



# Mersinli Wind Power Plant Project

Erosion Control, Soil and Spoil Management Plan

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## Quality information

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# 1. Purpose and Scope

“Alcazar Energy Partners (“Alcazar Energy”) through the Project Company, as defined below, is planning to construct and operate the Mersinli Wind Power Plant Project (“Mersinli WPP Project”, the “Project”), in İzmir province, within the administrative borders of Kemalpaşa, Torbalı and Bayındır districts, Çardaklı Tepe, Kartal Tepe, Mersinli, Karlık Tepe and Akçam Tepe localities. At the national tender stage conducted for the wind power projects in 2007, the previous Project owner established a project company, namely Yander Elektrik Muh. Mus. Ins. Tur. ve Tic. A.S. (“Yander Elektrik” or the “Project Company”), for the development of the Project. In May 2017, Alcazar Energy, through a wholly owned subsidiary, acquired 100% of the shares of Yander Elektrik and is now the sole owner of the Project.

This Erosion Control Soil and Spoil Management Plan (the Plan) is prepared for the Project to set out the management practices associated with prevention or reduction of erosion, minimisation of sediment related impacts and excavated material management (including topsoil management).

The Plan is in compliance with national legislation, requirements of international financing institutions (e.g. IFC Performance Standards, EBRD Performance Requirements) and other applicable Good International Industry Practices (GIIPs). The plan will be applied systematically in conjunction with the following related management plans and programs:

- Environmental and Social Management and Monitoring Plan (ESMMP);
- Contractor Management Plan;
- Reforestation Plan (in cooperation with the Forestry authorities);
- Air Quality and Dust Management Plan;
- Biodiversity Action Plan (BAP);
- Stakeholder Engagement Plan (incl. grievance mechanism);
- Traffic and Transport Management Plan and
- Waste Management Plan.

This Plan is a living document and the responsibilities, procedures and compliance actions should be updated as appropriate.

## **2. Legislative Requirements and Standards**

### **2.1 National Legislation**

The Environmental Law (No. 2872), which was published in Turkish Official Gazette No. 18132 dated August 11, 1983 and revised in Turkish Official Gazette dated May 29, 2013 (Law No. 6486) provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development phase. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations.

Those that pertain to the management of soil quality, water quality and waste will have direct and/or indirect impacts on the erosion and sediment control, landscape and reinstatement features at the Project Area. Major pieces of environmental legislation that will potentially impact management of these features include, but not limited to, the following:

- Regulation on Soil Pollution Control and Contaminated Sites by Point Source, Official Gazette No. 27967 dated June 17, 2011
- Water Pollution Control Regulation, Official Gazette No. 25687 dated December 31, 2004
- Regulation on Quality of Surface Water, Official Gazette No. 28483 dated November 30, 2012
- Regulation on Monitoring of Surface Water and Groundwater, Official Gazette No. 28910 dated February 11, 2014
- Regulation on Protection of Groundwater against Pollution and Deterioration, Official Gazette No: 28257 dated April 07, 2012
- Regulation on Control of Excavation, Construction and Demolition Waste, Official Gazette No. 25406 dated March 18, 2004
- Regulation on Waste Management, Official Gazette No: 29314 dated April 2, 2015

### **2.2 Requirements of International Financing Institutions**

#### **2.2.1 European Bank for Reconstruction and Development (EBRD) Performance Requirements (PRs)**

EBRD PR3 on Resource Efficiency and Pollution Prevention and Control and EBRD PR 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources are relevant requirements of the EBRD applicable to the scope of this Plan.

EBRD PR3 recognises that increased economic activity and urbanization can generate increased levels of pollution in air, water and land, as well as consume finite resources in a manner that may threaten people and the environment at the local, regional and global levels. Therefore, resource efficiency, pollution prevention and control are essential elements of environmental and social sustainability. Projects must meet good international practice (GIP) in this regard.

EBRD PR6 recognises that the conservation of biodiversity and sustainable management of living natural resources are fundamental to environmental and social sustainability. This PR recognizes the importance of maintaining core ecological functions of ecosystems and the biodiversity they support. All ecosystems support a complexity of living organisms and vary in terms richness, abundance and importance of species.

## 2.2.2 International Finance Corporation (IFC) Performance Standards (PSs) and Guidance

Also recognising that increased economic activity and urbanization can lead to higher pollution in air, water and land, and consume finite resources, IFC PS3 states that “during the project life-cycle, the client will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention principles and techniques that are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment”.

Soil erosion is included as a main environmental impact subject in IFC’s Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Construction and Decommissioning. Following a definition of how construction activities may lead to soil erosion, the Guideline lists mitigation and management measures for following subjects related to erosion and loss of soil resources:

- Sediment mobilization and transport,
- Clean runoff management,
- Road design,
- Disturbance to water bodies and
- Structural (slope) stability.

## 2.3 International Conventions

Turkey is a party to the European Landscape Convention (enforced in 2000 and ratified by Turkey in 2003).

# 3. Roles and Responsibilities

Roles and responsibilities for E&S management for the Project are described in detail in the Project ESMS. Within this scope, roles and responsibilities regarding erosion control, soil and spoil management are provided in Table 3-1.

**Table 3-1. Roles and Responsibilities**

Roles	Responsibilities
Project Execution Manager	<ul style="list-style-type: none"> <li>• Ensure adequate resources are provided for implementation of this Plan.</li> <li>• Ensure the Plan is distributed to all Contractors.</li> </ul>
Project Company / QHSE Manager and Team	<ul style="list-style-type: none"> <li>• As required, review and update the Plan (in coordination with the Project Company Environmental Specialist and Contractor QHSE Managers/ teams).</li> <li>• Ensure technical support is provided to Contractors for implementation of the Plan.</li> <li>• Ensure related trainings are provided by the contractors and the Project Company, through review of training records and related training documents.</li> <li>• Oversee contractors’ HSE compliance with Project requirements through contractor monitoring and reports.</li> </ul>
Project Company / Environmental Specialist	<ul style="list-style-type: none"> <li>• Main responsibility for ensuring the implementation of the Plan (including by the Contractors) and reporting of non-compliances and implementation performance of the Plan to the upper management.</li> </ul>

Roles	Responsibilities
	<ul style="list-style-type: none"> <li>• As required, review and update the Plan (in coordination with the Project Company Environmental Specialist and Contractor QHSE Managers/ teams).</li> <li>• Collect data from the Contractors on erosion and soil management practices and related data (e.g. amount of stripped topsoil, topsoil storage area locations and implemented measures for topsoil protection, details on revegetation activities, etc.).</li> <li>• Conduct periodic internal audits.</li> </ul>
Contractor QHSE Managers	<ul style="list-style-type: none"> <li>• Ensure this plan is implemented in line with Project standards.</li> <li>• Ensure related non-compliances are recorded and responded to immediately.</li> <li>• Provide related trainings.</li> <li>• Regularly inspect areas prone to erosion and ensure that measures are effectively implemented.</li> <li>• Conduct internal audits and record identified incompliances.</li> <li>• As required (e.g. identification of an incompliance, a change in applicable legislation, etc.), participate in development of corrective and/or enhancement actions.</li> <li>• Ensure erosion, soil and excavation material management issues are included in the monthly HSE review and incident reports to be prepared by the contractors for the Project Company Environmental Specialist and the Project Company QHSE Manager.</li> </ul>
All personnel	<ul style="list-style-type: none"> <li>• Participate in related trainings.</li> <li>• Ensure self-competency in terms of implementation of this plan.</li> </ul>

## 4. Erosion Control, Soil and Spoil Management

### 4.1 Erosion and Sediment Management

#### 4.1.1 Types of Erosion

Soil erosion is defined as the deterioration of soil by the physical movement of soil particles from one site to another. Erosion removes the topsoil first, which is rich in organic matter, has high fertility and varied soil life. The topsoil is either relocated elsewhere on-site or it is carried off-site and fills in drainage channels. When topsoil loss is significantly high, the remaining soil stratum that is not rich in nutrients cannot sustain vegetation, leading to desert-like conditions (WWF, 2006; Balasubramanian, 2017).

There are various categorisations for soil erosion, the main ones being water erosion and wind erosion. The definitions provided below are summarised from “the Land Degradation Assessment in Drylands (LADA) Project” manual prepared by Food and Agriculture Organization of the United Nations (FAO, 2011).

##### 4.1.1.1 Erosion by Water

There are a total of 4 water erosion types:

- Erosion by raindrop impact (splash erosion): Break up of soil clods/aggregates and dispersion of soil particles by the kinetic energy of the raindrop impacting on the soil. Following this, soil particles may be transported by surface runoff and finally resettle elsewhere. By raindrop impact, soil particles may also be thrown onto plant stems and leaves or manmade structures. FAO categorises this type of erosion as “very weak”.
- Sheet erosion: This type of erosion occurs due to surface runoff, which mobilizes the soil particles. Based on meteorological conditions, site conditions, etc., it is categorised as “very weak”, “weak” or “moderate” by FAO.
- Linear Erosion: Linear erosion occurs as a result of concentrated runoff water that is accompanied by scratching or scoring of the soil surface to various degrees. Based on the conditions and the site, it is categorised from “weak” to “very severe” (e.g. linear erosion occurring in areas that are periodically flooded, such as floodplains of rivers).
- Mass movement: This type of erosion occurs when saturated soil that is stored on a slope loses its stability (e.g. landslides and mud flow are types of mass movements). Deep mass movements are categorised as “very severe”.

##### 4.1.1.2 Erosion by Wind

Depending on the soil type, climate, vegetation cover and wind conditions; wind can also abrade and transport soil particles from an original site depositing them elsewhere. Wind erosion occurs by two mechanisms, namely deflation and accumulation:

- Deflation: Removal of soil particles which results in loss of topsoil, appearance of a stony surface and exposure of plant roots. Deflation is categorised in a range from “weak” to “severe”.
- Accumulation: Deposition of soil particles that are transported when the wind loses its intensity. Accumulation can occur on a wide spectrum: from sandy layers around vegetation to sand dunes and therefore is categorised in a range from “weak” to “severe”.

#### 4.1.2 Erosion and Sediment Control

The main aims of erosion control (EC) and sediment control (SC), especially during construction phase of the Project, should be the following:

- Prevent any type of erosion,
- Ensure interception and drainage of surface run-off,
- Ensure surface runoff does not cause erosion or collect sediments from disturbed areas,
- Ensure revegetation is conducted progressively and
- Ensure stabilization of disturbed slopes.

All inactive soil-disturbed areas at the Project area and most of the active areas prior to the onset of rain, must be protected from erosion. Soil disturbed areas may include relatively flat areas as well as slopes and typically, steep slopes and large exposed areas require the most robust erosion controls.

The key to EC is preventing the detachment of soil particles and reducing the volume of run-off water. This is achieved through the use of practices such as minimizing the land to be disturbed by activities, maintaining vegetative covers or substituting for lack of growing vegetation by mulching, hydroseeding or applying a compost blanket or erosion control mat, ensuring suitable drainage, etc. Some EC measures can be used effectively to temporarily prevent erosion by concentrated flows. These measures, used alone or in combination, prevent erosion by intercepting, diverting, conveying, and discharging concentrated flows in a manner that prevents soil detachment and transport. Temporary concentrated flow conveyance controls may be required to direct run-off around or through the Project in a non-erodible fashion. A list of EC measures is given in Table 4-1.

**Table 4-1: Erosion Control Measures**

Measure	Name	Description and Purpose
EC1	Scheduling	Activities will be scheduled to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking. Scheduling will cover development of a written plan that includes sequencing of construction activities and the implementation of EC while taking local climate (rainfall, wind, etc.) into consideration.
EC2	Minimizing Disturbance and Preservation of Existing Vegetation	Activities will be carefully planned to minimize disturbed areas and to preserve existing vegetation, which minimizes the potential of removing or injuring existing trees, vines, shrubs and grasses that protect soil from erosion.
EC3	Earth Dikes and Drainage Swales (diversion structures)	An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff water to a desired location. Earth dikes and drainage swales will be utilised to; divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.
EC4	Hydraulic Mulch	Hydraulic mulch consists of applying a mixture of shredded wood fibre or a hydraulic matrix, and a stabilising emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind. This measure will be considered in case other measures are observed to be insufficient.
EC5	Hydro seeding	Hydro seeding typically consists of applying a mixture of wood fibre, seed, fertilizer and stabilising emulsion with hydro mulch equipment, to temporarily protect exposed soils from erosion by water and wind. This measure will be considered in case other measures are observed to be insufficient.
EC6	Riprap	Riprap is a permanent, erosion-resistant ground cover of large, loose, angular stone with filter fabric or granular underlining. The purposes are to protect the soil from the erosive forces of concentrated runoff, to slow the velocity of concentrated runoff while enhancing the potential for infiltration and to stabilise slopes with seepage problems and/or non-cohesive soils. This is a potential design measure that may or may not be required based on site conditions.
EC7	Rock Breast Wall	A rock breast wall is a low retaining wall (usually 3 m or less in height) constructed against the base of a slope. The wall is usually built by stacking rocks atop one another in a single, one-rock width course. The purpose is to defend the toe of the slope and to prevent slope damage by erosion, especially piping and spring sapping as a result of seepage exiting from the face of the slope. This is a potential design measure that may or may not be required based on site conditions.

Sediment resulting from excessive erosion is a pollutant and sedimentation is defined as the settling of particles transported by water, when the velocity of water has decreased sufficiently enough to allow suspended soil particles to settle. Larger particles, such as gravel and sand, settle more rapidly than fine particles such as silt and clay.

Effective sediment control begins with proper erosion control, which minimizes the availability of particles for settling downstream. In other terms, sediment control is trapping detached soil particles that are being transported and ensuring they are deposited on site to prevent damage to other properties or receiving waters and rivers. SC measures include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped. SC measures can consist of installing linear sediment barriers (e.g. silt fence, sandbag barrier and straw bale barrier); installing fiber rolls, gravel bag berms or check dams to break up slope length or flow; or constructing a sediment trap or sediment basin. Linear sediment barriers are typically placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around soil stockpiles, and at other appropriate locations along the site perimeter.

The combination of EC and SC measures is usually the most effective mean to prevent sediment from leaving the project site and potentially entering storm drains or receiving waters. Therefore, all EC measures provided above are also effective for sediment control. Additional SC measures to be considered are provided in Table 4-2.

**Table 4-2. Sediment Control Measures**

Measure	Name	Description and Purpose
SC1	Silt Fence	A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.
SC2	Check Dam	A check Dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.
SC3	Wind Erosion Control	To prevent and alleviate dust problems, water spraying will be implemented when required (i.e. dry months).
SC4	Tracking and controlling vehicles and construction equipment	To prevent and alleviate the vehicle-generated sediment transport, measures such as entrance/outlet tire wash, stabilization of roads, etc. will be implemented.
SC5	Sediment Basin	A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

## 4.2 Landscape, Reinstatement and Topsoil Management

The most important measure during the construction phase will be to minimize the areas required for construction, followed by progressively revegetation of any area by native species, where activities are finalized. This will be carried out by reconstructing a similar topography and landscape character to the original topography and landscape characteristics of the area. Due to these measures no significant negative impact to the landscape is expected.

Reinstatement of the site will be performed by reinstatement of the soil by the use of proper means of top and subsoil management. The management also involves restoring the soil to its original place and other suitable locations on-site. Reinstatement of the site will be performed by bio-restoration of the soil, establishment of the vegetation cover after the construction and reinstatement of the soil by the use of proper means of top and subsoil management.

Landscape, reinstatement and topsoil management measures are provided in Table 4-3.

**Table 4-3. Landscape and Reinstatement Measures**

Measure	Name	Description and Purpose
LRT4	Topsoil Stockpile Management	<p>Proper soil management is expected to facilitate the reestablishment of the original vegetation cover and has crucial importance on the success of the bio-restoration and floristic reinstatement works. Its objective is to protect the soil during storage, preserving not only the soil quality but also the vegetative structures such as stolons, rhizomes of perennial plants and seeds of the annual plants. The following will be implemented within this regard:</p> <ul style="list-style-type: none"> <li>• Top soil will be stripped from the footprint of Project units at suitable depths (20 cm at forest lands; 30 cm at lands used for agriculture; 10 cm at open spaces). Unnecessary stripping will not be allowed.</li> <li>• Topsoil stripping will not be conducted during windy and rainy periods.</li> <li>• Stockpiles will be wetted during dry months.</li> <li>• Only relatively low slopes with little or no vegetation will be used for topsoil storage, height of stockpiles will not exceed 2 m and stockpiles will regularly be inspected to check stability.</li> <li>• Temporary drainage will be provided around storage areas.</li> <li>• Excavation waste will not be stored on-site.</li> <li>• Surface grading of stockpiles will be performed with lightweight tracked vehicles or wheeled vehicles to prevent soil compaction.</li> <li>• Stockpiles will be enclosed by wire backfill fence and adequate number of explanatory signboards will be provided.</li> <li>• Vegetative soil will not be used as fill material under any circumstances.</li> <li>• Regulation on Control of Excavated Soil, Construction and Demolition Wastes will be complied with during all activities.</li> </ul>
LRT1	Soil Spreading	Construction and landscape materials will be laid on sites of reinstatement by accurately spreading soil and other groundcover materials. This will be conducted progressively at sites where construction activities are completed. Stored top soil will be used for rehabilitation of sites.
LRT2	Tree or Shrub Plantation	<p>The planting of trees and shrubs will be carried out by using native species and within the right season for them.</p> <p>A separate Reforestation Programme will also be implemented by the Company, in cooperation with related forestry authorities. In addition, the Biodiversity Action Plan developed for the Project also covers plantation subjects.</p>
LRT3	Permanent Seeding	Permanently seeding local plant species will be conducted to establish sufficient vegetation cover and reinstate ecology for the longer term. The purpose of direct seeding is to bio-restoratively establish the original cover of ground vegetation within one year of planting to the percentage it could be possible. Together with tree and shrub plantation and EC and SC measures, its aims are to reduce erosion and decrease sediment yield from disturbed areas, to permanently stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allow selection of the most appropriate plant materials, to improve wildlife habitat and to reinstate disturbed visual amenity.

### 4.3 Spoil Management

The excavated materials will be used for fill works to the largest extent possible. However, design studies indicate an excess of 65,000 m<sup>3</sup> excavation material, which will constitute excavation waste. Measures for management of excavation waste are provided in Table 4-4.

**Table 4-4. Spoil Management Measures**

Measure	Name	Description and Purpose
SM1	Excavated Material Management	Prior to being transported for final off-site disposal, excavated materials will only be stored in selected areas to minimize further impacts on landscape. Topsoil storage areas will not be used for excavation waste storage. Transportation of excavation waste will be conducted progressively and excavated materials will only be disposed of in excavation waste storage areas approved by İzmir Metropolitan Municipality.
SM2	Other Spoil Management	Small pieces of timber, shavings, etc., will be sourced from vegetation clearing. These will be left on site, in a way that will not limit construction activities or mobility of wildlife, since they will fertilise the soil in time and contribute to rapid reinstatement. Other timber based construction waste such as pallets and formwork will be collected by related contractors and licensed firms for reuse.

## 5. Monitoring and Reporting

In addition to daily inspections, internal audits will also be conducted quarterly during the construction phase and annually during the operation phase. Results of inspections and monitoring will be provided to the upper management, as well as to EBRD within the scope of annual reporting.

Based on monitoring and audit results, corrective and/or enhancing actions will be designed and implemented. Performance of these actions will also be monitored and reported.

The general monitoring actions that should be implemented are provided in Table 5-1.

**Table 5-1. General Monitoring for Erosion, Soil and Spoil Management**

Action	Indicator	Timeline
Completion of pre-assessments and identification of EC, SC and LRT measures specific to each construction site (e.g. different turbine locations)	<ul style="list-style-type: none"> <li>Natural drainage patterns identified</li> <li>EC, SC and LRT measures designed specific to each site</li> </ul>	<ul style="list-style-type: none"> <li>Once prior to land preparation</li> </ul>
Monitoring of vegetation clearing	<ul style="list-style-type: none"> <li>Vegetation clearing remaining inside the identified zones</li> </ul>	<ul style="list-style-type: none"> <li>During land preparation</li> </ul>
Visual inspections of measures	<ul style="list-style-type: none"> <li>EC, SC, LRT measures in place</li> </ul>	<ul style="list-style-type: none"> <li>Throughout construction and operation phases (increase frequency during heavy rain months)</li> </ul>
Monitoring of wind erosion measures	<ul style="list-style-type: none"> <li>Amount of water used for water sprinkling of roads and construction areas</li> </ul>	<ul style="list-style-type: none"> <li>Throughout construction phase (increase frequency during dry months)</li> </ul>
Visual inspections of areas where vegetation clearing conducted	<ul style="list-style-type: none"> <li>Incompliances and problems identified</li> <li>Additional corrective or preventive measures implemented</li> </ul>	<ul style="list-style-type: none"> <li>Throughout construction and operation phase</li> </ul>
Visual inspections of revegetated areas	<ul style="list-style-type: none"> <li>Incompliances and problems identified</li> <li>Additional revegetation requirements (if any)</li> </ul>	<ul style="list-style-type: none"> <li>Throughout construction and operation phases (during revegetation works)</li> <li>Annually after revegetation works are completed (to check reinstatement performance)</li> </ul>
Legal compliance monitoring	<ul style="list-style-type: none"> <li>Protocol with Regional Directorate of Forestry signed and in place</li> <li>Selected excavation, construction and demolition waste storage areas have approval of the Municipality</li> </ul>	<ul style="list-style-type: none"> <li>As required</li> </ul>

## 6. Training

The Company will provide sufficient training to all Project personnel and ensure that Contractors' are also providing the same level of training to their own personnel. The environmental training related to erosion and sedimentation control will be given prior to initiation of land preparation. Periodically and as required, refresher trainings will also be provided. The training subject will cover relevant aspects of this Plan, compliance with legislative requirements and international standards, identification of potentially problematic areas and general awareness raising subjects for prevention of erosion.

## **7. Review and Update**

This Plan is a living document and the responsibilities, procedures and compliance actions shall be updated as required (e.g. after a change in related legislation). It is the responsibility of the Project Company's QHSE Manager and Environmental Specialist to be fully aware of its contents, to provide relevant training to staff and to ensure that procedures are being implemented to achieve compliance with this Plan. On the other hand, the Contractors' HSE Managers will be responsible of day to day implementation of the Plan.

## **8. References**

Balasubramanian, A., (2017). Soil Erosion – Causes and Effects, Technical Report, Centre for Advanced Studies in Earth Science, University of Mysore, Mysore

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