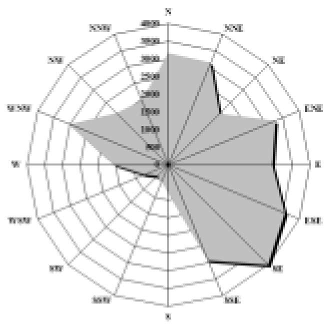
July



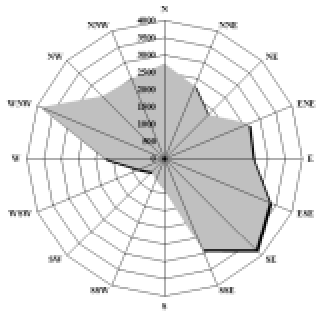
August



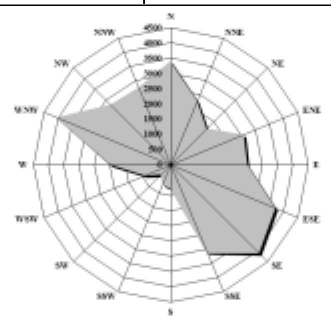
September



October



November



December

Figure 52: Monthly number of winds in Kocaeli Meteorological Station

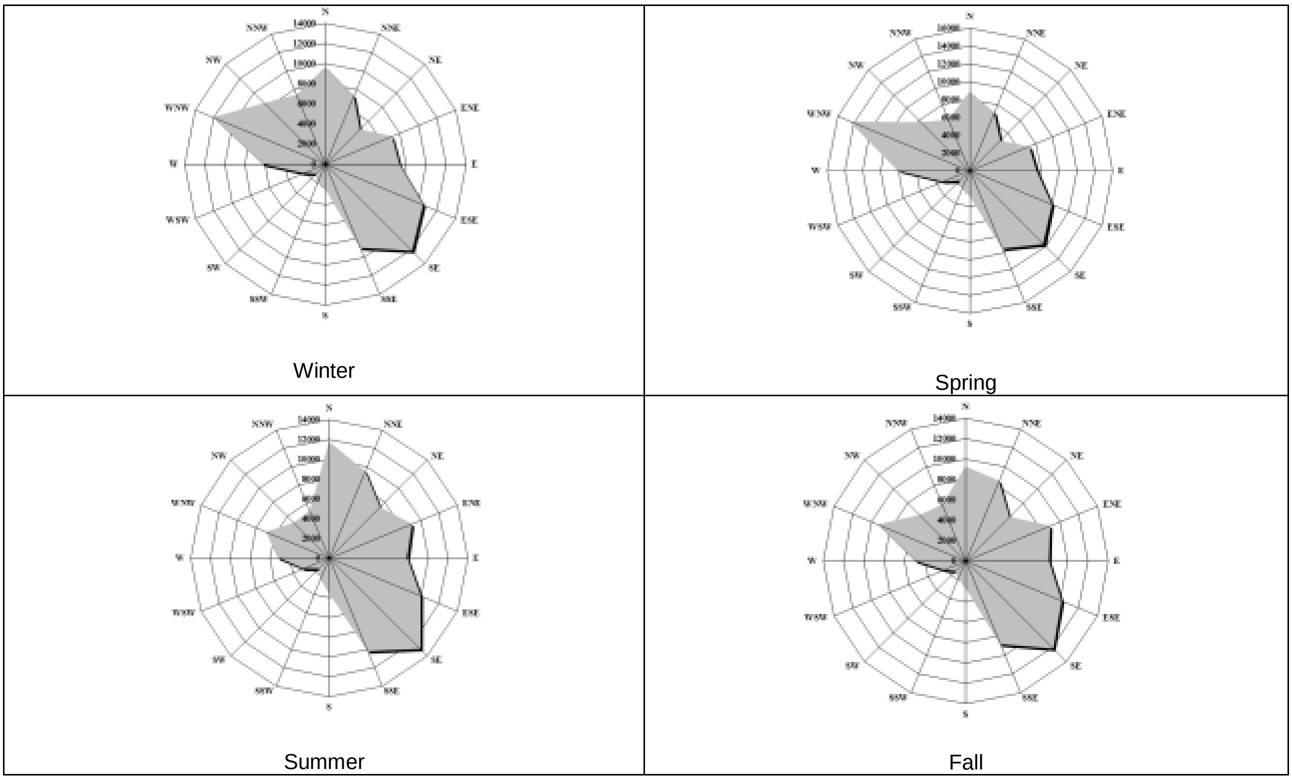


Figure 53: Seasonal number of winds in Kocaeli Meteorological Station

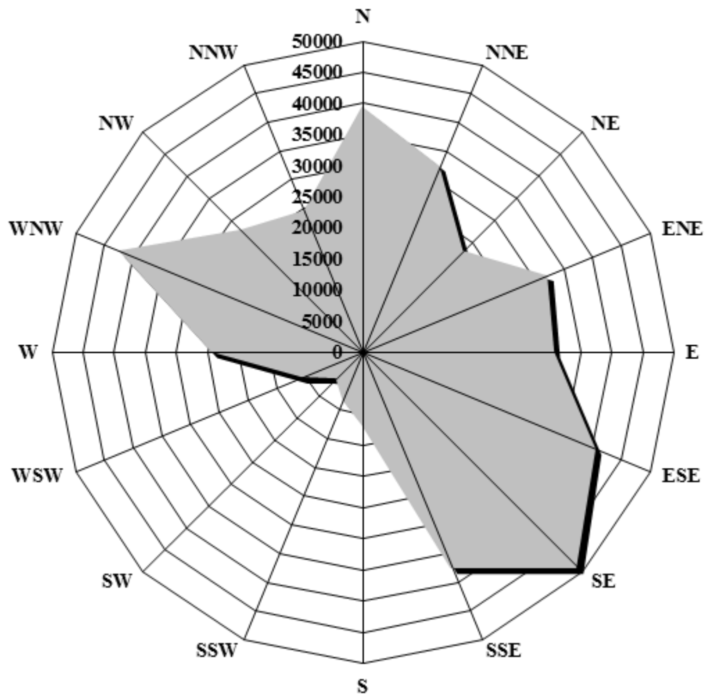


Figure 54: Annual number of winds at Kocaeli Meteorological Station

Wind Speed Based on Directions

According to the Kocaeli Meteorological Station data, Mean Monthly Wind Speed and Annual Wind Speed parameters are shown in the table and figure below, respectively. The maximum mean annual wind speed is 2.11 m/sec towards WNW (west of northwest) at Kocaeli Station.

Table 44: Monthly mean wind speed at Kocaeli Meteorological Station

Monthly Mean Wind Speed (m/sec)

Direction	January	February	March	April	May	June	July	August	September	October	November	December
N	1,3	1,4	1,5	1,4	1,4	1,5	1,6	1,6	1,5	1,3	1,2	1,3
NNE	1,2	1,4	1,4	1,4	1,3	1,4	1,4	1,4	1,4	1,3	1,1	1,2
NE	1,1	1,2	1,3	1,2	1,2	1,3	1,5	1,5	1,3	1,1	1	1,1
ENE	1,2	1,3	1,3	1,3	1,4	1,4	1,5	1,5	1,3	1,2	1,1	1,2
E	1,2	1,3	1,3	1,3	1,3	1,4	1,4	1,4	1,3	1,1	1,1	1,2
ESE	1,2	1,3	1,3	1,3	1,3	1,3	1,4	1,4	1,3	1,2	1,1	1,3
SE	1,2	1,2	1,1	1,2	1,2	1,2	1,2	1,3	1,1	1,1	1,1	1,2
SSE	1,2	1,4	1,2	1,2	1,3	1,3	1,3	1,3	1,3	1,1	1,1	1,2
S	1,2	1,4	1,3	1,4	1,3	1,3	1,3	1,2	1,2	1,2	1,2	1,3
SSW	1,2	1,4	1,2	1,2	1,3	1,3	1,3	1,2	1,2	1,1	1,2	1,3
SW	1,3	1,4	1,3	1,2	1,3	1,4	1,3	1,1	1,1	1,1	1,2	1,3
WSW	1,4	1,6	1,6	1,9	1,9	1,9	1,7	1,6	1,6	1,4	1,4	1,6
W	1,8	2,1	2,2	2,5	2,4	2,3	2	1,7	1,9	1,7	1,7	1,9
WNW	2,1	2,3	2,5	2,7	2,6	2,1	1,8	1,7	1,9	1,8	1,9	2
NW	1,6	1,7	1,8	1,8	1,6	1,5	1,4	1,3	1,4	1,4	1,4	1,6
NNW	1,4	1,6	1,7	1,5	1,5	1,4	1,5	1,4	1,4	1,3	1,3	1,5

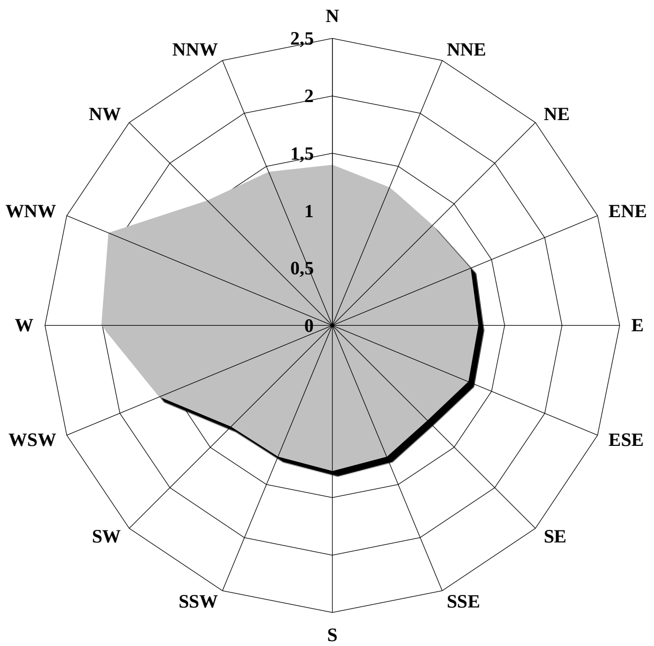


Figure 55: Annual mean wind speed at Kocaeli Meteorological Station

Regional Biological Components Characteristics

A **literature research** was performed focused on the RSA area in order to document species and habitat types potentially present in the study area. Scientific literature and "grey" literature were considered in order to give an overview of the vegetation occurring in the area.

A list of flora species was created from these field surveys and their global and national conservation status noted according the IUCN Red List (ver. of 2015.2) of Threatened Species and "The Red Data Book of Turkish Plants" (Ekim et. al., 2000).

For fauna species potentially present, literature researches is covered by the review of A. Demirsoy (1996), Türkiye Omurgalıları (Amfibiler, Memeliler, Sürüngenler), publication of the Ministry of Environment, General Directorate of Environmental Protection, Türkiye Herpatofaunası, publication of the Ministry of Environment and Türkiye Amfibileri, publication of Ege University, Department of Sciences. The compiled species lists include family, species, Turkish name, habitat and eventual endemism. The conservation status of the species is assessed globally through the IUCN Red List, BERN Convention categories, and locally through 2015 – 2016 Central Hunting Commission Decisions (M.A.K.), where applicable. The Risk and protection status categories for each are listed below.

Threat categories of flora and fauna species are listed in line with IUCN standards, while for fauna species also Berna Convention and MAK Decision were considered. In addition, the presence of exotic (Ex) or endemic (En) species is also highlighted.

IUCN Red List Categories

EN: Endangered
CR: Critically Endangered
VU: Vulnerable
LR: Lower Risk
NT: Near Threatened
LC: Least Concern
DD: Data Deficient

Bern Convention on the Conservation of European Wildlife and Natural Habitats (BERN):

Appendix-I: Strictly protected flora species
Appendix-II: Strictly protected fauna species
Appendix-III: Protected fauna species
Appendix-IV: Prohibited means and methods of killing, capture and other exploitation.

MAK: 2015-2016 Hunting Period Central Hunting Commission Decisions" prepared by the former Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks and published at Official Gazette dated 01.06.2009 and numbered 27245.

Appendix-I: indicates wild animals under protection by the former Turkish Ministry of Environment and Forestry
Appendix-II: indicates wild animals under protection by Turkish Central Hunting Commission
Appendix-III: indicates wild animals which could be hunted for a period of time

During the desktop study, the potential habitats present in the LSA were mapped based on the satellite imagery and the literature review. All the studies performed for previous components were taken into consideration for the assessment of habitat and biodiversity. The following aspects were taken into consideration:

- areas with high species biodiversity levels, identified through field surveys performed within flora, fauna and habitats studies;
- areas with potential presence of endemic, restricted-range, critically endangered and endangered species of flora and fauna, identified through literature research and field surveys performed within flora and fauna studies;

- presence of Critical habitats (IFC 2012);
- presence of protected areas.

The presence and main characteristics of protected areas within 20 km from the Project was also assessed through literature review. Protected areas considered included: natural parks, wetland areas, natural monuments, natural reserve areas, wildlife protection areas, areas for raising wild animal, cultural properties, natural properties, archaeological and protected areas, the areas protected under Boğaziçi law, bio-genetic reserve areas, biosphere reserves, specially protected environment areas, specially protected areas, protected areas concerning drinking and use water, tourism areas and centres, and other protected spaces have been taken into consideration.

In terms of phytogeography, the Project area falls between the western, or Euxinic, part of the "Euxine-Colchic Broadleaf Forests" ecoregion and the "Aegean And Western Turkey Sclerophyllous And Mixed Forests" ecoregion, that extends in a small strip along the northeastern edge of the Marmara Sea.

In the Euxinic, region, broadleaf deciduous forests constitute the main natural vegetation type. Oriental beech (*Fagus orientalis*) is the main canopy species, with sweet chestnut (*Castenea sativa*), sessile oak (*Quercus petrea ssp. iberica*), *Acer leatum, A. cappadocicum*, Caucasian elm (*Zelkova carpini*folia), and lime tree (*Tilia* spp.).

Figure 56: Euxine-Colchic Broadleaf Forests ecoregion (Source: The Encyclopedy of Earh http://www.eoearth.org/)

The Aegean and Western Turkey sclerophyllous and mixed forests typical climax vegetation is *Pinus brutia* forest. However, in presence of sallow soils or particular xeric conditions shrubland (or maquis) is the mature vegetation type.

Figure 57: Aegean And Western Turkey Sclerophyllous and Mixed Forests ecoregion (Source: The Encyclopedy of Earh http://www.eoearth.org/)

The LSA is situate between the Euxinic, part of the "Euxine-Colchic Broadleaf Forests" ecoregion and the nearby northern patch of the "Aegean And Western Turkey Sclerophyllous And Mixed Forests" ecoregion, that extends in a small strip along the northeastern edge of the Marmara Sea.

The "Euxine-Colchic Broadleaf Forests" ecoregion extends from Turkey's Istiranca Mountains in the west to the Abkhazia region of Georgia in the east. The western, or Euxinic, region is less humid and receives between 1,000 and 1,500 mm of average annual precipitation

The mature intact forests, including rare coastal temperate rainforests of this region are high in biodiversity. The western forests in particular tend to support a higher diversity of woody species, with up to 12-15 different trees per 500 m2. These forests have been heavily logged due to forest management strategies that emphasize wood production. The destruction of peat formations by draining and industrial peat mining threatens the habitat diversity upon which many bird communities depend.

The "Aegean And Western Turkey Sclerophyllous And Mixed Forests" ecoregion is part of the "Mediterranean Forests, Woodlands, and Scrub" ecoregions, characterized by hot and dry summers and cool and moist winters. In Turkey, this ecoregion extends from the south-western part of Thrace along the Aegean coast and south to Kumluca on the Mediterranean coast. There is also a small strip along the northeastern edge of the Marmara Sea.

The typical climax vegetation is the Aegean and Western Turkey sclerophyllous and mixed forests. Forest communities prevail on deeper soils or where there has been less interference with the natural climax vegetation. Forests are often found in riparian areas, where they receive more summer water. Tree species naturally present in this area are *Ceratonia siliqua* (locust), *Olea europaea* (olive), *Quercus coccifera* (cermes oak), *Pinus brutia* (calabrian pine), and *Pinus pinea* (pine).

In presence of sallow soils or particular xeric conditions, shrubland is the mature vegetation type. In many cases, shrubland is the result of degradation of former forest by logging or overgrazing, or disturbance by major fires. There are very few patches of undisturbed forest habitat remaining in this ecoregion. As in all Mediterranean coastal areas, dense human population, extensive settlements, and agricultural activities have largely destroyed the natural habitat. Urbanization, conversion to agriculture, over-grazing and illegal logging are the principal causes of destruction.

Regional Socioeconomic Conditions

The following information on the regional socioeconomic conditions have been collected through desktop studies.

The main sources for the literature data are:

- Turkish Statistical Institution
- East Marmara Development Agency

Table 45: Population Distribution Among Districts in Kocaeli

District	Population
İzmit	332 754
Başiskele	76 605
Çayırova	103 536
Darıca	164 385
Derince	130 657
Dilovası	45 610
Gebze	329 195
Gölcük	145 805
Kandıra	50 046
Karamürsel	50 046
Kartepe	101 692
Körfez	101 692

Table 46: Population figures in the quarter surrounding the Project Site

Quarter/Settlement	Total Population
Tavşantepe	13.280
28 Haziran	10.258
Yeşilova	10.364
Bekirdere	9.724
Malta	6.168
Gündoğdu	2.256

TÜİK, 2014

Table 47 The population distribution among age groups in Tavşantepe

Age	Approximate Population
0-18	6,000
19-35	4,000
36-65	3,500
65+	1,500

Table 48 Number of schools, students and teachers in Kocaeli

School Type	Indicator	Number
Preschool	Schools	426
	Students	23,450
	Teachers	944
Preliminary School	Schools	369
	Students	215,506
	Teachers	9,266
Middle School	Schools	87
	Students	49,376
	Teachers	2,143
Vocational schools(Middle school level)	Schools	102
	Students	50,889
	Teachers	2,134

reference: East Marmara Development Agency.

Table 49 Kocaeli education level

Literacy rate	Total	Male	Female
İlliterate	7,216	1,163	6,053
Literate but not graduate	9,322	2.676	6.646
Preliminary school	59,109	22,201	36,908
Middle school	49,940	27,476	22,464
Middle school equivalent	14,680	8,595	6,085
High school or equivalent	70,716	39,497	31,219
Vocational school graduates	46,229	25,329	20,900

TÜİK, 2013

Regional Archaeological Components Characteristics

Kocaeli province is located in the region known as Bithynia in ancient times. The city was named as Olbia, Astakos, Nicomedia, İznikmid, İzmid and Kocaeli respectively. The city was first mentioned as 'the country of Thracian originated people'. The mythos of Argos ship refers the people as Berykos. The language of the people is considered to be a Thracian originated Anatolian language.

At the end of the 8th century BC, Hellens have started to establish colonies at the coasts of Anatolia. One of these colonies is Astakos who has founded by the Megarans sailors. Astakos is the first settlement known in the region. The word Astakos means Lobster in Greek, the crustacean frequently hunted in Izmit Gulf. An ancient historian Skylaks has mentioned a settlement calls Astakos and pointed out "Olbia" in its location. It is concluded that "Astakos" and "Olbia" were two names used for the same settlement in different periods. Consequently, it is understood that today's Izmit is seen first time in history in 712 BC, with the names Olbia-Astakos-Nicomedia.

The years between 326-279 BC were an expansion period for the Bithynians. The elder son Zipoites who reigned after his father Bithynian King Bas, has been named as 'King' first time in the region under the influence of the Hellenistic Period and thus the region has started to be Hellenized. After the death of Zipoites, his son Nicomedes I reigned the Kingdom (280 BC).

During these years, the Galatians who have started to be gathered on the north of the Marmara Region have also started to gain power. Nicomedes invited them to settle in Anatolia. After the Anatolian invasion of the Galatians, Bithynians and their lands were devastated. Nicomedes have founded a new city across of Astakos that have been destroyed beyond repair. This city has been named as Nicomedia and it has become the capital of Bithynia. Nicomedia has turned into a Hellenistic city in 150 years.

Bithynia has come under the domination of Roman Empire during the reign of Nicomedes III (94-74 BC). Pompeius who have been assigned by the Roman Asian governor has sent all treasures to Rome. Thus Bithynian Kingdom which lasted 252 years has vanished.

The Emperor Traianus has appointed the Young Plinius as governor in AD 111, and Plinius has improved the city's infrastructure and planning. The information about this period can be followed in writings between Plinius and Traianus. Emperor Hadrianus has restored the city after the earthquake in AD 123 and he has gained the title "Resitutor Nicomedia" (Restorer of Nicomedia).

During the reign of Diocletianus (AD 284-305), governmental policies have changed due to the enlargement of the empire lands. He has established tetrarchy and he has declared himself Augustus of Asia Minor, settled in Nicomedia and declared the city as the capital of the Roman Empire. The city that had been destroyed by Goths was restored, the city has been moved to east and the fortification walls have been renewed to cover the new areas. Hippodrome, palace, temple, bath, administrative buildings, royala mint and shipyard have been built during this period. Nicomedia has become 4th big city after Rome, Antiokheia (Antakya) and Alexandreia (İskenderiye).

Nicomedia ceased to be the Capital after the Great Constantinius declared Byzantion as the capital of the East Roman Empire (Byzantine Empire) with the name of Constantinopolis. The importance of Nicomedia started to diminish. Izmit has come under the domination of Turks during the Seljukid Period in the 11th century (1078) and the regained its importance after Nicaea declared as the Capital of the Seljuk Empire. The city has been invaded by Aleksios Komnenos, the commander of the Crusaders, for a short period.

The city joined under the domination of the Ottoman Empire by Akçakoca, the margrave of Orhan Bey, in 1337. Nicomedia has named firstly as İznikmid then İzmid (İzmit). The city has reached its prime during the reign of Kanuni Sultan Süleyman. It has become an independent sanjak in 1888 and named as İzmit. The province covering the Izmit city later named as KOCAELİ meaning the land of Akçakoca who has conquered the city.

The city that has lost its importance after the destruction of the World War I was invaded by British (6.7.1920) and Greeks (28.4.1921) respectively and then it has been saved by the Turkish army on 28.06.1921.

Figure 58: Map Showing the Archaeological Sites in the Vicinity of the Project Area

Figure 59: Map Showing the Archaeological Sites in the Vicinity of İzmit

APPENDIX İ

HSE Risk Register

APPENDIX J

Impact Assessment Methodology and Matrices

A. Impact Assessment Results

a. Impact Assessment Methodology

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

The framework is based on the identification of the following elements:

- **Drivers**: project actions which can interfere significantly with the environment as primary generative elements of the environmental pressures;
- **Pressures** (impact factors): forms of direct or indirect interference produced by the project actions on the environment, able to influence the environmental state or quality;
- **State** (sensitivity): sum of the conditions which characterize the present quality and/or trends of a specific environmental and social component and/or of its resources';
- **Impacts**: changes undergone by the environmental state or quality because of the different pressures generated by the drivers;
- **Responses** (mitigation measures): actions adopted in order to improve the environmental conditions or to reduce pressures and negative impacts.

The overall impact analysis methodology has been developed by Golder based on its experience in the field of the environmental and social impact assessment; the methodology includes the following phases:

- definition of the current state or quality of the different environmental and social components potentially impacted based on the results of the baseline studies;
- identification of the impacts potentially affecting the environmental and social components in the different phases of the project (construction, operation and decommissioning/closure);
- definition and assessment of the effects of the planned mitigation measures.

Impact assessment was performed for main issues for each Environmental and Social component (discipline). The common impact assessment methodology consists of five main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of **residual effects**; and
- as necessary, identification of monitoring to evaluate and track performance.

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

i. Physical and Biological Components

The **impact assessment** on the single valued environmental component interfered in the different project phases is completed through the use of specific **environmental impact matrices** which compare the component state, expressed in terms of sensitivity, with the relevant impact factors, quantified on the basis of a series of parameters which include:

- duration (short, medium-short, medium, medium-long, long);
- frequency (concentrate, discontinuous, continuous);
- geographic extent (local, regional, beyond regional); and
- intensity (negligible, low, medium, high).

The quantification of the single impacts resulting from each factor acting on the environmental component is obtained assigning to each feature of the impact factor a score increasing in relation to the bigger entity of the impact related to it.

The features of the impact factors which are considered are hereinafter described.

The **duration** (D) defines the length of time when the impact factor is effective and it is differentiated in:

- short, within 1 year;
- medium-short, between 1 and 5 years;
- medium, between 5 and 10 years;
- medium-long, between 10 and 15 years;
- long, longer than 15 years.

The **frequency** (F) defines how often the potential impact factor occurs and is distinguished in:

- concentrate: if it presents one single and short event;
- discontinuous: if it presents an event repeated periodically or accidentally;
- continuous: if distributed uniformly over time.

The **geographic extent** (G) coincides with the area where the impact factor exerts its influence and it is defined as: local, regional, beyond regional.

The **intensity** (I) represents the entity of the impact factor, and can be represented by various physical quantities. The intensity can be also defined as: negligible, low, medium, high.

As the features of the impact factors influence in a different way the magnitude of the impact, a pondered coefficient is assigned to each of them using a pairwise comparison method.

The impact value results from the multiplication of the number resulting by a formula that connects all the parameters previously described, by the **sensitivity** (S) of the affected component to which a score has been assigned according to the evaluation carried out during the baseline activities.

Moreover the impact is assessed considering its probability of occurrence, its reversibility and its potential for mitigation.

The **probability of occurrence** (P) corresponds to the probability that the potential impact occurs, according to the evaluators experience and/or on the basis of the available bibliography. It is distinguished in low, medium, high and certain.

The **reversibility** (R) indicates the possibility to restore the qualitative state of the component following the modifications occurred because of the human intervention and/or through the component intrinsic resilience. It is distinguished in: short-term reversibility, medium-long term reversibility, irreversible.

The **mitigation** (M) corresponds to the possibility to alleviate the potential negative impact with proper design and/or management practices. The following mitigation classes are considered: high, medium, low, none.

The Impact value is assigned distinguishing if the impact itself is to be considered positive or negative with respect to the affected component, considering as positive a reduction/mitigation of the negative impacts already existing or potential future positive impacts on the environmental or social component. The impact value is directly proportional to the values of the features of the impact factors and is calculated by weighted multiplication of the value of the features of the impact factors valued according to the following scale:

- level 1: negligible overall impact;
- level 2: low overall impact;
- level 3: medium-low overall impact
- level 4: medium overall impact;
- level 5: medium-high overall impact;
- level 6: high overall impact.

ii. Social Components

With regards to social components, a qualitative methodology has been used to assess impacts, unlike the semi-quantitative methodology, above-described, used for environmental components (physical and biological). Because of specific characteristics of social studies, the assessment cannot be translated in a numerical form, but is nonetheless based on a rigorous and sound analysis endorsed by professional judgement of experts in the fields. In particular social impacts are not assessed on reversibility and frequency. Socio-economic impacts are part of an ongoing process of interdependent economic and social interactions, that generally cannot be reversed to return to one or all of the pre-project conditions. Although there are isolated exceptions, most socio-economic impacts are experienced continuously by people; thus, frequency is not a useful attribute for significance assessment. However, depending on the stage of the project (construction, operations), frequency of impact may increase or decrease.

b. Identification of the project actions

Activities or project actions that could potentially contribute to environmental or social changes during the construction, commissioning and operational phases have been identified from the project description and from the documents provided by the Client. Project actions which can interfere significantly with the environment are listed below for each phase.

Construction phase

- Surface levelling and grading
- Rock Fragmentation
- Temporary stockpiling of material
- Transport of construction material
- Construction of facilities
- Disposal of waste deriving from construction (including excavated soil)

Operation phase

- Disposal of waste (including medical waste)
- Operation of the facilities

Decommissioning/Closure phase

- Demolition/dismantling activities
- Disposal of waste deriving from dismantling/demolition
- Transport of dismantled material
- Reclamation/Reuse

It has to be highlighted that decommissioning phase will be analysed only qualitatively since the project duration will be of at least 25 years and there are not enough details for an in-depth analysis.

c. Identification of the components

After the identification of the Project actions, in order to identify the components potentially impacted by the project actions, matrixes have been created to link environmental, biological and social components to Project actions (). This assessment was preliminary performed in the Scoping phase before the application of the standard mitigation measures. Based on the new information made available from the Client or coming from the public consultations during the ESA preparation, the matrices have been revised and reported below.

Table 50: Matrix for physical components

Project Phases	Actions	Climate and meteorology	Air quality	Noise and vibration	Hydrogeology and groundwater quality	Geology and geomorphology	Soil and subsoil	Hydrology and surface water quality	Traffic and infrastructures
Construction phase	Surface levelling and grading								
	Rock Fragmentation								
	Temporary stockpiling of material								
	Transport of construction material								
	Construction of facilities								
	Disposal of waste deriving from construction								
Operational phase	Disposal of waste (including medical and radioactive wastes)								
	Operation of the facilities								
Decommissioning/Closure	Demolition/dismantling activities								
	Disposal of waste deriving from dismantling/demolition								
	Transport of dismantled material								

Table 51: Matrix for biological components

Project Phases	Actions	Terrestrial Flora	Terrestrial Fauna	Habitats, ecosystems and biodiversity	Protected Areas
Construction phase	Rock fragmentation				
	Surface levelling and grading				
	Temporary stockpiling of material				
	Transport of construction material				
	Construction of facilities				
	Disposal of waste deriving from construction (including excavated soil)				
Operational phase	Disposal of waste (including medical waste)				
	Operation of the facilities				
Decommissioning /Closure	Demolition/dismantling activities				
	Disposal of waste deriving from dismantling/demolition				
	Transport of dismantled material				
	Reclamation/Reuse				

Table 52: Matrix for social components

Project Phases	Actions	Demographic profile and land use, Employment and socio-economic conditions, Social capital	Health issues and facilities, Education issues and facilities	Cultural Heritage
Construction phase	Surface levelling and grading			
	Rock Fragmentation			
	Temporary stockpiling of material			
	Transport of construction material			
	Construction of facilities			
	Disposal of waste deriving from construction			
Operational phase	Disposal of waste (including medical waste)			
	Operation of the facilities			
Decommissioning/Closure	Demolition/dismantling activities			
	Disposal of waste deriving from dismantling/demolition			
	Transport of dismantled material			

Through the use of the matrices, the following components were identified in the Scoping phase as potentially impacted (negatively or positively) during the life-cycle of the Project.

- **Physical components**
  - Climate and meteorology
  - Air quality
  - Noise and vibration
  - Hydrogeology and groundwater quality
  - Geology and geomorphology
  - Soil and subsoil
  - Hydrology and surface water quality
  - Traffic and infrastructures
- **Biological components**
  - Terrestrial flora
  - Terrestrial fauna
  - Habitats, ecosystems and biodiversity
  - Protected areas
- **Social components**
  - Demographic profile
  - Land use
  - Employment and socio-economic conditions
  - Social capital
  - Health issues and facilities
  - Education issues and facilities
  - Apiculture
  - Cultural heritage

d. Identification of the impact factors

Project actions that could potentially contribute to environmental or social changes during the life-cycle of the Project have been identified through an analysis of the project documentation.

Project actions could potentially determinate, during the construction, operational and decommissioning/closure phases, impacts factors able to interfere positively or negatively, in a direct or indirect way, on the environmental and social components. Based on the components and project actions previously listed, the main impacts factors identified are listed below:

- Hydrological and hydrogeological change
- Top soil and lower soil removal

- Increasing of artificial surface
- Vegetation clearing and disturbance of terrestrial top soil
- Pollutant and dust emission in the atmosphere
- Emission of noise and vibrations
- Occupation of land
- Need of workforce
- Use of goods and services
- Demand for housing
- Unsatisfied occupational expectations
- Use of local infrastructures
- Increased road traffic
- Landscape features alteration
- Changes to land property and land use
- Creation of medical waste; storage, transportation and disposal
- Groundwater pollution
- Greenhouse gas emissions

In order to show the correlation among the project actions, the impact factors for different phases and the single components potentially impacted, the following correlation matrices were created.

Table 53: Matrix of physical components - Project Actions/Impact Factors

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
CLIMATE AND METEOROLOGY	**-**	**-**	**-**
	-	operation of the facilities	pollutant and dust emission in the atmosphere; greenhouse gas emissions
AIR QUALITY	Surface levelling and grading	-	pollutant and dust emission in the atmosphere
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	pollutant and dust emission in the atmosphere
	-	Operation of the facilities	
NOISE AND VIBRATIONS	Surface levelling and grading	-	emission of noise and/or vibrations
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	emission of noise and/or vibrations
	-	Operation of the facilities	
HYDROGEOLOGY AND GROUNDWATER QUALITY	Temporary stockpiling of material	-	hydrogeological change; groundwater pollution
	Construction of the facilities	-	

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	
GEOLOGY AND GEOMORPHOLOGY	Surface levelling and grading	-	Changes in the local morphology
	Temporary stockpiling of material	-	
	Construction of the facilities	-	
	-	-	
SOIL AND SUBSOIL	Surface levelling and grading	-	top soil and lower soil removal; occupation of land, pollutant emissions to the top soil
	Rock fragmentation	-	
	Temporary stockpiling of material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)		
	-	Disposal of waste (including medical and radioactive wastewater)	occupation of land
	-	Operation of the facilities	
HYDROLOGY AND SURFACE WATER QUALITY	Disposal of waste deriving from construction (including excavated soil)	-	hydrological change, surface water pollution, surface water run off
	-	Disposal of waste (including medical and radioactive wastewater)	
TRAFFIC AND INFRASTRUCTURE	Surface levelling and grading	-	increased road traffic
	Rock fragmentation	-	
	Transport of construction material	-	
	Construction of the facilities	-	

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	

Table 54: Matrix of biological components - Project Actions/Impact Factors

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
TERRESTRIAL FLORA	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	occupation of land; pollutant and dust emission in the atmosphere
	-	Operation of the facilities	
TERRESTRIAL FAUNA	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	occupation of land; pollutant and dust emission in the atmosphere; emission of noise and vibrations
HABITATS, ECOSYSTEMS AND BIODIVERSITY	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations; introduction of alien species
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	occupation of land; pollutant and dust emission in the atmosphere; emission of noise and vibrations
	-	Operation of the facilities	
PROTECTED AREAS	Rock fragmentation	-	emission of noise and vibrations

Table 55: Matrix of social components – Project Actions/Impact Factors

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
DEMOGRAPHIC PROFILE AND LAND USE, EMPLOYMENT AND SOCIO-ECONOMIC CONDITIONS, SOCIAL CAPITAL	Transport of construction material	-	need of workforce; use of goods and services; unsatisfied occupational expectations, use of local infrastructures
	Construction of facilities	-	need of workforce; use of goods and services; demand of housing
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	
CULTURAL HERITAGE	Rock Fragmentation	-	damage and destruction of cultural resources
	Construction of the facilities	-	
	-	-	
	-	-	
	-	-	
	-	-	
HEALTH ISSUES AND FACILITIES	Surface levelling and grading	-	groundwater pollution; Pollutant and dust emission in the atmosphere; Unsatisfied occupational expectations;
	Rock fragmentation	-	
	Construction of the facilities	-	
	-	Disposal of waste (including medical and radioactive wastewater)	need of workforce; use of goods and services; demand of housing; creation of medical waste; storage, transportation and disposal
	-	Operation of the facilities	

B. FINAL IMPACT ASSESSMENT MATRICES

Table 56: Impact assessment matrix for geology and geomorphology during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY CONSTRUCTION PHASE		Changes in the local morphology
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY CONSTRUCTION PHASE	Changes in the local morphology
	Negligible

Table 57: Impact assessment matrix for soil and subsoil characteristics during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS CONSTRUCTION PHASE		Top soil and lower soil removal	Pollutant emissions to the top soil	Occupation of land
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS CONSTRUCTION PHASE		Top soil and lower soil removal	Pollutant emissions to the top soil	Occupation of land
	medium			
	high			
		Low	**Negligible**	**Negligible**

Table 58: Impact assessment matrix for soil and subsoil characteristics during commissioning and operational phase after mitigation

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS COMMISSIONING AND OPERATIONAL PHASE		Occupation of land	Pollutant emissions in the top soil	Increase of artificial land use
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS COMMISSIONING AND OPERATIONAL PHASE		Occupation of land	Pollutant emissions in the top soil	Increase of artificial land use
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Low	**Negligible**	**Low**

Table 59: impact evaluation matrix for on hydrology and surface water quality component during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Negligible	**Negligible**	**Negligible**

Table 60: impact evaluation matrix for on hydrology and surface water quality component during commissioning and operational phase after mitigation

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrological change	Surface water pollution	Surface water run-off
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrological change	Surface water pollution	Surface water run-off
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Negligible	**Negligible**	**Negligible**

Table 61: impact evaluation matrix for on hydrogeology and groundwater quality component during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
Duration (D)	short		
	medium-short		
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		**Hydrogeological change**	**Groundwater pollution**
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Negligible	**Negligible**

Table 62: impact evaluation matrix for on hydrogeology and groundwater quality component during commissioning and operational phase after mitigation

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		**Hydrogeological change**	**Groundwater pollution**
Duration (D)	short		
	medium-short		
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrogeological change	Groundwater pollution
	medium		
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Negligible	**Negligible**

Table 63: Impact assessment matrix for air quality during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - [AIR] [CONSTRUCTION PHASE]		[pollutant and dust emission in the atmosphere]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	

IMPACT ASSESSMENT MATRIX - [AIR] [CONSTRUCTION PHASE]		[pollutant and dust emission in the atmosphere]
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

Table 64: impact evaluation matrix for atmosphere component during operational phase after mitigation

IMPACT ASSESSMENT MATRIX - [AIR] [OPERATION PHASE]		[pollutant and dust emission in the atmosphere]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	

IMPACT ASSESSMENT MATRIX - [AIR] [OPERATION PHASE]		**[pollutant and dust emission in the atmosphere]**
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

Table 65: impact evaluation matrix for noise and vibration component during construction phase after mitigation

IMPACT EVALUATION MATRIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE		**emission of noise and vibrations**
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	

IMPACT EVALUATION MATRIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE		emission of noise and vibrations
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

Table 66: Impact assessment matrix for traffic and infrastructures during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES CONSTRUCTION PHASE		Increased road traffic
Duration (D)	short	
	medium-short	
	medium	

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES CONSTRUCTION PHASE		Increased road traffic
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

Table 67: Impact assessment matrix for traffic and infrastructures during commissioning and operational phase after mitigation

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES COMMISSIONING AND OPERATIONAL PHASE		Increased road traffic
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES COMMISSIONING AND OPERATIONAL PHASE		Increased road traffic
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Low

Table 68: Impact evaluation matrix for terrestrial flora component during construction phase after mitigation

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA CONSTRUCTION PHASE		vegetation clearing and removal of terrestrial top soil	pollutant and dust emission in the atmosphere
Duration (D)	short		
	medium-short		
	medium		

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA CONSTRUCTION PHASE		vegetation clearing and removal of terrestrial top soil	pollutant and dust emission in the atmosphere
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Negligible	**Negligible**

Table 69: Impact evaluation matrix for terrestrial flora component during operational phase after mitigation

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere
Duration (D)	short		
	medium-short		

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA OPERATIONAL PHASE		**occupation of land**	**pollutant and dust emission in the atmosphere**
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Low	**Negligible**

Table 70: Impact evaluation matrix for terrestrial fauna component during construction phase after mitigation

IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA CONSTRUCTION PHASE		**vegetation clearing and disturbance of terrestrial top soil**	**pollutant and dust emission in the atmosphere**	**emission of noise and vibrations**
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Negligible	**Negligible**	**Negligible**

Table 71: Impact evaluation matrix for terrestrial fauna component during operational phase after mitigation

IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA OPERATIONAL PHASE		**occupation of land**	**pollutant and dust emission in the atmosphere**	**emission of noise and vibrations**
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Low	**Negligible**	**Negligible**

Table 72: Impact evaluation matrix for habitat and biodiversity component during construction phase after mitigation

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY CONSTRUCTION PHASE		**vegetation clearing and disturbance of terrestrial top soil**	**pollutant and dust emission in the atmosphere**	**emission of noise and vibrations**	**introduction of alien species**
Duration (D)	short				
	medium-short				
	medium				
	medium-long				
	long				
Frequency (F)	concentrate				
	discontinuous				
	continuous				
Geographic extent (G)	local				
	regional				
	beyond regional				
Intensity (I)	negligible				
	low				
	medium				
	high				
Reversibility (R)	short-term				
	long-term				
	irreversible				
Probability of occurrence (P)	low				
	medium				
	high				
	certain				
Mitigation (M)	high				
	medium				
	low				
	none				
Sensitivity (S)	negligible				
	low				
	medium				
	high				
		Low	**Negligible**	**Negligible**	**Negligible**

Table 73: Impact evaluation matrix for habitat and biodiversity component during operational phase after mitigation

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere	emission of noise and vibrations
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Low	**Negligible**	**Negligible**

APPENDIX K

Regulatory Framework

A. REGULATORY AND POLICY FRAMEWORK

a. Current National Environmental and Social Legislation

Turkish National Regulations that are applicable to the Project are provided in the table below.

Table 74: Relevant Turkish Regulations for the Hospital Project

Issue	Relevant Guidelines and Regulations
Construction Phase	
Environmental Issues	
General	- Environmental Law (Law Number: 2872)
Permitting	- Regulation on Environmental Impact Assessment - Regulation on Environmental Auditing - Regulation on Environmental Permits and Licenses
Air Quality	- Regulation on Control of Industrial Air Pollution - Regulation on Assessment and Management of Air Quality - Regulation on Control of Exhaust Gas Emission - Regulation on Air Pollution Caused by Heating - Regulation on Odour Causing Emissions
Energy Conservation	- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage
Water And Wastewater Quality	- Regulation on Control of Water Pollution - Urban Wastewater Treatment Regulation - Regulation on Protection of Wetlands - Regulation on Control of Pollution Caused by Hazardous Substances in Water and its Environment - Regulation on Management of Surface Water Quality
Hazardous Materials Management	- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials - Regulation on Preparation and Distribution of Material Safety Data Sheets on Hazardous Materials and Aids - Regulation on Classification, Package, and Labelling of the Hazardous Materials and Aids - Regulation on Inventory and Control of the Chemicals
Waste Management	- Regulation on Waste Management - Regulation on Control of Waste Oil - Regulation on Control of Medical Waste - Regulation on Control of Waste Batteries and Accumulators - Regulation on Control of Vegetative Oil - Regulation on Control of PCB and PCTs - Regulation on Control of Packaging Waste - Regulation on Control of End of Life Tires - Regulation on Control of End of Life Vehicles - Regulation on Landfills (Regular Storage of Wastes)
Noise	- Regulation on Assessment and Management of Environmental Noise

Soil Quality	- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources
Occupational and Community Health and Safety Issues	
Occupational and Community Health and Safety	- Labour Law - Occupational Health and Safety Law - Related regulations
Operation Phase	
Environmental Issues	
General	- Environmental Law (Law Number: 2872) - Land Acquisition Act of Turkey (Law Number: 2942) - Protection of Cultural and Natural Assets Law of Turkey (Law Number: 2863)
Permitting	- Regulation on Environmental Impact Assessment - Regulation on Environmental Auditing - Regulation on Environmental Permits and Licenses
Air Quality	- Regulation on Control of Industrial Air Pollution - Regulation on Assessment and Management of Air Quality - Regulation on Air Pollution Caused by Heating - Regulation on Odour Causing Emissions
Energy Conservation	- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage
Water and Wastewater Quality	- Regulation on Control of Water Pollution - Urban Wastewater Treatment Regulation
Hazardous Materials Management	- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials - Regulation on Preparation and Distribution of Material Safety Data Sheets on Hazardous Materials and Aids - Regulation on Classification, Package, and Labelling of the Hazardous Materials and Aids - Regulation on Inventory and Control of the Chemicals
Waste Management	- Regulation on Waste Management - Regulation on Control of Medical Waste - Regulation on Control of Waste Batteries and Accumulators - Regulation on Control of Vegetative Oil - Regulation on Control of Packaging Waste - Regulation on Control of End of Life Vehicles - Regulation on Landfills (Regular Storage of Wastes)
Noise	- Regulation on Assessment and Management of Environmental Noise
Soil Quality	- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources
Occupational and Community Health and Safety Issues	

Occupational and Community Health and Safety	- Labour Law (Law Number: 4857) - Occupational Health and Safety Law (Law Number: 6331) - Related legislation of the Ministry of Labour and Social Security
Issues about Health Services	
Health Services	- Health Services Basic Law (Law Number: 1593) - General Healthcare Law (Law Number: 3359) - Regulation on Operation of Inpatient Treatment Institutions - Regulation on Patient Rights - Regulation on Providence of Patient and Personnel Security - Related legislation of the Ministry of Health
Issues about Forensic Hospital	
Forensic Hospital	- Criminal Law (Law Number: 5237) - Law on Execution of Penalties and Security Precautions (Law Number: 5275) - Related legislation of the Ministry of Justice

i. Permitting Responsibilities

The Project is legally exempt from the requirement of an official Environmental Impact Assessment ("EIA") process. However, concrete plant(s) with the capacity of 100 m^3/hr and above and trigeneration plants with the installed capacity of 20 MWt and higher, are subject to preparation of a PDF and obtaining "EIA is not Required" decision in accordance with the Regulation on Environmental Impact Assessment (dated: November 25, 2014, Official Gazette No: 29186, Annex – II Article 18 and Article 44 of the Regulation, respectively).

A Trigeneration plant will be installed as a part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 2.5 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 15.8 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 18.3 MWt (15.8 + 2.5) which is below 20 MWt. The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the project is not subject to the preparation of PDF for the Trigeneration Plant.

There will be one concrete plants constructed under the scope of the Project. The capacity of concrete plant will be 90 m^3/hr. therefore; there will be no requirement for preparing a single PDF since the capacity of concrete plant will be only 90 m3/h.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m3/hr, referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary for the concrete plants.

Hospitals and healthcare facilities having capacity higher than 20 beds are included in Annex- 1 and the trigeneration plants having capacity more than 1 MWt thermal power are included in Annex-2 of the Regulation on Environmental Permits and Licenses (dated: September 10, 2014, Official Gazette No: 29115). Hence, Environmental Permit for operation phase will be received from the Ministry of Environment and Urbanization ("MoEU").

In addition, concrete plants with the capacity of 10 m^3/hr and above are included in Annex-2 of this regulation. Hence, Environmental Permit should be received from the Provincial Directorate of Environment and Urbanization. However, according to Clause 17 of the regulation, temporary facilities operated less than 1 year should apply to the Provincial Directorate for permit exemption.

b. International Requirements
i. International Conventions and Agreements

Turkey ratified the following main international conventions and agreements for environmental protection. Hence, the project will be performing in line with the project relevant requirements of this documentation:

- The United Nations Framework Convention on Climate Change, 2004
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 2008
- Beijing Convention on the Protection of the Ozone Layer, the Montreal Protocol on Substances depleting the Ozone Layer and the relevant amendments to the Protocol, 1989
- Convention on Long-Range Transboundary Air Pollution, 1979
- United Nations, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989
- United Nations Convention to Combat Desertification, 1994
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention);
- UNESCO, Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) and the relevant amendments to the Protocol, 2000
- UNESCO Convention on the Protection of the World Cultural and Natural Heritage, 1972
- United Nations Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), 1999
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), 1999

ii. Current European Union Environmental and Social legislation

Project has voluntarily decided to be in compliance with EU legislation in order to be in compliance with relevant and applicable EBRD and European Investment Bank ("EIB") requirements.

Relevant European Directives applicable to the Project are provided in the table below.

Table 75: Relevant European Regulations

Environmental Issues	
Impact assessment	Council Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment
Air quality	■ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Directive 2010/75/EU replaces definitively, with effect from 7 January 2014: • Directive 1999/13/EC on reducing emissions of volatile organic compounds (VOCs); • Directive 2008/1/EC concerning integrated pollution prevention and control; with effect from 1st January 2016:

Environmental Issues	
	• Directive 2001/80/EC on the limitation of emissions of certain pollutants from large combustion plants. ■ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe ■ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC ■ Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer ■ Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC ■ Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants
Energy Conservation	■ 32012L0027: Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance ■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control ■ EC/JRC 2008: IPPC Reference Document on Best Available Techniques for Energy Efficiency. June 2008
Water and Wastewater Quality	■ Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment ■ Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption ■ Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States ■ Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration ■ Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances ■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community ■ Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council

Environmental Issues	
Water Conservation	■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community ■ Council Directive of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC
Hazardous Materials Management	■ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC ■ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 ■ Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances ■ Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods
Waste Management	■ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste ■ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste ■ Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste ■ Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) ■ Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment ■ Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC ■ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives ■ Directive 2000/53/EC of the European Parliament and of 18 September 2000 on end-of life vehicles ■ 32012L0019: Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) Text with EEA relevance

Environmental Issues	
Noise	■ Council Directive of 6 February 1970 on the approximation of the laws of the Member States relating to the permissible sound level and the exhaust system of motor vehicles ■ Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors ■ Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise
Soil Quality	■ Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture ■ Directive 2004/35/CE of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
Nature Conservation and Biodiversity	■ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora ■ Council Decision 98/145/EC of 12 February 1998 on the approval, on behalf of the European Community, of the amendments to Appendices I and II to the Bonn Convention on the conservation of migratory species of wild animals as decided by the fifth meeting of the Conference of the parties to the Convention ■ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

Occupational and Community Health and Safety Issues	
Occupational and Community Health and Safety	■ Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work ■ Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace ■ Council Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (amending directives 95/63/EC and 2001/45/EC) ■ Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace ■ Council Directive 83/477/EEC of 19 September 1983 on the protection of workers from the risks related to exposure to asbestos at work ■ Council Directive 90/269/EEC of 29 May 1990 on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers ■ Council Directive 90/270/EEC of 29 May 1990 on the minimum safety and health requirements for work with display screen equipment

Occupational and Community Health and Safety Issues	
	■ Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work ■ Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work ■ Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites ■ Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work ■ Council Directive 92/85/EEC of 19 October 1992 on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding ■ Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres ■ Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration) ■ Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) ■ Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) ■ Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work ■ Council Directive 80/1107/EEC of 27 November 1980 on the protection of workers from the risks related to exposure to chemical, physical and biological agents at work ■ Council Directive 88/364/EEC of 9 June 1988 on the protection of workers by the banning of certain specified agents and/or certain work activities ■ Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances
Other	■ Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment ■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control

Occupational and Community Health and Safety Issues	
	■ Directive 2010/75/EC of the European Parliament and of the Council of 24 November 2010 concerning industrial emissions (integrated pollution prevention and control)

iii. Requirements of International Financial Institutions

International Standards (i.e. Equator Principles, IFC Performance Standards and guidelines, EBRD Performance Requirements) have been analysed by Golder and considered in the preparation of the present document.

1. Requirements of Equator Principles

The Equator Principles are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, EPFIs). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

Among other contents, the EPs endorse the environmental and social policies and guidelines of the World Bank.

The EPFIs emphasize that they will not provide loans to projects where the borrower will not or is unable to comply with the EPFIs social and environmental policies and procedures that implement the Equator Principles.

The EPFIs have ten (10) principles:

Principle 1: Review and Categorization

Principle 2: Social and Environmental Assessment

Principle 3: Applicable Social and Environmental Standards

Principle 4: Action Plan and Management System

Principle 5: Consultation and Disclosure

Principle 6: Grievance Mechanism

Principle 7: Independent Review

Principle 8: Covenants

Principle 9: Independent Monitoring and Reporting

Principle 10: EPFI Reporting

In addition, the Equator Principles endorse the applicable IFC Performance Standards, IFC General EHS Guidelines and IFC Industry Specific EHS Guidelines and EBRD Performance Requirements.

2. EBRD Performance Requirements

The 2014 Environmental and Social Policy of the EBRD is a document which details the commitments of the agreement establishing the Bank particularly for the "promotion of environmentally sound and sustainable development".

In order to translate this objective into successful practical outcomes, the Bank has adopted a comprehensive set of specific Performance Requirements (“PRs”) that clients are expected to meet, covering key areas of environmental and social impacts and issues. The Bank is committed to promoting EU environmental standards as well as the European Principles for the Environment, to which it is a signatory, which is reflected in the PR 3. The Bank expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs.

The breadth, depth, and type of analysis required for Environmental Assessment (“EA”) depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates potential environmental risks and impacts in the project impact zone; examines alternatives; identifies ways of selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

According to the EBRD’s environmental and social policy, the following requirements have to be taken into consideration:

- preparation of an ESIA;
- compliance with its PRs (where applicable) including:
  - PR1 - Assessment and management of environmental and social impacts and issues
  - PR2 - Labour and working condition
  - PR3 - Resource efficiency, pollution prevention and control
  - PR4 – Health and safety
  - PR5 - Land acquisition, involuntary resettlement and economic displacement
  - PR6 - Biodiversity conservation and sustainable management of living resources
  - PR7 - Indigenous peoples
  - PR8 - Cultural heritage
  - PR9 - Financial intermediaries
  - PR10 - Information disclosure and stakeholder engagement
- adherence to the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice (Aarhus Convention) that the Project meets good international environmental practice, such that:
  - EU standards (where applicable,); and
  - World Bank Group EHS Guidelines (where EU standards do not suffice).
- Compliance to Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal
- Adherence to Workers’ accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

The Project should also meet ILO core Labour standards on:

- Forced Labour (C105)
- Child Labour (C182)
- Discrimination (C111)
- Freedom of Association and the Right to Organize (C 87)
- Equal Remuneration (C100)
- Minimum Age (C138).

3. IFC Standards and Guidelines

The World Bank - IFC has developed performance standards, policies, general environmental, health and safety guidelines, and industry-specific environmental, health and safety guidelines on social and environmental sustainability, to minimize negative environmental and social impacts of the development projects it supports, and to optimize benefits.

a. IFC Requirements

IFC 2012 Performance Standards (IFC 2012 PS) have been considered the main reference as they are the most recent environmental and social standards issued by an International Financial Institution. IFC 2012 PS comprises 8 documents:

- **Performance Standard 1**: Assessment and Management of Environmental and Social Risks and Impacts
- **Performance Standard 2**: Labour and Working Conditions
- **Performance Standard 3**: Resource Efficiency and Pollution Prevention
- **Performance Standard 4**: Community Health, Safety, and Security
- **Performance Standard 5**: Land Acquisition and Involuntary Resettlement
- **Performance Standard 6**: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- **Performance Standard 7:** Indigenous Peoples
- **Performance Standard 8:** Cultural Heritage

Performance Standard 1 establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks and opportunities of projects;
- Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- The proponent's management of environmental and social performance throughout the life of the project.

Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describes potential environmental and social risks and impacts that require particular attention.

The key principles stated in the performance standards that are relevant for this methodology can be summarized as follows:

- principles of non-discrimination and equal opportunity;
- principles of non-discrimination apply to migrant workers;
- principles of pollution prevention;
- the principle of "like-for-like or better";
- principle of proportionality and good international practice;
- the holistic and ecosystem approaches;
- the participatory approach (social);
- the management and conservation principle;
- the preventive, precautionary and anticipatory principle.

b. IFC EHS Guidelines

The Environmental, Health, and Safety ("EHS") Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice ("GIIP"). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The General EHS Guidelines are organized as follows:

1. Environmental

1.1 Air Emissions and Ambient Air Quality

1.2 Energy Conservation

1.3 Wastewater and Ambient Water Quality

1.4 Water Conservation

1.5 Hazardous Materials Management

1.6 Waste Management

1.7 Noise

1.8 Contaminated Land

2. Occupational Health and Safety

2.1 General Facility Design and Operation

2.2 Communication and Training

2.3 Physical Hazards

2.4 Chemical Hazards

2.5 Biological Hazards

2.6 Radiological Hazards

2.7 Personal Protective Equipment (“PPE”)

2.8 Special Hazard Environments

2.9 Monitoring

3. Community Health and Safety

3.1 Water Quality and Availability

3.2 Structural Safety of Project Infrastructure

3.3 Life and Fire Safety (L&FS)

3.4 Traffic Safety

3.5 Transport of Hazardous Materials

3.6 Disease Prevention

3.7 Emergency Preparedness and Response

4. Construction and Decommissioning

4.1 Environment

4.2 Occupational Health & Safety

4.3 Community Health & Safety

References and Additional Sources

Apart from general guidelines, also applicable industry sector EHS guidelines were considered. These documents are technical reference with general and industry specific examples of GIIP and include:

- IFC EHS Guidelines for Healthcare Facilities
- Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

4. EIB Requirements

The 2013 Environmental and Social Practices handbook of the EIB is a document which provides advice on planning and managing the environmental and social appraisal and monitoring. It describes the steps for determining the scope of the environmental and social review process throughout the project cycle that the EIB shall carry out for all projects in all regions. It also explains the role of highly specialised units or individuals who collectively ensure that the Bank's activities respond to the highest possible standards.

The EIB applies a number of core environmental and social safeguard measures that reflect international good practice to all its lending activities. It requires that all its projects:

- apply the European Principles for the Environment[54], i.e. comply with EU environmental principles, standards and practices, if practical and feasible in some regions;
- comply with the EU environmental A*cquis*[55] on environmental assessment as defined in the EIB Sourcebook on EU Environmental Law[56];
- comply with international conventions and agreements ratified by the EU;
- comply with the EU social *Acquis*[57] as defined in the EIB Reference Book on EU Social Legislation and through the EIB Social Guidance Notes;
- apply "Best Available Techniques", as appropriate;
- apply good environmental management practices during project implementation and operation;
- adhere to other specific international good environmental and social practices.

If the EIA is required, the EIB Environmental and Social Statement requires that all projects, irrespective of location, comply with the process and content consistent with the requirements of the EU EIA Directive. Within the EU, the EIA is legally governed by the EU Directive on EIA. Outside the EU, the Bank refers to EU law as the benchmark of its EIA requirements. The EU approach is determined by the scale, nature and location of the project and the policy, institutional and socio-economic framework that is in place.

The promoter is responsible for carrying out an EIA according to national and other applicable environmental law, with reference to the EIA Directive and also the Habitats 92/43/EEC and Bird Directives 79/409/EEC, and the requirements of the Bank.

[54] The regional coverage of the European Principles for the Environment concerns at least the respective regions of operations of each signatory institution. For projects located in the Member States of the EU, the European Economic Area countries, the EU Candidate and potential Candidate countries, the EU approach, which is defined in the EC Treaty and the relevant secondary legislation, is the logical, uncontested and mandatory reference. The projects in this region should also comply with any obligation and standards upheld in relevant multilateral environmental agreements, such as Convention on Biological Diversity, the Espoo Convention, United Nations Framework Convention on Climate Change, etc. In all other countries, projects financed by the signatories should comply with the appropriate EU environmental principles, practices and standards, if practical and feasible, such as affordability, local environmental conditions, international good practice etc.

[55] The "environmental A*cquis*" is comprised of the main EU legal instruments, approximately 300 directives.

[56] http://www.eib.org/attachments/strategies/sourcebook-on-eu-environmental-law.pdf

[57] The "social *Acquis*" is the part of the *acquis communautaire* that includes the body of laws, principles, policy objectives, declarations, resolutions and international agreements defining the social policy of the EU.

The EIB recognises the significant value of biodiversity in terms of ecological services and economic and social values and that protecting biodiversity is a key element in sustainable development: acknowledging that its projects may have a potential impact on biodiversity, the Bank has taken a balanced approach to managing its operations in order to minimise any negative impacts on biodiversity by applying the precautionary principle[58] and to enhance positive impacts on biodiversity and ecosystems whenever practicable, to secure favourable economic, environmental and social outcomes of its financing activities.

The Bank's approach and commitment to nature and biodiversity are grounded in the principles and practices contained in the EU Nature Conservation Policy, namely the Birds (79/409/EEC) and Habitats Directives (92/43/EEC), and in international treaties and conventions signed by the EU, such as the Convention on Biological Diversity ("CBD"), the Conventional in International Trade in Endangered Species of Wild Fauna and Flora ("CITES"), the Bonn Convention on Migratory Species ("CMS") and the Ramsar Convention on Wetlands amongst others.

The environmental and social assessment should flag any potential impacts the project may have on biodiversity and these should include:

- potential impacts on protected areas and areas supporting protected species;
- impacts on other areas that are not protected but are important for biodiversity;
- activities posing a particular threat to biodiversity (in terms of their type, magnitude, location, duration, timing, reversibility);
- impact on areas that provide important biodiversity services including extractive reserves, indigenous people's territories, wetlands, fish breeding grounds, soils prone to erosion, relatively undisturbed or characteristic habitats, flood storage areas, groundwater recharge areas, etc.

The EIB will ensure that the appropriate mitigation measures have been developed to address the potential impacts on nature and biodiversity. These may include:

- restoring impacted areas with species consistent with local ecological conditions;
- offsetting biodiversity losses through the creation of ecologically comparable areas elsewhere that are managed for biodiversity;
- financial or in-kind compensation to direct users of biodiversity.

B. Project Environmental Standards

A summary of applicable national and international environmental standards are provided below. The most stringent legislative requirement will be valid for the project.

Water Quality

• Domestic Wastewater Effluent Quality

Domestic waste water will be created during construction and operation phases of the project. Domestic wastewater will be connected to sewerage system of the Municipality.

Regulation on Control of Water Pollution - Table 21.4 indicates domestic wastewater discharge standards for equivalent population higher than 100,000. However, the provisions set in Turkish Urban Wastewater

[58] The Precautionary Principle states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (The Rio Declaration (992) and the Preamble of the Convention on Biological Diversity (1992)).

Treatment Regulation, of which the discharge quality standards were valid by 31.12.2014, are exactly the same with the provisions set in EU Directive 91/271/EEC on Urban Wastewater Treatment.

Table 76: National Domestic Wastewater Discharge Standards

PARAMETER	UNIT	Turkish Regulation on Water Pollution Control Table 21 Domestic Wastewater Discharge Standards for equivalent population of 84-2,000		Turkish Urban Wastewater Treatment Regulation (dated 8.1.2006) *(limits to be applied after 31.12.2014)	Urban waste water directive 91/271/EEC
		Composite Sample 2 Hour	Composite Sample 24 Hour	Concentration (mg/L)	Concentration (mg/L)
Biochemical Oxygen Demand (BOD5)	mg/l	40	35	25	25
Chemical Oxygen Demand (COD)	mg/l	120	90	125	125
Suspended Solids (SS)	mg/l	40	25	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)
pH	-	6-9	6-9	-	

* Not applicable to centralized, municipal wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.
** MPN = Most Probable Number

Air Quality

• Ambient Air Quality

The Regulation on Assessment and Management of Air Quality Annex I (Limit Values, Target Values, Long Term Targets, Evaluation Thresholds, Public Information Thresholds) provides ambient air quality values for human health and ecosystem after January 1, 2014. Annex I (A: Transition Period Short and Long Term Limits) provides quality values for human health and ecosystem for the period between January 1, 2009 and January 1, 2014.

A comparison of the limit values in national regulation and WHO guidelines are provided in the table below.

Table 77: Ambient Air Quality Standards

Parameter	Average Period	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management			Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
		Annex – IA: Transition Period Limits (*)		Annex I: Future Target Values (year for target)	
		2008	2014		
SO_2 (µg/m^3)	**Hourly**	900	750	350 (2019) *(not to exceed over 24 in a year)*	350
	24 hr	400 (STL) (95% in a year)	250 (STL)	125 (2019) *(not to exceed over 3 in a year)*	125
	Yearly and winter season (Oct1 – March31) *(for wildlife and ecosystem)*	60 (LTL)	20	20 (2014)	
	Winter average (Oct1 – March31)	250	125		
	Target Limit for yearly average	60			
	Target Limit for winter average	120			
	LTL yearly	150 (LTL)			
NO_2 (µg/m^3)	**Hourly**			200 (2024) *(not to exceed over 18 in a year)*	200
	Yearly	100 (LTL)	60	40 (2024)	40
	24 hr	300 (STL) (95% in a year)			
NOx (µg/m^3)	**Yearly** *(for vegetation)*			30 (2014)	

PM$_{10}$ (µg/m^3)	**24 hr**	300 (STL) (95% in a year)	100	50 (2019) *(not to exceed over 35 in a year)*	50
	Yearly	150 (LTL)	60	40 (2019)	40
	Winter average (Oct1 – March31)	200	90		
Settled Dust (mg/m^{2}day)	Short term				390
PM$_{2.5}$ (µg/m^3)	24hr				
	1 year				
Lead (µg/m^3)	LTL – yearly (human health)	2 (LTL)	1	0.5 (2019) 1.0 (for areas in the vicinity of and contaminated by industries)	
Benzene (µg/m^3)	Yearly			5 (2021)	
CO (mg/m^3)	Max daily 8 hr average			10 (2017)	
	24 hr	30 (95% in a year)	10		
	Yearly	10			

LTL - Long-term Limit : The value not to be exceeded by the arithmetic average of all measurement results;
Long Term Value : Arithmetic average of all measurement results;
STL -Short Term Limit : The value not to be exceeded by 95% of maximum daily average measurement results or statistically all the measurement results;
Short Term Value : The value that 95% of maximum daily average measurement values or statistically all the measurement values are below and 5% are above;
(*): Until December 12, 2013; LTLs, STLs, and for SO_2 and PM10 winter standards are valid.

• Emissions

The Regulation on Control of Industrial Air Pollution regulates, with the following annexes, the rules, principles and emission limits that industrial facilities should follow:

- Annex-1: Regulation Principles and Limits for All Facilities
- Annex-2: Calculation of Contribution to Air Pollution and Air Quality Measurements
- Annex-5: Special Emission Limits for the Facilities of High Pollutant Capacity
- Annex-7: Emission Limits for Inorganic and Organic Dusts, Inorganic and Organic Vapours and Gases, Carcinogenic Substances, applicable after January 1, 2012
- Annex 12: Calculation of Non-Stack (Fugitive) Emissions Mass Flowrate

The Regulation on Control of Industrial Air Pollution - Annex 2 provides rules of calculation of contribution to air pollution from facilities and air quality measurements. It is indicated in Annex-2 that; mass flow rate of emissions are measured for existing facilities and calculated for planned facilities using emission factors. Hourly or daily, monthly and annual Contribution to Air Pollution of emissions in influence area is calculated if mass flow rate exceeds limit value given in Table 2.1 of the regulation. The limit value of dust, which will be generated in construction phase of the project, from non-point sources is 1.0 kg/hour in Table 2.1.

Regulation on Industrial Air Pollution Control Annex-5 A) Group 1 provides emission rules and limits for Combustion Facilities. The trigeneration plant with thermal capacity of 2.5 MWt will utilize natural gas for electricity requirements. Annex-5 A) Group I - Table 5.2 provides emission limits for gas fuel combustion facilities for heating thermal power of below 50 MWt. The emission limits are given below table.

Table 78: Regulation on Control of Industrial Air Pollution Table 5.2. - Emission Limits for Facilities with Thermal Capacity Lower than 50 MW

Fuel	SO_2 mg/Nm^3	CO mg/Nm^3	NO_2 mg/Nm^3	Dust mg/Nm^3
Natural gas, LPG, refinery gas	100	100	800	10

Noise and Vibration

Regulation on Assessment and Management of Ambient Noise provides ambient noise standards in Annex-VII Table 4 for Industrial Facilities and Table 5 for Construction Sites. The corresponding limits are provided in the tables below.

Table 79: Turkish Ambient Noise Limits Generated by Industrial Facilities

Receptor	LAeq (dBA) Day-time	LAeq (dBA) Evening-time	LAeq (dBA) Night-time
Noise sensitive areas - with training, culture and health areas, summer houses and camps	60	55	50
Combination of commercial and noise sensitive areas - with dense residential buildings	65	60	55
Combination of commercial and noise sensitive areas with dense commercial buildings	68	63	58
Industrial areas	70	65	60

Table 80: Turkish Ambient Noise Limits Generated by Construction Sites

Activity (construction, demolition and renovation)	LAeq (dBA) Day-time
Building	70
Road	75
Other sources	70

Soil Quality

The assessment of soil quality in Turkey is based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites“ (“Soil Regulation” or “Regulation”) originally published in the Official Gazette number

27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704 stating that the binding articles are effective as of 08 June 2015.

The Regulation states that, all the facilities/activities that are listed in the Annex 2 - Table 2 of the regulation, should submit the online Activity Preliminary Information Sheet to the MoEU. The facility/activity owners have to also submit a signed, hardcopy version of the form to the Provincial Directorate of the MoEU. The Provincial Directorate is responsible for submitting the approved form to the MoEU.

The Activity Preliminary Information Sheet is presented in Annex 3 of the Regulation.

The hospital project is included in the list of Annex-2 (NACE Code: 8610, hospital services).

The process described in the Regulation is as follows:

"CHAPTER III

Information System and Information Sheets

Obligation to Arrange Activity Preliminary Information Sheet

ARTICLE 8: (1) Existing activity owners who execute activities given in Annex 2 Table 2 and new activity owners shall fill the Activity Preliminary Information Sheet given in Annex 3 according to Polluted Fields Information System and submit to provincial directorate.

(2) Provincial Directorate shall control Activity Preliminary Information Sheets and approves on the Polluted Fields Information System.

(3) Activity owner is obliged to submit this form to provincial directorate in written and signed format, as well.

(4) Provincial Directorate is obliged to submit approved Activity Preliminary Information Sheets to the Ministry in written and signed format.

(5) Ministry shall add these statements into Potentially Polluted Fields List."

The Provincial Directorate of the MoEU would assess the Activity Preliminary Information Sheet and decide whether the facility should be included in the Potentially Polluted Sites List or not. The criteria for the assessment of the Activity Preliminary Information Sheet are presented in Annex 4 of the Regulation. In case one of the assessment criteria is valid for the facility, then the facility would be included in the Potentially Polluted Sites List. The criteria in Annex 4 are presented as follows:

Preliminary Site Assessment Criteria based on Activity Preliminary Information Sheet

1) Presence of hazardous chemicals at the facility of the storage type of any of the hazardous chemicals,
   a) For storage:
      - Lack of ground isolation, or
      - Use of open areas without drainage system.
   b) For above ground tanks:
      - Lack of leakage control , or
      - Lack of leakage control from the pipes, or
      - Lack of ground isolation.
   c) For underground tanks:
      - Tanks are single-walled, or
      - Tanks were installed 10 or more years ago, or
      - Lack of leakage control, or
      - Lack of leakage control from the pipes, or
      - Lack of corrosion protection or cathodic protection.

2) Occurrence of industrial accidents at the facility site.

3) Temporary storage of hazardous waste at the facility site; and
   a) If any of the stored wastes is marked by (A) per the Regulation on General Principals of Waste Management Annex-IV Waste List, or
   b) Lack of impermeable ground at the temporary waste storage area, or
   c) Lack of drainage system around the temporary waste storage area.

4) When a treatment plant is available for the industrial wastewater,
   a) Temporary storage of the sludge at the facility site, or
   b) Discharge of treated waste water to a property.

When a facility is added to the Potentially Polluted Sites List, based on the abovementioned assessment criteria, an audit would be conducted by the Provincial Directorate of the MoEU as outlined in the Regulation.

If an industrial accident or an industrial accident due to a natural hazard occurs, the accident would be reported in accordance with the Declaration Form presented in Annex 5 of the Regulation and the facility would be included in the Potentially Polluted Sites List.

According to the Regulation, once the site is added into the list of "Potentially Polluted Sites List", 1st Stage Investigation is requested by the MoEU as outlined in the Regulation and its Guidance documents. This may be followed by 2nd Stage Investigation, Risk Assessment and potentially by Clean-Up/Remediation all outlined and regulated by the provisions of the Soil regulation.

Hospitals are included in the list of industries provided in Annex 2 - Table 2 of the Regulation that is required to prepare and submit Activity Preliminary Information Sheet. Hence, an Activity Preliminary Information Sheet should be prepared and submitted when the relevant statement of the Regulation comes into force. Some of the potential wastes that are expected to be stored temporarily at the Project Site are marked by (A) in the Regulation on Waste Management Annex-IV Waste List. Thus, the Project Site may potentially be identified as a "Potentially Polluted Site" by the MoEU.

If the source of the pollution is unknown, however an indication of pollution is identified; samples would be collected and analysed for generic pollution indicator parameters, identified for each industrial activity based on the NACE code of the facility. The generic pollution indicator parameters for each industrial activity based on the NACE code of the facility is presented in Annex 2, Table 2 of the Regulation and the limits for the generic pollution indicator parameters are presented in Annex 1 of the Regulation.

Quality parameters for hospital services are provided in Annex 2 - Table 2 of the Regulation with NACE code of 8610 and generic limits are given in Annex 1 of the Regulation; and this information is summarized in the table below.

Table 81: Hospital Services Soil Quality Parameters and Generic Limits

Parameter	Generic Limits in Current Regulation on Soil Pollution Control and Contaminated Sites by Point Sources (Appendix I)				
	CAS-No	Absorption via ingestion of soil and dermal contact (mg/kg dry weight)	Respiration of volatile substances in ambient environment (mg/kg dry weight)	Respiration of fugitive dusts in ambient environment (mg/kg dry weight)	Transfer of pollutants from soil to groundwater and drinking groundwater (mg/kg dry weight)

					DF=10 (dilution factor*)	DF=1 (dilution factor*)
Lead	7439-92-1	400			135	14
Barium	7440-39-3	15643		433702	288	29
Cadmium	7440-43-9	70		1124	27	3
Molybdenum	7439-98-7	391			14	1
Selenium	7782-49-2	391			0,5	0,05
Silver	7440-22-4	391			16	2
Cadmium	7440-43-9	70		1124	27	3
Tin	7440-31-5	46929			54794	5479
Chromium +3	16065-83-1	117321				
Chromium +6	18540-29-9	235		24	10	1
Total Chromium	7440-47-3	235		24	900,000	1
Copper	7440-50-8	3129			514	51
Zinc	7440-66-6	23464			6811	681
Mercury	7439-97-6	23	3		3	0.6
Arsenic	7440-38-2	0.7		471	3	0.3
Total Petroleum Hydrocarbons (Aliphatic) (EC5-EC8)	0-01-0	4693			4	0.4
Total Petroleum Hydrocarbons (Aliphatic) (EC8 >-EC16)	0-01-1	7821			7	0.7
Total Petroleum Hydrocarbons (Aliphatic) (EC16 >-EC35)	0-00-9	156429			146	15
Total Petroleum Hydrocarbons (Aromatic) (EC5-EC9)	0-01-3	15643			15	1
Total Petroleum Hydrocarbons (Aromatic) (EC9>-EC16)	0-01-4	1564			1	0.1
Total Petroleum Hydrocarbons (Aromatic) (EC16>-EC35)	0-01-2	2346			2	0.2
Antimony	7440-36-0	31			2	0.2

TOX, TPH, Ag, As, Ba, Bi, Cd, Cr, Cu, Hg, Mo, Pb, Pt, Sb, Se, Sn, Zn

* If the distance to the aquifer is less than 3m, the aquifer is fractured or karstic or the area of the pollutant source is equal to or larger than 10 hectares, DF:1, otherwise DF:10.

APPENDIX L

Data Collected From Site

1. Geology and Geomorphology

Table 82: The lithology obtained from borehole logs

Borehole No	Borehole Depth (m)	Elevation (m)	Depth (m)		DESCRIPTION
BH-01	38.00	75.30	0.00	8.00	CLAY: Brown colored; very stiff to hard; contains calcareous concretion; gravels are coarse and medium, and limestone originated.
			8.00	16.00	Altered CLAYSTONE: Blackish yellow colored; completely weathered; very weak in strength; crushed; gravels are partly coarse.
			16.00	38.00	CLAYSTONE: Blackish green colored; moderately weathered; weak in strength; moderate to close fractured; fractures are oblique to core axis; poor to fair in rock quality
BH-12	32.00	69.15	0.00	33.00	CLAYSTONE: Yellowish white to partly pink to green colored; highly to moderate weathered; weak to medium
BH-14	38.00	76.27	0.00	38.00	clayey LIMESTONE: Yellowish white to partly pink colored; moderately weathered; weak in strength;
BH-17	38.00	76.28	0.00	5.00	CLAY: Yellow to beige colored; hard; contains calcareous concretion, minor amount of silt and minor amount of gravel; gravels are calcareous origin, fine grained.
			5.00	7.50	CLAYSTONE: Yellow to beige colored; completely to highly weathered; very weak in strength; intensely fractured to crushed; very poor in rock quality.
			7.50	13.50	CLAYSTONE: Dark grey colored; highly to partly completely weathered; weak in strength; intensely fractured to partly crushed, fractures are perpendicular to the core axis; poor in rock quality.
			13.50	38.00	clayey LIMESTONE: Yellowish white to partly pink colored; highly to moderately weathered; strong; fractures are closed and partly crushed, oblique to core axis; very poor to good in rock quality.
BH-19	32.00	69.58	0.00	0.90	TOP SOIL
			0.90	4.50	CLAY : Yellow to beige colored; contains calcareous concretion; little silt and gravel, gravels are coarse and limestone originated.
			18354	32.00	clayey LIMESTONE: Yellowish white to partly pink colored; moderately to partly highly weathered; strong; fractures are closed and partly crushed, oblique to core axis; very poor to fair in rock quality.
BH-23	35.00	72.07	0.00	0.40	ARTIFICIAL FILL: Yellowish white colored; clayey limestone.
			0.40	1.00	TOP SOIL
			1.00	8.00	CLAY: Yellow to beige colored; very stiff to hard; contains calcareous concretion, little silt, gravel, gravels are limestone originated and fine to coarse grained.
			8.00	22.00	clayey LIMESTONE: Yellowish white to partly pink colored; highly to partly completely weathered; medium strong in strength; fractures are closed to crushed, oblique to core axis; very poor to fair in rock quality.
			22.00	35.00	clayey LIMESTONE: Yellowish white to partly pink colored; moderately weathered; medium strong in strength; fractures are closed to crushed, oblique to core axis; very poor to poor in rock quality.
BH-25	35.00	72.54	0.00	1.00	ARTIFICIAL FILL: Brown colored, contains coarse grained gravel, boulders and excavated soil.
			1.00	7.50	CLAY: Yellowish to beige colored; hard; contains calcareous concretion; little silt; partly limestone gravels.
			18445	13.50	clayey LIMESTONE: Yellowish white to grey colored; highly weathered; medium strong in strength; fractures

Borehole No	Borehole Depth (m)	Elevation (m)	Depth (m)		DESCRIPTION
					are intense and crushed, oblique to core axis; very poor in rock quality.
			13.50	35.00	clayey LIMESTONE: Yellowish white to grey colored; moderately weathered; medium strong in strength; fractures are intense and crushed, oblique to core axis; very poor in rock quality.
BH-31	42.00	-	0.00	9.00	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong to strong; moderate to closely fractured, fracture surfaces are perpendicular and oblique to the core axis, very poor to poor in rock quality.
			9.00	23.00	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong to strong; moderate to closely fractured, partly crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to poor in rock quality.
			23.00	42.00	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong to strong; moderate to closely fractured, fracture surfaces are perpendicular and oblique to the core axis, very poor to poor in rock quality.
BH-32	47.00	-	0.00	24.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to partly highly weathered; weak to medium strong; fractures are intense to crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to fair in rock quality.
			24.00	33.50	clayey LIMESTONE: Yellowish white, beige to gray colored; slightly weathered; medium strong; moderate to closely fractured, fracture surfaces are perpendicular and oblique to the core axis; fair to good in rock quality.
			33.50	38.00	clayey LIMESTONE: Gray colored; moderately to partly highly weathered; weak to medium strong; fractures are intense to crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to fair in rock quality.
			38.00	47.00	clayey LIMESTONE: Gray colored; moderately to partly highly weathered; weak to medium strong; fractures are intense to crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to fair in rock quality.
BH-45	40.00	86.91	0.00	40.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to slightly weathered; medium strong to
BH-49	45.00	93.70	0.00	18.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to slightly weathered; medium strong; intensely fractured to partly crushed, fractures are perpendicular to core axis; very poor to poor in rock quality.
			18.00	45.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to slightly weathered; medium strong; intensely to closely fractured, fractures are oblique to core axis; very poor to good in rock quality.
BH-54	30.00	94.10	0.00	17.00	clayey LIMESTONE: Yellowish white to beige colored; highly to moderately weathered; medium strong; intensely fractured to partly crushed; very poor in rock quality.
			17.00	20.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to slightly weathered; medium strong; intensely to closely fractured; very poor to fair in rock quality.
BH-56	20.00	82.35	0.00	18.00	clayey LIMESTONE: Yellowish white colored; moderately weathered; medium strong; fractures are intense to crushed, perpendicular to core axis, fractures are filled with clay and partly calcite; very poor in rock quality.

Borehole No	Borehole Depth (m)	Elevation (m)	Depth (m)		DESCRIPTION
			18.00	30.00	clayey LIMESTONE: Yellowish white colored; moderately weathered; medium strong; fractures are intense, perpendicular to core axis, fractures are filled with clay and partly calcite; very poor in rock quality.
BH-58	38.00	95.77	0.00	17.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to partly highly weathered; medium strong; intensely fractured; very poor in rock quality.
			17.00	20.00	clayey LIMESTONE: Yellowish white to beige colored; moderately weathered; medium strong; intensely to closely fractured; very poor to fair in rock quality.
BH-61	35.00	96.31	0.00	17.00	clayey LIMESTONE: Beige colored; moderately weathered; medium strong to strong; fractures are closed to intense and partly crushed, oblique to core axis; very poor to poor in rock quality.
			17.00	35.00	clayey LIMESTONE: Beige colored; moderately to slightly weathered; medium strong to strong; fractures are closed to intense, oblique to core axis; poor in rock quality.
BH-62	17.00	78.77	0.00	17.00	clayey LIMESTONE: Yellowish white colored; highly
BH-64	32.00	97.60	0.00	6.00	clayey LIMESTONE: Yellowish white to beige colored; highly to moderately weathered; medium strong; fractures are intense to crushed, partly filled with clay; very poor in rock quality.
			6.00	27.00	clayey LIMESTONE: Yellowish white to beige colored; slightly to partly moderately weathered; medium strong; fractures are close; poor to fair in rock quality.
			27.00	32.00	clayey LIMESTONE: Yellowish white to beige colored; moderately weathered; medium strong; fractures are close to partly crushed, partly filled with clay; fair in rock quality.
BH-67	27.00	93.21	0.00	16.00	clayey LIMESTONE: Yellowish white to beige colored; slightly to moderately weathered; medium strong; fractures are close; very poor to fair in rock quality.
			16.00	27.00	clayey LIMESTONE: Yellowish white to beige colored; highly to partly moderately weathered; weak to medium strong; fractures are intense to crushed, filled with clay; very poor in rock quality.
BH-68	20.00	106.10	0.00	11.00	clayey LIMESTONE: Yellowish white to beige colored; highly to moderately weathered; weak to medium strong; fractures are intense to crushed, partly filled with clay; very poor to fair in rock quality.
			11.00	20.00	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong; fractures are medium to partly close; fair to very good in rock quality.
BH-75	32.00	-	0.00	14.00	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong to strong; moderate to closely fractured, partly crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to fair in rock quality.
			14.00	32.00	clayey LIMESTONE: Yellowish white to beige colored; moderately to partly highly weathered; weak to medium strong; fractures are intense to crushed, fracture surfaces are perpendicular and oblique to the core axis, very poor to poor in rock quality.
BH-77	27.00	119.62	0.00	5.00	clayey LIMESTONE: Yellowish white to beige colored; highly to moderately weathered; weak to medium strong; fractures are close to partly crushed; very poor to poor in rock quality.
			5.00	11.00	clayey LIMESTONE: Yellowish white to beige colored; slightly to moderately weathered; medium strong; fractures are close; poor to fair in rock quality.

Borehole No	Borehole Depth (m)	Elevation (m)	Depth (m)		DESCRIPTION
			11.00	13.50	clayey LIMESTONE: Yellowish white to beige colored; slightly weathered; medium strong; fractures are close; fair to good in rock quality.
			13.50	21.00	clayey LIMESTONE: Yellowish white to beige colored; slightly to partly highly weathered; medium strong to strong; fractures are medium to close; fair in rock quality.
			21.00	27.00	clayey LIMESTONE: Yellowish white to beige colored; highly to moderately weathered; weak to medium strong; fractures are close to crushed; very poor in rock quality.

2. Soil

No visual indications of contamination or potential contamination sources were observed at the Project Area during the site visit conducted on 3 - 4 February 2015. In the light of this observation, in order to describe the baseline soil quality, 3 soil samples (and 1 duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm) during the site visit.

Table 83: Soil Sampling Locations

Sampling ID	Coordinates (UTM ED50)			Date	Time
	Zone	Easting	Northing		
TK-1	35	749267	4519199	04.02.2015	11:50
TK-2	35	749905	4519161	04.02.2015	12:45
TK-3	35	749922	4518952	04.02.2015	14:00
TK-4 (Duplicate of the TK-2)	35	749905	4519161	04.02.2015	14:45

The assessment of soil in Turkey is based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites“ (“Soil Regulation”) originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704 stating that the binding articles became effective as of 08 June 2015.

The activities within the Site would be covered by Annex 2, Table 2 of the Soil Regulation:

Table 84: The activity specific contamination indicator parameters

NACE Code	Industrial Activity	Activity specific contamination indicator parameters
8610	Hospital Services	TOX, TPH, Ag, As, Ba, Bi, Cd, Cr, Cu, Hg, Mo, Pb, Pt, Sb, Se, Sn, Zn

The list of analytical parameters that need to be analysed in the samples, per the regulation, are referred to as “the activity-specific contamination indicator parameters”. Activity-specific contamination indicator parameters for the Project Area, listed in the table above are: Total Organic Halogens (TOX), Total Petroleum Hydrocarbons (TPH), Silver (Ag), Arsenic (As), Barium (Ba), Bismuth (Bi), Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Molybdenum (Mo), Lead (Pb), Platinum (Pt), Antimony (Sb), Selenium (Se), Tin (Sn), Zinc (Zn) (Table 84).

The map showing the study area and the soil sampling locations are given in Figure 60.

The three soil samples and one duplicate sample collected were sent to “Segal Çevre Ölçüm ve Analiz Laboratuarı” which is accredited by TURKAK for analyses. They were analysed in accordance with the Turkish legislation (parameters stated Table 84).

As the samples were collected from the topsoil, in accordance with the Soil Regulation and its Guidance Documents, the results were compared with the generic pollutant limit values listed in ANNEX 1: List of Generic Pollutant Limit Values, column “Ingestion of soil or dermal contact” and “Outdoor inhalation of fugitive dust”.

The Generic Pollutant Limit Values have the following description in the Soil Regulation: “Generic Pollutant Limit Value (GPLV): Refers to the Limit Value for a Pollutant, given in Annex 1 Generic Pollutant Limit Values List, calculated or determined by considering that intended use of the polluted area is or will be residential area and that it will pose risks on human health, and by assuming that humans are exposed to the pollutant at maximum level for a reasonable period.”

Figure 60: Soil and Surface Water Sampling Locations

Table 85: Comparison of the soil chemical analysis results with the Generic Pollutant Limit Values

Parameter	Unit	Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg oven dry soil)	TK-1	TK-2	TK-3	TK-4 (Duplicate of TK-2)
Antimony	mg/kg	31	-	<1.25	1.33	<1.25	1.3
Arsenic	mg/kg	0.4	471	4	5.5	7	7.25
Cupper	mg/kg	3129	-	144.75	24.75	28.25	41.25
Barium	mg/kg	15643	433702	93.75	161.75	136.25	174
Mercury	mg/kg	23	-	<0.25	<0.25	<0.25	<0.25
Zinc	mg/kg	23464	-	383.25	72	157.25	144.5
Silver	mg/kg	391	-	<5	<5	<5	<5
Cadmium	mg/kg	70	1124	<0.25	0.75	0.7	1.13
Tin	mg/kg	46929	-	<0.25	<0.25	<0.25	<0.25
Chromium	mg/kg	235	24	28.75	40.25	37.25	66
Lead	mg/kg	400	-	7.5	20	14.5	25.25
Molybdenum	mg/kg	391	-	<2.5	<2.5	<2.5	<2.5
Selenium	mg/kg	391	-	<1.25	<1.25	<1.25	<1.25
TPH	mg/kg			12.02	29.76	65.55	20.84
TOX	mg/kg			316.04	140.62	856.11	144.28

The results exceeding the limit values in the column “Ingestion of soil or dermal contact” are indicated in red and the results exceeding the limit values in the column “Outdoor inhalation of fugitive dust” are indicated in blue.

3. Surface Water Quality

In order to describe the baseline surface quality, one surface water sample was collected from the tributary of the Bıçkı Creek during the site visit conducted on 3 - 4 February 2015. The map showing the Project Area and the surface water sampling location is given in Fgure 60. The surface water sampling location and the relevant sample information (coordinates, names, sampling date and time) are given in Table 86.

Table 86: Surface Water Sampling Locations

Sampling ID	Coordinates (UTM ED50)			Date	Time
	Zone	Easting	Northing		
SK-1	35	748732	4518968	05.02.2015	12:45

Table 87: Surface Water Quality

Water Quality Parameters	Water Quality Classes				
	I	II	III	IV	SK-1
General Condition					
Temperature (°C)	≤ 25	≤ 25	≤ 30	> 30	25
Color (m^{-1})	RES 436 nm: ≤ 1.5	RES 436 nm: 3	RES 436 nm: 4.3	RES 436 nm: >4.3	<0.1
	RES 525 nm: ≤ 1.2	RES 525 nm: 2.4	RES 525 nm: 3.7	RES 525 nm: >3.7	<0.1
	RES 620 nm: ≤ 0.8	RES 620 nm: 1.7	RES 620 nm: 2.5	RES 620 nm: >2.5	<0.1
pH	6.5-8.5	6.5-8.5	6.0-9.0	< 6.0 or > 9.0	8.01
Electrical Conductivity (µS/cm)	< 400	1000	3000	> 3000	946
(A) Oxidation Parameters					
Oxygen Saturation (%)	>90	70	40	< 40	118
Dissolved Oxygen (mg O_2/L)	> 8	6	3	< 3	10.5
Chemical Oxygen Demand (COD) (mg/L)	< 25	50	70	> 70	12.0
Biochemical Oxygen Demand (BOD) (mg/L)	< 4	8	20	> 20	<1.0
B) Nutrient Parameters					
Ammonia as N (mg NH_4^+-N/L) [(c)]	< 0.2	1	2	> 2	<0.040
Nitrate as N (mg NO_3^--N/L)	< 5	10	20	> 20	2.91
Nitrite as N (mg NO_2^--N/L)	< 0.01	0.06	0.12	> 0.3	<0.0020
Total Kjeldahl Nitrogen as N (mg N/L)	< 0.5	1.5	5	> 5	0.78
Phosphorus (mg P/L)	< 0.03	0.16	0.65	> 0.65	0.014
C) Trace Elements (Metals) and Inorganic Contamination Parameters					
Aluminium (mg Al/L)	≤ 0.3	≤ 0.3	1	> 1	0.149
Arsenic (µg As/L)	≤ 20	50	100	> 100	<5.0
Copper (µg Cu/L)	≤ 20	50	200	> 200	1.2
Barium (µg Ba/L)	≤ 1000	2000	2000	> 2000	49.8
Boron (µg B/L)	≤ 1000	≤ 1000	≤ 1000	> 1000	310
Mercury (µg Hg/L)	≤ 0.1	0.5	2	> 2	<0.010
Zinc (µg Zn/L)	≤ 200	500	2000	> 2000	<2.0
Iron (µg Fe/L)	≤ 300	1000	5000	> 5000	203
Cadmium (µg Cd/L)	≤ 2	5	7	> 7	<0.40
Cobalt (µg Co/L)	≤ 10	20	200	> 200	<2.0
Chromium (µg Cr/L)	≤ 20	50	200	> 200	1.0
Lead (µg Pb/L)	≤ 10	20	50	> 50	<5.0
Manganese (µg Mn/L)	≤ 100	500	3000	> 3000	57.2
Nickel (µg Ni/L)	≤ 20	50	200	> 200	3.0
Selenium (µg Se/L)	≤ 10	≤ 10	20	> 20	<10.0
D) Bacteriological Parameters					
Fecal Coliform	10	200	2000	> 2000	10
Total Coliform	≤100	20000	100000	> 100000	80

Table 88[59]: Groundwater Table Measurements[60]

BH No	Groundwater Table Depth (m)	Groundwater Table Elevation (m)
BH-01	5.5	69.80
BH-12	16	53.15
BH-14	23	53.27
BH-17	0.5	75.78
BH-19	24	45.58
BH-23	28	44.07
BH-25	21	51.54
BH-31	30	49.41
BH-32	37	47.77

[59] The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015

[60] The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015

BH No	Groundwater Table Depth (m)	Groundwater Table Elevation (m)
BH-45	22	64.91
BH-49	31	62.70
BH-54	16	78.10
BH-56	8	74.35
BH-58	26	69.77
BH-61	24	72.31
BH-62	14	64.77
BH-64	24	73.60
BH-67	25	66.32
BH-68	18	88.10
BH-75	26	97.22

Table 89: Chemical test results for groundwater samples[61]

Test	Test Standard	BH-01	BH-17
pH (25°C)	TS EN ISO 10523	7.60±0.09	7.37±0.09
Conductivity (25°C), mS/m	TS 9748 EN 27888	77.69±0.50	76.47±0.50
Magnesium, mg/L	TS 4474 ISO 6059 TS 8196	13.39	14215
Total Hardness (CaCO3), mg/L	TS4474 ISO 6059	373.13±17.16	376.94±17.34
Total Alkalinity (CaCO3), mg/L	TS 3790 EN ISO 9963-1	315.17	316.15
Chloride, mg/L	TS 4164 ISO 9297	53.21	52.54
Sulphate, mg/L	TS 5095	47.26±5.20	47.02±5.17
Ammonium, mg/L	STMD 2005	0.195	0.200
Permanganate Index, mg oxygen/L	TS 6288 EN ISO 8469	1.33	1.40

[61] The Site Investigation and Geotechnical Evaluation Report for Kocaeli Integrated Health Campus Project, January 2015

Table 90: The lithology obtained from test pit logs

Test Pit No	Test Pit Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
TP-1	3.00	76.30	0.00-1.00	ARTIFICIAL FILL: Brown coloured; consists of solid waste, earthwork, debris, coarse gravel and cobble
			1.00-3.00	CLAY: Beige coloured; contains calcareous concretion; little silt, gravels, gravels are coarse grained, angular
TP-2	3.00	75.00	0.00-0.50	ARTIFICIAL FILL: Brown coloured; consists of solid waste, earthwork, debris, coarse gravel and cobble
			0.50-3.00	CLAY: Beige coloured; contains calcareous concretion; little silt, gravels, gravels are coarse grained, angular
TP-3	3.00	72.00	0.00-0.70	TOP SOIL
			0.70-3.00	CLAY: Beige to light brown coloured; contains calcareous concretion; little silt, gravels, gravels are coarse grained, angular, calcareous originated.
TP-6	1.20	85.00	0.00-1.20	Clayey LIMESTONE: Yellowish white to beige coloured; moderately to highly weathered; weak to medium strong; fractures are intense to crushed
TP-11	1.00	78.10	0.00-1.00	Clayey LIMESTONE: Yellowish white to beige coloured; moderately to highly weathered; weak to medium strong; fractures are intense to crushed
TP-13	1.30	120.50	0.00-0.30	TOP SOIL
			0.30-1.30	Clayey LIMESTONE: Yellowish white to beige coloured; moderately to highly weathered; weak to medium strong; fractures are intense to crushed

4. Air Quality

Table 91: $PM_{10,}$ Settled Dust and SO_2&NO_2 Measurement Summary

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results	Turkish Limit Value*	IFC, WHO Limit Value**
PM10-1 (µg/m^3)	749937-4518668	16.02.2015-17.02.2015	19.2	90	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
PM10-2 (µg/m^3)	750106-4519068	16.02.2015-17.02.2015	19.0		
PM10-3 (µg/m^3)	749566-4519064	16.02.2015-17.02.2015	18.5		
PM10-4 (µg/m^3)	749762-4519044	16.02.2015-17.02.2015	18.4		
SD-1 (mg/m^2-day)	749937-4518668	16.02.2015-16.03.2015	NR***	450	-
		16.03.2015-16.04.2015	NR		
SD-2 (mg/m^2-day)	750106-4519068	16.02.2015-16.03.2015	67.33		
		16.03.2015-16.04.2015	69.97		
SD-3 (mg/m^2-day)	750065-4518675	16.02.2015-16.03.2015	62.58		
		16.03.2015-16.04.2015	66.65		
SD-4 (mg/m^2-day)	749762-4519044	16.02.2015-16.03.2015	NR		
		16.03.2015-16.04.2015	NR		

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results	Turkish Limit Value*	IFC, WHO Limit Value**
P-1 ($\mu g/m^3$)	749937-4518668	16.02.2015-16.03.2015	(SO_2: NR), (NO_2: NR)	(SO_2: 20), (NO_2: 40)	(SO_2: 20), (NO_2: 40)
		16.03.2015-16.04.2015	(SO_2: <1.46), (NO_2: 63.88)		
P-2 ($\mu g/m^3$)	750106-4519068	16.02.2015-16.03.2015	(SO_2: 2.85), (NO_2: 48.42)		
		16.03.2015-16.04.2015	(SO_2: <1.46), (NO_2: 39.46)		
P-3 ($\mu g/m^3$)	749566-4519064	16.02.2015-16.03.2015	(SO_2: <1.65), (NO_2: 23.98)		
		16.03.2015-16.04.2015	(SO_2: <1.46), (NO_2: 66.62)		
P-4 ($\mu g/m^3$)	749762-4519044	16.02.2015-16.03.2015	(SO_2: <1.65), (NO_2: 26.51)		
		16.03.2015-16.04.2015	(SO_2: <1.46), (NO_2: 43.01)		
P-5 ($\mu g/m^3$)	749214-4519308	26.03.2015-26.04.2015	(SO_2: 3.34), (NO_2: 41.69)		
		26.04.2015-26.05.2015	(SO_2: 8.59), (NO_2: 64.1)		
P-6 ($\mu g/m^3$)	749456-4519173	26.03.2015-26.04.2015	(SO_2: 3.40), (NO_2: 36.64)		
		26.04.2015-26.05.2015	(SO_2: 1.87), (NO_2: 27.29)		
P-7 ($\mu g/m^3$)	749898-4519155	26.03.2015-26.04.2015	(SO_2: 4.63), (NO_2: 63.50)		
		26.04.2015-26.05.2015	(SO_2: 10.47), (NO_2: 53.40)		
P-8 ($\mu g/m^3$)	750332-4519227	26.03.2015-26.04.2015	(SO_2: 6.56), (NO_2: 63.36)		
		26.04.2015-26.05.2015	(SO_2: 5.55), (NO_2: 48.29)		
P-9 ($\mu g/m^3$)	749135-4519027	26.03.2015-26.04.2015	(SO_2: 3.91), (NO_2: 30.72)		
		26.04.2015-26.05.2015	(SO_2: 2.41), (NO_2: 32.91)		
P-10 ($\mu g/m^3$)	750111-4518737	26.03.2015-26.04.2015	(SO_2: 5.12), (NO_2: 61.51)		
		26.04.2015-26.05.2015	(SO_2: 5.07), (NO_2: 49.86)		
P-11 ($\mu g/m^3$)	749525-4518396	26.03.2015-26.04.2015	(SO_2: 1.51), (NO_2: 19.76)		
		26.04.2015-26.05.2015	(SO_2: 4.12), (NO_2: 48.82)		
P-12 ($\mu g/m^3$)	749035-4518549	26.03.2015-26.04.2015	(SO_2: 1.69), (NO_2: 12.28)		
		26.04.2015-26.05.2015	(SO_2: 2.47), (NO_2: 29.72)		

*Regulation on Control of Industrial Air Pollution (03.07.2009. OG No. 27277). App.1. Item 2.2

**World Health Organization, (WHO), IFC Environmental Health and Safety Guidelines

***No Result

****Human Interference

5. Ambient Noise Levels

Table 92: Background Noise Levels Observed at 15 Minutes Measurement Points

Point No.	Date	Leq (Total A) dB	Duration
N(15)-1	February 04th, 2015	57.1	15 minutes (11:15 – 11:30)
N(15)-2	February 04th, 2015	56.3	15 minutes (12:25 – 12:40)
N(15)-3	February 04th, 2015	44.7	15 minutes (13:30 – 13:35)
N(15)-4	February 04th, 2015	55.4	15 minutes (15:00 – 15:15)

Table 93: Background Noise Levels Observed at 24 Hours Measurement Points

Point No.	Date	Leq (Total A) dB					Duration
		L_{day*} (09:00 - 17:00)	$L_{evening*}$ (17:00 - 23:00)	L_{night*} (23:00 - 09:00)	L_{day**} (07:00 - 22:00)	$L_{night**}$ (22:00 - 07:00)	
N(24)-1	February 16th-17th, 2015	61.8	61.2	57.6	61.2	57.7	24 hours (14:27 – 14:26)
N(24)-2	February 16th-17th, 2015	64.8	62.4	58.8	63.8	58.1	24 hours (13:30 – 13:29)
N(24)-3	February 16th-17th, 2015	71.9	72.0	72.2	72.0	72.0	24 hours (18:11 – 18:10)
N(24)-4	February 16th-17th, 2015	70.0	68.8	69.1	69.5	69.1	24 hours (18:25 – 18:24)

*Time durations for L_{day}, $L_{evening}$ and L_{night} are described in Turkish Regulation on Assessment and Management of Environmental Noise.

**Time durations for L_{day} and L_{night} are described in IFC General EHS Guidelines - Environmental Noise Management.

6. Biodiversity

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A **field survey** was conducted on March 27th (2015) in the LSA in order to confirm the habitats and identify the presence of flora and fauna species with particular regard for characteristic, exotic, threatened or protected species. Analysis of flora species assemblages helped to confirm the habitat classification and the potential for hosting fauna species.

The vegetation present in the LSA represents a mixture of these two types described above. In the valley bottom, in presence of deeper and more humid soils the species present are those characteristic of Euxinic deciduous vegetation (e.g. *Alnus glutinosa Carpinus betulus*), while on the hill top the species present are those typical of the sclerophyllous Mediterranean maquis (e.g. *Quercus coccifera, Cistus salviifolius, Palirus spina-cristii*).

A total of 14 vegetation surveys were conducted in the LSA in order to identify the presence of vascular plant species with particular regard for characteristic, exotic, threatened or protected species. The species observed and their global and national conservation status according the IUCN Red List of Threatened Species and "The Red Data Book of Turkish Plants" (Ekim et. al., 2000) are listed below.

Table 94: List of vascular plant observed during the survey in the LSA

Family	Species (Scientific name)	Plant Growth Form	Endemic or Exotic	IUCN Category
ARACEAE	*Arum maculatum*	*Forb*	-	NE
ARALIACEAE	*Hedera helix*	*Vines*	-	NE
ASPARAGACEAE	*Asparagus acutifolius*	*Forb*	–	NE
	Muscari comosum	*Forb*	-	NE
	Ruscus aculeatus	*Shrub*	-	NE
ASPHODELACEAE	*Asphodelus ramosus*	*Forb*	–	NE
ASTERACEAE	*Centaurea diffusa*	*Forb*	–	LC
	Taraxacum officinalis	*Forb*	–	NE
ASTERACEAE	*Tragopogon longirostis*	*Forb*	–	LC*
BETULACEAE	*Alnus glutinosa*	*Tree*	-	LC
	Carpinus betulus	*Shub*	-	LC
BRASSICACEAE	*Capsella bursa-pastoris*	*Forb*	–	LC
CARYOPHYLLACEAE	*Silene* sp.	*Forb*	–	-
CISTACEAE	*Cistus salviifolius*	*Forb*	–	NE
COMPOSITAE	*Tripleurospermum* sp.	*Forb*	–	-
CORNACEAE	*Cornus mas*	*Shub*	-	NE
CUPRESSACEAE	*Cupressus sempervirens*	*Shrub*	–	LC
ERICACEAE	*Arbutus unedo*	*Shub*	-	NE
EUPHORBİACEAE	*Euphorbia falcata*	*Forb*	–	LC
FABACEAE	*Robinia pseudoacacia*	*Tree*	Ex	NE
FAGACEAE	*Quercus coccifera*	*Shrub*	–	LC

Family	Species (Scientific name)	Plant Growth Form	Endemic or Exotic	IUCN Category
	Quercus ilex	*Shrub*	–	LC
	Quercus petraea	*Tree*	-	NE
	Quercus robur	*Tree*	-	LC
GERANIACEAE	*Geranium sylvaticum*	*Forb*	-	NE
	Geranium robertianum	*Forb*	-	NE
IRIDACEAE	*Iris sp.*	*Forb*	-	-
PINACEAE	*Pinus brutia*	*Shrub*	–	LC
	Pinus nigra	*Shrub*	–	LC
PLANTAGINACEAE	*Veronica persica*	*Forb*	-	LC
PLATANACEAE	*Platanus hybridus*	*Tree*	Ex	LC
POACEAE	*Poa* sp.	*Graminoid*	–	-
POLYGONACEAE	*Polygonum cognatum*	*Forb*	–	LC
	Rumex acetosella	*Forb*	–	LC
RHAMACEAE	*Paliurus spina-christi*	*Shrub*	–	NE
ROSACEAE	*Rosa* sp.	*Shrub*	–	-
	Rubus sp	*Shrub*	-	-
	Sarcopoterium spinosum	*Shrub*	–	NE
RUBIIACEAE	*Galium aparine*	*Forb*	-	NE
SALICACEAE	*Populus alba*	*Tree*	-	LC
	Populus euroamerucana	*Tree*	Ex	-
	Salix sp.	*Tree/Shrub*	–	-
SIMAROUBACEAE	*Alianthus altissima*	*Shrub*	Ex	-
LABIATE	*Lamium purpureum*	*Forb*	-	NE

Figure 61: Ruscus aculeatus and Arum maculatum (top left), Quercus coccifera (top right), Muscari comosum (bottom left), Geranium sylvaticum (bottom right)

A list of species potentially present in the area is given for: Amphibians (Table 95), Reptiles (Table 96), Birds (Table 98) and Mammals (Table 98). Species observed in the area during the site visit that took place in March 27th (2015), are indicated with an O (Observed), while species potentially present in the area according to literature research, are indicated with an L (Literature). The species in the lists were selected considering both the species distribution and the capacity of habitat present in the LSA to host this species.

The conservation status of each species is assessed according to local and international convention. The species lists include data on family, scientific name, common name, preferred habitat and if the species is exotic (Ex) or endemic (En). IUCN Status, BERN Convention, and 2015-2016 Central Hunting Commission decisions (M.A.K.) categories are also indicated where applicable.

Table 95: Amphibia (Amphibians)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
BUFONIADE							

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
Bufo bufo	Common Toad	Under humid stone, earth channels and cracks	-	LC	III	-	L
Pseudepidalea variabilis	Green toad	In stony open spaces on the trees and boscage	-	DD	II	-	L
HYLIDAE							
Hyla arborea	Tree frog	Loose and gumbo earth inner and dead water	-	LC	II	-	L
PELOBATIDAE							
Pelobates syriacus	Eastern Spadefoot	Under humid stone, earth channels and cracks	-	LC	II	-	L

Table 96: Reptilia (Reptiles)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	BERN	MAK	Literature / Observed
TESTUDINIDAE							
Testudo graeca	Spur-thighed Tortoise	Stony, sandy and dry places	-	VU	II	I	L
LACERTIDAE							
Lacerta trilineata	Balkan Green Lizard	Roadside well-planted areas, and regions not too far from water	-	LC	II	I	L
GEKKONIDAE							
Hemidactylus turcicus	Turkish Gecko	Under stone, rock crevices, house and ruins.	-	LC	III	I	L
TYPHLOPIDAE							
Typhlops vermicularis	Eurasian Blind Snake	In the humid soil and under stone	-	-	III	I	L
COLUBRIDAE							
Zamenis situla	European Ratsnake	Woodland edges, forested ravines, scrubland and thickets, rocky outcrops.	-	LC	II	I	L
Zamenis longissimus	Aesculapean Snake	Woodland edges, forested ravines, scrubland and thickets, rocky outcrops.	-	LC	II		L
SCINCIDAE							
Ablepharus kitaibelii	European Copper Skink	Dry areas including south facing slopes, meadows, scrubland and clearings in woodland.	-	LC	II	I	L

Table 97: Aves (Birds)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK.	Literature / Observed
ALAUDIDAE							
Alauda arvensis	Eurasian Skylark	Farm, open field, shrubland and mountainside.	-	LC	III	II	L
HIRUNDINIDAE							
Riparia riparia	Sand Martin	Forests and cities	-	LC	II	I	L
Hirundo rustica	Barn Swallow	Settlement	-	LC	II	I	L
Delichon urbica	Northern House-martin	Settlement and rocky places	-	LC	II	I	L
Hirundo daurica	Red-rumped Swallow	Steppes and coasts	-	LC	II	I	L
TURDIDAE							
Luscinia megarhynchos	Common Nightingale	Woodlands, parks and cemeteries	-	LC	III	I	L
SYLVIDAE							
Sylvia hortensis	Orphean Warbler	Shrubland, brushwood, gardens and lowlands	-	LC	II	I	L
Sylvia rueppelli	Rueppell's Warbler	Thick thorny shrubs	-	LC	II		L
COLUMBIDAE							
Streptopelia decaocto	Eurasian Collared-dove	Cities, forestry and boscage	-	LC	III	II	O
Columba palumbus	Common Woodpigeon	Settlements and woodlands	-	LC	III	III	L
Streptopelia turtur	European Turtle-dove	Settlements and agricultural lands	-	LC	III	III	L
PHASIANIDAE							
Alectoris chukar	Chukar Partridge	Stony and rocky places	-	LC	III	III	L
Coturnix coturnix	Common Quail	Sowed farms, grasslands and steps	-	LC	III	III	L
PASSERIDAE							
Passer domesticus	House Sparrow	Settlements, farms and boscages	-	LC	-	III	O
E**MBERIZIDAE**							
Emberiza cirlus	Cirl Bunting	Settlements, schrubland and forestlands	-	LC	II		L
Emberiza cia	Rock Bunting	Schrublands and rocky areas,	-	LC	II		L

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK.	Literature / Observed
Emberiza melanocephala	Black-headed Bunting	Agricultural areas, schrublands	-	LC	II		L
PARIDAE							
Parus major	Great Tit	Woodlands, parks and gardens	-	LC	II	I	L
FALCONIDAE							
Falco tinnunculus	Common Kestrel	Settlements and forestlands	-	LC	II	I	L
Falco peregrinus	Peregrine Falcon	Forestlands and open fields	-	LC	II	I	L
Falco columbarius	Falco columbarius	Valleys with ruderal vegetation and wetland areas	-	LC	II	I	L
CORVIDAE							
Corvus monedula	Eurasian Jackdaw	Woodlands, rocky places and ruins	-	LC	-	III	L
Corvus frugilegus	Rook	Lowlands, woodlands, parks and gardens	-	LC	-	III	L
Corvus corone	Carrion Crow	Open fields and farms	-	LC	-	III	L
Garrulus glandarius	Eurasian Jay	Mixed woodland, urban parks	-	LC	-		O
Pica pica	Black-billed Magpie	Rarely woodlands, parks and gardens	-	LC	-	III	O
APODIDAE							
Apus apus	Common Swift	Woodlands	-	LC	III	I	L
PICIDAE							
Picus viridis	Eurasian Green Woodpecker	Forestlands, boscages and gardens	-	LC	II	II	L
FRINGILLIDAE							
Fringilla coelebs	Eurasian Chaffinch	Forestlands, woodlands, parks and gardens	-	LC	III	II	L
Carduelis carduelis	European Goldfinch	Woodlands and gardens	-	LC	II	I	L
STURNIDAE							
Sturnus vulgaris	Common Starling	Settlements and farms	-	LC	-	II	O

Table 98: Mammalia (Mammals)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
SORICIDAE							
Crocidura leucodon	Bicolored Shrew	Bostcages, open fields	-	LC	III	-	L
RHINOLOPHIDAE							
Rhinolophus ferrumequinum	Greater Horseshoe Bat	Forestlands, woodlands and boscages	-	LC	II	I	L
Rhinolophus hipposideros	Lesser Horseshoe Bat	Forestlands, woodlands and boscages	-	LC	II	I	L
Myotis mystacinus	Whiskered Myotis	Small caves, castle wall, garret, tree hollow and bark -	-	LC	-	I	L
MURIDAE							
Apodemus flavicollis	Yellow-necked Field Mouse	Humid forests and forest limit	-	LC	-	-	L
M USTEL DAE							
Mustela nivalis	Least Weasel	All kinds of habitat	-	LC	III	II	L
Martes foina	Martes foina	deciduous forest, forest edge, and open rocky hillsides	-	LC	III		L
ERINACEIDAE							
Erinaceus concolor	Southern White-breasted Hedgehog	Urban, suburban and agricultural areas to natural vegetation	-	LC	III		L
LEPORIDAE							
Lepus europaeus	European Hare	All kinds of habitat	-	LC	III	III	L
STURNIDAE							
Vulpes vulpes	Red Fox	Forestland, farms and open fields	-	LC	-	III	L

The following bird species were incidentally observed in the study area: common starling *(Sturnus vulgaris)*, black-billed magpie *(Pica pica)*, eurasian jay *(Garrulus glandarius)*, house sparrow *(Passer domesticus)* and eurasian collared-dove *(Streptopelia decaocto)*. These species are common in anthropic habitats.

7. Archaeology

The archaeological publications regarding the area were reviewed. Consequently, an academic background on the archaeological potential of the area was established. Indication of any previously identified and registered cultural assets were searched by contacting the Kocaeli Regional Preservation Board for Cultural Assets. Before the field works, REGIO Site Team has analysed the aerial photographs of the project area together with the GIS Team .In addition, a 1/25000 scale map with corner coordinates of the project area were produced for the field work

Archaeological sites identified during the desktop studies were marked on the map to form an association with the project area. Desktop studies were implemented in parallel with the field works. Resources used during the desktop studies are:

- Academic Publications
- Historical maps
- Reports on previous Cultural Heritage Works and Field Survey Results
- Inventory Archives of the Ministry of Culture and Tourism.

A study plan for field works has been developed considering the geographical context of the project area. According to the methodology, the project area was divided into grids on the east-west direction and the survey was conducted by walking across the grids in order to scan archaeological assets within the area. The survey carried out by 2 archaeologists experienced on construction and infrastructure projects[62] (Figure 62).

Figure 62: Project area where archaeological site surveys were conducted

The vegetation (trees and bushes) was the most important obstacle for effective observation of the surface during the survey of the project area. It is aimed to observe, register and evaluate the visible archaeological traces (potsherds, architectural remains, burials, tumuli, etc.) with respect to geological and archaeological features of the region. In the areas where the archaeological potential is high, archaeological studies were conducted to identify any archaeological assets to the extent permitted by the surface conditions.

[62] Halim ÖZATAY, Serkan AKDEMİR.

Figure 63: Archaeological Team in the Project Area

APPENDIX M

Air Quality and Noise Modelling

AIR QUALITY MODELLING

CONSTRUCTION

During the construction phase impacts will be mainly associated to air pollutants and dust emission.

The project actions related to the abovementioned impact factor are the following: surface levelling and grading, temporary stockpiling of the material, disposal of grading material, transport of construction material.

Construction activities will affect air quality mainly through emissions of dust from the excavation and storage of soil, vehicles traffic on unpaved roads, the emission of particulate from vehicle exhausts and the emission of particulate from stationary sources like power generators. Emissions of gaseous pollutants, particularly NO_x and SO_2, will be mostly related to the vehicle and machinery exhausts and emissions from stationary sources like power generators.

Exhaust Gases

In general, diesel oil will be used as fuel for the construction machinery. However, the pollution created by the emission of vehicles in the project area is considered not to affect the existing air quality negatively when it is taken into account that such vehicles will be operated for 10 hours a day and they will not be in use continuously.

In below table, type and number of engineering vehicles, horse power and the emission factors were shown. Emission values from engineering vehicles have been calculated by using the Exhaust Emission Factors for Non-road Engine Modelling (Report No. NR-009A) of United States Environmental Protection Agency (EPA).

Table 99: Exhaust Emission Factors for Construction Equipment

Machinery / Equipment	Number	Engine Power (HP)	Emission Factors (g/hp-hr)			
			HC	CO	NOx	PM
Concrete Mobile Pump	5	400	0.3	1.0	4.5	0.4
Concrete Stationary Pump	6	440	0.3	1.0	4.5	0.4
Bulldozer	2	220	0.4	1.0	4.5	0.4
Excavator	16	260	0.4	1.0	4.5	0.4
Wheeled Loader	1	200	0.4	1.0	4.5	0.4
Tracked Loader	1	200	0.4	1.0	4.5	0.4
Backhoe Loader	4	200	0.4	1.0	4.5	0.4
Truck (26 m^3)	36	250	0.4	1.0	4.5	0.4
Truck (20 m^3)	9	250	0.4	1.0	4.5	0.4
Lorries (18-wheeler)	2	250	0.4	1.0	4.5	0.4
Hi-Ups (30 tons)	2	250	0.4	1.0	5.2	0.7
Tractor	4	60	0.4	1.0	4.5	0.4
Grader	1	200	0.4	1.0	4.5	0.4
Air Compressor	7	10	0.6	2.5	5.0	0.6

Forklift	4	75	0.4	1.0	5.2	0.7
Telescopic Forklift	3	125	0.4	1.0	4.5	0.4
Generator (250 kV)	15	250	0.4	1.0	4.5	0.4
Generator (400 kV)	5	400	0.3	1.0	4.5	0.4
Roller	1	50	0.6	2.5	5.0	0.6
Paver	1	225	0.4	1.0	4.5	0.4
Bobcat	2	60	0.4	1.0	5.2	0.7
Mobile Crane	10	200	0.4	1.0	4.5	0.4
Concrete Placing Boom	10	270	0.4	1.0	4.5	0.4
Water Tanker	4	200	0.4	1.0	4.5	0.4

Exhaust emission values from the construction equipment have been calculated by using these coefficients and illustrated in below table.

Machinery / Equipment	Number	Engine Power (HP)	Emission (kg/hr)			
			HC	CO	NOx	PM
Concrete Mobile Pump	5	400	0.60	2.00	9,00	0,80
Concrete Stationary Pump	6	440	0.79	2.64	11,88	1,06
Bulldozer	2	220	0.18	0.44	1,98	0,18
Excavator	16	260	1.66	4.16	18,72	1,66
Wheeled Loader	1	200	0.08	0.20	0,90	0,08
Tracked Loader	1	200	0.08	0.20	0,90	0,08
Backhoe Loader	4	200	0.32	0.80	3,60	0,32
Truck (26 m^3)	36	250	3.60	9.00	40,50	3,60
Truck (20 m^3)	9	250	0.90	2.25	10,13	0,90
Lorries (18-wheeler)	2	250	0.20	0.50	2,25	0,20
Hi-Ups (30 tons)	2	250	0.20	0.50	2,60	0,35
Tractor	4	60	0.10	0.24	1,08	0,10
Grader	1	200	0.08	0.20	0,90	0,08
Air Compressor	7	10	0.04	0.18	0,35	0,04
Forklift	4	75	0.12	0.30	1,56	0,21

Telescopic Forklift	3	125	0.15	0.38	1,69	0,15
Generator (250 kV)	15	250	1.50	3.75	16,88	1,50
Generator (400 kV)	5	400	0.60	2.00	9,00	0,80
Roller	1	50	0.03	0.13	0,25	0,03
Paver	1	225	0.09	0.23	1,01	0,09
Bobcat	2	60	0.05	0.12	0,62	0,08
Mobile Crane	10	200	0.80	2.00	9,00	0,80
Concrete Placing Boom	10	270	1.08	2.70	12,15	1,08
Water Tanker	4	200	0.32	0.80	3,60	0,32
Total			13,57	35.70	160.54	14.51

Dust Emissions

During the construction activities the emission scenario will be mainly related to the dust suspension generated by the levelling and grading, the temporary stockpiling of the material, the vehicles movement to transport construction material to the construction areas.

Dust emissions regarding to the construction works was simulated by AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model) model.

For the site preparation, 2,500,000 m^3 of excavation will be required.

There should be 3 major components for running the AERMOD model to simulate the distribution of dust. These are:

- Source (air pollutant),
- Surface data (topography)
- Meteorological data

Source

During the excavation and filling operations within the scope of the project, dust emission shall be created. In dust emission calculations the soil density is assumed as 1.6 ton / m^3. A total of 2,500,000 m^3 (2,500,000 m^3 x 1.6 ton / m^3 = 4,000,000 ton) material will be produced during the construction works in the project area.

Dust emission shall be resulting from, transferring and unloading the material during the excavation within the scope of the project. Emission factors specified in the Articles d.1 and d.2 of the Annex-12 of the Regulation on the Control of Industrial Air Pollution published on 03.07.2009 in Official Gazette No.27277, have been accepted in order to calculate the amount of dust emission. All measures given in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order to minimize dust emission during the construction period.

Considering the working principles and emission factors below, hourly mass flow of dust emission to be released during the filling operations is calculated on the basis of this formula:

Dust Emission Amount = Production Amount x Emission Factor

	Uncontrolled	Controlled
Dismantling Emission Factor (kg/ton)	0.025 kg/ton	0.0125 kg/ton
Loading Emission Factor (kg/ton)	0.010 kg/ton	0.005 kg/ton
Unloading Emission Factor (kg/ton)	0.010 kg/ton	0.005 kg/ton
Transporting Emission Factor (kg/km-trip)	0.7 kg/km-trip	0.35 kg/km-trip
Fragmentation	-	0.08 kg/ton

For Rock Fragmentation

Within the scope of the rock fragmentation process for one pulse, there will be 40 holes with the distance of 3 m with each other. There will be 20 fragmentations in a month. There will not be any fragmentation study at weekends

Amount of Rock Fragmented : 2,500,000 m^3 (4,000,000 ton)

Duration of Rock Fragmentation : 12 months

Daily Working Time : 10 hours/day

Amount of Hourly Excavation Material : ~1,666 tons/hour (4,000,000 ton / 12 / 20 / 10)

Dust Emission During Fragmentation

Dust emission (Controlled) = 1,666 tons/hour x 0,08 kg/ton = 133.3 kg/hour

For Excavation:

Amount of Excavation : 2,500,000 m^3 (4,000,000 ton)

Duration of Excavation : 12 months

Daily Working Time : 10 hour/day

Amount of Hourly Excavation Material : ~1,111 tons/hour (4,000,000 ton / 12 / 30 / 10)

Emission Values:

Dust Emission During Dismantling

Dust emission (Uncontrolled) = 1,111 tons/hour x 0,025 kg/ton = 27.7 kg/hour

Dust emission (Controlled) = 1,111 tons/hour x 0,0125 kg/ton = 13.8 kg/hour

Dust Emission During Loading

Dust emission (Uncontrolled) = 1,111 tons/hour x 0,01 kg/ton = 11.1 kg/hour

Dust emission (Controlled) = 1,111 tons/hour x 0,005 kg/ton = 5.5 kg/hour

Dust Emission During Unloading

Dust emission (Uncontrolled) = 1,111 tons/hour x 0,01 kg/ton = 11.1 kg/hour

Dust emission (Controlled) = 1,111 tons/hour x 0,005 kg/ton = 5.5 kg/hour

Dust Emission During Transportation

The distance between project site and the excavation storage site is 14 km. However, only 800 m of the total of 14,000 m is stabilized road.

Dust emission (Uncontrolled) = (12 trip/day x 0.7 kg/km x 1.6 km) / 10 hour/day = 1.3 kg/hour

Dust emission (Controlled) = (12 trip/day x 0.35 kg/km x 1.6 km) / 10 hour/day = 0.65 kg/hour

Table 100: Total Dust Emissions

	Controlled (kg/hour)	**Uncontrolled (kg/hour)**
Dust Emission During Dismantling	13.8	27.7
Dust Emission During Loading	5.5	11.1
Dust Emission During Unloading	5.5	11.1
Dust Emission During Transportation	0.65	1.3
Total	**25.45**	**51.2**

In total, the amount of dust emission will be 25.45 kg/hour if it is controlled and 51.2 kg/hour if it is uncontrolled as it is described in the aforementioned regulation.

Total amount of dust emission to be released due to the operations to be performed during the excavation works are above the limit value (1kg/h) specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution. Therefore, AERMOD modelling was performed in order to calculate the values of contribution of dust emissions to the ambient air quality.

Surface data (topography)

Topographic values are crucial for the distribution of emission values. The sensitive points and topography was divided into grids by 250 m x 250 m cells within the 64.000.000 m^2 area (with the dimension of 8000 m x8000 m).

Meteorological data

According to the Kocaeli Meteorological Station 1961-2014 data, wind rose regarding to the long term wind numbers is shown below. Besides, the wind rose which is determined according to the 2005 Kocaeli wind direction numbers is also shown below. It is obvious that wind roses of long term and year of 2005 are shown lots of similar characteristic with respect to dominant wind directions and distribution of wind. Therefore, 2005 year of meteorological data was determined to be representative for the wind characteristics of the area and used for AERMOD.

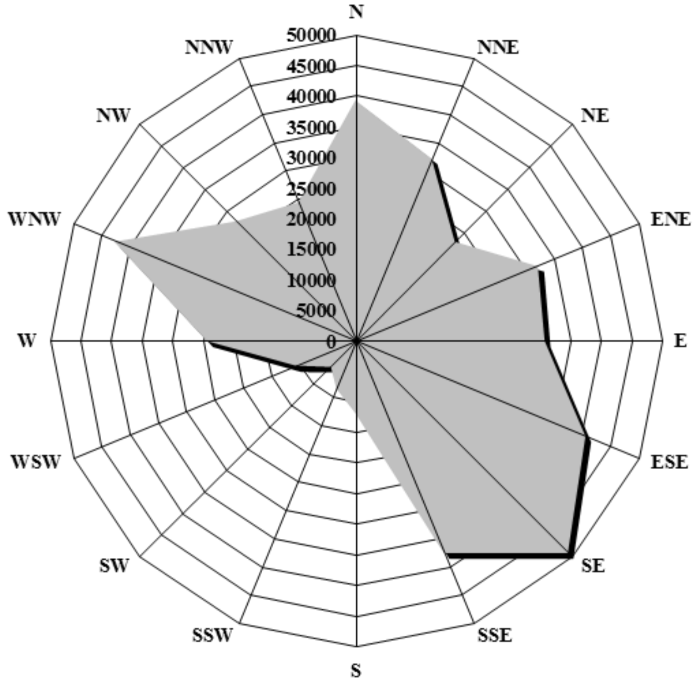


Figure 64: Annual number of winds at Kocaeli Meteorological Station

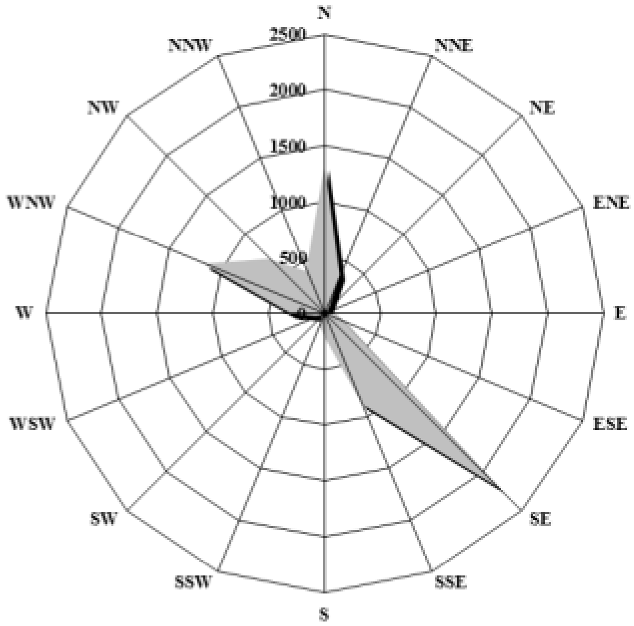


Figure 65: Number of winds at year of 2005 Kocaeli Wind Number

Meteorological pre-processor software AERMET which is supported by USEPA (United States Environmental Protection Agency) was used in the preparation of the meteorological data for the AERMOD model.

While calculating the meteorological data input, the quality control of the hourly raw surface data and upper atmosphere data of the relevant year and the station is done, and height is calculated. Subsequently, data are combined under a single file and the hourly values are calculated through defining the parameters specific to the site (surface roughness, albedo rate and bowen rate). Finally, profile file would be prepared according to the arranged surface file and consisting of the standard deviation of wind speed, direction, temperature and wind components on numerous different levels.

In the AERMET meteorology pre-processor software:

For hourly surface observations, the values of hourly temperature, wind speed, wind direction, cloud base height and station pressure were produced according to the Kocaeli Meteorological Station.

For upper atmosphere observations, the values of atmospheric pressure, elevation from ground level, dry thermometer temperature, wind direction (degree of deviation from N) and wind speed (m/sec) were also produced according to the Kocaeli Meteorological Station.

Model Results

PM_{10}

The comparison of dust emission model results with the limit values of Regulation on the Control of Industrial Air Pollution is shown in the below table.

Table 101: Modelling Results

Scenario	Maximum Annual Emission Value (µg/m^3) and Location	Limit Value (µg/m^3)	Maximum 24 Hours Average Emission Value (µg/m^3) and Location	Limit Value (µg/m^3)
Controlled	0.506 (749125, 4519625)	56	6.26 (749125, 4519625)	90
Uncontrolled	1.01 (749125, 4519625)		12.5 (749125, 4519625)	

As seen in the table above all emission values to be released due to the operations to be performed during the excavation works are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution.

Settled Dust

The comparison of settled dust concentration values to the limit values of Regulation on the Control of Industrial Air Pollution is shown in the below table.

Table 102: Settled Dust

Parameter	Conc. (max)		Limit Value
	Controlled	Uncontrolled	
Settled Dust	19.17 mg/m^2 day (749375, 4519625)	37.93 mg/m^2 day (749375, 4519625)	390 mg/m^2-gün

As seen in the table above all emission values to be released due to the operations to be performed during the excavation works are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution.

Rock Fragmentation

Table 103: Fragmentation

Scenario	Maximum Annual Emission Value ($\mu g/m^3$) and Location	Limit Value ($\mu g/m^3$)	Maximum 24 Hours Average Emission Value ($\mu g/m^3$) and Location	Limit Value ($\mu g/m^3$)	Settled dust (mg/m2-gün)	Limit Value (mg/m2-gün)
Controlled	53 (749125, 4520375)	56	710 (749375, 4520625)	90	1.544 (749625, 4519375)	390

As seen in the table above all emission values to be released due to the operations to be performed during the rock fragmentation are above the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution except from the annual emission value. Due to the nature of the fragmentation process, these results are normal and the dust emissions precipitate quickly. Rock fragmentation process creates sudden and intense emissions as well as the sudden precipitation.

In addition to this, all measures specified in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order minimize the dust emission within the scope of the project. Dust distribution maps are shown below figures.

Cumulative Impact

In order to assess the cumulative impacts, contribution of ambient PM_{10} and settled dust measurements to the model results were studied. PM_{10} was simulated annually and daily separately. Ambient PM10 air quality measurements were conducted for 24 hours. Therefore, 24 hour PM10 measurements are converted to the annual values by using the England Environmental Agency Annex-F. Converted measurement results are shown in below table.

Table 104: Converted Concentrations

Measurement No:	Concentration (24 hour), ($\mu g/m^3$)	Concentration (annual), ($\mu g/m^3$)
PM10-1 ($\mu g/m^3$)	19.2	16.2 ((19.2/0,59)*0,5)
PM10-2 ($\mu g/m^3$)	19.0	16.1 ((19.0/0,59)*0,5)
PM10-3 ($\mu g/m^3$)	18.5	15.6 ((18.5/0,59)*0,5)
PM10-4 ($\mu g/m^3$)	18.4	15.5 ((18.4/0,59)*0,5)

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

Table 105: Cumulative Values of PM10 and Settled dust

Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
PM10-1 ($\mu g/m^3$)	Controlled daily	2.64	19.2	21.84	90 ($\mu g/m^3$)
	Uncontrolled daily	5.22		24.42	
PM10-2 ($\mu g/m^3$)	Controlled daily	1.34	19.0	20.34	

Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
	Uncontrolled daily	2.67		21.67	
PM10-3 (µg/m³)	Controlled daily	1.33	18.5	19.83	
	Uncontrolled daily	2.63		21.13	
PM10-4 (µg/m³)	Controlled daily	1.31	18.4	19.71	
	Uncontrolled daily	2.60		21.0	
PM10-1 (µg/m³)	Controlled annual	0.36	16.2	16.56	56 (µg/m³)
	Uncontrolled annual	0.70		16.90	
PM10-2 (µg/m³)	Controlled annual	0.14	16.1	16,24	
	Uncontrolled annual	0.27		16.37	
PM10-3 (µg/m³)	Controlled annual	0.19	15.6	15.79	
	Uncontrolled annual	0.38		15.98	
PM10-4 (µg/m³)	Controlled annual	0.21	15.5	15.71	
	Uncontrolled annual	0.41		15.91	
SD-2 (mg/m²-day)	Controlled settled dust	3.31	69.97	73.28	390 (mg/m²-day)
	Uncontrolled settled dust	6.60		76.57	
SD-3 (mg/m²-day)	Controlled settled dust	6.86	66.65	73.51	
	Uncontrolled settled dust	13.54		80.19	

As seen from above table, cumulative values for both controlled and uncontrolled situations are below the limit values.

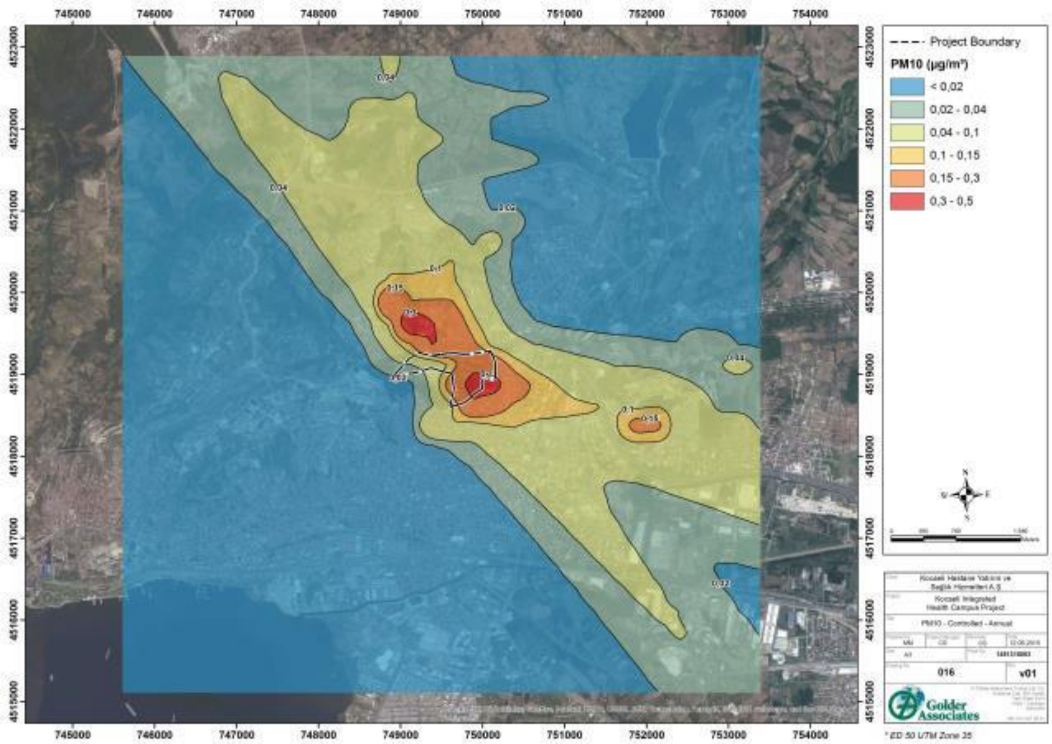


Figure 66: Controlled Annual

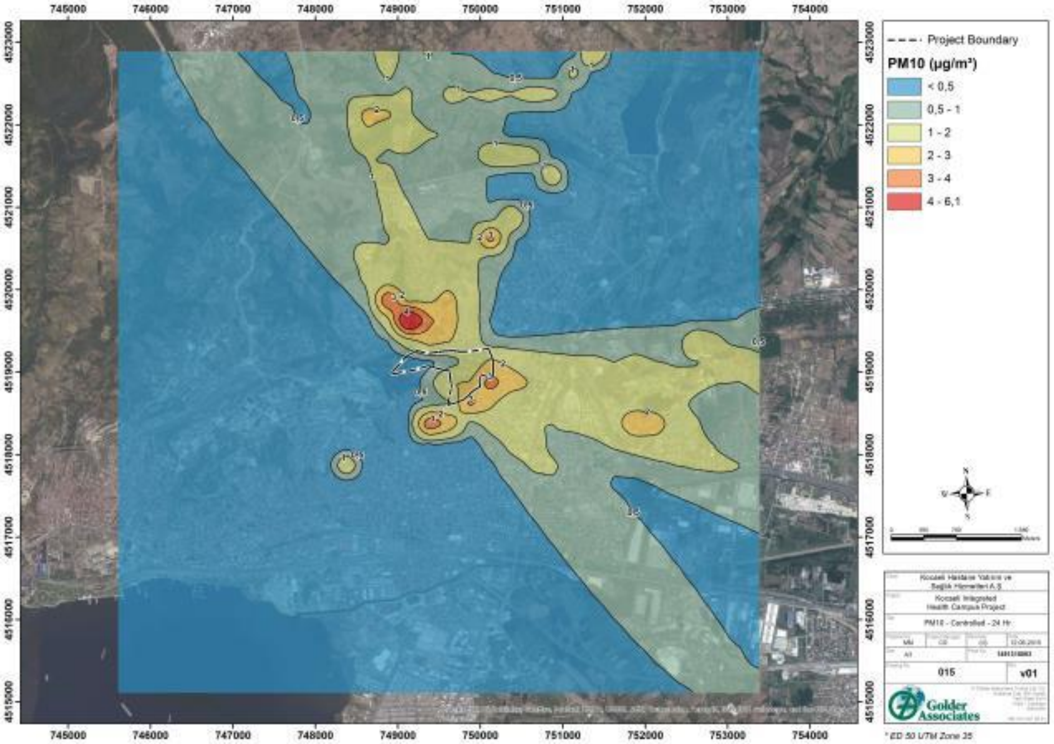


Figure 67: Controlled Daily

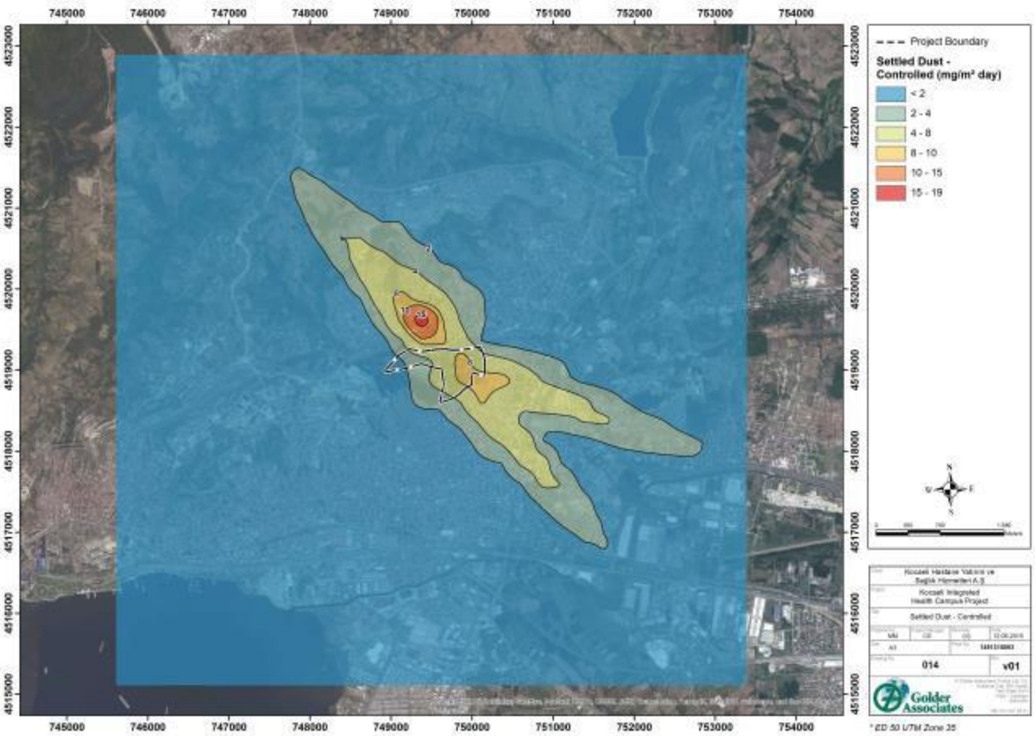


Figure 68: Controlled Settled Dust

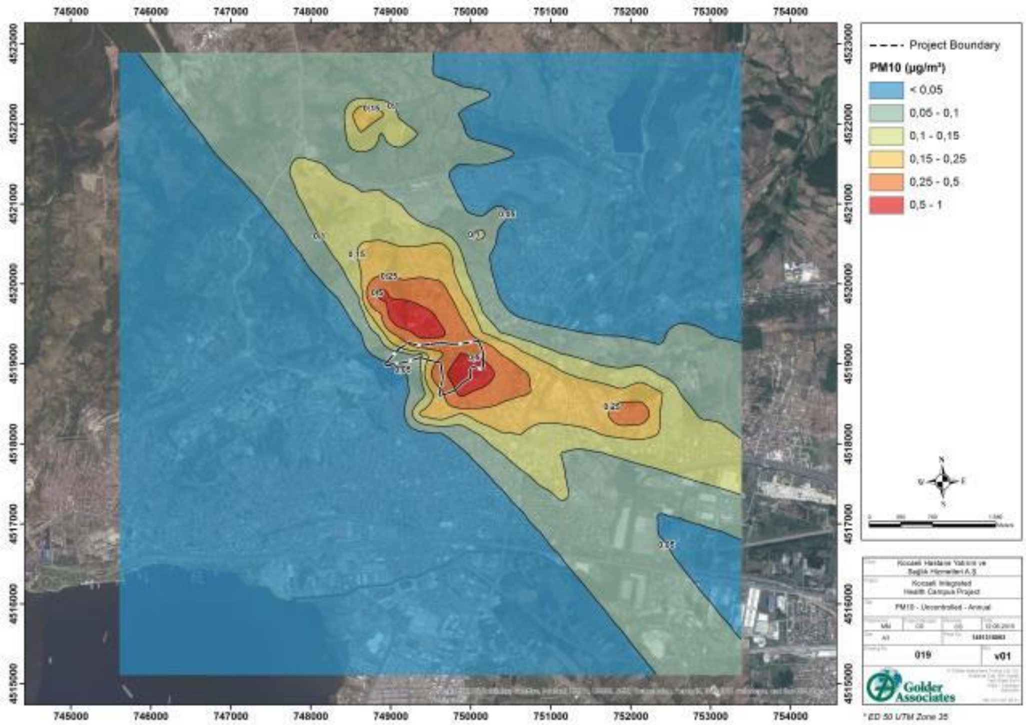


Figure 69: Uncontrolled Annual

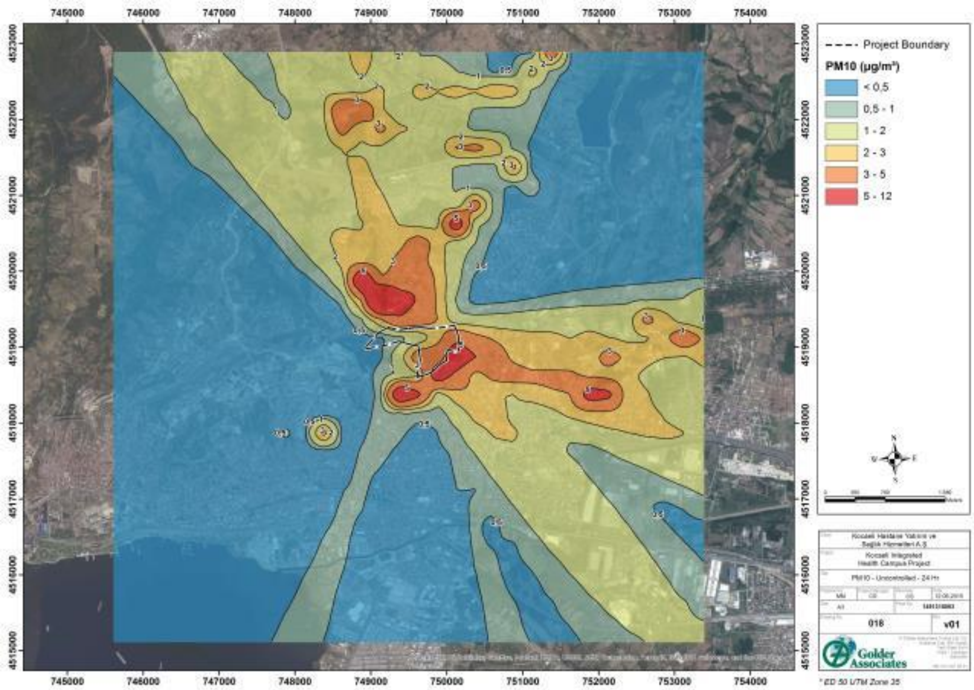


Figure 70: Uncontrolled Daily

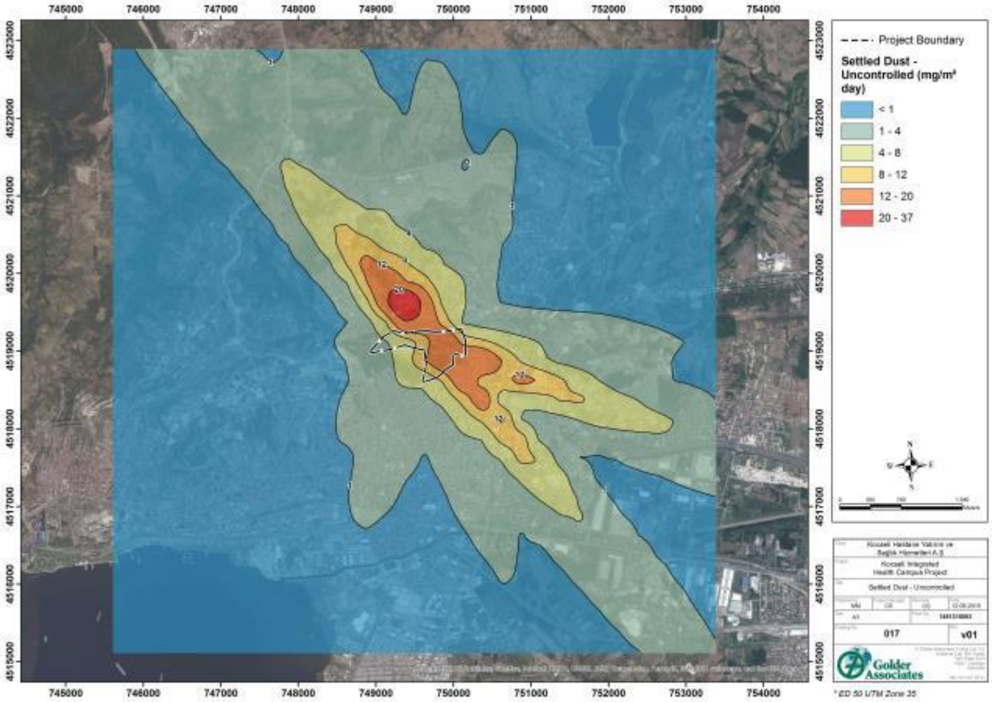


Figure 71: Uncontrolled Settled Dust

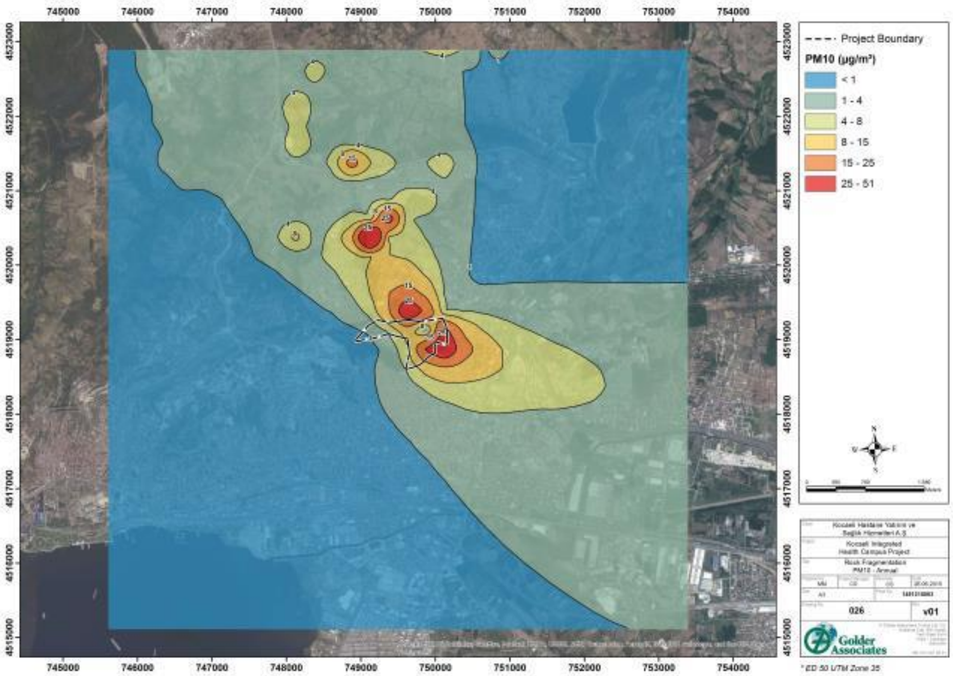


Figure 72: Fragmentation Annual

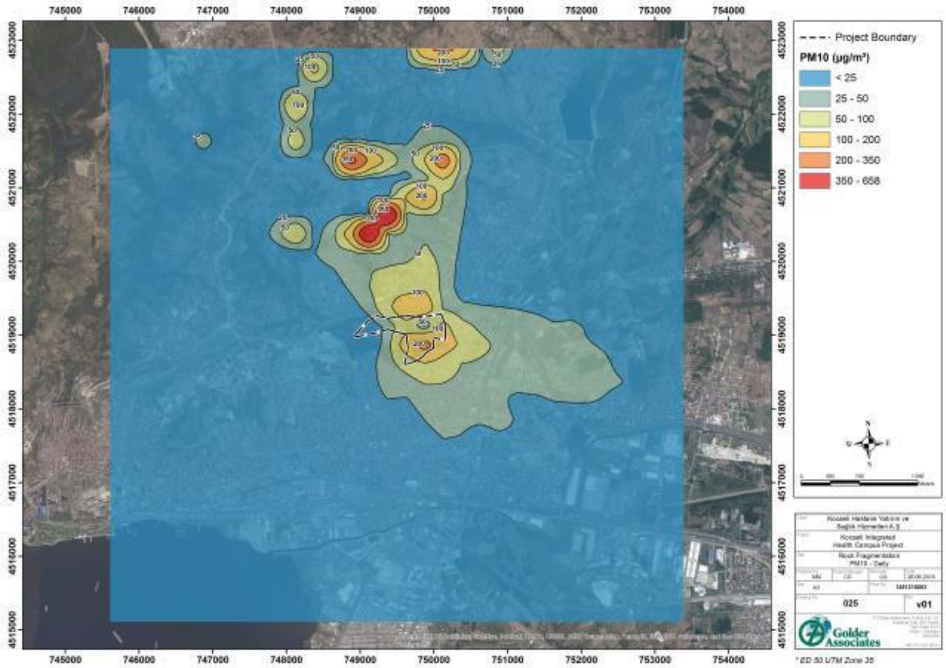


Figure 73: Fragmentation Daily

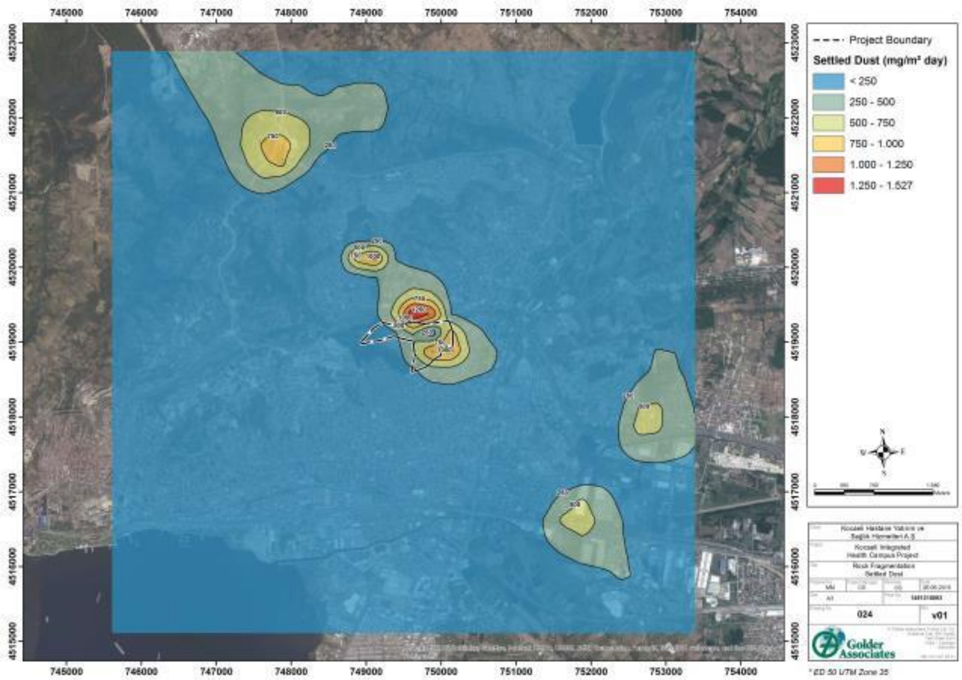


Figure 74: Fragmentation Settled Dust

COMMISSIONING AND OPERATIONAL PHASE

In order to evaluate impacts on air quality due to the project during the commissioning and operational phase in comparison to existing ambient air quality conditions and to set the most suitable stack heights, an air dispersion model has been developed.

Regarding air pollutants measured within the impact zone of the Project, those used as impact descriptors are represented by nitrogen oxides ("NOx"), sulphur dioxide ("SO_2").

Air dispersion modelling has been conducted using AERMOD. For each pollutant, concentration values at ground level were calculated needed to make comparisons with the expected air quality standards.

Within the model domain there are not air quality monitoring stations.

The Project is to produce part of its own power through a Trigeneration plant with an estimated maximum installed capacity of 2.5 MWt thermal capacity. The Trigeneration plant will comprise two gas engines each with an installed capacity of maximum 1.25 MWt. The Trigeneration system is to use natural gas supplied by the city network. There will also be 5 boilers with the each capacity of 3.16 MWt.

By using AERMOD, the worst case scenario has been developed regarding all gas engines and boilers operated at the same time.

Stack properties for the Project is shown below table.

Table 106: Stack Properties

	Parameter	**Value**
Gas Engines	NO_2	30 mg/Nm^3 (0.6 kg/h)
	SO_2	60 mg/Nm^3 (1.2 kg/h)
	Flow rate	20,000 Nm^3/h
	Stack Gas Exit Temperature	100°C
	Stack Gas Exit Velocity	7 m/s
	Stack Internal Diameter	0.5 m
	Stack Height	13 m
Boilers	NO_2	50 mg/Nm^3 (0.4 kg/h)
	SO_2	60 mg/Nm^3 (0.45 kg/h)
	Flow rate	8,000 Nm^3/h
	Stack Gas Exit Temperature	150°C
	Stack Gas Exit Velocity	2.5 m/s
	Stack Internal Diameter	0.5 m
	Stack Height	13 m

The sensitive points and topography was divided into grids by 250 m x 250 m cells within the 64.000.000 m^2 area (with the dimension of 8000 m x8000 m).

<u>Model Results</u>

NO_2 & SO_2 concentrations have been calculated in accordance with the AERMOD. Maximum values are shown in below table corresponding to the related coordinates.

Table 107: Maximum NO2&SO2 concentrations

NO_2 (µg/m^3)					**SO_2 (µg/m^3)**				
	Model results	Location	Limit Value (National)	Limit Value (IFC)		Model results	Location	Limit Value (National)	Limit Value (IFC)

NO_2 (µg/m^3)					SO_2 (µg/m^3)				
Hourly	151.6	(749625-4518625)	200	200	Daily	90.9	(748875-4519875)	125	125
Annual	7.95	(748875-4519875)	40	40	Annual	11.2	(748875-4519875)	20	-

As seen in the table above all emission values to be released due to the operations are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution and IFC, WHO Ambient Air Quality Guidelines.

Cumulative Impact

In order to assess the cumulative impacts, contribution of background SO2&NO2 measurements to the model results were studied. SO2 and NO2 were simulated annually and daily separately. Ambient SO2&NO2 air quality measurements were conducted for two periods.

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

Table 108: Annual Cumulative Values of SO2 and NO2

Measurement No:	AERMOD Conc.		Background Measurements		Cumulative Value		Limit Values	
	SO2	NO2	SO2	NO2	SO2	NO2	SO2	NO2
P-1 (µg/m^3)	1,49	0,97	-	-	-	-	20	40
P-2 (µg/m^3)	0,72	0,46	2.85	48.42	3.57	48.88		
P-3 (µg/m^3)	2,18	1,52	1.65	23.98	3.83	25.5		
P-4 (µg/m^3)	1,86	1,24	1.65	43.01	3.51	44.25		
P-5 (µg/m^3)	1,94	1,31	3.34	41.69	5.28	43.0		
P-6 (µg/m^3)	2,04	1,35	3.40	36.64	5.44	37.99		
P-7 (µg/m^3)	0,98	0,63	4.63	63.50	5.61	64,13		
P-8 (µg/m^3)	0,31	0,20	6.56	63.36	6.87	63.56		
P-9 (µg/m^3)	0,98	0,64	3.91	30.72	4.89	31.36		
P-10 (µg/m^3)	1,36	0,88	5.12	61.51	6.48	62.39		
P-11 (µg/m^3)	2,51	1,72	1.51	19.76	4.02	21.48		
P-12 (µg/m^3)	0,11	0,07	1.69	12.28	1.8	12.35		

As seen from above table, cumulative values for SO2 concentration results are below the applicable limit values. Besides, cumulative NO2 values do not comply with both Turkish and IFC standards. It is recommended that ambient air quality should be monitored in a monthly basis in order to assess the contribution of the Project to the ambient air quality. The mitigation measures which are provided in chapter 9.1.6.2 will also be applied.

In addition to this, all measures specified in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order minimize the dust emission within the scope of the project. SO_2&NO_2 distribution maps are shown below figures.

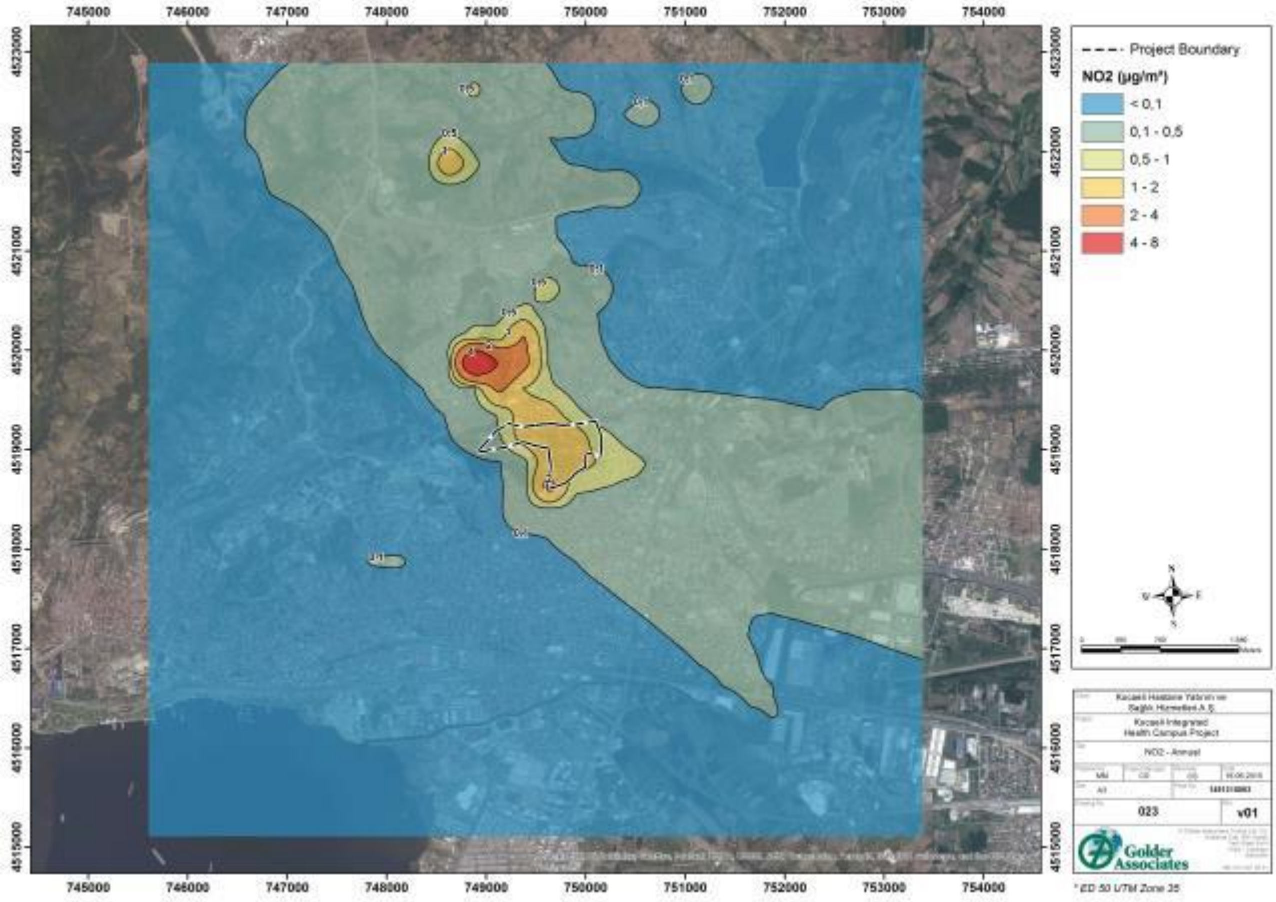


Figure 75: NO2 Annual

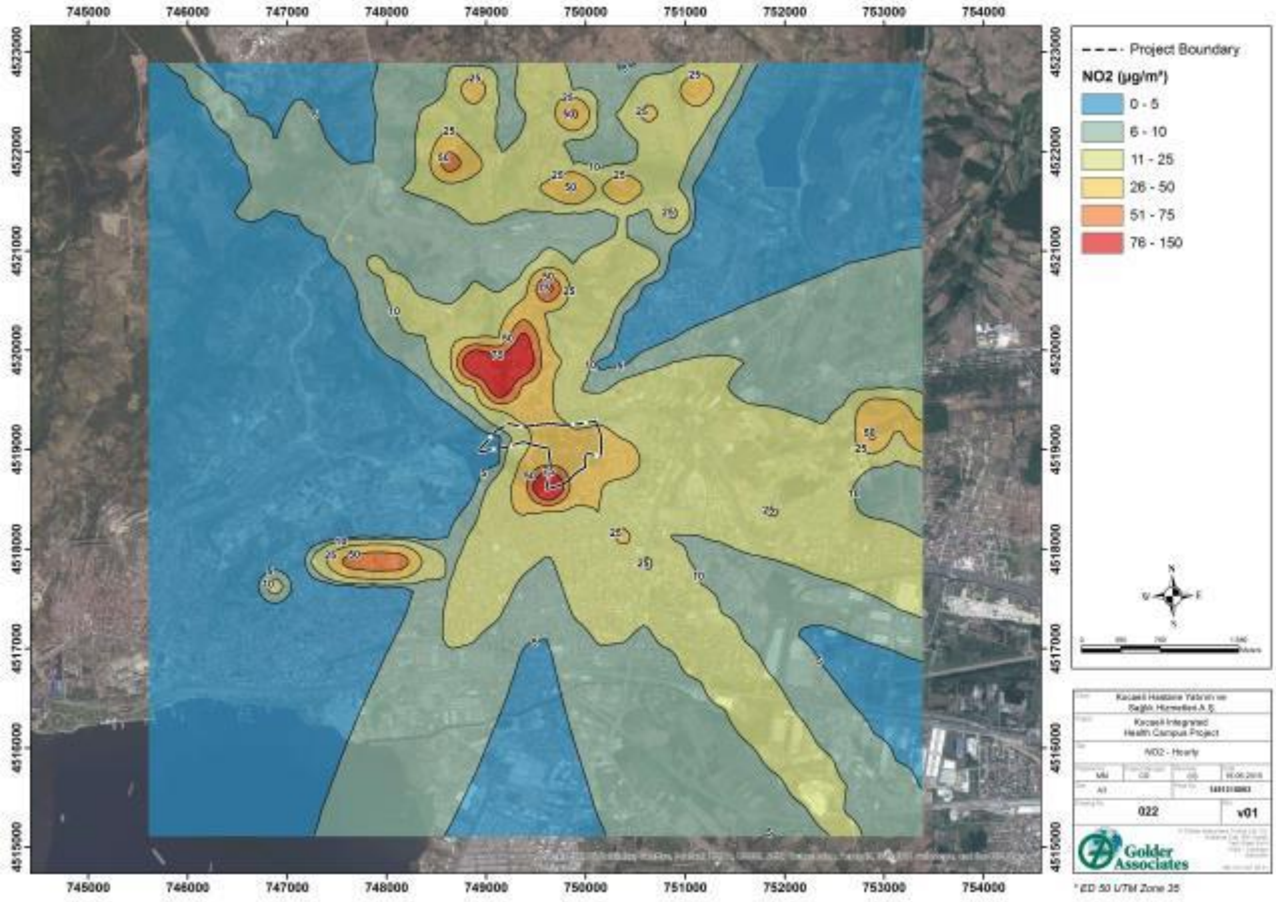


Figure 76: NO2 Hourly

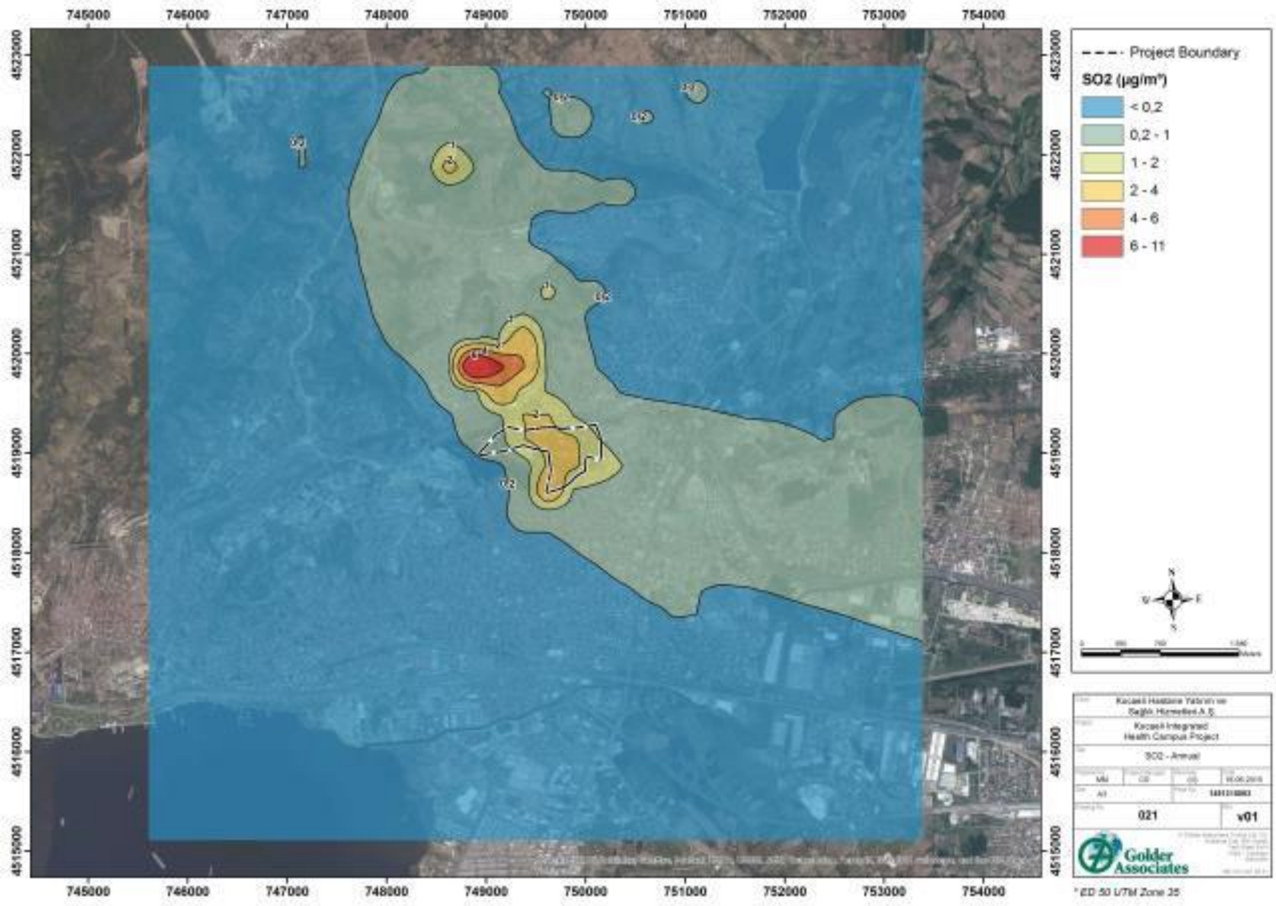


Figure 77: SO2 Annual

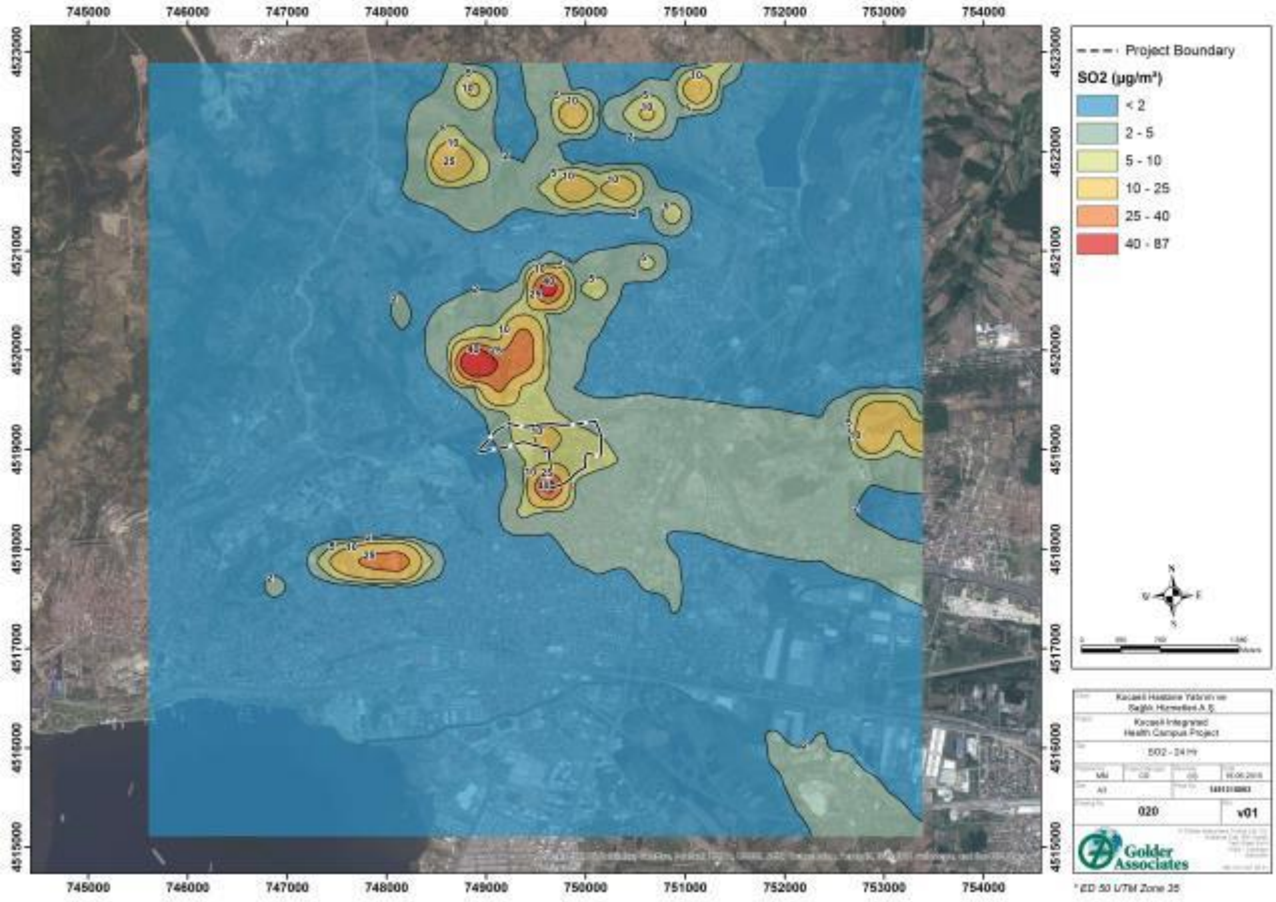


Figure 78: SO2 Daily

NOISE EMISSION MODELLING

Construction Phase

The sound power levels of construction machinery are obtained from library of SoundPLAN Essential 3.0 software as given below table and figures.

Table 109: Expected Sound Levels of Machinery and Equipment to Be Used During Construction

Machinery / Equipment	Number	Expected Sound Level dB (L_W) (*)
Concrete Plant	2	109 (1 may external supply)
Concrete Mixer	10	94
Concrete Mobile Pump	5	109
Concrete Stationary Pump	6	109
Bulldozer	2	114
Excavator	16	105
Wheeled Loader	1	113
Tracked Loader	1	115
Backhoe Loader	4	111
Truck (26 m3)	36	94
Truck (20 m3)	9	94
Lorries (18-wheeler)	2	94
Hi-Ups (30 tons)	2	116
Tractor	4	94
Grader	1	114
Air Compressor	7	103
Forklift	4	100
Telescopic Forklift	3	100
Generator (250 kV)	15	102
Generator (400 kV)	5	102
Roller	1	112
Paver	1	112
Bobcat	2	105

Tower Crane	23	105
Mobile Crane	10	105
Elevator	7	
Concrete Placing Boom	10	71.6
Water Tanker	4	93.7

Noise calculations are undertaken to predict noise levels due to the proposed project works at the closest noise sensitive receptors which are the residential buildings. The residential buildings are very close to the east and south of the boundary of the project area as shown in Figure 79. The predicted sound levels were compared with the measured ambient noise levels in the project area and at the sensitive receptors. Noise modelling study has been conducted using SoundPLAN Essential 3.0 software and according to ISO 9313-2:1996.[63]

The model calculation area (i.e. study area) has dimensions of 2.5 x 1. km and covers receptors 500 m away from the project area are as shown below figure. The calculation area covers the residential buildings around the project area.

[63] ISO 9613-2: Acoustics -- Attenuation of sound during propagation outdoors - Part 2: General method of calculation, ISO, 1996

Figure 79: Model domain

To run the model it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in SoundPLAN software to create the model is given in below table.

Table 110: Model Inputs

Model Input	Data Source
Receptor Locations	Established from aerial photo of the surrounding area (Google Earth view) and site visits
Machinery and Equipment	Number and type of the machinery/equipment are provided from the project owner and sound levels of them are determined from SoundPLAN software
Topography	1/25,000 scaled topographical map from General Command of Mapping
Calculation Method	ISO 9613-2: 1996
Temperature (ºC)	14.8 [64]
Relative Humidity (%)	71.1
Air Pressure (bar)	1006

Following conditions are assumed during modelling study:

- The model provides for the prediction of sound pressure levels based on down-wind (worst-case) conditions and other conditions favourable for noise distribution according to the ISO standard. In case of a wind blowing from the receptor towards the noise source, noise levels will be significantly lower than the calculated level;
- Weather conditions which may create additional noise (rain, wind etc.), existing trees or buildings are not considered during the model.
- It is assumed that all noise sources will be operating continuously with a 100% on-time. Consequently, the noise level predictions are considered to be conservative, that is, levels higher than what would be expected from actual operations.

As mentioned above, topographical information of the project area and surrounding are entered to the model. Each noise source is used as single point source in the noise model as shown below figure. The closest residential regions to the project area are entered as receptor in the model to calculate sound level there. The closest residential buildings are located about 20 m east and south of the project area.

[64] Annual average temperature – ESA Report Section 9.1.1.

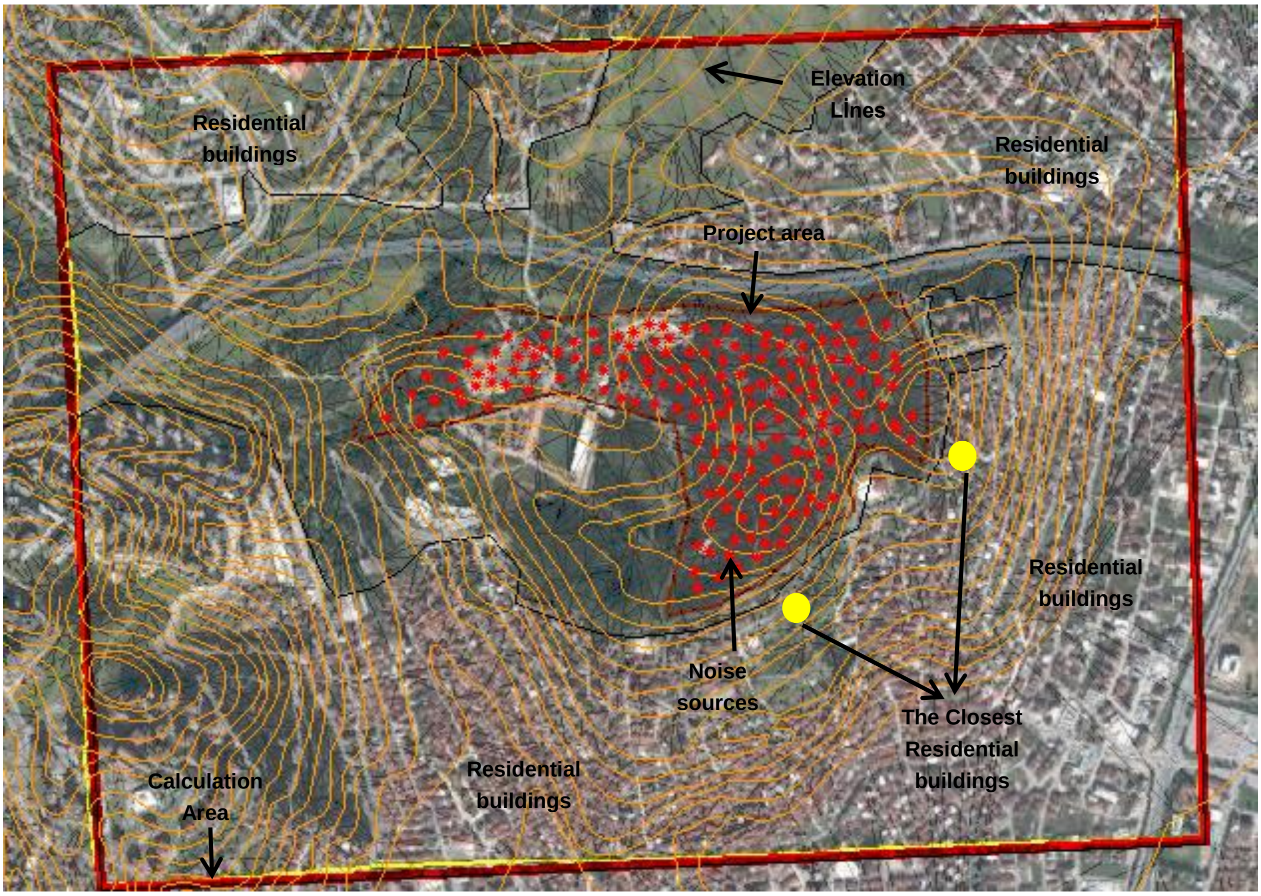


Figure 80: Model layout for construction phase

The Regulation on Assessment and Management of Environmental Noise provides noise emission limits for construction sites as presented in the table below. Accordingly, level of the noise generated by the construction of the Project should not exceed 70 dBA.

Table 111: Ambient Noise Limits of Turkish Legislation for Construction Sites

Activity (construction, demolition and renovation)	L-day (dBA) Day-time
Building	70
Road	75
Other Sources	70

Based on the calculations, the highest noise level in the residential region is about 62 dBA at east of the project area as shown in Figure 81. This result complies with the 70 dBA limit. The actual noise levels at Project Site is expected to be lower than the calculated value since all equipment/machinery will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.

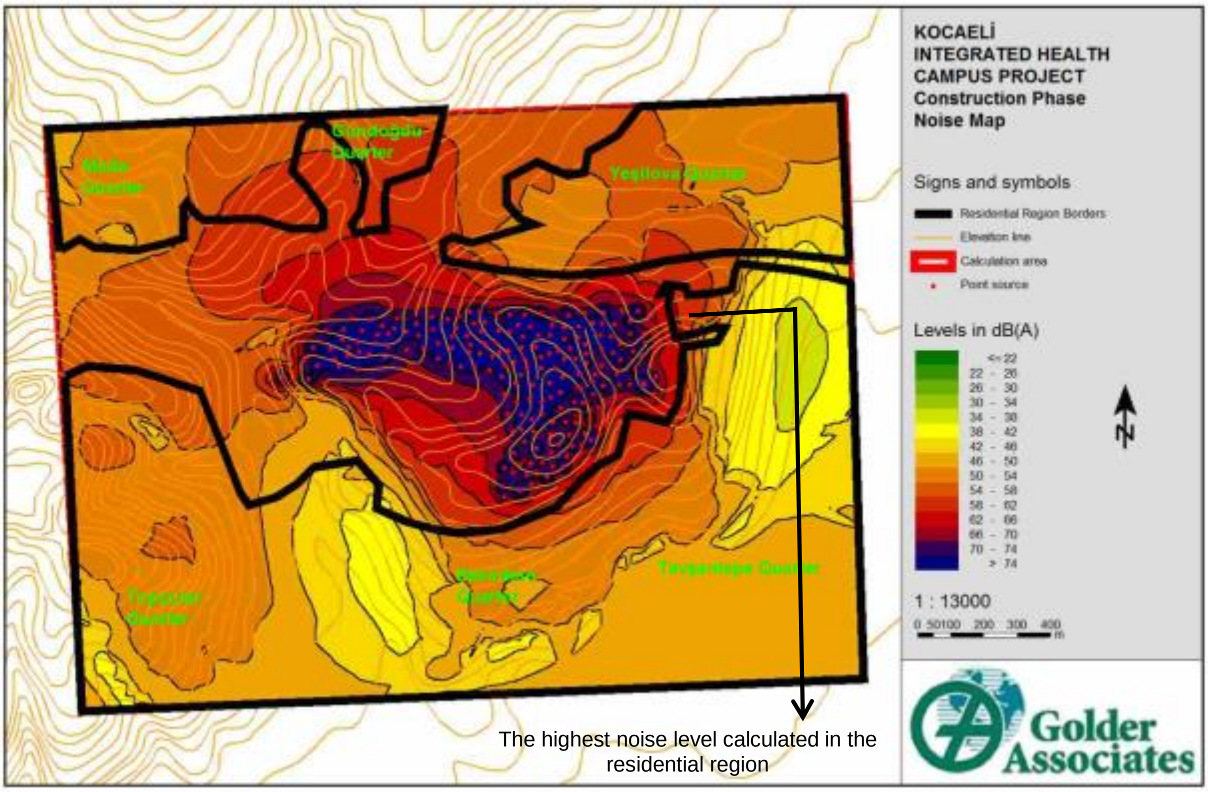


Figure 81: Construction Phase Noise Map

Commissioning and Operation Phase

Only project unit having possibility to create noise is the trigeneration plant with an estimated maximum installed capacity of 2.5 MWt, described in Section 4.2.1. Estimated noise level of the trigeneration plant is 92 dBA according to the library of SoundPLAN Essential 3.0 software[65]. As compared to the construction phase model results, operation phase noise level will in the surroundings be much lower and no exceedances in relation applicable standards are expected in the ambient noise levels.

The noise to be generated during Project operation is expected to be caused by the emergency generators, helicopter movement and ambulance movements.

The sound power levels for operation phase are obtained from library of SoundPLAN Essential 3.0 software as given below table and figures.

Table 112: Expected Sound Levels of Machinery and Equipment to Be Used During Construction

Machinery / Equipment	Number	Expected Sound Level dB (L_W) (*)
Trigeneration Plant	3	92
1 helicopter	1	112.1

[65] Power Stations (Generator Turbine Room)

Ambulance	5	102.5

Noise calculations are undertaken to predict noise levels due to the proposed project works at the closest noise sensitive receptors which are the residential buildings. The residential buildings are very close to the east and south of the boundary of the project area as shown in Figure 79. The predicted sound levels were compared with the measured ambient noise levels in the project area and at the sensitive receptors. Noise modelling study has been conducted using SoundPLAN Essential 3.0 software and according to ISO 9313-2:1996.[66]

The model calculation area (i.e. study area) has dimensions of 2.5 x 1. km and covers receptors 500 m away from the project area are as shown below figure. The calculation area covers the residential buildings around the project area.

To run the model it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in SoundPLAN software to create the model is given in below table.

Table 113: Model Inputs

Model Input	Data Source
Receptor Locations	Established from aerial photo of the surrounding area (Google Earth view) and site visits
Machinery and Equipment	Number and type of the machinery/equipment are provided from the project owner and sound levels of them are determined from SoundPLAN software
Topography	1/25,000 scaled topographical map from General Command of Mapping
Calculation Method	ISO 9613-2: 1996
Temperature (ºC)	14.8 [67]
Relative Humidity (%)	71.1
Air Pressure (bar)	1006

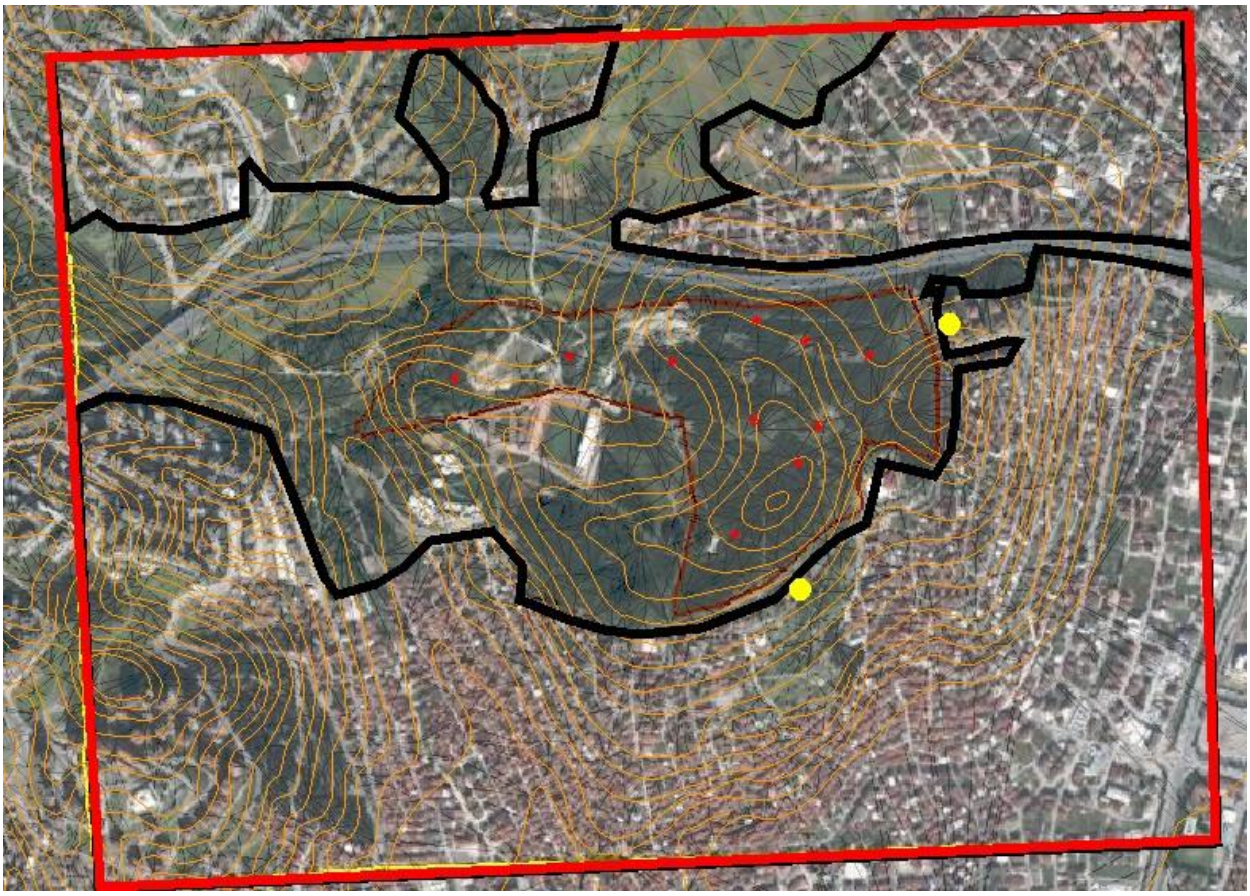
Following conditions are assumed during modelling study:

- The model provides for the prediction of sound pressure levels based on down-wind (worst-case) conditions and other conditions favourable for noise distribution according to the ISO standard. In case of a wind blowing from the receptor towards the noise source, noise levels will be significantly lower than the calculated level;
- Weather conditions which may create additional noise (rain, wind etc.), existing trees or buildings are not considered during the model.
- It is assumed that all noise sources will be operating continuously with a 100% on-time. Consequently, the noise level predictions are considered to be conservative, that is, levels higher than what would be expected from actual operations.

As mentioned above, topographical information of the project area and surrounding are entered to the model. Each noise source is used as single point source in the noise model as shown below figure. The closest residential regions to the project area are entered as receptor in the model to calculate sound level there. The closest residential buildings are located about 20 m east and south of the project area.

[66] ISO 9613-2: Acoustics -- Attenuation of sound during propagation outdoors - Part 2: General method of calculation, ISO, 1996

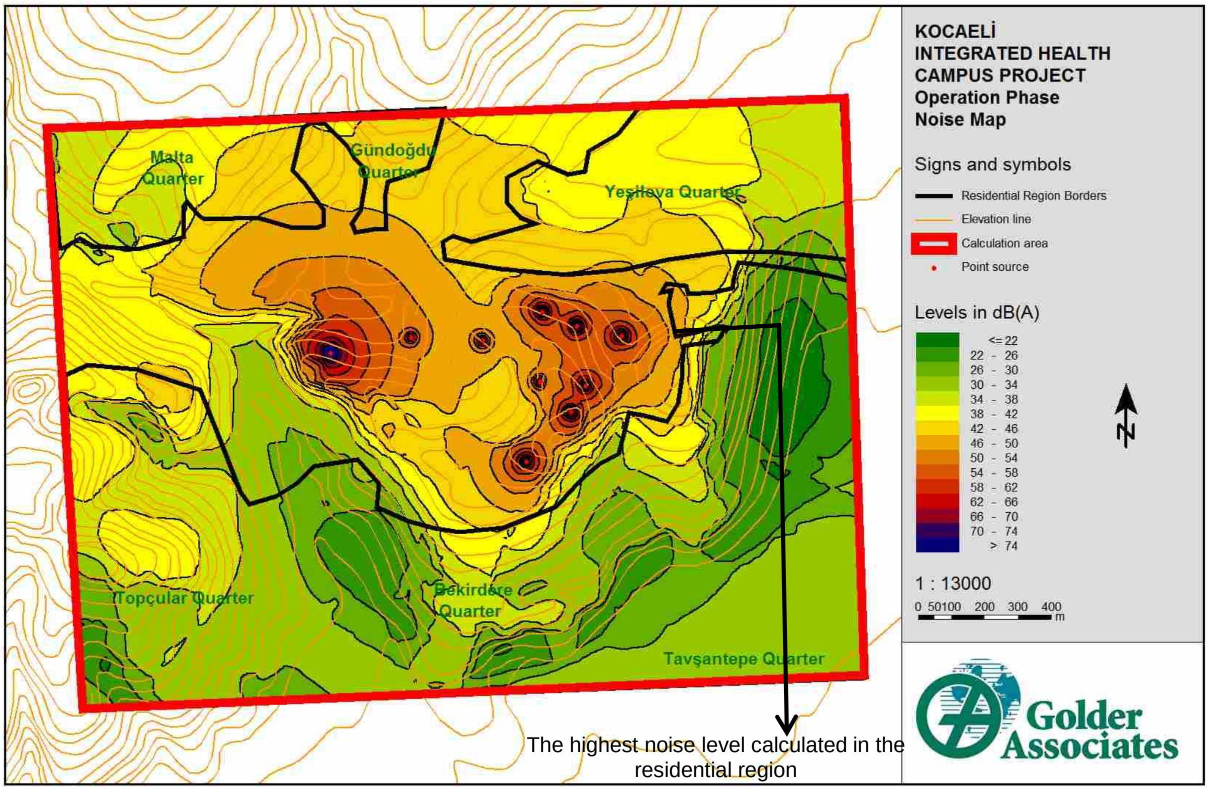
[67] Annual average temperature – ESA Report Section 9.1.1.



Model Layout for Operation Phase

The Regulation on Assessment and Management of Environmental Noise provides noise emission limits for “Noise sensitive areas where education, culture and health facilities and recreational areas are densely located” as presented in the Table 12. Accordingly, level of the noise generated by the operation of the Project should not exceed 65 dBA. The Noisel level modelled at the closest residential building (35 m north of the project site) is 46 dBA.

Based on the calculations, the highest noise level in the residential region is about 46 dBA at east of the project area as shown in below figure. This result complies with the 65 dBA limit. The actual noise levels at Project Site is expected to be lower than the calculated value since all sources will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.



As described under the baseline results in Section 8.1.7 and APPENDIX L N(24)-2 is the nearest measurement location to the point where the highest noise level is calculated. Day time noise levels measured at this location are 64.8 dBA (09:00 – 17:00) and 63.8 dBA (07:00 - 22:00). Hence, calculated noise level is not greater than the baseline level and will not create additional noise higher than the regulatory limit.

According to the IFC EHS Guideline, It should be maximum increase in background levels of 3 dB at the nearest sensitive receptor. Since it is the most stringent limit, IFC limit will be taken into consideration during the operation phase.

The Project is already located at nearby the highway. Current noise and model results for operation have been assessed cumulatively which reflects the total impact of noise related to highway and operation of hospital. Golder aware that, there will be additional traffic movements related to operation of the hospital. In addition, Golder also took all machinery and equipment work at the same time and a specific point location into consideration at construction phase. According to the Golder's experience and specialist, it is conveniently thinkable that additional traffic at operational stage will not be an issue in terms of noise due to the below justifications:

- The road is a divided highway, which means that the direction of the traffic flow is both from east – west and west – east.
- There has already been public transportation services to the Project area.
- Lack of the assessment of how many heavy grant and light vehicle movements will occur during the operation phase in and nearby the hospital campus.
- Emission sources are not point source.
- Lack of knowledge of the average speeds of the passing cars.

There will also be monthly noise monitoring at sensitive receptors during the operation phase. In case of any exceedance of limit values, as a stakeholder the Metropolitan Municipality will be informed and SPV will coordinate with the Municipality to set up noise barriers.

APPENDIX N

Environmental and Social Action Plan (ESAP)

APPENDIX O

Correspondences

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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