SAKARYA GAS FIELD DEVELOPMENT PROJECT - ESIA

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

Chapter 5 ESIA Methodology

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5.0 ESIA METHODOLOGY

This chapter aims at describing the methodological approach of the process behind this ESIA, which is basically composed by three major steps:

1) **Definition of the baseline**, or the description of the environmental (i.e., in its physical and biological components) and social context prior the realisation of the project;

2) **Impact assessment**, which is the evaluation of the possible interferences created by the Project on the baseline conditions of the environmental and social context; and

3) **Environmental and Social Management System Framework**, which organizes the mitigations and monitoring activities to be carried out within the Project implementation.

For what concerns the second point, the methodology adopted by Golder for the Environmental and Social Impact Assessment has been designed to be analytical and transparent and to allow for a semi-quantitative analysis of the impacts on the various environmental and social components. This methodology is based on the premise that projects can generate both negative and positive impacts whose magnitude that can be evaluated considering the different characteristics of the project activities and of the environmental and social context.

This methodology is based on three main analytical phases, as described below:

- **Phase 1: Identification of Project Actions and Impact Factors**
  - **Project actions:** activities directly or indirectly related to the project that can interfere with the context, generating environmental or social pressures;
  - **Impact factors**: direct or indirect interferences generated by the project actions on the context and able to influence the state or quality of one or more environmental and social components;
- **Phase 2: Identification of Environmental and Social Components and Sensitivity level allocation**
  - **Identification of the components potentially subject to interference:** using a specific cross-refence matrix between the impact factors and the project actions, it is the process identifying the components potentially subject to impacts in each phase of the Project (for example: construction, operation; decommissioning).
  - **Sensitivity of the component**: sum of the conditions characterizing the current quality and/or the dynamics of a specific environmental and social component and/or of its resources;
- **Phase 3: Impact Assessment**
  - **Impacts**: changes suffered by the environmental and/or social quality status due to the effects caused by the impact factors on the environmental or social components;
  - **Mitigation measures**: actions adopted to mitigate negative impacts or to maximize the effects of positive impacts on the environmental and social components.

The three phases are illustrated in the figure below and described in the following paragraphs.

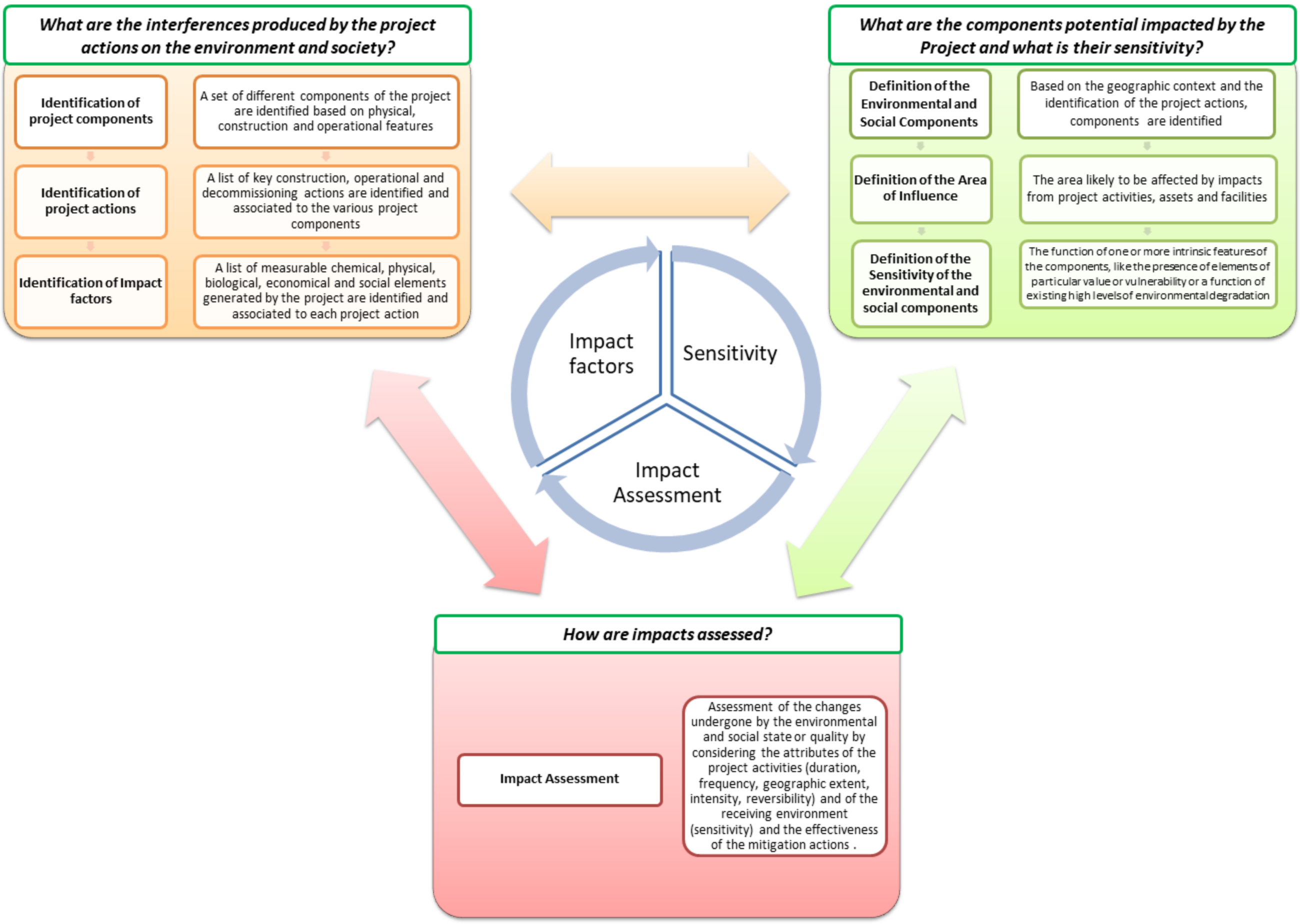

Figure 5-1: Three Phases of ESIA Process

5.1 Definition of the Baseline

Such as previously stated, the definition of baseline aims at describing the environmental context (i.e., in its physical and biological components), as well as the social one prior the realisation of the Project in order to act as a starting point from which building the impact assessment. The goal is to assign a sensitivity value to each environmental and social component expected to be affected by the Project.

One of the most important conditions to describe the environmental baseline is to be as more specifical as possible in relation to the Project. For this reason, two typologies of study areas are designed:

- A Regional Study Area (RSA); and
- An Area of Influence (AoI).

5.1.1 Design of the Study Areas

Both the areas are meant to provide a description as more site-specific as possible. However, they are designed with different aims.

5.1.1.1 Regional Study Area (RSA)

A sufficiently wide area containing a geographically distinct assemblage of species, natural and social communities, and environmental conditions, defined in order to act as a starting point for the understanding of the environmental and social context at local scale or the detection of habitats and species. Also serviceable as a source of information in case of absence of site-specific data, the main purpose of the RSA is to give the proper weight to the each component described in the baseline.

The RSAs for each component are presented in the relevant sections.

5.1.1.2 Area of Influence (AoI)

As defined by IFC PS1, the Area of Influence encompasses, as appropriate:

- The area likely to be affected by: (i) the project[1] 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;[2] (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.[3]
- Cumulative impacts[4] that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The AoIs for each component are presented in the relevant sections, whereas the general AoIs are reported here below.

[1]Examples include the project's sites, the immediate airshed and watershed, or transport corridors.

[2]Examples include power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, construction camps, and contaminated land (e.g., soil, groundwater, surface water, and sediments).

[3]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.

[4]Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities. Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

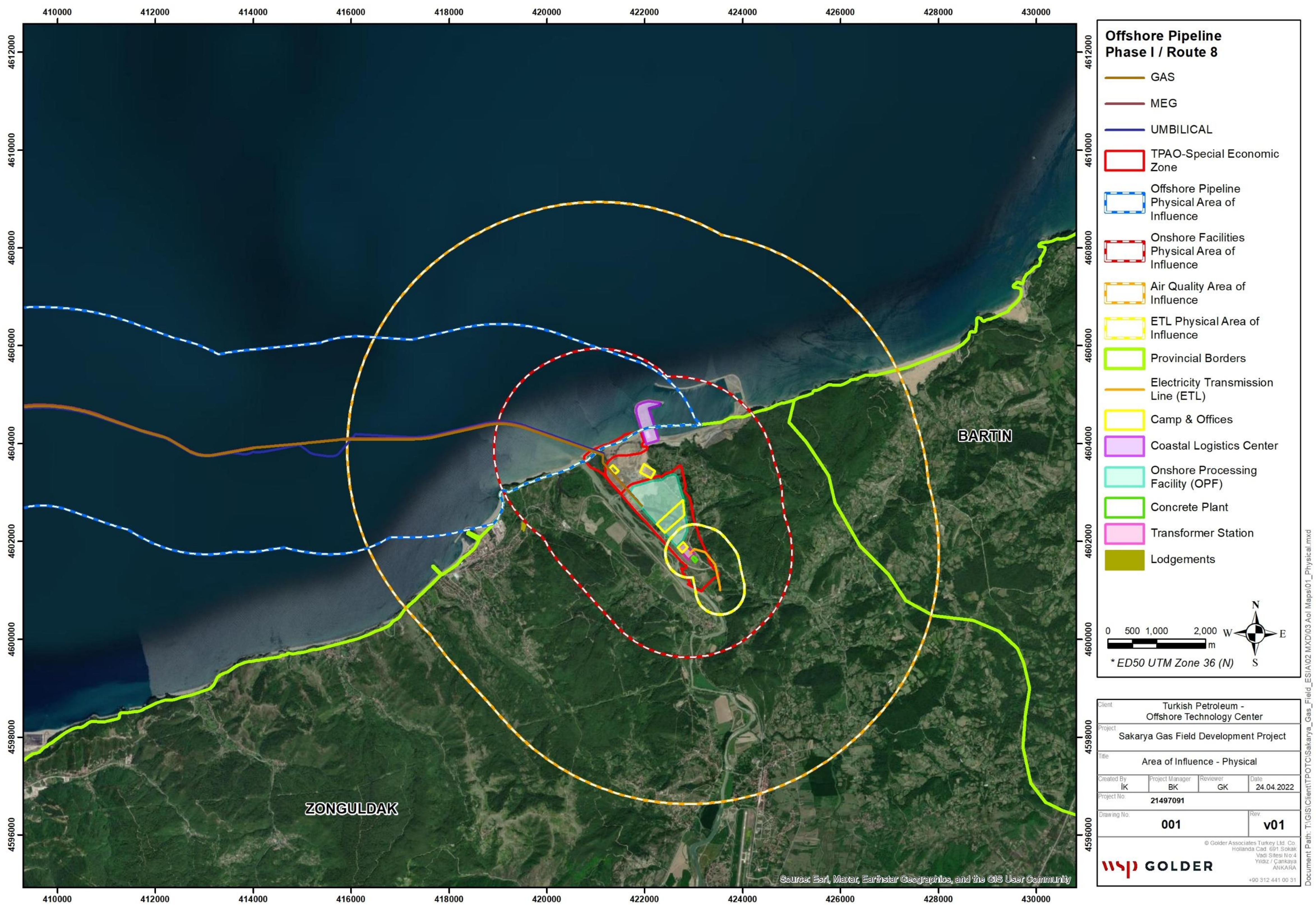

Figure 5-2: Map Showing Physical Area of Influence

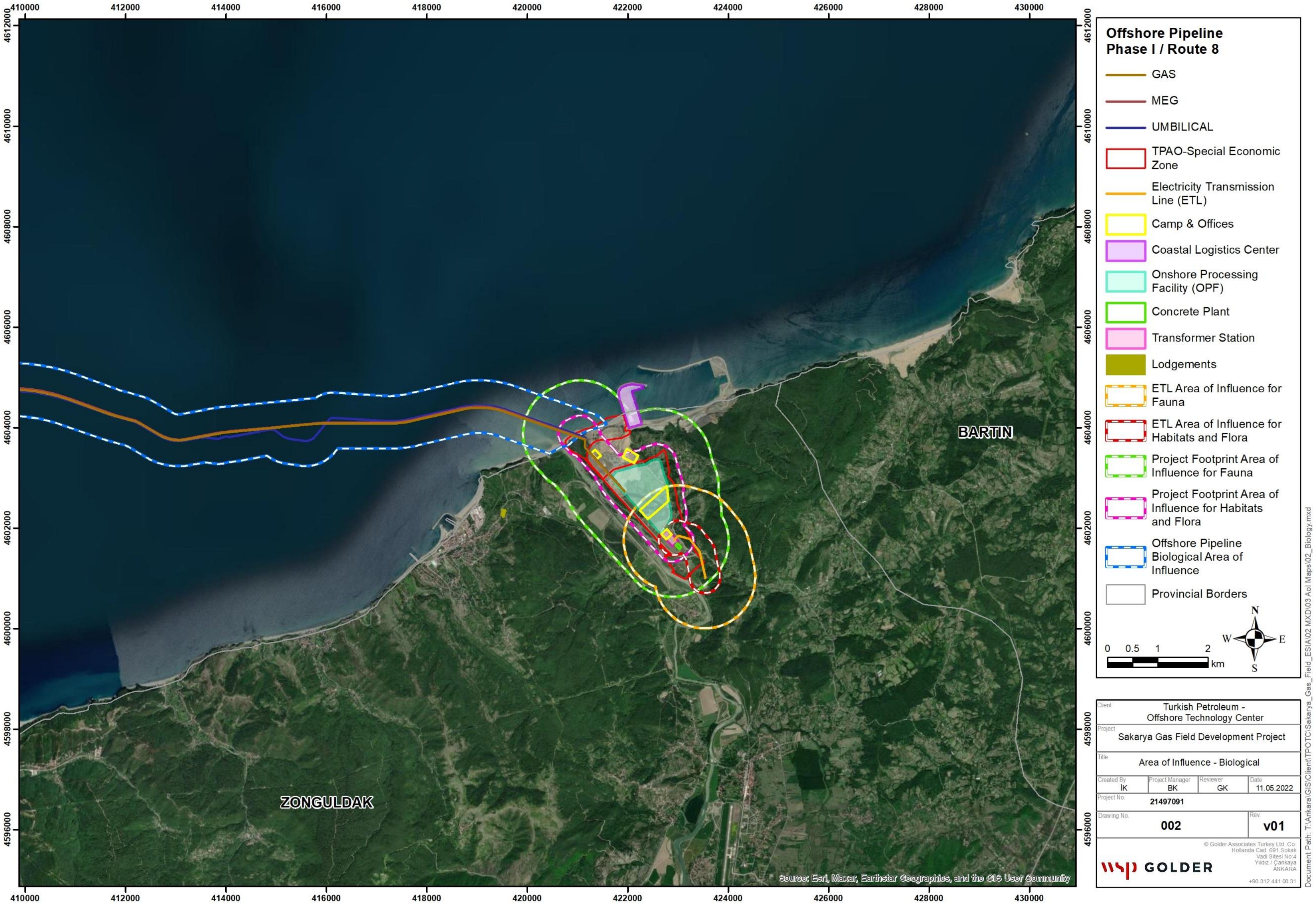

Figure 5-3: Map Showing Biological Area of Influence

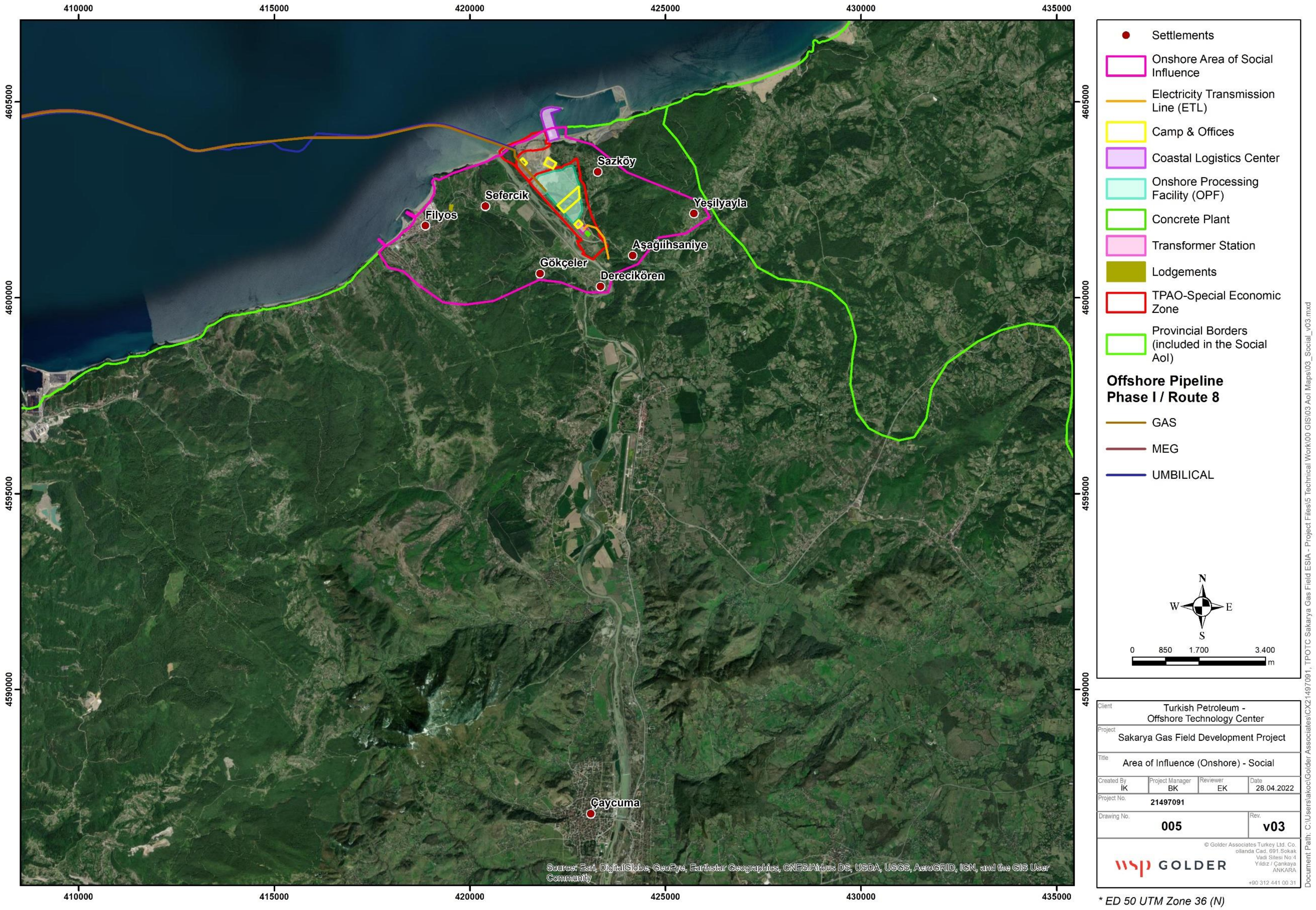

Figure 5-4: Map Showing Social Area of Influence (Onshore)

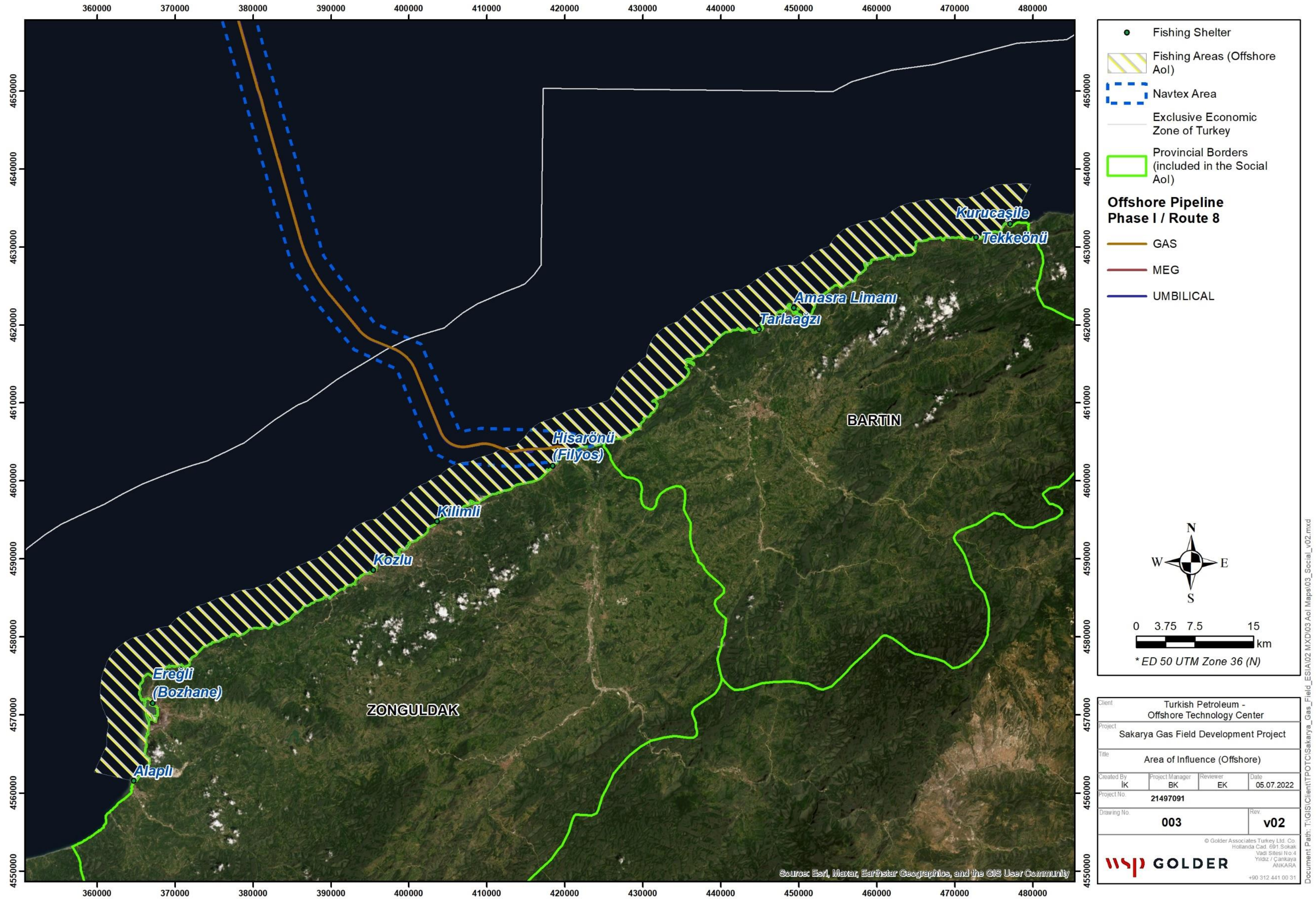

Figure 5-5: Map Showing Social Area of Influence (Offshore)

5.1.2 General methodology for defining the baseline

The baseline for this ESIA was defined combining secondary sources of data for all the environmental and social with the gathering of primary data for some specific components.

Secondary sources included both scientific literature (i.e., peer-reviewed papers) and grey literature. This latter included, but were not limited to:

- Reports published by international (e.g., IUCN) and national (e.g., universities) bodies and organizations;
- International and local websites;
- Published documentation for the permitting process of similar projects or projects in the vicinities (e.g., ESIAs, EMPs etc.);
- International and public databases retrievable online.

Primary data included, but were not limited to:

- Direct field data specifically gathered for the purpose of this baseline (e.g., environmental samplings and site visits);
- Direct field data gathered by the Client gathered for the purpose of the construction of the Project (e.g., Side Scan Sonar echomosaics);
- Interviews and surveys conducted with the local population (e.g., household surveys and interviews to local fishermen);
- Consultation of local hardcopy archives not available online (e.g., municipality archives).

The specific methodology applied to define the baseline for each environmental and social component is described at the beginning of their relevant section.

The social baseline section is also carried out taking into consideration the **Stakeholder Engagement** process. The specific methodologies of such process, as well as the Stakeholder Engagement Plan (SEP), are presented in the relevant section.

5.1.2.1 Assignment of the Sensitivity Level

As previously stated, the final goal of the definition of the baseline is the evaluation of the sensitivity of each environmental and social component, in order to perform the impact assessment process which directly takes into account the specifical features of the components analyzed.

Each environmental and social component may different sensitivity to possible impacts generated by the Project. The sensitivity of a component is typically evaluated on the basis of the presence/absence of some features which define both the component's current degree of quality and susceptibility to changes. As examples, for physical components the sensitivity is typically related to the presence of elements that are at the highest or lowest scale of quality, for biodiversity it is related to the presence of threatened, endemic, or protected species or habitats and for social components to the presence of vulnerable elements of the community like poor, elderly, members of ethnic or religious minorities, indigenous people, etc. The **sensitivity (S)** of the component is defined using component-specific metrics during the baseline and can assume values between 1 and 5 associated to a definition from Low to High. The S value is assigned considering both the component's characteristics and the possible presence of sensitivity features.

The following list presents potential sensitivity features used by the experts in defining the sensitivity of the environmental and social components considered in ESIA studies.

Geology and geomorphology:

- Presence of faults: areas with active faults are considered to pose highest risks to the project and hence are considered of higher sensitivity.
- Presence of landslides: areas within the range of landslides are considered to pose highest risks to the project and hence are considered of higher sensitivity.
- Other geohazards: (karst areas, slope erosion, liquefaction, stream channels, etc.). the presence of other geohazards in the Project area is considered of higher sensitivity.
- Seismicity: the location of the Project in areas classified as at seismic risk is considered of higher sensitivity.

Soils:

- Soil agricultural potential: soils with highest agricultural potential according to local or global assessments are attributed a higher sensitivity,
- Soil erosion potential: soils with highest erosion potential according to local or global assessments are attributed a higher sensitivity.
- Soil pollution potential: soils in areas identified and previously used for industrial, mining, or intensive agriculture are attributed a higher sensitivity.

Surface water:

- Presence of waterbodies in the Project area of influence and level of ecological integrity; the sensitivity increases with the level of ecological integrity.
- Presence of waterbodies in the Project area of influence and level of water/sediment pollution; the sensitivity increases in the presence of polluted watercourse.
- Presence of waterbodies and level of tolerance to hydrological changes; the sensitivity is higher for waterbodies with a low level of tolerance for hydrological changes.

Groundwater:

- Presence of shallow aquifers; the sensitivity increases with the presence of shallow aquifers that could be more easily exposed to contamination source.
- Productivity of exploited aquifers; aquifers with low productivity might be depleted in case the Project entails groundwater abstraction. The sensitivity is higher for aquifer with low productivity.
- Presence and extent of existing groundwater exploitation; the sensitivity is higher for aquifers already exploited.
- Rock permeability; the sensitivity increases in case the subsoil is made of rocks with high permeability.

- Aquifer vulnerability; the sensitivity increases with the vulnerability of the aquifer as determined by accepted methodologies.

Marine Sediment:

- Fine sediment; the sensitivity increases because of the fine sediment contaminants sorption.
- Zones with sediment contamination level above the thresholds; the sensitivity increases if the sediment are already polluted.

Marine water:

- Zones with limited circulation and water mass exchange; the sensitivity increases in case of limited circulation.
- Zones with wide sectors with limited bathymetric range; the sensitivity increases in shallow water.
- Zones with water contamination level above the thresholds.

Marine acoustic climate:

- Areas not affected by noise generated by artificial sources; the sensitivity increase if artificial sources of noise are limited or absent.
- Areas known to be important for cetaceans and ecologically significant for the marine fauna in general; the sensitivity increases if these receptors are present.

Landscape and components with sensitivity to visual quality:

- Presence and number of settlements/people within the visual zone of visual influence.
- Presence of areas of touristic interest within the visual zone of visual influence.
- Presence of roads and volume of traffic within the visual zone of visual influence.
- Presence of archaeological, cultural, historic areas within the visual zone of visual influence.
- Presence of natural parks protected and classified areas within the visual zone of visual influence.

Components with sensitivity to air emissions:

- Presence of settlements and population potentially exposed to air emissions from the Project; the sensitivity increases with the number of people exposed.
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to air emissions from the Project; the sensitivity increases with the number of vulnerable people exposed.
- Air quality levels in the areas affected by the Project; the sensitivity increases in areas already polluted and in areas designated for air quality protection.
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Components with sensitivity to noise and vibration:

- Presence of settlements and population potentially exposed to noise and vibration from the Project; the sensitivity increases with the number of people exposed.
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to noise and vibration from the Project; the sensitivity increases with the number of vulnerable people exposed.
- Ambient noise and vibration levels and/or sources in the areas affected by the Project; the sensitivity increases in areas already experiencing high levels of noise and vibrations and in areas designated for protection from noise and vibrations.
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Habitats and biodiversity features:

- Number of species of flora or fauna present in the habitat. The sensitivity increases with the number of species present.
- Presence of threatened species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of threatened species present and the threat level.
- Presence of endemic or restricted range species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of species present and the level of endemicity.
- Presence of protected species or species listed in international conventions for the protection of biodiversity. The sensitivity increases with the number of protected/listed species.
- Presence of invasive alien species. The sensitivity is higher for habitats in areas with a higher number of invasive alien species present.
- Presence of natural habitats; the sensitivity increases with the surface of natural habitats present in the Project area of influence.
- Presence of threatened or protected habitats; the sensitivity increases with the surface of threatened or protected habitats present in the Project area of influence.
- Presence of critical habitats; the sensitivity increases with the surface of critical habitats present in the Project area of influence.
- Presence of relevant nursery, spawning or feeding grounds or migration routes.

Protected areas:

- Presence of protected areas; the sensitivity increases with the number, extent and level of protection of protected areas present in the Project area of influence.

Local communities:

- Presence of skilled personnel in the local community; the sensitivity (to positive impacts) is higher the more people with skills relevant to the Project.

- Presence of businesses and economic activities relevant to the Project; The sensitivity to positive impacts is higher for communities with a well-structured business community.
- Level of health care available; the Project could cause a population influx that can put a strain to existing health services if left unmanaged. The sensitivity of communities is higher in areas with an insufficient level of healthcare available.
- Presence of communicable diseases; the spreading of communicable diseases can be exacerbated by the influx of workers due to the Project. The sensitivity of communities is higher for those more prone to be affected due to local conditions.
- Overall health state of the population; the Project might cause increased levels of exposure to environmental health determinants like air pollutants, noise and vibrations, etc. The sensitivity of communities is higher in the presence of existing health issues in the communities potentially affected by the Project.
- The presence of environmental health determinants like air and water pollution, soil and groundwater contamination increase the community sensitivity.
- Areas with concentrated fisheries activities; areas with abundance of fishery resources.

Cultural heritage:

- Presence of protected or recognized sites of archaeological or cultural value; the sensitivity increases with the number, cultural/scientific value and level of protection of sites potentially affected;
- Presence of sites with a high archaeological potential in the absence of specific site information or appropriate protection mechanisms; the sensitivity increases with the archaeological potential as indicated by relevant experts;
- Presence of intangible cultural values like sacred sites, initiation sites, sites used for cultural events, sites recognized in oral traditions, etc. the sensitivity increases with the number of sites and values as recognized by the local communities.

The component's Sensitivity can vary from low (1) to high (5) according to the following definitions:

- **Low (1):** the component does not present elements of sensitivity;
- **Medium-low (2)**: the component presents few elements of sensitivity that have limited significance;
- **Medium (3):** the component presents numerous elements of sensitivity that have limited significance;
- **Medium-high (4):** the component presents few elements of sensitivity that have high significance;
- **High (5):** the component presents numerous elements of sensitivity that have high significance.

The list of the sensitivity features represents a tool/guideline used by the experts along with the "expert judgement" in order to rank the sensitivity of each component in the abovementioned five classes.

5.2 Impact Assessment

5.2.1 Identification of Project Actions and Impact Factors

5.2.1.1 Project Actions, Impact Factors and Environmental/Social Components

The Project was examined and divided into the following elements:

- **Project phases:** construction, operation, and decommissioning.
- **Project components:** units with specific physical, technological and location that are part of the Project as described in Chapter 3.
- **Project actions:** individual actions that are necessary for the construction, operation or decommissioning of the various Project components.
- **Impact factors**: forms of direct or indirect interference produced by the Project actions on the environment and society, able to influence the environmental and social state or quality.
- **Environmental and social components**: the environmental and social components potentially impacted by the impact factors.

5.2.1.1.1 Project Phases

The **construction phase** comprises the construction of:

- Subsea Production System (SPS);
- SURF (Marine and coastal transition subsea cables and pipeline);
- Onshore Processing Facility (OPF, including MEG recovery and desalination unit, natural gas combustion, steam boiler, transformer unit, groundwater treatment for boiler and domestic use);
- Industrial Wastewater Treatment Plant (Project component of the OPF; including the discharge system to the river);
- Transformer Station and Energy Transmission Line (Project component of the OPF);
- Construction Camp Sites & Permanent Lodgings (Project component dealing with all Units)

The **operation phase** comprises the functioning of SURF, OPF and Industrial Wastewater Facility.

The **decommissioning phase** deal with the dismission of the three Project components abovementioned.

5.2.1.1.2 Project Components

Project Components should be identified coherently with the definition of the IFC PS1 as follows:

- The project and the client’s activities and facilities that are directly owned, operated or managed (including by contractors) and that are an essential component of the project;
- Unplanned but predictable developments caused by the project that may occur later or at a different location; and
- 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.

5.2.1.2 Identification of the Project Actions

Project Actions are activities directly or indirectly related to the Project which can interfere with the environment as primary generative elements of environmental or social pressures, defined in the context of this methodology as impact factors. The actions derive from the analysis and breakdown of the intervention foreseen to complete the Project taking into account the whole Project's lifecycle (i.e., design, construction, operation and decommissioning).

All the Project Actions identified in each its phase of the specific Project subject to this ESIA are presented here below.

5.2.1.3 Identification of the Impact Factors

Project Actions can determine Impact Factors on the components, intended as potential interferences that can influence, both positively or negatively, directly or indirectly, the environmental and/or social quality.

Such Impact Factors as determined the Project Actions are listed and identified for each environmental and social component.

5.2.1.4 Identification of the Environmental and Social Components

Based on the Project typology, the environmental and social components identified and described in the baseline, and potentially affected (both negatively and positively) are assessed under every Impact Factor generated by the project.

5.2.2 Impact Assessment

5.2.2.1 Scoring of the Impact Factors

The **impact factors** identified during the analysis of the Project and through the definition of the Project phases and Project actions are assessed for their magnitude, using a scoring system. The criteria considered to assess the impact factor score are the following:

Duration (D) is the duration of the impact factor. It may vary from short to long according to the following definitions:

- Short: when the duration is shorter than one month;
- medium-short: when the duration is between one month and six months;
- medium: when the duration is between six months and two years;
- medium-long: when the duration is between two and five years;
- long: when the duration is over five years.

Frequency (F) is the frequency with which the impact factor manifests itself. It may vary from concentrated to continuous according to the following definitions:

- concentrated, if it consists of a single event;
- infrequent, if it consists of a few events evenly or randomly distributed over time;
- frequent, if it consists of several events evenly or randomly distributed over time;

- highly frequent, if it consists of a high number of events evenly or randomly distributed over time. ;
- continuous, if the event has no interruption over time.

Geographic extent (G) is the geographical area within which the impact factor can exert its effects. It may vary from Project site to transboundary according to the following definitions:

- Project site: the impact factor is confined within the facility boundary or exclusively controlled by the Project;
- local: the impact factor extends to the areas or communities neighbouring the Project site with component AoIs;
- regional: the impact factor extends to an area beyond the surroundings of the Project site and to regional physical (airshed – watershed, etc.) or administrative boundaries as described in component RSAs;
- national: the impact factor extends throughout several regions or to the entire country;
- transboundary: the impact factor has an international or global reach.

Intensity (I) is a measure of the physical, economic or social extent of the impact factor. It may vary from negligible to very high according to the following definitions:

- negligible: the impact factor is generated in amounts that cannot be easily detected or perceived and that are unlikely to cause any detectable change in the target environmental or social components;
- low: the impact factor is generated in amounts that can be detected or perceived but whose effects are unlikely to cause tangible changes in the target environmental or social components;
- medium: the impact factor is generated in amounts that are within legal standards or accepted industry practices and/or whose effects are likely to cause tangible changes in the target environmental or social components;
- high: the impact factor is generated in amounts that at the limit of legal standards or accepted industrial practices and/or whose effects are likely to cause serious impairment in the target environmental or social components;
- very high: the impact factor is generated in amounts that are at risk of exceeding the limits of legal standards or accepted industrial practices and/or whose effects are likely to cause very serious to catastrophic damage to the target environmental or social components;

Each of the parameters listed above can have a value between 1 and 5. The magnitude of the impact is determined through an **Impact Factor Score (IFS)** which sums the score of each of the 4 parameters, hence it can assume a value between 5 and 20.

5.2.2.2 Calculation of the Impact Value

The calculation of the Impact Value is done combining the Impact Factor Score, which express the impact magnitude, with the sensitivity of the target component, as determined during the baseline, and weighted considering the impact reversibility.

The **Reversibility (R)** is the property of an impact to reduce its intensity over time and to eventually disappear entirely. It may vary from reversible to irreversible according to the following definitions:

- reversible in the short term, if the initial condition of the component will be restored in a period between weeks and months after the end of the impact factor and/or the restoration activities;
- reversible in the short/mid-term, if the initial condition of the component will be restored in a period between a few months and one year after the end of the impact factor and/or the restoration activities;
- reversible in the mid-term, if the initial condition of the component will be restored in a period between one year and five years after the end of the impact factor and/or the restoration activities;
- reversible in the long term, if the initial condition of the component will be restored in a period between five and 25 years after the end of the impact factor and/or the restoration activities;
- irreversible, if it is not possible to predict restoration to the initial conditions.

The reversibility is measured on a scale between 1 (short term) and 5 (irreversible).

The **Impact Value (IV)** is calculated by multiplying the Impact Factor Score with the component's Sensitivity level and with the Reversibility, according to the following formula: IV= IFS x S x R.

5.2.2.3 Calculation of the Residual Impact

The next step consists in assessing the mitigation measures effectiveness to reduce or eliminate the negative impact (or to maximize the positive one). The mitigation measures should be defined with reference to the mitigation hierarchy listed below in descending order of effectiveness:

- Avoid;
- Minimize;
- Restore;
- Offset;
- Compensate.

The effectiveness of the mitigation measures defined in the environmental and social management plan is assessed using expert judgement and the outcomes from previous applications of similar mitigation measures to similar Projects. The definitions of the mitigation effectiveness may vary from none to high, as described below:

- None: the measures can reduce the impacts by less than 20% of the expected outcome;
- Medium low: the measures can reduce the impacts by 20% - 40% of the expected outcome;
- Medium: the measures can reduce the impacts by 40% - 60% of the expected outcome;
- Medium high: the measures can reduce the impacts by 60% - 80% of the expected outcome;
- High: the measures can reduce the impacts by more than 80% of the expected outcome.

The Mitigation effectiveness is measured on a scale from 1 to 0.2 (1 = minimum effectiveness; 0.2 = maximum effectiveness) and the **Residual Impact Value (RIV)** is calculated multiplying the impact value with the impact mitigation effectiveness as per the following formula: RIV = IV x M.

5.2.2.3.1 Positive impacts

Positive impacts are typically associated with economic and social opportunities and sometimes with environmental aspects a Project can solve (for example: a Project located in a brownfield where existing environmental issues can be addressed). Projects are typically promoting activities to enhance the economic, social and environmental opportunities through specific programs, plans and measures including, for example, professional skills generation, community investment, shared value programs, remediation programs, biodiversity conservation Projects, etc.

The assessment of positive impacts is based on the same parameters used to assess the negative ones. The only difference is that the mitigation measures are replaced by enhancement measures, or measures to maximize the potential positive impacts.

The enhancement measures effectiveness defined in the environmental and social management plan is assessed using expert judgement and the outcomes of previous application of similar enhancement measures to similar Projects. The definitions of the enhancement effectiveness may vary from none to high as shown below:

- None: the measures can enhance the positive impacts by less than 10% of the expected outcome;
- Medium low: the measures can enhance the positive impacts by 10% - 20% of the expected outcome;
- Medium: the measures can enhance the positive impacts by 20% - 30% of the expected outcome;
- Medium high: the measures can enhance the positive the impacts by 30% - 40% of the expected outcome;
- High: the measures can enhance the positive impacts by more than 40% of the expected outcome.

5.2.2.4 Scale of Residual Impacts

The scale of the residual impact resulting from the calculation described above ranges from 0.8 to 500. The impact value is then scaled to 5 levels by dividing into 5 classes with an equal number of values, the entire distribution of values obtained.

The residual negative impacts are classified into 5 levels according to the table below:

Residual impact score	Residual impact definition	Colour Code
0.8 – 33.0	Negligible	
33.1 – 76.0	Low	
76.1 – 136.0	Medium	
136.1 – 228.0	High	
228.1 – 500.0	Very High	

The residual positive impacts are classified into 5 levels according to the table below:

Residual impact score	Residual impact definition	Colour Code
0.8 – 33.0	Negligible	
33.1 – 76.0	Low	
76.1 - 136.0	Medium	
136.1 - 228.0	High	
228.1 – 500.0	Very High	

Therefore, the approach described above, through the use of the formulas and the scoring system for the impact factors, as well as for the reversibility and the effectiveness of the mitigation measures, provides a quantitative data. This data is not meant to be considered as an indisputable value, but it represents a support to the expert for the evaluation of the impacts.

5.2.2.5 Overall Assessment

The methodology described above allows for an analytical assessment of impacts caused by individual impact factors over individual components. The process therefore results in a table presenting several impacts from different impact factors for each component.

The table defines the assessment of the overall impact on each component. It is a synthesis of the impacts on a component from all the impact factors generated by the Project actions. The impact assessment provides a comprehensive view of the impact value that affects the environmental or biological component.

The impact assessment is expressed based on the assessor's experience, assigning higher weight to the values less favourable to the component's protection, in order to guide the assessment toward a more prudential approach.

Impacts are presented in separate tables for negative and positive impacts to avoid automatic trade-offs and/or mediating between positive and negative aspects, as they are often targeting different sections of the community.

5.2.3 Cumulative Impact Assessment

Cumulative impacts are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses.

The EBRD Environmental and Social Policy states that "*The environmental and social assessment process will […] additionally, […].consider cumulative impacts of the Project in combination with impacts from other relevant past, present and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the Project that may occur later or at a different location*."

IFC Performance Standard 1 (2012) and another recent publication by IFC (Good Practice Handbook on Cumulative Impact Assessment and Management, August 2013) require that the ESIA includes a cumulative impact assessment (CIA), i.e. "*cumulative impacts that result from the incremental impact, on areas or resources* *used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*".

Those guidelines denote that the scope of the cumulative impact assessment should be commensurate with the extent of cumulative impacts anticipated. This gives good direction to produce a focused assessment, considering only relevant disciplines. Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities[5]. In addition, although the quoted requirements indicate that *past, present and reasonably foreseeable/reasonably defined developments* including *unplanned but predictable activities* should be considered in the assessment, it is clear that most if not all of past and existing developments have generated or generate impacts that contribute in defining the existing baseline on which the Project will cumulate its impacts. This implies that impacts of past and existing projects will be captured in the baseline investigations, and the cumulative impact assessments therefore comes down to assessing how the Project impacts may cumulate with future impacts of existing projects or with impacts from future or reasonable planned and foreseeable developments, whose impacts have to be estimated and predicted as they are not yet occurring.

Cumulative impacts can result from various types of interaction among different impact factors:

- Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example, the concurrent presence of the emission of noise and emission of dust during construction at the same location;
- Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example, the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
- Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example, we can consider the emission of dust from the construction and the concurrent construction of a new infrastructure project at the same location.

The process followed for the assessment is consistent with the framework provided by IFC and illustrated in the figure below, as described in the following paragraphs. Good Practice Handbook proposes as a useful preliminary approach for developers in emerging markets the conduct of a rapid cumulative impact assessment (RCIA) which is illustrated below.

[5] Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

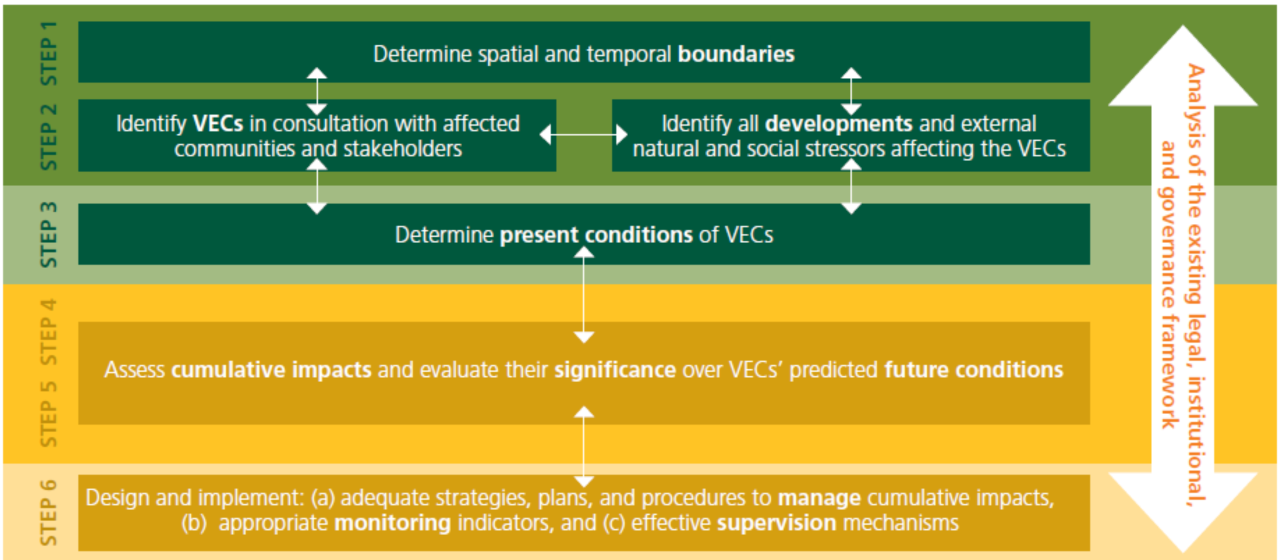

Figure 5-6: RCIA: Six-Step Approach

For the purposes of the present study, the cumulative impact assessment (CIA) is limited to those residual impacts (post mitigation) resulting from past projects (captured through the baseline investigations) and from future residual effects of present or reasonably foreseeable projects and activities.

The foreseeable projects that will supplement the Project with a third-party service or other independent projects proposed in the area were identified and described to be considered in the CIA. There must be a reasonable potential that the other projects' impacts will overlap with those of the Project in time and/or space. If this overlap is not apparent, then a CIA is not warranted.

For cumulative effects to occur, residual impacts from the Project need to cumulate with residual impacts from other projects.

5.3 Environmental and Social Management System Framework

The applicable lenders standards require that there is an Environmental and Social Management System (ESMS) for the Project ensuring:

- the execution of the Project in compliance with the commitments addressed in the ESIA for the minimization of significant and potential environmental and social impacts;
- compliance with all applicable Project Standards as well as relevant IFI guidelines provided in the ESIA.

As TP-OTC and its contractors have management plans and procedures for its operations related to the Project, the mitigations derived from the impact assessment and plans prepared within the scope of the ESIA will be incorporated in the existing system by TP-OTC.

The general framework of the Sakarya Gas Field Project ESMS is described in Chapter 12 of this report.

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