

Borusan EnBW Enerji Yatırımları ve Üretim A.Ş. Istanbul, Turkey

Saros Hybrid Solar Power Plant Project

Environmental and Social Impact Assessment

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Saros Hybrid Solar Power Plant Project

Environmental and Social Impact Assessment

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TABLE OF CONTENTS

				Page
LIS	T OF TA	ABLES		6
LIS	T OF FI	GURES		9
AB	BREVIA	TIONS A	ND ACRONYMS	11
1	INTRO	DUCTIO	Ν	13
	1.1	OVERA	ALL ESIA METHODOLOGY	14
		1.1.1	Document Review	14
		1.1.2	Site Surveys	14
		1.1.3	Public Consultations	15
2	PROJ	ECT DES	CRIPTION	16
	2.1	PROJE	ECT OVERVIEW	16
	2.2	PROJE	ECT LOCATION AND SURROUNDINGS	16
		2.2.1	Site Access	21
	2.3	KEY PF	ROJECT COMPONENTS	22
		2.3.1	Photovoltaic Modules (PV Modules)	24
		2.3.2	Mounting / Tracking Systems	24
		2.3.3	Combined Inverter and Step-up Transformer Stations	25
		2.3.4	Cabling	26
		2.3.5	Substations & Energy Transmission Line (ETL)	26
		2.3.6	Site Access and Internal Roads	27
		2.3.7	Administration Building and Control Centre	29
		2.3.8	Temporary Construction Laydown Area	29
	2.4	LAND F	PREPARATION AND CONSTRUCTION PHASE ACTIVITIES	29
		2.4.1	Schedule	29
		2.4.2	Workforce and Workers' Accommodation	32
		2.4.3	Construction Activities	32
		2.4.4	Construction Machinery and Equipment	32
	2.5	OPERA	ATION AND MAINTENANCE ACTIVITIES	33
		2.5.1	Project Lifetime	33
		2.5.2	Workforce	33
	2.6	WATEF	RUSE	33
	2.7	PROJE	ECT ALTERNATIVES	34
		2.7.1	No Development Option	34
		2.7.2	Alternative Site Location	37
		2.7.3	Alternative Technologies	37
3	POLIC	CY, INSTI	TUTIONAL AND LEGAL FRAMEWORK	38
	3.1	NATIO	NAL REGULATORY FRAMEWORK	38
		3.1.1	RELEVANT INSTITUTIONS	38
		3.1.2	Environmental and Social Legislation in Force	38
		3.1.3	Expropriation Law	41
		3.1.4	Labour Law and Regulations	41
		3.1.5	Biodiversity and Sensitive Areas	42
		3.1.6	Cultural Heritage	42
		3.1.7	Energy Production	42
	3.2	PERMI	ITS, LICENSES AND APPROVALS	43

D -----

	3.3	INTER	NATIONAL STANDARDS	44
		3.3.1	Equator Principles IV	44
		3.3.2	International Finance Corporation (IFC) Sustainability Policies and Standards	46
		3.3.3	IFC Environmental, Health and Safety Guidelines	48
		3.3.4	EBRD Environmental and Social Policy and Performance Requirements	49
		3.3.5	EBRD Sub-sectoral Environmental and Social Guidelines	51
		3.3.6	European Union EIA Legislation	51
		3.3.7	International Conventions and Protocols	52
	3.4	PROJE	CT ENVIRONMENTAL AND SOCIAL CATEGORISATION CRITERIA	53
4	IMPAG	CT ASSES	SSMENT METHODOLOGICAL APPROACH	54
	4.1	PROJE	CT AREA OF INFLUENCE (AOI)	54
	4.2	IDENTI	FICATION AND CHARACTERISATION OF IMPACTS	54
	4.3	EVALU	ATION OF IMPACTS	55
		4.3.1	Magnitude of Impact	56
		4.3.2	Sensitivity of Receptors	57
		4.3.3	Assessment of Impact Significance	57
		4.3.4	Mitigation Potential and Residual Impacts	58
		4.3.5	Figure 4.3-1: Mitigation HierarchyResidual Impact Assessment	59
		4.3.6	Cumulative Impacts	59
5	ENVIF	RONMENT	TAL IMPACTS AND MITIGATION MEASURES	60
	5.1	AMBIEI	NT AIR QUALITY	60
		5.1.1	Project Standards	60
		5.1.2	Baseline Conditions	61
		5.1.3	Sensitivity of Receptor	66
		5.1.4	Impact Assessment	66
	5.2	NOISE	IMPACTS	73
		5.2.1	Project Standards	73
		5.2.2	Baseline Conditions	74
		5.2.3	Sensitivity of Receptor	75
		5.2.4	Impact Assessment	76
	5.3	LANDU	ISE, SOILS AND VISUAL IMPACTS	82
		5.3.1	Project Standards	82
		5.3.2	Baseline Conditions	83
		5.3.3	Impact Assessment	88
	5.4	WATEF	R AND WASTEWATER	92
		5.4.1	Project Standards	92
		5.4.2	Baseline Conditions	94
		5.4.3	Sensitivity of Receptors	96
		5.4.4		96
	5.5	WASIE		100
		5.5.1	Project Standards	100
		5.5.2	Sensitivity of Receptor	100
	F 0	5.5.3	Impact Assessment	100
	5.6	BIODIV	/EKƏLIY	108
		5.6.1		108
		5.6.2	Assessment Methodology	112
		5.6.3	Baseline Conditions	115

		5.6.4	Impact Assessment	149
		5.6.5	Mitigation Measures	158
		5.6.6	Residual Impact	163
		5.6.7	Monitoring Requirements	164
6	SOCIO	-ECONON	AIC IMPACTS AND MITIGATION MEASURES	166
	6.1	METHO	DOLOGY	166
		6.1.1	Assessment Approach	166
		6.1.2	Project Standards	170
	6.2	BASELI	NE CONDITIONS	170
		6.2.1	The local population in the project affected settlements differs in summer and winter Some households reside in this region only in the summer months and, during the v they live in places such as Istanbul.Demographic Characteristic of the Households	r. vinter 170
PEF	RCENT			171
		6.2.2	Economy, Income and Employment	172
		6.2.3	Agriculture	174
		6.2.4	Animal Husbandry	176
		6.2.5	Housing Conditions	177
		6.2.6	Health	178
		6.2.7	Household Appliances	178
		6.2.8	Vulnerable People	179
		6.2.9	Stakeholder Engagement	179
	6.3	SOCIAL	IMPACTS ASSESSMENT	181
		6.3.1	Land Acquisition and Economic Displacement	181
		6.3.2	Employment Opportunities	183
		6.3.3	Business Opportunities	185
		6.3.4	Operation Phase	186
		6.3.5	Worker Accommodation	186
		6.3.6	Cultural Heritage	188
7	CUMUL		IPACT ASSESSMENT (CIA)	189
	7.1	CIA ME	THODOLOGY	189
	7.2	CUMUL	ATIVE IMPACT ASSESSMENT STUDY	190
		7.2.1	Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries	190
		7.2.2	Step 2: Scoping Phase II – Other Activities and Environmental Drivers	192
		7.2.3	Step 3: Establish Information on Baseline Status of VECs	193
		7.2.4	Step 4: Assessment of Cumulative Impacts on VECs	193
		7.2.5	Step 5: Assessment of Significance of Predicted Cumulative Impacts	195
		7.2.6	Step 6: Management of Cumulative Impacts – Design and Implementation	196
8	ENVIR	ONMENT	AL AND SOCIAL MANAGEMENT SYSTEM	197
	8.1	ORGAN	ISATIONAL RESPONSIBILITY	197
	8.2	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN 201		
	8.3	MONITO	DRING E&S PERFORMANCE	202
	8.4	MANAG	EMENT OF CONTRACTORS AND SUPPLIERS	202
	8.5	STAKEF	IOLDER ENGAGEMENT	202
		8.5.1	Roles and Responsibilities	202

LIST OF TABLES

Table 2-1: Key Project Characteristics	16
Table 2-2 Distance to Surrounding Settlements	17
Table 2-3: Surrounding Settlements	17
Table 2-4 Project Development Phases	30
Table 2-5 Project timeline	31
Table 2-6: Construction Machinery and Equipment Planned to be Used	32
Table 3-1: Relevant Permits, Licenses and Approvals [Hold: Project Company to provide information]	43
Table 3-2: Organization of the IFC General EHS Guidelines	48
Table 4-1: Impact Characterization Criteria	55
Table 4-2: Impact Significance Matrix	57
Table 5-1: Turkish Ambient Air Quality Limit Values	60
Table 5-2: IFC - WHO Ambient Air Quality Guideline Values	61
Table 5-3: Long Term Meteorological Data of Çanakkale Province (1960-2018)	61
Table 5-4: Average Monthly Wind Speed (1960-2017)	62
Table 5-5: Çan AQMS - Measured Annual Average Concentrations	63
Table 5-6: PM10 and SD Measurement Results (24 hour) (August 5-8, 2019)	64
Table 5-7: Total GHG Emissions in Turkey over Years (2014-2018)	65
Table 5-8: GHG Emissions by Sectors (2014-2018)	65
Table 5-9: Sensitivity Criteria for Air Quality Receptors	66
Table 5-10: Uncontrolled Particulate Emission Factors for Open Dust Sources	66
Table 5-11: Parameters used in Estimation of Dust Emissions	67
Table 5-12: Estimated Dust Emissions due to Site Preparation Works	67
Table 5-13: Estimated Fuel Consumption of Planned Construction Machinery and Equipment	68
Table 5-14: Tier 2 Emission Factors for Diesel Construction Equipment	68
Table 5-15: Estimated Exhaust Emissions from Construction Machinery and Equipment	69
Table 5-16: Tier 2 Emission Factors for Diesel heavy-duty vehicles	69
Table 5-17: Estimated Exhaust Emissions from Road Transportation	69
Table 5-18: Environmental Noise Limits for Industrial Facilities (RAMEN)	73
Table 5-19: Environmental Noise Limits for Construction Areas (RAMEN)	73
Table 5-20: IFC – WHO Noise Limits at the Receptors	73
Table 5-21: Noise Measurement Results with Respect to RAMEN Standards	75
Table 5-22: Sensitivity Criteria for Noise Receptors	76
Table 5-23: Sound Power Levels of Construction Machinery and Equipment	76
Table 5-24: Noise Levels with Respect to Distance	77
Table 5-25: Calculated Noise Levels at the Receptors with respect to IFC/WHO Standards	79
Table 5-26: Dutch Target and Intervention Values for Soil Remediation (4 February 2000)	82
Table 5-27: Sector Specific Parameters and Limit Values Specified in Turkish Regulation on Soil Po Control and Contaminated Sites by Point Source for Electricity Generation Facilities	ollution 83
Table 5-28: Land Type Distribution within the Greater WF License Area	83
Table 5-29: Land Use Capability Classes	84
Table 5-30: Land Use Capability Classes and their Suitability for Land Use	85
Table 5-31: National (RWIHC) and International (WHO) Limits for Drinking Water	93
Table 5-32: National and International Limits for Domestic Wastewater Discharge	94
Table 5-33: Main Surface Waters in Çanakkale Province	94
Table 5-34: Groundwater Resources of Çanakkale Province	95

Table 5-35: Sensitivity Criteria for Water Resources	96
Table 5-36: Construction Phase Domestic Waste Generation and Additional Load to the Local Ir 101	ıfrastructure
Table 5-37: Operation Phase Domestic Waste Generation and Additional Load to the Local Ir 103	ıfrastructure
Table 5-38: Annexes to the EU Birds Directive	109
Annex V species (over 90): Member States must ensure that their exploitation and taking in compatible with maintaining them in a favourable conservation status. Table 5- Protection under the Habitats Directive	the wild is 39: Species 110
Table 5-40: Impact Magnitude Criteria	114
Table 5-41: Criteria for determining conservation value (sensitivity of the biodiversity receptors)	114
Table 5-42 Legally Protected Areas around the Saros WF	116
Table 5-43 Biga Dağları KBA-Listed Flora and Fauna	116
Table 5-44 Plant Species within the AOI	122
Table 5-45: Reptile Species Found within the AOI	142
Table 5-46: Mammals of the Biodiversity Study Area	143
Table 5-47: Conservation Values of Target Bird Species	149
Table 5-48: Significance of Land Preparation and Construction-Phase Impacts on Biodiversity	155
Table 5-49: Significance of Operation-Phase Impacts on Biodiversity	156
Table 5-50: Residual Impact Significance on Biodiversity Receptors	163
Table 5-51: Significance of Operation-Phase Impacts on Biodiversity	163
Table 6-1: Sample Size in Household Survey	167
Table 6-2: Assessment Criteria	168
Table 6-3: Significance Criteria	169
Table 6-4: Population of the Nearest Settlements	170
Table 6-5: Household Size Distribution	170
Table 6-6: Age Distribution	171
Table 6-7: Education Level	171
Table 6-0. Number of fears in the village/Town	171
Table 6-10: Second Income Source	172
Table 6-11: Average Monthly Income (TL)	172
Table 6-12: Number of Working People	172
Table 6-13: Unemployed Person in the Households	173
Table 6-14: Number of Unemployed Person	174
Table 6-15: Retired Persons in the Household	174
Table 6-16: Comparison of Income Level	174
Table 6-17: Owning Agricultural Land	175
Table 6-18: Status of Land Used for Agriculture	175
Table 6-19: Size of Agricultural Land (da)	175
Table 6-20: Agricultural Production	176
Table 6-21: Livestock Property	176
Table 6-22: Number of Animals	176
Table 6-23: Graphic Grazing Animals (%)	177
Table 6-24: Products from Animal Husbandry	177
Table 6-25: Type of Houses	177
Table 6-26: Number of Rooms in Houses	177
Table 6-27: Property of the Residence	178

Table 6-28: Having Chronic Diseases	178
Table 6-29: Disabled Person in Household	178
Table 6-30: Home Appliances	179
Table 6-31: Vulnerable Households	179
Table 6-32: Heard About the Project	179
Table 6-33: Project Related Subjects that Residents are Interested	180
Table 6-34: Positive Impacts of the Project	180
Table 6-35: Negative Impacts of the Project	180
Table 6-36: Thoughts on the Project	181
Table 6-37: Land Acquisition Status	182
Table 7-1 Identified Specific VECs	190
Table 7-2 Solar and Wind Power Developments Identified within the CIA Study Area	193
Table 7-3 Cumulative Impact Potential of the Identified Existing and Future Developments on the VECs	194
Table 7-4 Cumulative Impact Significance: Summary Table	196
Table 8-1: Key EHS Roles and Responsibilities	200
Table 8-2: Stakeholder Engagement Roles & Responsibilities	203

LIST OF FIGURES

Figure 2.2-1 Project Location	17
Figure 2.2-2: Project Site and Surrounding Settlements	18
Figure 2.2-3: Overview West Cluster of the Project Area	19
Figure 2.2-4 Overview Middle Cluster of the Project Area	19
Figure 2.2-5 Overview Northern Cluster of the Project Area	20
Figure: 2.2-6 Site Access to the Cluster 1	21
Figure 2.3-1: Main Components of a Utility Scale Solar PV Plant (IFC, 2015)	23
Figure 2.3-2: Preliminary Plant Layout	23
Figure 2.3-3 A Typical Twin Plus Module	24
Figure 2.3-4: Graphical Diagram Showing Tracking System	25
Figure 2.3-5: Map Showing the Proposed ETLs	27
Figure: 2.3-6 Site Access to the Cluster 1	28
Figure 2.7-1 Turkiye Solar Energy Potential Atlas	34
Figure 2.7-2 Canakkale Province Solar Energy Potential Atlas	35
Figure 2.7-3 Çanakkale Province Global Radiation Values (KWh/m2-day)	35
Figure 2.7-4: Çanakkale Province Sunshine Durations (hour)	36
Figure 2.7-5: Çanakkale Province PV Type-Area-Producable Energy (KWh-Year)	36
4.3.5 Figure 4.3-1: Mitigation HierarchyResidual Impact Assessment	59
Figure 5-1: Seasonal Wind Rose Diagrams (1960-2017)	62
Figure 5-2: Annual Average Wind Speed Diagram (1960-2017)	63
Figure 5-3: PM10 and Settled Dust Measurement Locations	64
Figure 5-4: GHG Scopes and Associated Emissions	71
Figure 5-5: Background Noise Measurement Locations	74
Figure 5-6: Noise Measurement Device	75
Figure 5-7: Noise Propagation with Respect to Distance from the Source	78
Figure 5-8: Land Use Map showing the License Area	84
Figure 5-9: Level 1 Land Cover Classification of the License Area (Corine, 2012)	85
Figure 5-10: Erosion Risk Analysis Map	86
Figure 5-11: Earthquake Zoning Map of Çanakkale	87
Figure 5-12: Earthquake Risk Map of Turkey (AFAD, 2018)	87
Figure 5-13: 3D Visual Representation from Bodurlar VP	90
Figure 5-14: 3D Visual Representation from Kocalar VP	91
Figure 5-15: 3D Visual Representation from Dedeler VP	91
Figure 5-16: Water Bodies near the Project Area	95
Figure 5-17: Recycling Process of PV Panels	104
Figure 5-18: Structure of the IUCN Red List Categories and Criteria	111
Figure 19: Deciduous Mixed Oak Forest (G1.7)	118
Figure 20: Pinus nigra and deciduous mixed oak forest (G4.B)	119
Figure 21: East Gariks (F6.2)	119
Figure 22: Permanent Mesotrophic Grassland (E2.1)	120
Figure 23: Small Scale Agricultural Lands	120
Figure 5-24: Mitigation Hierarchy	158
Figure 7-1 RCIA Logical Framework	189
Figure 7-2 CIA Study Area	192

Figure 8-1: Preliminary Project Organogram

199

ABBREVIATIONS AND ACRONYMS

Bern	Convention on the Conservation of European Wildlife and Natural Habitats
BMP	Biodiversity Management Plan
CITES	Convention on the International Trade in Endangered Species of Wild Flora and Fauna
CLO	Community Liaison Officer
CO ₂	Carbon Dioxide
CR	Critically Endangered
dBA	A-weighted decibels
E&S	Environmental & Social
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
EPFI	Equator Principles Financial Institutions
EPRP	Emergency Preparedness and Response Plan
EP	Equator Principles
ERP	Emergency Response Plan
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
ESR	Ecosystem Services Review
ETL	Energy Transmission Line
EU	European Union
GIIP	Good International Industry Practice
GISD	Global Invasive Species Database
GISP	Global Invasive Species Programme
GWH	Gigawatt-hour
HR	Human Resources
HSS	Health Safety and Security
IAS	Invasive Alien Species
IBA	Important Bird Areas
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFC	International Finance Corporation
I <u>FI</u>	International Finance Institutions
ILO	International Labour Organization
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
km	kilometre
.kmz	Google Earth files
KPI	Key Performance Indicator
kV	kilovolt
LAP	Land Acquisition Plan
LC	Least Concern
LLEP	Labour and Local Employment Plan
m	Metre
MoEU	Ministry of Environment and Urbanization
MV	Medium voltage

MW	Megawatt
NT	Near Threatened
NTS	Non-Technical Summary
OHS	Occupational Health and Safety
OSGB	Joint Health and Safety Unit
PCM	Public Consultation Meeting
PAP	Project Affected Parties
PDR	Project Description Report
PS	Performance Standards
P <u>V</u>	Photovoltaic
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RER	Renewable Energy Resource
SCADA	Supervisory Control and Data Acquisition
SEP	Stakeholder Engagement Plan
SMP	Security Management Plan
SoW	Scope of Work
TEİAŞ	Turkish Electricity Transmission Company
TIA	Technical Interaction Analysis
TTMP	Traffic and Transport Management Plan
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WWMP	Waste and Wastewater Management Plan

1 INTRODUCTION

RINA Tech UK Ltd. (RINA) has been appointed by Borusan EnBW Enerji Yatırımları ve Üretim A.Ş. to provide technical advisory services to support the Client's invest of the 94 MW Saros Hybrid Solar Power Plant (the Project). The Project is located in Çanakkale/Turkey. The Project is owned by Borusan EnBW Enerji Yatırımları ve Üretim A.Ş. ("Borusan", "the Project Owner", "the Client", "the Company").

RINA has undertaken the review from the point of view of an Independent Engineer in accordance with the proposal 'QUO-0000065850-F6J - D3 - Saros Hybrid Solar.pdf' dated May 2022. The work was based on the documentation provided by the Client in a Virtual Data Room (VDR) and a site visit carried on 14th -15th November 2022 out by RINA. While every effort has been made to check source information, RINA takes no responsibility for the completeness or otherwise of the information provided for the purpose of the review.

Within the scope of Saros WPP Auxiliary Resource SPP Project, in the preliminary stage, it is planned to establish 30 Supplementary Source SPPs on an area of 171.48 ha, and the EIA Application File was submitted on 15.09.2021. However, due to the changes made in certain areas in the EMRA application process, which is carried out in parallel with the EIA process, the project area has been revised so that 23 Auxiliary Source SPPs will be built in an area of 140.62 hectares, all within the borders of Saros WPP power plant. The Ministry of Environment, Urbanization and Climate Change has been notified about that change.

The project with the "EIA Positive" Decision dated 18.03.2019 with Decision No. 5377, will be established in the power plant area determined as "Saros WPP (Installed Power: 138 MWm / 138 MWe)" and will be established as per the "Electricity Market License Regulation", which was published in the Official Gazette dated 08.03.2020 and numbered 31062 of the Energy Market Regulatory Authority and entered into force on 01.07.2020. It has been determined as an auxiliary resource within the scope of the Regulation on Making Amendments on Electricity Market License Regulation. In this context, an application has been made to EMRA to amend the license in order to transform the facility into a multi-source electricity generation facility. SPP field coordinates will be included in the License within the scope of "Procedures and Principles Regarding the Determination of Power Plant Sites of Production Facilities Subject to Associate License or Licenses in the Electricity Market" published in the Official Gazette dated 25.06.2020 and numbered 31166. The Saros Wind Power Plant, together with the Auxiliary Source Solar Power Plant, will have a total installed capacity of 231,9998 MWm.

Throughout the report, RINA has provided comments and opinions on the risks identified and has recommended suitable mitigation strategies.

The scope provided in this report includes:

- Project Information;
- Project Site Characteristics;
- Environmental and Social Standards;
- Environmental and Social Baseline
- Impact Assessment Methodological Approach;
- Environmental, Socio-economic Impacts and Mitigation Measures
- Compliance Summary;
- Proposed Assessment Requirements;
- Conclusions and Recommendations.

Each of these services is presented in the subsequent sections of this report.

1.1 OVERALL ESIA METHODOLOGY

This ESIA report has been developed in line with international best practices and includes the following:

- description of the proposed Project including its objectives, design concepts and use of resources;
- description of the Project alternatives and selection criteria;
- description of the local policies and legal framework and international standards applicable to the proposed project;
- description of the baseline conditions in the Project area of influence, covering the physical location, environmental settings, social and economic aspects;
- details of the anticipated impacts on the environment and socio-economic aspects of the surrounding area;
- identification of appropriate prevention and mitigation measures;
- a framework Environmental and Social Management Plan (ESMP) presenting the Project activities, potential impacts, and prevention/mitigation actions to be taken to manage the identified impacts and bring the Project in line with international Lender requirements and standards;
- a Stakeholder Engagement Plan (SEP); and
- development of an Environmental and Social Action Plan (ESAP) describing and prioritizing the actions that need to be taken to fulfil the identified gaps in order to satisfy lender requirements and thereby accessing the relevant project financing.

The above-described methodology identifies impacts resulting from the proposed Project, based on the baseline conditions and project design information provided by the Project Owner.

This ESIA process has been undertaken based on the following key steps; these are described in more detail in the below subsections.

- Document Review
- Site Surveys
- Detailed Impact Assessment Studies
- Stakeholder Engagement.

1.1.1 Document Review

Project-related documents were reviewed for a clear understanding of the terms of reference, environmental and social status of the Project area, demographic trends, land use patterns in the affected areas, development strategies and plans as well as the applicable policy and legal framework; key documents reviewed included:

- Design documents provided by the Project Owner;
- Local EIA Report of the Project;
- Geotechnical Survey Reports;
- IFC PSs and EHS Guidelines;
- EBRD PRs and EHS Guidelines;
- Relevant Turkish Legal, Policy and Regulatory documents;
- Literature review including International Best Practices.

1.1.2 Site Surveys

RINA undertook a visit to the project site between 14th-15th November 2022 to undertake visual observations of the relevant areas directly and indirectly affected by the Project, as well as undertake some preliminary engagement with local communities, to assess the physical, biological and social environment of the Project area as well as the Project Affected Parties (PAPs).

The aim of the site visit was to verify the findings of the local Environmental Impact Assessment (EIA) and studies undertaken for the project so far, and identify any areas that may not have been addressed, and to get a comprehensive picture of the existing status of the physical and biological environment at the project site and its surroundings, in order to support the findings of our desktop review of available information.

Prior to the site visit RINA specialists undertook a preliminary review of project documents and observed the status of project activities, including on-site E&S management, stakeholder engagement and relevant plans. The landscape, biodiversity, social aspects were assessed both with onsite observations and through discussions with local people.

The visit was undertaken by a multidisciplinary team, including the following local and international Environmental & Social (E&S) renewables specialists:

- Environmental Expert Doruk Takmaz and,
- Two social surveyors working with Social Expert Prof. Dr. Feryal Turan for conducting interviews with local residents.

Ms. Emel Yaşaroğlu (Environmental Process Senior Engineer of BOYLAM), Mr. Hakan Tavşan (Site Manager) accompanied the RINA specialists, introduced the project site and responded to relevant questions.

1.1.3 Public Consultations

In accordance with Article 9 of the Turkish Regulation on Environmental Impact Assessment (latest version published in the Official Gazette dated July 29, 2022, numbered 31907), a Public Consultation Meeting (PCM) was organized in Kocalar village on October 05, 2021 as part of the local EIA studies.

Meeting announcements were published in one national and one local newspaper prior to the meeting date. Besides, meeting invitations were posted in the central areas of Kocalar, Bodurlar, Dedeler, Kovandagi villages and residents of these villages were invited.

Ministry of Environment, Urbanisation and Climate Change General Directorate of EIA, Permission and Inspection, Çanakkale Provincial Directorate of Environment, Urbanization and Climate Change, Boylam Energy Investment Production and Trade. Inc., EN-ÇEV Enerji Çevre Yatırımları ve Danışmanlığı Haritacılık İmar İnş. A.Ş., Mukhtars of the villages and local residents from the nearby villages attended Public Consultation meeting.

At the Public Participation Meeting, detailed information related to the solar power plant was shared with the participants and a visual presentation was made. EN-ÇEV A.Ş. and Boylam Energy Investment Production and Trade. Inc. representatives answered questions asked by the participants and timeline of the Project milestones was delivered also.

Main questions raised and requests made by the local residents during the meeting are as follows:

- Whether local residents may benefit from the electricity produced,
- Construction of the village road,
- installation of the solar panel in the water tank,
- Questions regarding closed roads during Hybrid Power Plant construction phase

2 PROJECT DESCRIPTION

This section provides a detailed description of the Project; including key components, supporting infrastructure, associated facilities to be constructed and operated within the Project Area, as well as the overall project schedule, and permitting process. The Project Description is presented under the following main sections:

- Project Overview
- Project Location and Surroundings
- Key Project Components
- Land Preparation and Construction Phase Activities
- Operation and Maintenance Activities
- Project Emissions, Effluents and Wastes.

2.1 **PROJECT OVERVIEW**

Borusan plans to establish and operate Saros Hybrid Solar Power Plant with an installed capacity of 93.9998 MWp / 93.9998 Mwe in an area of 140.62 hectares in Bodurlar,Kocalar, Dedeler and Kovandagi locality of Canakkale province. Estimated annual electricity production of the Plant is 551,988,000,00 kWh/year.

A summary of key project characteristics is provided in Table 2-1. More details of the Project components are provided in Section 2.3 of this ESIA report.

Project Characteristic	Description	
Number of PV Panels	23	
Solar Module Model	Phono Solar-Twinplus Module Series 430-450 W	
Number of Inverter Stations	NA at the time of writing this report	
Total Installed Capacity	93.9998 MWp / 93.9998 Mwe	
Substations	Existing substations of the Saros Wind Power Plant: Main Substation Secondary Substation	
ETL Connection to Network	 Two existing 154 kV ETLs of the Saros WPP, as follows: 31 km ETL connecting to the Çan Substation to the southeast, and 5.36 km connecting to the operating Kocalar WF Substation located to the north. 	

Table 2-1: Key Project Characteristics

2.2 PROJECT LOCATION AND SURROUNDINGS

The Project is located within the administrative boundaries of Çan and Merkez Districts of Çanakkale Province. The Project Site covers an area of 140.62 ha. The project location is shown in

Figure 2.2-1.

The closest settlement to the Project location is Dedeler Village followed by Kocalar and Bodurlar Villages. The nearest residential dwelling is located approximately 200m west of the Hybrid Solar PV Area – H04 in Dedeler

Village. The location of the surrounding settlements in relation to the project are shown in Figure 2.2-2 and the distances to the project components are presented in Table 2-3.

Number	Village	Closest PV	Distance of the nearest house (km)	Population
1	Bodurlar	H-01	0,81	77
2	Dedeler	H-04	0,20	49
3	Kocalar	H-21	0,38	70
4	Karacalar	H-04	2,89	31
5	Kirazlı	H-04	4,17	119
6	Kumarlar	H-20	4,99	150
7	Üvezdere	H-23	7,01	38
8	Akçalı	H-03	4,02	49
9	Haliloğlu	H-02	3,75	37
10	Camyayla	H-06	4,94	64

Table 2-2 Distance to Surrounding Settlements



Figure 2.2-1 Project Location



Figure 2.2-2: Project Site and Surrounding Settlements

The License Area is generally mountainous with a complex terrain and elevations West Cluster ranging between 480m and 530m, Middle Cluster 465 and 500m, Northeast Cluster 445 and 480 m. The License Area consists mainly lands registered as forest (141 ha) and privately owned agricultural lands (31.9 ha). Private agricultural lands are used for non-irrigated (dry) agricultural activities. According to the previous studies, most of the lands are not used for agricultural activities due to low agricultural yields and in addition to the decrease in the youth population in the region due to migration.

Access to the Project site is provided by the road separated from the Çanakkale-Çan highway and via the existing cadastral roads, and no additional road construction is planned. Besides, within the scope of the project; no access roads to existing public roads are planned.

The Project site can be subdivided into three clusters, which can also be attributed to different landscape features, as follows (see Figure 2.2-3, Figure 2.2-4 and Figure 2.2-5):

West Cluster (Cluster 1) (H01-H03): located on a northwest edge of the License Area where altitude ranges between 479m to 541m. H01 to H03 are located near T1 and T2 on non-irrigated (dry) agricultural lands that are mostly not in use or used for animal grazing.

Middle Cluster (Cluster 2) (H04-H20): located in the middle of the License Area where altitude ranges between 467m to 507m. H04-H-20 are located near T12 and T13 mainly on non-irrigated (dry) agricultural lands that are mostly not in use or used for animal grazing.

Northern Cluster (Cluster 3) (H21-H23): located on the north of the Middle Cluster near the Main Substation. These parcels are also located on non-irrigated agricultural lands that are not in use.



Figure 2.2-3: Overview West Cluster of the Project Area



Figure 2.2-4 Overview Middle Cluster of the Project Area



Figure 2.2-5 Overview Northern Cluster of the Project Area

2.2.1 Site Access

A network of access roads were installed within the scope of Saros Wind Power Plant Project during the construction phase and providing access to the turbines for maintenance purposes during operation. The access roads were routed to follow the existing road network, such as village roads, forest fire-fighting paths, wherever possible. Within the scope of Hybrid SPP Project, some internal access roads will need improvement and there will be no need for building of new routes. The access roads will be routed to by-pass residential areas as much as possible.

The existing access roads have a width of 6m and a total length of 58km. The existing and the improved access roads are shown in the map given below (Figure 2-6 and Figure 2.7).

Within the scope of the project, only land arrangement and assembly will take place, and there is no need for any material supply. In case of need, it will be procured from the nearest material quarries, which have all necessary legal permissions, for a fee.

Small amount of concrete will be used during the construction of the foundations of the panels. Ready-mixed concrete needed at this stage will be procured from the market. The transfer of the solar panel modules will be arranged with respect to the Routing Plan to be developed. The delivery route for PV panels between the panel factory and the Project site will be determined with respect to Routing Plan. Vehicle access to the is via D210 Çan-Çanakkale Road; Figures below show the primary roads that are used to access the site.

- Site access-1 to access the panel areas in the west cluster (Cluster 1) (see Figure 2-6.)
- Site access-2 to access the turbines located in the middle cluster (Cluster 2) and north east cluster (Cluster 3) (see Figure 2-7).



Figure: 2.2-6 Site Access to the Cluster 1



Figure: 2-2.7: Site Access to the Cluster 2 and Cluster 3

2.3 KEY PROJECT COMPONENTS

The main components of the SPP include:

- PV modules
- Mounting / Tracking Structures
- DC/AC current inverters
- Cabling
- Transformers
- Substations
- Energy Transmission Lines
- Supervisory Control and Data Acquisition (SCADA) System
- Associated infrastructure and utilities, including:
 - Site security, including fencing and CCTV
 - Buildings, including onsite substation, connection building, control building, guard cabin, and spare parts storage.
 - Access road and internal road network
 - Water supply infrastructure.

The main components of a utility scale grid connected solar PV power plant and their general arrangements are shown below in Figure 2.3-1.



Figure 2.3-1: Main Components of a Utility Scale Solar PV Plant (IFC, 2015)



Figure 2.3-2: Preliminary Plant Layout

2.3.1 Photovoltaic Modules (PV Modules)

The facility to be established is planned to convert solar energy into electrical energy through a photovoltaic system. In the project, systems that will achieve the highest efficiency with the use of the latest technology will be used. Direct current electrical energy produced by monocrystalline half-cut photovoltaic modules in the solar power plant will be converted into alternative energy with the help of inverters. Monocrystalline Solar Energy Panel technology and Phono Solar brand Twinplus Module Series 430-450 W model solar panels were selected as panel technology at the facility.

Monocrystalline solar cells are also referred to as single crystalline cells which are easily identifiable by their deep black colour and cut edges. Monocrystalline solar cells are also made from a very pure form of silicon, making them the most efficient material when it comes to the conversion of sunlight into energy.

Additionally, monocrystalline solar cells are also the most space-efficient form of silicon solar cell. In fact, they take up the least space of any solar panel technology that is currently on the market. They also have the great advantage of being the longest lasting solar cell technology,



Figure 2.3-3 A Typical Twin Plus Module

2.3.2 Mounting / Tracking Systems

Mounting Structure will be designed and constructed by "continuously hot-dip galvanized steel"

Structural calculations of mounting structure will be prepared and submitted by the Company for review and approval with reference of mentioned national and international standards; including but not limited to:

- TS 498 (Design load for buildings),
- TDY 2007 & TDY 2018 (Turkish Earthquake Code on buildings),
- TDY 2018 (Turkish Earthquake Code) for cold formed steel structures
- Turkish Regulation on Steel Structures, published in Official Gazette No.30333 on 15.02.2018,
- Eurocode EN 1991 and series
- EN 1090 and series
- TS 13891

Since the application areas of photovoltaic systems are always designed to cover the entire surface, they must be integrated with the existing grounding system.

PV modules will be mounted on a structure to keep them oriented in the correct direction and to provide them with structural support and protection. Mounting structures may be fixed or tracking. Fixed tilt arrays are typically tilted away from the horizontal plane in order to maximise the annual irradiation they receive. The optimum tilt angle is dependent on the latitude of the site location.

Fixed mounting systems keep the rows of modules at a fixed tilt angle19 while facing a fixed angle of orientation.¹

In locations with a high proportion of direct irradiation, single- or dual-axis tracking systems can be used to increase the average total annual irradiation. Tracking systems follow the sun as it moves across the sky. These are generally the only moving parts employed in a solar PV power plant. Single-axis trackers alter either the orientation or tilt angle only, while dual-axis tracking systems alter both orientation and tilt angle. Dual-axis tracking systems are able to face the sun more precisely than single-axis systems.



Figure 2.3-4: Graphical Diagram Showing Tracking System

(Source: AL-Rousan et. al, Advances in solar photovoltaic tracking systems: A review, Renewable and Sustainable Energy Reviews Volume 82, Part 3, February 2018)

2.3.3 Combined Inverter and Step-up Transformer Stations

Inverters are required to convert the DC electricity generated by the PV modules to alternating current (AC) to allow connection to the transmission network.

The output from the inverters needs a further step-up in voltage to reach the AC grid voltage level. The step-up transformer takes the output from the inverters to the required grid voltage.

According to the Project Specifications, transformers will be located with inverter and MV kiosks as separated with minimum 3m distance. The foundation heights will be minimum 50 cm above ground level.

There will be a rigid busbar between the inverter and the transformer. The energy input will be a power jack system for easier maintenance.

Each step-up transformer will be three phase type, 0.400/33 kV (or with suitable primary side voltage and current in accordance with inverter AC output), 50 Hz. "Two primary and One secondary" type three windings' transformers may be used where required as per design.

¹ The orientation angle or "azimuth" is the angle of the PV modules relative to south. Definitions may vary but 0° represents true south, -90° represents east, 180° represents north, and 90° represents west.

The noise level will be in accordance with relevant national regulation and standard. Transformers will have Off Circuit Tap Changer with tapings. The vector group, impedance, bushing rating, HV/LV termination & neutral earthing will also meet the system requirement & also be in line with standards as mentioned in the project specifications. Transformers will be in accordance to IEC 60076 or equivalent to any other international standard.

In the characteristics of the transformer-inverter skid, the ingress protection class will beat the level of IP43-54 and the enclosures will be protected via filter system to avoid undesired entrances such as dust etc. Air conditioning system will also be adapted for the skid structure.

2.3.4 Cabling

The connection between the panels and the substations will be through underground medium voltage (MV) transmission cables. These underground cables will be buried in excavated trenches that will be backfilled. Such trenches will typically be 0.6 m wide and 1.25 m deep similar to the Saros WPP project infrastructure..

2.3.5 Substations & Energy Transmission Line (ETL)

Substations

The following substations that were constructed as part of the Saros WF Project will be used for the SPP Project:

- Saros WF Main Substation; and
- Saros WF Secondary Substation.

These substations are connected via a 9.33 km 154 kV overhead ETL. The substations occupy around 1.07ha and 0.15ha, respectively.

Both substations are high voltage (HV) transformer substations that convert the to a higher voltage (from 34.5kV to 154kV) which is more appropriate for transmission and connection to the national grid as it reduces transmission loses.

Energy Transmission Line (ETL)

Project connection to the national grid will be via two existing 154 kV overhead electricity transmission lines (ETL) from the Saros WF Main Substation, as follows:

- 31 km ETL connecting to the Çan Substation lying to the southeast; the ETL consists of 30 suspension and 68 transposition towers; and
- 5.36 km connecting to the operating Kocalar WF Substation located to the north. The ETL consists
 of 13 suspension and seven transposition towers. There are no settlement areas existing within
 the ETL route. The route is situated 610m northeast of the nearest house in Kocalar Village.

Both of the ETLs are operated by TEIAS (Turkish Electricity Transmission Company).

In addition to the overhead ETLs described above, there are two internal ETLs that are 3x477 million cubic meter (MCM):

- 0.51km 34.5kV overhead ETL that connects T4 and T5 to the secondary substation, and
- 9.33km 154kV overhead ETL that connects the secondary substation to the main substation. The transmission line will consist of totally 31 towers (six suspension and 25 transposition towers). There are no settlements lying within 100 m of the 9.33 km ETL route, with the closest houses located in Kocalar Village.

The 31 km 154kV ETL route between Saros WF Main Substation and the existing Çan Secondary Substation does not pass through any settlement areas. In general, this ETL route generally runs more than 500m away from the nearest villages, except for a few houses located in, Kocalar, Küçüklü, Kumarlar, Küçükpaşa, Etili and Hurma Villages within the 500m corridor of the ETL route.



Figure 2.3-5: Map Showing the Proposed ETLs

2.3.6 Site Access and Internal Roads

A network of access roads were installed within the scope of Wind Power Plant Project during the construction phase and providing access to the turbines for maintenance purposes during operation. The access roads were routed to follow the existing road network, such as village roads, forest fire-fighting paths, wherever possible. However, some internal access roads will need improvement and there will be no need for new routes to be built for the SPP project. The access roads will be routed by-passing residential areas as much as possible.

The existing access roads have a width of 6m and a total length of 58km. The existing and the improved access roads are shown in the map given below (Figure 2-6 and Figure 2.7).

Within the scope of the project, only land arrangement and assembly will take place, and there is no need for any filling material supply. In case of need, it will be procured from the nearest material quarries, which have all necessary legal permissions.

Within the scope of the project, a small amount of concrete will be used for the foundations of the panels. Readymixed concrete will be procured from the market. The transfer of the solar panel modules will be arranged with respect to the Routing Plan to be developed. The delivery route for PV panels between the panel factory will be determined with respect to the Routing Plan. Vehicle access to the site is via D210 Çan-Çanakkale Road; Figures below shows the primary roads that are being used to access the site.

- Site access-1 to access the turbines located in the west cluster (Cluster 1) (see Figure 2-6.)
- Site access-2 to access the turbines located in the middle cluster(Cluster 2) and north east cluster (Cluster 3) (see Figure 2-7).



Figure: 2.3-6 Site Access to the Cluster 1



Figure: 2-3.7: Site Access to the Cluster 2 and Cluster 3

2.3.7 Administration Building and Control Centre

During the operation phase, existing administration building of the WPP will be used for the administrative activities of the SPP Project. Besides, administration building hosts a control centre including a Scada monitoring & controlling desk. The facility will be monitored instantaneously for 24 hours by means of the Scada system. The facility will be monitored instantaneously for 24 hours by means of the Scada system. Detection of the maintenance need and instant failures will be done through this system.

2.3.8 Temporary Construction Laydown Area

The temporary construction laydown area including the facilities to be used during construction is planned to be located within the Cluster 2 as shown in the figure below.

The laydown area will accommodate sites of the Project Company, the Contractor and the sub-contractors. There will be offices, meeting room(s), toilets, dining hall, material storage areas and worker's camp site for accommodation within the laydown area.

The laydown area will function as a general mobilisation site for construction and will be removed in the operation phase.



Figure: 2-3.8: Temporary Construction Laydown Area

2.4 LAND PREPARATION AND CONSTRUCTION PHASE ACTIVITIES

Land preparation and construction activities as well as schedule, workforce and relevant construction machinery equipment are described below.

2.4.1 Schedule

The construction period of the Project is planned to take 15 months (3 months for vegetative soil stripping works, 8 months for construction works, 8 months for assembly and commissioning, and related activities are expected to continue in parallel). The estimated schedule of the project is given below.

Table 2-4 Project Development Phases

Project Phase	Works for each phase
Mobilization	Site Delivery
	Establishment of temporary utility services
	Establishment of living places in facility
	Electrical installation of temporary containers
Construction	Land Preparation
	Mounting System Installation
	Panel Installation
	Electrical Installation
	Connection to the System
Operation	Connection to YEKDEM
	Connection to the Grid

Saros Hybrid Solar Power Plant Project Environmental and Social Impact Assessment

Security level: RINA/CL/SENSITIVE

Table 2-5 Project timeline

Summary table for Saros Hybrid SPP	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	2024-2031 YEKDEM Phase	2032-2061 Market Sale
Application to EMRA and Approval													-									-					-								
EIA Positive Decision																																			
Mapping																																			
Soil Survey																																			
Zoning plan process - institution opinions																																			
Zoning plan process - ministry approval, suspension and finalization																																			
Land Acquisition (Procurement- Expropriation)																																			
Construction																																			
Operation – YEKDEM Phase																													YEKDEM - Partially Acceptance					YEKDEM – Fully Installed Power	
Operation – Market Sale																																			Market Sale

2.4.2 Workforce and Workers' Accommodation

2.4.3 Construction Activities

The construction phase activities include the following key activities:

- Land clearing for site preparation and internal access roads;
- Excavation and filling;
- Transportation of supply equipment, components and materials;
- Construction of foundations, involving excavations and placement of concrete;
- On-site assembly of tracker systems and installation of PV modules;
- Installation of electrical connection systems, including cabling;
- Construction of offices and warehouses;
- Construction of Substations and ETLs;
- Testing, commissioning and connection to the grid.

2.4.4 Construction Machinery and Equipment

Typical list of machinery and equipment that is used for construction activities is provided in. Electricity required during the construction phase will be supplied from on-site diesel generators.

Construction machinery and equipment that is planned to be used during the construction phase is listed in Table 2-6.

Machinery / Equipment	Maximum Number
Excavator	10
Grader	3
Vibratory Roller	4
Water Sprinkler	4
Loader	3
Backhoe loader	2
Truck	40
Dozer	3
Tractor	5
Crane	5
Colon Pile Driver	7

Table 2-6: Construction Machinery and Equipment Planned to be Used

2.5 **OPERATION AND MAINTENANCE ACTIVITIES**

2.5.1 Project Lifetime

Saros Hybrid SPP Project is licensed to generate electricity for 49 years starting from the licensing date (October 18, 2012) according to the Energy Generation License ("License") obtained from the Energy Market Regulatory Authority (EMRA).

The design lifetime of solar panels is approximately 25 years, but in practice solar panels should last longer with proper maintenance (IFC, EHS Guidelines). Therefore, the Project operation phase will require routine (preventive) maintenance that will be conducted throughout the project lifetime in order to ensure extended system lifetime, as well as compliance with manufacturer warranty and increase in efficiency and energy production.

When the facility is operational, it will operate 24 hours a day, 365 days a year.

Routine maintenance activities may include cleaning for maintenance, maintenance of electrical components, control equipment and access roads.

2.5.2 Workforce

The Project is expected to employ 40 people during the land preparation and construction phases of the project, and 5 people during the operation phase. Unqualified personnel will be employed from the region as much as possible during the construction phase, and during the operation phase, permanent personnel will be employed from the region.

The staff will work 8 hours a day in 3 shifts. When the facility goes into operation, it will operate 24 hours a day, 365 days a year.

2.6 WATER USE

Construction and Operation Phase

Water demand associated with the construction phase will principally be for drinking and sanitary use by project personnel and water required for dust suppression. Similarly, water demand during operation will be limited to drinking and sanitary use by personnel. Water demand will be supplied via 10-ton water tank which is allocated in the administrative building.

Estimated water demand for dust suppression is 40 tons. Water for dust suppression will be supplied from the common water source (village fountain) of Etili Village. Analysis reports proving that the water quality meets the standards set by the Regulation on Water Intended for Human Consumption have been obtained from the Headman of Etili and transferring water tankers have been contracted.

Periodic cleaning of the solar panels is essential in order to minimize the efficiency losses in the solar power plant. The cleaning frequency of the panels varies according to the several conditions such as meteorological, soil structure, vegetation coverage, height etc of the area where the power plant is located. According to the information obtained from the Project Company, wet cleaning will be applied for cleaning of photovoltaic panels. Wet cleaning is planned to be carried out once a year and 5 tonnes/MW (470 tonnes/year) water is estimated to be utilised.

Turkish Statistical Institute (Turkstat) has reported that average daily water consumption per person was 228 litres in 2020. Accordingly, daily water demand is estimated to be 9.12 m³ for 40 workers during the peak construction time and 1.14 m³ for 5 employees during operations.

Drinking water will be purchased as bottled water from the local market and utility water will be supplied via tankers from the nearby villages where the standards for utility purposes are met.

2.7 **PROJECT ALTERNATIVES**

2.7.1 No Development Option

The 'No Action Alternative" represents the option to not build the Saros Hybrid SPP Project continuing to rely on the existing wind power plant to produce electricity.

With the development of science and technology in the world, the need for energy is increasing. It has become inevitable to be in search of alternatives in energy production and to closely monitor technical and economic developments. As a result of the environmental and economic effects caused by fossil fuels such as oil, coal and natural gas, the demand in energy production has turned to renewable energy sources.

As a result of the insufficient resources available to meet the constantly increasing energy needs in the world and in Turkey, the search for alternative energy sources continues rapidly to meet this need. The use of renewable energy sources is important in order to prevent the damages that may occur in nature as a result of the consumption of traditional fossil fuel-based energy production and to protect the environment.

"Green Energy" has become one of the basic needs of both Turkey and the world in order to prevent damage to the environment, to minimize the damage, to cope with global warming and to reduce carbon emissions. Environmental factors are gaining more and more importance in energy production and in the selection of energy sources.

Nowadays, where renewable energy sources have become very important, studies in this field have also gained momentum. The share of solar energy in electricity generation, which has a very important place among renewable energy sources in the world and in Turkiye, is increasing day by day.

Trying to become one of the world's leading countries in solar energy, Turkiye has a significant solar energy potential. In addition, it is one of the countries that tries to benefit from the said resource to the highest extent. Especially in recent years, large investments have been made in the solar energy systems sector and many studies have been carried out to improve the sector. Compared to European and other world states, Turkiye's solar energy potential and annual sunshine duration are quite high (Figure 2.7-1).



Figure 2.7-1 Turkiye Solar Energy Potential Atlas²

In addition, Çanakkale has a substantial solar potential especially in the south and central part of the province. Some solar energy potential figures of Çanakkale Province including prepared solar energy potential atlas, global radiation values (KWh/m²-day), sunshine durations are given in the figures below.

² Ministry of Energy and Natural Resources



Figure 2.7-2 Canakkale Province Solar Energy Potential Atlas²



Figure 2.7-3 Çanakkale Province Global Radiation Values (KWh/m2-day)²



Figure 2.7-4: Çanakkale Province Sunshine Durations (hour)²



Figure 2.7-5: Çanakkale Province PV Type-Area-Producable Energy (KWh-Year)²

As presented in the figures, Çanakkale Province has a significant solar potential. In this regard, no action alternative is not an option to be taken into consideration, being the construction of the new hybrid Solar Power Plant the most feasible option.
2.7.2 Alternative Site Location

Alternative site studies to be carried out regarding the site selection of the project are subject to certain legislative provisions. According to the Electricity Market License Regulation, any additional plants should not be established outside the license area. Therefore, Project will be realized in the license area of existing Saros Wind Power Plant.

2.7.3 Alternative Technologies

Solar Power Plants basically work on two different principles. These are the photovoltaic system and the thermal system.

In the photovoltaic system, the radiation coming from the sun is converted into energy by means of panels, and the obtained energy is used by making it suitable for use with the inverter device.

In thermal systems, the sunrays are transmitted to a certain point by means of special mirrors, and oil, water and similar liquids at this point are heated, and mechanical energy is converted into kinetic energy by means of steam pressure with this heated liquid, as in thermal systems.

Among PV technologies, monocrystalline half-cut solar panels were chosen because of their higher efficiency.

3 POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK

This Chapter describes the institutional, national and international legal framework relevant to the Project, covering national environmental, cultural, health and safety legislation, as well as international environmental and social standards, including the International Finance Corporation's (IFC) Environmental and Social (E&S) Sustainability Policy (2012) and related Performance Standards (PSs); EBRD E&S Policy (April 2019) and related Performance Requirements (PRs) and Equator Principals (EPs) IV.

3.1 NATIONAL REGULATORY FRAMEWORK

National regulation framework applicable to the management of environmental, social, labour and energy generation subjects within the scope of the Project are detailed in below sections.

3.1.1 Relevant Institutions

The following ministries and directorates are considered as the relevant government institutional stakeholders:

- Ministry of Environment and Urbanization (MoEU)
- General Directorate of Nature Conservation and National Parks
- Provincial Directorate of Environment and Urbanization
- Ministry of Agriculture and Forestry
- Provincial Directorate of Agriculture and Forestry
- Ministry of Energy and Natural Resources
- Energy Market Regulatory Authority
- Ministry of Family, Labour and Social Services
- Ministry of Transport and Infrastructure
- Ministry of Health
- Provincial Directorate of Family, Labour and Social Services
- Governorship of Çanakkale
- District Governorship of Çan
- Çanakkale Municipality.

3.1.2 Environmental and Social Legislation in Force

Turkish Environmental Law (No. 2872), which was first published in the Official Gazette No. 18132 dated August 11, 1983, defines the main principals for the protection of environment in line with sustainable environment and development principles, in addition to relevant institutional responsibilities. It also outlines the legislative framework for regulation of industries and their liabilities regarding the assessment and management of potential impacts on environment due to their activities.

The most recent amendments to the Environmental Law were introduced on December 10, 2018 (No: 7153) and February 22, 2019 (No: 7166).

In addition to Environmental Law and the associated regulations, there are other laws that complement the regulation related to the protection of environment, social rights and safety of community, including:

- Expropriation Law (Law No: 2942)
- Pasture Law (Law No:4342)
- Groundwater Law (Law No: 167)
- Law on National Parks (Law No: 2873)
- Law on Conservation of Cultural and Natural Assets (Law No: 2863)
- Traffic Law (Law No: 2918)
- Labour Law (Law No:4857)
- Law on Soil Conservation and Land Use (Law No:5403)
- Municipality Law (Law No: 5393)
- Public Health Law (Law No: 1593)

• Settlement Law (Law No: 5543).

Under the relevant laws, regulations, communiques and by-laws applicable to the Project include but are not limited to:

General

- Regulation on Environmental Impact Assessment
- Regulation on Environmental Permits and Licenses
- Regulation on Environmental Audit
- Regulation Concerning Environmental Management Services Consulting Firms
- Communique on Certificate of Competency
- Regulation for Starting Up and Opening a Workplace.

Air Quality

- Regulation on Assessment and Management of Air Quality
- Regulation on Control of Industrial Air Pollution
- Regulation on Control of Exhaust Gas Emission
- Regulation on Monitoring of Greenhouse Gas Emissions
- Regulation of Control of Air Pollution Originated from Heating
- Regulation on Reduction of Sulphur Rates in Certain Types of Fuels.

Noise

- Regulation on Assessment and Management of Environmental Noise (RAMEN)
- Regulation on Environmental Noise Emission Caused by Equipment Used Outdoors

Land Use and Soil Protection

- By-Law on Protection and Use of Agricultural Lands and Land Consolidation
- Implementation Regulation of 16th Article of the Forestry Law
- Implementation Regulation of 17/3rd and 18th Articles of the Forestry Law
- Regulation on Land Consolidation
- Regulation on the Control of Soil Pollution and Lands Contaminated by Point Sources.

Water Resources

- Water Pollution Control Regulation
- Regulation on Monitoring of Surface Water and Groundwater
- Regulation on Surface Water Quality
- Regulation on Protection of Groundwater against Pollution and Deterioration
- Regulation on Control of Pollution Caused by Hazardous Substances in the Aquatic Environment and Its Surroundings
- Regulation on Water Intended for Human Consumption
- Regulation on Pit Opening Where Sewer System Construction is not Applicable.

Waste Management

- Regulation on Waste Management
- Regulation on the Control of Excavation Soil, Construction and Demolition Waste
- Communique on Transportation of Wastes by Highway
- Regulation on the Landfill of Wastes
- Regulation on Control of Packaging Wastes
- Regulation on the Control of Medical Wastes
- Regulation on the Control of Waste Oils
- Regulation on the Control of Waste Batteries and Accumulators
- Regulation on the Control of Waste Tires
- Regulation on the Control of Waste Vegetable Oils
- Regulation on the Control of Waste Electrical and Electronic Equipment

- Communique on Recovery of Some Non-Hazardous Wastes
- Regulation on the Control of End-of-Life Vehicles
- Zero Waste Regulation.

Chemicals

- Regulation on Classification, Labelling and Package of the Materials and Mixtures
- Regulation on the Control of Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs)

Labour, Health and Safety

- Regulation on Occupational Health and Safety Services
- Regulation on Risk Assessment for Occupational Health and Safety
- Communiqué on Hazard Classes List related to Occupational Health and Safety
- First Aid Regulation
- Regulation Concerning the Classification, Packaging and Labelling of Dangerous Substances
- Regulation Concerning the Protection of Workers from Risks Associated with Noise
- Regulation Concerning the Protection of Workers from Risks Associated with Vibration
- Regulation on Management of Dust
- Regulation on Personal Protective Equipment
- Regulation Concerning the Use of Personal Protection Equipment at Workplaces
- Regulation on Emergency Situations in Workplaces
- Regulation on Health and Safety at Construction Works
- Regulation on Health and Safety Conditions Regarding Use of Work Equipment
- Regulation on Health and Safety Regarding Temporary and Time Limited Works
- Regulation on Health and Safety Precautions Regarding Working with Chemicals
- Regulation on Health and Safety Signs
- Regulation on Material Safety Data Sheets on Hazardous Materials and Mixtures
- Regulation on Methods and principals for Workers Health and Safety Trainings
- Regulation on Protecting Workers from Hazards of Explosive Environments
- Regulation on Prevention and Mitigation of Impacts of Large-Scale Industrial Accidents
- Regulation on Subcontractors
- Regulation on Suspension of Work in Workplaces
- Regulation on the Transportation of Dangerous Materials on Motorways
- Regulation on Vocational Training of the Employees Working in Dangerous and Highly Dangerous Workplaces
- Regulation on the Protection of Buildings from Fire.

Social

• Regulation on Implementation of Resettlement Law.

3.1.2.1 Environmental Impact Assessment Regulation

In accordance with the Article 10 of the Environmental Law, the institutions, organizations and facilities that may lead to environmental issues because of their planned activities are obliged to submit an Environmental Impact Assessment (EIA) Report or a Project Description File to the Ministry of Environment and Urbanization (MoEU). Within this context, the EIA Regulation was first put into force after being published in the Official Gazette numbered 21489 and dated February 7, 1993. The last and currently in force EIA Regulation was published in the Official Gazette numbered 29186 and dated November 25, 2014. The latest amendment to the Regulation was done on November 28, 2019.

Annex-1 and Annex 2 of the EIA Regulation, based on activity type and/or facility capacity, categorize investments and facilities as projects subject to full-scale EIA process (Annex-1) or projects subject to screening-elimination process (Annex-2).

For the investments listed under Annex-2, initially a Project Description File is prepared in accordance with the format specified under Annex-4 of the Regulation, and the MoEU evaluates the necessity for a full-scale EIA study for the subject project.

Categorization of the solar power plant projects under the current EIA Regulation is described below:

- Full EIA process (Annex-1) is required for SPP projects with a project area of and above 20ha or capacity
 of 10 MWe and above;
- Screening-elimination process (Annex-2) is required for SPP projects with a project area of 2ha to 10ha and a total installed capacity of 1 MWe to 10 MWe (excluding roof and façade systems);
- SPP projects that have less than 1 MWe installed capacity are not subject to screening-elimination process.

An Environmental Impact Assessment (EIA) was conducted in line with the national EIA Regulation for the Saros Hybrid SPP Project ,. After consideration of the EIA Report, MoEU issued an "EIA Positive Certificate" with decision number 6611 was obtained on April 1, 2022.

Saros WF Project includes two electricity transmission lines (ETL) connecting the project to the national grid that are 5.36 km and 31 km long at 154 kV voltage level, and two internal ETLs: (1) 0.51 km 34.5 kV overhead ETL connecting T4 and T5 to the secondary substation, and (2) 9.33 km 154 kV overhead ETL that connects the secondary substation to the main substation.

According to the Annex-1 and Annex-2 of the EIA Regulation, ETL projects are categorized as follows:

- Full EIA process (Annex-1) is required for ETLs with voltage above 154 kV and length of 15 km and over;
- Screening-elimination process (Annex-2) is required for ETLs with voltage above 154 kV and length of 5-15 km;
- No EIA process is required for ETLs with voltage level below 154 kV or ETLs with voltage level above 154 kV but length less than 5 km.

Accordingly;

- for the 31 km 154 kV ETL, an EIA process was completed on September 26, 2019. This ETL was handed over to and operated by TEIAS (Turkish Electricity Transmission Company) after construction. The EIA was submitted by TEIAS to the MoEU and therefore the Project Company was not involved in the EIA process;
- for the 5.36 km and the 9.33 km 154 kV ETLs, which are classified under Annex-2 of the Regulation, Project Description Files were submitted to the MoEU on May 22, 2019 and June 21, 2019, respectively;
- for the 0.51 km 34.5 kV internal ETLs, no EIA process is required; connecting T18 to T25 to the main substation.

3.1.3 Expropriation Law

In Turkey, any expropriation needs to comply with the Expropriation Law No. 2942. The Expropriation Law, where public interest requires, sets out the procedures for expropriation of immovable property in possession of natural and private legal entities by the state and public legal entities, methods for calculation of the expropriation price, registration of the immovable property and the right of way in the name of the authority, and settlement of related disputes.

These provisions of the Law are also applicable for expropriations in the name of natural and private legal entities. Unlike in purchase procedures, the owner's consent will not be sought for the immovable property to be expropriated. Expropriation involves compulsory appropriation of the immovable property by the State for public interest.

3.1.4 Labour Law and Regulations

The Labour Law governs subjects related to labours (No: 4857, published in Official Gazette numbered 25134 and dated June 10, 2003). The Labour Law also covers legislative framework for the regulation of industries and their potential impact on human health and safety.

In addition, Occupational Health and Safety Law (No: 6331, published in Official Gazette numbered 28339 and dated June 30, 2012) outlines the legal framework for health and safety at workplaces. Legislation in relation with these laws is provided in Section 3.1.1.

3.1.5 Biodiversity and Sensitive Areas

The importance of protecting biological diversity is emphasized in Article 9 of the Environmental Law (amendment came into force by the Law 5491 dated April 26, 2006) that introduces penal sanctions against damage to the environment, including destruction of biological diversity, if detected through inspection and audits. Associated laws and regulations governing the conservation of habitats and species in Turkey are:

- Regulation on Protection of Wildlife and Wildlife Development Areas
- Law on National Parks
- Law for the Protection of Cultural and Natural Assets
- Decree-Law Establishing the Special Environmental Protection Agency
- Terrestrial Hunting Law
- Law on Fisheries
- Law for the Protection of Animals
- Regulation for the Protection of Wetlands
- Regulation for Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora
- Regulation on Fisheries.

In addition to these laws, other environmental regulations and legislations ensure management of environmental aspects (i.e. air quality, environmental permitting, management of chemicals, noise control, soil quality, water quality and waste management) that might have secondary impacts on biodiversity.

3.1.6 Cultural Heritage

In line with the Law on Preservation of Cultural and Natural Assets No. 2863 (amended by Law No. 3386), published in the Official Gazette No. 18113 and dated 23 July 1983, movable and immovable cultural and natural heritage assets are protected and should be conserved. According to the Law, key heritage assets that are identified as cultural and natural heritage under legal protection are defined as follows:

- Natural and immovable cultural assets of the 19th century and earlier.
- Any immovable cultural asset constructed after the end of the 19th century but categorized as "a significant asset which requires preservation" by the Ministry of Culture and Tourism.
- Immovable cultural assets located within the Protected Sites that are specified by the Law.

According to the Law on the Conservation of Cultural and Natural Assets No. 2863, all cultural and natural assets requiring protection are considered as state property. As stated in the same law, the Ministry of Culture and Tourism and its local branches (Boards for Conservation of Cultural Assets and Museums) are the main national government institutions that have the authority to conduct studies for the identification and registration of cultural assets and to define the conditions of conservation and use of these sites.

The requirements set out in Law on Preservation of Cultural and Natural Assets that will be complied with during the project activities are as follows:

- Obligation to notify (Article 4);
- Quality of state property (Article 5);
- Transfer to museums (Article 25).

3.1.7 Energy Production

There are multiple national laws and regulations on energy generation that are related to the Project; these include but are not limited to the following:

- Law on Utilization of Renewable Energy Resources for Electricity Generation (Law No: 5346)
- Electricity Market Connection and System Use Regulation
- Electricity Market Distribution Regulation
- Electricity Market License Regulation
- Regulation on Competitions Regarding Preliminary License Applications Made for Installation of Energy Generation Facilities Based on Wind and Solar Power.

3.2 PERMITS, LICENSES AND APPROVALS

Permits, licenses and approval applicable to the Project are listed in Table 3-1.

Permit **Related Authority/Entity** Status/Remarks Energy Generation License no EÜ/11649-15/05363 updated on 16 February **Energy Market Regulation** 2023 valid until 18 October 2061 License Authority **EIA** Positive Ministry of Environment and Certificate for the Obtained on April 1, 2022. Decision Number: 6611 Urbanization Plant **ETL** Connection **Turkish Electricity** To be signed during the course of further development Agreement **Transmission Company** Ministry of Science, Industry Zoning Plan has been approved on 11.05.2020 for Zoning Plan and Technology (which is Saros WPP

Table 3-1: Relevant Permits, Licenses and Approvals [Hold: Project Company to provide information]

Approval	replaced by Ministry of Industry and Technology).	To be updated prior to construction				
Building Permit for substations and administrative buildings	Metropolitan Municipality of Çanakkale Municipality of Çan District	Completed within the scope of Saros WPP.				
Opinion Letter on Military Forbidden Zones and Safety Zones	Presidency of General Staff	The lands under the jurisdiction and disposal of the authorized bodies of the state within the scope of the project (Military Forbidden Zones, areas allocated to public institutions and organizations for certain purposes, Council of Ministers No. 7/16349 published in the Official Gazette dated 25.09.1978 and numbered 16415 There are no areas, etc., which are limited by its decision.				
Waste Disposal Agreements	Municipality/Licensed Disposal Firms	Agreements to be secured with a licenced transfer firm prior to construction				
Wastewater Disposal Agreement	Municipality	Agreement to be secured with a licenced transfer firm prior to construction				
Temporary Acceptance	Ministry of Energy and Natural Resources	To be obtained prior to operation phase				
Workplace Opening and Operating Permit	Municipality/Governorate	To be obtained prior to operation phase				
Waste Management Plan Approval	Provincial Directorate of Environment and Urbanization	To be obtained early operation phase				

3.3 INTERNATIONAL STANDARDS

In addition to the applicable national Laws, this ESIA Report has been prepared with reference to the following international policies and procedures regarding the assessment and management of environmental and social impacts of the projects that are adopted by the international finance institutions (IFIs):

- Equator Principles (EPs) IV (which comes into force on 1st October 2020);
- IFC Performance Standards (PS) (2012);
- IFC General and Sector Specific Environmental Health and Safety (EHS) Guidelines;
- EBRD Environmental and Social Policy (2019) and Performance Requirements (PR);
- OECD Common Approaches (2016).

In addition, consideration has also been given to European Union EIA Legislation and relevant International Conventions and Protocols signed by Turkey.

3.3.1 Equator Principles IV

First issued in 2006, the Equator Principles is a risk management framework, adopted by 97 financial institutions (known as Equator Principles Financial Institutions or EPFIs) in 37 countries to support certain investment decisions by applying environmental and social standards to determine, assess and manage environmental and social risks in projects. EP IV (the fourth iteration of the EPs that in force since October 2020) comprises 10 core principles:

- **Principle 1 Review and Categorization:** When a Project is proposed for financing, the finance institution will, as part of its internal environmental and social review and due diligence, categorize it based on the magnitude of its potential environmental and social risks and impacts. Such screening is based on the environmental and social categorization process of IFC (Category A, B or C). Using categorization, the finance institutions' environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts.
- **Principle 2 Environmental and Social Assessment:** For all Category A and Category B Projects, the finance institution will require the client to conduct an Assessment process to address, to the finance institution's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The Assessment Documentation should propose measures to minimize, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project, and include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment.
- **Principle 3 Applicable Environmental and Social Standards:** The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.
- Principle 4 Environmental and Social Management System and Equator Principles Action Plan: For all Category A and Category B Projects, the finance institution will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards.
- Principle 5 Stakeholder Engagement: For all Category A and Category B Projects, the finance institution will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.
- **Principle 6 Grievance Mechanism:** For all Category A and, as appropriate, Category B Projects, the finance institution will require the client, as part of the Environmental and Social Management System, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user.

- **Principle 7 Independent Review:** For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the finance institution's due diligence, and assess Equator Principles compliance.
- **Principle 8 Covenants:** An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects.
- Principle 9 Independent Monitoring and Reporting: To assess Project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan, the finance institution will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the finance institution.
- **Principle 10 Reporting and Transparency:** For all Category A and, as appropriate, Category B Projects, the client will ensure that, at a minimum, a summary of the ESIA is accessible and available online; and the client will publicly report GHG emission levels during the operational phase for Projects emitting over 100,000 tons of CO₂ equivalent annually.

The EPs apply to the four financial products described below when supporting a new project:

- Project Finance Advisory Services where total project capital costs are US\$10 million or more;
- Project Finance with total project capital costs of US\$10 million or more;
- Project-Related Corporate Loans where all four of the following criteria are met: (i) the majority of the loan
 is related to a single project over which the client has Effective Operational Control; (ii) the total aggregate
 loan amount is at least US\$100 million; (iii) the EPFIs' individual commitment is at least US\$50 million;
 and (iv) the loan tenor is at least two years; and
- Bridge Loans with a tenor of less than two years that are intended to be refinanced by Project Finance or a Project-Related Corporate Loan that is anticipated to meet the relevant criteria described above.

While the EPs are not intended to be applied retroactively, EPFIs apply them to the expansion or upgrade of an existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact.

The fourth iteration of the Equator Principles (EP IV) includes revisions in four key areas:

• The scope of applicability of the EPs: The total threshold for Project-Related Corporate Loans (PRCLs) has reduced to US\$50 million, where the total aggregate loan amount and the EPFI's individual commitment (before syndication or sell down) meets the new threshold.

Project-related Refinancing and Project-related Acquisition Financing is added to the scope of the EPs with the following criteria:

The underlying Project was financed in accordance with the EPs;

There has been no material change in the scale or scope of the Project;

The Project is not yet completed (see section Scope). For Project-Related Corporate Loans, the exception for sovereign borrowers is removed for Category A, and as appropriate for Category B Projects.

- Applicable standards in designated vs. non-designated countries: Principle 3 retains the list of 'Designated Countries' i.e. high-income OECD countries as a proxy for governance. However, it clarifies that the EPFI will evaluate the specific risks of the Project to determine whether one or more of the IFC Performance Standards could be applied to address those risks, in addition to host country laws. In addition, the EPs require that the EPFI's due diligence includes, for all Category A and Category B Projects, a review of how the Project meets each of the Equator Principles.
- Human Rights and social risk: The Preamble states that EPFIs will fulfil their responsibility to respect Human Rights in line with the UN Guiding Principles on Business and Human Rights. Principle 2 strengthens language on human rights, stating that the Environmental and Social Impact Assessment

(ESIA) included in the Assessment Documentation should include the assessment of potential adverse Human Rights impacts.

A Human Rights Impact Assessment study has not been carried out in the context of the ESIA for the Project. However, an additional scoping study can be carried out if requested by the Lenders.

EP IV also discusses the requirement for 'Free, Prior and Informed Consent' (FPIC) where indigenous peoples may be present and impacted by the project. However, this requirement is not relevant to the project as there are no indigenous people in Turkey.

• **Climate change:** Execution of a Climate Change Risk Assessment is needed in line with the latest version of the Equator Principles (IV, dated July 2020) and the Recommendations of the Task Force on Climate-related Financial Disclosures.

A Climate Change Risk Assessment (CCRA) study has not been carried out as part of the ESIA works, since Saros Hybrid SPP is a renewable power project and has GHG emissions largely below the threshold of 100,000 tCO2e/y. However, if requested by the Lenders a stand-alone CCRA study can be carried out as additional study.

3.3.2 International Finance Corporation (IFC) Sustainability Policies and Standards

IFC, a member of the World Bank (WB) Group, has published the most recent Performance Standards (PS) on Environmental and Social Sustainability in 2012 that defines clients' responsibilities for managing their Environmental and Social risks.

IFC uses a process of environmental and social categorization to reflect the magnitude of risk and impacts of the Project, as summarized below:

- Category A: business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented;
- Category B: business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures; and
- Category C: business activities with minimal or no adverse environmental or social risks and/or impacts.

The IFC PSs on Environmental and Social Sustainability has eight components, which provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way. The PSs are the standards that the client is to meet throughout the life of an investment. Guidance Notes that serve to explain the means to achieve compliance with the PSs support IFC PSs.

A brief description of each IFC PS is provided below:

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

PS 1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks and opportunities of the Project; also, for effective community engagement through disclosure. Objectives of PS 1 are:

- To identify and evaluate environmental and social risks and impacts of the Project.
- To adopt a 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.
- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them.
- To ensure that relevant environmental and social information is disclosed and disseminated.

PS 2: Labour and Working Conditions

PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. Objectives of PS 2 are:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labour laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labour.

PS 3: Resource Efficiency and Pollution Prevention

PS 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 are:

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions.

PS 4: Community Health, Safety and Security

PS 4 recognizes that project activities, equipment and infrastructure can increase community exposure to risks and impacts. The objectives of PS 4 are:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

PS 5: Land Acquisition and Involuntary Resettlement

PS 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Objectives of PS 5 are:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objectives of PS 6 are:

- To protect and conserve biodiversity
- To maintain the benefits from ecosystem services

• To promote the sustainable management of living natural resources through the adoption of practices which integrate conservation needs and development priorities.

PS 7: Indigenous Peoples

PS 7 recognizes that indigenous people as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population and sets objectives to anticipate and avoid adverse impacts of projects on them through ensuring appropriate management and consultation principles. As there are no indigenous people in Turkey the requirements set out in this PS are not considered applicable to the Project.

PS 8: Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. The objectives of PS 8 are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

In conclusion, PS 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
- Management of environmental and social performance throughout the life of the project.

PS's from 2 to 8 establish objectives and requirements to avoid, minimize and where residual impacts remain, to compensate for risks and impacts affective on workers, communities and the environment. All IFC PSs and related guidance notes will be applicable to the Project thus have been considered in the scope of the ESIA studies except for PS 7 which is not relevant to the Project since there are no indigenous people in Turkey.

3.3.3 IFC Environmental, Health and Safety Guidelines

3.3.3.1 IFC General EHS Guidelines

IFC has EHS Guidelines that are technical reference documents with general and industry specific examples of good international industry practice. The guidelines are developed to be used together with the relevant industry sector EHS guidelines that provide guidance to users on EHS issues in specific industries. The guidelines include performance levels and measures that are generally considered achievable in new facilities by existing technology at reasonable costs. When host country regulations and limits differ from the levels and measures presented in the IFC EHS Guidelines, projects should aim achieving the stricter one.

The organization of the IFC General EHS Guidelines are organized as presented in Table 3-2.

Table 3-2: Organization of the IFC General EHS Guidelines

Main Subject	Торіс
Environmental	 Air Emissions and Ambient Air Quality Energy Conservation Wastewater and Ambient Water Quality Water Conservation Hazardous Materials Management Waste Management
	Noise Contaminated Land
Occupational Health and Safety	General Facility Design and Operation

Main Subject	Торіс				
	Communication and Training				
	Physical Hazards				
	Chemical Hazards				
	Biological Hazards				
	Radiological Hazards				
	Personal Protective Equipment (PPE)				
	Special Hazard Environments				
	Monitoring				
	Water Quality and Availability				
	Structural Safety of Project Infrastructure				
	Life and Fire Safety				
Community Health and Safety	Traffic Safety				
	Transport of Hazardous Materials				
	Disease Prevention				
	Emergency Preparedness and Response				
	Environment				
Construction and Decommissioning	Occupational Health & Safety				
	Community Health & Safety				

3.3.3.2 EHS Safety Guidelines for Electric Power Transmission and Distribution

IFC EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

3.3.4 EBRD Environmental and Social Policy and Performance Requirements

Throughout their life phases, EBRD financed projects are required to comply with the Bank's E&S Policy (2019) to ensure environmentally and socially sustainable development. In this regard, the projects are expected to meet the key environmental and social requirements outlined by the PRs set by the Bank. The EBRD PRs are described below.

EBRD PR 1: Assessment and Management of Environmental and Social Risks and Impacts

EBRD PR 1 covers integrated assessment to identify the environmental and social impacts and issues associated with projects and management of the environmental and social performance throughout the life of the project. EBRD PR 1 also outlines the responsibilities of the client in the process of assessing the potential environmental and social impacts and issues associated with the project, and developing and implementing procedures for managing and monitoring these impacts and issues.

EBRD PR 2: Labour and Working Conditions

EBRD PR 2 consists of general requirements on human resources policies, working relationships, child labour, forced labour, non-discrimination and equal opportunity, workers' organizations, wages, benefits and condition of work, Occupational Health and Safety (OHS), worker accommodation, retrenchment and grievance mechanism, non-employee workers, supply chain, security personnel requirements which are applicable to the Project. The PR requires the clients to respect and protect the fundamental principles and rights of workers and protect and promote the safety and health of workers, especially by promoting safe and healthy working conditions.

EBRD PR 3: Resource Efficiency and Pollution Prevention and Control

EBRD PR 3 consists of general requirements on resource efficiency, pollution prevention and control, greenhouse gases, water, waste and safe use and management of hazardous substances and materials which are applicable to the Project. The PR requires the clients to identify project-related opportunities for energy, water and resource efficiency improvements and waste minimization, adopt the mitigation hierarchy approach to addressing adverse impacts on human health and the environment arising from the resource use and pollution released from the project and promote the reduction of project-related greenhouse gas emissions.

EBRD PR 4: Health, Safety and Security

This PR addresses the client's responsibility to identify and to avoid or minimize the risks and adverse impacts to community health, safety and security that may arise from project activities. General requirements for health and safety management (occupational health and safety, community health and safety) and specific requirements for health and safety management (Infrastructure and equipment design and safety, hazardous materials safety, traffic and road safety, natural hazards, exposure to disease and emergency preparedness and response) are discussed in this PR.

EBRD PR 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

This PR outlines the requirements related to involuntary resettlement (physical and economic displacement) that can be full, partial, permanent, or temporary as a result of project-related land acquisition and/or restrictions on land use. The objectives of this PR are to avoid or, when unavoidable, minimize, involuntary resettlement by exploring alternative project designs, to mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use, restore or, where possible, improve the livelihoods and standards of living of displaced persons8to pre-displacement levels and improve living conditions among physically displaced persons through the provision of adequate housing, including security of tenure at resettlement sites.

EBRD PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This PR outlines the biodiversity conservation requirements, legally protected and internationally recognized areas of biodiversity value, invasive alien species and sustainable management of living natural resources, crop and livestock production, fisheries and aquaculture, natural and plantation forestry, supply chain and genetically modified organisms (GMOs). The objectives of this PR are to protect and conserve biodiversity using a precautionary approach, to adopt the mitigation hierarchy approach, and to promote good international practice (GIP) in the sustainable management and use of living natural resources.

EBRD PR7: Indigenous Peoples

This PR recognizes that projects can create opportunities for Indigenous Peoples to participate in and benefit from project-related activities that may help them fulfil their aspiration for economic and social development. As government often plays a central role in the management of issues related to Indigenous Peoples, clients should cooperate and collaborate, as appropriate, with the responsible authorities and relevant communities in managing the risks and impacts of their activities. As there are no indigenous people in Turkey the requirements set out in this PR are not considered applicable to the Project.

EBRD PR 8: Cultural Heritage

This PR outlines the requirements related to cultural heritage for present and future generations. The aim of this PR is to protect cultural heritage and to guide clients in avoiding or mitigating adverse impacts on cultural heritage in the course of their business operations. The client is expected to be precautionary in their approach to the management and sustainable use of cultural heritage.

EBRD PR 9: Financial Intermediaries

This PR recognizes that Financial Intermediaries (FIs) are a key instrument for promoting sustainable financial markets and provide a vehicle to channel funding to the micro, small and medium-sized enterprise (SME) sector. Such FIs include a variety of financial service providers, including private equity funds, banks, leasing companies,

insurance companies and pension funds. FIs are engaged in a wide range of activities, such as microfinance, SME lending, trade finance, large-scale infrastructure finance, medium to long-term corporate or project finance, and housing finance.

EBRD PR 10: Information Disclosure and Stakeholder Engagement

This PR outlines the requirements related to an open and transparent engagement between the client, its workers, local communities directly affected by the project and, where appropriate, other stakeholders. The client is expected to outline a systematic approach to stakeholder engagement, to promote improved environmental and social performance of clients through effective engagement with the project's stakeholders and to ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately.

Direct investment projects must meet PRs 1 to 8 and 10. Each PR defines, in its objectives, the desired outcomes, followed by specific requirements for projects to help clients achieve these outcomes. Compliance with relevant national law is an integral part of all PRs.

Of the PRs, PR 7 is not applicable since there are no indigenous people in Turkey; and PR 9 is not relevant to the Project. All other EBRD PRs will be applicable and have been considered in the scope of the ESIA studies.

3.3.5 EBRD Sub-sectoral Environmental and Social Guidelines

EBRD's sub-sectoral Environmental and Social Guidelines are designed to assist credit/investment officers in local financial institutions and other non-environmental experts. They help in identifying major environmental activity risks, important management actions, and the essentials of environmental and social due diligence in over 80 industry activities. EBRD's guidelines are published for guidance only.

Sub-sectoral Environmental and Social Guidelines: Building and Construction Activities cover construction operations that may take place on greenfield sites, areas designated for industrial development (often land with an industrial park) or at a site with existing or historic activities. These guidelines include reference to IFC's EHS Guidelines which have been taken into consideration for the Project.

3.3.6 European Union EIA Legislation

Compliance with the EU EIA Directive is also taken into consideration since Turkey is a candidate for EU membership. Turkey's environmental legislation is developed mostly in line with EU Directives and national EIA Regulation is consistent with the EU EIA Directive.

The EU EIA procedure can be summarized as follows: the developer may request the competent authority to state what should be covered by the EIA information to be provided by the developer (scoping stage); the developer must provide information on the environmental impact (EIA report – Annex IV); the environmental authorities and the public (and affected Member States) must be informed and consulted; the competent authority decides, taking into consideration the results of consultations. The public is informed of the decision afterwards and can challenge the decision before the courts.

The EIA Directive (2011/92/EU, amended in 2014 by 2014/52/EU) applies to a wide range of defined public and private projects, which are defined in Annexes I and II:

- Mandatory EIA: all projects listed in Annex I are considered as having significant effects on the environment and require an EIA.
- Discretion of Member States (screening): for projects listed in Annex II, the national authorities have to
 decide whether an EIA is needed. This is done by the "screening procedure", which determines the effects
 of projects based on thresholds/criteria or a case-by-case examination. However, the national authorities
 must take into account the criteria laid down in Annex III (criteria to determine whether the projects listed
 in Annex II should be subject to an environmental impact assessment), which evaluates the project in
 consideration with the size of the project, cumulative impacts, physical and ecological properties of the
 location, and characteristics of the potential impact, etc.

According to the EU EIA Directive, the Project is under Annex II activities, which includes "Industrial installations for the production of electricity, steam and hot water (projects not included in Annex I)".

Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 km are included in Annex I of the same Directive. However, overhead lines that will be constructed within the scope of the Project are either 154kV or 400kV with lengths shorter than 15km. Therefore, the overall Project can be considered as Annex II Project.

3.3.7 International Conventions and Protocols

Turkey is party to various conventions and protocols related to management of environmental resources, biodiversity and cultural heritage at global and regional scales. The international conventions and protocols related to the Project and to which Turkey is a party are listed below:

Environment, Biodiversity and Cultural Heritage

- Kyoto Protocol enforced on February 16, 2005 and ratified by Turkey on August 26, 2009.
- United Nations Framework Convention on Climate Change enforced on March 21, 1994 and ratified by Turkey May 24, 2004.
- European Landscape Convention enforced in 2000 and ratified by Turkey in 2003.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora enforced on July 01, 1975 and ratified by Turkey December 22, 1996.
- Convention on Biological Diversity enforced on December 29, 1993 and ratified by Turkey in 1996.
- International Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) enforced on December 21, 1975 and ratified by Turkey in 1994.
- Bern Convention on the Conservation of European Wildlife and Natural Habitats enforced June 01, 1982 and ratified by Turkey in 1984.
- Convention on the Protection of the World Cultural and Natural Heritage enforced on December 17, 1975 and ratified by Turkey on February 14, 1983.

Labour

In 1932, Turkey became a member of the International Labour Organization (ILO), a specialized United Nations (UN) agency, which states its goals as "to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues". Conventions that are directly related to the Project in terms of providing a general labour management framework are listed below:

- ILO Safety and Health in Construction Convention enforced on January 11, 1991 and ratified by Turkey on March 23, 2015
- ILO Occupational Safety and Health Convention enforced on August 11, 1983 and ratified by Turkey on April 22, 2005
- ILO Worst Forms of Child Labour Convention enforced on November 19, 2000 and ratified by Turkey on August 02, 2001
- ILO Forced Labour Convention enforced on May 01, 1932 and ratified by Turkey on October 30, 1998
- ILO Minimum Age Convention enforced on June 19, 1976 and ratified by Turkey on October 30, 1998
- ILO Freedom of Association and Protection of the Right to Organize Convention enforced on July 04, 1950 and ratified by Turkey July 12, 1993
- ILO Worker's Representatives Convention enforced on June 30, 1973 and ratified by Turkey on July 12, 1993
- ILO Human Resources Development Convention enforced on July 19, 1977 and ratified by Turkey on July 12, 1993
- ILO Employment Policy Convention enforced on July 15, 1966 and ratified by Turkey on December 13, 1977
- ILO Social Security Convention enforced on April 17, 1955 and ratified by Turkey on January 29, 1975
- ILO Equal Remuneration Convention enforced on May 23, 1953 and ratified by Turkey on July 19, 1967

- ILO Discrimination (Employment and Occupation) Convention enforced on June 15, 1960 and ratified by Turkey on July 19, 1967
- ILO Abolition of Forced Labour Convention enforced on January 17, 1959 and ratified by Turkey on March 29, 1961
- ILO Right to Organize and Collective Bargaining Convention enforced on July 18, 1951 and ratified by Turkey on January 23, 1952

3.4 PROJECT ENVIRONMENTAL AND SOCIAL CATEGORISATION CRITERIA

For projects considered by IFIs for financing, the process for the assessment of environmental and social risks and impacts could range from full-scale ESIA to limited or focused assessments depending on the scale of the project and significance of the risks and impacts.

IFC, as part of the review of environmental and social risks and impacts of a proposed investment, uses a process of environmental and social categorization to reflect the magnitude of risks and impacts. The resulting category also specifies IFC's institutional requirements for disclosure in accordance with IFC's Access to Information Policy. These categories, which are also adopted by Equator Principles IV are as follows:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.
- Category FI: Business activities involving investments in financial institutions (FIs) or through delivery mechanisms involving financial intermediation (This category is further divided in 3 as FI-1, FI-2, and FI-3).

In IFC's Guidance Note 1 on the Assessment and Management of Environmental and Social Risks and Impacts, it is further stated that "For certain projects, and particularly for greenfield investments and projects (including, but not limited to, major expansion or transformation-conversion activities) involving specifically identified physical elements, aspects and facilities that are likely to generate potentially significant adverse environmental and social risks and impacts, the client should conduct a comprehensive full-scale ESIA".

The EBRD also categorizes each project to determine the nature and level of environmental and social investigations, information disclosure and stakeholder required. EBRD's description of each category is as follows:

- Category A: Projects that could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorization, cannot readily be identified or assessed, and which, therefore, require a formalized and participatory environmental and social impact assessment process.
- Category B: Projects with potential adverse future environmental and/or social impacts that are typically sitespecific, and/or readily identified and addressed through mitigation measures.
- Category C: Projects that are likely to have minimal or no potential adverse future environmental and/or social impacts and can readily be addressed through limited environmental and social appraisal.

The EBRD also provides an indicative list for Category A projects in the scope of its Environmental and Social Policy (2019) where Solar Power Projects are not included.

Based on above criteria and potential adverse impacts due to the Saros Hybrid SPP Project, the Project is considered as Category B Project in line with both IFC and EBRD standards.

4 IMPACT ASSESSMENT METHODOLOGICAL APPROACH

This section presents the methodological approach used for the assessment of the potential environmental and socio-economic impacts associated with the construction and operation of the proposed Project and associated facilities and indicates how the relevant mitigation measures to be adopted for avoiding, reducing or compensating such impacts will be considered as part of the impact assessment process.

Impact identification and assessment starts with scoping. Once identified, potential impacts need to be assessed in order to enable a judgement of their significance that allows for the prioritization of the mitigation/enhancement and management measures. Potential Project impacts are assessed in relation to environmental and biological resources as well as socio-economic resources (community, individuals, and social, economic and cultural assets) within the Project Area of Influence (AoI).

The principal ESIA steps comprise the following:

- <u>Impact prediction</u>: to determine what could potentially happen to resources or receptors because of the Project and its associated activities potential impacts are identified during the ESIA scoping phase.
- <u>Impact evaluation</u>: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource or receptor.
- <u>Mitigation and enhancement</u>: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- <u>Residual impact evaluation</u>: to evaluate the significance of impacts assuming effective implementation of identified mitigation and enhancement measures.

4.1 **PROJECT AREA OF INFLUENCE (AOI)**

According to the IFC Performance Standard 1 "where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence (AoI)", which is defined as to encompass the following (IFC, 2012):

- 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.
- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly affected by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The Project AOI consists of the environmental and social aspects within the Project License Area and the surrounding settlements that will potentially be affected by the Project activities and operations. Additionally, receptors within the 500m corridor along the project access roads and ETLs that was constructed are also assessed within the AOI.

4.2 IDENTIFICATION AND CHARACTERISATION OF IMPACTS

An 'impact' is any change to a resource or receptor caused by the presence of a project component or by a projectrelated activity. Impacts can be negative or positive and are defined in terms of their characteristics, including the impact's type (direct, indirect, induced, cumulative) and the impact's spatial and temporal features (i.e. extent, duration, scale and frequency).

Types of impacts are described as below:

- <u>Direct:</u> applies to an impact which can be clearly and directly attributed to a particular environmental or social parameter (e.g. dust generation directly affects air quality).
- <u>Indirect:</u> applies to impacts which may be associated with or subsequent to a particular impact on a certain environmental or social parameter (e.g. high levels of dust could entail nuisance and health effects to workers on site).
- <u>Induced:</u> applies to impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project.
- <u>Cumulative</u>: applies to impacts that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect.

Impact characteristics are defined Table 4-1 below.

Duration	Short-term: impacts with relatively short duration with respect to the whole duration of the project (e.g. limited to five-year period).	Long-term: impacts whose effects last longer than a period of five years, but limited to within the project lifetime.	Permanent: impacts that cause a permanent change in the baseline conditions and therefore also evaluated as irreversible
Extent	Local: impact affecting the environment or communities within the Project Aol.	Regional: impact affecting a wider area or socio- economic asset of importance going beyond the communities in the Project Area of Influence.	National: impact extending to the national level, or affecting assets of national importance.
Frequency	One-off/ Occasional: impacts that occur once only or occasionally.	Intermittent: impacts that occur periodically or repeatedly.	Continuous: impacts that happen continuously
Intensity/Impact scale	Low : limited impacts not causing any change or causing change hardly distinguishable from background conditions	Medium : impacts causing change, but not affecting the core structures/functions of the resource/receptor	High : impacts causing evident changes of core structures/functions of the resource/receptor
Likelihood	Unlikely: The event is unlikely but may occur at some time during normal operating conditions	Possible: The event is likely to occur at some time during normal operating conditions.	Likely: The event will occur during normal operating conditions (i.e. it is essentially inevitable).

Table 4-1: Impact Characterization Criteria

4.3 EVALUATION OF IMPACTS

A consistent approach to the assessment of impacts will be followed to enable environmental and social (E&S) impacts to be broadly compared across the ESIA. A set of generic criteria are used to determine impact significance and are applied across the various environmental and social parameters.

Environmental and social impacts are quantified as much as possible. For cases where quantification is not possible/applicable, a qualitative assessment is conducted using professional judgement, experience and available knowledge, and including the consideration of stakeholder views. Where there are limitations to the data, and/or uncertainties, these are recorded in the relevant sections, along with any assumptions made during the assessment.

In order to determine the significance of each impact, two overall factors are considered:

- Magnitude and nature of impacts
- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions.

4.3.1 Magnitude of Impact

Once impacts are characterised as per Table 4-1, they are assigned a 'magnitude' which is typically a function of some combination (depending on the subject receptor) of the following characteristics:

- Duration
- Extent
- Frequency
- Scale.

Magnitude is a continuum from small to large, along which evaluation requires professional judgement and experience. Each impact is evaluated on a case-by-case basis and the rationale for each determination is noted. Magnitude designations for negative effects are *negligible, small, medium* and *large*. The magnitude designations themselves are universally consistent, but the definition for the designations varies by issue. In the case of a positive impact, no magnitude designation is assigned as it is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact.

In the case of impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is used. In addition, the likelihood factor is also considered, together with other impact characteristics, when assigning a magnitude designation while likelihood is considered either possible or likely for impacts from a planned activity.

For biophysical impacts, the semi-quantitative definitions for the spatial and temporal dimension of the magnitude of impacts used in this assessment are provided as follows:

Negligible Magnitude Impact results in changes to the environment that may be immeasurable, undetectable or within the range of normal natural variation. Such changes are regarded as having no impact and characterised as having a negligible magnitude.

Low Magnitude Impact affects a specific area, system, aspect (physical), group of localised individuals within a population (biological) and at sufficient magnitude to result in a small increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) over a short time period (one plant/animal generation or less, but does not affect other trophic levels or the population itself), and localised area.

Moderate Magnitude Impact affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) and may bring about a change in abundance and/or distribution over one or more plant/animal generations, but does not threaten the integrity of that population or any population dependent on it (physical and biological). A moderate magnitude impact may also affect the ecological functioning of a site, habitat or ecosystem but without adversely affecting its overall integrity. The area affected may be local or regional.

High Magnitude Impact affects an entire area, system (physical), aspect, population or species (biological) and at sufficient magnitude to cause a significant measurable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) or a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations (physical and biological). A high magnitude impact may also adversely affect the integrity of a site, habitat or ecosystem.

For socioeconomic impacts, the magnitude considers the perspective of those affected by taking into account the likely perceived importance of the impact, the ability of people to manage and adapt to change and the extent to which a human receptor gains or loses access to, or control over socio-economic resources resulting in a positive or negative effect on their well-being. The quantitative elements are included into the assessment through the designation and consideration of scale and extent of the impact.

4.3.2 Sensitivity of Receptors

In addition to characterising the magnitude of impact, the other principal step necessary to assign significance for a given impact is to define the sensitivity of the receptor. There are ranges of factors to be considered when defining the sensitivity of the receptor, which may be physical, biological, cultural or human. Where the receptor is physical (for example, a water body) its current quality, sensitivity to change, and importance (on a local, national and international scale) are considered. Where the receptor is biological or cultural (i.e. the marine environment or a coral reef), its importance (local, regional, national or international) and sensitivity to the specific type of impact are considered. Where the receptor is human, the vulnerability of the individual, community or wider societal group is considered. As in the case of magnitude, the sensitivity designations themselves are universally consistent, but the definitions for these designations will vary on a resource/receptor basis. The universal sensitivity of receptor is low, medium and high.

For ecological impacts, sensitivity is assigned as negligible, low, medium or high based on the conservation importance of habitats and species. For socio-economic impacts, the degree of sensitivity of a receptor is defined as the level of resilience (or capacity to cope) with sudden social and economic changes. Criteria for deciding on the value or sensitivity of biological and socioeconomic receptors are presented as follows:

Negligible: A resource/receptor that has no or very low importance and rarity. The value of the resource/receptor is easily replaceable, or the resource/receptor is commonplace in the context of the assessment scope.

Low: A resource/receptor that has a high capacity to resist change. Recovery/regeneration is spontaneous upon cessation of Project activities. The value of the resource/receptor is considered low or easily replaceable or the resource/receptor is commonplace in the context of the assessment scope.

For ecological receptors, not protected or listed as common / abundant, or not critical to other ecosystem functions (e.g. key prey species to other species). For social receptors, those affected are able to adapt with relative ease and maintain pre-impact status.

Medium: A resource/receptor that has a moderate capacity to resist change. Recovery may require some intervention measures and/or time after cessation of project activities. A resource/receptor that is important locally or regionally in the context of the assessment scope.

For ecological receptors, not protected or listed but may be a species common globally but rare in Turkey with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline. For social receptors, those able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.

High: A resource/receptor with limited or no capacity to resist change and is vulnerable. Recovery will require a long time or may not be possible (permanent loss). A resource/receptor that is important nationally or globally in the context of the assessment scope.

For ecological receptors, specifically protected under national legislation and/or international conventions. Listed as rare, threatened or endangered. For social receptors, those affected will not be able to adapt to changes and continue to maintain pre-impact status.

4.3.3 Assessment of Impact Significance

In order to assess the significance of an impact, the sensitivity of the receiving environmental or social parameter is considered in association with the magnitude of the impact, according to the matrix shown in Table 4-2.

Magnitude of	Sensitivity of receptor						
impact	Negligible	Low	Medium	High			
Negligible	Negligible	Negligible	Negligible	Negligible			
Low	Negligible	Negligible	Minor	Moderate			
Moderate	Negligible	Minor	Moderate	Major			
High	Minor	Moderate	Major	Major			

Table 4-2: Impact Significance Matrix

While the above matrix provides a framework for the determination of significance and enables comparison across environmental and social parameters, a degree of professional judgement is required, and some parameter-specific factors considered in making a determination of impact significance.

Additional guidance to the degrees of significance in the ESIA is provided below. Positive impacts provide resources or receptors, most often people, with positive benefits. Note that positive impacts are defined, but not rated for significance.

- **Negligible significance**: The impact is hardly distinguishable from background conditions and expected development in a no-project situation or the predicted effect is deemed 'imperceptible' or is indistinguishable from natural background variations.
- **Low significance**: a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.
- **Medium significance**: has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
- High significance: an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of impact assessment is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP³ has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

4.3.4 Mitigation Potential and Residual Impacts

A key objective of an ESIA is to identify and define socially, environmentally and technically acceptable and costeffective mitigations measures to avoid, reduce, remedy or compensate for potential negative impacts, and to enhance potential environmental and social benefits.

Impacts with <u>negligible and low significance</u> usually do not require any additional mitigation measure. This means that these impacts are within acceptable limits because:

- they are very unlikely to happen; and/or
- the sensitivity of receiving environment is very low; and /or
- project designs have installed sufficient control mechanisms.

For negligible and low significance impacts, should inherent control measures fail, the implementation of additional control measures should ensure impacts remain acceptable.

Impacts with <u>medium significance</u>, deemed as significant impacts, require additional mitigation measures to reduce the impacts at acceptable levels. These impacts can be minimized in order to reach negligible or low levels that are also deemed as acceptable level of impacts (using effective control measures).

Impact with <u>high significance</u> generally require imperative mitigation to reduce the significance to lower levels before proceeding with the Project.

Positive impacts should be subject to enhancement measures where possible.

The approach followed to define mitigation measures is based on a typical hierarchy of decisions and measures, as described in Figure 4.3-1. The priority is to first apply mitigation measures to the source of the impact (i.e. to avoid or reduce the magnitude of the impact from the associated Project activity); and then to address the resultant

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³ ALARP, which stands for "as low as reasonably practicable" is a principle that aims to reduce residual risk while not incurring unrealistic costs or effort.

effect to the resource/receptor via abatement or compensatory measures or offsets (i.e. to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).



4.3.5 Figure 4.3-1: Mitigation HierarchyResidual Impact Assessment

Once mitigation measures are declared, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation measures.

4.3.6 Cumulative Impacts

Cumulative impacts result from combination of an impact from the Project with an impact from another activity / project. How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g. already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts.

The approach for assessing cumulative impacts is to screen potential interactions with other projects based on:

- Projects that are already in existence and are operating;
- Projects that are approved but not as yet built or operating; and
- Projects that are a realistic proposition but are not yet built.

5 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 AMBIENT AIR QUALITY

5.1.1 Project Standards

The Project will comply with the following regulations and standards:

- Turkish Air Quality Assessment and Management Regulation (AQAMR).
- Turkish Industrial Air Pollution Control Regulation (IAPCR).
- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, April 30, 2007.
- Directive 2008/50/EC on ambient air quality and cleaner air for Europe.
- World Health Organization (WHO) Ambient Air Quality Guidelines.

Regulation on Assessment and Management of Air Quality published in Official Gazette numbered 26898 and dated June 6, 2008 and Regulation on Industrial Air Pollution Control published in Official Gazette numbered 27277 dated on July 3, 2009 are regulations that govern the ambient air quality in Turkey. Ambient air quality standards for pollutants defined in Turkish regulations are presented in Table 5-1 for 2024 and subsequent years. These limit values are based on a tiered system and decrease gradually to reach the target criteria in 2024.

Industrial Air Pollution Control Regulation aims to protect human health and environment from negative impacts of air pollution in the receiving environment by controlling emissions in the form of smoke, dust, gas, vapour and aerosols generated because of industrial activities and energy production. Emission limits are defined for stack and non-stack emission sources in the Regulation (Annex 2, Table 2.1). When these emission limits are exceeded, the contribution to air pollution should be calculated with an internationally recognized dispersion model.

Parameter	Duration	Limit Value (µg/m³)
	Hourly (cannot be exceeded more than 24 times a year)	350
SO ₂	24 hour	125
	Long term limit	60
	Annual and winter season (October 1 - March 31)	20
NO	Hourly (cannot be exceeded more than 18 times a year)	200
NO ₂	Annual	40
DM	24 hour (cannot be exceeded more than 35 times a year)	50
	Annual	40
СО	8 hour daily maximum	10.000
O ₃	8 hour daily maximum	120
VOC*	Hourly	280
VUC	24-hour	70

Table 5-1: Turkish Ambient Air Quality Limit Values

*: Limit Value for VOC is provided in Industrial Air Pollution Control Regulation while others are in Regulation on Assessment and Management of Air Quality

IFC EHS Guideline refers to the limit values recommended by the World Health Organization (WHO) Ambient Air Quality Guidelines as given in Table 5.2 below. In addition, the IFC EHS Guidelines suggest that air emissions from project activities should not result in pollutant concentrations higher than the relevant national ambient quality guidelines and standards.

Parameter	Duration	Guideline Value (µg/m³)
20	10 minute	500
302	24 hour	20
NOr	Hourly	200
NO2	Annual	40
Porticulate Matter (DM.c)	24 hour	50
	Annual	20
Particulate Matter (DM, -)	24 hour	25
	Annual	10
O ₃	8 hour daily maximum	100

Table 5-2: IFC - WHO Ambient Air Quality Guideline Values

5.1.2 Baseline Conditions

5.1.2.1 <u>Climate and Meteorological Data</u>

In order to evaluate the meteorological conditions of the project area, long-term statistical data recorded by Çanakkale Meteorology Station for the period 1960-2017 was reviewed; the findings are discussed below and the overall data is presented in Appendix A for reference.

According to the Saros Hybrid Solar PV Project Environmental Impact Assessment Report (2022). Çanakkale, where the Mediterranean climate is predominant, is in a transition zone between the Mediterranean and Black Sea climates. Terrain elevation, with respect to sea level, increases from the coastal area as you move inland and therefore temperature differences increase. While the Mediterranean climate is predominant at Edremit Gulf, central and Gelibolu Peninsula are dominated by colder weather. Winters and springs are rainier than other seasons. Çanakkale differs from neighbouring Provinces by the elevated wind speeds it experiences throughout the whole year.

The monthly average, maximum and minimum temperature records and long-term rainfall observation data are provided in Table 5-3. As presented in the table, average annual temperature is 15.1°C while the maximum temperature is 39.1°C and minimum is -11.2°C. Average annual rainfall is recorded as 631.7 mm in Çanakkale, with the highest daily rainfall observed in May at 110 mm. Average annual humidity is recorded as 75.1%.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Νον	Dec	Ann
Avg. Temp. (°C)	6.2	6.7	8.4	12.5	17.5	22.2	24.9	24.9	21	16.2	12	8.3	15.1
Max. Temp. (°C)	20	21.2	24.2	28.4	38.9	36.8	39	39.1	35.9	31.7	25.2	22.9	39.1
Min. Temp. (°C)	-9.2	- 11.2	-8.4	-1.3	3.4	6.6	11.4	11.6	6	0.4	-4.4	-8.4	-11.2
Avg. Total Rainfall (mm)	88.5	70.7	64.1	48.2	31.8	24.2	15	7.7	26	57.9	85.7	111.9	631.7
Max. Daily Rainfall (mm)	91.5	58.7	86	72.2	110	50.5	80.6	45.5	63.8	104.8	101.9	96.3	110

Table 5-3: Long Term Meteorological Data of Çanakkale Province (1960-2018)

Annual wind rose diagrams (annual and seasonal) based on the wind data recorded by the Çanakkale Meteorology Station are presented in Figure 5-1. As it can be seen from the diagrams, the predominant wind direction is observed to be north-northeast (NNE); northeast (NE) and east-northeast (ENE) are the second and the third predominant wind directions.

Wind data shows that average annual wind speed is around 4 m/s in Çanakkale. Table 5-4 presents average monthly wind speed data. Furthermore, average wind speed diagram, which is provided in Figure 5-2, shows that the directions with the highest wind speed are south-southwest (SSW), southwest (SW) and south (S). The maximum wind speed of 38.7 m/s was recorded in February and southwest direction.

Table 5-4: Average Monthly Wind Speed (1960-2017)

	Jan	Feb	Mar	Apr	Мау	June	July	Aug	Sep	Oct	Nov	Dec	Ann
Avg. Wind Speed (m/s)	4.30	4.50	4.20	3.80	3.50	3.40	3.90	4.00	3.70	3.80	3.90	4.40	4.00





Figure 5-1: Seasonal Wind Rose Diagrams (1960-2017)





5.1.2.2 <u>Air Quality</u>

The closest Air Quality Monitoring Station (AQMS) to Saros WF Project is located in Çan District (approximately 11 km to the southeast to the Project). Online air quality data including 5-year (2014-2018) annual average concentrations of (PM_{10} , SO_2 , NO, O_3 , CO, NO_x) measured in Çan AQMS are presented in Table 5-5. As it is seen from the table, all parameters have shown fluctuating trends in the previous years. It should be noted that annual average concentration of PM10 measured in Çan AQMS is always above the Turkish and the WHO limit values while NO_2 is below these standards. On the other and, annual average concentration of SO2 is observed to be below the Turkish limit values in 2018 and 2020 while it is observed this limit in 2019, 2021 and 2022.

Veer	Annual Average Concentration (µg/m³)							
real	PM10	SO ₂	NO ₂	O ₃	CO	NOx		
2018	54.00	12.06	15.45	50.15	NM	29.66		
2019	54.90	23.46	7.34	48.05	NM	19.62		
2020	46.55	17.95	7.31	63.45	NM	17.02		
2021	49.72	28.64	16.93	51.09	NM	30.95		
2022	51.94	30.91	19.83	42.01	NM	34.07		
Turkish Ambient Air Quality Limits (Annual)	40	20	40	-	-	-		
IFC/WHO Ambient Air Quality Limits (Annual)	20	-	40	-	-	-		

Table 5-5: Çan AQMS - Measured Annual Average Concentrations

Source: Official Website of National Air Quality Monitoring Station (<u>http://www.havaizleme.gov.tr</u>); * NM: Not measured

As the records of Çan Air Quality Monitoring station would not provide representative data for the project site, baseline measurements were required in order to further understand the ambient air quality at the project area. Therefore, 2019 ambient air quality measurement results of the Saros WF Project baseline studies have been utilised for this purpose.

24 hour PM_{10} and settled dust (SD) measurements were conducted at the settlements near Saros WF Project Area between August 5, 2019 and August 8, 2019. The measurement locations were selected by taking into account that construction activities may affect nearby settlements, agricultural and meadowlands through dust generation.

 PM_{10} and SD measurement locations are shown in Figure 5-3and results are presented in Table 5-6. All PM_{10} measurement results were well below the 24-hour limit value (50 µg/m³) set by the Turkish Regulation on Assessment and Management of Air Quality and WHO Ambient Air Quality Guidelines.



Figure 5-3: PM10 and Settled Dust Measurement Locations

Settlement where	Coord	linates	PM10	Settled Dust	
taken	Х Ү		(µg/m³)	(mg/m²-day) ¹	
Turkish Ambient Air Quali	ty Limits (24hr)	50	-		
IFC/WHO Ambient Air Qu	ality Limits (24hr)	50	-		
Akçalı Village	467222	4436823	27	8	
Bodurlar Village	469667	4440165	16	9	
Kocalar Village	479857	4435948	18	7	

Table 5-6: PM10 and SD Measurement Results (24 hour) (August 5-8, 2019)

Bahadırlı Village	492463	4431084	37	NM ²
Doğancılar Village	490949	4432693	28	8

*: ¹: Average of two periods; ²: Not measured

Online data gathered from Turkstat (Turkish statistical Institute, 2018) on Greenhouse Gas (GHG) emissions for all sectors (energy, industry, agriculture and waste) in Turkey between 2014 and 2018 are presented in Table 5-7 and GHG emissions by sectors are presented in Table 5-8. According to Turkstat data, total GHG generation in 2018 was 520.9 million tons CO_{2eq} which decreased by 1 % when compared to the previous year.

Table 5-7: Total GHG Emissions in Turkey over Years (2014-2018)

Year	Total (CO₂₀q) (Million Tonnes)	Total (CO2eq)CO2CH4(Million Tonnes)(Million Tonnes)(Million Tonnes)		N₂O (Million Tonnes)	F-gases (Million Tonnes)
2014	458.0	361.7	57.3	33.9	5.1
2015	472.2	381.3	51.3	34.7	4.8
2016	498.5	401.2	53.9	37.1	6.3
2017	526.3	425.3	54.2	38.5	8.2
2018	520.9	419.2	57.6	38.9	5.2

Source: www.tuik.gov.tr, TurkStat, Greenhouse Gas Emissions Statistics; http://tuik.gov.tr/PreIstatistikTablo.do?istab_id=614

Table 5-8: GHG Emissions by Sectors (2014-2018)

Year	Total (Million Tonnes)	Energy (Million Tonnes)	Industrial processes and product use (Million Tonnes)	Agriculture (Million Tonnes)	Waste (Million Tonnes)
2014	458.0	325.8	58.5	55.5	18.2
2015	472.2	340.9	57.0	55.4	18.8
2016	498.5	359.7	62.2	58.2	18.4
2017	526.3	379.9	66.5	62.5	17.4
2018	520.9	373.1	65.2	64.9	17.8

Source: www.tuik.gov.tr, TurkStat, Greenhouse Gas Emissions Statistics; http://tuik.gov.tr/PreIstatistikTablo.do?istab_id=488

5.1.3 Sensitivity of Receptor

The sensitivity of the receptors was defined based on the criteria provided in Section 4.3.2 of this ESIA and associated baseline conditions. Receptors of the ambient air quality impact and their sensitivity are presented in Table 5-9 below:

Table 5-9: Sensitivity Criteria for Air Quality Receptors

Receptors	High	Medium	Low	Negligible
Human / Ecological Receptors	Residents of nearby settlements (i.e. Bodurlar, Akçalı, Haliloğlu, Karacalar, Dedeler, Kocalar, Kumarlar, Bahadırlı, and Doğancılar)	Agricultural areas and forest lands within the License Area Key Biodiversity Areas (i.e. small section of Biga Mountains KBA)	Users of agricultural areas	Industrial Areas

5.1.4 Impact Assessment

5.1.4.1 Land Preparation and Construction Phase

The main emission sources of the land preparation and construction period are:

- Dust emissions due to land preparation and general construction activities including earthworks; and
- Exhaust emissions from the construction machinery and equipment.

Dust generation comprises the major source of air pollution caused by construction activities especially the earthworks. Project earthworks will comprise land levelling and excavation, construction of access roads and excavations for underground cable trenches. Particulate matter is present in the atmosphere for only a short period after release, as particles are heavy enough to settle relatively quickly. Therefore, impacts of dust emission will be localised and will not cause long-term or widespread changes to local air quality. However, deposition of particulate matter will cause short-term impacts on the settlements and agricultural areas in close proximity to the project area.

An average of 5 cm stripping will be carried out for the entire panel area resulting in approximately 60,000 m³ excavation material. Excavated materials are planned to be temporarily stored on site near the excavation points until they are used for filling. In addition, 40,000 m³ of structural fill material will be transferred to the site for backfilling. Excavation works are anticipated to be completed within 9 months.

Dust emissions are closely related to the specific source conditions, such as type of activity, nature of earth, and the meteorological conditions. However, dust emissions due to site preparation activities can be predicted using the typical emissions factors as presented in the following table (US EPA, 2016).

Table 5-10: Uncontrolled Particulate Emission Factors for Open Dust Sources

Sources	TSP Emission Factors	Unit
Topsoil removal by scraper	0.029	kg/ton
Truck loading by power shovel	0.018	kg/ton
End dump truck unloading	0.004	kg/ton

* Emission factors derived from Section 11.9, Table 11.9-4 of AP-42 (US EPA, 2016).

Once excavation details are known, site preparation activities and corresponding dust emissions can be calculated based on the following assumptions on cut and fill amounts, bulk density of soil, duration of earth works, size of the area on which activities take place, etc. The variables used in estimation of dust emissions are presented in Table 6.8 and the estimated controlled and uncontrolled dust emissions are presented in

Table 5-12. It is assumed that 30% of Total Suspended Particulate (TSP) emissions is due to PM₁₀.

	Excavation amount	60,000	m ³
Excavation	Excavation amount per day	266	m³/day
	Bulk density of sandy soil	1.60	ton/m ³
	Mass of excavated soil	96,000	ton
	Area of concern	120	ha
	Fill amount	40,000	m ³
Ē	Mass of soil to be filled	64,000	ton
	Daily amount of fill	284	m³/day

Table 5-11: Parameters used in Estimation of Dust Emissions

Table 5-12: Estimated Dust Emissions due to Site Preparation Works

Activity	Uncontrolled TSP Emission (kg/hr)	Uncontrolled PM10 Emission (kg/hr)	Controlled TSP Emission (kg/hr)	Controlled PM10 Emission (kg/hr)	Total PM Flux (g/m².sec)
Topsoil removal by scraper	0.39	116.00	0.19	0.06	1.38 x10⁻⁵
Truck loading by power shovel	0.24	72.00	0.12	0.04	8.54 x10 ⁻⁶
End dump truck unloading	3.5x10⁻⁵	1.07 x10 ⁻⁵	1.78 x10⁻⁵	5.33 x10 ⁻⁶	1.26 x10 ⁻⁹

As it is seen in

Table 5-12 estimated dust emissions resulting from excavation works is not likely to exceed the limit value (1kg/hr) defined in the Industrial Air Pollution Control Regulation even when uncontrolled. Therefore, the Project will not benefit from the modelling study and potential impacts are considered insignificant.

In addition to dust emissions, there will be exhaust gases emissions from operation of construction machinery and equipment. Construction machinery and equipment that is planned to be used during the construction phase and associated fuel consumption are listed in Table 5-13. Calculation of exhaust emissions is based on the following assumptions:

- Diesel fuel will be used for all construction machinery and equipment;
- All machinery and equipment will operate at the same time but not in the same position and that they will be scattered at different locations within the license area;
- All machinery and equipment will comply with Stage V emissions⁴.

⁴ Machinery complying with the European Commission's proposed 'Stage V' emission limits.

Machinery / Equipment	Maximum Number	Engine Power (kW)	Fuel Consumption (g fuel / kWh)
Excavator	10	500	250
Grader	3	228	250
Vibratory Roller	4	55	260
Water Sprinkler	4	88	255
Loader	3	183	250
Backhoe loader	2	183	250
Truck	40	367	250
Dozer	3	130	250
Tractor	5	130	250
Crane	5	367	250
Colon Pile Driver	7	135	250

Table 5-13: Estimated Fuel Consumption of Planned Construction Machinery and Equipment

EMEP/EEA Air Pollutant Emission Inventory Guidebook (2016) – Update May 2017, Tier 2 approach for Category 1.A.2.g.vii: Mobile combustion in manufacturing industries and construction was adopted for the calculation of NOx, CO, PM and SO₂ emissions. Tier 2 emission factors (EFs) presented in Table 5-14 below have been used for calculations:

Table 5-14: Tier 2 Emission Factors for Diesel Construction Equipment

	NOx	со	РМ
Emission Factors (g/ton fuel)	7,663	7,352	116

Source: EMEP/EEA Air Pollutant Emission Inventory Guidebook (2016) Tier 2 Emission Factors for Non-road mobile sources and machinery, Table 3-2.

The generic algorithm for calculating emissions using the Tier 2 approach is:

$$E_i = \sum FC \times EF_i$$

where:

Ei = mass of emissions of pollutant i [g/sec],

FC= fuel consomption [ton fuel/sec],

EFi = average emission factor for pollutant i [g/ton fuel],

i = pollutant type.

Fuel consumption (FC) above is calculated as follows:

$$FC\left[\frac{\text{ton fuel}}{\text{sec}}\right] = \text{Engine Power } [kW] \times FC\left[\frac{\text{g fuel}}{\text{kWh}}\right] \times \frac{1 \text{ ton}}{10^6 g} \times \frac{1h}{3600 \text{sec}}$$

SO₂ emissions are estimated by assuming that all sulphur in the fuel is transformed completely into SO₂ using the formula given below:

$$E_{SO2} = 2 \sum k_S \times FC$$

where:

kS = weight related sulphur content of fuel [kg/kg] (taken as 400 ppm),

FC = fuel consumption [kg] (given in Table 5-13).

Calculated emissions of NOx, CO, PM and SO_2 for the peak time of construction activities (assuming that all construction machinery is operational at the same time) are presented in Table 5-15 below.

Table 5-15: Estimated Exhaust Emissions from Construction Machinery and Equipment

Parameters	Estimated Emission Rates (g/sec)
NO _x (as NO ₂)	6.35 (1.27 as NO ₂)
CO	6.09
PM	0.096
SO ₂	0.663

Exhaust Emissions from Road Transportation was also calculated based on Tier 2 exhaust emission factors for heavy-duty vehicles as presented in Table 5-16. Calculations were based on the assumptions that maximum estimated number of heavy-duty vehicles will operate at the same time with 60km/hr speed. Calculated emissions due to road transport are provided in Table 5-17 below.

Table 5-16: Tier 2 Emission Factors for Diesel heavy-duty vehicles

	NOx	СО	PM
Emission Factors (g/veh.km)	0.012	0.121	0.0013

Source: EMEP/EEA Air Pollutant Emission Inventory Guidebook (2016) Tier 2 Emission Factors for Non-road mobile sources and machinery, Table 3-2.

Table 5-17: Estimated Exhaust Emissions from Road Transportation

Parameters	Estimated Emission Rates (g/sec)
NO _x (as NO ₂)	0.34 (0.06 as NO ₂)
CO	0.008
PM	0.080
SO ₂	0.134

The most critical phase occurs, when several concurrent activities on site will involve a higher number of different heavy equipment for construction and earth moving. As such, the exhaust emissions will be effective for a limited period of time and mostly effective within the boundaries of the construction area (local scale of influence). The potentially induced impact on air quality due to exhaust emissions from road transport and construction equipment during construction phase is evaluated of **low significance** and **reversible**.

Based on above calculations and baseline conditions of the License Area, evaluation of the potential impact on air quality, mainly due to dust emissions from land preparation and construction activities is summarised in the following table.

Pacantar	Sonoitivity	Nature of Impact			Impact		Impact
Neceptor	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significance
Residents of Bodurlar, Kocalar and Dedeler	High	Short- term	Local	Intermittent	Low	Negligible	Negligible
Agricultural areas and forest lands Section of Biga Mountains KBA near the Project Area	Medium	Short- term	Local	Intermittent	Low	Low	Minor
Users of agricultural areas	Medium	Short- term	Local	Intermittent	Low	Low	Minor

5.1.4.1.1 *Mitigations, Management and Monitoring*

The following measures will be implemented avoid or minimise the potential impacts on air quality during the land preparation and construction phase of the Project:

- Construction Dust and Air Emission Control Plan will be implemented.
- Daily Visual Checks will be conducted at the selected nearby settlements and necessary mitigations such as stop/pause of construction activities will be taken where required;
- Dust control methods such as covers, or wind barriers/curtains implemented for open materials storage piles and at locations where dust generating activities will be carried out;
- Access roads will be chip sealed to prevent dust generation by vehicle movements;
- Speed limits will be in place for vehicles travelling inside the construction site;
- Loads in all trucks transporting dust-generating materials will be covered to prevent dust generation;
- Loading and unloading of materials will be applied without throwing and scattering;
- Vehicle engines and other machinery will be turned off when not in use, avoiding any unnecessary emissions;
- Periodical maintenance of machinery and equipment will be carried-out to ensure their good working condition and compliance with standards and technical regulations for the protection of the environment and have appropriate certifications;
- Minimum number of machinery and equipment will operate at the same time where possible;
- Project Grievance Mechanism will be applied as part of Stakeholder Engagement Plan. If any comment related with dust and air quality is received through the Grievance Mechanism, the complaint will be evaluated and where necessary corrective actions will be implemented.

5.1.4.1.2 *Residual Impact*

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential air quality impacts are summarized below.

Receptor	Impact Significance
Residents of Bodurlar, Kocalar and Dedeler	Negligible
Agricultural areas and forest lands Section of Biga Mountains KBA near the Project Area	Negligible
Users of agricultural areas	Negligible

5.1.4.2 Operation Phase

During the operation of the plant, electrical energy will be used for heating of the administrative building therefore no emissions will occur, and also vehicle traffic will be minimal. Therefore, the operation of the plant is not anticipated to cause air emissions and have any adverse impact on local air quality.

Accordingly, the anticipated impact on local ambient air quality during operations will be negligible.

5.1.4.3 <u>Greenhouse Gas Emissions</u>

GHG Protocol of the World Business Council on Sustainable Development and World Resources Institute was followed for GHG assessment of the Saros Hybrid SPP Project.

GHG assessment is based on definition of the operational boundaries and scope of the direct and indirect emissions for operations within an organizational boundary. The operational boundaries of consideration are classified as Scope 1, Scope 2 and Scope 3; an overview of these scopes and their associated emissions are illustrated in Figure 5-4.



Figure 5-4: GHG Scopes and Associated Emissions5

Scope 1 – Direct GHG Emissions are typically direct GHG emissions from company owned facilities and vehicles.

<u>Scope 2 – Electricity Indirect GHG Emissions</u> include emissions from the generation of purchased electricity that is consumed in company's owned or controlled equipment or operations.

Scope 3 – Indirect GHG Emissions include extraction and production of purchased materials and fuels, transport – related activities, electricity-related activities not included in Scope 2, leased assets, franchises and outsourced activities, use of sold products and services and waste disposal.

⁵ <u>https://ghgprotocol.org/</u>

GHG Protocol mandates calculation of Scope 1 and Scope 2 while calculation of Scope 3 emissions is optional.

According to the World Bank, energy generated from renewable sources avoids emissions that would otherwise be generated wholly or partly from more carbon-intensive sources.⁶ In other words, renewable energy projects displace emissions associated with other electricity generation on the grid. Furthermore, the World Bank notes that the construction phase emissions for renewable energy projects may be excluded from GHG assessment.

In order to calculate the Project's contribution to displacement of emissions associated with other electricity generation on the national grid, annual energy production of the project was multiplied by the combined margin (CM) emission factor for Turkey, which was reported as 0.497 tCO_{2e} /MWh in 2017^7 . Noting that annual energy production of the Project will be about 0.55 TWh after fully operational, energy production by the Project will annually displace 0.27 million tCO₂e emission on the national grid.

Based on GHG emission calculations provided above and the baseline characteristics of the area, summary of the impact evaluation for GHG Emissions associated with the operation phase is provided below.

Receptor	Sensitivity	Nature of Impact			Impact	Impact	
		Duration	Extent	Frequency	Intensity	Magnitude	Significance
GHG Emission Displacement due to Operations	Medium	Long-term	International	Continuous	High	Moderate (Positive)	Moderate (Positive)

5.1.4.4 Decommissioning Phase

Potential air emission sources (mainly dust and exhaust emissions) will be similar to the construction phase during the decommissioning phase. Mitigation measures will be similar to the ones that will be taken during construction and be in place to minimise the impacts until the decommissioning activities are complete. Therefore, **limited impacts** are anticipated on ambient air quality.

⁶ IFI Approach to GHG Accounting for Renewable Energy Projects (World Bank, 2015)

⁷ <u>https://www.climate-transparency.org/wp-content/uploads/2017/07/B2G2017-Turkey.pdf</u>
5.2 NOISE IMPACTS

5.2.1 Project Standards

The Saros Hybrid SPV Project is required to comply with the following regulations and standards:

- Turkish Regulation on the Assessment and Management of Environmental Noise (RAMEN).
- IFC General EHS Guidelines: Noise Level Guidelines, April 30, 2007.
- WHO Guidelines for Community Noise, 1999.

The Turkish RAMEN sets noise limits for different types of areas including industrial zones, residential areas or combination of both for three periods; day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) which is presented in Table 5-18. The Regulation also sets specific limit values for the construction activities as provided in Table 5-19. Construction activities are not allowed near or within the residential areas during evening and night-time (between 19:00-- and 07:00). In line with RAMEN, construction activities will only take place in daytime therefore the stricter of day-time limit values of RAMEN and IFC/WHO Guidelines need to be by the Project activities.

Table 5-18: Environmental Noise Limits for Industrial Facilities (RAMEN)

Area Type	L _{Aeq} Day (07:00- 19:00) (dBA)	L _{Aeq} Evening (19:00- 23:00) (dBA)	L _{Aeq} Night (23:00- 07:00) (dBA)
Areas where sensitive receptors are located including education, culture, health, summer houses and camping areas	60	55	50
Commercial and residential areas where residential buildings dominate	65	60	55
Commercial and residential areas where workplaces dominate	68	63	58
Industrial areas	70	65	60

Table 5-19: Environmental Noise Limits for Construction Areas (RAMEN)

Construction Activity (construction, demolition, maintenance)	L _{Aeq} day (07:00- 19:00) (dBA)
Building	70
Road	75
Other	70

According to the IFC General EHS Guidelines, noise levels at the receptors should not exceed the noise levels set by WHO Guidelines for Community Noise as provided in Table 5-20 or result in a maximum increase in background levels of 3 dB at the nearest receptor off-site.

Table 5-20: IFC – WHO Noise Limits at the Receptors

Receptor	L _{Aeq} Day (07:00- 22:00) (dBA)	L _{Aeq} Night (22:00- 07:00) (dBA)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

* IFC EHS Guidelines define the daytime as 07:00-22:00 and night-time as 22:00-07:00.

5.2.2 Baseline Conditions

Within the scope of Saros Wind Farm ESIA studies, baseline environmental noise measurements were conducted by an accredited laboratory in August 5-8, 2019 at six (6) locations. Noise sensitive locations were selected based on distances to the Saros WF turbines and access roads (Figure 5-5 for the measurement locations). The noise measurements were performed for 48 hours at four locations that are the closest settlements to the turbines.

Although Doğancılar and Bahadırlı Villages are located at relatively longer distances to the Project Area, these settlements might be sensitive to noise due to the access routes that will pass through their borders. For this reason, one-hour daytime and evening-time measurements were performed at these two locations.

Noise measurements were undertaken with SVAN 971 and SVAN 975 devices (See Figure 5-6 for devices photo), which comply with the standards of ANSI S1.4, IEC 651, IEC 61672-1:2002 and IEC 804. Calibration of the equipment was done before and after each measurement with a SV 30A SN: 22502 acoustic calibrator at 94 and 114dBA. All measurement systems were set to log LAeq noise levels over the required fifteen-minute intervals during measurement period. Noise measurements were undertaken 1.5m above ground level and at least 3.5 m far from any vertical reflective surfaces.



Figure 5-5: Background Noise Measurement Locations

The noise measurement locations and results with respect to RAMEN and IFC/WHO standards are provided in Table 5-21. Noise Measurement Report prepared by the laboratory is provided in Appendix B.

As seen from Table 5-21, there is exceedance of IFC/WHO limit value for evening time (22:00-07:00) at Haliloğlu Village (N-HLL). Similarly, one-hour measurement results that were conducted at Doğancılar (N-DGN) and Bahadırlar (N-BHD) Villages are above the same limit. On the other hand, all results are below Turkish RAMEN standards for residential areas.

Noise		Coordinates		Results with respect to RAMEN Standards Leq (dBA)			Results with respect to IFC/WHO Standards Leq (dBA)	
Measurement Locations		x	x Y	Day Time (07:00-19:00)	Evening Time (19:00-23:00)	Night Time (23:00-07:00)	Day Time (07:00-22:00)	Evening Time (22:00-07:00)
				60 dBA	55 dBA	50 dBA	55 dBA	45 dBA
N-BDL	Bodurlar	469669	4440172	45.4	42.0	41.5	43.3	41.5
N-AKC	Akçalı	467232	4436841	42.6	37.2	34.7	41.8	35.6
N-HLL	Haliloğlu	470256	4435303	47.6	45.4	52.7	47.0	52.4
N-KCL	Kocalar	479852	4435943	42.2	45.0	41.7	42.7	42.7
N-DGN	Doğancılar	490933	4432691	51.6	51.8	48.6	51.6	50.4
N-BHD	Bahadırlı	492464	4431085	45.4	42.0	41.5	43.3	41.5

Table 5-21: Noise Measurement Results with Respect to RAMEN Standards



Figure 5-6: Noise Measurement Device

5.2.3 Sensitivity of Receptor

The sensitivity of the receptors was defined by following the approach that Turkish RAMEN defined to set ambient noise levels for different receptors and taking the criteria provided in Section 5.2.2 of this ESIA and associated baseline conditions into account.

Receptors sensitivity criteria is presented in Table 5-22 below. Due to the distance to the Saros Hybrid SPV Project, residents of Bodurlar, Kocalar and Dedeler Villages have been identified as the noise sensitive receptors (High sensitivity) of the Project activities.

Table 5-22: Sensitivity Criteria for Noise Receptors

Receptors	High	Medium	Low	Negligible
Human receptors	Areas where sensitive receptors are located including education, culture, health, summer houses and camping areas (i.e. Bodurlar, Kocalar and Dedeler)	Commercial and residential areas where residential buildings dominate	Commercial and residential areas where workplaces dominate	Industrial areas

5.2.4 Impact Assessment

5.2.4.1 Land Preparation and Construction Phase

During land preparation and construction activities noise impacts will occur due to operation of construction machinery and equipment.

Generated noise levels at source will be a function of number and type of operating machinery and equipment at the construction sites. Noise levels at the receptors will differ depending on:

- Alignment of the machinery and equipment throughout the Project area;
- Distance to the receptor;
- Ground and air absorption and barrier effects.

Type, number and sound power levels of construction machinery and equipment that are currently planned to be operated during construction activities are provided in Table 5-23. Construction equipment noise levels provided in the Construction Noise Handbook (2006) of the U.S. Federal Highway Administration have been referred to for the estimated maximum sound levels at 50 feet (15m) from sources.

Table 5-23: Sound Power Levels of Construction Machinery and Equipment

Machinery / Equipment	Maximum Number Planned	Lmax @50ft (dBA)
Excavator	8	85
Grader	2	85
Vibratory Roller	4	85
Water Sprinkler	3	80
Loader	1	85
Backhoe loader	5	80
Dump Truck	10	84
Dozer	2	85
Tractor	2	84
Crane	3	85
Concrete Mixer	8	84
Concrete Pump	2	82
Pile Driver	8	101
Telehandler	8	80

*: Source: Construction Equipment Noise Levels and Ranges, Construction Noise Handbook of the U.S. Federal Highway Administration

Cumulative Noise Level at the Source is calculated based on the assumption that the maximum number of all machines/equipment operates at the same time at one location with maximum sound levels in order to demonstrate the worst-case situation.

Total noise level generated by all noise sources, is calculated with the formula given below:

$$L_{WT} = 10 Log\left(\sum_{i=1}^{n} 10^{L_{Wi}/10}\right)$$

where;

n: Number of noise source

LWi: Sound power level of each source (dBA)

LWT: Cumulative noise level at the source

Accordingly, total noise level at the source has been calculated as <u>101.2 dBA</u>. It should be noted that Pile Driver generates sound intermittently while piling; therefore, it isn't considered as a continuous noise source. When calculations made taking into pile drivers account it is identified that noise level at source may increase up to <u>110.6</u> <u>dBA</u> intermittently during piling works.

Cumulative Noise Level at the Receptor is calculated by using the following formula:

$$L_{PT} = L_{WT} + 10 \times \log\left(\frac{Q}{4.\pi r^2}\right)$$

where;

LPT: Noise power level at the receptor (dB);

Q: Ground absorption coefficient (assumed as 1 due to reflect land);

r: Distance between the source and the receptor.

The noise levels at different distances are given in Table 5-24 and noise propagation diagram with respect to distance from the source is presented in Table 5-24.

Distance (m)	Max. LAeq (dBA) due to construction activities	Max. LAeq (dBA) during Piling Activities
At source (0m)	101.2	110.6
30	60.7	70.0
60	54.7	64.0
90	51.2	60.5
120	48.7	58.0
150	46.7	56.1
200 (Dedeler Vilage)	44.2	53.6
300	40.7	50.0
400 (Kocalar Vilage – Noise Measurement point)	38.2	47.5
900 (Bodurlar Vilage – Noise Measurement point)	31.2	40.5
1500	26.7	36.1
2000	24.2	33.6

Table 5-24: Noise Levels with Respect to Distance



Figure 5-7: Noise Propagation with Respect to Distance from the Source

Cumulative noise levels at the baseline measurement locations in Bodurlar and Kocalar have been calculated by taking the background noise levels at these receptors into account. In the absence of measurement result for Dedeler, background noise level at the nearest point – Kocalar has been referred. Comparison between the results with and without piling and corresponding limits are presented in Figure 5-7. Construction activities are not allowed near or within the residential areas during evening and night-time (between 19:00-- and 07:00). In line with RAMEN, construction activities will only take place in daytime therefore day-time limit values of both RAMEN and IFC/WHO Guidelines which are stricter need to be met.

It should be noted that calculations are based on the worst-case scenario that considers maximum number of construction machinery and equipment will operate at the same time, at one location with maximum sound levels. Furthermore, no atmospheric or barrier effect (artificial barriers, topographical conditions vegetation) was taken into account to simulate the worst-case conditions.

As summarised in the table below, cumulative noise levels at the nearest sensitive receptors are anticipated to be below the day-time limit value set by IFC/WHO and EBRD during construction activities even when piling is carried out. However, it is likely that maximum increase in background levels of 3 dB at these receptors will exceed 3dBA threshold that is set by IFC/WHO during piling activities in Kocalar and during general construction activities in Dedeler. Therefore, impact significance is anticipated to be <u>Negligible</u> for Bodurlar, <u>Moderate</u> for Kocalar and <u>High</u> for Dedeler villages.

L _{day} (07:00- 19:00) (dBA)							
Noise Measurement Locations	Baseline Noise Level Noise Level Activities		Noise Level due to Construction ActivitiesCumulative Noise Level at the Receptor due to Construction <u>Activities</u>		Cumulative Noise Level due to Construction Activities Including <u>Piling</u>	Limit Value set by IFC/WHO	
Bodurlar	43.3	31.2	40.5	43.6	45.1	55	
Kocalar	42.7	38.2	47.5	44	48.7	55	
Dedeler	42.7*	44.2	53.6	46.5	53.9	55	

Table 5-25: Calculated Noise Levels at the Receptors with respect to IFC/WHO Standards

*. In the absence of baseline noise measurements for Dedeler results for Kocalar was utilised due to the closed distance.

Based on baseline conditions, nature of the receptors and abovementioned calculations, noise impact evaluation for Land Preparation and Construction Phase is summarised below:

Pacantar	Soncitivity	Nature of Impact				Impact	Impact
ιτεσεριοί	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significance
Bodurlar	High	Short-term	Local	Intermittent	Low	Negligible	Negligible
Kocalar	High	Short-term	Local	Intermittent	Medium	Low	Minor
Dedeler	High	Short-term	Local	Intermittent	Madium	Modorato	Minor to
High	підп				Medium	Moderate	Moderate

5.2.4.1.1 *Mitigations, Management and Monitoring*

The following mitigations and monitoring activities will be implemented in order to minimise and monitor the potential noise impacts on the sensitive receptors during land preparation and construction phase:

- Project specific Construction Noise Management Plan will be developed and implemented;
- Construction activities will be carried out between 08:00 and 18:00 only;
- Construction vehicle engines and other machinery will be turned off when not in use, avoiding any unnecessary noise generation;
- When piling works are conducted other machinery will be turned-off to avoid exceedances at the nearest noise sensitive receptors;
- Periodical maintenance of machinery and equipment will be carried out to ensure their good working conditions;
- The number of machinery and equipment operating at the same time will be kept minimal where possible;
- Grievance mechanism will be implemented in line with the Project Stakeholder Engagement Plan. If any grievance related with noise is received from the Noise Sensitive Receptors (NSR) identified in this ESIA, one time noise monitoring will be conducted at these receptors and corrective actions taken where necessary.

5.2.4.1.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential construction noise impacts are summarized below.

Receptor	Impact Significance
Bodurlar	Negligible
Kocalar	Minor
Dedeler	Minor to Moderate

5.2.4.2 Operation Phase

Noise sources during operation of Solar Power Plants are known to be very limited. Transformers and inverters will be enclosed and there will be minimal noise emissions from traffic caused by employee transportation. Therefore, noise emissions will be minimal when compared to the construction phase.

Number or model of inverters that will be installed for the Project are not known at the time of writing this report. However, inverter stations are planned to be enclosed in unit that consist inverters, step-up transformers and MV Rind Main Units. Sound pressure levels of most commonly used inverter stations are known to be around 85/75 dBA 1m/10m in front of the enclosure and 1m above ground. Although the exact location of the inverter stations is not known, noise level generated by the inverter stations is not expected to cause any increase at the background noise levels of the nearest sensitive receptors. Therefore, cumulative noise levels at the closest noise sensitive receptors are predicted to be well below the IFC/WHO Guideline Limit Values, which are stricter than Turkish RAMEN limits. Noise impact evaluation for the operation of the Saros Hybrid Solar Power Plant is summarised below:

Pocontor	Soncitivity	Nature of Impact				Impact	Impact
Sensitivity		Duration	Extent	Frequency	Intensity	Magnitude	Significance
Bodurlar	High	Long-term	Local	Continuous	Low	Negligible	Negligible
Kocalar	High	Long-term	Local	Continuous	Low	Negligible	Negligible
Dedeler	High	Long-term	Local	Continuous	Low	Negligible	Negligible

5.2.4.2.1 Mitigations, Management and Monitoring

The following mitigations and monitoring activities are implemented in order to minimise and monitor the potential noise impacts on the sensitive receptors during the operation phase:

- Grievance mechanism is in place in line with the Project Stakeholder Engagement Plan. If any grievance related with noise is received, noise monitoring is conducted at these receptors to verify compliance with the standards and corrective actions taken where necessary.
- Periodical maintenance of plant components such as inverters, transformers and other equipment and vehicles used for transportation to and from the Site carried out to ensure their good working conditions.

5.2.4.2.2 Residual Impact

Residual impact that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential operational noise impacts is anticipated to be negligible for all receptors.

5.2.4.3 Decommissioning Phase

The magnitude of the noise impact during decommissioning phase is anticipated to be similar to the construction noise for a shorter period. Mitigation measures will be similar to the ones taken during the construction. The evaluation of the decommissioning noise impact is summarised below:

Receptor	Sensitivity	Nature of Impact				Impact	Impact
		Duration	Extent	Frequency	Intensity	Magnitude	Significance
Bodurlar	Madarata	Chart				L out to	Nogligible to
Kocalar	to High	term	Local	Intermittent	Low	Low to Moderate	Minor
Dedeler	torngri	tonn				Moderate	Winter

5.2.4.3.1 *Mitigations, Management and Monitoring*

The Project Company should ensure that the decommissioning contractor(s) have a detailed plan in place prior to the decommissioning activities for taking necessary mitigations to avoid/minimise noise impacts on the nearest sensitive receptors.

5.3 LANDUSE, SOILS AND VISUAL IMPACTS

5.3.1 Project Standards

Saros Hybrid SPP Project activities will be subject to provisions of the following national laws and regulations in Turkey:

- Law on Soil Conservation and Land Use (Law No:5403);
- Pasture Law (Law No:4342);
- Expropriation Law (Law No: 2942); and
- Regulation on the Control of Soil Pollution and Lands Contaminated by Point Sources.

Table 5-26 presents limit values specified in Dutch Target and Intervention Values (4 February 2000), while Table 5-27 shows sector specific (Electric Power Generation) Generic Contaminant Limit Values specified in the Turkish Regulation on Soil Pollution Control and Contaminated Sites by Point Source.

Table 5-26: Dutch Target and Intervention Values for Soil Remediation (4 February 2000)

Parameter	Dutch Limits (mg/kg)		
	Target Value ¹	Intervention Value	
Total Petroleum Hydrocarbons (TPH)	5	5,000	
Arsenic	29	55	
Barium	160	625	
Cadmium	0.8	12	
Chromium	100	380	
Copper	36	190	
Mercury	0.3	10	
Molybdenum	3	200	
Lead	85	530	
Antimony	3	15	
Selenium ³	0.7	100	
Zinc	140	720	

¹: Target value indicates the level at which there is a sustainable soil quality.

²: Intervention Value indicates the action limit for particular parameter.

³: In the absence of intervention and corresponding target value for Selenium, the indicative level for serious soil contamination and the accompanying target value is referred

 Table 5-27: Sector Specific Parameters and Limit Values Specified in Turkish Regulation on Soil

 Pollution Control and Contaminated Sites by Point Source for Electricity Generation Facilities

	Turkish Regulation on Soil Pollution Control and Contaminated Sites by Point Source ¹							
Parameter	Engulfment of the soil and absorption by means of dermal contact	Inhalation of volatile matter in external environment	Inhalation of fugitive dust in the external environment (mg/kg)	Moving of the contaminants to the surface water and drinking of the surface water (mg/kg)				
	(mg/kg)	(mg/kg)		Dilution Factor ³ = 10	Dilution Factor = 1			
Total Organic Halogens (TOX) ²	-	-	-	-	-			
Total Petroleum Hydrocarbons (TPH)	188,496	-	-	175	17.4			
Arsenic	0.4	-	471	3	0.3			
Boron ²	-	-	-	-	-			
Barium	15,643	-	433,702	288	29			
Cadmium	70	-	1,124	27	3			
Chromium	235	-	24	900,000	1			
Copper	3,129	-	-	514	51			
Mercury	23	3	-	3	0.6			
Molybdenum	391	-	-	14	1			
Lead	400	-	-	135	14			
Antimony	31	-	-	2	0.2			
Selenium	391	-	-	0.5	0.05			
Zinc	23,464	-	-	6,811	681			

¹: Generic Contaminant Limit Values (for Generation of Electric Power, NACE Code:3511) specified in Regulation on Soil Pollution Control and Contaminated Sites by Point Source, Official Gazette No. 27605 dated June 8, 2010.

²: No limit value is provided for TOX and Boron, however these two parameters are presented in sector specific indicator parameters list provided in the Annex-2 of the regulation.

³: In occurrence of one the events such as the distance to the aquifer is less than 3 m; existence of fractured or karstic aquifer; and the area of the contaminant source is equal to or greater than 10 ha; the Dilution Factor shall be taken as "1", in other cases, the Dilution Factor shall be taken as 10.

5.3.2 Baseline Conditions

5.3.2.1 Land Use

Land use types of Çanakkale Province is 54.03% forest, 43.40% agricultural land, 1.82% artificial land, 0.23% wetlands and 0.52% water bodies (Çanakkale Province Environmental Status Report, 2017). The Saros WF License Area consists of forest land (81.6%), agricultural land (16.5%) and meadows or treasury lands (1.9%). The Project components of the Saros Hybrid SPP will be completely located on agricultural land.

Table 5-28: Land Type Distribution within the Greater WF License Area

Land Type	Area (ha)	Percentage (%)
Forest	141	81.6
Agricultural Lands	28.6	16.5
Meadow or Treasury Lands	3.3	1.9
TOTAL	172.9	100

5.3.2.2 Land Use Capability Class

Land use capability classes defined by the Ministry of Agriculture and Forestry (former Ministry of Agricultural and Rural Services) are provided in Table 5-29.

According to the 1/100,000 scale Land Use Map Figure 5-8 showing the Project Area and its vicinity, the Project Area is composed of Class VI and Class VII soils; that are unsuitable for agriculture.





Arability	Capability Class	Description	Factors Limiting Agriculture
	I	It is arable for many crop types.	There is no or little limitation.
Agricultural lands	II	It is suitable for long-term cultivation of several types of crops.	Special mitigation measures are required for soil and water loss.
suitable for soil cultivation	111	It is suitable for the cultivation of specific crops that provide special mitigation measures. Generally, it needs special care during agricultural use.	It is prone to erosion and artificial drainage is required during cultivation.
	IV	With suitable ploughing, some special agricultural crops can be cultivated. Generally, it needs special care during agricultural use.	There are serious limitations related with soil depth, stone content, humidity and inclination.
Agricultural	V	This class includes soils that are even or slightly inclined, stony or very moist. These are not suitable for ploughing and cultivation. Generally, they are used for meadow or forestry area.	They have weak drainage and a structure not suitable for ploughing.
suitable for soil cultivation	VI	This is not suitable for ploughing and cultivation. They are mostly used as pasture and forestry area.	Very serious limitations are present owing to inclination and shallow soil.
	VII	It is not economic for agricultural activities; however, it is suitable for weak pasture or afforestation areas.	There are limitations owing to shallow soil, stone content, inclination and erosion.
Non-arable lands	VIII	It is not suitable for vegetation. It can be used for recreational purposes or as wild life protection area.	It is lacking soil.

Table 5-29: Land Use Capability Classes

The suitability of different land classes for cultivation, grazing and forestry activities is defined in the Technical Procedure on Soil and Land Classification Standards dated 2008 by the former Ministry of Agricultural and Rural Services as presented in Table 5-30. Accordingly, soils within the License Area (Classes VI and VII) are not suitable for agricultural use while they are fully suitable for forestry and limitedly suitable for pasture/grazing.

Table 5-30: Land Use Capability Classes and their Suitability for Land Use

Land Use Wild Life Forestry			Pasture/Grazing			Agriculture			
Capability			Limited	Moderate	Intensive	Limited	Moderate	Intensive	Very Intensive
Class I									
Class II									
Class III									
Class IV									
Class V									
Class VI									
Class VII									
Class VIII									

Source: Technical Procedure on Soil and Land Classification Standards, 2008.



According to the Corine Database (2012), forests and agricultural lands cover the Saros WF License Area. As it can be seen in Figure 5-9 Saros Hybrid SPP Sites are located on Agricultural Areas.



5.3.2.3 Major Soil Groups

Project area has shallow and very shallow depth in terms of Great Soil Group (BTG) combination into the lime-free brown forest soils, which are non-dry agriculture fallow in terms of current land use.

5.3.2.4 Erosion Degree

According to the Landscape Rehabilitation Analysis⁸ carried out for the Saros WF Project, erosion severity degree of the License area was mainly identified as Degree 1: None or very low level of erosion; Degree 2: Moderate level of erosion. Erosion Risk Analysis Map of the Project Area is presented in Figure 5-10.

West Cluster (H01-H03) and Middle North Cluster (H21-H23) of the Project Site are located on lands with Degree 2: Moderate level of erosion severity while Middle Cluster (H04-H20is located on lands with Degree 1: None or very low level of erosion; Degree 2: Moderate level of erosion severity.



Figure 5-10: Erosion Risk Analysis Map

5.3.2.5 <u>Geological Characteristics</u>

According to the previous studies carried out within the borders of Çanakkale Province, the pre-Triassic Phase Fazlıkonağı formation lays at the bottom. Lower Triassic aged Karakaya formation is unconformably over the Fazlıkonağı formation. Karakaya formation is covered by Middle-Upper Triassic Kapıkaya formation in conformity while it is unconformably covered by the Jurassic Sarıkaya formation. Sarikaya Formation is unconformably overlain by the Maestrichtian-Upper Paleocene Lört formation. This unit is unconformably overlain by the Lower Lutetian aged Karaağaç Port formation which is followed by Fiçitepe formation. Upper Lutetian aged Soğucak formation unconformably covers Fiçitepe formation. Eocene aged Burgas, Korudağ, Keşan, Kanlıbent and Oligocene Armuttepe formations, overlie Soğucak formation. Upper Miocene-Pliocene aged Çanakkale formation unconformably overlies the aged units at the bottom.

The Project Area consists of Oligocene undifferentiated volcanic and Miocene terrestrial clasts. The rock units, which are mapped in the study area, are identified under four subheadings: Metamorphic, volcanic, plutonic and sedimentary assemblages (En-Çev, Saros WF Environmental Impact Assessment Report, 2018).

⁸ Source: Gokmenoglu, Saros Wind Farm Project, Landscape Rehabilitation Plan (2019).

5.3.2.6 Natural Hazards

According to the findings of the National Earthquake Research Program carried out by the Disaster and Emergency Management Presidency of Turkey (AFAD), occurrence of natural hazard events such as: earthquakes, landslides, rock falls, flooding, avalanches and others in Çanakkale is below the Country average.

Earthquakes

Çanakkale province is located within a 1st Degree seismic zone according to Earthquake Zoning Map of Turkey (Figure 5-11). According to the AFAD's Earthquake Risk Map of Turkey (2018), maximum ground acceleration with 10% probability of exceedance in 50 years (475 years-return-period) is 0.3g near the Project Area (See Figure 5-12 for the map). The North Anatolian Fault, which runs between the Marmara Sea and the Gulf of Saros, poses earthquake risk in the region.

AFAD reports that 39 earthquakes have occurred in Çanakkale in last 50 years with no losses (https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx).



Figure 5-11: Earthquake Zoning Map of Çanakkale





Landslide and Snowslide

Risk of landslide is mainly present in Ambarova Village in Biga District of Çanakkale. This problem in the District has started in 1995, its magnitude has increased since 2000, and two large-scale slides occurred in 2003 and 2004. It was reported that there is still risk near Ambaroba Village, which may cause massive hazard on the environment (Çanakkale Province Environmental Status Report, 2007). No snowslides have been observed in Çanakkale to date.

There are old landslide, creep, flooding, slide and shallow landslide areas identified in 3km, 2km, 1.5km and 1km distances to the License Area. There is no landslide or snow slide risk identified within the License Area (Saros WF Project, Environmental Impact Assessment Report, 2018). It is considered that factors affecting risk of landslide can differ from site to site and therefore it is recommended to identify potential landslide areas prior to the construction activities.

Flooding

According to the statistics of the Disaster and Emergency Management Presidency of Turkey (AFAD), 19 flooding events with no losses have been observed in Çanakkale in last 50 years (<u>https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx</u>).

No natural hazards such as flooding, landslide, rockfall or snowfall have occurred within the Project Area (Saros Hybrid SPP Project, Environmental Impact Assessment Report, 2022).

5.3.3 Impact Assessment

5.3.3.1 Land Preparation and Construction Phase

The major Project impacts and/or risks on soils during land preparation and construction phase are summarised below:

- Loss of topsoil (in terms of quantity and/or vegetative quality);
- Soil disturbance and erosion, due to earthworks;
- Soil contamination risk from accidents and improper management of hazardous materials and waste.

Loss of Top-Soil

Along the Project Site, topsoil will be stripped for land preparation and construction with an average stripping depth of 5 cm where required.

Stripped topsoil will be stored at the platform area of the closest turbine and used for filling at the same areas.

Considering above facts, receptors sensitivity is determined as low and potential impact of top-soil stripping is anticipated to be moderate in magnitude with minor significance.

Soil Disturbance and Erosion

As described in previous sections, the Project site consists predominantly lime-free brown forest soils and erosion severity degree is generally very low and low except for the areas with moderate severity at the Middle Cluster. Therefore, Project Site is not consiered vulnerable to erosion.

Flooding Risk and Drainage

Considering that no flood event has occurred within the Project Site to date no future risk is anticipated.

Accidental Soil Contamination

Soil contamination during the land preparation and construction phase of the Project may occur as a result of accidental spills and releases of hazardous materials and wastes. Management and mitigation strategies needs to be implemented in the event that soil contamination takes place depending on the level and extent of contamination.

Pollution Prevention Control Plan and Emergency Preparedness and Response Plan will be developed and implemented for the Project during construction phase. Through the implementation of relevant mitigation,

management and response measures, the extent of accidental releases can be limited such that impact of spills or leakages can be kept at minimum levels.

Necessary mitigation and management measures (see below) should be in place to avoid and minimise potential impacts due to soil contamination by accidental spills and leaks, therefore no significant impact is anticipated during construction.

Summary of the impact evaluation for land use and soils associated with the construction phase is provided below:

Potential Impact /	Sensitivity		Nature	Impact	Impact			
Risk	against impact	Duration	Extent	Frequency	Intensity	Magnitude	Significance	
Loss of Topsoil	Medium	Short-term	Local	Intermittent	Low	Low	Minor	
Soil Disturbance and Erosion	Low	Short-term	Local	Intermittent	Low	Low	Minor	
Soil Contamination	Medium	Short-term	Local	Intermittent	Low	Low	Negligible	

Visual Impacts

Visual impacts associated with the construction activities will be due to the presence of construction machinery and equipment on site and installation of the project components, which will happen gradually (occasional) throughout the construction period. Visual impacts due to the construction works, machinery and installation of project components are considered negligible.

5.3.3.1.1 *Mitigations, Management and Monitoring*

Soil Loss and Erosion

- Topsoil removal and excavation will be kept minimum and limited to the areas where strictly required;
- Grading will be in line with the natural slope and drainage conditions;

Soil Contamination

- Discharge of wastes and hazardous materials into soil will be prohibited;
- Septic tank integrity checking will be carried out regularly and septic tanks are emptied regularly via vacuum trucks;
- Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan;
- Solid wastes, hazardous wastes and wastewater generated at site will be managed through implementation of the Waste and Wastewater Management Plan;
- Hazardous Materials will be stored in a dedicated enclosed bunded area and managed through implementation of the Pollution Prevention Control Plan;
- Training Programme covering aspects related with management of hazardous substances will be in place;
- Hazardous waste will be temporarily stored on-site in a designated area which is appropriately enclosed and with concrete paved surface;
- Waste storage out of the designated storage areas will be prohibited; and
- Oil changes, refuelling, or lubrication of vehicles will be conducted in a dedicated area. Storage tanks and refuelling stations are equipped with drip trays and spill control equipment.

5.3.3.2 Operation Phase

Soil Disturbance and Erosion

Provided that necessary measures are taken during and post construction, there will be no more project activities that may cause soil distrubance or erosion during operation.

Accidental Soil Contamination

There is minimal need to the use of hazardous materials during the operation phase, however soil contamination may still occur during the operation phase due to accidental spills and releases of hazardous materials and wastes. Management and mitigation strategies needs to be implemented in the event that soil contamination takes place depending on the level and extent of contamination.

Pollution Prevention Control Plan and Emergency Preparedness and Response Plan should be developed and implemented to minimise potential negative impacts in case of any spill or leakage.

No significant impact is anticipated during operation provided that necessary measures are in place to avoid or minimise soil contamination.

Visual Impact

Visual effects of PV Plants arise from changes in the composition and character of views available to receptors affected by the proposed development (e.g. residents, recreational users, tourists etc.). Visual impact assessment considers the response of the receptors who experience these effects, and it considers the overall consequence of these effects on the visual amenity of the view.

Considering topographical characteristics of the region and layout of the Project, receptors of visual impacts are identified as residents of Dedeler, Bodurlar and Kocalar villages.

3D visual representations (Figure 5-13, Figure 5-14 and Figure 5-15) were produced via Google Earth in order to identify potential level of visibility of the Project components from these settlements. Locations (i.e. Highest and closest points) from where panel areas are most visible were selected as Viewpoints(VP). As can be seen from these images, visibility of West Cluster from Bodurlar Village is limited with Low impact magnitude; visibility of Middle Wast Cluster from Kocalar Village has Negligible magnitude. On the other hand, visibility of Middle Cluster from Dedeler Village has Low to Moderate magnitude.



Figure 5-13: 3D Visual Representation from Bodurlar VP



Figure 5-14: 3D Visual Representation from Kocalar VP



Figure 5-15: 3D Visual Representation from Dedeler VP

Potential Impact /	Sensitivity		Nature	Impact	Impact			
Risk	against impact	Duration	Extent	Frequency	Intensity	Magnitude	Significance	
Soil Disturbance	Medium	Short-term	Local	Intermittent	Low	Low	Minor	
Soil Contamination	Medium	Short-term	Local	Intermittent	Low	Low	Negligible	
Visual Impact - Bodurlar	High	Long-term	Local	Continuous	Low	Low	Minor	
Visual Impact - Kocalar	High	Long-term	Local	Continuous	Low	Negligible	Negligible	
Visual Impact - Dedeler	High	Long-term	Local	Continuous	Medium	Moderate	Moderate	

5.3.3.2.1 Mitigations, Management and Monitoring

The following design criteria and mitigation measures are recommended to be applied to the Saros Hybrid SPP Project to minimise land use, soil and visual impacts as much as possible;

- Project layout will avoid sensitive landscapes and forested areas;
- A waste management plan will be developed for the project to comply with the national legislation;
- If used during operations, septic tank integrity checking will be carried out regularly;
- An Emergency Preparedness Response Plan will be developed against acute spill scenarios;
- Hazardous waste and materials will be stored at designated and appropriately designed storage areas.

5.3.3.2.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential land use, soil and visual impacts are summarized below.

Potential Impact / Risk	Impact Significance		
Soil Disturbance	Negligible		
Soil Contamination	Negligible		
Visual Impact - Bodurlar	Minor		
Visual Impact - Kocalar	Negligible		
Visual Impact - Dedeler	Minor		

5.4 WATER AND WASTEWATER

5.4.1 **Project Standards**

The Project will comply with the following regulations and standards:

- Guidelines for Drinking Water Quality World Health Organisation (WHO), 2011.
- Regulation on Water Intended for Human Consumption (RWIHC), Chemical Parameters and Indicator Parameters Turkish Ministry of Health, 2005;
- Water Pollution Control Regulation (WPCR); (Official Gazette Date: 31.12.2004, No: 25687), Standards for Discharge of Domestic Wastewater into Receiving Water Bodies (Population 84-2000);
- IFC's General Environmental, Health and Safety (EHS) Guidelines, Indicative Values for Treated Sanitary Sewage Discharges.

Table 5-31 combines the national standards for drinking and utility water (water intended for human consumption) set by RWIHC and limit values set by WHO Drinking Water Guidelines. As can be seen from the Table below the RWIHC standards are more stringent and therefore take precedence; the Project will be required to comply with these standards during all phases.

Parameter	Turkish RWIHC Limit Values	IFC Limit Values (WHO Drinking Water Guidelines)
Antimony (mg/L)	0.005	0.020
Arsenic (mg/L)	0.01	0.01
Barium (mg/L)	-	0.7
Benzene (mg/L)	0.001	0.01
Boron (mg/L)	1	2.4
Cadmium (mg/L)	0.005	0.003
Chromium (mg/L)	0.05	0.05
Copper (mg/L)	2	2
Cyanide (mg/L)	0.05	-
Fluoride (mg/L)	1.5	1.5
Lead (mg/L)	0.01	0.01
Mercury (mg/L)	0.001	0.006
Nickel (mg/L)	0.02	0.07
Nitrate (mg/L)	50	50
Nitrite (mg/L)	0.5	3
Selenium (mg/L)	0.01	0.04
Aluminium (mg/L)	0.2	-
Ammonium (mg/L)	0.5	-
Chloride (mg/L)	250	-
Conductivity (µS/cm)	2500	-
рН	6.5≤pH≤9.5	-
Iron (mg/L)	0.2	-
Manganese (mg/L)	0.05	-
Sulphate as SO ₄ (mg/L)	250	-
Sodium (mg/L)	200	-
Uranium (mg/L)	-	0.03

Sanitary (domestic) wastewater management is regulated by the Water Pollution Control Regulation (WPCR) in Turkey. If it is discharged to receiving environment, final discharge of wastewater is subject to the Environmental Permit obtained from the Provincial Directorate of Environment and Urbanization of the related Province according to the WPCR. Limits for domestic wastewater discharge are set for different BOD Load and population ranges in the WPCR.

IFC EHS guideline values applicable to sanitary wastewater discharges should be met; according to the IFC EHS Guidelines, sanitary discharges should also comply with national or local standards

Table 5-32 presents the relevant limit values set by the WPCR and IFC General EHS that will be applicable to the Project; the most onerous standard for each parameter should be applied to the Project.

Parameter	WPCR (BOD Load 5-120 kg/day; Population 84- 2000) Limit Limit (2 hr Composite (24 hr Composite Sample) Sample)		IFC General EHS Guidelines: Wastewater and Ambient Water Quality
BOD (mg/L)	50	45	30
COD (mg/L)	180	120	125
Total Suspended Solids (mg/L)	70	45	50
рН	6-9	6-9	6-9
Total Nitrogen (mg/L)	-	-	10
Total Phosphorus (mg/L)	-	-	2
Oil and Grease (mg/L)	-	-	10
Total Coliform Bacteria (Most Probable Number/100mL)	-	-	400

Table 5-32: National and International Limits for Domestic Wastewater Discharge

5.4.2 Baseline Conditions

5.4.2.1 Surface Waters

Çanakkale, where the Project is located, is within the boundaries of Marmara Catchment Area. Annual surface water flow capacity of Marmara Catchment Area is reported as 5.08×10^9 m³, which is 2.77% of Turkey's surface water potential. The Catchment's water supply potential for drinking, utility and industrial purposes is estimated as 2.5×10^9 m³/yr, which corresponds to 89% of its total catchment potential (Tubitak, Preparation of Catchment Protection Action Plans Project, Marmara Catchment Area).

Main streams of Çanakkale are listed in Table 5-33. The nearest stream to the Project Area is 40 km long Sarıçay Stream (Kocaçay). Sarıçay's tributary partially runs through the License Area in the west and south clusters. Tributaries of Sarıçay are generally intermittent streams with low flow rates. In addition, Ortaca and Kalgımaç Creeks are intermittent creeks that are located in south of the Project Area.

River/Stream/Creek Name	Total Length (km)	Max. Flow Rate (m³/s)	Source	Discharge to
Kara Menderes	109	1530	Kaz Mountains	Marmara Sea
Tuzla	80	1400	Kırburun	Aegean Sea
Sarıçay (Kocaçay)	40	1300	Küçükburun	Dardanelles
Kocabaş	84	1345	Kaynarca	Marmara Sea
Mıhlı	28	75	Kaz Mountains	Edremit Gulf
Kavak	50	1100	Ballı	Saros Gulf
Koca	62	4.6	Bardakçı	Kocabaş Creek
Agonya	148	2.3	Katrandağı	Ortaca

Table 5-33: Main Surface Waters in Çanakkale Province

There are no lakes near Saros WF Project. Atikhisar Dam is located downstream of Sarıçay and is the main drinking water supply of Çanakkale City Centre. In addition, Bayramiç, Gökçeada and Tayfur Dams are used for drinking and utility water supply in the Province.

In Çanakkale, there are 29 ponds and dams under operation by State Hydraulics Works used for irrigation water supply (Saros WF Project Environmental Impact Assessment Report, 2018). The closest dams to the License Area are Koyunyeri Dam (2.8 km to the southeast), Atikhisar Dam (7.5 km to the west) and Bakacak Dam (10 km to the northeast).

There is Altınzeybek-2 Pond located near Kumarlar Village within the Saros WF License Area. Altınzeybek-2 Pond was built in 2019 by a private mining company for providing water supply to the nearby villages for potable use and irrigation.

Figure 5-16 shows the dams and ponds located near the Project as well as the intermittent streams within it.



Figure 5-16: Water Bodies near the Project Area

5.4.2.2 <u>Groundwater</u>

Groundwater capacity of Çanakkale is 66.5x10⁶ m³/yr while the annual safe abstractable groundwater volume is 88 hm³. As the streambeds are generally dry, groundwater drainage to the sea is 12.5x10⁶ m³/yr in Gelibolu Peninsula (Saros Hybrid SPP Project Environmental Impact Assessment Report, 2022). Groundwater resources of Çanakkale Province are listed in Table 5-34.

Table 5-34: Groundwater Resources of Çanakkale Province

Resource Name	Capacity (x10 ⁶ m³/yr)
Bayramic-Evciler-Ayazma	50.08
Yenice Çınar	0.409
Yenice-Ilica	1.04
Geyikli-Pınarbaşı-Kırkgözler	0.63

Source: Saros Hybrid SPP Project Environmental Impact Assessment Report, 2022

Çanakkale has rich geothermal resources. There are 12 geothermal resources; one of these is Tuzla Geothermal Plant, in the province. Tuzla Geothermal Plant was designed to have annual capacity of 51.000.000 kWh energy production (Çanakkale Province Environmental Status Report, 2017).

5.4.3 Sensitivity of Receptors

The sensitivity of the receptors (i.e. water resources near the Project) was defined based on the criteria provided in Chapter 5.2.2 of this ESIA and associated baseline conditions. As explained in Section 5.4.2 of this ESIA, the closest surface water to the License Area is Sarıçay Stream which partially runs through it. Considering that Atikhisar Dam is located downstream of Sarıçay and is the main drinking water supply of Çanakkale City Centre, the sensitivity of Sarıçay has been defined as High. Additionally there is Altınzeybek-2 Pond located near Kumarlar Village within the Saros WF License Area which is providing water supply to the nearby villages for potable use and irrigation. Therefore its sensitivity has been defined as High.

Table 5-35: Sensitivity Criteria for Water Resources

Receptors	High	Medium	Low	Negligible
Ecological Receptors	Water resources important nationally or globally Sarıçay and Altınzeybek-2	Water resources important locally or regionally	Water resources with low importance or easily replaceable	Water resources with no or very low importance

5.4.4 Impact Assessment

5.4.4.1 Land Preparation and Construction Phase

Potential impacts on water resources due to the land preparation and construction phase include (1) Impacts on Surface Water Resources and (2) Impacts on Groundwater by means of water use and degradation of water quality due to wastewater generation and settled dust.

Impacts on Surface Water Resources

Water demand associated with the construction phase will principally be for drinking and sanitary use by project personnel and water required for dust suppression. Similarly, water demand during operation will be limited to drinking and sanitary use by personnel.

Estimated water demand for dust suppression is 40 tons. Water for dust suppression will be supplied from the common water source (village fountain) of Etili Village. Analysis reports proving that the water quality meets the standards set by the Regulation on Water Intended for Human Consumption have been obtained from the Headman of Etili and transferring water tankers have been contracted. Water trucks and sprinklers will carry on dust suppression (maximum of 80 tonnes/day) during dry periods. Since the water on ground for dust suppression will evaporate on site, no wastewater generation is expected due to this activity.

Turkish Statistical Institute (Turkstat) has reported that average daily water consumption per person was 228 litres in 2020. Accordingly, daily water demand is estimated to be 9.12 m³ for 40 workers during the peak construction time.

Drinking water will be purchased as bottled water from the local market and utility water will be supplied via tankers from the nearby villages where the standards for utility purposes are met.

No impact of construction works on water quality of nearby surface waters is anticipated due to the long distance between the Project Site and the nearest surface water bodies.

It should be noted that there will be a Pollution Prevention and Control Plan in place and management of hazardous materials will be carried out in line with this Plan. In addition, storage areas (within the laydown area) and construction activities will not be near the watercourses. Therefore, such impacts are not likely to occur.

		Nature of Impact				Impact	Impact
Receptor	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significanc e
Degradation in surface water quality due to silty	Sarıçay and its tributaries: High	Short-term	Regional	Intermittent	Low	Negligible	Negligible
water run-off and settled dust	Altınzeybek-2 Pond: High	Short-term	Local	One-off	Low	Negligible	Negligible
Degradation in surface water quality due to	Sarıçay and its tributaries: High	Short-term	Regional	Intermittent	Low	Negligible	Negligible
hazardous materials spill/leakage	Altınzeybek-2 Pond: High	Short-term	Local	One-off	Low	Negligible	Negligible

5.4.4.1.1 *Mitigations, Management and Monitoring*

The following measures will be in place to avoid or minimise the potential impacts on water resources during land preparation and construction phase:

- Project Dust and Air Emission Control Plan will be developed and implemented by the Project Company and the contractors;
- Project Waste Management Plan will be developed and implemented to ensure proper wastewater management during the construction;
- Construction Pollution Prevention and Control Plan, which covers the necessary hazardous materials handling measures, will be developed and implemented by the Project Company and the contractors;
- Construction Emergency Preparedness and Response Plan will be developed and implemented by the Project Company and the contractors;
- Hazardous materials management will be in line with the Construction Pollution Prevention and Control Plan;
- Spill kits, absorbent pads and sands will be available and easily reachable on site at all times;
- Stored fuels and waste oils will be contained within bunded areas sufficient to contain spills and leaks;
- Regular dust suppression will be applied in line with the Dust Management Plan;
- Regular checks of hazardous materials storage areas will be carried out to ensure there are no spill/leakage and all requirements are met;
- All maintenance activities will be performed on suitable impermeable ground to avoid potential transport of contaminants to surface waters and groundwater;
- Regular checks and maintenance of construction machinery and vehicles will be carried out in order to
 prevent spills and leakages of fuel and other hazardous materials;
- Domestic wastewater generated during construction phase will be collected in non-leaking septic tanks installed and periodically vacuumed by vacuum trucks and discharged to the Municipality's sewage system;
- National/local permitting requirements will be fulfilled for the management, collection and discharge of domestic wastewaters.

5.4.4.1.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential impacts are summarized below.

Receptor	Impact Significance
Degradation in surface water quality due to silty water run-off and settled dust	Negligible
Degradation in surface water quality due to hazardous materials spill/leakage	Negligible

5.4.4.2 Operation Phase

Similar to the land preparation and construction phase, potential impacts on surface and groundwater resources are associated with water demand and wastewater generation. Assuming that daily water demand per capita is 228 litres (reported 2018 value by TUIK for Turkey), daily water demand will be around 1.14 m³ for 5 employees during operations. This will be collected in septic tank(s)/mobile toilets to be built/ provided in the Project Area and periodically collected by vacuum trucks to be discharged to the Municipality's sewage system subject to required permits. Therefore, **no impacts** are anticipated since there will not be any wastewater discharges or impacts to the environment during the operation phase.

Drinking water will be purchased as bottled water from the local market and utility water will be supplied Water demand will be supplied via 10-ton water tank which is allocated in the administrative building. No surface water or groundwater resources will be utilized for this purpose.

Water Demand for PV Panel Cleaning

PV Panels' cleaning can be carried out in different ways: Wet Cleaning and Dry Cleaning are commonly used methods. Wet cleaning includes spraying the modules with low-pressure water that is closely matched in temperature to the temperature of the module while dry cleaning includes using a dry brushing technique.

Water demand during operation phase will be mainly for wet panel cleaning.

According to the information gathered from the Project Company, wet cleaning will be applied for cleaning of photovoltaic panels. Wet cleaning is planned to be carried out once a year. It is estimated that 5tonnes water will be utilised for every MW. Therefore, 470 tonnes/year water will be utilised annually. The Project Company considers two sources for panel cleaning water supply:1) village fountain of Etili Village and 2) purchase from the market.

Based on planned panel cleaning configuration, the impact on availability of the water sources is considered to be minor during the operation phase. However, once the source is selected, it is recommended to further assess availability of the selected source based on current capacity and demand.

A special solution will be added to the cleaning water in order to reduce lime stains. According to the available certificate of the product, residual content of the water is suitable for food industry.

Storage of chemicals and fuels will be at designated areas with adequate size and containment and amount of these materials will be minimal during the operations. Therefore, potential impact is considered to be minimal and unlikely to occur during the operations. In conclusion, **negligible** impacts on groundwater resources are anticipated during the operation phase.

Pagantar	Sensitiv	Nature of Impact				Impact	Impact
Receptor	ity	Duration	Extent	Frequency	Intensity	Magnitude	Significance
Degradation in groundwater quality due to hazardous materials spill/leakage	Medium	Short-term	Local	One-off	Negligible	Negligible	Negligible
Reduction in capacity of water resources due to use for panel cleaning	Medium	Long-term	Local	Intermittent	Low	Minor	Minor

5.4.4.2.1 Mitigations, Management and Monitoring

The following measures will be in place during operation to ensure the proper waste management:

- Groundwater use for construction activities is strictly avoided;
- Project Dust and Air Emissions Control Plan is in place and implemented by the Project Company and the contractors;
- Project Waste Management Plan is in place to ensure proper wastewater management during the construction;
- Project Pollution Prevention and Control Plan, which covers the necessary hazardous materials handling measures, is in place and implemented by the Project Company and the contractors;
- Emergency Preparedness and Response Plan is in place and implemented by the Project Company and the contractors;
- Hazardous materials management is in line with the Pollution Prevention and Control Plan;
- Spill kits, absorbent pads and sands are available and easily reachable on site at all times;
- Hazardous Materials are stored in proper designated areas in line with Project Pollution Prevention and Control Plan;
- Stored fuels and waste oils are contained within bunded areas sufficient to contain spills and leaks;
- Dust minimising measures are applied in line with the Dust and Air Emissions Control Plan;
- Regular checks of hazardous materials storage areas are carried out to ensure there are no spill/leakage and all requirements are met;
- All maintenance activities are performed on suitable impermeable ground to avoid potential transport of contaminants to surface waters and groundwater;
- Regular checks and maintenance of construction machinery and vehicles are carried out in order to prevent spills and leakages of fuel and other hazardous materials;
- Domestic wastewater generated during construction phase is collected in non-leaking septic tanks installed and periodically vacuumed by vacuum trucks; Septic tank integrity checks are conducted regularly;
- National/local permitting requirements are fulfilled for the management, collection and discharge of domestic wastewaters.

5.4.4.2.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential impacts are summarized below.

Receptor	Impact Significance
Degradation in groundwater quality due to hazardous materials spill/leakage	Negligible
Reduction in capacity of water resources due to use for panel cleaning	Minor

5.4.4.3 Decommissioning Phase

Amount of water demand and wastewater generation in decommissioning phase will be similar to the land preparation and construction phase. In addition, mitigation measures identified for land preparation and construction phase will be applicable to decommissioning phase. Considering the nature of the project activities and baseline conditions any impacts on water resources will be **negligible** during this phase.

5.5 WASTE MANAGEMENT

5.5.1 **Project Standards**

The Project will comply with but not limited to the following regulations and standards:

- Regulation on Waste Management;
- Regulation on Control of Packaging Wastes;
- Regulation on the Control of Waste Oils;
- Zero Waste Regulation;
- IFC, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Waste Management and Construction and Decommissioning parts (2007).

5.5.2 Sensitivity of Receptor

Potential receptors that are assessed for the impacts of improper waste management activities are listed as follows:

- existing local infrastructure including Municipality Landfill Facilities and Waste Recycling/Management Facilities;
- environmental aspects (i.e. Soil, surface water and groundwater) and
- project personnel and community health and safety.

The sensitivity of the receptors was defined based on the criteria provided in Chapter 5.2.2 of this ESIA and associated baseline conditions as summarised below:

Receptors	High	Medium	Low	Negligible
Human / Ecological /Infrastructure Receptors	Community Health and Safety (i.e. project personnel and residents of nearby settlements)	Loss of valuable material	Existing Waste Management Infrastructure	-

5.5.3 Impact Assessment

Potential impacts associated with improper management of hazardous and non-hazardous wastes will include:

- Additional load to the existing waste management infrastructure (i.e. landfill sites and recycling facilities);
- Soil, surface water and groundwater contamination and environmental nuisance;
- Potential degrading impacts on personnel and public health and safety; and
- Loss of materials that have potential to be reused/ recovered/ recycled.

5.5.3.1 Land Preparation and Construction Phase

Main waste types that are generated during the land preparation and construction phase include domestic waste, packaging waste, excavation and construction waste, hazardous waste, and other special hazardous wastes such as medical waste, waste electric/electronic equipment, waste batteries and accumulators, waste oils, waste vegetable oils, end-of-life tires and vehicles, etc.

The Project Company and the contractors are dedicated to avoid and/or minimize impacts due to waste generation by complying with the requirements of Project Waste Management Plan and national legislation as well as applying international standards on waste management.

Domestic Waste and Packaging Waste

Turkstat has reported that average daily domestic waste generation was 1.85 kg per capita in Çanakkale in 2020, which was higher than the country average of 1.13 kg per capita.

In Çanakkale there are two Sanitary Landfills operated by the Municipalities and/or Associations. The nearest landfill to the Project Area is Çanakkale Sanitary Landfill, located at a distance of 17km from the Centre of Çanakkale Province and 12km from the Project Site. According to the Çanakkale Province Environmental Status Report (2017), the capacity of it is 1.3×10^6 m³ and 18.6 tonnes/day domestic waste was landfilled at this landfill in 2016.

Estimated domestic waste generation for construction phase has been calculated based on above provided statistics and presented in Table 5-36. As shown, domestic waste generation is estimated to be 74kg/day during construction phase. Additional load to the local landfill facilities due to the Project construction activities is estimated to be 0.39% which is negligible.

Table 5-36: Construction Phase Domestic Waste Generation and Additional Load to the Local Infrastructure

Average Project Phase Manpower Gene Çanakka		Average Daily Waste Generation in Çanakkale (kg/day)	Average Daily Domestic Waste Generation due to the Project(kg/day)	y Additional Load to ste the Local Landfill e to Facilities (%) day)		
Land Preparation and Construction	40	1.85	74	0.39		

According to the Environmental Indicators published by the Ministry of Environment and Urbanization, 30% of generated municipal waste (by weight) consists of packaging waste (i.e. recyclable waste) (Ministry of Environment and Urbanization, 2018)⁹. Therefore, the daily packaging waste generation is estimated at approximately 22.2 kg during construction period. Generated domestic waste is/will be stored at waste storage areas on site and regularly transferred to the Çanakkale Sanitary Landfill via trucks in line with the local regulations and international standards. Similarly, packaging waste (and all other recyclable wastes) will be segregated and stored at the temporary storage facilities on site and regularly collected by a licensed recycling company for proper management in compliance with the local regulations.

Waste management training will be provided and separate collection of packaging waste will be encouraged to decrease the total generated amount of municipal waste that will be landfilled. Therefore, the potential additional load on the capacity of existing waste disposal facilities is considered **negligible**.

Recyclable waste bins are available in common areas of the Site. According to the available waste registers, scrap metal, paper and cardboards are being segregated at Site. The Project Company will take necessary action and make arrangements to segregate waste plastic and glass and send off-site at the earliest.

Currently, no licensed environmental service providers are contracted but the Company aims to assign service providers at the beginning of the construction.

Excavation and Construction Waste

An average of 5 cm stripping will be carried out for the entire panel area resulting in approximately 60,000 m³ excavation material. Excavated materials are planned to be used for backfilling after temporarily storing on site near the excavation points until they are used for filling.

Other types of construction specific waste include timber, shavings, wooden pallets, metal scraps and cement bags etc. Segregation and temporary storage of these wastes will be carried out in line with requirements of Project Waste Management Plan and regularly collected by a licensed waste management/recycling company.

Hazardous and Special Wastes

Materials contaminated with hazardous materials (i.e. fuels, chemicals, paints, oils, solvents et.), waste oils, waste vegetable oils, waste tires, used batteries and accumulator, electronic waste, fluorescents and trace amount of medical wastes are generated during land preparation and construction. The Pollution Prevention and Control Plan

⁹ Environmental Indicators, Ministiry of Environment and Urbanisation, 2018 (https://cevreselgostergeler.csb.gov.tr)

and Waste Management Plan are in place for the construction phase and requires all hazardous waste to be stored in a dedicated and secure area that provides the necessary protection to the environment and workers. Management of hazardous wastes are carried out in compliance with these management plans.

Temporary storage of wastes are implemented at designated waste storage areas in compliance with the Project Waste Management Plan and national legislative requirements. Thus, **no significant impact** is anticipated.

Waste PV Panels

Potential impacts due to waste PV Panels are evaluated in Section 5.5.3.2 – operation phase.

Summary of Construction Phase impacts is provided below:

Pacantar	Sopoitivity	Nature of Impact				Impact	Impact
Receptor	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significant
Community Waste Management Facilities	Low	Short-term	Local	Continuous	Low	Low	Negligible
Soil, surface and groundwater	Medium	Short-term	Local	Intermittent	Low	Low	Minor
Personnel and Community Health and Safety	High	Short-term	Local	Intermittent	Low	Low	Moderate
Loss of valuable recyclable/reusable material	Low	Long-term	Regional	Intermittent	Low	Negligible	Negligible

5.5.3.1.1 *Mitigations, Management and Monitoring*

The following measures will be taken in order to avoid/minimize potential impacts of waste generated during land preparation and construction activities:

- The Project will follow the principles of waste hierarchy of reduce, reuse, recycle and disposal;
- Waste Management Plan for the construction will be implemented by the Project Company and the contractors. The plan will form a framework for the key aspects of waste management;
- Dedicated and appropriate waste storage areas (i.e. waste storage containers with adequate size, separate waste containers for different waste types, secondary containment and impermeable floor) will be installed on site;
- Waste minimization, segregation, labelling, storage, transportation and recycling/disposal strategies will be applied in order to meet the national and international standards;
- Necessary environmental permits are / will be obtained from the related Municipality and Directorate of Environment and Urbanization for all waste management activities;
- Licensed waste transportation, recycling, recovery and disposal companies holding necessary permits will be engaged;
- Training covering waste generation and management will be provided to construction phase personnel to raise awareness; and
- Regular visual checks will be carried out to ensure waste segregation and disposal practices will be in line with the Waste Management Plan.

5.5.3.1.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential impacts related to waste management are summarized below.

Receptor	Impact Significant
Community Waste Management Facilities	Negligible
Soil, surface and groundwater	Negligible
Personnel and Community Health and Safety	Minor
Loss of valuable recyclable/reusable material	Negligible

5.5.3.2 Operation Phase

Domestic and Packaging Waste

Number of project personnel will significantly decrease (5 people) once the construction is over and the plant is fully operational leading to reduced amount of domestic waste, estimated to be 9.25 kg/day (See Table 5-37 for details). This number corresponds to approximately 0.006% of the current load on the local waste management facilities. Similar to the construction phase, domestic waste will be temporarily stored near the Administrative Building and regularly disposed at the Çanakkale Sanitary Landfill. A licensed recycling company will regularly collect packaging waste. All, waste management practices will be carried out in compliance with the Project Waste Management Plan and national regulations. Therefore, potential impact from waste management will be **negligible**.

Table 5-37: Operation Phase Domestic Waste Generation and Additional Load to the Local Infrastructure

Project Phase	Manpower	Average Daily Waste Generation per capita in Çanakkale (kg/day)	Average Daily Domestic Waste Generation due to the Project(kg/day)	Additional Load to the Local Landfill Facilities (%)
Operation	5	1.85	9.25	0.0007

Hazardous and Special Wastes

During operation phase, there will be limited quantities of hazardous wastes potentially including materials contaminated with hazardous substances, waste oils, waste vegetable oils, waste tires, used batteries and accumulator, electronic waste, fluorescents. The Project will comply with the national regulations and apply international standards to waste management strategies in line with the Project Waste Management Plan. **No significant impact** is anticipated.

Waste PV Panels

PV Panel waste classification follows the basic principles of waste classification. This also considers material composition by mass or volume and properties of the components and materials used (e.g. solubility, flammability, toxicity). It accounts for potential mobilisation pathways of components and materials for different reuse, recovery, recycling and disposal scenarios (e.g. materials leaching to groundwater, admission of particulate matter into the soil)(https://www.irena.org/documentdownloads/publications/irena_ieapvps_end-of-life solar pv panels 2016.pdf).

From a regulatory point of view, PV panel waste still largely falls under the general waste classification. An exception exists in the EU where PV panels are defined as e-waste in the WEEE Directive. The term 'electrical and electronic equipment' or EEE is defined as equipment designed for use with a voltage rating not exceeding 1,000 V for alternating current and 1,500 V for direct current, or equipment dependent on electric currents or electromagnetic fields in order to work properly, or equipment for the generation of such currents, or equipment for the transfer of such currents, or equipment for the measurement of such currents (EU, 2012).

In the EU, the solar cells manufacturers are bound by law to fulfil specific legal requirements and recycling standards in order to make sure that solar panels do not become a burden to the environment.

There are two main types of solar panels, requiring different recycling approaches. Both types—silicon based, and thin-film based—can be recycled using distinct industrial processes. A schematic presentation of recycling process of both panel types is provided in Figure 5-17 (<u>https://www.greenmatch.co.uk/blog/2017/10/the-opportunities-of-solar-panel-recycling</u>).



Figure 5-17: Recycling Process of PV Panels

Most defective panels are typically returned to the contract partner, a producer service partner or the manufacturer itself for inspection and repair to be reused.

Since currently only moderate PV waste quantities exist on the global waste market, there are not sufficient quantities or economic incentives to create dedicated PV panel recycling plants. End-of-life PV panels are thus typically processed in existing general recycling plants in most countries. Here, the mechanical separation of the major components and materials of PV panels is the focus. This still achieves high material recovery.

If not managed properly, end-of-life and broken/damaged solar panels can cause negative impacts on environment and human health due to their hazardous material content. Therefore, the Project Company is recommended to evaluate potential management strategies and liaise with the PV panel manufacturer or assign a certified waste management company to secure an appropriate and effective recycling/re-use mechanism for end-of-life and broken or damaged solar panels.

Based on above information and discussions, significance of potential impacts associated with operation phase are summarised below:

Pacantar	Soncitivity	Nature of Impact				Impact	Impact
Receptor	Ochality	Duration	Extent	Frequency	Intensity	Magnitude	Significant
Community Waste Management Facilities	Low	Long-term	Local	Continuous	Low	Negligible	Negligible
Soil, surface and groundwater	Medium	Long-term	Local	Intermittent	Low	Negligible	Negligible
Personnel and Community Health and Safety	High	Long-term	Local	Intermittent	Low	Negligible	Negligible
Loss of valuable recyclable/reusable material - general	Low	Long-term	Regional	Intermittent	Low	Negligible	Negligible
Management of damaged PV Panels	High	Long-term	Regional	Intermittent	Low	Low	Moderate

5.5.3.2.1 *Mitigations, Management and Monitoring*

The following measures will be in place to avoid or minimise the potential negative impacts due to waste management during operation phase:

- Operation phase Waste Management Plan to be implemented;
- Proper waste storage areas (i.e. waste storage containers with adequate size, separate waste containers for different waste types, secondary containment and impermeable floor) will be available on site;
- Waste minimization, segregation, labelling, storage, transportation and recycling/disposal strategies will be applied in order to meet the national and international standards;
- Necessary environmental permits will be obtained from the related Municipality and Directorate of Environment and Urbanization for the operation phase;
- Licensed transportation, recycling, recovery and disposal companies will be engaged;
- Training covering waste generation and management will be provided to operation personnel to raise awareness;
- Broken or damaged solar panels are/will be immediately shifted to a designated area to avoid any type of land contamination; and
- A waste management company certified for electronic waste management and recycling will be appointed.
- The broken/damaged panels are/will be stored at a dedicated storage area with adequate bunding until the time of transfer to the recycling facility.
- Regular visual checks will be carried out to ensure waste segregation and disposal practices are in line with the operation phase Waste Management Plan.

The Project Company is recommended to take the following actions/mitigations in order to minimise negative impacts due to end-of-life and broken/damaged PV panels:

- Develop and implement an appropriate and effective recycling/re-use mechanism (covering storage, transportation, recycling and re-use) for end-of-life and broken or damaged solar panels as electronic wastes;
- Ensure broken/damaged panels are stored at a dedicated storage area with adequate bunding and regularly sent to the Manufacturer or a certified waste management facility for evaluation when a reasonable amount that is easy to transfer is reached;
- Consider developing social responsibility campaigns such as sending damaged PV panels to high-schools or universities to support or create education and research studies for the students.

5.5.3.2.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation measures addressing potential impacts related to waste management are summarized below.

Receptor	Impact Significant
Community Waste Management Facilities	Negligible
Soil, surface and groundwater	Negligible
Personnel and Community Health and Safety	Negligible
Loss of valuable recyclable/reusable material	Negligible
Management of Damaged PC Panels	Minor

5.5.3.3 Decommissioning Phase

Waste generation during the decommissioning phase is anticipated to be similar to the construction phase. However, depending on the relevant legislative requirements, removal of project infrastructure may lead to plant components, ETL components, electrical equipment, scraps, waste cables and demolition wastes that will require proper management in addition to the general construction wastes. End-of Life PV panels will be the main concern at the time of commissioning if not managed/recycled appropriately It is recommended to develop an appropriate recycling/re-use mechanism for end-of-life and broken or damaged solar panels in cooperation with the PV panel Manufacturer. If this option is found inapplicable, other recycling facilities should be engaged for this purpose.

Based on above information and discussions, significance of potential impacts associated with decommissioning are summarised in following table:

Receptor	Sensitivity	Nature of Impact				Impact	Impact
		Duration	Extent	Frequency	Intensity	Magnitude	Significant
Community Waste Management Facilities	Low	Short-term	Local	Intermittent	Low	Negligible	Negligible
Soil, surface and groundwater	Medium	Short-term	Local	Intermittent	Low	Low	Minor
Personnel and Community Health and Safety	High	Short-term	Local	Intermittent	Low	Low	Moderate
Loss of valuable recyclable/reusable material	Low	Long-term	Regional	Intermittent	High	High	Moderate
Management of end- of-life PV Panels	High	Short-term	Regional	One-off	High	High	Major

5.5.3.3.1 Mitigations, Management and Monitoring

The following measures will be taken to avoid/minimise potential impacts of decommissioning related waste management:

- The Project Company will engage with the relevant authorities regarding the decommissioning of the Solar Power Plant;
- The Project Company will ensure that the decommissioning contractor(s) will have in place a detailed plan
 prior to the decommissioning activities for reuse, recycling, recovery and management of panel
 components, substations, waste cables, electrical equipment and other demolition waste based on the
 available most recent technologies and in line with the requirements of the relevant authorities;

- The Project Company should either secure panel recycling agreement and procedure with the panel manufacturer or engage with other recycling companies; and
- Licensed waste transportation, recycling, recovery and disposal companies will be engaged.

5.5.3.3.2 Residual Impact

Residual impacts that might incur after the implementation of the mitigation hierarchy and mitigation measures addressing potential impacts related waste management are summarized below.

Receptor	Impact Significant
Community Waste Management Facilities	Negligible
Soil, surface and groundwater	Negligible
Personnel and Community Health and Safety	Minor
Loss of valuable recyclable/reusable material	Minor
Management of end-of-life PV Panels	Moderate

5.6 **BIODIVERSITY**

This section presents the baseline conditions and the assessment of Project impacts on biodiversity associated with the construction, operation and decommissioning of the Project. It identifies the relevant framework of the legislation and other requirements, and identifies and assesses potential significant impacts, prior to defining appropriate mitigation measures that will be implemented as part of the Project throughout its lifetime. The baseline includes protected areas, habitats and species, with information being used from primary and secondary sources.

In line with the national legislation, international standards and the best practices, the ultimate objective of biodiversity studies is to ensure that there are no-net-losses in natural habitats and species' populations, and net gains are achieved in critical habitats. Accordingly, following a thorough baseline study, it is required to take necessary measures to minimize potential impacts on biodiversity and ecosystem services adopting an adaptive management system and following a mitigation hierarchy in compliance with the provisions of IFC PS6 and EBRD PR 6.

5.6.1 **Project Standards**

The biodiversity section of this ESIA follows the IFC PS6 (2012) and associated Guidance Note (GN6 published on January 1, 2012 and last updated on June 27, 2019) on biodiversity conservation and sustainable management of living natural resources.

The IFC PS6 main objectives are:

- To protect and conserve biodiversity
- To maintain the benefits from ecosystem services
- To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities

IFC PS6 requires that a conservation value is allocated to the ecological features (protected areas, habitats and species) which are likely to be directly or indirectly impacted in the Project Aol. Under the IFC guidance, the requirements of PS6 apply to projects in all habitats, whether or not those habitats have been previously disturbed and whether or not they are legally protected. Specifically a project is required to:

- Assess significance of project impacts on all levels of biodiversity as an integral part of the social and environmental assessment process
- Take into account differing values attached to biodiversity by specific stakeholders
- Assess major threats to biodiversity, especially habitat destruction and invasive alien species

In accordance with IFC PS6, habitats are divided into modified, natural and critical habitats. Critical habitats can be either modified or natural habitats supporting high biodiversity value, including:

- Habitat of significant importance to critically endangered and/or endangered species (International Union for Conservation of Nature and Natural Resources (IUCN) Red List)
- Habitat of significant importance to endemic and/or restricted-range species
- Habitat supporting globally significant concentrations of migratory species and/or congregatory species
- Highly threatened and/or unique ecosystems
- Areas associated with key evolutionary processes

Since habitat destruction is recognised as a major threat to the maintenance of biodiversity and to assess likely significance of impacts, IFC PS6 requires the following depending on habitat status:

Modified Habitat: exercise care to minimise any conversion or degradation of such habitat, depending on scale of project, identify opportunities to enhance habitat and protect and conserve biodiversity as part of operations.

Natural Habitat: developer will not significantly convert or degrade such habitat unless no financial/technical feasible alternatives exist, or overall benefits outweigh cost (including those to biodiversity), and conversion or degradation is suitably mitigated. Mitigation must achieve no net loss of biodiversity where feasible; offset losses through creation of ecologically comparable area that is managed for biodiversity, compensation of direct users of biodiversity.
Critical Habitat: in areas of critical habitat the developer will not implement project activities unless there are no measurable adverse impacts on the ability of the critical habitat to support established populations of species described or on the functions of the critical habitat; no reduction in population of a recognised critically endangered or endangered species and lesser impacts mitigated as per natural habitats.

The Birds Directive (2009/147/EC)¹⁰

Often migratory, wild bird species can only be protected by cooperating across borders. Urban sprawl and transport networks have fragmented and reduced their habitats, intensive agriculture, forestry, fisheries and the use of pesticides have diminished their food supplies, and hunting needs to be regulated in order not to damage populations. Concerned with their decline, Member States unanimously adopted the Directive 79/409/EEC in April 1979. It is the oldest piece of EU legislation on the environment and one of its cornerstones. Amended in 2009, it became the Directive 2009/147/EC PDF.

Habitat loss and degradation are the most serious threats to the conservation of wild birds. The Directive therefore places great emphasis on the protection of habitats for endangered and migratory species. It establishes a network of Special Protection Areas (SPAs) including all the most suitable territories for these species. Since 1994, all SPAs are included in the Natura 2000 ecological network, set up under the Habitats Directive 92/43/EEC.

500 wild bird species across Europe are protected under the five annexes to the Birds Directive as explained in Table 5-38.

Annex	Explanation
I	194 species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.
II	82 bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.
111	Overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for 26 species listed here.
IV	The directive provides for the sustainable management of hunting but Member States must outlaw all forms of non-selective and large scale killing of birds, especially the methods listed in this annex.
V	The directive promotes research to underpin the protection, management and use of all species of birds covered by the Directive, which are listed in this annex.

Table 5-38: Annexes to the EU Birds Directive

The Habitats Directive (92/43/EEC11)

Adopted in 1992, the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It forms the cornerstone of Europe's nature conservation policy with the Birds Directive and establishes the EU wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments.

Annex I lists 233 European natural habitat types, including 71 priority (i.e. habitat types in danger of disappearance and whose natural range mainly falls within the territory of the European Union).

All in all, over 1.000 animal and plant species, as well as 200 habitat types, listed in the directive's annexes are protected in various ways:

¹⁰ Source: <u>http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm</u>

¹¹ Source: <u>http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm</u>

Annex II species (about 900): core areas of their habitat are designated as sites of Community importance (SCIs) and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species.

Annex IV species (over 400, including many annex II species): a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites.

Annex V species (over 90): Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status. Table 5-39: Species Protection under the Habitats Directive

International Conventions and Protocols

Conventions on different aspects of biological diversity that Turkey is party to and thought to be relevant to this Project are:

- Convention on Biological Diversity (CBD) (1997) and the Cartagena Protocol on Biosafety
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) / Agreement on the Conservation of Populations of European Bats (EUROBATS)
- Convention to Combat Desertification (CCD)
- Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (RAMSAR)
- Convention for the Protection of World Cultural and Natural Heritage
- Convention on Plant Genetic Resources for Food and Agriculture
- Convention for the Conservation of European Wildlife and Natural Habitats (BERN)
- European Landscape Convention

IUCN Red List of Threatened Species¹²

The IUCN Red List of Threatened Species is the world's most comprehensive information source on the extinction risk of animals, fungi and plants. Assessors place species into one of the IUCN Red List Categories, based on a series of assessment criteria. For each species, The IUCN Red List provides information about its range, population size, habitat and ecology, use and/or trade, threats and conservation actions. The IUCN Red List Categories indicate how close a species is to becoming extinct. The nine Red List Categories are shown in Figure 5-18.

Species are assessed against five criteria (see below) based on geographic range, population size and population decline/increase, in addition to extinction probability analyses. These criteria determine which category is most appropriate for the species.

Species in the Vulnerable, Endangered and Critically Endangered categories are collectively described as 'threatened'. The IUCN Red List does not include Not Evaluated species. Critically Endangered species may also be tagged as Possibly Extinct or Possibly Extinct in the Wild.

¹² https://www.iucnredlist.org/

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Figure 5-18: Structure of the IUCN Red List Categories and Criteria

5.6.2 Assessment Methodology

5.6.2.1 Ecological Area of Influence

The Ecological Area of Influence (AoI) was determined to include the areas directly affected by the Project and areas which will be temporarily affected during construction as follows:

- Project Area and 100m buffer zone around it
- ETL routes and 500m corridor around them.

The field surveys consisted of the defined AoI while the desktop review, critical habitat assessment and ecological impact assessment studies consisted of internationally recognised and protected areas.

A data search covering an area of 50 km was completed using the Integrated Biodiversity Assessment Tool (IBAT) in order to further inform the identification of potential valued ecological receptors as well as the EAAA. In additional to the IBAT search attempts were made to consult with Plantlife, Botanical Species Specialist and BirdLife Partner in Turkey. Responses were not received from Plantlife / Botanical Specialist and the response from the BirdLife Partner was that their policy was not to share data with commercial enterprises or professional consultants.

5.6.2.2 Desktop Review

A desktop based literature review of national and international, sources was undertaken, this has included a full IBAT report covering a 50 km search area.

Furthermore, literature data on the following nature conservation areas and other protected areas (existing or proposed) has also been collected and reviewed:

- Ramsar sites
- Key Biodiversity Areas (KBA)
- Important Bird Areas (IBA)
- Important Plant Area (IPA)
- Protected areas in Turkey.

The relevant literature review findings are provided in Section 5.6.3 Baseline Conditions of this report and full reference list is provided in Section 10 – References.

5.6.2.3 Biodiversity Field Studies

Biodiversity surveys were undertaken for the larger WF project from 2019, with updates specific to the Saros SSP being undertaken at various times throughout 2022.

Survey team included Ornithologist Prof. Dr. Ali Erdogan as bird specialist, survey supervisor and coordinator, Botanist Prof. Hayri Duman, Zoologist Prof. Dr. Mustafa Sözen as Mammalian specialist, Asst. Prof. Dr. Serbülent Paksuz as a bat expert and Zoologist Prof. Dr. Mehmet Öz from Akdeniz University as the amphibian and reptile specialist.

5.6.2.3.1 Flora and Vegetation Survey

Comprehensive flora and fauna (amphibian, reptile, mammal and bird) surveys were undertaken for the wider Saros WPP area in 2019. Further surveys, targeting the specific SPP panel locations, were carried out over two days in both June 2022 and October 2022.

Plant specimens were evaluated considering the underground and above ground organs, flower status, fruit, etc., which are systematic importance for the family level. Plant specimens were pressed during fieldwork in such a way that their morphological appearance would not deteriorate. Based on field surveys, a list of flora species including directly observed species with the study area has been prepared.

Threat statuses for flora species identified within the biodiversity study area were evaluated according to the categories and criteria presented in the reference book of Red Data Book of Turkish Plants (Ekim et al., 2000).

Turkish plant names have been identified based on Turkish Plant Names Dictionary and The Plant List of Turkey (Vascular Plants) (Baytop 1994, Güner et al., 2012). In addition, other scientific databases such as TUBIVES, Noah's Ark Biological Diversity Database (www.tubives.com, <u>www.nuhungemisi.gov.tr</u>) have been referred for flora studies.

Identified habitats of the AoI were evaluated according to the European Nature Information System (EUNIS) and a detailed classification was made. Project flora and vegetation studies are conducted by Prof. Hayri Duman who is a botanical expert.

5.6.2.3.2 Mammals (excl. Chiroptera) and Herpetofauna Surveys

In 2019, extensive fauna and bird observations were carried out within the wider Saros WF survey area. For the Saros SSP, fieldwork was carried out across two survey visits in June 2022 and October 2022 in the areas that SSP panels are to be constructed.

To survey these areas, transect routes were walked and faunal records were recorded and the habitat structure of these areas were examined. Points that are especially important for the fauna were determined, and the amphibian, reptile, bird and mammal species encountered in these areas were recorded. In order to identify amphibian specimens, observations were made especially in areas with water resources. Observations for reptiles have been made in many different areas, such as under stones, under logs, rocky areas, open areas, edges of bush and woodland. In order to identify mammalian specimens, traces and signs such as nests, footprints, direct observation, feeding residues were recorded in the visited areas. In addition to these, all bird specimens observed in the area were also recorded.

The occurrence of the species within the Study Area was determined in two categories:

- Measurement of abundance based on the total number of individuals of a species recorded within given area
- Measurement of commonness based on the number of locations within which a species is observed in a given area (Sutherland 2006).

Detailed studies on Sherman trapping, photo trap work, long-term bird observations, amphibian and reptile studies and the general fauna of the area were carried out in 2019 with long-term and detailed studies, a similar study was not repeated during this research period. Instead, the panel areas that will be affected by the project were visited in June and October 2022, and up-to-date and on-site fauna data were collected and the effects of the activities to be carried out in the area on the fauna were evaluated.

Abundance is categorized in 3 levels: i) abundant; species with high density, ii) relatively abundant; species with moderate density, and iii) rare; species with low density (e.g. only 1-2 individuals of species were observed). Commonness is categorized in 3 levels: i) very common; when the species were observed in the Project site, its surroundings and settlements close to project site, ii) common; when the species were observed in Project site and its surroundings, and iii) uncommon; when the species were seen only a part of Project site or some parts of Project site.

Fauna species have been assessed according to the IUCN Red List, Habitats Directive, and international conventions; Bern and CITES, in order to better identify species' statuses. In the analysis of each species though, due to lack of sufficient population data on many of the fauna species, population estimates and potential impact assessments were based on expert judgment and assessment of potential impacts.

5.6.2.3.3 Avifauna Surveys

Initial avifauna survey consisted of a desktop literature survey and field study, which collated information from the Saros WPP and SPP, to cover migratory and breeding bird species.

The Project site and AoI do not support habitats which would be important for species of wintering wildfowl and wading birds (*e.g.* large areas of open water for roosting or extensive grassland for grazing).

For bird surveys, fixed transect and fixed-point surveys were performed. In the fixed transect designed in a 'zig zag' pattern, with the transect being started on the northern field boundary, then crossing the plot every 100m until the southern field boundary is reached. The length of the transect therefore varied from site to site but was roughly the same distance (Bibby et al 2000, Sutherland et al. 2004). One or two observers carried out the surveys each day between 08.00 and 18.00 for almost 8-10 hours in a day. With the method, both the project site and its close proximity up to 5 km were observed and assessed.

Information on animal diversity and avian activity was also collected from residents and shepherds in the region.

Fixed-point surveys are standard monitoring method for detection of soaring migrant and other birds (Bibby et al. 2000, Sutherland et al. 2004, 2006, Panuccio et al. 2013, 2017). Avifauna surveys also covered Lakes Aci Göl and Meke which are located approximately 7-8 km southeast to the Project Site.

Avian species were identified by visual contact. Species identification was made by referring to Mullarney et al. (2003). Due to the limitations such as poor visibility, high flight heights of soaring birds, difficult field and bad weather conditions in the project site, photography was also used to identify of soaring birds. Photography is one the best

option for difficult to detect species, has regularly been used for birds under poor visibility, or difficult field and bad weather conditions (Wehrmann et al. 2019). Binoculars (Nikon 8x40 and Olympus 10x50), HD cameras (Canon 7D and Canon 70D) with tele-lenses (Canon 400 mm and Canon 100-400 mm) were used as field equipment.

Further information was also collected through interviews with local people within the Study Area and review of contemporary literature and Study Team's previous field surveys in the region (Kılıç 1999, Kiziroğlu 2008, Svensson et al. 2010, Kirwan et al. 2010, Kiziroğlu 2015).

5.6.2.4 Impact Assessment

The magnitude of the potential impacts upon each ecological feature (Table 5-40) is assessed for the construction, operation and decommissioning of the Project.

In accordance with IFC PS6, the conservation value (sensitivity) or weighting attributed to each ecological feature which occurs within the Project AOI needs to be assessed, and these are defined in Table 5-41.

In order to categorise the sensitivity on the basis of biodiversity-specific criteria typically adopted for the assessment of ecological impacts, slightly differs from the evaluation matrix presented in Chapter 4 – Impact Assessment Methodological Approach.

Significance has been determined by the interaction between the magnitude of impacts and the sensitivity of receptors affected, as depicted in the impact evaluation matrix shown in Chapter 4.

Table 5-40: Impact Magnitude Criteria

Category	Definition
High	Fundamental change to the specific environmental conditions assessed resulting in long term or permanent change, typically widespread in nature (regional national and international), would require significant intervention to return to baseline; exceeds national standards and limits.
Moderate	Detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change
Low	Detectable but minor change to the specific environmental conditions assessed.
Nealiaible	No perceptible change to the specific environmental conditions assessed

Accordingly, overall magnitude of each impact was estimated as a factor of the foreseen geographic extent, duration, and frequency of the impact. Sensitivity criteria used in the assessment of impacts on these biodiversity groups are presented in Table 5-41.

Conservation Value (Sensitivity)	Species Criteria	Habitat or Site Criteria
High	IUCN Critically endangered, endangered and Vulnerable species. Nationally protected species of significant population size and importance. Local endemic flora species Bird species with elevated conservation concern; species with declining local population; breeding residents.	Internationally designated sites (or equal status). Nationally designated sites (or equal status). Critical habitats of significant international or national ecological importance.
Medium	IUCN Near Threatened species. Nationally protected species or rare species, but not a significant population size and not of national importance. Regional endemic flora species	Regionally important natural habitats. Priority habitats listed under Annex I of the Habitats Directive. Modified habitats with high biodiversity or under significant threat of loss within the region.
Low	IUCN Least Concern. Widespread species Non-breeding and non-resident bird species	Undesignated sites and habitats of natural habitats of some local biodiversity and cultural heritage interest. Modified habitats with limited ecological value. Other sites with little or no local biodiversity and cultural interest. Modified habitats with limited biodiversity value.

Table 5-41: Criteria for determining conservation value (sensitivity of the biodiversity receptors)

Negligible

Species of no national importance / no relevance to the site

Highly modified habitats of no biodiversity value.

5.6.3 Baseline Conditions

5.6.3.1 Protected Areas

According to IFC PS 6, there are two different types of protected areas; Legally Protected Areas and Internationally Recognized Areas. Legally Protected Areas meet the IUCN definition for a protected area, while Internationally Recognized Areas are defined as UNESCO World Heritage Sites, UNESCO Man and Biosphere Reserves, Key Biodiversity Areas, and wetlands designated under the Ramsar Convention.

Similarly, EBRD PR6 is guided by the International Union for Conservation of Nature (IUCN) definition of "Protected Area" and Protected Area is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values".

5.6.3.1.1 Legally Protected Areas

The International Union for Conservation of Nature (IUCN) proposes the following definition for a protected area, which today is widely used around the globe, and recognized as the definition of legally protected areas by PS6:

"A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values."

Legally protected areas constitute an integral part of biodiversity conservation efforts, as well as ecosystem services provided by ecological functions they convey. In Turkey, Ministry of Agriculture and Forestry is the main official body responsible for development and implementation of national biodiversity conservation policies, action plans, designation of conservation areas, and many other related tasks conducted by its central and local directorates within the Ministry's organizational structure.

IUCN Protected Area Management Categories were adopted to restructure the Turkish Protected Area System in 2006 through the Biodiversity and Natural Resource Management Project undertaken by the Ministry's General Directorate of Nature Conservation and National Parks. The IUCN Protected Area Management Categories provide a global framework and is recognized by the CBD, with an initial objective of creating a common understanding of protected areas within and between countries. Categorization is done according to the primary management objectives for a protected area, based on the principles listed as the following; assignment to a category is a not a commentary on management effectiveness, the categories systems is international; national names for protected areas may vary, and all categories are important; and gradation of human intervention is implied. Accordingly, legally protected areas in Turkey, were re-classified under the 6 protected area management categories defined by the IUCN Guidelines, which identify the main reasons for management as the following:

Strict protection [Ia) Strict nature reserve and Ib) Wilderness area]

- II Ecosystem conservation and protection (i.e., National park)
- **III Conservation** of natural features (i.e., Natural monument)
- **IV** Conservation through active management (i.e., Habitat/species management area)
- V Landscape/seascape conservation and recreation (i.e., Protected landscape(seascape)
- VI Sustainable use of natural resources (i.e., Managed resource protected area)

The National EIA Report for the Project was prepared in 2018 in line with the Turkish environmental legislation and granted the Project with "EIA Positive Decision". In line with the provisions of the EIA Regulation, the Project Site and the wider area it is located in was studied in terms of its overlap with any of the legally protected areas as listed by the Ministry; national parks, nature protection areas, nature parks, natural monuments, wildlife reserves, conservation forests, natural protected areas (Turkish acronym SIT), special protection areas, Ramsar sites, biosphere reserves, and UNESCO World Heritage sites.

The National EIA report affirms that the Project does not overlap with a national park, nature park, natural monument or nature protection areas. There is an official statement from the Çanakkale Governship Provincial Directorate of Environment and Urbanization dated October 8, 2018, which identifies that the Project site is not located within a natural protected area (SIT). Likewise, another official statement from Çanakkale Regional Directorate of Forestry dated October 15, 2018, stating that the Project site is not located within registered forest land. Distances to the nearest legally protected areas from the Project Site are provided in Table 5-42.

Table 5-42 Legally Protected Areas around the Saros WF

Name	Protected Area Category	Distance from the Project License Area
Troy	National Park	31 km
Kazdağları	National Park	45 km
Darıdere	Nature Park	48 km
Ayazma Pınarı	Nature Park	44 km
Kazdağı Göknarı	Nature Protection Area	43 km

5.6.3.1.2 Internationally Recognized Areas

According to the IFC PS6, Internationally Recognized Areas are "areas of recognized importance to biodiversity conservation but are not always legally protected". Also, IFC PS 6 GN54 states that Projects that are located within internationally and/or nationally recognized areas of high biodiversity value (i.e. Key Biodiversity Areas (KBAs), which encompass Important Bird and Biodiversity Areas (IBAs)) or areas that meet the criteria of the IUCN's Protected Area Categories Ia, Ib and II. may require a critical habitat assessment.

The following sources were utilised for understanding status of the area in terms of internationally recognised areas :

- "122 Important Plant Areas of Turkey", Ozhatay et al. (2005) define important plant areas (IPAs) in Turkey, based on internationally recognised criteria and locally collected data. Each IPA is explained in terms of its general characteristics, detailed flora species' composition, threats it faces and related conservation efforts if there are any.
- Important Bird and Biodiversity Areas (IBA) by BirdLife International.
- Key Biodiversity Areas (KBAs) of Turkey, Doğa Derneği (2006). The inventory defines 305 KBAs in terms of their outstanding characteristics and provides a detailed list of species and their global and regional threat statuses (Eken et al., 2006).

Biga Dağları (Mountains)" KBA

Biga Dağları (Mountains)" is one of the KBAs identified by the inventory with an assigned code of MAR009, covering an area of 31,081 ha, where the elevation changes between 200 and 934 meters. The KBA is located in the central section of the Biga Peninsula, which borders the Dardanelles to the north, and Gulf of Edremit to the south. Biga Mountains, with a peak at 934 m, is a small mountain range extending in the north-south direction.

KBA-listed species are provided in Table 5-43, and a map showing the KBA overlaps with the WPP Project License Area., however the boundary of the SPP does not overlap with the KBA boundaries.

Table 5-43 Biga Dağları KBA-Listed Flora and Fauna

Species	IUCN Red List Category
Plants	
Crocus candidus	VU
Galanthus trojans	CR
Paeonia mascula spp. bodurii	EN
Birds	
Dendrocopos syriacus	LC
Lullula arborea	LC

Although quite limited, information on Biga Dağları KBA suggests that the area was appointed as a KBA due to presence of the three endemic flora species, as it had also been previously identified as an Important Plant Area

(IPA), with overlapping boundaries. The two KBA-listed bird species, on the other hand, are Habitats Directive Annex II species due to their declining populations in Europe, but based on expert judgement their populations in the area and also wider region at their preferred habitats are healthy with no direct threats.

Available data has been screened with an attempt to appoint an IUCN Protected Area Management Category to Biga Dağları KBA, which has no official conservation status, neither it is otherwise managed. Therefore, it is open to access by local people, as well as others due to presence of hunting grounds in certain parts of the KBA. There are also agricultural areas across the KBA, also around Saros WF turbine sites that are partially in use, while some are abandoned.

Given the current practices in the area, it is suggested that the KBA is divided between a "Category IV: Habitat/species management area", which includes that hunting grounds, and "Category V: Protected Landscape / Seascape" for areas that are used for agriculture and other activities by humans. The primary objective of designation of a Category IV protected area is to maintain, conserve and restore species and habitats, which is the general strategy in areas of introduced wildlife species for hunting purposes. The management approach undertaken for the Project meets that of a Category IV Protected Area in terms of active management to maintain target species, active management of natural or semi-natural ecosystems, and active management of culturally-defined ecosystems. For Category V, on the other hand, the primary goal is to protect and sustain important landscapes / seascapes and the associated nature conservation and other values created by interaction with humans through traditional management practices. When assigned, Category V requires that the area should have unique or traditional land-use patterns and human settlements that have evolved in balance with their landscape. If the KBA was to be considered for active management practices, considering the scale of the area, and different management objective for already existing zones, it would be inevitable to assign different categories as suggested.

Canakkale Strait IBA

The Canakkale Strait IBA was located through the IBAT website and lies approximately 20km west of the Saros SSP. It covers an area of 110,269ha and covers the all of the Canakkale Strait and land adjacent. Although quite limited, information on Canakkale Strait IBA suggests that the area was appointed due to presence of a passage movement of Yelkouan Shearwater during the last assessment of the area in 2016. Yelkouan Shearwater are a vulnerable species in the IUCN Red List. This species triggered three IBA criteria:

A1 The site is known or thought regularly to hold significant numbers of a globally threatened species. **A4** The site is known or thought to hold congregations of $\geq 1\%$ of the global population of one or more species on a regular or predictable basis.

B1ii The site is one of the 'n' most important in a country for a species with an unfavourable conservation status in the region, and for which the site-protection approach is thought to be appropriate.



Figure Showing the Canakkale Strait, in relation to the Saros SSP

5.6.3.2 Habitat Classification

The European Nature Information System (EUNIS) puts forward a system for identification and classification of European habitat types. Classification area is quite large including the entire European mainland and seas including islands that are close to the mainland (except for Cyprus, Iceland and Greenland), EU states' archipelagos (Canary Islands, Madeira Islands and Azore Islands) and the European mainland to the west of Ural Mountains that cover Turkey and the Caucasus. The aim of the EUNIS habitat classification is to create a European reference set of habitat types including a description of all types and hierarchical classification (EEA, 2012).

The Aol habitats have been assessed based on the EUNIS classification scheme, which has been a useful tool not only in terms of relation to national vegetation definitions to regional/international level, but also putting forward a correspondence to the Habitats Directive Annex I habitats, to further assess within the scope of the critical habitat assessment and designation of special areas of conservation under the Directive.

The Aol was observed to be a combination of natural and modified habitats. Vegetation types identified within the biodiversity study area are described below:

Mixed Deciduous Oak Forests (G1.7): It forms one of the common vegetation types of the project area. These forests are quite common in Marmara and Western Black Sea regions in our country (Photo 7). These forests within the project area are not very healthy as they are represented at the edges of the fields. The characteristic types of vegetation are deciduous oaks. The dominant tree species of this habitat are *Quercus frainetto, Quercus cerris, Quercus petraea subsp. iberica.*

The cover of the forest cover varies between 60-80% and its length varies between 2-6 meters. Also, Juniperus *oxycedrus, Ruscus aculeatus var. aculeatus*, which is less dominant in this habitat. Trees and shrubs spread such as *Osyris alba, Pyrus elaeagnifolia, Prunus divaricata subsp. divaricate*.

The forest flora of this habitat is also rich. *Brachypodium sylvaticum, Pilosella piloselloides subsp. megalomastix, Dactylis glomerata subsp.* Shade-loving plants such as *hispanica, Cistus creticus, Cistus salviifolius, Moenchia mantica, Geranium asphodeloides, Anthoxanthum odoratum, Tuberaria guttata, Salvia tomentosa, Silene italica, Lathyrus laxiflorus and Oenanthe silaifolia spread.* In addition, endemic species *Crocus candidus* and *Thymus zygioides* spread in this habitat



Figure 19: Deciduous Mixed Oak Forest (G1.7)

Pinus nigra and deciduous mixed oak forest (G4.B): Black pine and deciduous mixed oak forests are very little represented in the project area. The dominant species of these forests are *Pinus nigra, Quercus frainetto, Quercus cerris* and *Quercus petraea*. The overlap of this vegetation type, in which deciduous and coniferous forests are mixed, reaches 70-80% in places. Its length varies between 4-8 meters. In the lower flora of the tree layer, herbaceous species such as *Crepis rubra, Crocus candidus, Thymus zygioides, Moenchia mantica, Silene italica* spread.



Figure 20: Pinus nigra and deciduous mixed oak forest (G4.B)

East Gariks (F6.2): Represents the relatively modified *Paliurus-spina-christii* thickets found in the project area (Photo 10). The dominant species of vegetation are *Paliurus-spina-christii* and *Prunus spinosa* (Photo 11). In the lower flora, shrubs and herbaceous species such as *Cistus creticus, Dracunculus vulgaris, Stachys cretica, Campanula lyrata, Dactylis glomerata, Thymus zygioides spread.*



Figure 21: East Gariks (F6.2)

Permanent mesotrophic grassland (E2.1): It represents the meadows used as pasture in the project area. This habitat, which develops in forest clearings, is the feeding area of small and bovine animals (Photo 12). The dominant species of the habitat are *Hordeum bulbosum Sanguisorba minor, Cynodon dactylon, Dactylis glomerata, Poa bulbosa, Lolium rigidum, Medicago sativa, Lotus corniculatus, Ononis spinosa, Trifolium stellatum, Crocus pulchellus, Trifolium campestre.*



Figure 22: Permanent Mesotrophic Grassland (E2.1)

Small-Scale Agricultural Lands (I1.2): Since the project area is close to the settlements, there is a lot of small-scale agricultural area in the project area. These agricultural areas are mainly used for grazing today, and wheat is cultivated in a small part of them.



Figure 23: Small Scale Agricultural Lands

Desk Study

A literature survey was conducted as part of the baseline studies. According to the desk-top survey no literature, directly related to the flora characteristics of the Study Area, was identified.

On the other hand, since the WPP Project Site overlaps the KBA, studies conducted within the Mountains KBA (Bağçı 1993; Eken et al., 2006; Özhatay et al., 2005; Kurt et al., 2013) were also reviewed as part of desktop review. These studies recorded number of endemic species including:

- Critically Endangered (CR): Astragalus cicerellus, Astragalus gigantostegius, Astragalus victoria,
- Endangered (EN): Campanula antalyensis, Gladiolus humulus
- Vulnerable (VU): Acantholimon halophilim, Allium vuralii, Delphinium cinereum, Gladiolus halophilus, Lepidium caespitosum, Onobrychis paucijuga, Sphaerophysa kotschyana, Trigonella isthmocarpa, Verbascum pyroliforme
- Least Concern (LC): Allium sieheanum, Limonium liliacinum.

It should be noted that none of these species were identified at the Study Area during the field surveys conducted in 2022 on the Saros SPP site. It should also be noted that the Saros SPP does not overlap the boundaries of the KBA.

A total of 121 taxa that belong to 26 different families were identified during the field studies (see Table 5-44). Of these taxa, six (6) are identified as endemic however none of them are rare. Relative abundance of the species within the AOI was determined through a scale 1-5. Legend is provided below the table.

Six endemic species, distributions of which are regional, are *Anthemis fumarifolia, Astragalus lycius, Petrosimonia nigdeensis, Cousinia birandiana, Cousinia iconica* and *Linaria corifolia*. IUCN Red List Category of all endemic species are Least Concern. None of these species are listed under Mountains KBA.

Genera and species are listed alphabetically for clear presentation. While listing the species, their phytogeographic region, endemism levels, threat statuses of endemic and rare plant species, their inclusion in Bern or CITES lists, habitats and abundance in the AoI where field studies were conducted are also presented in Table 5-44.

Environmental and Social Impact Assessment

Security level: RINA/CL/SENSITIVE

Table 5-44 Plant Species within the AOI

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
ANACARDIACEAE	1	Pistacia terebinthus L. subsp. terebinthus	Mediterrenian					x						x			
APOCYNACEAE	2	Vinca major L. subsp. major	Mediterrenian						x					x			
ARACEAE	3	<i>Dracunculus vulgaris</i> Schott	Mediterrenian					x						x			
ARISTOLACHIACEAE	4	<i>Aristolochia bodamae</i> Dingler	Europe-Siberia					х						x			
	5	<i>Aristolochia pallida</i> Willd.	wide spread					x						x			
ASPLENIACEAE	6	Ceterach officinarum DC.	wide spread					x						x			
	7	Asplenium adiantum- nigrum L.	wide spread					x						x			
ASTERACEAE	8	<i>Achillea coarctata</i> Poir.	wide spread						x			х		x			
	9	<i>Achillea wilhelmsii</i> C. Koch	wide spread						x			х		x			
	10	<i>Anthemis austriaca</i> Jacq.	wide spread						x	х				x			
	11	Anthemis chia L.	Mediterrenian						х	х			х				
	12	Anthemis cretica subsp. <i>leucanthemoides</i> (Boiss.)	wide spread					x						x			
	13	Anthemis tinctoria L. var. tinctoria	wide spread					х		х				x			
	14	Bellis annua L.	Mediterrenian					х		х	х		х				
	15	Bellis perennis L.	Mediterrenian					х		х	х			х			
	16	Bellis sylvestris Cyr.	wide spread							х				х			
	17	Calendula arvensis L.	Mediterrenian									х		х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	٩T			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	18	Carduus nutans L. sensu lato	wide spread						x			х		х			
	19	Carlina vulgaris L.	wide spread									х		х			
	20	Carthamus lanatus L.	wide spread						х			х		х			
	21	Centaurea cyanus L.	wide spread					х		х				х			
	22	<i>Centaurea iberica</i> Trev. Ex Sprengel	wide spread						x					х			
	23	<i>Centaurea solstitialis</i> L. subsp. <i>solstitialis</i>	wide spread						x					x			
	24	<i>Centaurea urvillei</i> DC. subsp. <i>stepposa</i> Wagenitz	Iran-Turan						x					x			
	25	<i>Centaurea virgata</i> Lam.	wide spread						х					х			
	26	Cichorium intybus L.	wide spread					х				х		х			
	27	<i>Chondrilla juncea</i> L. there is. <i>juncea</i>	wide spread						х			х		х			
	28	<i>Cirsium balikesirense</i> Yıldız, Arabacı & Dirmenci	Mediterrenian	VU		x		x	x					x			
	29	Cirsium italicum (Savi) DC.	Mediterrenian						x					х			
	30	Cirsium vulgare (Savi) Ten.	wide spread					х						x			
	31	<i>Conyza canadensis</i> (L.) Cronquist	wide spread									х		х			
	32	Crepis alpina L.	wide spread					х		х				х			
	33	Crepis foetida L.	wide spread					х		х	х			х			
	34	Crepis rubra L.	Mediterrenian	VU					х					x			
	35	<i>Crepis sancta</i> (L.) Babcock	wide spread					х		х	x			x			
	36	<i>Doronicum orientale</i> Hoffm.	wide spread					х		х				х			
	37	Echinops ritro L.	wide spread						х			х		х			
	38	Filago pyramidata L.	Mediterrenian						х			х		х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	39	Helminthotheca echioides (L.) Holub	wide spread					x		x				x			
	40	Hyphocoeris radicata L.	Europe-Siberia					x	x	x				x			
	41	Lactuca serriola L.	Europe-Siberia						х			х		х			
	42	Lapsana communis L. subsp. intermedia (Bieb.) Hayek	wide spread					x		x				x			
	43	Leontodon tuberosus L.	Mediterrenian					х		х				х			
	44	Matricaria chamomilla L. var. chamomilla	Mediterrenian						x					x			
	45	Onopordum illycum L. there <i>is cardunculus</i> Boiss.	Mediterrenian						x					x			
	46	Picnomon acarna (L.) Cass.	Mediterrenian						х			x		х			
	47	Pilosella hoppeana (Schultes) CH& FWSchultz	wide spread					x		x	x			x			
	48	<i>Scariola viminea</i> (L.) FW Schmidt	wide spread						x			х		х			
	49	<i>Senecio vernalis</i> Waldst. meat kit	wide spread						х			х		х			
	50	Senecio vulgaris L.	wide spread						х			х		х			
	51	Sonchus asper (L.) Hill subsp. glaucescens (Jordan) Ball.	wide spread						x			x		x			
	52	<i>Tragopogon</i> <i>longirostris</i> Bisch. ex Schultz Beep.	wide spread						x			x		x			
	53	<i>Tripleurospermum</i> oreades (Boiss.) Rech. Elephant. There is. oreades	wide spread						x					x			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	54	Tussilago farfara L.	Europe-Siberia					х		х				х			
	55	Xanthium spinosum L.	wide spread									х		x			
	56	Xanthium strumarium L.	Mediterrenian									х		x			
	57	Xeranthemum annuum L.	wide spread						x			х		x			
BORAGINACEAE	58	Buglossoides arvensis (L.) Johnston	wide spread						x					x			
	59	Echium italicum L.	Mediterrenian						х					х			
	60	Heliotropium europaeum L.	Mediterrenian						х					х			
	61	Myosotis arvensis L.	Europe-Siberia					х		х				х			
	62	Myosotis refracta Boiss. subsp. refracta	Mediterrenian					х		х				х			
BRASSICACEAE	63	<i>Alliaria petiolata</i> (Bieb.) Cav. & Grande	wide spread					x						x			
	64	<i>Alyssum minutum</i> Schlecht. ex DC.	wide spread					х		х				х			
	65	<i>Alyssum murale</i> Waldst. & Kit.	wide spread					x		x				x			
	66	Arabis verna (L.) DC.	wide spread					х		х				х			
	67	Capsella bursa- pastoris (L.) Medik.	wide spread					x		х		х		х			
	68	Cardamine graeca L.	wide spread					х						х			
	69	Cardamine hirsuta L.	wide spread					х						х			
	70	Clypeola jonthlaspi L.	wide spread						х			х		х			
	71	Descurainia sophia (L.)	wide spread					x		x				x			
	72	<i>Erophila verna</i> (L.) Chevall. subsp. <i>verna</i>	wide spread					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	73	<i>Erysimum</i> <i>smyrnaeum</i> Boiss. & Honey.	wide spread					x			x		x				
	74	Hirschfeldia incana (L.) LagFoss	wide spread					х			х			х			
	75	Thlaspi perfolatum L.	wide spread					х				х		х			
CYPERACEAE	76	Carex divulsa Stokes ssp. divulsa	Europe-Siberia					х		x				х			
	77	Carex otrubae Podp.	Europe-Siberia					х		х				х			
	78	Carex remota L.	Europe-Siberia					х		х				х			
CAMPANULACEAE	79	<i>Campanula lyrata</i> Lam. subsp. <i>lyrata</i>	Mediterrenian					x						х			
	80	Legousia pentagonia (L.) Thellung	Mediterrenian					x		x				х			
CAPRIFOLIA CEAE	81	<i>Lonicera etrusca</i> Santi	Mediterrenian					х		x				х			
	82	Sambucus ebulus L.	Europe-Siberia									х		х			
CARYOPHYLLACEAE	83	Arenaria serpyllifolia L. var leptoclados Reichb.	wide spread					x		x				x			
	84	<i>Cerastium gracile</i> Duf.	wide spread					x		x				х			
	85	Cerastium illyricum Ard. subsp. comatum (Pesv.) PDSeel & Whitehead	Mediterrenian					x		x				x			
	86	Dianthus calocephalus Boiss.	wide spread						x					х			
	87	Moenchia mantica (L.) Bartl. Subsp. mantica	wide spread						x			x		x			
	88	Petrorhagia velutina velutina (Guss.) Ball & Heywood	Mediterrenian					x		x				x			
	89	Silene gallica L.	wide spread					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	90	Silene italica (L.) Pers.var. incana Gris.	Mediterrenian					х		х				х			
	91	Silene vulgaris (Moench) Garcke var. vulgaris	wide spread					x		x				x			
	92	<i>Stellaria media</i> (L.) Vill.	wide spread					x		х				x			
	93	Velezia rigida L. var. fasciculata (Boiss.) Post.	Mediterrenian						x					x			
CHENOPODIACEAE	94	Chenopodium album L.	wide spread									x		х			
	95	Chenopodium foliosum (Moench) Aschers	wide spread									x		x			
CISTACEAE	96	Cistus salviifolius L.	Mediterrenian					х						х			
	97	Cistus creticus L.	Mediterrenian					х							х		
	98	<i>Tuberaria guttata</i> (L.) Fourr. there is. <i>guttata</i>	wide spread					x						x			
CONVOL VULA CEAE	99	Convolvulus arvensis L.	wide spread									х		x			
CORNACEAE	one hundred	Cornus mas L.	Europe-Siberia					х						х			
CRASSULACEAE	101	Sedum album L.	wide spread						х					х			
	102	Sedum confertiflorum Boiss.	Mediterrenian						x					x			
	103	Sedum pallidum Bieb. there is. <i>bithynicum</i> (Boiss.) Chamberlain	Europe-Siberia						x					x			
	104	Umbilicus rupestris (Salisb.) Dandy	wide spread					х			х			x			
CUPRESSACEAE	105	Juniperus oxycedrus L. ssp. oxycedrus L.	Mediterrenian					х		х				x			
CUSCUTACEAE	106	Cuscuta australis R. subsp. tinei.	Mediterrenian						x			x		х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
CYPERACEAE	107	Carex panicea L.	Europe-Siberia					х		х				х			
DIPSACACEAE	108	<i>Knautia integrifolia</i> (L.) Bert there is. <i>bidens</i> (Sm.) Borbas	Mediterrenian						x					x			
	109	Pterocephalus plumosus (L.) Coulter	wide spread						x					х			
	110	Scabiosa argentea L.	wide spread						х					х			
EUPHORBIACEAE	111	Euphorbia amygdaloides L. var. amygdaloides	Europe-Siberia					x		x	x			x			
	112	Euphorbia helioscopia L. var. haussknechtii (Boiss.) Boiss.	wide spread						x			x		x			
	113	<i>Euphorbia myrsinites</i> L.	wide spread						x					x			
	114	<i>Euphorbia rigida</i> Bieb.	Mediterrenian					x						x			
	115	Mercurialis perennis L.	Europe-Siberia					x						x			
FABACEAE	116	<i>Chamaecytisus hirsutus</i> (L.) Link	wide spread					x		x				х			
	117	Coronilla parviflora Willd. there is. <i>Luchani</i> Uhrova	Mediterrenian						x					x			
	118	<i>Genista carinalis</i> Gris.	wide spread					x		x				х			
	119	Hippocrepis unisiliquosa L. subsp. unisiliquosa	Mediterrenian						x					x			
	120	Hymenocarpus circinnatus (L.) Savi	Mediterrenian					х		x				x			
	121	Lathyrus aphaca L. there is. affinis (Guss.) Arc.	Mediterrenian					x		x				x			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	122	<i>Lathyrus laxiflorus</i> (Desf.) O. Kuntze	wide spread					х		x	х			х			
	123	<i>Lens nigricans</i> (Bieb.) Godr.	Mediterrenian					x		x	x			х			
	124	Lotus corniculatus L.var. corniculatus	wide spread						x					x			
	125	Medicago orbicularis (L.) All.	Mediterrenian						х					х			
	126	<i>Medicago sativa</i> L. subsp. <i>sativa</i>	wide spread					х		х				х			
	127	Medicago polymorpha L. var. vulgaris (Benth.) Shinners	wide spread							x				x			
	128	<i>Onobrychis aequidentata</i> (Sibth. & Sm.) d'Urv.	Mediterrenian					x						x			
	129	Ononis spinosa subsp. antiquorum (L.) Briq.	Mediterrenian						x					x			
	130	Ornithopus compressus L.	Mediterrenian					х		х				х			
	131	<i>Trifolium</i> angustifolium L. there is. angustifolium	wide spread					x		x				x			
	132	<i>Trifolium arvense</i> L. there is. <i>arvense</i>	wide spread					х		х				х			
	133	<i>Trifolium campestre</i> Schreb.	Mediterrenian					х		х				х			
	134	Trifolium hybridum L. var. hybridum	wide spread					х		x				х			
	135	Trifolium isthmocarpum Brot.	wide spread					х		х				х			
	136	<i>Trifolium pratense</i> L. var. <i>practice</i>	wide spread					x		x				х			
	137	Trifolium repens L. var. repens	wide spread					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	138	Trifolium stellatum L.	wide spread					х		х				х			
	139	Trifolium uniflorum L.	Mediterrenian					х		х				х			
	140	Vicia cracca L. subsp. stenophylla Vel.	wide spread					х	x					х			
	141	Vicia hybrida L.	Mediterrenian					х						х			
	142	Vicia narbonensis L. var. narbonensis	wide spread					х		х				х			
FAGACEAE	143	<i>Quercus cerris</i> L. var. <i>cerris</i>	Mediterrenian					х		х	х					x	
	144	<i>Quercus frainnetto</i> Ten.	wide spread					х		х	х					х	
	145	Quercus infectoria Olivier subsp. infection	Europe-Siberia					x			x					x	
	146	Quercuspetrea(Mattuschka)Liebl.subsp.iberica(Steven ex Bieb.)Krassiln	wide spread					x		x	x					x	
GENTIANACEAE	147	<i>Centaurium erythraea</i> Rafn. ssp. <i>rumelicum</i> (Velen.) Melderis	Mediterrenian						x					x			
GERANIACEAE	148	<i>Erodium ciconium</i> (L.) L'Herit	wide spread						х					х			
	149	<i>Geranium</i> <i>asphodeloides</i> Burm. Elephant. Subsp. <i>asphodeloides</i>	Europe-Siberia					x						x			
	150	Geranium lucidum L.	wide spread					х		х				х			
	151	Geranium purpureum Vill.	wide spread					x		x				х			
	152	Geranium rotundifolium L.	wide spread					x		x				х			
HYPERICACEAE	153	Hypericum aucheri Jaub. & Spach	Mediterrenian					х	х					х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	154	Hypericum olympicum L. subsp. olympicum	Mediterrenian						x					x			
	155	Hypericum perforatum L.	wide spread						x					х			
HYPOLEPIDACEAE	156	<i>Pteridium aquilinum</i> (L.) Kuhn	wide spread					х						х			
IRIDACEAE	157	<i>Crocus candidus</i> ED Clarke	Mediterrenian	VU		x		x		x				x			
	158	<i>Crocus pulchellus</i> Herbert	Mediterrenian					х		х				х			
	159	<i>Gladiolus italicus</i> Miller	Mediterrenian						x					х			
	160	<i>Romulea bulbocodium</i> (L.) Seb.&Mauri	Mediterrenian						x					x			
JUNCACEAE	161	<i>Luzula forster</i> (Sm.) DC.	Europe-Siberia					х		х				х			
	162	Juncus effusus L.	wide spread						х					х			
	163	<i>Juncus gerardi</i> Loisel subsp. <i>gerard</i>	wide spread					х		х				х			
LAMIACEAE	164	<i>Acinos rotundifolius</i> Persian.	wide spread					х						х			
	165	<i>Clinopodium vulgare</i> L. <i>subsp. arundonum</i> (Boiss.) Nyman	wide spread					x		x				x			
	166	Lamium amplexicaule L.	Europe-Siberia					х		х				х			
	167	Lamium garganicum L. subsp. striatum (Sm.) Hayek var. striatum	Mediterrenian					x		x				x			
	168	<i>Lamium purpureum</i> L. there is. <i>purpureum</i>	Europe-Siberia					х		х				х			
	169	Marrubium vulgare L.	wide spread						х					х			
	170	<i>Melissa officinalis</i> L. subsp. <i>officinalis</i>	wide spread					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		HA	ABIT/	٩T			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	171	<i>Origanum vulgare</i> L. subsp. <i>hirtum</i> (Link) Letswaart	Mediterrenian					x		x				x			
	172	Prunella vulgaris L. var. laciniata	Europe-Siberia					х		х				х			
	173	Salvia aethiopis L.	wide spread						х					х			
	174	<i>Salvia tomentosa</i> Miller	Mediterrenian					х		x				х			
	175	<i>Salvia virgata</i> Jacq.	Iran-Turan					х		х				х			
	176	Scutellaria albida L. subsp. albida	Mediterrenian					x		x				х			
	177	Stachys cretica L. subsp. smyrnaea Rech.fil.	Mediterrenian	LC			x		x					x			
	178	Teucrium chamaedrys L. subsp. chameedrys	Europe-Siberia					x		x				x			
	179	Teucrium lamiifolium d'Urv. Subsp. Iamifolium	wide spread					x		х				x			
	180	<i>Thymus zygioides</i> Griseb. there <i>is</i> <i>lycaonicus</i> (Celak.) Ronniger	Mediterrenian	LC			x	x	x	x				x			
LILIACEAE	181	Allium carinatum ssp. pulchellum L.	Mediterrenian						x					x			
	182	<i>Allium cyrillii</i> Ten.	Mediterrenian					х						х			
	183	<i>Allium orientale</i> Boiss.	Mediterrenian					х						х			
	184	Allium paniculatum L. subsp. paniculatum	Mediterrenian					х						х			
	185	Allium scorodoprasum L. ssp .rotundum (L.) Stearn.	Mediterrenian					x	x	x				x			
	186	Asparagus acutifolius L.	Mediterrenian					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	187	Asphodelus aestivus Brot.	Mediterrenian						x			x		x			
	188	Gagea bohemica (Zauschn.)Schultes & Schultes fil.	wide spread					х		х				x			
	189	Ornithogalum narbonense L.	Mediterrenian					х		х				х			
	190	Ornithogalum umbellatum L.	wide spread					х		x				х			
	191	<i>Muscari neglectum</i> Guss.	Mediterrenian					х		x				х			
	192	<i>Muscari comosum</i> (L.) Miller	Mediterrenian						х			х		х			
	193	Ruscus aculeatus L. var. angustifolius Boiss.	wide spread					x		x				x			
	194	Scilla autumnalis L.	wide spread						х					х			
	195	Smilax excelsa L.	Europe-Siberia					х						х			
LYTHRACEAE	196	Lythrum salicaria L.	Europe-Siberia						х			х		х			
MALVACEAE	197	<i>Alcea pallida</i> Waldst. & Kit.	wide spread						x					х			
	198	Malva sylvestris L.	wide spread					х						х			
OLEACEAE	199	Jasminum fruticans L.	Mediterrenian					х		х				х			
	200	Phillyrea latifolia L.	Mediterrenian					х						х			
ORCHIDACEAE	201	<i>Cephalanthera damasonium</i> (Miller) Druce	Europe-Siberia					x		x				x			
	202	<i>Limodorum</i> abortivum (L.) Swartz	wide spread					х		x				х			
PAPAVERACEAE	203	<i>Corydalis integra</i> Barbey & Major	wide spread					х		х				х			
	204	<i>Fumaria vaillantii</i> Lois.	wide spread					х		х				х			
	205	Papaver dubium L.	wide spread					х						х			
	206	Papaver rhoeas L.	wide spread						х			х		х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		HA	\BIT/	٩T			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	207	<i>Roemeria hybrida</i> (L.) DC.	wide spread						x			x		х			
PINACEAE	208	<i>Pinus brutia</i> Ten .	Mediterrenian								х			х			
	209	<i>Pinus nigra</i> JF Arenold subsp. there <i>is nigra caramanica (</i> Loudon) Rehder	wide spread								x				x		
PLANTAGINACEAE	210	Plantago bellardii All.	wide spread						х			х		х			
	211	Plantago coronopus L. subsp. coronopus	Europe-Siberia						x					х			
	212	Plantago lagopus L.	Mediterrenian						х					х			
	213	<i>Plantago lanceolata</i> L.	wide spread						x					х			
POACEAE	214	Aegilops triuncialis L. subsp. triuncialis	wide spread					х						х			
	215	Aegilops umbellulata Zhuk. subsp . umbellulata	Iran - Turan					x						x			
	216	<i>Agrostis capillaris</i> L. there <i>is aristata</i> (Boiss.) M. Doğan	Europe-Siberia					х		x				x			
	217	<i>Aira elegantissima</i> Schur subsp. <i>ambigua</i> (Arc.) M. Doğan	wide spread					x						x			
	218	Alopecurus myosuroides Hudson there is myosuroides	Europe-Siberia					x		x				x			
	219	Anthoxanthum odoratum L. subsp. odoratum	Europe-Siberia					x		x				x			
	220	<i>Brachypodium</i> <i>sylvaticum</i> (Hudson) P. Beauv	Europe-Siberia					х		х				x			
	221	Briza maxima L.	wide spread					х		х				х			
	222	Brizamedia L.	wide spread					х		х				Х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	ENDEMI R W			HA	\BIT/	AT			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	223	<i>Bromus japonicus</i> Thunb.subsp . <i>japonicus</i>	wide spread					x	x	x				x			
	224	Bromus squamosus L. subsp . noëanus Boiss. ex Pénzes	wide spread					x	x	x				x			
	225	Bromus sterilis L.	wide spread					х	х	х				х			
	226	Bromus tectorum L.	wide spread					х	х	х				х			
	227	<i>Cynodon dactylon</i> (L.) Persian . there <i>is</i> <i>dactylon</i>	wide spread						x			x		x			
	228	Cynosurus cristatus L.	Europe-Siberia					х		х				х			
	229	Dactylis glomerata L. subsp . hispanica (Roth) Nyman	Mediterrenian					x		x				x			
	230	<i>Festuca valesiaca</i> Schleicher ex Gaudin	wide spread					х		х				х			
	231	<i>Gaudinia fragilis</i> (L.) P. Beauv.	Europe-Siberia					х	x					х			
	232	Hordeum bulbosum L.	wide spread					х		х				х			
	233	Hordeum murinum L. subsp . leporinum (Link) Arc.	Mediterrenian					x		x				x			
	234	<i>Lolium rigidum</i> Gaudin there <i>is</i> <i>rigidum</i>	Mediterrenian					x		x				x			
	235	<i>Milium vernale</i> Bieb. Subsp. <i>vernale</i>	Mediterrenian					x						х			
	236	<i>Piptatherum coerulescens</i> (Desv.) P. Beauv.	wide spread					x		x				x			
	237	Poaannua L.	wide spread						х					х			
	238	Poa bulbosa L. subsp. timeolontis (Boiss.) Hayek	wide spread					x		x	x			x			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	TS	BERN	END	EMIC		H	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	239	<i>Taeniatherum caput- medusae</i> (L.) Nevski subsp . <i>crinitum</i> (Schreber) Melderis	Iran - Turan						x					x			
	240	<i>Trachynia distachya</i> (L.) Link	Mediterrenian						x					x			
	241	<i>Vulpia ciliata</i> Dumort subsp. <i>ciliata</i>	wide spread						x	х				x			
POLYGONACEAE	242	Polygonum bellardii All.	wide spread									х		х			
	243	Rumex acetocella L.	wide spread					х		х				х			
	244	Rumex tuberosus L. subsp. tuberosus	wide spread					x		x				x			
POLYPODIACEAE	245	Polypodium vulgare L. subsp. vulgare	wide spread					х						x			
PRIMULACEAE	246	Anagallis arvensis L.var. arvensis	wide spread						x					x			
	247	Androsace maxima L.	wide spread						х					х			
	248	Lysimachia vulgaris L.	wide spread					х						x			
RANUNCULACEAE	249	<i>Adonis flammea</i> Jacq.	wide spread						x					x			
	250	Ceratocephalus falcatus (L.) Pers.	wide spread						x			х		х			
	251	Clematis vitalba L.	wide spread							х				х			
	252	<i>Nigella arvensis</i> L. var. <i>involucrata</i> Boiss.	wide spread						x			x		x			
	253	Ranunculus arvensis L.	Mediterrenian					х						х			
	254	Ranunculus constantinopolitanus (DC.) d'Urv.	wide spread					x			x			x			
	255	Ranunculus ficaria L. subsp. ficariiformis Rouy & Fouc .	wide spread					x		x				x			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		HA	BIT	AT			RE ABU	LATI NDA	VE NCE	
						R	w	1	2	3	4	5	1	2	3	4	5
	256	Ranunculus illyricus L. subsp. illyric	wide spread					х		х				x			
	257	Ranunculus marginatus d'Urv. subsp . <i>trachycarpos</i> (Fisch. & Mey.) Min.	wide spread					x						x			
RESEDACEAE	258	<i>Reseda lutea</i> L. var. <i>lutea</i>	wide spread					х						х			
RHAMNACEAE	259	<i>Paliurus spina-christii</i> Miller	wide spread					х						х			
ROSACEAE	260	<i>Agrimonia eupatoria</i> L.	wide spread					х						х			
	261	Aphanes floribunda (Murb.) Rothm.	Mediterrenian					х						x			
	262	<i>Crataegus monogyna</i> Jacq. Subsp. <i>monogyna</i>	wide spread					x						x			
	263	Geum urbanum L.	Europe-Siberia					х		х				х			
	264	<i>Orthurus</i> <i>heterocarpus</i> (Boiss.) Juz.	wide spread					x		x				x			
	265	<i>Potentilla micrantha</i> Ramond ex DC	wide spread					х		х				x			
	266	Potentilla recta L.	wide spread					х		х				х			
	267	Potentilla reptans L.	wide spread					х		х				х			
	268	<i>Prunus divaricata</i> Ledeb. subsp . <i>divaricata</i>	wide spread					x						x			
	269	Prunus spinosa L.	Europe-Siberia					х						х			
	270	Pyrus elaeagnifolia Pallas subsp . elaeagnifolia	wide spread					x						x			
	271	Rosa canina L.	wide spread					х		х				х			
	272	Rubus idaeus L.	wide spread					х		Х				х			
	273	<i>Rubus sanctus</i> Schreber	Mediterrenian					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H/	ABIT	АТ			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	274	Sanguisorba minor Scop. subsp . muricata (Spach)Brig	wide spread					x						x			
	275	Sorbus domestica L.	Europe-Siberia					х						х			
RUBIACEAE	276	<i>Asperula involucrata</i> Wahlenb	Europe-Siberia					х		x				x			
	277	Crucianella angustifolia L.	Mediterrenian					х		x				х			
	278	<i>Cruciata taurica</i> (Pallas ex Willd.) Ehrend.	Iran - Turan					x		x				x			
	279	<i>Galium paschale</i> Forskal	Mediterrenian					x		x				x			
	280	Galium spurium L. subsp.spurium	Europe-Siberia					х						x			
	281	Sherardia arvensis L.	Mediterrenian					х		х				х			
SANTALACEAE	282	Osyris alba L.	Mediterrenian					х		х				х			
SCROPHULARIACEAE	283	<i>Bellardia trixago</i> (L.) All.	Mediterrenian					x		x				x			
	284	<i>Kickxia elatine (</i> L.) Dumort <i>subsp. Crinita</i> (Mabille) Greuter	Mediterrenian						x			x		x			
	285	Linaria pelisseriana (L.) Miller	Mediterrenian					x						x			
	286	Parentucellia latifolia (L.) Caruel subsp . latifolia	Mediterrenian						x					x			
	287	Verbascum aschersonii Boiss. & Sint. Ex Murb.	Mediterrenian	VU		x		x		x				x			
	288	Verbascum xanthophoeniceum Griseb.	Mediterrenian					x		x				x			
	289	Veronica chamaedrys L.	Europe-Siberia					x		x				x			
	290	<i>Veronica cymbalaria</i> Bodard	Mediterrenian					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H/	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
	291	Veronica hederifolia L. subsp. triloba (Opiz) Celak.	wide spread					x						x			
STYRACACEAE	292	Styrax officinalis L.	wide spread					х		х				х			
UMBELLIFERAE (APIACEAE)	293	Anthriscus nemorosa (Bieb.) Sprengel	wide spread					x						x			
	294	Apium graveolens L.	wide spread					х						х			
	295	Caucalis platycarpos L.	Mediterrenian					х						x			
	296	Conium maculatum L.	wide spread					х		х				х			
	297	Daucus carota L.	wide spread						х			х		х			
	298	<i>Eryngium campestre</i> L. var. <i>campestre</i>	wide spread					x						x			
	299	<i>Eryngium creticum</i> Lam.	Mediterrenian					x	x					x			
	300	Lagoecia cuminoides L.	Mediterrenian					х						х			
	301	<i>Myrrhoides nodosa</i> (L.) Cannon	wide spread					x		x				x			
	302	Oenanthe pimpinelloides L.	wide spread					х		x	x			x			
	303	<i>Oenanthe silaifolia</i> Bieb.	wide spread					х		x				х			
	304	Scandix australis subsp. grandiflora (L.) Thell.	wide spread						x			x		x			
	305	Tordylium apulum L.	Mediterrenian					х						х			
	306	<i>Torilis arvensis</i> (Huds.) Link subsp. <i>elongata</i> (Hoffmanns. & Link) Cannon	Mediterrenian					x						x			
URTICACEAE	307	Urtica dioica L.	wide spread					х		х				х			
	308	Urtica pilulifera L.	Mediterrenian					х		х				х			

Environmental and Social Impact Assessment

FAMILY	NO	TAXON	FCB	тѕ	BERN	END	EMIC		H/	ABIT	AT			RE ABU	LATI NDA	VE NCE	
						R	W	1	2	3	4	5	1	2	3	4	5
VALERIANACEAE	309	<i>Valerianella carinata</i> Lois .	wide spread					x						x			
	310	<i>Valeriana dioscoridis</i> Sm.	Mediterrenian					x		х				х			
VIOLACEAE	311	<i>Viola Sieheana</i> Becker	wide spread					x		х				х			
	312	Viola odorata L.	wide spread					х		х				х			
	313	<i>Viola occulta</i> Lehm.	wide spread					х						х			
ZYGOPHYLLLA CEAE	314	Tribulus terrestris L.	wide spread									х		х			

5.6.3.3 Fauna (Mammals (excl. Chiroptera) and Herpetofauna)

Desktop based literature survey was conducted to support the field studies carried out for the Project.

There are two mammal (*Ursus arctos, Myomimus roachi*) and one reptile (*Testudo graeca*) species listed as CITES species noted within the project area.

Lists of animals included in **Table 5-45**, **Table 5-46** and **Table 5-47** do not only include the species directly observed within the AOI but also include those that could possibly occur in the Saros SPP AOI Species presence within the AOI is based on habitat suitability, previous records and expert judgment. This way, it was aimed to ensure that the ecological impact assessment is not only confined to the findings of field surveys conducted for the Project, which were limited to June and October 2022 but to a wider range of all available data.

5.6.3.3.1 Amphibians and Reptiles

According to the contemporary literature, seven amphibians, one tortoise, two gekkonids, one agamids, two sicincids, four lacertids and 13 snake species are considered likely to be present in the Biodiversity Study Area see

According to the BERN convention lists of amphibians, there are 3 species in the Annex II list and 4 species in the Annex III list. According to IUCN criteria, there are no amphibian species in the project area in the threatened categories. Any amphibian species included in the CITES lists are not found in the project area.

0 S	ORDER, Species	-idae:	Family,	Common name	BERN	IUCN	CITES
U	URODELA (CAUDATA)						
S	Salamanric	dae					
Li	issotriton v	/ulgaris*		Smooth Newt	App III	LC	-
T	riturus kar	elinii		Crested Newt	App II	LC	-
A	NURA						
B	Bufonidae						
В	Bufo bofo			Common Toad	App III	LC	-
B	Bufo viridis			Green Toad	App III	LC	-
H	lylidae						
H	lyla orienta	alis		Oriental Tree Frog	App II	LC	-
P	Pelobatida	е					
P	Pelobates s	syriacus		Syrian Spadefoot	App II	LC	-
R	Ranidae						
P	Pelophylax	ridibundu	s*	Levantine Frog	App III	LC	-

Table 5-45: Amphibians found within the AOI

A total of 24 reptile species were listed based on the literature and observation results for the SPP project site. The two water turtle species listed for the Saros WPP area were excluded from the current list since there are no water resources suitable for sheltering these species in the SPP area.

According to the BERN contract lists, there are 14 species in the Appendix II list and 10 species in the Apendix III list in the project area from reptiles. Mediterranean Spur-thighed Tortoise (*Testudo graeca*,) is included as Vulnerable on the IUCN Red List and this species was frequently recorded throughout the SPP AOI. This species is also included on Appendix II list of the Bern Convention.

	ORDER, -idae: Family, Species	Common name	BERN	IUCN	CITES	
	TESTUDINATA					
	Testudinidae					
	Testudo graeca*	Common Tortoise	APP II	VU	APP-II	
	SQUAMATA					
	ALTTAKIM: LACERTILIA	(Lizards)				
	Gekkonidae					
	Mediodactylus kotschyi	Kotschy's Gecko	APP II	LC		
	Hemidactylus turcicus	Turkish Gecko	APP III	LC		
	Anguidae					
	Pseudopus apodus*	European Glass Lizard	APP II	LC		
	Scincidae					
	Ablepharus kitaibelii*	Juniper Skink	APP II	LC		
	Trachylepis aurata	Levant Skink	APP III	LC		
	Lacertidae					
	Lacerta trilineata*	Balkan Green Lizard	APP II	LC		
	Lacerta viridis*	Green Lizard	APP II	LC		
	Ophisops elegans*	Snake-eyed Lizard	APP II	LC		
	Podarcis muralis	Common Wall Lizard	APP II	LC		
	ALTTAKIM: OPHIDAE (SI	nakes)				
	Boidae					
	Eryx jaculus	Sand Boa	APP III	LC		
	Colubridae					
	Dolichophis caspius*	Caspian Whip Snake	APP III	LC		
	Eirenis modestus	Ring-Headed Dwarf Snake	APP III	LC		
	Elaphe sauromates	Eastern Four-Lined Ratsnake	APP III	LC		
	Malpolon insignitus	Eastern Montpellier Snake	APP III	LC		
	Platyceps najadum	Dahl's Whip Snake	APP II	LC		
1.	Platyceps collaris	Collared Dwarf Racer	APP III	LC		
	Telescopus fallax	Soosan Snake	APP II	LC		
	Zamenis situla	European Ratsnake	APP II	LC		
	Natrix natrix*	Grass Snake	APP III	LC		
	Natrix tessellata	Tessellated Water Snake	APP II	LC		
	Typhlopidae					
	Typhlops vermicularis	Worm Snake	APP III	LC		
	Viperidae					
	Montivipera xanthina	Ottoman Viper	APP II	LC		
	Vipera ammodytes	Nose-horned Viper	APP II	LC		

Table 5-46: Reptile Species Found within the AOI

5.6.3.3.2 Mammals

Among the mammals, there are 19 species in the Appendix II list and 9 species in the Appendix III list present in the Project area and its immediate surroundings. According to the IUCN criteria, there are two mammal species (Brown Bear (VU), and Roach's Mouse-tailed Dormouse (VU)) in the threatened categories in the area. According to the MAK lists, 2 of the mammal species in the area are listed in the Appendix I list, and 3 of them are listed in the Appendix II list. According to the CITES lists, 2 of the mammal species found in the area are on the Appendix II list. The majority of these species are directly observed in the project area, catching with traps, viewing with photo traps or observing their nests, and some of them are likely to be in the project area according to the habitat characteristics of the project area and the general distribution information of the species in Turkey.

Table 5-47: Mammals of the Biodiversity Study Area								
MAMMALS								
	ORDER, -idae: Family,	Common name	BERN	IUCN	MAK	CITES		
	ERINACEOMORPHA							
	Erinaceidae							
	Erinaceus concolor*	Southern White-breasted Hedgehog	-	LC	-	-		
	SORICOMORPHA							
	Soricidae							
	Neomys anomalus	Southern Water Shrew	APP III	LC	-	-		
	Crocidura suaveolens*	Lesser White-toothed Shrew	EK-II	LC	-	-		
	Crocidura leucodon*	Bicolored shrew	APP III	LC	-	-		
	Talpidae							
	Talpa levantis*	Levantine Mole	APP III	LC	-	-		
	LAGOMORPHA							
	Leporidae							
	Lepus europaeus*	European Hare	EK-III	LC	APP I	-		
	RODENTIA	•						
	Sciuridae							
	Sciurus anomalus*	Caucasian Squirrel	EK-II	LC	-	-		
	Muridae							
	Microtus hartingi*	Harting's vole	-	LC	-	-		
	Microtus levis	Southern vole	-	LC	-	-		
	Cricetulus migratorius*	Grey dwarf hamster	-	LC	-	-		
	Apodemus mystacinus*	Broad-toothed field mouse	-	LC	-	-		
	Apodemus flavicollis*	Yellow-necked Mouse	-	LC	-	-		
	Apodemus witherbyi*	Steppe field Mouse	-	LC	-	-		
	Mus domesticus	House Mouse	-	LC	-	-		
	Mus macedonicus*	Macedonian mouse	-	LC	-	-		
	Rattus rattus	Black rat	-	LC	-	-		
	Spalacidae	Körfareler						
	Nannospalax xanthodon*	Xanthodon's blind Mole Rat	-	DD	-	-		
	Gliridae	Yediuyurlar						
	Dryomys nitedula*	Forest Dormouse	EK-III	LC		-		
1.	Myomimus roachi	Roach's mouse-tailed dormouse	EK-II	VU	-			
	CARNIVORA							
	Canidae	Köpekgiller						
	Canis aureus*	Golden jackal	-	LC	APP I	-		
	Vulpes vulpes*	Red fox	-	LC	APP I	-		
	Ursidae	Ayılar						
	Ursus arctos	Brown bear	EK-II	VU		EK-II		

	Mustelidae	Sansargiller				
	Mustela navilis*	Least weasel	RK-III	LC	APP II	-
	Martes foina*	Beech marten	EK-III	LC	APP II	-
	Meles meles*	European badger	EK-III	LC	APP I	-
	Felidae	Kediler				
	Felis silvestris*	Wildcat	EK-II	LC	-	EK-II
	ARTIODACTYLA					
	Suidae	Domuzgiller				
	Sus scrofa*	Wild boar	-	LC	APP II	-
	Cervidae	Geyikgiller				
2.	Capreolus capreolus*	European roe deer	-	LC	-	-

DD: Data deficient, LC: Least concern, NT: Near threatened Source: O: Observation; L: Literature


Figure 6 Some mammal species from the project site: a. Microtus hartingi, b. Martes foina, c. Erinaceus concolor, d. Meles meles, e. Sciurus anomalus, f. Capreolus capreolus, g. Vulpes vulpes, h. Felis silvestris, i. Sus scrofa, j. Talpa levantis yuvası, k. Apodemus sp., I. Canis aureus, m. Lepus europaeus

5.6.3.4 <u>Bats</u>

Sound recordings were made from 2 different localities with a full-spectrum bat detector between September and October 2022 at the Saros SPP site, especially in areas where solar panels will be heavily installed. In the

monitoring studies performed with the bat sound detector at the SPP site, the maximum bat activity was recorded as 82 bats/night (September) in the area around Kocalar village and 57 bats/night (October) in the area around Bodurlar village.

According to the results of the sonogram analysis of the bat sound recordings, a total of 14 bat species were recorded during the surveys of the Saros SPP in autumn 2022. The following species were recorded:

Latin Name	Common Name	Latin Name	Common Name
Eptesicus serotinus	Serotine Bat	Plecotus auritus	Brown Long-Eared Bat
Rhinolophus ferrumequinum,	Greater Horseshoe Bat	Hypsugo savii	Savi' Pipistrelle
Rhinolophus hipposideros,	Lesser Horseshoe Bat	Pipistrellus pipistrellus	Common Pipistrelle
Rhinolophus euryale	Medditeranean Horseshoe Bat	Pipistrellus kuhlii	Kuhl's Pipistrelle
Nyctalus noctula,	Noctule Bat	Pipistrellus nathusii	Nathusius Pipistrelle
Nyctalus leisleri,	Leisler's Bat	Vespertilio murinus	Particoloured Bat
Nyctalus lasiopterus	Greater Noctule Bat		

According to the analysis of bat sound recordings, *Pipistrellus pipistrellus* (64 bats/night) is the bat species with the highest activity at the Saros SPP site.

5.6.3.5 <u>Avifauna</u>

Avifauna studies for the Project have been designed to cover migration and breeding season and were carried out with the Saros WF project simultaneously.

256 species of birds have been recorded within 50 km of the project site according to the data returned on the IBAT report. Of these ten are listed by the IUCN as being Vulnerable or Endangered and these are:

- Endangered: Saker Falcon *Falco cherrug*, Steppe Eagle *Aquila nipalensis*, Egyptian Vulture *Neophron percnopterus* and White-headed Duck *Oxyura leucocephala*.
- Vulnerable; Eastern Imperial Eagle *Aquila heliaca*, Greater Spotted Eagle *Clanga clanga*, Great Bustard *Otis tarda*, European Turtle Dove, Common Pochard *Aythya farina* and Marbled Teal *Marmaronetta angustirostris*.

5.6.3.5.1 *Scoping*

Firstly, species-specific information was gathered with the primary goal of defining target species to be surveyed. Then, habitat structure in the area was assessed in collaboration with the botanist, to identify potential ranges for species at the Project Site prior to field surveys. Lastly, designated sites in the region were assessed to further analyse specific bird interest of these sites and in what capacity they would be incorporated into the impact analysis.

The avifauna of Turkey is represented by 400 regular species, including 39 species of birds of prey, 4 species of vultures, and 2 species of storks (Kirwan et al., 2008). Moreover, Turkey lies on two main migration routes of the soaring birds (Newton, 2010).

Although, raptors are especially vulnerable to collisions due to their flight behaviours, and their populations are under higher risk of decline, other species, especially those that are potential breeders at the Project footprint have also been given special consideration. The energy transmission lines (ETLs), on the other hand, pose a threat for large bodied flying birds, particularly storks and waterfowls. Certainly, the impact of the ETL is anticipated to be higher than the impact of the components of the SPP.

In line with the guidelines and best international practices, as referred to by EBRD PR6 and IFC PS6, breeding bird surveys were conducted to record distribution of breeding birds that use the AoI. Vantage point surveys were also completed during spring 2022 to record soaring birds, including raptors, storks and their allies, migrating over the Project site and wider AoI.

Although the main emphasis of the Project avifauna studies is the target species, it is important to understand distribution, abundance and potential displacement effects on populations of secondary species that are breeding residents and/or species of regional conservation significance.

5.6.3.5.2 *Findings*

36 bird species were observed at the Auxiliary Solar Power Plant Project sites. Two species of global conservation concern were recorded and these were; European Turtle-dove which is included on the IUCN Red List as Vulnerable and Egyptian Vulture which is listed as Near Threatened.

For the Chukar, the SPP installation areas are outside the distribution areas of the species in the region and this species is not expected to be affected by the SPP areas and this species is not considered further in this report. Other detected species are in the category of Least Concern (Least Concern) species that are common in the region and global.

No specific species list was complied for the Saros SSP area.

5.6.3.5.3 Migratory soaring birds and migration routes within the area

In the Western Palearctic, each year millions of birds migrate from wintering areas in Africa to breeding areas in Eurasia in spring and after breeding in Eurasia to Africa in autumn using Eurasian-African flyway. Eight migration bottlenecks were described in the Western Palearctic and three of them (Bosporus in Istanbul, Artvin-Borçka in Artvin Province and Belen in Hatay Province) are located in Turkey.

The primary routes of the north-south migratory bird movements in Turkey occur between the Eastern Black Sea (Borçka) and Thrace region (Bosporus) in the north and the Mediterranean region in the south (Belen) (Cameron et al. 1967, Shirihai and Christie 1992, Shirihai 2000, Panuccio et al. 2017). These migratory movements occur mainly on a north-south axis in relation to weather conditions, geography, topography and species and individual level differences (Michev et al. 2012 Tøttrup et al. 2008, Agostini et al. 2015).

Soaring birds tend to follow the narrow traditional routes where thermals and other updrafts develop and minimize the large barriers such as sea crossings (Panuccio et al. 2013, Trierweiler et al. 2014). These traditional routes are often called primary or major migration routes. On these routes or flyways, soaring birds must pass narrow corridors which are considered as bottlenecks where most of the migration activity occur between these bottlenecks along the flyways (Newton 2010.

No large-scale migration was observed during the ornithological surveys. Furthermore, the Project Site is not located on the primary migration routes of soaring migrant birds; however, transit passing Egyptian vulture through the Project Site was observed. Also, European Turtle-dove which is summer visitor in the region was observed usually near the villages and agricultural areas.

5.6.3.6 Fauna Species of Concern

Of the fauna species detected within the AoI, Near Threatened and Vulnerable species were further assessed as species of concern for the ecological impact assessment study.

Roach's Mouse-Tailed Dormouse (Myomimus roachi)

Roach's Mouse-Tailed Dormouse is a nocturnal, obligately hibernating dormouse. It inhabits woodland areas and is a registered species from Terzialan village, a region close to the project area. It is presently listed as "Vulnerable" on the 2009 IUCN meeting Red List of Threatened Species because of large-scale agricultural activities that result in habitat destruction and fragmentation.

Although this species was not noted during the surveys, they are expected to be present and use hollow trees for nesting.

Brown Bear (Ursus arctos)

Brown Bears are large, omnivourous mammals which inhabit the woodlands, and have been noted by villagers to visit the area, albeit rarely. It is presently listed as "Vulnerable" on the 2009 IUCN meeting Red List of Threatened Species because of large-scale agricultural activities that result in habitat destruction and fragmentation.

Common Tortoise (Testudo graeca)

Different subspecies of Common Tortoise have widespread distribution in Turkey. It is a typical Mediterranean species living in humid and damp steppes, semi-steppe and forested habitats, including agriculturally used areas. However, its population has been declining due to habitat loss and fragmentation (Türkozan et al. 2003, 2005) and presently listed as "Near Threatened" by IUCN (Tortoise & Freshwater Turtle Specialist Group 1996). Tortoise is diurnal active, terrestrial and relatively slow-moving specie. Breeding takes place in the spring, usually in late March, April and May.

Common Tortoise was seen regularly throughout the survey period. Therefore, it is selected as one of the indicator species of this study.

Egyptian Vulture (Neophron percnopterus)

During the field studies, individuals were seen passing over the region, however it is noted that they only use the region rarely for migration.

European Turtle-dove (Streptopelia turtur)

European Turtle-dove is a migratory species with a western Palearctic range covering most of Europe and the Middle East and including Turkey and north Africa, although it is rare in northern Scandinavia and Russia. It winters in south of the Sahara. The species is considered as Vulnerable because it has undergone rapid declines in Europe while, in Russia and Central Asia, it is thought it's believed to have experienced more severe declines due to loss of foraging and nesting sites as well as disease and hunting along its migration routes. Estimated global population size is 19,300,000-71,400,000 individuals. This roughly equates to 12,800,000-47,600,000 mature individuals. Further validation of this estimate is needed. (BirdLife International 2020c). Species is a summer visitor, usually arriving in April and leaving September. It prefers nesting in bushes in landscapes with a rich, patchy habitat mosaic of open cultivated land for feeding adjacent to wooded areas with trees and bushes in clumps (woods, copses, groves) or lines (riparian woodlands, hedges).

European Turtle-dove is summer visitor in the AoI and it was usually observed near the villages and agricultural areas during the field studies. Several individuals were also observed within the Project Site and is likely to breed within the woodland areas as well as using the agricultural areas for foraging.

Fable 5-48: Conservation Values of Target Bird Species								
Scientific Name	Common Name	RD B	IUC N	BERN	NGC	CITES	Regional Status	
Neophron percnopterus	Egyptian Vulture	A.3	EN	Annex II	Not in scope	Annex II	S	High Sensiti ve
Streptopelia turtur	European Turtle- dove	A.3. 1	VU	Annex III	Annex II	Not in scope	S	

5.6.3.7 Invasive Alien Species

According to IFC PS 6 GN99, an alien or non-native plant or animal species is one that is introduced beyond its original range of distribution. Invasive alien species are non-native species that may become invasive or spread rapidly by outcompeting other native plants and animals when they are introduced into a new habitat that lacks controlling factors as determined by natural evolution. Invasive alien species are recognized to be a major global threat to biodiversity and ecosystem services.

No invasive species were noted within the project area.

5.6.4 Impact Assessment

This section presents the identification and assessment of the following potential biodiversity impacts of the Project during the construction, operation and decommissioning phases.

The following *Sections 5.6.4.1* and *5.6.4.2* assess these impacts in relation to the identified protected areas and biodiversity receptors. Relevant mitigation measures are provided in Section 5.6.5.

5.6.4.1 Land Preparation and Construction Phase

Potential impacts from Construction activities may include:

- Habitat loss and degradation (permanent and temporary)
- Disturbance (e.g. noise, artificial light, dust)
- Injury or mortality
- Indirect impacts(e.g. Accidental introduction and dispersal of invasive species from construction activities)

5.6.4.1.1 *Protected Areas and Internationally Recognised Areas*

As explained in Section 5.6.3.1, the Project Site is not located within or overlaps with any of Turkey's legally Protected Areas. No direct or indirect impacts of Project activities are anticipated on any protected sites due to distance.

The Canakkale Strait IBA is not expected to be impacted by the project due to the distance between the SPP and the IBA.

5.6.4.1.2 Terrestrial and Wetland Habitats and Flora

Habitat loss and Degradation

The most significant impacts of the land preparation and construction phase of the Project would be **habitat loss** and **degradation** for terrestrial flora and fauna species as a result of the construction of internal roads and buildings. These impacts are however likely to be limited due to the extent of the permanent habitat loss. Temporary impacts to habitats and flora are also likely as a result of the construction of the solar units.

Field surveys identified five habitat types in the AOI of the Project. The habitats within the AOI are mainly formed of woodland and farmland, with some areas of scrub The modified habitats, agricultural land and East Gariks of negligible conservation value and are not discussed further in this ESIA.

The most valuable natural habitat in the AOI is Mixed Deciduous Oak Forest (G1.7 according to EUNIS Habitat Directive) The conservation value is considered to be Medium, not higher because of its widespread existence in the Region.

There are no Critically Endangered (CR) or Endangered (EN) plant species identified through flora surveys. Although some endemic plant species were detected in the AOI, these species are widespread in the region and are all of Least Concern according to the IUCN Red List. Therefore, their conservation values are determined as Low while the impact magnitude is considered as Low to Moderate.

Construction activities will be limited to the Project Site and ETL route, where a minimum clearing of natural vegetation will be ensured (limited to the roads and building footprints where not possible to avoid). The ETL route vegetation can be rehabilitated using suitable natural shrub species. For the overall habitat structure, again due to the main impacts being restricted to roads and building footprints, the overall integrity of the habitats is anticipated to remain. Grassland habitats within the SPP are likely to recover however permanent loss of some woodland habitat will be unavoidable.

Injury or mortality

Not applicable for habitats and flora.

5.6.4.1.3 *Terrestrial Habitats and Fauna*

Mammals

Mammals are likely to be affected by construction through habitat loss/degradation, disturbance (presence of people, artificial lighting, dust and noise), injury or mortality due to construction work and increased traffic and temporary habitat fragmentation.

Construction activities will be limited to the Project Site and ETL route and 500m corridor (the AoI); therefore, associated impacts will be confined to the AoI.

Habitat loss and Degradation

The habitats affected by the construction are common at the national and local level and the areas affected directly are relatively small.

Loss of breeding sites and nests is another significant impact related to habitat loss, especially for those that are ground-nesting. Fauna species identified at the Biodiversity Study Area, are those that are found in the larger area, with alternative habitats outside the AoI.

Possible occurrence of 16 mammal species (five based on direct observation, 11 based on literature) were determined in the AoI. Amongst these, Brown Bear and Roach's Mouse-Tailed Dormouse, was considered as species of concern due to its IUCN Red List status (VU). Both species were determined to have a Medium conservation value, due to their conservation status and impact magnitude is assessed as being Moderate as a result of loss of breeding habitat and fragmentation.

Project impacts on these species during construction are considered to be of Low to Moderate magnitude.

All other mammal species recorded in the AoI are of low conservation value. The construction impacts described above are considered to be of low magnitude and the resulting effect is negligible.

Disturbance

Disturbance due to presence of people, artificial lights, generation of noise and dust is likely to affect mammal species within the AoI. Similar to the habitat loss, impacts associated with disturbance due to project activities are considered to be of Low of magnitude while the impact significance will be negligible for mammals with Low conservation value and Moderate for Brown Bear and Roach's Mouse-Tailed Dormouse that have Medium conservation value without any mitigations.

Injury and Mortality

Fauna species that are present or likely to be present in the Aol will face injury and mortality risks due to the Project activities. Impact magnitude is considered to be High which will lead to moderate significance impact for mammals with low conservation value, and Brown Bear, and Major significance impact for Roach's Mouse-Tailed Dormouse has while there are no mitigations in place.

Indirect Impacts

Indirect impacts (such as project-induced access by third parties, in-migration and associated impacts on resource use, including land conversion, hunting and wildlife trade, and spread of invasive alien species) can affect mammal species in the AoI. However, given the nature of the Project Site and Project activities, magnitude of indirect impacts will be negligible leading to an impact with negligible significance.

Bats

Habitat loss and Degradation

The habitats affected by the construction are common at the national and local level and the areas affected directly are relatively small.

Loss of breeding sites and nests is another significant impact related to habitat loss, especially for those that are tree roosting. Fauna species identified at the Biodiversity Study Area, are those that are found in the larger area, with alternative habitats outside the AoI. There were no caves noted within the AoI.

Possible occurrence of 14 bat were determined in the AoI. Amongst these, four species were considered as species of concern due to its IUCN Red List status: *Rhinolophus euryale* (NT), *Myotis bechsteinii* (NT), Myotis capaccinii. (VU), and Nyctalus lasiopterus (VU) All species were determined to have a Medium conservation value, due to the loss of breeding habitat and fragmentation.

Project impacts on these species during construction are considered to be of Low to Moderate magnitude.

Disturbance

Disturbance due to presence of people, artificial lights, generation of noise and dust is likely to affect amphibians and reptiles within the AoI. Similar to the habitat loss, impacts associated with disturbance due to project activities are considered to be of Low of magnitude while the impact significance will be negligible for species with low conservation value and Moderate for all bats with Medium conservation value.

Injury and Mortality

Bats will face injury and mortality risks due to the Project activities within the AoI. Impact magnitude is considered to be High which will lead to moderate significance impact for species with low conservation value and moderate significance impact for Common Tortoise that has Medium conservation value while there are no mitigations in place.

Indirect Impacts

Given the nature of the Project Site and Project activities, magnitude of indirect impacts will be negligible leading to an impact with negligible significance.

Amphibians and reptiles

Amphibians and reptiles in the Project AoI are likely to be affected by construction through habitat loss/degradation, disturbance (presence of people, artificial lighting, dust and noise), injury or mortality due to construction works and increased traffic, and temporary habitat fragmentation.

Habitat loss and Degradation

Common Tortoise (*Testudo graeca*) is listed as Vulnerable under IUCN Red List. Different subspecies of Common Tortoise have widespread distribution in Turkey.

Construction impacts on the species that exist in the AoI are considered to be of Low magnitude and the impact significance is considered to be Moderate for Common Tortoise and Negligible for other species.

Disturbance

Disturbance due to presence of people, artificial lights, generation of noise and dust is likely to affect amphibians and reptiles within the AoI. Similar to the habitat loss, impacts associated with disturbance due to project activities

are considered to be of Low of magnitude while the impact significance will be negligible for species with low conservation value and Moderate for Common Tortoise that has High conservation value without any mitigations.

Injury and Mortality

Amphibians and reptiles will face injury and mortality risks due to the Project activities within the Aol. Impact magnitude is considered to be High which will lead to moderate significance impact for species with low conservation value and major significance impact for Common Tortoise that has High conservation value while there are no mitigations in place.

Indirect Impacts

Indirect impacts (such as project-induced access by third parties, in-migration and associated impacts on resource use, including land conversion, hunting and wildlife trade, and spread of invasive alien species) can affect amphibian and reptile species in the AoI. However, given the nature of the Project Site and Project activities, magnitude of indirect impacts will be negligible leading to an impact with negligible significance.

Avifauna

Bird species are likely to be affected by loss/degradation of breeding/feeding habitat and disturbance (presence of people, artificial lighting, dust and noise) during construction. Construction impacts will be confined to Project Site and ETL routes with 500m corridor. The habitats affected by the construction are common at the national and local level and the areas affected directly are relatively small.

Among the bird species that are present or likely to occur within the AoI, two are either threatened or near threatened as per IUCN Red List: European turtle-dove (*Streptopelia turtur*) is Vulnerable; Egyptian vulture (*Neophron percnopterus*) is an Endangered species according to IUCN.

These species are considered to have high sensitivity/conservation value due to their conservation values as per IUCN Red List and Red data book for birds of Turkey (Kiziroğlu, 2008).

According to the field study findings, the Aol could have some suitable nesting habitat for Turtle Dove but is not a critical nesting/breeding ground for any Endangered avifauna species. The Project activities may lead to a net loss or reduction in the global or national/regional population for Turtle Dove, but will not impact Egyptian Eagle or any species of conservation concern. It is likely that any potential impact due to habitat loss on these species would be tolerated by the local population. Therefore, the potential impacts due to habitat loss would be minor in magnitude.

Significance of potential impacts on biodiversity during land preparation and construction as per sensitivity of the receptors and nature of each impact is summarized in Table 5-48.

5.6.4.2 Operation Phase

5.6.4.2.1 Protected Areas and Internationally Recognised Areas

As explained in Section 5.6.3.1, the Project Site is not located within any of Turkey's legally Protected Areas nor is it within any internationally recognised areas.

5.6.4.2.2 *Terrestrial Fauna*

There will be no additional habitat loss during the operational phase of the Project. Impacts on ecological receptors within the AoI will therefore be limited to

- Disturbance
- Injury/mortality through accidents, collisions through ETLs
- Displacement of some fauna
- Indirect Impacts

Mammals

Mammals are likely to be affected during the operational phase of the Project as a result of increased disturbance, noise, dust and injury or mortality because of collision with site vehicles or electrocution with buried cables. Increases in disturbance due to presence of people, artificial lighting, noise and dust will be relatively insignificant during operation compared the construction phase. Similarly, vehicle movements will be reduced when compared to the construction phase therefore injury /mortality risks will be lower.

Unmitigated these impacts are likely to be Low on both Roach's Mouse-Tailed Dormouse and Brown Bear which are both of Medium conservation value. The overall impact significance is therefore considered to be Moderate.

Amphibians and reptiles

Amphibians and reptiles are likely to be affected by habitat loss within the Project Site. Considering the impact magnitude will be low and receptor sensitivity of Vulnerable Common Tortoise - *Testudo graeca* (High).

Disturbance and injury/mortality impacts will be insignificant when compared to construction phase similar to mammals.

<u>Avifauna</u>

Once the PV Panels are installed, the site appearance from the air will be altered significantly which may cause potential disorientation of birds from dense arrays of panels resembling water bodies and therefore potential for collision mortality.

Limited number of scientific papers in the peer-reviewed literature present fatality information from fatality monitoring studies at a photovoltaic utility-scale solar energy facility; however, more data exists in unpublished reports. A study made a comprehensive overview of bird mortality patterns by synthesising results from fatality monitoring studies at 10 photovoltaic solar facilities across 13 site-years in California and Nevada. Study identified variability in the distribution of avian orders and species among and within Bird Conservation Regions and concluded that a cause of mortality could not be determined for approximately 61% of intact carcasses introducing uncertainty into the interpretation of the fatality estimates. The study estimated an average annual fatality rate of 2.49 birds per megawatt per year for a PV Plants.

A recent study in the UK¹³ found no peer-reviewed papers to support claims that PV panels were causing mortality in birds, although it should be noted that no UK or European studies could be found. PV panels inevitably present some risk of collision mortality to birds as likely as collision with any fixed object or man-made structure, such as fences, towers or buildings (Drewitt and Langston, 2008). There is no firm evidence of large numbers of bird strikes associated with PV panels. Although, there is some concern that waterfowls might be attracted to PV panels, mistaking them for water surfaces, there is little evidence for this (http://ww2.rspb.org.uk/Images/Renewable energy report tcm9-297887.pdf).

In the light of above, the potential negative impacts on avifauna species associated with PV panels glare and resembling water bodies are considered to be minor, both in terms of likelihood of impact as well as the significance of the Project site and wider IBA for wintering wildfowl. However, it is recommended to monitor bird fatalities and panel appearance at the Project Site during operations. Applying hedgerows between sections may reduce collision risks to waterfowl.

No impact in terms of population decrease is expected as a result of collision, displacement or barrier effect.

ETLs are expected to have considerable impact on birds as they are important mortality factor for soaring birds. In most cases, accidents on over-ground powerlines lead to severe injuries or immediate death. Electrocution harms mostly birds sitting on the ground rail or having ground contact. Current passage through the body causes primary damages to tissues and impaired functions: muscles and nerves abruptly stop functioning. The bird will fall from the pole and crash onto the ground, where the bird suffers further serious injuries. In case of collision accidents, birds crash at high flight speed into cables or wires. The resulting injuries vary widely and are comparable to traumata caused by collisions with cars.

Most of the target species, some of which are endangered such as Egyptian vulture, were spotted near the existing ETLs. Also, when the identified migration routes in the Project Site are assessed in relation of the planned ETL

¹³ Taylor, R., Conway, J., Gabb, O. & Gillespie J. (2019). Potential ecological impacts of ground-mounted photovoltaic solar panels.

routes it is anticipated that the 400kV ETL lines and towers will partially coincide with the migration routes of soaring birds. Soaring birds such as storks, eagles, vultures and other raptors are reported to be commonly affected by power lines with considerable risk on birds flying at heights between 20m and 50m.

Because of their long-suspended insulators, the risk of electrocution by High Voltage powerlines are reported to be low while death by collision with the cables poses much higher risk. On the other hand, powerlines where the conductor cables are arranged at different heights (multi-level arrangements) and with neutral cables high above the conductor cables are known to pose more threat while the powerlines with conductor cables arranged at one height (single-level arrangement) pose less risk of collision.

5.6.4.3 Decommissioning Phase

The project is not expected to be decommissioned at least for 30 years. Impacts during decommissioning are expected to be temporary and the magnitude of the impact will depend on how much of the infrastructure is removed. Decommissioning is expected to have a moderate adverse impact significance on the ecological features within the Project AOI, given similar factors highlighted during construction in section 5.6.4.1 for both. Once fully decommissioned and the habitats recovered from disturbance, the long-term impact significance is likely to be moderate positive following the reinstatement of native vegetation and colonisation by animal species.

Environmental and Social Impact Assessment

Table 5-49: Significance of Land Preparation and Construction-Phase Impacts on Biodiversity

			Nature	Impact	Impact		
Receptor	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significance
	Ha	abitat loss / degra	dation, disturbance	e, increased inj	ury and mortality		
Priority habitats: Deciduous Oak Woodland Prunus spinosa and Oak Mixed Woodland Permanent Mesotrophic Crassland	Medium	Long-term	Local	One-off	Low	Moderate	Moderate
Widespread endemic flora	Low	Long-term	Local	One-off	Low	Moderate	Minor
Other Habitats (Modified / degraded)	Low	Long-term	Local	One-off	Low	Low	Negligible
Roach's Mouse- Tailed Dormouse	Medium	Long-term	Local	One-off	Medium	Low	Moderate
Brown Bear	Low	Long-term	Local	One-off	Low	Low	Minor
Common Tortoise	High	Long-term	Local	One-off	Low	Low	Moderate
Bat Species	Low	Long-term	Local	One-off	Low	Low	Negligible
Other Fauna species in the AOI with less conservation value	Low	Long-term	Local	One-off	Low	Low	Negligible
Target bird species:Egyptian vulture - Neophron percnopterusEurepean turtle dove - Streptopelia turtur	High	Long-term	Local	One-off	Low	Low	Minor
Breeding bird species using the AOI (not	Medium	Long-term	Local	One-off	Low	Low	Minor

Saros Hybrid Solar Power Plant Project

Environmental and Social Impact Assessment

Security level: RINA/CL/SENSITIVE

Popontor Sonoitivity			Nature	Impact	Impact		
Receptor	Sensitivity	Duration	Extent	Frequency	Intensity	Magnitude	Significance
observed during the field surveys)							
		Dest	ruction of Breeding	g/Roosting Site	S		
Fauna	Medium to High	Medium-term	Local	One-off	Low	Low	Moderate
Target bird species	High	Medium-term	Local	One-off	Low	Low	Moderate
Breeding bird species	High	Medium-term	Local	One-off	Low	Low	Moderate
Bat Species	Medium	Medium-term	Local	One-off	Low	Low	Moderate
		Indirect Envir	ronmental Impacts	(dust, noise, w	aste, etc.)		
Priority habitats	High	Short-term	Local	Intermittent	Low	Low	Moderate
Widespread endemic flora	Low	Short-term	Local	Intermittent	Low	Low	Negligible
Fauna	Low to High	Short-term	Local	Intermittent	Low	Low	Negligible to Moderate
Target bird species	High	Short-term	Local	Intermittent	Low	Low	Moderate
Breeding bird species	Medium	Short-term	Local	Intermittent	Low	Low	Minor
Bat species	Medium	Short-term	Local	Intermittent	Low	Low	Minor

Table 5-50: Significance of Operation-Phase Impacts on Biodiversity

Receptor	Sensitivity	Nature of Impact			Impact Magnitude	Impact Significance	
		Duration	Extent	Frequency	Intensity		
	Disturba	ance, injury / mort	ality associated w	/ith collision im	pacts / road casualties	s	
Collision with PV Panels							
Waterfowls	Low to Medium	Long-term	Local	Intermittent	Medium	Moderate	Minor
Target bird species	High	Long-term	Local	Intermittent	High	Low	Moderate
Breeding bird species	Medium	Long-term	Local	Intermittent	High	Low	Minor
Collision with ETLs and ETL towers							
Target bird species	High	Long-term	Local	Intermittent	High	High	Major

Saros Hybrid Solar Power Plant Project

Environmental and Social Impact Assessment

Security level: RINA/CL/SENSITIVE

Receptor	Sensitivity		Nature c	of Impact		Impact Magnitude	Impact Significance
Breeding bird species	Medium	Long-term	Local	Intermittent	High	High	Major
Bat species	Medium	Long-term	Local	Intermittent	High	High	Major
			Collision with	Vehicles			
Roach's Mouse-Tailed Dormouse	Medium	Long-term	Local	One-off	Low	Low	Minor
			Displacem	nent			
Fauna	Low to Medium	Medium-term	Local	One-off	Low	Moderate	Moderate
Target bird species	High	Medium-term	Local	One-off	Low	Negligible	Negligible
Breeding bird species	Medium	Medium-term	Local	One-off	Low	Moderate	Moderate
Bat species	Medium	Medium-term	Local	One-off	Low	Moderate	Moderate
		I	ndirect Environme	ntal Impacts			
Priority habitats	High	Short-term	Local	Intermittent	Low	Negligible to Low	Moderate
Widespread endemic flora	Low	Short-term	Local	Intermittent	Low	Negligible to Low	Negligible
Fauna	Low to High	Short-term	Local	Intermittent	Low	Negligible to Low	Negligible to Moderate
Target bird species	High	Short-term	Local	Intermittent	Low	Negligible to Low	Moderate
Breeding bird species	Medium	Short-term	Local	Intermittent	Low	Negligible to Low	Minor
Bat species	Medium	Short-term	Local	Intermittent	Low	Negligible to Low	Minor

5.6.5 Mitigation Measures

Project Specific Biodiversity Management Plan (BMP) will be developed and implemented throughout the Project lifetime with the main objective of achieving "no-net-loss" of biodiversity, in accordance with IFC PS 6 and associated guidance notes. A conceptual framework for the mitigation hierarchy (avoid, reduce, remedy and offset) is presented in Figure 5-24. BMP will include the mitigation pan set out in the sections below, along with details of monitoring which will be completed at the pre-construction, construction, operation and decommissioning of the Project.

In order to reach habitat and species conservation targets, the mitigation hierarchy approach has been adopted to be implemented throughout the Project life-cycle in managing impacts on biodiversity to achieve no-net-loss.



Figure 5-24: Mitigation Hierarchy

For each group of biodiversity features that has been subject to impact assessment, the mitigation hierarchy presented in Figure 5-24 has been considered.

5.6.5.1 Generic Mitigation Measures

The following generic mitigation measures will be applied throughout the Project:

- All construction and operational working areas will be kept to a minimum to reduce habitat loss.
- All type of impact on natural habitats outside the Project footprint will be avoided during land clearance and topsoil removal;
- Boundaries of the construction areas, including traffic routes, will be limited only to designated sites.
- On-site vehicle speed limits (20kmph) will be implemented to avoid potential road-kills;
- Dust suppression measures, such as water sprays, will be implemented for reduction of dust during the working period.
- All construction and operational activities will comply with the international guidelines on the prevention and management of alien plant and animal species across the Project.
- During vegetation clearance or felling, any animals found should be removed and released to a safe refugia.
- All workers involved in Project activities will be made aware of the environmental and ecological sensitivities (natural habitats and threatened and protected species) of the region, the Project site and project activities. Staff will be provided with relevant information through staff induction, toolbox talks, leaflets and office posters.
- The lighting of the project site will be kept to a minimum, and sensory lighting systems will be considered instead of night-long active lighting. Lights will be directed downwards;
- A ban will be enforced on workers killing or trapping wild animals, for food or trade. Signage will be installed to reinforce the hunting ban throughout the project areas.

5.6.5.2 Mitigation Measures for Terrestrial Habitats and Flora

All construction and operational working areas will be kept to a minimum to reduce habitat loss and degradation. Off-road access will be prohibited. Plans will be implemented to minimise all construction traffic activities. Dust suppression measures will be implemented during the working periods.

The BMP will provide further guidance however the mitigations will include the following practices at minimum:

- Soil removed from construction sites will be stored and used in the restoration.
- Select the location of the stockpiles with consideration of environmental safeguards
- Limit the Project activities with the boundaries of the construction area, including traffic routes to avoid impact on the adjacent vegetation;
- Preserve vegetation as much as feasible
- Keep land clearance of natural vegetation at minimum and restricted to designated sites
- Stabilise all destructed habitats and rehabilitate as early as possible
- Clear vegetation before nesting seasons of animals identified in the area
- Prior to clearing the extent of clearing areas will be clearly marked out with appropriate flagging material
- Clearing is to be to be carried out in a sequential manner and in a way that directs escaping wildlife away from clearing and into adjacent native vegetation or natural areas of their own volition
- If non-mobile fauna are found prior to or during clearing activities, it shall be relocated from the clearing area to a safe and suitable location containing the microhabitat features, preferably within 200 m of the capture location;
- Train on-site employees to be aware of significance of habitats and species, nests of fauna species, to avoid any destruction or displacement without an expert opinion on the status of the nests. Collaborate with biodiversity experts to implement a training and awareness program.
- Develop and implement Biodiversity Management Plan
- Ensure proper waste disposal avoiding natural habitats
- Avoid any destruction to habitats other than those at designated construction sites
- Allow for adaptive management and take additional measures if needed

5.6.5.3 Mitigation Measures for Terrestrial Flora

There are no flora species of conservation significance present within the SPP AOI and as such mitigations for specific plant species are not recommended.

A seed collection exercise has been completed for the Saros WPP Project and these seeds have been sent to the national seed bank. Working areas will be clearly defined to avoid habitat impacts outside of the SPP AOI. Any topsoil that is stripped will be stored according to industry standard best practice and will be spread out on completion of the construction phase of the project. Vegetation is likely to re-establish from the seed bank on completion of the construction phase. The rate of vegetation establishment will be monitored in the first few years post-construction and additional seeding and habitat rehabilitation will be completed, if necessary.

Areas of woodland have been cleared in preparation of the construction phase of the project and this work was undertaken by the local community with the support of the Forest Department and supervised by appropriately qualified ecologists.

If the above-mentioned precautions are taken, the effect of the activity on the flora is minimized.

5.6.5.4 *Mitigation Measures for Terrestrial Fauna*

Ban on Hunting

A ban on hunting by construction and operation staff will be implemented to reduce pressure on species protected species in the Project areas and surroundings. All construction and operation staff living at the Project site will be required to follow company rules and code of conduct. Signage will be installed illustrating the hunting ban on any species throughout the Project areas.

Reptiles

As Common Tortoise is present within the area, and may suffer from both the construction phase of the project, a translocation should be undertaken.

Prior to works in an area containing tortoise burrows, all burrows will be checked be ecologists using an endoscope and if empty, works will proceed. If any animal is found in the burrow during periods of inactivity the burrow will be clearly marked with a flag and a taped exclusion area of 5m around the burrow. Burrow locations will also be and left until the active period to allow the burrow to be rechecked or to allow the animal to be captured and moved whilst active.

In all pre-works / pre-construction periods where translocation is possible, captured individuals will be placed in boxes with grass and hay. The tortoises will be sorted by size, with tortoises of the same size being stored together. Captured individuals will be marked on their costal or supracaudal scute and animals should NOT be painted or obviously marked. Scute marks can be positioned to indicate year of capture and photographs of the upper carapace should be sufficient to identify individuals, if required. The use of paints or other obvious marks on the carapace of caught animals could increase their visibility and risk of predation, especially from aerial predators or increase the risk of being poached. Captured animals can be held in their boxes for up to 24 hours prior to release in the previous used and agreed receptor site. Any boxes containing tortoises must be kept in the shade.

Any further translocation because of pre-works / per-construction surveys should be fully detailed in a report which will include the following information:

- Survey dates and timing of capture and release
- Weather conditions during survey and relocation effort
- Location of captured individuals
- Number of captured individuals during each relocation effort
- Number of juveniles, mature males and mature females
- Number of males and females released at each site
- Number of mortalities during relocation effort
- Information pertaining to observations of other reptile species including capture and release measures

A receptor site should be established that can accommodate a population of Common Tortoise. Specific measures will be established through the Biodiversity Management Plan to ensure no net loss.

Mammals

In the studies carried out in 2019 and 2022, no Roach's Mouse-Tailed Dormouse were located. In addition, no specimens of the species were found in the enclosures made in various parts of the project area and throughout the ETL. However, it is not certain that this species is absent, so possible presence has been assumed. Despite this possibility, it is important to protect the old, fruity and hollow trees where the species can nest during the project activities.

Trees have been removed with support of the Forest Department and under the supervision of qualified ecologists and no Roach's Mouse-tailed Dormouse were found during these works. Any additional tree removal will require a pre-commencement check for Roach's Mouse Tailed Dormouse and, assuming no mice are found, subsequent felling must be supervised by a qualified ecologist.

Brown Bear was also not noted during surveys. In the interviews with the villagers, they stated that the Brown Bear is rarely seen once in 5-10 years in the region and are therefore unlikely to be affected by the project in its construction or operational phase.

<u>Avifauna</u>

Management strategies and mitigation measures addressing appropriate removal of topsoil and vegetation will be implemented to ensure no individuals are killed or no galleries are destructed, and populations of the species continue to survive in the area.

To minimise the potential impact to all breeding bird species, vegetation clearance will be undertaken outside of the main bird breeding period if possible. Where this is not possible, the areas to be cleared will be checked for breeding birds prior to the clearance and if nesting birds are found, appropriate mitigation measures will be implemented. This may involve avoiding construction within 50m of the active nest until the chicks have fledged.

Bats

Trees have been removed with support of the Forest Department and under the supervision of qualified ecologists. No bat roosts were impacted.

Any additional tree removal will require a pre-commencement check for bat roosts and, assuming no roosts are identified, subsequent felling must be supervised by a qualified ecologist.

5.6.5.5 Mitigation Measures to prevent intrusion and spread of invasive species

No invasive species were noted within the AoI, however if they are located the following advice should be taken.

IFC PS6 (IFC, 2012a) includes the following best practice measures with regard to IAS:

- Must not intentionally introduce alien species unless this is in accordance with existing regulatory framework
- Must not deliberately introduce IAS irrespective of regulatory framework
- Introduction of alien species (eg in planting) must be subject to a risk assessment
- Implement measures to avoid accidental introduction or spreading of alien species (see below)
- Consider the implementation of measures to eradicate IAS from natural habitats over which Kalyon has management control

In the absence of industry specific guidance, construction and operational activities on this Project will comply with international guidelines on the prevention and management of IAS (IPIECA & OGP, 2010). Preventative, control and monitoring measures will need to be implemented with regard to the following aspects of the Project:

Packaging and movement of materials:

- Minimise traffic and the distance it has travelled
- Source goods/materials locally where possible
- Contain any IAS and report their presence

Vehicles and plant:

- As-new' wash-down is essential before entering non-infested areas and after working in infested areas
- Train and raise awareness regarding IAS
- Pressure wash vehicle tyres in a contained area
- Contain and destroy residue
- Record and report the presence of any IAS

Soil and vegetation:

- Minimise disturbance to, or movement of, soil and vegetation
- Prevent soil damage and erosion
- Ensure imported soil/other materials are safe and free of IAS (source from a reputable supplier, request information on the soil's origin and certification of IAS free status if possible)
- Prevent IAS establishment on exposed stored soil (do not store bare soil near known sources of IAS, consider using matting to cover exposed soil)
- Ensure infested material is disposed of safely
- Retain as much natural vegetation as possible

Landscaping and Reclamation:

- Use native plants for reinstatement and landscaping
- Assess any non-native species (to be used in landscaping) for IAS potential
- Consider that some IAS may be soil-based
- Avoid altering soil and water body properties

It has to be mentioned that not all the above measures will need to be implemented; risk screening will need to be undertaken by the contractor for each construction site and this will inform the implementation of the most appropriate prevention and control measures.

5.6.5.6 *Mitigation Measures to prevent Indirect Impacts*

There will be Project specific Dust and Air Quality Management Plan, Noise Management Plan, Waste Management Plan and Pollution Prevention Plan in place and implemented during the Construction Phase. Similarly, Operation Environmental and Social Management Plan and sub-plans will be implemented during operations to comply with international standards and GIIP to minimize dust and noise emissions, and implement all necessary measures in line with the Project management plans which will minimise indirect impacts on biodiversity features.

<u>Noise</u>

The following measures will be implemented to reduce noise levels and disturbance to wildlife:

- Avoidance of unnecessary revving of engines and switch off equipment when not in use
- Vehicles and equipment will be properly maintained to meet the manufacturers' noise rating levels. Any silencers or bearings which become defective would be replaced as soon as possible
- Using reverse warning systems incorporating broadband noise where practicable
- Using enclosures for noisy plant such as pumps or generators
- Minimising drop height of materials
- Limiting the use of particularly noisy plant or vehicles where practicable
- Plant and vehicles will be operated with noise control hoods closed

Control of Artificial Lighting

Artificial lighting used on construction sites and camps at night will be shaded and directed downwards to avoid light spillage and disturbance to birds or other wildlife.

<u>Dust</u>

Dust suppression measures will be employed as necessary during the construction, operation and decommissioning phases of the Project. These measures will include the use of water to supress the spread of dust and or modifying site wide speed limits.

5.6.6 Residual Impact

Implementation of the mitigation hierarchy and mitigation measures addressing each potential impact on biodiversity, residual impacts that might incur when avoidance, minimization and restoration measures are taken are summarized in Table 5-50, with the assumption that all recommended mitigation measures are in place.

Table 5-51: Residual Impact Significance on Biodiversity Receptors	

Receptor	Impact Significance	
Habitat loss / degradation, disturbance, increased injury and	d mortality	
Priority habitats: Deciduous Oak Woodland	Minor	
Priority habitats: Prunus spinosa and Oak Mixed Woodland	Minor	
Priority habitats: Mesotrophic Grassland	Minor	
Widespread endemic flora	Negligible	
Other Habitats (Modified / degraded)	Negligible	
Roach's Mouse-Tailed Dormouse	Minor	
Brown Bear	Negligible	
Common Tortoise - Testudo graeca	Minor	
Bats of conservation concern	Negligible	
Other Fauna species in the AOI with less conservation value	Negligible	
Target bird species: Egyptian vulture - <i>Neophron percnopterus</i> European turtle dove - <i>Streptopelia turtur</i>	Negligible	
Breeding bird species using the AOI (not observed during the field surveys)	Negligible	
Destruction of Breeding/Roosting Sites		
Fauna	Minor	
Target bird species	Minor	
Breeding bird species	Minor	
Indirect Environnemental Impacts (dust, noise, waste, etc.)		
Priority habitats	Minor	
Widespread endemic flora	Negligible	
Fauna	Negligible to Minor	
Target bird species	Minor	
Breeding bird species	Negligible	

Table 5-52: Significance of Operation-Phase Impacts on Biodiversity

Receptor	Impact Significance
Permanent Habitat Loss, disturbance, increased injury and i	nortality
Priority habitats	Minor
Widespread endemic flora	Negligible
Other Habitats	Negligible

Receptor	Impact Significance			
Anatolian Ground Squirrel - Spermophilus xanthoprymnus	Minor			
Common Tortoise - Testudo graeca	Minor			
Lizard of Anatolian - Parvilacerta parva	Negligible			
Target bird species:				
Eastern imperial eagle - <i>Aquilla heliacal</i>	N a sultantia la			
Egyptian vulture - Neophron perchopterus	Negligible			
Steppe eagle - Aquila hipalerisis				
Breeding bird species	Negligible			
Collision with PV Panels				
Waterfowls	Negligible			
Target bird species	Minor			
Breeding bird species	Negligible			
Collision with ETLs and ETL towers				
Target bird species	Minor			
Breeding bird species	Negligible			
Displacement				
Fauna	Negligible			
Target bird species	Negligible			
Breeding bird species	Negligible			
Indirect Environmental Impacts (dust, noise, waste, etc.)				
Priority habitats	Negligible			
Widespread endemic flora	Negligible			
Fauna	Negligible to Moderate			
Target bird species	Minor			
Breeding bird species	Negligible			

5.6.7 Monitoring Requirements

Project specific Biodiversity Monitoring will be detailed in a separate Biodiversity Management Plan (BMP) in order to validate the accuracy of predicted impacts and risks to biodiversity values posed by the project, and the predicted effectiveness of biodiversity management actions so that the project achieves no net loss to habitats and associated species of conservation concern. The monitoring and evaluation program will include the following: (i) baseline, measures of the status of biodiversity values prior to the project's impacts; (ii) process, monitoring of the implementation of mitigation measures and management controls; and (iii) outcomes, monitoring of the status of biodiversity values during the life of the project, compared to the baseline during construction and operation. Specific thresholds will be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The programme will cover methods in line with IFC PS 6 and accompanying Guidance Note (GN6) as well as PS 1.

5.6.7.1 Habitat and Flora Species

Trees that have been, or are to be, removed will either be replaced through a re-planting scheme within the boundary of the application site or a contribution will be made to the relevant authority which ensure that the project results in a net gain of woodland.

Vegetation surveys will be completed as part of the operational monitoring, and compared to the results of surveys completed for the ESIA. This will monitor the regrowth of habitats that are to be lost during the construction of the solar farm. Corrective actions will be taken as necessary to ensure that the project results in a net gain of the Annex 1 habitat within the Project area, including the ETL.

5.6.7.2 Common Tortoise

Due to the Common Tortoise population on site, and following their translocation, monitoring for this species is important to ensure there is limited residual impact. Operational impacts are not predicted to be significant however site staff will be asked to look for, and report, any Common Tortoise around the Project area, including the ETL.

Surveys will be completed across the site to record the ongoing population and distribution of Common Tortoise, along with other reptiles, amphibians and mammals. Specific measures will be detailed in the Biodiversity Action Plan.

5.6.7.3 <u>Bats</u>

Operational impacts are not predicted to be significant however site staff will be asked to record mammal, amphibian or reptile fatalities on the site roads and this information will be passed on to the Project Ecologist. Corrective actions including signage, decreasing of site wide speed limits or if necessary, construction of animal tunnels will be considered.

5.6.7.4 Avifauna

During construction, construction areas will be checked for breeding bird activity and if recorded breeding activity will be allowed to finish prior to the area being cleared.

Operational carcass searching surveys will be completed across the Project area including the ETL. Carcass surveys will be completed for at least the first year of operation. The frequency of these surveys will be determined based on the results of scavenger removal and searcher efficiency trials. Additional measures to protect birds may need to be implemented based on the result of the operational surveys, including the carcass searches.

Survey methods will be included in a Biodiversity Management Plan (BMP).

5.6.7.5 Introduction and Spread of IAS

During construction, visual checks will be undertaken for the accidental introduction or spread of alien, invasive species, especially plant species which may be brought into the areas from construction activities (on vehicles, in any imported materials). Checks by a qualified ecologist will be undertaken around all major working areas in the Project Site and under the ETLs monthly. Measures to remove/eradicate any species introduced, if found, will be put in place.

Especially during any restoration/rehabilitation work to be conducted, the approach would be to give preference to native species and those that have higher adaptive capacity. Necessary screening will be conducted to avoid any accidental introduction.

6 SOCIO-ECONOMIC IMPACTS AND MITIGATION MEASURES

The main objective of the study is to identify potential social impacts of the Saros WF Hybrid Solar PV Project. This social impact assessment (SIA) intends to determine whether the proposed project has the positive and adverse effects on individuals, households and institutions. It also explores the unintended consequences, whether positive or negative on the local people. Some of the questions addressed include the following: "How will the project affect the local people?" "Are there any improvements in income or job opportunities as a direct result of the project?" The study assesses the significance of identified impacts in the light of mitigation measures incorporated into design and management of the Project. All potential impacts; negative/positive, long term/short term, planned/unplanned, expected/unexpected, cumulative and perceived should be taken into consideration together. Interdependency and mutual interaction among all sorts of impact complicates impacts to be separately assessed.

The key objectives of the study are to:

- Identify existing social and economic condition of the project area;
- Evaluate the social-economic impact of the proposed project activities on the households and investigate whether certain social groups would be adversely affected;
- Identify opinions and attitudes of project-affected people towards the Project and expectations attributable to the project;
- Identify and assess potential project-related social impacts across the whole operational life cycle;
- Describe, where appropriate, the general mitigation measures that have been incorporated into the Project.

It should be noted that each criterion is ranked with scores. According to the impact significance, appropriate management measures are defined.

6.1 **METHODOLOGY**

SIA is not a single method but a collection of tools and approaches. A wide range of social science methods can be used in carrying out SIA and a variety of data-gathering techniques is employed, depending on purpose and context. A good SIA provides qualitative and quantitative indicators of social impacts.

6.1.1 Assessment Approach

6.1.1.1 Baseline Study Approach

Data for the social impact assessment are obtained from the following sources:

- Secondary data,
- Quantifiable sample survey (household questionnaire and settlement questionnaire)
- Depth interview with key informants
- Participant observation

6.1.1.1.1 Secondary Data

Secondary data sources used in this study include census data, geographical data (including maps), and national and local government statistics, documentation from community-based organizations. Many of the data included in this report are from the Turkish Statistical Institute (TÜİK).

6.1.1.1.2 *Quantifiable Sample Surveys*

Household Questionnaire:

Household Questionnaire: Surveys were used to collect quantitative data on a reliable sample of households in the Study Area. The household survey interviews with randomly selected households around the settlements were conducted between November 14 and 15, 2022. Surveys are valuable for collecting data on individual and

household attributes such as family configuration, education levels, mobility, income sources, and health status and so on. The survey used the face-to-face interview method. The survey involved a formal visit to families and individual interviews with the adult member of the family using a standard questionnaire.

The settlements that would be potentially affected from the Project are Bodurlar, Dedeler and Kocalar villages. There are 207 people and approximately 71 households. The sample size was determined with .90 confidence level and plus or minus .1 margin of error. The sample size was determined using the following formula:

$$n = \frac{N * t^{2} * p * q}{((N-1) * d^{2}) + (t^{2} * p * q)}$$

n= sample size N= population d= margin of error p= estimated prevalence in the project area t= confidence level at 90%

q= 1-p

Although the sample size was 35, interviews with 32 households' members were conducted. The size of the sample in each community depended on the number of residents of the neighbourhood. The social and economic characteristics of households are similar. The numbers of household and the number of respondents are presented in Table 6-1.

Table 6-1: Sample Size in Household Survey

Settlement	Number of Households	Number of interviews
Bodurlar	27	11
Dedeler	18	10
Kocalar	26	11
Total	71	32

Settlement Questionnaire:

Village background information was gathered through questionnaires and discussions with headmen. These surveys mainly served for gathering information about the settlement as a whole.

Depth interview with key informants

Depth-interviews included interviews with representative of NGOs, representatives of government institutions and company officials. Depth interviews are realized based on semi-structured questionnaire.

Observation

Participant observation is a field technique to develop in-depth understanding of peoples' motivations and attitudes. It is based on looking, listening, asking questions and keeping detailed field notes.

6.1.1.1.3 *Data Entry and Analysis*

Data entry activities were carried in Ankara. Questions were constructed mostly as close-ended. However, few open-ended questions were inevitable and used in the study. SPSS 21 was used for data entry. The collected data for this study was analysed by simple descriptive statistical techniques.

Social Baseline Conditions were identified based on the evaluation of the primary data collected from the Projectaffected area.

6.1.1.2 Social Impact Assessment Approach

Social impacts can be defined as "impacts on the lives of individual people or groups or categories of people, or forms of social organization" (Adams, 2000). In the Guidelines and Principles for Social Impact Assessment (2003) prepared by The Interorganizational Committee in 2003 the notion of social impacts is defined as follows: "The consequences to human populations of any public or private actions-that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society". The term also embodies all human impacts including cultural impacts, community impacts, infrastructural impacts, gender impacts, resource issues, political impacts etc".

According to Vanclay (2002) social impacts may cause change on one or more of the following:

- People's way of life
- Their culture;
- Their community;
- Their natural environment;
- Their health and wellbeing; and
- Their fears and aspirations.

Many researches define project affected/impacted people different ways. When the affected communities are examined, the range of possible affected groups or categories is very wide. As Adams (2000) points out, 'interested and Affected Parties' as a better way refers to the whole range of winners and losers from the project construction. These groups are heterogeneous and gendered.

Positive and negative social and economic impacts/costs of any projects are rarely distributed evenly. As the impacted communities are themselves heterogeneous, there can be significant disparities in impacts, particularly among different socio-economic groups/categories.

All potential impacts; negative/positive, long term/short term, planned/unplanned, expected/unexpected should be taken into consideration together in a social impact assessment. Interdependency and mutual interaction among all sorts of impact complicates impacts to be separately assessed.

6.1.1.2.1 Assessment Criteria

An 'impact' is any change to a resource or receptor caused by the presence of a project component or by a projectrelated activity. Impacts can be negative or positive and are described in terms of their characteristics, including type and spatial and temporal features (namely extent, duration, scale and frequency) of the impact. Impact characteristics are defined in the subsections below.

The following criteria will be taken into consideration:

- > the nature of the impact i.e. positive, negative, neutral
- > the duration of the impact i.e. short term, long term, permanent
- the magnitude: high, medium, low;
- the likelihood or probability of the impact actually occurring;
- > the extent of the impact on a local, regional or global level.

Table 6-2: Assessment Criteria

CRITERIA	DESCRIPTION		
NATURE OF IMPACT			
POSITIVE NEUTRAL NEGATIVE	Self-explanatory, Evaluation type of effect		
	DURATION OF IMPACT		
SHORT TERM	0 – 5 years		
MEDIUM TERM	6 – 19 years		
LONG TERM/PERMANENT	> 20 years		
	PROBABILITY OF IMPACT		
LOW: RARE/HIGHLY UNLIKELY	An event which would be highly unlikely to occur even once over the life of the Project.		
MEDİUM:POSSIBLE	An event which may occur several times over the life of the Project.		
HİGH:PROBABLE/CERTAIN	Events which are likely to occur at regular intervals.		
	MAGNITUDE OF IMPACT		
NO IMPACT	People are not affected in any way by a particular activity.		
LOW	Requires no further Project action (the magnitude is low/or that adequate controls are already in place).		
MEDIUM	Must demonstrate the impact has been reduced to a level that is As Low As Reasonably Practicable (ALARP).		
HIGH	Always requires exploration of measures to minimize/reduce it to an acceptable level.		
	EXTENT OF IMPACT		
LOW	Site specific/Local: Extends only as far as the activity; or Limited to the site and its immediate surroundings		
MEDIUM	Regional/provincial Will have an impact on the region/province		
нідн	National Will have an impact on a national scale -particularly if an ecosystem or species of national significance is affected		
Adopted: Sakhalın Energy http://www.sakhalinenergy.ru/media/us	Investment Company, Social Impact Assessment, er/libraryeng/socialstake/socialimpact/doc 38 sia chp9.pdf;		

Impact significance is defined to be a combination of the consequence and the overall significance can be determined as follows:

Table 6-3: Significance Criteria

High Significance	The impacts will have a major influence on the activity and/or environment.		
Moderate Significance	The impacts will have a moderate influence on the activity and/or environment.		
Low Significance	The impacts will have a minor influence on the activity and/or environment.		
No Impact	The impact will have no influence.		
Adopted: Impact As	ssessment Criteria <u>http://www.jgafrika.com/wp-content/uploads/gravity</u> forms/3-		
b8d8e30e4905104910678	082015e80a2/2017/12/Section-24G-Mpact-Appendix-G Assessment-Criteria 1.pdf		

6.1.2 **Project Standards**

Project related national and international standards are outlined in Section **3** of the ESIA Report. SIA has been prepared in compatibility with the following legislation and standards:

- Turkish national regulations (Environmental Assessment Regulation, Official Gazette, 2014).
- Standards set by international financial institutions: European Bank for Reconstruction and Development (EBRD) (2019) Environmental and Social Policy and Performance Standards (2012) on the Environmental and Social Sustainability of the International Finance Corporation (IFC).

6.2 BASELINE CONDITIONS

This section provides social, economic and demographic characteristics of the households, land use, land ownership, opinion on the project and main problems in the settlements located around the proposed Project area.

Three settlements are likely to be affected by the proposed Project. These settlements are Bodurlar, Kocalar and Dedeler. According to the Address Based Population Census of 2021, the total general population of these villages is 207. The most populated village is Bodurlar village. The population of the villages is presented in Table 6-4

Table 6-4: Population of the Nearest Settlements

Settlements	Population
Bodurlar	80
Dedeler	50
Kocalar	77
Total	207

Source: https://data.tuik.gov.tr/

The local population in the project affected settlements differs in summer and winter. Some households reside in this region only in the summer months and, during the winter they live in places such as Istanbul.

6.2.1 Demographic Characteristic of the Households

There was total of 85 people in surveyed households and the average household size is 2.66 persons per household which is lower than the national average of 3.23 (TÜİK, 2021). In this survey, the smallest household had only one member whereas the largest household had six members. 56.3% of the surveyed households had two members while 15.6% has three members. Household size distribution is summarized in Table 6-5.

Household Size	Frequency	Percent
1 person	2	6.3
2 people	18	56.3
3 people	5	15.6
4 people	5	15.6
6 people	2	6.3
2 people 3 people 4 people 6 people	18 5 5 2	56.3 15.6 15.6 6.3

Table 6-5: Household Size Distribution

The highest percentage (34.8%) is in the age group of 61-70. The percentage of age groups of 51-60 is 16.8% and the percentage of age groups 71-80 is 15.6 in the surveyed households. It is therefore possible to say that most of the people in the project area are old. In Turkey, age distributions of urban and rural populations differ. Because there is significant out-migration from the rural areas; especially young people leave their homes to have better job opportunities and income elsewhere. Hence, the rural areas lose especially the young and skilled population. As these younger people leave villages, their older relatives stay in the villages. Moreover, low productivity in

32

Total

100.0

agriculture and the lack of social services also lead to out-migration. These factors affect demographic and economic conditions of rural areas adversely.

Age Range	Frequency	Percent
0-10	6	7.2
11-20	2	2.4
21-30	8	9.6
31-40	6	7.2
41-50	5	6.0
51-60	14	16.8
61-70	29	34.8
71-80	13	15.6
81-90	2	2.4
Total	85	100.0

Table 6-6: Age Distribution

Most of the members of households were primary school graduates (54.2 %) while secondary school graduates consisted 14.5 percent. The illiteracy rate is high (15.7%) (Table 6-7). Based on the available data, most of the illiterate people are elderly and women. There are no elementary or secondary schools in any of the potentially affected villages. The nearest primary, secondary and high schools are located at Çanakkale Province and Çan District. The nearest university is located in Çanakkale Province.

Table 6-7: Education Level

	Count	Percent
Illiterate	13	15.7%
Literate	4	4.8%
Primary school	45	54.2%
Secondary school	12	14.5%
High school	9	10.8%
Total	83	100.0%

84.4% of the respondents lived in the region since their birth and 9.4 percent of the respondents lived at their current place for 6-10 years Table 6-8. Those who said that they lived in this settlement for less than 5 years used to live in Çanakkale Province.

Table 6-8: Number of Years in the Village/Town

	Frequency	Percent
Since birth	27	84.4
1-5 years	2	6.3
6-10 years	3	9.4
Total	32	100.0

6.2.2 Economy, Income and Employment

The most important sources of income are animal husbandry (43.8%), pension (21.9%) and agriculture (21.9%) (Table 6-9).

	Frequency	Percent
Agriculture	7	21.9
Income from permanent job	3	9.4
Animal husbandry	14	43.8
Support /aid (NGOs, state etc.)	1	3.1
Pension	7	21.9
Total	32	100.0

Table 6-9:Main Source of Income

The people who participated in the survey stated that the secondary importance income sources are animal husbandry (37.5 %), pension (33.3 %) and agriculture (25.0 %) (Table 6-10). This condition is related with the high ratio of retired people in houses and salary/wage appears as an important income source. Most of the households engage agricultural production and animal husbandry. Agricultural production is carried out for subsistence purpose instead of being a source of income.

Table 6-10: Second Income Source

	Frequency	Percent
Agriculture	6	25.0
Income from permanent job	1	4.2
Animal husbandry	9	37.5
Pension	8	33.3
Total	24	100.0

The average monthly income of the study area is 4,884.37 TL. However, income disparities among households are quite significant in these households. The highest average monthly income is about 15,000 TL; while the lowest income is about 1,000 TL.

Table 6-11: Average Monthly Income (TL)

Income	Frequency	Percent
1000	1	3.1
1500	1	3.1
2000	1	3.1
3000	2	6.3
3500	7	21.9
4000	3	9.4
4500	2	6.3

Income	Frequency	Percent
4800	1	3.1
5000	4	12.5
5500	4	12.5
6000	1	3.1
7500	2	6.3
8500	1	3.1
9000	1	3.1
15000	1	3.1
Total	32	100.0

The results from the survey indicate that for 31.3% of the households, there is only one person who has a job or a source of income while in additional 28.1 % of the households there are two people who has a job or a source of income. The survey also indicated that 34.4% of the respondents said that there were no employed people in their household. Some of these households are retired residents and have retirement pension. (Table 6-12).

Table 6-12: Number of Working People

Number of Working People	Frequency	Percent
No one	11	34.4
1 person	10	31.3
2 persons	9	28.1
3 persons	1	3.1
More than 4 persons	1	3.1
Total	32	100.0

A total of 12.5 % of the respondents stated that there was an unemployed person in their households and one respondent stated that there were three unemployed people in their household.

In this study unemployed people defined as follows: unemployed persons were not employed and had actively sought work during the last six months. Because of the low productivity in agriculture, lack of work opportunities in other sectors hinders people's ability to increase their income. The unemployment rate in Turkey was reported at 10.1% in September of 2022 (<u>www.tuik.gov.tr</u>). Many experts state that this figure does not reflect the overall picture because of widespread undeclared or hidden unemployment.

Table 6-13: Unemployed Person in the Households

	Frequency	Percent
Yes	4	12.5
No	28	87.5
Total	32	100.0

Table 6-14: Number of Unemployed Person

Number Person	of	Unemployed	Frequency	Percent
1			2	50.0
2			1	25.0
3			1	25.0
Total			4	100.0

A total of 77.4% of the respondents stated that there was a retired person in their households. The high level of retired people in the area shows that most of the population is old. In Turkey, there is significant out-migration from the rural areas; especially young people leave their homes to have better job opportunities and income elsewhere. Hence, the rural areas lose especially the young and skilled population. As these younger people leave villages, their older relatives stay in the villages. Moreover, people who migrated from these villages returned their home town when they retired. 83.% of the respondents stated that there is only one retired person in their households.

Table 6-15: Retired Persons in the Household

	Frequency	Percent
Yes	24	77.4
No	7	22.6
Total	31	100.0

The respondents' perceptions on their household incomes in comparison with the regional evaluation can be figured as follows: 62.5% of the households consider themselves at the average level; 21.9% of the households consider themselves below the average level; and 15.6% consider themselves above the regional averages (See Table 6-16).

Table 6-16: Comparison of Income Level

	Frequency	Percent
Above the average	5	15.6
Average	20	62.5
Below the average	7	21.9
Total	32	100.0

6.2.3 Agriculture

68.8 % of households in the project area have agricultural land (Table 6-17). Around 91.0 % of households use their own land and 4.5 % of households use an agricultural land that belongs to their relatives or rented from someone else (see Table 6-18). There is no significant difference among villages in terms of agricultural production. Rain-fed farming was observed in the project area. However, only 1 household stated that they practiced irrigated farming. Wheat, barley, oat and rye are the major crops.

Table 6-17: Owning Agricultural Land

	Count	Percent	
Yes	22	68.8	
No	10	31.3	
Total	32	100.0	

Table 6-18: Status of Land Used for Agriculture

	Count	Percent
Own land	20	90.9
Rent	1	4.5
Used free of charge (belongs to relative)	1	4.5
Total	22	100.0

On average, households had 56.64 da of land. While the size of land owned by household ranges from 6 to 120 da (see Table 6-19). 82.4% of the farmers use fertilizer and chemicals for agricultural activities.

An affected peson regarding agriculture commented on the land status as follows: "Lands are small. These are enterprises with small lands. There are too many divided lands. There are property problems. The locals are elderly in general. They directly produce according to their individual needs. These are small family businesses..." (interview with local people).

Size of Agricultural Land (da)	Frequency	Percent
6	1	4.5
20	1	4.5
25	1	4.5
30	1	4.5
35	1	4.5
40	2	9.1
50	4	18.2
55	1	4.5
60	2	9.1
61	1	4.5
70	2	9.1
74	1	4.5
80	1	4.5
100	2	9.1
120	1	4.5
Total	22	100.0

Table 6-19: Size of Agricultural Land (da)

The survey shows that most of the households rely on farming for subsistence. Crops are partially kept for the subsistence and the rest are sold at the market. 75.0 % of the respondents stated that they consume their entire production at home (Table 6-20). It can be said that households engage in the agricultural production to meet the needs of their own households. They consume most of their products in the household. Due to the fact that the households do not have a large amount of land and the household members participate in production, the people living in the area mostly cultivate their own lands and produce to meet their own needs.

Table 6-20: Agricultural Production

	Frequency	Percent
Sell at market	3	18.8
Consume at home	12	75.0
Both sell and consume	1	6.3
Total	16	100.0

6.2.4 Animal Husbandry

81.3% of the households have animal stock (See Table 6-21). Animal products contribute significantly for the subsistence of these households. Livestock is an important component of the livelihood of most households with low income and could be a critical input in the dominant starch diet, reducing malnutrition and improving their lives. Animal stock of the households in the project area is composed of cattle, sheep and poultry.

Table 6-21: Livestock Property

	Frequency	Percent
Yes	26	81.3
No	6	18.8
Total	32	100.0

11 households have 446 cattle in total, 8 households have 292 sheep-goat and 7 households have a total of 91 poultry. One household has beehives and one household has working animals (See Table 6-22).

Table 6-22: Number of Animals

	Total Number of Animals
Cattle	446
Sheep-goats	308
Poultry	91
Beehive	2
Load-carrying animals	1

84.0% of the respondents stated that they graze their animals in the meadows or the grasslands near the place where they lived.

Table 6-23: Graphic Grazing Animals (%)

	Frequency	Percent
Yes	21	84.0
No	4	16.0
Total	25	100.0

According to the survey results 26.9 % of the respondents stated that they consume their entire product at home and 53.8 % of the respondents both sell at market and consume for their own need (Table 6-24). Some portion of products is kept for the subsistence and the rest is sold at the market.

Table 6-24: Products from Animal Husbandry

	Frequency	Percent
Sell at market	5	19.2
Consume at home	7	26.9
Both sell and consume	14	53.8
Total	26	100.0

6.2.5 Housing Conditions

According to the survey results stone and reinforced concrete buildings are dominant in the affected communities. A total of 84,4% of buildings used as dwellings in survey villages are stone and 12.5% of the houses are reinforced concrete. (see Table 6-25).

Table 6-25: Type of Houses

	Frequency	Percent
Brick	1	3.1
Stone	27	84.4
Reinforced concrete	4	12.5
Total	32	100.0

The houses in the affected communities dominantly have two or three rooms. 50% of houses in the project area have two rooms. (See Table 6-26)

Table 6-26: Number of Rooms in Houses

	Frequency	Percent
1	1	3.1
2	15	46.9
3	16	50.0
Total	32	100.0

81.3% of the respondents are owner of their residences and 18.8 % stated that the owner of their residence is a relative.

Table 6-27: Property of the Residence

	Frequency	Percent
Our own house	26	81.3
Owned by a relative	6	18.8
Total	32	100.0

6.2.6 Health

The household survey revealed that most (81.3%) of the community members travel to Çanakkale for their medical needs. 43.5% of the households that participated in this study have at least one member with chronic disease. High blood pressure, diabetes and heart diseases are the most common chronic diseases. 87.5% of the households have health insurance.

Table 6-28: Having Chronic Diseases

	Frequency	Percent
Yes	17	53.1
No	15	46.9
Total	32	100.0

Three of these households have a person with special needs or disability. Three of these disabled people were elderly. The majority of households (95.6%) have no disabled person or a person with special needs. (See Table 6-29).

Table 6-29: Disabled Person in Household

	Frequency	Distribution (%)
No disabled	29	90.6
Elderly	1	3.1
Alzheimer	1	3.1
Mentally disabled	1	3.1
Total	32	100.0

6.2.7 Household Appliances

The availability of some modern household equipment and appliances is an indicator of the standard of living as well as the tendency and openness to new attitudes and practices. The majority of houses in the survey area had major electrical appliances; all houses had a refrigerator, mobile phone and satellite TV. 93.8%had a washing machine and 12.5% of houses had dishwashers (see Table 6-30).

Table 6-30: Home Appliances

	Have	Don't have
Refrigerator	100.0	-
Telephone	100.0	-
Washing machine	93.8	6.2
Dishwasher	12.5	87.5
Vacuum cleaner	40.6	59.4
Computer	-	100.0
Satellite TV	100.0	-

6.2.8 Vulnerable People

Vulnerable groups that may be disproportionately affected by the project due to their disadvantaged status were considered with respect to factors such as gender, age, physical or mental disability, poverty or economic disadvantage. The people considered to be vulnerable in the affected settlements are listed below.

- Disabled households
- The Poor households
- Female headed households

The vulnerable households are given Table 6-31. The information was obtained through the household surveys.

Table 6-31: Vulnerable Households

Vulnerability	Number of Households
Female Headed Household	4
Poor Household (Their income under 3000 TL)	5
Disabled/ person with special needs	3

6.2.9 Stakeholder Engagement

Although a PCM was held, the survey results revealed that 40.6% of the respondents heard about the project while 59.4% have not been informed about the project (See Table 6-32).

Table 6-32: Heard About the Project

	Frequency	Percent
Yes	13	40.6
No	19	59.4
Total	32	100.0

78.1 % of the respondents stated that they want to be informed about the project. Approximately 64.0% of the interviewees asked for information about the project to be given by state officials and 40.0 % by parties implementing the project.

In accordance with Article 9 of the Environmental Impact Assessment Regulation (Official Gazette dated 25.11.2014 and numbered 29186), a "Public Participation Meeting must be held in order to inform the public about the project and to receive their opinions and suggestions on the project. Within the scope of the project, "A Public Consultation Meeting in the EIA Process" was held in the province of Kocalar Village on 05.10.2020. Two more meetings were held with the participation of people whose lands were affected. The EIA report is available on the website.

54.5% of the interviewees would like to be informed about the environmental impacts of the Project on environment while 22.7% would like to be informed about its social and economic impacts.

	Frequency	Percent
Impact of the project on environment	12	54.5
Social and economic impacts of the project	5	22.7
Job opportunities	1	4.5
Expropriation/ land acquisition	4	18.2
Total	22	100.0

Table 6-33: Project Related Subjects that Residents are Interested

Providing energy for the country and job opportunities are considered as the most important positive impact of the project. Most of the local people think that the project will provide some benefits for Turkey but no direct benefits for the local communities. The main perceived benefit of the project is direct employment. It is known that unemployment rate in Turkey is high. Despite the project's efforts to maximize the number of local people employed, the number of people who will gain employment are likely to be lower than local expectation due to the Project's nature.

Some residents of the affected communities had some concerns about the Project. Main concerns that were raised during the surveys include negative impacts on agricultural land and environment, noise, dust and traffic in the construction phase. They fear that their vegetable and other crops will be negatively affected from the Project. As can be seen in Table 6-34 and Table 6-35, most of the interviewees do not have information about the positive and negative impacts of the project. Based on the data, it can be said that the local residents are not acquainted entirely with accurate information about the project that can have considerable impact on their lives. Therefore, it is important to provide accurate information for local people at the beginning of the Project.

Table 6-34: Positive Impacts of the Project

Positive Impacts	Distribution (%)
Provides energy to our country	34.5
It contributes development of the project area	3.4
It would provide employment opportunity for community	13.8

Table 6-35: Negative Impacts of the Project

Negative Impacts	Distribution (%)
Environmental degradation	60.0
Damage of agricultural land	60.0
Problems related to expropriation	37.9
Noise, dust, traffic in the construction phase	20.7
Other	24.1
It was observed that the NGOs, state officials and headmen had positive attitudes about the Project. The headmen were informed of the Project and expected positive impacts such as job opportunities and development of infrastructure (roads). One of the state officials said that "Solar energy is clean and renewable. This kind of projects protect environment and provides energy" (Interview with state officials). One of the NGO's members said that "We support these projects. However, these projects should not be located in agricultural areas. If we want to protect environment, we should use solar, wind energy. However, these projects cover a large area and site selection is very important" (interview with NGO member).

Summary of opinion/thoughts about the Project obtained from the interviews is presented in Table 6-36:

Table 6-36: Thoughts on the Project

	Thoughts
Public authorities	 Clean and renewable energy Provides energy for our country Promotes development Contributes to the protection of the environment There is no important negative impacts of solar energy.
NGOs	 Renewable energy Sustainable development Should not be done in agricultural areas Covers a large area

6.3 SOCIAL IMPACTS ASSESSMENT

6.3.1 Land Acquisition and Economic Displacement

Based on the existing information, the Project will affect some land. A total of 1,406,193 m² land will be affected by land acquisition for the Project. This area is classified as agricultural land and privately owned. The area is not suitable for agricultural activities and is not used by any people for economic purposes. The land acquisition process is still on-going. Slightly less than 1,000,000 m² land has been purchased through mutual agreement to date while 411,000 m² land is subject to land expropriation. Although no-one would be required to physically move from their homes or villages as a result of the project, land owners would lose the use of ownership of land. 29 % of interviewees stated that their lands will be affected by the Project; their lands will be expropriated. The land acquisition process has been almost completed. It is important to note that expropriation is not the only way of land acquisition for the privately-owned parcels; they can be acquired through *willing buyer/seller arrangement*. The company officials stated that they want to purchase the lands required for the project as much as possible. The Project company recognizes that mutual agreement is the best option, if the landowners have serious and reasonable objection to the price.

Company officials stated that necessary efforts have been made to ensure that agricultural areas are not affected. For example, 70 decares of 100 decares of land were subject to purchase/expropriation, but the project area was revised because the land has been used for agriculture. Since the remaining 30 decares area would not be useful, the entire 100-decares parcel was not purchased. In Kocalar Village, on plot 130/14, there was a section where the cows stayed. Here, the necessary space is left for the cows on the basis of the person's request.

It is important to note that some plots are held jointly by members of a family. In other words, the number of owners is not identical with the number of households. It is possible to say that particularly in rural areas several persons may have title deed.

Table 6-37: Land Acquisition Status

Land Acquisition Status	Frequency	Percent
Yes	9	29.0
No	21	67.7
In progress	1	3.2
Total	31	100.0

Landowners will be compensated for the permanent acquisition of their land as well as crops/trees on their land if any. Compensation values for land will be proposed to the affected households/people. The proposed values are calculated based on the evaluation of various criteria as stated by the Turkish Expropriation Law.

6.3.1.1 Construction Phase

There will be unavoidable disruption due to the use of land during the construction period of the project. The majority of the residents do not rely on the land for subsistence but temporary or permanent loss of their land may have potential impacts on the land owners. It is important to note that most of surveyed households are engaged in animal husbandry and agriculture either for cash income or subsistence.

Furthermore, there are meadow /pasture lands near the project area, and these are used for grazing. Therefore, there might be disruption to livestock activity and potential loss of livestock related income during construction.

The scale of this impact is expected to be local and has a negative nature.

The degree of significance is moderate.

Decenter	Soncitivity		Nature o	Impact	Impact		
Receptor Sensitivity		Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Farmers and land users	Medium	Short- term	Local	Constant	Likely	Moderate	Moderate

6.3.1.1.1 *Mitigations, Management and Monitoring*

As part of the detailed engineering and micro-siting, the final site selection was undertaken to minimise economic impacts and disruption to farming activities. It is also recommended that the economic impacts to farmers and land users are managed through a Land Acquisition Plan (LAP). The LAP will be aligned with the principles of IFC PS5, and will include:

- Carry out land acquisition in accordance with the laws and regulations of Turkey and World Bank/International Finance Corporation and EBRD.
- Pay special attention to vulnerable and disadvantaged groups including those without formal title to land.
- Monitor the full and effective implementation of the Land Acquisition Plan.
- Ensure compensation is paid for temporary acquisition of land and loss of trees/crops if applicable.

6.3.1.1.2 *Residual Impact*

Once the LAP has been implemented, the impact significance will be reduced to minor.

Receptor	Construction Phase Residual Impact
Farmers and land users	Minor

6.3.1.2 Operation Phase

During the operation of the Project, land that was temporarily acquired for the construction will be returned to the original land owner and/ or user. During operation, the farmers and herders will be able to continue with their activities without being affected. Therefore, potential impact is anticipated to have Minor significance.

Pacantar	Soncitivity		Natu	Impact	Impact		
Neceptor	Sensitivity	Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Farmers and land users	Medium	Long-term	Local	Constant	Likely	Low	Minor

6.3.1.2.1 *Mitigations, Management and Monitoring*

The mitigation measures listed in the construction phase also apply to the operation phase.

6.3.1.2.2 Residual Impact

Once the LAP has been implemented, the impact significance will be reduced to negligible.

Receptor	Construction Phase Residual Impact
Farmers and land users	Negligible

6.3.2 Employment Opportunities

6.3.2.1 Construction Phase

Limited number of temporary jobs will be created locally during the construction phase. Based on information from the company, the Project will create approximately 225 (maximum 350 at the peak time) employment opportunities including skilled and unskilled labour There will opportunities for eligible persons within the affected communities to apply for work, for varying skill levels.

An additional benefit would be that using local labour would obviate the need for temporary housing for construction workers. Apart from direct opportunities that will be created, a number of indirect jobs will also be created in the construction phase.

This impact would be positive on unemployment people in the local area.

It is expected that the scale of this impact will be local and the nature positive. This impact is short-term.

The degree of significance is moderate.

Pocontor	Soncitivity		Natu	Impact	Impact		
Receptor	Sensitivity	Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Eligible and able people in the local communities	Medium	Short- term	Local	Transient	Likely	Moderate	Moderate (positive)

6.3.2.1.1 *Mitigations, Management and Monitoring*

In order to enhance local employment related with the construction phase the following mitigation is recommended:

- A Labour and Employment Management Plan to be developed.
- Recruitment / hiring of workers from the local communities as much as possible .
- Transparency of recruitment / hiring procedure.
- Promotion of gender equality during recruitment selection process
- If possible, training and skills development programmes for unemployed people in the project area.

6.3.2.1.2 Residual Impact

Residual impact is Moderate (positive).

Receptor	Construction Phase Residual Impact
Eligible and able people in the local communities	Moderate (Positive)

6.3.2.2 Operation Phase

The Project is expected to create approximately 5 employment opportunities for administrative and technical professionals during operation which will have limited impact on the local communities. Operation phase personnel will accommodate in Çanakkale City Centre.

Decenter Consitivity	Soncitivity		Natu	Impact	Impact		
Receptor	Sensitivity	Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Eligible and able people in the local communities	Medium	Long-term	Local	Continuous	Possible	Low	Minor (positive)

6.3.2.2.1 *Mitigations, Management and Monitoring*

The mitigation measures listed in the construction phase also apply to the operation phase.

6.3.2.2.2 Residual Impact

Residual impact is Minor (positive).

Receptor	Construction Phase Residual Impact
Eligible and able people in the local communities	Minor (Positive)

6.3.3 Business Opportunities

The project will create business opportunities for companies at the national and regional level, and also to some extent for companies in the project region. The construction phase also will stimulate the economic activity of the adjacent communities near the solar energy project and the services that these communities provide.

6.3.3.1 Construction Phase

The project might create business opportunities for local economy. However, the opportunities for local economy will be very limited. Construction activities are likely to stimulate economic activities of the adjacent communities. The potential opportunities for local services sector would be linked to accommodation, catering, cleaning, transport and security. It is expected that the scale of this impact will be local, short-term with positive nature.

The degree of significance is minor.

Deserter Consitivity	Sopoitivity		Nature	Impact	Impact		
Receptor	Sensitivity	Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Local and regional people and companies	Medium	Short- term	Local	Transient	Likely	Low	Minor (positive)

6.3.3.1.1 Mitigations, Management and Monitoring

In order to enhance business opportunities related with the construction phase the following mitigation should be implemented:

- Identify opportunities to procure of goods and services from the local area.
- Develop a database of local companies and inform the tender process.

6.3.3.2 Residual Impact

Residual impact is minor (positive).

Receptor	Construction Phase Residual Impact
Local and regional people and companies	Minor (positive)

6.3.4 Operation Phase

6.3.4.1 Potential Impacts

The project might create very limited business opportunities for local and regional economy in this phase.

Receptor	Sensitivity		Nature	Impact	Impact		
		Duration	Extent	Frequency	Likelihood	Magnitude	Significance
Local and regional people and companies	Medium	Long- term	Local	Continuous	Likely	Low	Negligible (positive)

6.3.4.2 Management and Mitigation

The mitigation measures listed in the construction phase also apply to the operation phase.

6.3.4.3 Residual Impact

Creation of additional business opportunities. The benefit is to be very limited. The residual impact is negligible (positive).

Receptor	Operation Phase Residual Impact
Local and regional people and companies	Negligible (positive)

6.3.5 Worker Accommodation

There is no detail information about the exact number of workers, location and area of land needed for the construction camp at the time of writing this report. Where possible, the EPC will house workers in existing accommodation in Çanakkale City Centre and where using local labour, these workers will be able to reside in their own home during the construction activities. Where existing accommodation is not an option, the EPC will use temporary camps for the workers.

6.3.5.1 Construction Phase

6.3.5.1.1 *Potential Impacts*

The project description outlines the construction schedule, and the construction activities are estimated to continue for 15 months. Where it is not possible to arrange for the construction workers to stay in existing accommodation and homes, the EPC will provide temporary accommodation for a portion of the workers.

Receptor Ser	Soncitivity	Nature of Impact				Impact	Impact
	Sensitivity	Duration	Extent	Frequency	Likelihood	Magnitude	Significance

Construction workers	Medium	Short- term	Local	Transient	Likely	Medium	Moderate
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6.3.5.1.2 *Management and Mitigation*

It is recommended to develop a Camp Site Management Plan (CSMP) in line with IFC's 'Workers' Accommodation Processes and Standards Guidance Note' and implement during the construction phase. The CSMP should set out the standards that need to be applied to workers' accommodation for Projects funded by IFC and provide benchmarks that the project (The Project Company and all Contractors) will need to align with, and the standards include provisions such as guidance on worker and community interactions as well as:

- Minimum space allocated per person;
 - Not more than eight workers accommodated in the same room, with separate beds for each worker, partitions to ensure privacy and a minimum distance of one metre between beds;
 - Not more than one worker per 5m² (surface) and one worker per 10m³ (volume);
- Supply of safe water in the workers' dwelling in such quantities as to provide for all personal and household uses;
 - o 100 litres of water per worker per day on average should be available personal hygiene purposes.
- Adequate sewage and garbage disposal systems;
- Appropriate protection against heat, cold, damp, noise, fire, and disease-carrying animals, and, in particular, insects;
- Adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting;
 - o One hand wash sink per ten persons;
 - o One toilet per ten persons / One urinal per fifteen persons / One shower per ten persons;
 - o Regular cleaning of soil and sanitary facilities and regular washing of bed linen; and
 - Separate storage provided for boots and PPE.
- A minimum degree of privacy both between individual persons within the household and for the members of the household against undue disturbance by external factors;
- The suitable separation of rooms devoted to living purposes from quarters for animals;
- A separate bed for each worker;
- Separate gender accommodation;
- Adequate sanitary conveniences;
- Appropriate heating, ventilation and/or air conditioning provided at the accommodation so that the inside temperature is kept around 20°C ; and
- Common dining rooms, canteens, rest and recreation rooms and health facilities, where not otherwise available in the nearest community.

6.3.5.1.3 *Residual Impact*

Following implementation of mitigation measures described above, the residual impact is considered to be minor.

Receptor	Construction Phase Residual Impact
Construction workers	Minor

6.3.5.2 Operation Phase

During the operation phase there will be no temporary worker camps. The personnel hired for the operation and maintenance of the SPP will be able to reside in their own homes, or where necessary in local accommodation in Çanakkale City Centre. This impact is considered minor.

6.3.6 Cultural Heritage

IFC PS 8 emphasizes the importance of cultural heritage and requires protection of cultural heritage during all phases of projects and states the need for a chance finds procedure.

The main legislation concerning cultural heritage in Turkey is the Law on Conservation of Cultural and Natural Assets (Law No: 2863, Official Gazette 18113, Date: July 23, 1983). The Law defines cultural assets and sets provisions for their protection, including the procedure for notifying the Ministry of Culture and Tourism or the closest governmental administrative body in case a previously unidentified potential cultural asset is discovered.

BOYLAM consulted the Çanakkale Regional Boards for Conservation of Cultural Assets that serve under the General Directorate of Cultural Assets and Museums of Ministry of Culture and Tourism for identification of any registered cultural importance. The desk studies showed that there is no cultural asset within the project area. It is however noted that immovable cultural heritage may be located within rural settlements and hilly mountainous regions. For this reason, and in accordance with GIIP, the Contractor is required to put in place provisions for identification of unidentified or unexpected finds during below ground works commensurate with the nature and scale of the risk.

Since the Project's land preparation and construction phase will involve earthworks and excavation activities, a chance find procedure will be implemented in order to prevent potential harm to any other undiscovered archaeological finds that might be present at the Project Area. The Project will comply with the requirements of Turkish Law with regard to management of any probable chance finds that may be discovered during the Project works.

BOYLAM has developed a Chance Find Procedure that aims to avoid / and or reduce project risks that may result due to chance finds in accordance with Good International Industry Practice (GIIP). This sub-plan applies to the Project Company and the Contractor (including sub-contractors and third-party consultants). The sub-plan is applicable to the construction phase only and applies to activities connected with the Project construction site(s), upgrade of existing and/or development of new access roads, interconnection works, transport and delivery of materials to and from site and interactions with the local community.

The following mitigation measures will be implemented in order to ensure that potential chance finds that may be encountered during earthworks and construction activities are managed properly:

- The Chance Finds Procedure will be implemented throughout the land preparation and construction phase of the Project.
- All the Project Company and the contractors' personnel will be informed about the implementation of the Chance Finds Procedure and related trainings will be provided.
- Access to construction sites will not be allowed during the land preparation and construction phase. Since the identified cultural heritage site is located adjacent to the turbine construction site, communities' access near to this site may be regulated in cooperation with the authorities.
- In case of a chance find, all activities that may potentially harm the archaeological find will be ceased, the area will be secured, and the chance find will be recorded. The Museum Directorate will be notified immediately for further actions.
- The Project Company will collaborate with the authorities for the investigation of the site and will take relevant measures to avoid any further disturbance.
- Within the scope of stakeholder engagement to be conducted, ongoing information disclosure to communities will include any chance finds. If deemed necessary, consultations with local communities will also be done.
- If any cultural site is present, The Project Company will also take necessary measures to
 ensure that the availability/accessibility of this resource is not impacted by the Project during
 also the operation phase.
- In case of any grievance regarding intangible cultural heritage, the grievance will be responded to appropriately in compliance with the grievance procedure.

7 CUMULATIVE IMPACT ASSESSMENT (CIA)

Cumulative impacts occur when the effects of developments (action, project or activity) overlap with the effects of other existing, planned or anticipated future developments by affecting the same VECs.

This chapter aims to assess the potential cumulative environmental and social impacts of Saros Hybrid SPP Project on the Valued Environmental and Social Components (VECs), together with other existing and future power developments in the area.

CIA process is defined by IFC as (i) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social drivers on the chosen VESCs over time, and (ii) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible.

7.1 CIA METHODOLOGY

The CIA study for Saros Hybrid SPP Project has been conducted following the six-step process specified by the IFC's Good Practice Handbook on the Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. Figure 7-1 illustrates the Rapid Cumulative Impact Assessment (RCIA) logical framework which is suggested to be conducted by the IFC. Steps of the RCIA process is as follows:

- Step 1: Scoping Phase I VESCs, Spatial and Temporal Boundaries: Determine spatial and temporal boundaries and identify VECs.
- Step 2: Scoping Phase II Other Activities and Environmental Drivers: Identify all developments and external natural and social stressors affecting the VECs.
- Step 3: Establish Information on Baseline Status of VESCs: Determine present conditions of VECs.
- Step 4: Assess Cumulative Impacts on VESCs
- Step 5: Assess Significance of Predicted Cumulative Impacts
- Step 6: Management of Cumulative Impacts



Figure 7-1 RCIA Logical Framework

7.2 CUMULATIVE IMPACT ASSESSMENT STUDY

7.2.1 Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries

The CIA studies mainly focus on the valued environmental and social components (VECs) such as:

- Physical features (e.g. biodiversity);
- Ecosystem services;
- Natural processes;
- Socio-economic conditions;
- Cultural aspects

Table 7-1 Identified Specific VECs

Environmental/Social Aspects	VECs	Specific VECs	
Air Emissions	Air quality in local settlements	Residents of Kocalar, Bodurlar, and Dedeler Villages	
Noise	Background noise levels at local settlements	Residents of Kocalar, Bodurlar, and Dedeler Villages	
Landscape and Visual Environment	Visual Environment of local settlements	Residents of Kocalar, Bodurlar, and Dedeler Villages	
	Key Biodiversity Area	Biga Mountains KBA	
	Priority Habitats	Pinus brutia woodland Pinus nigra and mixed deciduous woodland	
	Important Flora Species	Verbascum hasbenlii, Digitalis trojana, Verbascum aschersonii, Ferulago trojana Crocus candidus, Crepis rubra, Rorippa thracica	
Biodiversity	Important Fauna Species	Emys orbicularis, Testudo graeca, Mediodactylus kotschyi, Pseudopus apodus, Ablepharus kitaibelii, Lacerta trilineata, Lacerta viridis, Ophisops elegans, Crocidura suaveolens, Sciurus anomalus, Myomimus roachi, Ursus arctos	
	Migratory and Breeding Bird Species	Ciconia nigra, Ciconia ciconia, Pernis apivorus, Circaetus gallicus, Hierraetus pennatus, Aquila chrysaetos, Circus aeruginosus, Accipiter brevipes,	

		Accipiter nisus, Accipiter gentilis,
		Buteo buteo, Buteo rufinus,
		Falco tinnunculus, Falco eleonorae, Falco subbuteo, Falco peregrinus
		Rhinolophus blasii, R.euryale
		R.ferrumequinum, R.hipposideros, R. mehelyi,
		Barbastella barbastellus,
	Priority Bot Species	Myotis oxygnathus,
		Hypsugo savii, Pipistrellus pipistrellus, P.nathusii, Eptesicus serotinus, Nyctalus leisleri,
		N.noctula Vespertilio murinus, N. lasiopterus,Tadarida teniotis
	Land Acquisition	Dedeler Kocalar Bodurlar
Socio-economic Conditions	Socio-economic activities	Socio-economic activities of land owners and farmers
	Regional socio-economy	
	Community Health, Safety and Security	Residents of local settlements: Kocalar, Bodurlu, Dedeler

The **spatial boundary** of the CIA study is determined as to cover Saros SPP Project's direct impact area (Project footprint, Saros WF License Area and the nearby settlements affected by the project activities/components and the borders of the selected VECs. The portion of Saros WF Licence Area is within the Biga Mountains KBA). Therefore, considering habitat integrity; the spatial boundary of the CIA Study has been determined to cover the Saros WF Licence Area, project access roads, ETLs and Biga Mountains KBA (See Figure 7-2).

The **temporal boundary** of the CIA study is determined as the timeframe from the beginning of land preparation activities until the end of the Energy Generation Licence duration (49 years from the licensing date). Since the construction activities are planned to be completed within 19 months, which is significantly shorter than the operation phase, the operation phase of the Project is determined as the focus of this CIA study as the most conservative timeframe.



Figure 7-2 CIA Study Area

7.2.2 Step 2: Scoping Phase II – Other Activities and Environmental Drivers

Other past developments whose impacts persist, existing and foreseeable developments and environmental drivers within the spatial and temporal boundaries of the CIA Study, which would have potential impacts on the VECs, have been identified through a desk-based review of Electricity General Licenses issued by the EMRA for wind and solar power plants.

Available information on the existing and foreseeable developments identified within the CIA boundary are provided in Table 7-2. As seen from the table, there are two operational wind power developments within the CIA boundary: Kocalar WF, located 2.7km north and Üçpınar WF, located 4km north of Saros WF in additional to the Saros WF Project.

According to the information obtained from EMRA, no other existing or planned power developments (solar or other sectors) have been identified within the CIA Study Area.

Development Name	Project Company	Location	Capacity (MW)	Electricity Generation License Information	National EIA Status	Project Status
Saros WF and Saros Hybrid SPP	Borusan EnBW Enerji Yatirimlari ve ÜretimA.Ş.	Saros WF License Area	138	License No: EU/4074-2/2451 Start: 18.02. 2012 End: 18.02. 2061 Licence amendment is expected for the current layout	EIA Positive Decision for Saros WF obtained on: 19.03. 2019 EIA Positive Decision for Saros Hybrid SPP obtained on April 1, 2022. Decision Number: 6611	Saros WF is operational Saros Hybrid SPP is pre- construction
Üçpınar WF	Derbent Enerji	4km to Saros WF at the closest point	99	License No: EU/3433-10/2085 Start Date: 29.09.2011 End Date: 29.09.2060	EIA Not Required Decision obtained on:02.03.2009 Amended on: 04.04.2017	Operation
Kocalar WF	lsıder Enerji	2.7km to Saros WF at the closest point	26	License No: EU/3570-5/2180 Start Date: 22.12.2011 End Date: 22.12.2060	EIA Not Required Decision obtained on:30.09.2011 Amended on: 04.04.2017	Operation

Table 7-2 Solar and Wind Power Developments Identified within the CIA Study Area

7.2.3 Step 3: Establish Information on Baseline Status of VECs

• Information on the baseline status of the VECs is mainly based on the environmental and social baseline information presented in this ESIA.

7.2.4 Step 4: Assessment of Cumulative Impacts on VECs

Analysis of cumulative impacts on VECs involves estimating the future state of the VECs that may result from the impacts they experience because of past, existing or foreseeable developments. The concern is not just estimation of the development's impact, but estimation of the future condition of VECs in the context of all stresses—which is the cumulative impact—and can be evaluated in reference to an established threshold level of acceptable condition, if known, or in reference to a past baseline.

The cumulative impact potential on the VECs has been evaluated considering the projects affecting the VECs along with the Saros Hybrid SPP Project. If a VEC is found likely to be affected by one or more Projects in addition to Saros WF Project, there is cumulative impact potential on that VEC (See Table 7-3 for the CIA findings).

Environmental and Social Impact Assessment

Table 7-3 Cumulative Impact Potential of the Identified Existing and Future Developments on the VECs

Environmental/Social Aspect	Specific V/ECo	Project Under Assessment		Cumulative Impact Predicted		
		Saros Hybrid SPP	Saros WF	Kocalar WF	Üçpınar WF	(Yes/No)
	Kocalar	✓	\checkmark	✓	\checkmark	Yes
	Dedeler	✓	\checkmark		\checkmark	Yes
Impacts on Air Quality and	Bodurlar	✓	\checkmark		\checkmark	Yes
Noise	Agricultural areas and forest lands Section of Biga Mountains KBA near the Project Area	✓	✓			No
	Users of agricultural areas	✓	\checkmark			No
	Kocalar	✓	\checkmark	\checkmark	\checkmark	Yes
Visual Impact	Dedeler	✓	\checkmark	✓	\checkmark	Yes
	Bodurlar	✓	\checkmark	\checkmark	\checkmark	Yes
	Biga Mountains KBA	\checkmark	\checkmark	\checkmark	\checkmark	Yes
	Priority Habitats		\checkmark			No
	Important Flora		\checkmark			No
Biodiversity	Important Fauna		\checkmark			No
	Migratory and Breeding Bird Species		\checkmark	✓	\checkmark	Yes
	Priority Bat Species		\checkmark	\checkmark	\checkmark	Yes
	Bodurlar	✓	\checkmark			No
	Dedeler	\checkmark	\checkmark			No
Land Acquisition	Kocalar		\checkmark			No
	Socio-economic Conditions in the Region	\checkmark	\checkmark	\checkmark	\checkmark	Yes
	Kocalar	✓	\checkmark			No
Community Health and	Bodurlar	\checkmark	\checkmark			No
Salety	Dedeler	✓	\checkmark			No







7.2.5 Step 5: Assessment of Significance of Predicted Cumulative Impacts

According to the IFC's Good Practice Handbook, the significance of a cumulative impact is evaluated not in terms of the amount of change, but in terms of the potential resulting impact to the vulnerability and/or risk to the sustainability of the VECs assessed. This means evaluating cumulative impacts in the context of ecological thresholds. Determining ecological thresholds for biological and social VECs has proven to be difficult. In many cases, such thresholds may not be clearly identified until they are actually crossed, at which point recovery may take a long time with considerable cost or may simply not be possible. Consequently, a precautionary approach that explicitly considers uncertainty in ecological and sociological relationships is essential when thresholds of acceptable VEC condition are being established.

Determination of thresholds is an essential component not only for the assessment of significance of cumulative impacts but also for the design of management strategies. To be able to determine the significance of cumulative impacts, some limits of acceptable change in VEC condition are needed to which incremental effects can be compared. In practice, if the cumulative impacts of all combined developments on a VEC do not exceed a limit or threshold, the development would be considered acceptable. Thresholds are limits beyond which changes resulting from cumulative impacts become of concern; they are typically expressed in terms of carrying capacity, goals, targets, and/or limits of acceptable change. In reality, however, since such thresholds are not widely defined or available, the CIA is often hindered.

Good practice implies making attempts to estimate thresholds for VECs studied, and applying the mitigation hierarchy to manage those impacts that may result in exceeding predicted thresholds.

An alternative is to identify the limits of acceptable change, in consultation with the scientific community and the affected community. This approach focuses on the identification of VEC conditions that are deemed acceptable to stakeholders. The advantage of this approach is that once acceptable VEC conditions have been agreed upon, the appropriate combination of levels of use and management strategies required to sustain those conditions can be determined.

Finally, in the absence of defined thresholds or in the face of an inability to determine limits of acceptable change, practitioners should first acknowledge this lack or inability as part of the CIA process, and use their best efforts to suggest appropriate thresholds or limits, based on available scientific evidence and in consultation with stakeholders, government agencies, and technical experts.

Based on the approaches suggested by IFC and the CIA limitations, the significance of cumulative impacts is evaluated not in terms of the amount of change, but in terms of the potential resulting impact to the vulnerability and/or risk to the sustainability of the VECs assessed.



Table	7-4	Cumulative	Impact	Significance:	Summary	Table
able	1	Cumulative	impact	Significance.	Summary	Table

Environmental/Social Aspect	Specific VECs	Impact significance
	Kocalar	Minor
Impacts on Air Quality	Dedeler	Minor
	Bodurlar	Minor
	Kocalar	Minor
Visual Impact	Dedeler	Moderate
	Bodurlar	Minor
	Biga Mountains KBA	Moderate
Diadius with	Migratory and Breeding Bird Species	Minor
Biodiversity	Priority Bat Species	Minor
	Socio-economic Conditions in the Region	Moderate

7.2.6 Step 6: Management of Cumulative Impacts – Design and Implementation

The management measures needed to prevent cumulative impacts will depend on both the context in which the development impacts occur (i.e. the impacts from other projects and natural drivers affect the VECs) and the characteristics of the development's impacts. Since cumulative impacts typically result from the actions of multiple stakeholders, the responsibility for their management is collective, requiring individual actions to eliminate or minimise individual development's contributions. It should be noted that there is limited information on other developments at the time of conducting this CIA.



8 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

Borusan Enbw has developed a corporate ESMS framework which is covering all Power Projects that are owned by Borusan's and its SPV companies. This ESMS framework consists policies and sub-thematic plans that cover all projects. The Project Company will implement this environmental and social management system (ESMS) to oversee the development, construction, and operational activities of the Saros Hybrid SPP Project by tailoring the existing corporate ESMS and extending the Saros WF Project ESMS. The ESMS will be composed of Borusan-EnBW's policies, project assessment documentation, project specific management plans, supporting thematic sub-plans and reporting templates for monitoring progress. The ESMS will be supported by the management plans to be prepared by the Contractor outlining procedures for implementing the requirements of Borusan-EnBW's requirements. The ESMS framework will be aligned with the requirements of ISO14001:2015 Environmental management, ISO 26000:2010 Social responsibility; and ISO 45001 Occupational Health and Safety management. Underpinning the project plans are a number of project polices that set out the core values and principles of the Project:

- Corporate Environment and Social Policy;
- Corporate Health, Safety and Security Policy;
- Project Specific Labour Commitment Policy;
- Project Specific Code of Conduct Workers;
- Project Specific Code of Conduct Security Personnel; and Project Specific Local Content Policy.

8.1 ORGANISATIONAL RESPONSIBILITY

The Project Company has developed a preliminary organisational structure to oversee and manage all Project activities during the construction phase (will be updated for operational phase). A preliminary organogram is set out in Figure 8-1 and in Table 8-1. Project personnel's key EHS roles and responsibilities will be set out in procedures created as part of an ESMS.



Assistant General Manager - AGM Evren Aktaş

	Project Management Functions							
	Assistant Project Mngr - APM (Ömer Karamanlı)	Commercial Project Mngr- CPM (Nihan Eryavuz)	Project Manager - PM (Cenk Bulca)					
Project Support	Administrative Functions	Engineering Functions	HSE Functions	Planning Functions	Procurement Functions	Site Management Functions		
Finance & Controlling (Murat Gördeslioğlu)	Administrative Processes (Gökmen Say / Özlem Yedek)	Electrical Engineering (Hasan Zafer Çetinkaya)	HSE Specialist (Yağmur Galip Yıldırım)	Planning & Schedule (NN)	Procurement (Caner Sonugelen)	Site Manager (Hakan Tavşan)		
Purchasing & Commercial Management (Nihan Eryavuz)	Communication & PR (Canan Coşkun Güleç)	Solar Engineering (Mahir Tosun)	HSE Manager (Seda Sönmez)		Logistics, Insurance (Deniz Hoşafçı)	CLO (at site) Financial & Administr. Specialist (NN)		
Legal (Ruşen Gürlük Yarpınar)	Local Relations & Permits (Hakan Tavşan, Financial & Administr. Specialist (NN)	Survey Engineering (NA)	HSE Specialist (site) (NN)			Site Civil Engineer (nn)		
IT (Onur Aydoğan)	Contract Management (Nihan Eryavuz)	Civil Egineering (Erdem Üncü)				Site Electrical Technician (nn)		
Accounting (Esra Solak)	EIA & Carbon (Emel Yaşaroğlu)					Site Electrical Technician (NN)		
HR (Ece Yetişen Sun / Levent Şimşir)	Land Acquisition (by purchasing) (Mesut Çetinkaya) TKGM- Çanakkale							
Finance and Payment								





Figure 8-1: Preliminary Project Organogram



Table 8-1: Key EHS Roles and Responsibilities

Role	E&S Responsibility
Project Manager (Assistant Project Manager	Overall responsibility for ensuring the implementation of the Project Company's Construction Environmental and Social Management Plan (CESMP);
(Home/site based)	• Secure financial and human resources required to implement the CESMP; and
	 Nominate personnel to assist the Site Manager and CLO as required.
Site Manager (Site based)	Oversee and ensure the implementation of CESMP by the Contractor (including all subcontractors);
	Oversee and report Contractor's E&S performance to the Construction Director;
	Attend regular EHS meetings with Contractor;
	 Provide support to CLO to manage community issues and any grievances;
	 Coordinate regular audits and inspections to check that committed impact mitigation measures are being implemented; and
	Compile monthly reports in accordance with requirements of this CESMP.
E&S Specialist (Home	Review and approve Contractor CESMP and supporting documentation.
based)	 Review E&S reporting and communication with Lenders.
EHS Specialist (Site based)	 Responsible for implementing national permit requirements under the responsibility of the Project Company;
	 Oversee and ensure the implementation of CESMP by the Contractor (including all subcontractors);
	Oversee and report Contractor's EHS and social performance to the Construction Manager / Project Director;
	 Attend regular EHS meetings with Contractor (s);
	• Provide support to CLO to manage community issues and any grievances;
	 Coordinate regular audits and inspections to check that committed impact mitigation measures as per Contactor ESMP are being implemented;
	 Perform labour audits for all new contractors on site;
	Compile monthly reports in accordance with requirements of the CESMP;
	 Liaise with Ministry of environment and prepare statutory reports and H&S reporting;
	Monitor close out of actions in the Corrective Action Plan (CAP);
	 Provide training to the Project Company's personnel on E&S matters (and maintain the Project Company's training records); and
	Oversee Contractor training (and record keeping).
Community Liaison Officer	 Manage all communication with community and local stakeholders;
(Site based)	 Implement requirements of the Stakeholder Engagement Plan;
	 Maintain and implement the community grievance mechanism;
	• As secretary of the Project Stakeholder Committee, convene and arrange regular
	meetings to maintain regular communication with wider community;
	 Liaise with community leaders on project activities;
	Support Contractor to engage local labour and verify implementation of Labour Management Plan;
	Maintain socio-economic statistics with regard to recruitment of local workers; and



Role	E&S Responsibility								
	• Produce monthly summaries that provide details related to community investment activities and the implementation of the worker and community grievance mechanism.								
HR Manager and Team	Ensure Project labour management practices adhere to the Project standards;								
(Personnel Affairs)	Maintain and implement the worker grievance mechanism as per LMP;								
	• Ensure contractors implement the Project worker grievance mechanisms, through review of grievance records reports;								
	 Keep the records regarding the personnel of the Project Company and the contractors; 								
	 Conduct labour audits for all new contractors on site as well as periodic labour audits; 								
	 Produce monthly summaries that provide details related to worker grievance mechanism and HR related issues. 								

Whilst some staff and responsibilities is expected to change as the Project moves through construction into operation, the overall structure and roles and responsibilities will be defined during its inception and modifications implemented as required.

8.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Project is committed to implement a Construction Environmental and Social Management Plan (CESMP) and an operational one (OESMP) before each phase commences. The objective of CESMP is to provide a description of all proposed activities and planned facilities and to outline the actions to be taken by the Contractor to enable the Project to:

- Conform to all applicable laws, implementing regulations, financing institution obligations, permit obligations and good international industry practice (GIIP);
- Not cause undue harm or damage to natural resources, life (including human and wildlife); property, or sites, structure or objects of historical or archaeological significance;
- Be constructed in a safe manner;
- Formalise the overall programme for environmental and social management throughout the Project's life cycle;
- To be considerate of nearby community and to honor commitments made in community disclosure and consultation activities; and
- To set a framework for Contractors to implement E&S, H&S, labour and security measures on site during construction and operation.

The CESMP will present the framework for implementation, management and monitoring of the ESHS, labour and security requirements for the Project:

- Camp Site Management Plan
- Traffic Management Plan
- Security Management Plan
- Emergency Preparedness and Response Plan
- Biodiversity Management Plan
- Stakeholder Engagement Plan
- Land Acquisition Plan
- Livelihood Restoration Plan (if required).

The OESMP will focus on the following:

- Emergency Preparedness and Response Plan
- Biodiversity Management Plan
- Stakeholder Engagement Plan



8.3 MONITORING E&S PERFORMANCE

Project commits to develop an internal monitoring program that covers the following topics as a minimum:

- Status of the project.
- Status of permits and compliance with national legislation and IFC requirements.
- Status of environmental management, social and health and safety.
- Status of compliance of the ESAP (when available).
- Submission of an environmental and social compliance report to Lenders on an annual basis or as agreed.

In addition to the internal monitoring programme there will be Lender's regular monitoring to confirm the Project compliance in terms of above-mentioned topics.

8.4 MANAGEMENT OF CONTRACTORS AND SUPPLIERS

The Contractor will review in detail the Project Company CESMP and sub-plans. The Contractor will then prepare, implement, and regularly update a Contractor Construction Environmental & Social Management Plan (CCESMP).

The Contractor CESMP must be submitted prior to mobilisation for approval and they must prepare a site plan indicating:

- Key activity areas including waste management, hazardous material control, maintenance, workshops, refuelling, temporary storage, welfare facilities, concrete batching, etc.;
- Highlight on site plan the position of all sensitive receptors (e.g. nearby residential properties);
- Permitted routes to the site and traffic management requirements;
- Clearly identify laydown area;
- Location of storage facilities and type of storage (fuel, materials, waste, chemicals); and
- Site vehicle access and delivery points.

The Contractor should audit all sub-contractors and third party suppliers prior to contracting to verify their eligibility to meet the E&S obligations as set out in Project CESMP. This shall include:

- Confirm willingness to adhere to ESHS and labour policies of the Project Company;
- Documentation to their entitlement to wages and benefits, hours of work, overtime arrangements and overtime compensation, and leave for illness, maternity, vacation or holiday, that at a minimum comply with national law. This includes respecting a collective bargaining agreement with a workers' organisation if there is such an agreement to working conditions, terms of employment (worker contracts);
- Confirm no serious EHS incidents or fatalities in the last five years; and
- Willingness to provide appropriate personal protective equipment (PPE) in conjunction with training, use and maintenance of the PPE. PPE provides additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems and ability to implement OHS procedures.

8.5 STAKEHOLDER ENGAGEMENT

The Project Company is responsible for all external communications to the community. The Project Company's Community Liaison Officer (CLO) will manage interactions with the wider community. The Contractor is responsible for adhering to and supporting the Project Company to implement the requirements of the SEP. The Contractor is responsible for providing the CLO with detailed schedule and sufficient notice of project activities that are likely to have impact on local communities, to allow for transparent and effective communication regarding the Project. The below section describes the relevant roles and responsibilities, stakeholder identification, analysis, and engagement processes developed to date, which are further detailed in the SEP.

8.5.1 Roles and Responsibilities

The Project Company is responsible for the implementation of the SEP throughout the Project lifecycle. Stakeholder engagement processes will be carried out within the limits of responsibilities as set out in the table below which will be updated accordingly in line with any organizational changes throughout the various phases of the Project.



Table 8-2: Stakeholder Engagement Roles & Responsibilities

Unit / title / location	Duties and responsibilities
CLO (site)	 Recording grievances and requests, submission to the relevant unit / Site Chief, coordination and follow-up of the necessary action Meeting, informing and reporting with complainant and requesters Implementation of Stakeholder Engagement Plan requirements and inter-unit coordination Reporting of stakeholder engagement activities Updating and preparing the website, brochures and other communication tools and ensuring accessibility for all stakeholders
Site Manager	 Regular local and regional stakeholder visits Organizing information meetings Complaints and requests are evaluated and directed to the relevant unit / necessary action is taken Representation and spokesperson for project stakeholders (local)
Project Manager Unit Managers: Corporate Communication, Human Resources, Purchasing, Administrative Affairs, Health Safety Environment and others as applicable	 Providing technical, administrative, financial and human resources support to stakeholder engagement activities Management and tracking of resources dedicated to stakeholder engagement activities Representation and spokesperson for project stakeholders (local and regional) Undertaking necessary actions identified as a result of consultations/engagement activities
Assistant General Manager / General Manager / Senior Management (headquarters)	 Providing the necessary resources for effective stakeholder engagement activities Representation and spokesperson for project stakeholders (national and international)

Appendix A Çanakkale Meteorological Station Station Long Term Data



METEOROLOJİ GENEL MÜDÜRLÜĞÜ ÇANAKKALE METEOROLOJİ İSTASYONUNDA STANDART ZAMANLARDA GÖZLENEN EN BÜYÜK YAĞIŞ DEĞERLERİ (mm)

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		47.3 39.9	67 6 30 5 69 2 72 6 73 6 73 6 73 6 73 6 73 6	34.4 41.0 30.2	48.0 41.2 66.0	352 260 461 235	29.9 17.0 72.2	174 204 214	51.8 63.7 22.4 32.1	24.2 38.9 78.4	28.7 28.7 39.2	39.7 39.7 53.8 37.7	49.1 41.8 37.9 12.0	94.5 94.5 16.4 16.4 17.8	16.1					49.0	6 67.3 67.3	1001 1136 1271	TAD S
	8 14 / 5 15 5	57.4 37.0 78.4 41.4 39.8	60.4 30.5 15.7 47.9 36.8	34.2 34.1 27.7	35.5 88.7 41.2 65.9	321 260 396 235	27.6 72.5 72.2	151 201 210	50.4 53.7 22.4 24.7	20.6 3377 52.1	28.7 36.7 36.7	22 9 36 8 63 8 37 1	49.1 40.2 29.3 10.6	810 935 433 433 433						4/4 4 93.5 19.46	60.4 60.4	731 89.0 110.9	1. W.L
SAAI	6 / F	30.2 30.3 30.3 30.3	55.1 30.0 48.9 47.9 77.8	24 0 14 0 21 5	23.0 53.0	32 0 39 6 23 5	241 145 722 722	142 191 204	50.4 63.5 19.7 23.3	206 300 441	28.7 36.6	32.2 35.4 35.7 35.7	464 384 252 10.6	774 913 146 415 904						42 0 91 3 18 81	G 6	69.8 85.2 96.7 108.0	110.1
	5	2 82 2 82 2 82 2 82	52.7 30.0 47.4 47.9 47.9 47.9	219 340 136	24.1 82.6 41.2 40.5	32 0 26 0 39 6 23 5	2210 14.0	14.0 18.1 19.4	50.4 61.7 18.6 23.1	20.3 24.3 37.1	<u>78.3</u> 78.3 74.6 74.6	214 364 537 367	40.7 371 25.2 10.6	751 902 415 74 5 74 6						4(401 18.50 18.50	G 81 2	6/4 826 938 105.0	118.7
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	244	44.4 1/11 50.4 27.7 38.5	47.2 30.0 47.8 47.8 47.8	321 205 205	187 559 353 353	21.7 25.8 39.5 23.5 23.5 23.5	184 1184 1184	14.0	43.2 47.6 17.9 20.9	191	255 255 653 193	335 335 637 203	342 332 252 10.6	67.0 9.1 34.0						4/ 34.4 68.2 15.54	G 6	57.3 70.1 79.5 88.9	1911
		10.3 30.3 23.7 23.7 23.7 23.7	42.6 30.0 12.6 47.6 31.3	32.0 32.0 18.6	53.6 53.6 32.8	31 4 24 8 36 2 23 5	150	14.0 161 145	408 175 19.1	163 186 260	63 9 18.9 18.9	125 129 614 192	255 301 225 106	605 646 8.4 290						316 646 14.77	G G 437	533 665 744 874	1 12 11
	100	290 290 199 195	23.0 28.5 30.8 11.5 42.5 42.5	99 293 85 127	401 361 25.4	27.6 24.8 29.7 23.5	15.0 7.4 7.6 1.5	101	322	149 97 250	161 561 12.0	75 282 578 168	214 250 203 10.0	48.0 54.4 8.1 22.0 8.0						4/ 57.8 12.52	588 368	44 9 55 2 62 8 70 3	77.9 0.49
	14.2	217 217 142 194	13.4 20.4 29.5 24.8 24.8 24.8	81 251 85 111	9.6 32.0 26.3 16.0	241 240 235	141 141 235 235	60 128 113	208 194 149	149	15.0 33.3 33.3	40 234 308 162	21.0 20.5 16.1 8.1	37.7 28.8 6.5 11.0						199 394 8.11	G G 26.6	31.9 3355 4315 4315	51.3 5.1.3
MA	127 127 127	14 F 14 F 9.4	95 131 24.4 76 76	74 156 75 82 82	210 210 157 11.9	16.2 13.4 20.4	13.7 5.8 14.6	33 12.H	111	14.9	15.6 15.6 18.7 8.5	33 170 232 162	205 115 159 7.7	23.5 19.0 5.2 10.9 2.8						4/ 14.8 5.15	G 0 40	22.4 28.6 29.1	0.2F
UAK	01 010 010	83 138	71 109 164 74 74	62 68 88 7.1	153 10.1 89	125 137 172	126	28 119 103	128	14.8 9.7 9.8	139 175 75	115 179 182	140 81 143 70	125 185 109 109						4/ 119 361	G 115	772 202 224 B	7.17 1.15
	5 m	104 6.0 5.3 8.2	89 89 75 75 75	00044	45 57 70	78 78 96	10000	25 7.8 6.7	11.8 9.4 11.1 8.5	146 87 73	114	30 74 123 9.8	4 2 2 2 2	10.0 16.5 10.4 10.4	3					4/ 83 165 266	6 105 105	122 14.4 17.8	C BL
VELEN		2100 0100 0100	005	1000 9999 9988	987 995 994	992 991 991	2820	983 982	981 979 978	975 975 975	973 973 971	9570 968 967	966 964 963	962 961 959 959	957 955 955 955	952 951 950	949 948 947 945	945 944 943	941 940 939	-EB Id.S	A LE		E al
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Selami TLDIRIM Kayıtlara Uygunuur ^{Veri} Kontrol ve İstatistik Şube Müdür Vekili



T.C. ORMAN ve SU İŞLERİ BAKANLIĞI METEOROLOJİ GENEL MÜDÜRLÜĞÜ

ÇANAKKALE İSTASYONUNDA UZUN YILLAR FEVK (OLAĞANÜSTÜ OLAY) HADİSELERİ

TARİH	İSTASYON	OLAY	ZARAR								
08.07.1975	Çanakkale	Yağış ve sel	Sellerden dolayı zirai ürünler zarar görmüş								
08.07.1975	Çanakkale	Dolu	Dolu zirai ürünlere zarar vermiş								
10.01.1981	Çanakkale	Kar	Kardan dolayı karayolu trafiğinde aksamalar olmuş								
25.07.1983	Çanakkale	Firtina	Firtinadan dolayı zirai ürünler zarar görmüş								
26.02.1985	Canakkale	Don	Dondan dolayı zirai ürünler zarar görmüş								
12.01.1987	Canakkale	Firtina	Fırtınadan dolayı yerleşim yerleri zarar görmüş								
25.02.1987	Canakkale	Don	Dondan dolayı zirai ürünler zarar görmüş								
08.09.1997	Çanakkale	Yağış ve sel	Sellerden dolayı zirai ürünler,çevre ve yerleşim yerleri zarar görmüş								
09.12.1997	Çanakkale	Yağış ve sel	Sellerden dolayı zirai ürünler,çevre ve yerleşim yerleri zarar görmüş								
05.04.2000	Çanakkale	Firtina	Fırtınadan dolayı yerleşim yerleri zarar görmüş								
05.04.2000	Çanakkale	Yangın	Orman yangını çıkmış								
26.02.2001	Çanakkale	Firtina	Limanda seferler durmuş,ağaçlar devrilmiş ve 5 ayrı bölgede orman yangını çıkmış								
09.10.2003	Çanakkale	Firtina	Bazı ağaçları kırmış,elektrik hatlarına zarar vermiş ve deniz trafiğinde aksamalar olmuş								
22.01.2004	Çanakkale	Kar ve firtina	Elektrik direkleri yıkılmış ve kesintiler olmuş,bazı ağaçlar devrilmiş ve zeytin ağaçların %20-70 dalları kırılmış,seralarda çökmeler olmuş ve 10 000 küçükbaş hayvan açlıktan ve soğuktan telef olmuş								
26.01.2005	Çanakkale	Hortum	İnsan,hayvan,ulaşım ve yerleşim yerleri zarar gördü								
15.02.2005	Çanakkale	Firtina	İnsan,hayvan,ulaşım ve yerleşim yerleri zarar gördü								
21.03.2007	Çanakkale	Firtina	İnsan.hayvan,ulaşım ve yerleşim yerleri zarar gördü								
22.11.2008	Çanakkale	Firtina	İnsan - hayvan - ulaşım ve yerleşim yerleri zarar gördü								
12.08.2012	Çanakkale	Dolu	Ekinler yattı								
18.09.2012	Çanakkale	Yağış ve sel	İnsan hayvan ulaşım ve yerleşim yerleri zarar gördü								
21.10.2012	Çanakkale	Yağış ve sel	Ekili tarım alanları sular altında kaldı								
29,10.2012	Çanakkale	Firtina	İnsan hayvan ulaşım ve yerleşim yerleri zarar gördü								
01.12.2012	Çanakkale	Yağış ve sel	Yerleşim yerleri zarar gördü								
01.12.2012	'ÇANAKKALE'	'44- Şiddetli yağış nedeniyle yerleşim alanlarında sel'	'35- İnsanlar zarar gördü'								
23.05.2013	'ÇANAKKALE'	'19- Tam firtina (24.5- 28.4 m/sn)'	'50- Orman yangını çıktı'								
03.12.2013	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'								
14.05.2014	'ÇANAKKALE'	'17- Firtina Hortum'	'02- Ağaçlarda dallar kırıldı'								
01.06.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'								
04.06.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'01- Ekili tarım alanları zarar gördü'								
16.07.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'								
24.07.2014	'ÇANAKKALE'	'43- Şiddetli yağış Sel Su baskını'	'08- Karayolu ulaşımı aksadı'								

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T.C. ORMAN ve SU İŞLERİ BAKANLIĞI METEOROLOJİ GENEL MÜDÜRLÜĞÜ

TARİH	İSTASYON	OLAY	ZARAR							
02.08.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
07.08.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
07.09.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'05- Yerleşim yerleri zarar gördü'							
17.09.2014	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
23.10.2014	'ÇANAKKALE'	'I7- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
28.12.2014	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
30.12.2014	'ÇANAKKALE'	'56- Kar'	13- Insan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
01.01.2015	'ÇANAKKALE'	'49- Don'	'01- Ekili tarım alanları zarar gördü'							
12.01.2015	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
30.01.2015	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
09.02.2015	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
06.04.2015	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'13- İnsan hayvan ulaşım ve yerleşim yerleri zarar gördü'							
17.06.2015	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'05- Yerleşim yerleri zarar gördü'							
07.08.2015	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
07.08.2015	'ÇANAKKALE'	'72- Yıldırım düşmesi'	'IS- Orman yangını çıktı'							
12.09.2015	'ÇANAKKALE'	'72- Yıldırım düşmesi'	'05- Yerleşim yerleri zarar gördü'							
12.09.2015	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'10- Deniz ulaşımı aksadı'							
22.10.2015	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
23.10.2015	'ÇANAKKALE'	17- Firtina Hortum	'10- Deniz ulaşımı aksadı'							
30.10.2015	'ÇANAKKALE'	17- Firtina Hortum	'10- Deniz ulaşımı aksadı'							
20.11.2015	'ÇANAKKALE'	'17- Firtina Hortum'	'10- Deniz ulaşımı aksadı'							
16.12.2015	'ÇANAKKALE'	'17- Firtina Hortum'	'10- Deniz ulaşımı aksadı'							
08.11.2016	ÇANAKKALE'	'17- Firtina Hortum'	11- Haberleşme ve enerji nakil hatları zarar gördü							
27.11.2016	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'13- Insan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
01.12.2016	'ÇANAKKALE'	'49- Don'	'01- Ekili tarım alanları zarar gördü'							
28.12.2016	'ÇANAKKALE'	'17- Firtina Hortum'	10- Deniz ulaşımı aksadı							
28.12.2016	'ÇANAKKALE'	'56- Kar'	'13- Insan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
06.01.2017	'ÇANAKKALE'	'56- Kar'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
15.01.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'							
17.07.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'05- Yerleşim yerleri zarar gördü'							

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T.C. ORMAN ve SU İŞLERİ BAKANLIĞI METEOROLOJİ GENEL MÜDÜRLÜĞÜ

TARİH	ISTASYON	OLAY	ZARAR
17.07.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
27.07.2017	'ÇANAKKALE'	'22- Dolu'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
27.07.2017	'ÇANAKKALE'	'22- Dolu'	12- Ulaşım araçları zarar gördü'
25.09.2017	'ÇANAKKALE'	'17- Firtina Hortum'	'02- Ağaçlarda dallar kırıldı'
26.09.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _ Su baskını'	'13- İnsan hayvan ulaşım ve yerleşim yerleri zarar gördü'
30.11.2017	'ÇANAKKALE'	'I7- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
30.11.2017	'ÇANAKKALE'	'17- Firtina Hortum'	'10- Deniz ulaşımı aksadı'
08.12.2017	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
15.12.2017	'ÇANAKKALE'	'17- Firtina _ Hortum'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
15.12.2017	'ÇANAKKALE'	'17- Firtina _ Hortum'	'09- Demiryolu ulaşımı aksadı'
22.12.2017	'ÇANAKKALE'	'56- Kar'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
29.12.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _Su baskını'	'13- İnsan _ hayvan _ ulaşım ve yerleşim yerleri zarar gördü'
29.12.2017	'ÇANAKKALE'	'43- Şiddetli yağış _ Sel _Su baskını'	'13- İnsan hayvan ulaşım ve yerleşim yerleri zarar gördü'

sidim

Selami YILDIRIM /eri Kontrol ve Istatistik Şube Müdür Vekili

...ayıtlara Uygundur.



T.C. Orman ve Su İşleri Bakanlığı

Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017 17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S.	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık Ortalama Hava Basıncı (hPa)	58	1019.0	1017.6	1016.2	1013.7	1013.7	1012.8	1011.7	1012.4	1015.3	1018.2	1018.6	1018.7	1015.7
Aylık Maksimum Hava Basıncı (hPa)	58	1042.7	1040.0	1032.2	1033.0	1026.3	1025.8	1023.6	1022.2	1028.9	1031.3	1035.8	1042.9	1042.9
Aylık Minimum Hava Basıncı (hPa)	58	997.5	998.9	985.9	985.4	997.7	994.9	995.9	998.7	995.5	994.0	992.0	993.0	985.4
Aylık Ortalama Sıcaklık (°C) Günlük Ortalama	58	6.2	6.7	8.4	12.5	17.5	22.2	24.9	24.9	21.0	16.2	12.0	8.3	1 5 .1
Sıcaklığın 5 °C ve Üzerinde Olduğu Gün Sayısı Oralaması	58	18.27	18.74	26.20	29.91	31.00	30.00	31.00	31.00	30.00	31.01	28.91	24.03	330.07
Günlük Ortalama Sıcaklığın 10 °C ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	6.27	6.53	10.67	24.96	30.96	30.00	31.00	31.00	30.00	29.77	21.41	10.93	263.50
Günlük Maksimum Sıcaklıkların Aylık Ortalaması (*C) Günlük Minimum	58	9.7	10.3	12.5	17.2	22.6	27.9	30.7	30.5	26.3	20.6	16.0	11.7	19.7
Sicaklikların Aylık Ortalaması (*C)	58	3.2	3.6	5.1	8.7	13.0	17.0	19.6	19.8	16.1	12.2	8.5	5.3	11.0
Aylık Maksimum Sıcaklık (*C)	58	20.0	21.2	24.2	28.4	38.9	36.8	39.0	39.1	35.9	31.7	25.2	22.9	39.1
Aylık Maksimum Sıcaklığın Kayıt Edildiği Tarih (Gün-Ay-Yıl)	58	03/01/1971	14/02/1977	27/03/2001	29/04/2013	30/05/2017	24/06/2007	01/07/2017	06/08/2017	04/09/2015	08/10/1984	14/11/2004	02/12/2010	06/08/2017
Maksimum Sıcaklığın 30 °C ve Üzerinde Olduğu Gün Sayısı	58					0.43	8.03	19.75	18.79	3.22	0.08			50.30
Orelaması Maksimum Sıcaklığın 25 °C ve Üzerinde Olduğu Gün Sayısı	58				0.39	7.98	24.82	30.46	30.44	21.31	3.27	0.01		118.68
Ortalaması Maksimum Sıcaklığın 20 °C ve Üzerində Olduğu Gün Sayısı Ortalaması	58	0.01	0.08	0.74	6.56	24.27	29.72	31.00	30.98	29.18	19.43	3.96	0.31	176.24

Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekili Layıtlara Üygündür.



T.C. Orman ve Su İşleri Bakanlığı

Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - CANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S. (YIL)	Ocak	Şubat	Mart	Nisan	Mayis	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Maksimum Sıcaklığın - 0.1 °C ve Altında Olduğu Gün Sayısı Ortalaması	58	0.60	0.34	0.10									0.15	1.19
Aylık Minimum Sıcaklık (*C)	58	-9.2	-11. 2	-8.4	-1.3	3.4	6.6	11.4	11.6	6.0	0.4	-4.4	-8.4	-11.2
Aylık Minimum Sıcaklığın Kayıt Edildiği Tarih (Gün-Ay-Yıl)	58	17/01/1963	14/02/2004	05/03/1987	09/04/2003	01/05/1990	08/06/1962	02/07/1964	30/08/1965	26/09/1960	30/10/1987	26/11/1967	22/12/1967	14/02/2004
Minimum Sıcaklığın -0.1 'C ve Altında Olduğu Gün Sayısı Ortalaması	58	6.87	5.62	2.51	0.06							0.65	3.51	19.22
Minimum Sıcaklığın -3 °C ve Altında Olduğu Gün Sayısı Ortalaması	58	2.43	1.93	0.37								0.03	0.79	5.55
Minimum Sıcaklığın -5 1C ve Allında Olduğu Gün Sayısı Ortalaması	58	1.06	0.68	0.15									0.18	2.07
Minimum Sıcaklığın -10 'C ve Altında Olduğu Gün Sayısı Ortalaması	58		0.01											0.01
Minimum Sıcaklığın -15 'C ve Allında Olduğu Gün Sayısı Ortalaması	٥													
Minimum Sıcaklığın -20 'C ve Altında Olduğu Gün Sayısı Ortalaması	0													
Minimum Sıcaklığın 20 °C ve Üzerinde Olduğu Gün Sayısı Ortalaması	58					0.06	3.87	14.70	15.93	2.96	0.37	0.01	0.01	37.91
Minimum Sıcaklığın 15 °C ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	0.06	0.12	0.06	0.29	7.77	23.55	29.96	30.10	20.31	7.27	2.12	0.50 Sei	122.11 mi YU DID
													Veri Kon	Müdür Vekili



T.C.

Orman ve Su İşleri Bakanlığı

Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Resat S. (YIL)	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Minimum Sıcaklığın 10 °C ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	2.67	2.34	2.96	10.79	26.89	29.82	31.00	31.00	29.29	23.17	11.86	5.75	207.54
Minimum Sıcaklığın 5 °C ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	10.03	10.67	16.27	26.31	30.94	30.00	31.00	31.00	30.00	30.13	23.36	15.82	285.53
Aylık Ortalama Toprak Üstü Minimum Sıcaklığı (°C)	58	2.2	2.4	3.7	7.0	11.3	15.2	17.9	18.0	14.4	10.7	7.2	4.3	9.5
Aylık Maksimum Toprak Üstü Minimum Sıcaklığı (°C)	58	0.6	-0.4	2.4	5.7	9.8	14.0	23.6	18.7	13.6	9.3	7.5	0.4	23.6
Aylık Minimum Toprak Östü Minimum Sıcaklığı (°C)	58	-10.7	-12.1	-11.1	-4.2	0.2	5.7	9.5	10.1	-50.0	-5.3	-5.5	-9.9	-50.0
Toprak Üslü Minimum Sıcaklığın -0.1 °C ve Altında Olduğu Gün Sayısı Ortalaması	58	9.41	8.53	5.27	0.51					0.01	0.08	1.89	5.93	31.63
Toprak Üstü Minimum Sıcaklığın -3 °C və Altında Olduğu Gün Sayısı Ortalaması	58	4.08	3.60	1.53	0.06					0.01	0.01	0.55	1.82	11.66
Toprak Üstü Minimum Sıcaklığın -5 °C ve Allında Okluğu Gün Sayısı Ortalaması	58	1.74	1.56	0.36						0.01	0.01	0.06	0.67	4.41
Toprak Üstü Minimum Sıcaklığın -10 °C ve Altında Olduğu Gün Sayısı Ortalaması	58	0.10	0.01	0.03						0.01				0.15
Aylık Ortalama Su Buharı Basıncı (hPa)	58	8.1	8.3	9.1	11.2	14.8	18.2	19.9	20.1	17.1	13.9	11.7	9.2	13.4 Selami YIVD

Ven Kontrol Ve İstatistik Şube Müdür Vekili

Vauillans Ilummdun



T.C. Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S. (YIL)	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık Ortalama Nispi	58	81.4	80.2	79.1	77.2	74.8	69.7	65.4	65.7	69.9	76.0	79.9	81.5	75.1
Nem (%) Aylık Maksimum Nispi Nem Ortalaması (%)	58	96.2	96.0	96.5	95.9	95.0	93.7	91.3	91.8	93.9	95.2	96.2	96.3	94.8
Aylık Minimum Nispi Nem Ortalaması (%) Aylık Ortalama	58	47.8	45.6	39.3	37.0	32.7	30.0	29.7	29.2	31.5	38.5	43.7	49.8	37.9
Bulutluluk Miktari (8 Okta)	58	4.2	4.0	3.6	3.2	2.7	1.9	1.1	1.1	1.8	2.9	3.6	4.2	2.9
Aylık Açık (Bulutsuz) Günler Sayısı Ortalaması	58	5.70	5.20	7.30	8.50	11.40	17.20	24.20	24.60	18.30	11,20	6.60	4.90	145.10
Aylık Bulutlu Günler Sayısı Ortalaması	58	22.40	20.60	21.50	20.60	19.30	12.80	6.50	6.40	11.30	18.80	22.40	23.50	206.10
Aylık Kapalı (Gökyüzü Bulutlarla Kaplı) Günler Sayısı Ortalaması	58	3.60	3.80	2.20	1.80					1.00	2.00	1.50	3.40	19.30
lylik Toplam Yağış Dıtalaması (mm≃kg+m²) DMGİ	0													
Aylık Maksimum Yağış mm=kg+m²) OMGİ	0													
ylık OMGİ Maksimum ağış kayıt tarihi gün-ay-	14	04/01/2016	06/02/2016	22/03/2007	08/04/2013	25/05/2005	14/06/2011	04/07/2005	11/08/2008	08/09/2014	28/10/2010	28/11/2016	01/12/2012	28/10/2010
ıl ıylık Yağışlı Gün Sayısı 0rtalaması (mm≖kg+m²) 0MGİ	14	11.57	11.14	10.86	7.21	5.71	5.21	1.71	1.21	4.29	7.21	7.79	10.71	84.62
lylik Toplam Yağış Ortalaması (mm≖kg+m²)	58	88.5	70.7	64.1	48.2	31.8	24.2	15.0	7.7	26.0	57.9	85.7	111.9	631.7
ıylık Maksimum Yağış πm=kg+m³)	58	91.5	58.7	86.0	72.2	110.0	50.5	80.6	45.5	63.8	104.8	101.9	96.3	110.0
ylık Maksimum Yağışın layıt tarihi gün-ay-yıl	58	22/01/2004	13/02/1999	22/03/2007	14/04/1986	15/05/1996	03/06/1980	03/07/1962	13/08/2012	25/09/1968	03/10/1962	18/11/1961	08/12/1997	15/05/1996
Sünlük Toplam Yağışın).1 mm, ve Üzerinde Diduğu Gün Sayısı Ortalaması	58	11.91	10.72	9.98	8.60	5.86	4.14	1.90	1.40	3.38	6.38	8.88	12.59	85.74 Selami YIL/
													ver	Müdür Ve

Layitlara Uygundur.

METEOROLOJI

T.C.

Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S. (YIL)	Ocak	Şubat	Mart	Nisan	Mayis	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Günlük Toplam Yağışın 10mm. ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	3.09	2.40	2.09	1.52	0.84	0.72	0.33	0.14	0.69	1.71	2.67	3.78	19.97
Günlük Toplam Yağışın 50 mm. ve Üzerinde Olduğu Gün Sayısı Ortalaması	58	0.09	0.03	0.05	0.07	0.09	0.02	0.05		0.05	0.07	0.22	0.22	0.97
Aylık Kar Yağışlı Günler Sayısı Ortalaması	58	1.81	1.50	0.76	0.03							0.05	1.10	5.25
Aylık Karla Örtülü Gün Sayısı Orlalaması	58	4.05	2.96	3.25									2.89	13.15
Aylık Ortalama Kar Yüksekliği (cm)	58	10.6	5.6	7.5									6.4	7.5
Aylık Maksimum Kar Yüksekliği (cm)	58	63	30	24									32	63
Aylık Maksimum kar kayıt tarihi gün-ay-yıl	58	26/01/2006	13/02/2004	05/03/1987									18/12/2001	26/01/2006
Aylık Yağışlı Günler Sayısı Ortalaması	58	12.69	10.88	10.78	8.95	6.45	4.60	2.07	1.43	3.78	6.86	9.48	13.02	90.99
Aylık Yağmurlu Günler Sayısı Ortalaması	58	11.40	9.83	10.10	8.83	6.43	4.60	2.05	1.43	3.78	6.76	9.36	12.14	86.71
Aylık Dolulu Günler Sayısı Ortalaması	58	0.45	0.52	0.26	0.33	0.12	0.16	0.07			0.03	0.22	0.26	2.42
Aylık Sisli Günler Sayısı Ortalaması	58	0.86	0.74	0.57	0.29	0.02			0.02	0.03	0.21	0.79	0.83	4.36
Aylık Kırağılı Günler Savısı Ortalaması	58	2.34	2.07	1.66	0.14						0.09	0.76	1.95	9.01
Aylık Çiğli Günler Sayısı Ortalaması	58	2.31	2.52	3.60	4.45	4.22	2.28	1.74	2.38	4.52	5.97	4.84	2.36	41.19
Aylık Orajlı Günler Sayısı Ortalaması	58	0.45	0.52	0.36	0.57	0.93	1.43	0.52	0.55	0.52	0.67	0.78	0.53	7.83
Aylık Ortalama Rüzgar Hızı (m+sn)	58	4.3	4.5	4.2	3.8	3.5	3.4	3.9	4.0	3.7	3.8	3.9	4.4	4.0
Aylık Maksimum Rüzgar Yönü ve Hızı (m+sn)	52	SSE 35.2	SW 38.7	SSE 35.4	SSE 34.5	SSE 26.6	SW 31.1	NW 31.8	NNE 23.7	W 32.7	W 31.9	SSW 33.9	SW 34.1	SW 38.7

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Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekiliaylınara Uygundur.



T.C. Orman ve Su İşleri Bakanlığı

Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - CANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S.	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık Maksimum Rüzgarın Kayıt Edildiği Tarih (Gün-Ay-Yıl)	52	01/01/1980 02:22	15/02/1991 20:50	05/03/1970 00:14	05/04/2000 11:04	23/05/2013 06:07	25/06/1968 17:35	25/07/1983 20:08	20/08/1965 12:26	06/09/1995 20:55	09/10/2003 02:43	13/11/1992 06:56	16/12/1969 19:40	15/02/1991 20:50
Aylık Kuvvetli Rüzgarlı Gün Sayısı ort.	54	12.28	11.56	14.02	12.37	12.33	12.54	17.04	18.33	14.91	13.57	10.94	12.35	162.24
Aylık Firtinalı Günler Sayısı Ortalaması	54	5.78	5.69	4.78	2.50	1.43	0.98	2.02	2.37	1.81	3.52	4.39	6.15	41.42
Aylık Hakim Rüzgar Yönü ve Yüzdesi (%) Aylık N Yönünde	58	NNE 29.10	NNE 27.88	NNE 28.77	NNE 22.23	NNE 25.24	NNE 26.36	NNE 34.65	NNE 37.24	NNE 31.60	NNE 30.42	NNE 24.78	NNE 26.23	NNE 28.71
Rüzgarın Esme Sayıları Toplamı	58	1826	1975	2371	2762	2931	3037	2928	2917	2490	2130	1568	1522	28457
Aylık N Yönünde Esme Oranı (%)	58	4.24	5.03	5.51	6.62	6.92	7.35	6.80	6.82	6.01	4.95	3.76	3.54	5.62
Ortalama Rüzgar Hizi (m+sn)	58	2.7	2.8	2.7	2.2	2.3	2.6	3.2	3.6	3.3	3.0	2.6	2.9	2.8
Aylık NNE Yonunde Rüzgarın Esme Sayıları Toplamı	58	12526	10948	12381	9280	10697	10889	14912	15938	13093	13102	10333	11286	145385
Aylık NNE Yonünde Esme Oranı (%) Aylık NNE Yönünde	58	29.10	27,88	28.77	22.23	25.24	26.36	34,65	37.24	31.60	30.42	24.78	26.23	29.00
Ortalama Rüzgar Hızı (m+sn)	58	3.8	3.8	3.8	3.2	3.2	3.4	4.1	4.3	3.9	3.8	3.3	3.7	3.7
Aylık NE Yönünde Rüzgarın Esme Sayıları Toplamı	58	9930	9447	9367	8108	8108	9204	12624	13138	11257	10596	8221	9051	119051
Aylık NE Yönünde Esme Oranı (%) Aylık NE Yönünde	58	23.07	24.06	21.77	19.43	19.13	22.28	29.33	30.70	27.17	24.60	19.71	21.03	23.52
Ortalama Rüzgar Hizi (m+sn)	58	3.1	3.3	3.3	2.8	2.7	2.8	3.4	3.4	3.0	3.0	2.7	3.1	3.1
Aylık ENE Yönünde Rüzgann Esme Sayıları Toplamı	58	4144	2910	3118	3143	3516	4082	4062	4151	5385	5486	5368	4996	50361
Aylık ENE Yönünde Esma Oranı (%)	58	9.63	7.41	7.25	7.53	8.30	9.88	9.44	9.70	13.00	12.74	12.87	11.61	9.95

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Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekili .Cayıtlara Üygundur. METERIKOLOJI

T.C.

Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre Rasat S. Ocak Şubat Mart Nisan Mayıs Haziran Temmuz Ağustos Eylül Ekim K	Kasım	Aralık	YILLIK
Aylik ENE Yönünde			
Ortalama Rūzgar Hizi 58 2.1 2.1 2.1 2.0 1.9 1.9 2.4 2.5 2.1 2.0 (m+so)	1.9	2.1	2.1
Avlik E Yönünde			
Ruzgarin Esme Savilari 58 1780 1112 1528 1267 1235 1251 1429 1218 1588 2045	2119	1855	18427
Toplami			10427
Aylik E Yönünde Esme so 440 000 055 001 001 000 000 000 000			
Orani (%) 58 4.13 2.83 3.55 3.04 2.91 3.03 3.32 2.85 3.63 4.75 Avlik E Yönünde	5.08	4.31	3.64
Ordalema Růzgar Hizi 58 1.8 1.7 1.8 1.7 1.5 1.5 1.9 1.7 1.7 1.7	17	18	17
(m+sn)		1.0	
Aylık ESE Yönünde			
Ruzgarın Esme Sayıları 58 330 241 265 318 370 324 169 257 290 289	340	389	3582
Toplamı			
Aylik ESE Yönünde 58 0.77 0.51 0.52 0.75 0.87 0.70 0.70 0.70 0.70 0.77		0.00	0.74
Esme Orani (%) 58 0.77 0.61 0.62 0.76 0.87 0.78 0.39 0.60 0.70 0.67	0.82	0.90	0.71
Aylık ESE Yönünde			
Ortalama Rüzgar Hizi 58 1.7 1.4 1.4 1.4 1.3 1.3 1.3 1.4 1.2 1.4	1.5	1.6	1.4
(m+sn)			
Aylık SE Yönünde			
Rüzgarın Esme Sayıları 58 279 329 194 223 302 189 83 98 121 233	356	565	2972
Toplam			
Ayik SE Yonünde Esme 58 0.65 0.84 0.45 0.53 0.71 0.48 0.19 0.23 0.29 0.54	0.85	1 31	0.60
Orani (%) 55 5.55 5.77 5.40 5.75 5.25 5.77	0.05	1.31	0.55
Aylık SE Yönünde			
Ortalama Rūzgar Hizi 58 2.7 3.0 2.2 1.8 1.6 1.3 1.2 1.2 1.4 1.8	2.3	3.2	2.0
(m+sn)			
Aylık SSE Yönünde			
Ruzgann Esme Sayılan 58 1/63 1/15 993 //9 574 394 136 135 272 725	1600	2387	11473
Ayik SSE Yonunde 58 4.10 4.37 2.31 1.87 1.35 0.95 0.32 0.32 0.66 1.68	3.84	5.55	2.28
Esme Urani (%)			
	4.5	6.0	2.6
Undalma Ruzgar ruzi 30 3.2 3.3 4.1 3.3 2.3 2.0 2.0 1.8 2.4 3.0	4.0	5,3	3.0
Ayin 3 Johunug Dépages Remo Sawlay 58 3083 2528 2142 1761 1308 701 233 333 553 1246	3350	2074	20771
muzyani dayilan bu buub zuzo znaz 1701 1500 731 525 552 555 1540 Taalami	JJJU	JZ/4	20771
suprami Avlik S Von/inde Esma			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			

alum Selami YILDIRIM veri Kontrol ve İstatistik Şube Müdür Vekili .ayıtlara Uygundur.



T.C.

Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017 17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik; 6.0 m

Parametre	Rasat S.	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık S Yönunde							-							
Ortalama Rüzgar Hızı (m+sn)	58	6.1	6.2	5.3	4.1	3.1	2.8	2.5	2.8	3.4	4.3	5.5	6.2	4.4
Ayılık SSVV Yonunde Rüzgarın Esme Sayıları Toplamı	58	2743	2873	2863	3495	2853	1887	958	831	1334	1869	3157	3370	28233
Aylık SSW Yönünde Esme Oranı (%)	58	6.37	7.32	6.65	8.37	6.73	4.57	2.23	1.94	3.22	4.34	7.57	7.83	5.60
Aylık SSW Yonunde Ortalama Rüzgar Hızı (m∻sn) Aylık SW Yönünde	58	5.7	5.6	5.0	4.4	3.8	3.5	3.6	3.6	4.0	4.5	5.4	5.8	4.6
Rüzgarın Esme Sayıları Toplamı	58	1893	2318	3796	4783	4035	2831	987	1007	1847	2185	2280	1879	29841
Aylık SW Yönünde Esme Oranı (%) Aylık SW Yönünde	58	4 40	5.90	8.82	11.46	9.52	6.85	2.29	2.35	4.46	5.07	5.47	4.37	5.91
Ortalama Rüzgar Hızı (m+sn) Aylık WSW Yönünde	58	4.8	4.7	4.7	4.7	4.1	3.9	3.6	4.0	4.6	4.6	4.5	5.0	4.4
Rüzgarın Esme Sayıları Toplamı	58	645	822	1000	1263	1507	1084	478	273	614	716	755	660	9817
Aylık WSW Yönünde Esme Öranı (%) Aylık WSW Yönünde	58	1.50	2.09	2.32	3.03	3.56	2.62	1.11	0.64	1.48	1.66	1.81	1.53	1.95
Ortalama Rüzgar Hizi (m+sn)	58	3.9	3.6	3.6	3.6	3.1	2.9	2.8	3.1	3.5	3.6	3.7	3.7	3.4
Aylık W Yönünde Rüzgarın Esme Sayıları Toplamı	58	234	183	312	455	380	405	194	167	243	304	362	256	3495
Aylık W Yönünde Esme Oranı (%)	58	0.54	0.47	0.73	1.09	0.90	0.98	0.45	0.39	0.59	0.71	0.87	0.59	0.69
Ortalama Rüzgar Hizi (m*sn) Avlik WNW Yönünde	58	3.0	2.5	2.5	2.4	2.2	2.1	2.4	2.6	2.5	2.6	3.1	3.0	2.6
Rüzgarın Esme Sayıları Toplamı	58	149	151	232	410	387	594	569	244	306	221	237	159	3659
Aylık WNW Yönünde Esme Oranı (%)	58	0.35	0.38	0.54	0.98	0.91	1.44	1.32	0.57	0.74	0.51	0.57	0.37	0.72

Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekili

.ayıtlara Uygundur.


т.с.

Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S. (YiL)	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	zummeT	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık WNW Yonunde														
Ortalama Rüzgar Hızı (m+sn)	58	2.4	1.9	2.1	2.0	1.9	2.4	3.0	2.8	2.5	2.0	2.2	2.2	2.3
Aylık NW Yönünde														
Rüzgarın Esme Sayıları Toplamı	58	355	386	714	923	1096	1436	1182	776	670	581	463	241	8823
Aylık NW Yönünde Esme Oranı (%) Aylık NW Yönünde	58	0.82	0.98	1.66	2.21	2.59	3.48	2.75	1.81	1.62	1.35	1.11	0.56	1.75
Ortalama Rüzgar Hızı	58	1.8	1.9	1.9	2.0	2.0	2.4	2.9	2.8	2.4	1.9	1.8	1.6	2.1
(m+sn)														
Rüzgarın Esme Sayıları Toplamı	58	883	972	1394	2333	2503	2485	1640	1117	11 70	915	773	874	17059
Aylık NNW Yönünde Esme Oranı (%) Aylık NNW Yönünde	58	2.05	2.48	3.24	5.59	5.91	6.02	3.81	2.61	2.82	2.12	1.85	2.03	3.38
Ortalama Rüzgar Hızı (m+sn)	58	1.8	1.9	2.0	2.0	2.1	2.2	2.5	2.8	2.4	2.1	1.8	2.0	2.1
Aylık Günlük Ortalama Rüzgarın 2.5 (m+sn) ve Üzerinde Okluğu Gün Sayısı Ort.	58	0.40	0.38	0.42	0.38	0.37	0.36	0.45	0.46	0.40	0.39	0.36	0.40	4.80
Aylık Günlük Ortalama Rüzgarın 5.0 (m+sn) ve Üzerinde Olduğu Gün Sayısı Ort.	58	0.17	0.17	0.16	0.13	0.09	0.08	0.11	0.12	0.10	0.13	0.13	0.19	1.60
Aylık Ortalama 5 cm. Toprak Sıcaklığı (°C)	58	6.3	7.0	9.7	15.3	21.8	27.1	29.8	29.2	24.2	17.5	12.2	8.0	17.3
Aylık Maksimum 5 cm. Toprak Sıcaklığı (*C)	58	18.3	21.0	29.5	36.1	45.1	54.2	52.0	50.8	45.4	39.2	26.3	21.0	54.2
Aylık Minimum 5 cm. Toprak Sıcaklığı (*C)	58	-1.0	0.0	0.0	0.8	7.4	10.9	16.1	14.7	6.9	2.6	0.1	0.0	-1.0
Aylık Ortalama 10 cm. Toprak Sıcaklığı (°C)	57	6.5	7.1	9.6	15.0	21.0	26.0	28.7	28.4	24.1	17.8	12.5	8.4	17.1
Aylık Minimum 10 cm. Toprak Sıcaklığı (*C)	57	0.0	-0.2	0.2	3.1	6.6	12.4	15.7	16.4	11.4	6.4	1.5	0.3	-0.2 /

0.3 Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekili ayıtlara Uygundur.



T.C. Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017 17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S.	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	YILLIK
Aylık Maksimum 10 cm. Toprak Sıcaklığı (*C)	57	16.0	16.8	23.0	29.0	38.2	39.8	41.8	43.5	39.0	29.3	22.2	20.2	43.5
Aylık Ortalama 20 cm. Toprak Sıcaklığı (*C)	58	6.6	6.9	9.2	14.2	20.0	24.8	27.5	27.4	23.7	18.0	12.8	8.7	16.7
Aylık Minimum 20 cm. Toprak Sıcaklığı (*C)	58	0.2	0.2	0.6	5.5	8.3	12.2	18.8	17.6	13.3	8.3	3.5	1.0	0.2
Aylık Maksimum 20 cm. Toprak Sıcaklığı (°C)	58	14.0	13.9	19.1	23.8	28.0	35.1	33.6	39.4	31.2	29.3	21.0	18.0	39.4
Aylık Ortalama 50 cm. Toprak Sıcaklığı (°C)	52	9.0	8.8	10.2	13.9	18.7	23.1	25.9	26.5	24.1	19.8	15.1	11.3	17.2
Aylık Minimum 50 cm. Toprak Sıcaklığı (°C)	52	4.5	0.2	4.3	0.2	9.3	9.8	21.5	21.3	18.6	13.4	9.2	4.6	0.2
Aylık Maksimum 50 cm. Toprak Sıcaklığı (*C)	52	15.2	14.7	16.5	20.8	24.8	28.4	28.9	30.3	29.8	25.2	22.6	17.8	30.3
Aylık Ortalama 100 cm. Toprak Sıcaklığı (°C)	52	11.4	10.5	11.0	13.3	16.6	20.2	23.1	24.3	23.5	20.8	17.3	13.9	17.2
Aylık Minimum 100 cm. Toprak Sıcaklığı (°C)	52	8.4	8.2	8.0	9.6	0.0	0.0	19.9	21.5	19.8	15.7	3.6	5.3	0.0
Aylık Maksimum 100 cm. Toprak Sıcaklığı (°C)	52	14.7	13.3	15.3	16.7	19.8	23.5	27.6	28.7	28.7	26.1	22.5	18.4	28.7
Aylık Toplam Açık Yüzey Buharlaşması Ortalaması (mm) Aylık Maksimum Açık	58	26.6	38.3	55.2	110.6	168.6	217.1	268.8	253.5	171.3	103.5	55.7	31.2	1490.0
Yüzey Buharlaşması mm	45	7.20	16.50	6.00	12.50	15.30	16.40	17.50	14.60	12.40	9.20	10.00	5.20	17.50
Aylık Oralama Güneşlenme Süresi (saat)	58	3.5	4.2	5.4	7.3	9.4	10.9	11.6	11.0	8.8	6.3	4.3	3.0	7.1
Ayıık Toplam Kuresel Radyasyon Toplamı kWsaat+m ³	8	37.1	58.3	99.5	145.2	176.9	186.6	189.0	175.0	121.9	87.2	56.4	38.1	1334.1

Selami YILDIRIM Veri Kontrol ve İstatistik Şube Müdür Vekili

.....y.uara Uygunuui.



T.C. Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü

UZUN YILLAR TÜM PARAMETRELER BÜLTENİ 1960 - 2017

17112 - ÇANAKKALE Enlem: 40.141 Boylam: 26.3993 Yükseklik: 6.0 m

Parametre	Rasat S. (YIL)	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylöl	Ekim	Kasım	Aralık	YILLIK
Aylık Ortalama Küresel Güneş Radyasyonu (cal+cm²)	48	138.6	202.7	300.4	410.6	503.0	553.4	558.3	499.0	393.5	263.6	168.8	121.3	342.8
Aylık Maksimum Küresel Güneş Radyasyonu (cal+cm²)	47	0.51	0.68	0.87	1.04	1.12	1.13	1.09	1.04	0.95	0.78	0.58	0.46	0.85
Aylık Ortalama Deniz Suyu Sıcaklığı (*C)	57	9,4	8.3	9.0	11.8	15.8	20.6	23.7	24.3	22.1	18.7	15.3	12.0	15.9
Aylık Maksimum Deniz Suyu Sıcaklığı (°C)	55	13.1	13.8	13.5	16.0	21.9	24.4	26.1	27.2	28.3	23.7	19.0	16.8	28.3
Aylık Minimum Deniz Suyu Sıcaklığı (*C)	55	0.3	3.5	5.0	7.6	11.0	15.1	19.3	2.6	17.0	14.0	9.8	6.8	0.3
Aylık Ortalama İşba Sıçaklığı (*C)	18	3.3	3.8	5.5	8.2	12.4	15.5	17.1	17.4	14.7	11.8	8.9	5.1	10.3
Aylık Maksimum İşba Sıcaklığı (*C)	18	14.4	14.0	15.0	20.0	21.6	26.7	29.1	27.4	24.8	23.0	21.5	19.4	29.1
Aylık Minimum İşba Sıcaklığı (*C)	18	-13.8	-15.1	-12.7	-13.3	-13.9	0.0	-4.9	1.1	2.1	-4.6	-31.1	-11.9	-31.1

sung Selami YILDIRIM

Veri Kontrol ve İstatistik Şube Müdür Vekili Kayıtlara Uygundur.



I.C. Orman ve Su İşleri Bakanlığı Meteoroloji Genel Müdürlüğü UZUN YILLAR TÜM PARAMETRELER BÜLTENİ Notları

 Kar yüksekliği cm. olarak ölcülmektedir. -1 değeri kar veryüzünde örtü olarak olmayıp, etrafta parcalar halinde olduğunu bildirir. 2) Saat UTC (koordine edilmis evrensel saat) saatidir. Türkiye saatine cevirmek için kısın 2 saat, yaz saatine göre ise 3 saat eklenir. 2016 Yılı ye sonrası 3 saat eklenir. Son 35 güne kadar olan bilgiler kalite kontrolünden geçmemiştir, daha sonraki tarihlerde değerler değişebilir. Sistemde ve verilerde düzenlemeler yapılmıştır, önceki veriler ile zaman zaman farklılıklar olabilir. 2) Günlük Minimum Sıcaklığın 0 °C 'nin altına düştüğü günler DONLU GÜN olarak ifade edilir. 3) Saniyedeki hızı; 10.8 ile 17.1 metre arasındaki rüzgarlar kuvvetli rüzgar, 17.2 metre ve daha fazla olan rüzgarlar ise firtina olarak nitelendirilmektedir. Kuvvetli Rüzgar: 10.8-13.8 m/sn (6 Bofor), Firtinamsi Rüzgar: 13.9-17.1 m/sn (7 Bofor), Firtina:17.2-20.7 m/sn (8 Bofor), Kuvvetli Firtina: 20.8-24.4 m/sn (9 Bofor), Tam Firtina: 24.5 - 28.4 m/sn (10 Bofor), Çok Şiddetli Firtina: 28.5-32.6 m/sn (11 Bofor), Harikeyn (Orkan): 32.7 m/sn (12 Bofor) ve fazlasi). 4) (N) Kuzey, (NNE) Kuzey-Kuzeydoğu, (NE) Kuzeydoğu, (ENE) Doğu-Kuzeydoğu, (E) Doğu, (ESE) Doğu-Güneydoğu, (SE) Güney-Güneydoğu, (SE) Güney-Güneydoğu, (S) Güney, (SSW) Güney-Güneybatı, (SW) Güneybatı, (WSW) Batı-Güneybatı, (W) Batı, (WNW) Batı-Kuzeybatı, (NW) Kuzeybatı, (NNW) Kuzey-Kuzeybatı, (C) Sakin. 5) Günlük Toplam Yağış miktarları bir gün evvel saat 06:00 UTC ile içinde bulunulan günün 06:00 UTC saatleri arasında ölçülen yağış miktarlarının toplamını ifade eder. 6) Günlük Mevcut Kar Kalınlıklarına ait ölcümler günde bir defa sabah saat 06:00 UTC'de yapılır ve ölcülen kalınlık om olarak o güne kayıt edilir. -1 LEKE olup, karın veryüzünde örlü olarak olmayıp, etrafta parcalar halinde olduğunu bildirir. (BU DURUM MANUEL ÖLÇÜM YAPAN İSTASYONLARIMIZ İÇİN GEÇERLİ OLUP, KAR SENSÖRLÜ OMGİ'LER İÇİN GEÇELİ DEĞİLDİR.) 7) Oraj (Gökgürültülü Simsek) hadisesi görüldüğünde özellikle yağışla birlikte görüldüğünde civarda yıldırım düşmesine ve dolu yağışına neden olabilir. 8) Görüş Mesafesi 1 ile 10 km. arasında ise; puş, kuru duman ve/veya görüş kısıtlayıcı hadise olduğu, 1 km. ve daha az ise; sis ve/veya yoğun bir sekilde görüş mesafesi kısıtlayıcı hadise olduğu anlaşılır. 9) Bulutluluk gözlemleri Klima, Sinoptik ve Metar rasatları yapan istasyonlarımızda verilebilir. OMGİ 'lerde ise bulutluluk ölçümü yapılmamaktadır. Toplam bulut kapalığı ölçümü 8/8 (8 OKTA) olarak yapılmaktadır. 1-2 Az Bulutlu (Few), 3-4 Parçalı Bulutlu (SCT), 5-6-7 Çok Bulutlu (BKN) ve 8 Tamamen Bulutla Kapalı (OVC). 10) YERİN HALİ KOD DEĞERLERİ TABLOSUNDA; 0 : Yeryüzü Kuru, 1 : Yeryüzü Nemli, 2 : Yeryüzü Islak (Yeryüzünde küçük veya büyük su birikintisi var), 3 : Yeryüzü Donmuş, 4 : Yeryüzü Buzlu (kar veya eriyen kar yok), 5 : Yeryüzünün yarısından daha azını kaplayan kar veya eriyen kar (buzlu veya buzsuz),6 : Yeryüzünün tamamını değil fakat yarısından daha fazlasını kaplayan kar veya eriyen kar (buzlu veya buzsuz), 7 : Yeryüzünün tamamını kaplayan kar veya eriyen kar (buzlu veya buzsuz),8 : Yeryüzünün tamamını değil fakat yarısından fazlasını kaplayan gevşek kuru kar, toz veya kum, 9 : Yeryüzünün tamamını kaplayan gevsek kuru kar, toz veya kolduğunu ifade eder. 11) OMGİ'ler (Olomatik Meteoroloji Gözlem İstasyonu) insansız olarak çalışmakta ve gözlem rasatları da yapılmamaktadır. Yağıs, sıcaklık, rüzgar, nem, başınç vş. gibi ölcüm bilgileri verilebilir. Yağısın cinsi (yağmur, kar, dolu), orai, görüş mesafeşi (siş - ouş), bulutluluk vş. gibi gözleme dayalı bilgiler ise verilememektedir.

Selami YILDIRIM Veri Kontrol ve İstatistik Ser Müdür ayıtlara Uygundur.

T.C.



Appendix B Laboratory Results





SEGAL CEVRE ÖLCÜM ve ANALİZ LABORATUARI

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RINA CONSULTING MÜHENDISLIK LTD. STI Değirmen Sok, Nisakule İs Merkezi No:18 Kat:9 Kozvatağı / **ISTANBUL**

05.08.2019 - 08.08.2019

Mevcut Durum Gürültü Ölcümü – P-21280/19

Boylam Enerji Yatırım Üretim ve Ticaret A.Ş. tarafından Çanakkale ili Merkez ve Çan ilçeleri sınırları içerisinde "Saros Rüzgar Enerji Santrali Projesi" kapsamında yakın 4 köyde 48 saatlik, 2 köyde gündüz akşam ve gece mevcut durum gürültü ölçümleri yapılmıştır.

Raporun Tarihi ve Sayfa Sayısı

Name and Number of the Project

Number and date of the Pages of the Report

18.10.2019 - 14 sayfa

Deney laboratuvarı olarak faaliyet gösteren SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. TÜRKAK'tan AB-0425-T ile TS EN ISO IEC 17025 standardına göre akredite edilmiştir. SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. accredited by TÜRKAK under registration number AB-0425-T for TS EN ISO IEC 17025 as test laboratory'

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararasi Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve deney/ölçüm metotları takip eden sayfalarda verilmiştir. The test and /or measurements results, the uncertainties with confidence probability and test methods are given on the following pages which are part of this report.

> Prepared by Satilmis DC

Raporu Onaylayan onfirm by Laboratuar Müdürü

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llk Basim: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 1 / 14

Müsterinin Adı/ Adresi

Ölcüm Tarihi:

Measurement Date

Proje Adı ve No

Açıklamalar

Remarks

Customer Name / Address



İlk Basım: 03.05.2010 RP.02 / Rev.05 Rev. Tarihi: 25.09.2019 Sayfa 2 / 14 SEGAL ÇEVRE ÖLÇÜM ve ANALİZ LABORATUARI Aşağı Öveçler Mah. 1322.Cad (Eski 6.cad) No:12 Çankaya-ANKARA Tel: 0 312 481 83 00 Fax: 0 312 481 83 99 mail: segal@segalanaliz.com web: www.segalanaliz.com, www.segal.com.tr

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GENEL BILGILER

1- TESİSİN TİCARİ UNVANI Boylam Enerji Yatırım Üretim ve Ticaret A.Ş

2- - TESISIN TICARI ADRESI

Çan /Çanakkale

3- TESISIN FAALIYET TÜRÜ

Tesis, rüzgar enerjisi elektrik üretim tesisi olarak hizmet verecektir.

Boylam Enerji Yatırım Üretim ve Ticaret A.Ş. Çanakkale ili merkez ve Çan ilçeleri sınırları dahilinde Saros Rüzgar Çiftliği (WF) kurmayı planlamaktadır. Proje, toplam 1383 MWe / 138 MWm kurulu güce sahip toplam kurulu gücü 483,6 GWh olan 27 Rüzgar Türbini Jeneratörü (WTGs) içermektedir.

Önerilen rüzgar çiftliği, her biri 5.111 MWlık kapasiteye sahip GE 4.8-5.5 MWlık türbinlerden oluşmaktadır:

Proje, ulusal şebekeye 154 kV gerilim seviyesinde 5.3 km ve 31 km uzunluğunda iki adet enerji iletim hattı üzerinden bağlanacak ve TEIAŞ tarafından inşa edilecek ve işletilecek olan Saros Trafo Merkezi aracılığıyla ulusal şebekeye bağlanacaktır. Şirket). Ayrıca, Projenin inşa edilecek iki trafo merkezi bulunmaktadır ve bu iki trafo arasında 154 kV gerilim seviyesinde 9.2 km olan bir havai iletim hattı olacaktır.



Proje alanı uydu görüntüsü

WTG'ler batı-doğu uzaması yaklaşık 25km olan bir alana yayılacaktır. Maksimum kuzey-güney uzantısı yaklaşık 6 km'dir. Proje sınırı toplamda yaklaşık 83 km2'lik bir alanı kapsamaktadır.

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ÜRKAK

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R-42086/19

10/19

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Proje sahası Çanakkale il merkezine yaklaşık 19km, Çan ilçesine 11km uzaklıktadır. Proje, dik dalgalı ve karmaşık topografya ile karada yer almaktadır.

Proje alanına tarım arazisi ve orman arazisi olarak sınıflandırılan araziler hakimdir. WTG'ler ve erişim yolları, esas olarak özel sektöre ait olan sulu olmayan (kuru) tarım arazileri ve ormanlık çalı açıklıklarında bulunur. Proje yerleşimi, türbinleri ve erişim yollarını yoğun ormanlık alanlardan ziyade çoğunlukla açık alanlara yerleştirmek için tasarlanmıştır. WTG'ler ve ayrıca tarım yapılmayan yerlerde. Proje tasarımında yer alan tarım arazileri, düşük tarımsal verim ve bölgedeki genç nüfusun azalması nedeniyle ekilmiyor veya hayvan otlatmak için kullanılıyor.

4- TESISIN FAALIYET SÜRESI

Ilk Basim: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Sayfa 3 / 14

Proje yapım aşamasında olup inşaat faaliyeti bulunmamaktadır.



Ölçüm noktalarının uydu görüntüsü





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Ölçüm	Ölçüm Yeri	Koord	linatları	Sicaklik	Nem	Rüzgar Hızı
Noktası		X	Y	(°C)	(%)	(m/sn)
1	Bodurlar Köyü	469669	4440172	30	32	2,9

Tablo 1: Ölçüm Sonuçları

İlk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 4 / 14

				Ölçüm Sonucu	Ölçüm	Ölçüm	
1 Nolu	Saat	Tarih	L _{eg} (dBA)	Ortalaması	Sonucu	Sonucu Ortalaması	
				L _{eq} (dBA)	L90 (dBA)	L 90 (dBA)	
	07:00-08:00		43,9		38,2		
	08:00-09:00		42,7		38,5		
	09:00-10:00		48,7		39,1		
	10:00-11:00		44,1		39,5		
N 00	11:00-12:00		44,2		39,3		
-19	12:00-13:00		44,4	46.0	39,8	20.1	
00 Sür	13:00-14:00		49,4	40,0	40,8	39,1	
0.7	14:00-15:00	6	45,5		40,1		
	15:00-16:00	01	47,0		39,3		
	16:00:17:00	3.2	44,9		38,9		
	17:00-18:00	.0	45,9		37,0		
	18:00-19:00	-06	45,4		37,8		
510	19:00-20:00	19-	40,0		37,6		
000	20:00-21:00	50.	44,1	40.0	38,4	20.0	
19 ¥	21:00-22:00	.8	44,9	43,0	40,6	39,3	
4.0.1	22:00-23:00	5.0	41,3	ĺ	40,1		
	23:00-00:00	0	40,6		39,4		
â	00:00-01:00		40,1		39,1		
00	01:00-02:00		39,6		38,6		
07	02:00-03:00		39,1	40.0	38,2	00.4	
00°C	03:00-04:00		39,0	40,6	38,2	38,4	
33.(04:00-05:00		41,7		38,1	-	
	05:00-06:00		39,1		37,7		
	06:00-07:00		43,4		38,1		



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AB-0425-T

R-42086/19

10/19

llk Basım: 03.05.2010 RP.02 / Rev.05 Rev. Tarihi: 25.09.2019 Sayfa 5 / 14

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Ölçüm	Ölçüm Yeri	Koord	linatları	Sicaklik	Nem	Rüzgar Hızı	
Noktası	Olçulli Terr	X	Y	(°C)	(%)	(m/sn)	
1	Bodurlar Köyü	469669	4440172	31	34	2,5	

Tablo 2: Ölçüm Sonuçları

1 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)		
	07:00-08:00		41,5		30,1			
	08:00-09:00		44,2		33,4			
	09:00-10:00		45,9		37,0			
6	10:00-11:00		45,4		36,8			
üz 9:0	11:00-12:00		45,3]	36,6			
-19	12:00-13:00		44,6	447	37,4	25.6		
0 0 0	13:00-14:00		45,6	44,7	37,1	55,0		
01:10	14:00-15:00	6	43,6	j	37,3			
=	15:00-16:00	01	42,5		35,4			
	16:00:17:00	8.2	45,1		35,1			
	17:00-18:00	0.	46,4		31,7			
	18:00-19:00	10	43,4		32,6			
CLA	19:00-20:00	19-	19-	19.	37,1		30,3	
:00	20:00-21:00	20	40,2	40.0	34,9	27.0		
19 23: 23:	21:00-22:00	.08	42,9	40,0	39,2	57,0		
	22:00-23:00	9.0	41,2		39,0			
	23:00-00:00	•	39,9		37,3			
â	00:00-01:00		39,8		36,5			
Ŏ	01:00-02:00		38,9		35,7			
-07	02:00-03:00	[36,0	42.2	33,7	24.7		
00-(Ge	03:00-04:00		40,1	42,3	36,7	34,7		
33:	04:00-05:00		41,3		33,4			
9	05:00-06:00		34,2		26,7			
	06:00-07:00		48,9		28,7			





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AB-0425-T

R-42086/19

10/19

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Noktası	Olçanı Terr	X	Y	(°C)	(%)	(m/sn)	
2	Akçalı Köyü	467232	4436841	30	30	2,2	

Tablo 3: Ölçüm Sonuçları

İlk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Sayfa 6 / 14

2 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)
	07:00-08:00		45,8		23,4	
	08:00-09:00		36,5		24,7	
	09:00-10:00		36,2		27,6	
indüz 0-19:00)	10:00-11:00		43,2		29,8	
	11:00-12:00		41,3		29,3	
	12:00-13:00		40,2	/1 0	31,5	20.5
3ür 00	13:00-14:00		42,7	41,0	31,1	20,0
01:0	14:00-15:00	6	40,7		30,7	
	15:00-16:00	101	44,0		32,3	
	16:00:17:00	8.2	43,9		31,2	
	17:00-18:00	0.0	40,7		26,8	
	18:00-19:00	õ	34,9		26,4	
540	19:00-20:00	- 19	38,2	20.2	26,5	
00 00	20:00-21:00	50	36,3		23,4	25.2
19 19 23:	21:00-22:00	.08	32,1	50,5	25,6	20,2
	22:00-23:00	5.0	41,7		24,5	
	23:00-00:00	0	28,4		23,4	
â	00:00-01:00		29,5		22,9	
Ŏ.	01:00-02:00		24,0		22,4	
-01 -01	02:00-03:00		24,8	25.1	21,9	21.7
Gec (23:00-(03:00-04:00		26,5	35,1	21,5	21,7
	04:00-05:00		21,7		19,2	
	05:00-06:00		42,6		19,1	
	06:00-07:00		37,0		21,4	





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AB-0425-T

R-42086/19

10/19

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Ölçüm	Ölçüm Yeri	Koord	linatları	Sicaklik	Nem	Rüzgar Hızı (m/sn)	
Noktası	Olçulli Teri	X	Y	(°C)	(%)		
2	Akçalı Köyü	467232	4436841	30	34	1,9	

Tablo 4: Ölçüm Sonuçları

llk Basim: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Sayfa 7 / 14

2 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)				
	07:00-08:00		41,6		28,5					
	08:00-09:00		46,2		29,9					
	09:00-10:00		45,8		30,1					
00) 9:00)	10:00-11:00		40,5		29,5					
	11:00-12:00		42,0		32,9					
-16	12:00-13:00		41,8	13.2	31,1	30.4				
00 Sür	13:00-14:00		42,6	70,2	30,8	50,4				
04:50	14:00-15:00	റ	43,5		33,0					
	15:00-16:00	01	40,9		30,3					
	16:00:17:00	8.2	43,5		29,3					
	17:00-18:00	0.	40,9		29,0					
	18:00-19:00	-0	44,6		26,2					
540	19:00-20:00	19-	19-	19-	19-	19-	34,3		26,0	
00:00	20:00-21:00	50	35,7	25.7	24,8	05 F				
19 AKS	21:00-22:00	38.	33,3	55,7	26,2	25,5				
	22:00-23:00	.0	38,1		24,9					
	23:00-00:00	0	28,4		24,9					
â	00:00-01:00		32,6		27,8					
Ŏ	01:00-02:00		34,1		29,6					
Gece 23:00-07:1	02:00-03:00		32,8	24.2	28,0	26.2				
	03:00-04:00		29,3	54,5	24,4	20,3				
	04:00-05:00		23,9		20,1					
- · ·	05:00-06:00		40,1	-	21,4					
	06:00-07:00		35,2		26,2					





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Ölçüm	Ölçüm Yeri	Koord	linatları	Sicaklik	Nem	Rüzgar Hızı	
Noktası	Olçanı Ten	X	Y	(°C)	(%)	(m/sn)	
3	Haliloğlu Köyü	470256	4435303	28	23	2,2	

Tablo 5: Ölçüm Sonuçları

llk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 8 / 14

3 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)
	07:00-08:00		48,1		27,8	
	08:00-09:00		43,5]	30,7	
	09:00-10:00		46,5		32,4]
ô	10:00-11:00		44,9		33,9]
0:0	11:00-12:00		45,1		37,3	
-15	12:00-13:00		45,6	18.1	39,1	30.2
00 Sür	13:00-14:00		50,7	40,1	39,8	39,2
01:10	14:00-15:00	റ	49,9		44,1	
E	15:00-16:00	01	49,9		44,6	
	16:00:17:00	8.2	48,9		40,0	
	17:00-18:00	0.0	50,5		37,6	
	18:00-19:00	ő	45,6		33,9	
540	19:00-20:00	19	41,9		30,9	
000	20:00-21:00	20	44,3	110	30,1	27.7
4k§ 19	21:00-22:00	08	43,6	44,0	40,4	37,7
	22:00-23:00	5.0	47,5		40,1	
	23:00-00:00	•	41,4		38,8	
â	00:00-01:00		40,4		37,6	
0.	01:00-02:00		41,2		37,4	
07	02:00-03:00		41,3	E1 0	36,4	25.2
00	03:00-04:00		38,0	51,0	34,2	35,3
33:	04:00-05:00		52,3		29,6	
<u> </u>	05:00-06:00		58,4		25,1	
	06:00-07:00		54,8		25,5	

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R-42086/19

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Ölçüm	Ölçüm Yari	Koordinatları		Sicaklik	Nem	Rüzgar Hızı
Noktası Olçum Yeri		X	Y	(°C)	(%)	(m/sn)
3	Haliloğlu Köyü	470256	4435303	32	35	2,4

Tablo 6: Ölçüm Sonuçları

Ilk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 9 / 14

3 NOLU	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)
	07:00-08:00		43,9		31,2	
	08:00-09:00		43,0		33,0	
	09:00-10:00		45,3		34,2	
6	10:00-11:00		46,8		36,5	
1Z	11:00-12:00		47,9		39,6	
-15	12:00-13:00		49,3	47.0	39,9	38.2
00 00	13:00-14:00		49,1	47,0	41,2	50,2
01:0	14:00-15:00	6	47,7		38,6	
E C	15:00-16:00	01	46,6		39,6	
	16:00:17:00	8.2	46,6		41,3	
	17:00-18:00	0.	46,6		37,2	
	18:00-19:00	-01	46,8		34,2	
<pre>c 1 ~</pre>	19:00-20:00	19-	37,8		31,1	
00000	20:00-21:00	20	46,8	15.0	31,9	38.2
19 23:	21:00-22:00	38.	43,5	40,9	41,0	30,2
	22:00-23:00	90.0	49,0		40,4	
	23:00-00:00	0	41,3		39,1	
<u> </u>	00:00-01:00		41,9		38,4	
Ŏ	01:00-02:00		41,3		38,4	
-01	02:00-03:00		39,9	53 /	37,6	36,1
Ű8	03:00-04:00		48,5	55,4	35,3	
23:	04:00-05:00		51,6		28,3	
<u> </u>	05:00-06:00		59,6		25,5	
	06:00-07:00		57,6		26,9	

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Ölçüm Ölçüm Xori		Koord	Koordinatları		Nem	Rüzgar Hızı
Noktası	Noktası Olçum Feri		Y	(°C)	(%)	(m/sn)
4	Kocalar Köyü	479852	4435943	31	35	3,5

Tablo 7: Ölçüm Sonuçları

llk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 10 / 14

4 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)
	07:00-08:00		44,5		34,9	
	08:00-09:00		39,1		32,8	
	09:00-10:00		38,6		33,0	
6	10:00-11:00		41,5		35,9	
N.0	11:00-12:00		44,7		35,6	
-16	12:00-13:00		43,6	13.1	35,4	34.2
3ür 00	13:00-14:00		45,0	45,1	34,5	3 4 ,2
07:0	14:00-15:00	റ	44,1		34,4	
Ē	15:00-16:00	6	42,4		34,2	
	16:00:17:00	8.2	42,1		32,7	
	17:00-18:00	0.	45,9		33,1	
	18:00-19:00	- <u> </u>	38,5		31,1	
540	19:00-20:00	19	40,2		32,1	
00:00	20:00-21:00	20	44,9	11.9	31,7	26 5
19 23: 23:	21:00-22:00	.08	45,0	44,0	39,5	30,5
	22:00-23:00	0.0	46,9		37,8	
	23:00-00:00	0	40,7		35,2	
6	00:00-01:00		41,7		33,6	
Ŏ.	01:00-02:00		41,6		34,8	
-04	02:00-03:00	[40,1	44 E	33,3	22.2
ŰÖ	03:00-04:00	[37,0	41,5	31,2	33,3
33.	04:00-05:00	[39,1		31,9	
3	05:00-06:00		45,8		32,0	
	06:00-07:00		40,3		32,8	





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AB-0425-T

R-42086/19

10/19

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Ölçüm Ölçüm Xari		Koordinatları		Sicaklik	Nem	Rüzgar Hızı
Noktası	Ölçülli Teri	X	Y	(°C)	(%)	(m/sn)
4	Kocalar Köyü	479852	4435943	30	32	3,8

Tablo 8: Ölçüm Sonuçları

lik Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 11 / 14

4 Nolu	Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu Ortalaması L _{eq} (dBA)	Ölçüm Sonucu L90(dBA)	Ölçüm Sonucu Ortalaması L90 (dBA)
	07:00-08:00		41,6		28,3	
	08:00-09:00	ļ	40,7		32,8	
	09:00-10:00	[38,7		33,9	
í í	10:00-11:00		39,0		32,0	
NO	11:00-12:00		41,0		33,1	
-16	12:00-13:00		36,7	11 1	30,6	22.5
00 Sür	13:00-14:00		40,3	4 1,1	31,8	32,5
1:10	14:00-15:00	6	39,9		32,9	
E	15:00-16:00	01	42,8		34,4	
	16:00:17:00	8.2	43,1		33,6	
	17:00-18:00	Ö.	44,5		32,6	
	18:00-19:00	õ	38,9		30,7	
c.i.a	19:00-20:00	19-	43,2		29,5	
00 00	20:00-21:00	50	41,7	45.0	30,7	27.4
4k§ 19	21:00-22:00	8.	46,9	45,2	40,4	37,1
	22:00-23:00	7.0	46,8		38,8	
	23:00-00:00	0	45,1		38,6	
	00:00-01:00		43,6		37,5	
ö	01:00-02:00		44,0		37,9	
04 04	02:00-03:00		43,1	44.0	35,6	25.0
0 0 0	03:00-04:00		40,9	41,8	31,9	35,2
23:	04:00-05:00		36,5		29,5	
	05:00-06:00	[33,1		29,0	
	06:00-07:00		35,5	ĺ	29,2	

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Ölçüm Ölçüm Vəri		Koord	Koordinatları		Nem	Rüzgar Hızı
Noktası	Olçum Ten	X	Y	(°C)	(%)	(m/sn)
5	Bahadırlı Köyü	492464	4431085	25	40	1,4

Tablo 9: Ölçüm Sonuçları

İlk Basım: 03.05.2010

RP.02 / Rev.05

Rev. Tarihi: 25.09.2019

Savfa 12 / 14

Zaman Dilimi	ÖlçümSonucu L _{eq} (dBA)	ÖlçümSonucu L90 (dBA)
Gündüz	51,8	39,5
Akşam	53,4	47,4
Gece	48,6	46,0

Ölçüm Noktası Ölçüm Yeri		Koord	Koordinatları		Nem	Rüzgar Hızı
		X	Y	(°C)	(%)	(m/sn)
6	Doğancılar Köyü	490933	4432691	23	42	2,1

Tablo 10: Ölçüm Sonuçları

Zaman Dilimi	ÖlçümSonucu L _{eq} (dBA)	ÖlçümSonucu L90 (dBA)
Gündüz	51,4	42,0
Akşam	49,1	46,9
Gece	48,5	45,4

Tablo 11: Bodurlar Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	05.08.2010.06.08.2010	42,2	39,1	55
22:00-07:00	05.08.2019-00.08.2019	40,7	38,6	45
07:00-22:00	06 08 2010 07 08 2010	44,1	35,7	55
22:00-07:00	00.00.2019-07.00.2019	42,2	35,5	45

Tablo 12: Akçalı Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L₌q (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	05 09 2010 06 09 2010	41,2	28,9	55
22:00-07:00	05.08.2019-00.08.2019	36,2	22,1	45
07:00-22:00	06 08 2010 07 08 2010	42,4	29,8	55
22:00-07:00	00.00.2019-07.06.2019	34,9	26,1	45

Tablo 13: Haliloğlu Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	05.08.2019-	47,5	38,8	55
22:00-07:00	06.08.2019	51,5	36,2	45
07:00-22:00	06.08.2019-	46,5	38,0	55 62
22:00-07:00	07.08.2019	53,1	36,9	45 5

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R-42086/19

10/19

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Tablo 14: Kocalar Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	06.09.2010.07.09.2010	43,3	34,6	55
22:00-07:00	00.00.2019-07.00.2019	42,6	34,1	45
07:00-22:00	07.09.2010.09.09.2010	42,0	33,6	55
22:00-07:00	07.00.2019-00.00.2019	42,8	35,8	45

Tablo 15: Bahadırlı Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	05.08.2019-	51,8	42,9	55
22:00-07:00	06.08.2019	51,6	46,5	45

Tablo 16: Doğancılar Köyü Ölçüm Sonuçları

Saat	Tarih	Ölçüm Sonucu L _{eq} (dBA)	Ölçüm Sonucu L90 (dBA)	Sınır Değer IFC L _{eq} (dBA)
07:00-22:00	07.08.2019-	51,4	43,4	55
22:00-07:00	08.08.2019	48,8	45,9	45

ÖLÇÜM YÜKSEKLİĞİ

Açık alanda yapılan ölçümler yansıtıcı yüzeylerden en az 3,5 metre uzakta, yerden 1,5 metre yükseklikte yapılmıştır.

ÖLÇÜM METODOLOJİSİ

Ölçümler; TS ISO 1996-2 ve TS 9315 ISO 1996-1 standartlarında ve Çevresel Gürültünün Değerlendirilmesi ve Yönetimi Yönetmeliği'nde belirtilen prensiplere uygun şekilde yapılmıştır.

ÖLÇÜM CİHAZI

Ölçümler; SVANTEK Marka SVAN 971 ve SVAN 957 gürültü ölçme cihazı ile yapılmıştır. Aşağıda cihaz ile ilgili teknik özellikler verilmiştir.

Cihaz, yapılan ölçümleri hafızasına otomatik olarak kaydeder. Karanlık ortamlarda aydınlatması kullanılarak ölçüm yapılabilir. Cihaz ile eşdeğer gürültü seviyesi (Leq), ortalama, minimum ve maksimum gürültü seviyeleri hesaplanabilmektedir. Cihazların ölçüm belirsizliği % ± 0,46 ve % ± 0,52 'dir.

ÖLÇÜMLERİ YAPAN KİŞİ / KURUM / KURULUŞ ADI

Ölçümü Yapan kişinin (Kamil Erhan CAN) akustik konusundaki bilgi birikimi Ek-1'de Raporu hazırlayan kişinin (Satılmış DOĞAN) akustik konusundaki bilgi birikimi Ek-2'de, Raporu onaylayan kişinin (Fevzi KARAKAYA) akustik konusundaki bilgi birikimi Ek-3'de sunulmuştur.

ÖLÇÜME BAŞLAMADAN VE ÖLÇÜM SIRASINDA YAPILAN AYARLAMALAR Ölçüm öncesi ve sonrası; ölçüm cihazı, "SV 30A SN: 22502 Akustik kalibratör" ile 94 ve 114 dBA' da kontrol edilmiştir ve cihaz fast moduna getirilerek 15 dakika ölçüm yapacak şekilde ayarlanarak 48 saat boyunca ölçüm gerçekleştirilmiştir.

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EKLER

- Ek.1 Ölçümü Yapan Kişinin Yetki Belgesi Ek.2 Raporu Hazırlayan Kişinin Yetki Belgesi Ek.3 Raporu Onaylayan Kişinin Yetki Belgesi Ek.4 Ölçüm Cihazı Kalibrasyon Belgeleri
- Ek.5 Ölçüm Cihazı Kalibratörü Kalibrasyon Belgeleri
- Ek.6 Ölçüm Fotoğrafları



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Müşterinin Adı/ Adresi

Proje Adı ve No

Açıklamalar

Remarks

Customer Name / Address

Numunenin Adı ve Örnekleme Tarihi

Name and Sampling Date of the Sample

Name and Number of the Project

Numunenin Kabul Tarihi

Date of Sample Acceptance

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05.08.2019 – 04.10.2019 (Çöken Toz Ölçümü) 05.08.2019 – 08.08.2019 (PM 10 Ölçümü)

Çöken Toz Örneklemesi ve PM 10 Ölçümü - P-21280/19

09.08.2019 PM 10 Filtresi 05.09.2019 Çöken Toz Filtresi 05.10.2019 Çöken Toz Filtresi

Boylam Enerji Yatırım Üretim ve Ticaret A.Ş. tarafından Çanakkale ili Merkez ve Çan ilçeleri sınırları içerisinde "Saros Rüzgar Enerji Santrali Projesi" kapsamında yakın 5 köyde 24 saatlik pm10 ve 4 noktada 30 gün süre ile 2 ay çöken toz ölçümleri yapılmıştır. PM 10 ölçümleri yapılmıştır.

Deneyin Yapıldığı Tarih	15.08.2019-18.08.2019 PM 10 Filtres		
Date of the Test	05.09.2019 Çöken Toz Filtresi		
	05.10.2019 Çöken Toz Filtresi		
<u>Raporun Tarihi ve Sayfa Sayısı</u>	18.10.2019 – 7 savfa		

Number and date of the Pages of the Report

Deney laboratuvarı olarak faaliyet gösteren SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. TÜRKAK'tan AB-0425-T ile TS EN ISO IEC 17025 standardına göre akredite edilmiştir. SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. accredited by TÜRKAK under registration number AB-0425-T for TS EN ISO IEC 17025 as test laboratory"

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Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve deney/ölçüm metotları takip eden sayfalarda verilmiştir. The test and /or measurements results, the uncertainties with confidence probability and test methods are given on the following pages which are part of this report.

Raporu Hazırlayan Prepared by Satılmış DOGAN Kimyager

FevrilkARAKAYA Laboratuar Müdürü)

Confirm by

aporu Onaylayan







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A.GİRİŞ

Proje kapsamında 5 noktada 24 saat süre ile PM 10 ve 4 noktada 30 süre ile 2 ay çöken toz ölçümü gerçekleştirilmiştir.

Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği, sanayi ve enerji üretim tesislerinin faaliyeti sonucu atmosfere yayılan is, duman, toz, gaz, buhar ve aerosol halindeki emisyonları kontrol altına almak; insanı ve çevresini hava alıcı ortamındaki kirlenmelerden doğacak tehlikelerden korumak; hava kirlenmeleri sebebiyle çevrede ortaya çıkan umuma ve komşuluk münasebetlerine önemli zararlar veren olumsuz etkileri gidermek ve bu etkilerin ortaya çıkmamasını sağlamayı amaçlamaktadır

B.TESISE AIT BILGILER

Tesisin Adı: Boylam Enerji Yatırım Üretim ve Ticaret A.Ş Firma Adresi: Çan /Çanakkale

Boylam Enerji Yatırım Üretim ve Ticaret A.Ş. Çanakkale ili merkez ve Çan ilçeleri sınırları dahilinde Saros Rüzgar Çiftliği (WF) kurmayı planlamaktadır. Proje, toplam 1383 MWe / 138 MWm kurulu güce sahip toplam kurulu gücü 483,6 GWh olan 27 Rüzgar Türbini Jeneratörü (WTGs) içermektedir.

Önerilen rüzgar çiftliği, her biri 5.111 MWlık kapasiteye sahip GE 4.8-5.5 MWlık türbinlerden oluşmaktadır: Proje, ulusal şebekeye 154 kV gerilim seviyesinde 5.3 km ve 31 km uzunluğunda iki adet enerji iletim hattı üzerinden bağlanacak ve TEIAŞ tarafından inşa edilecek ve işletilecek olan Saros Trafo Merkezi aracılığıyla ulusal şebekeye bağlanacaktır. Şirket). Ayrıca, Projenin inşa edilecek iki trafo merkezi bulunmaktadır ve bu iki trafo arasında 154 kV gerilim seviyesinde 9.2 km olan bir havai iletim hattı olacaktır.

WTG'ler batı-doğu uzaması yaklaşık 25km olan bir alana yayılacaktır. Maksimum kuzey-güney uzantısı yaklaşık 6 km'dir. Proje sınırı toplamda yaklaşık 83 km2'lik bir alanı kapsamaktadır.

Proje sahası Çanakkale il merkezine yaklaşık 19km, Çan ilçesine 11km uzaklıktadır. Proje, dik dalgalı ve karmaşık topografya ile karada yer almaktadır.

Proje alanına tarım arazisi ve orman arazisi olarak sınıflandırılan araziler hakimdir. WTG'ler ve erişim yolları, esas olarak özel sektöre ait olan sulu olmayan (kuru) tarım arazileri ve ormanlık çalı açıklıklarında bulunur. Proje yerleşimi, türbinleri ve erişim yollarını yoğun ormanlık alanlardan ziyade çoğunlukla açık alanlara yerleştirmek için tasarlanmıştır. WTG'ler ve ayrıca tarım yapılmayan yerlerde. Proje tasarımında yer alan tarım arazileri, düşük tarımsal verim ve bölgedeki genç nüfusun azalması nedeniyle ekilmemekte veya hayvan otlatmak için kullanılmaktadır.

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R-42087/19

10/19

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Proje alanı uydu görüntüsü

C.ÖLÇÜM YAPILAN BÖLÜM, ÖLÇÜM PARAMETRELERİ, ÖLÇÜM YÖNTEMİ VE ÖLÇÜM CİHAZI VE SONUÇLARI

Ölçüm yapılan yerler ve koordinatları Tablo-1 de verilmiştir.

Tablo –	1:	PM	10	(Toz)) Ölçümü	Yapılan	Yerler
---------	----	----	----	-------	----------	---------	--------

No	Ölçüm Yapılan Bölüm	GPS Koordinati	Ölçüm Tarihi
1	Akçalı Köyü	E:467222 N:4436823	05.08.2019-06.08.2019
2	Bodurlar Köyü	E:469667 N:4440165	05.08.2019-06.08.2019
3	Kocalar Köyü	E:479857 N:4435948	06.08.2019-07.08.2019
4	Bahadırlı Köyü	E:492463 N:4431084	06.08.2019-07.08.2019
5	Doğancılar Köyü	E:490949 N:4432693	07.08.2019-08.08.2019





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Ölçüm noktalarının uydu görüntüsü

Ölçüm yapılan yerler ve koordinatları Tablo-2 de verilmiştir.

Tablo – 2: Çöken Toz Ölçümü Yapılan Yerler

No	Ölçüm Yapılan Bölüm	GPS Koordinati	Ölçüm Tarihi
1	Akçalı Köyü	E:467253 N:4436845	
2	Bodurlar Köyü	E:469665 N:4440155	05 08 2010 04 10 2010
3	Kocalar Köyü	E:480655 N:4434145	05.06.2019-04.10.2019
4	Doğancılar Köyü	E:490950 N:4432701	



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Ölçüm noktalarının uydu görüntüsü

D.ÖLÇÜM SONUÇLARI;

Projede, emisyon ölçüm yerleri, Bakanlık tarafından onaylanmış standartlara göre, teknik yönden hatasız ve ölçüm için gerekli bağlantıları yapmaya imkan verecek şekilde seçilmiştir. Emisyon ölçümleri, sürekli rejimde çalışır halde ve izne esas olan en büyük yükte yapılmış olup ölçümlerde kullanılan cihazlar ve metotları Türk Standartlarına ve EPA normlarına uygundur.

PM 10 ÖLÇÜMLERİ;

MCZ LVS 1 PM 10 partikül madde ölçüm cihazı ile çapları 10 mikrondan küçük parçacıklar gravimetrik metot ile filtre kağıdı üzerinde TS EN 12341 standardına uygun olarak tutulur. MCZ LVS 1 ölçüm cihazı ise pompa kontrollü, zaman ve hacim ayarlı, elektrik ile çalışan ortamda toz örneklemesinde kullanılan ölçüm cihazıdır.

MCZ LVS 1 ölçüm cihazı kullanırken, örnekleme yapılacak filtre kâğıtları, araziye gitmeden önce laboratuarın 19-21°C sıcaklığa ve %45-50 bağıl neme sahip olduğu koşullarda klima yardımıyla 48+12 saat boyunca şartlandırılır. Şartlandırılma sonunda filtre kâğıtları hassas terazide tartılarak tartım sonuçları kaydedilir, filtre kâğıtları araziye gönderilecekleri temiz petri kaplarına yerleştirilir ve örnekleme noktasına götürülür.

Örnekleme cihazları, her türlü hava koşullarında kolayca ulaşılabilecek bir yer olarak seçilen örnekleme noktasına taşınır. Cihaz hava akımını engelleyebilecek herhangi bir engelden en az 30 cm uzaklıkta düzgün bir alana yerleştirilir ve cihaz kullanma talimatında belirtilen şekilde ölçüm ve örnekleme yapılır. Pompa durdurulduktan sonra filtre kâğıdını cımbız yardımıyla çıkartarak, daha önce içerisinden çıkarılan petri kabına yerleştirip, tartılmak üzere laboratuvara gönderilir.

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MCZ LVS 1 kullanılan cihazdan elde edilen filtre kağıdı laboratuarda 19-21°C sıcaklığa ve %45-50 bağıl neme sahip olduğu koşullarda klima yardımıyla 48+24 saat boyunca şartlandırılıp, hassas terazide tartılarak tartım sonuçları kaydedilir.

PM 10 konsantrasyonu (C) μ g/m³ olarak aşağıdaki formül ile hesaplanır: C = 1000 (M₂-M₁)/ (V) M₂= Filtre kağıdının deneyden sonraki ağırlığı, (mg) M₁= Filtre kağıdının deneyden önceki ağırlığı, (mg) V= Çekilen gaz hacmi, (m³) V = 60 * Q_{act} * t / 1000 t = Zaman, saat PM 10 ölçümü için çekiş debisi 2,3 m³/h'dir.

PM 10 Ölçüm Sonuçları:

Tablo - 3: PM 10 Ölçüm Sonuçları

Ölçüm Yapılan Bölüm	PM 10 Ölçüm Sonucu (µg/m³)
Akçalı Köyü	27
Bodurlar Köyü	16
Kocalar Köyü	18
Bahadırlı Köyü	37
Doğancılar Köyü	28

MCZ Marka 1005-039 ve 1808-147 Seri Numaralı PM10 örnekleme cihazları ile ölçüm yapılmıştır.

ÇÖKEN TOZ ÖLÇÜMLERİ:

Tesis inceleme alanında Dört Yönlü Ortam Havası Örnekleme Cihazı ile Gravimetrik Metotla Çöken Toz Tayini yapılmıştır. Dört Yönlü Ortam Havası Örnekleme Cihazı ile ortamda çöken toz tayini TS 2342 standardına uygun olarak ölçülür. Örnekleme sistemi 1 taban plakası, 1 tripod ve 4 toz toplama kabından oluşmaktadır. Böylelikle, örnekleme sistemi 4 ana yönden oluşabilecek çöken tozları toplayabilmekte ve belli bir noktadaki tozun kaynağı anlaşılabilmektedir.

Çöken toz Ölçüm Sonuçları:

Tablo - 4: Çöken toz Ölçüm Sonuçları

Ölçüm Noktası Adı	1.Periyot (mg/m²-gün)	2.Periyot (mg/m²-gün)	Ortalama (mg/m²-gün)
Akçalı Köyü	7	8	8
Bodurlar Köyü	8	9	9
Kocalar Köyü	6	7	7
Doğancılar Köyü	7	9	8

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E.EKLER

- Ek 1. Türk Akreditasyon Kurumu Akreditasyon Sertifikası
- Ek 2. Cihaz Kalibrasyon Belgeleri
- Ek 3. Ölçüm Hesabında Kullanılan Formüller
- Ek 4. Ölçüm Fotoğraflar

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