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Addressing Environmental and Social Challenges in Large Infrastructure Projects

The TANAP Case Study

Addressing Environmental and Social Challenges in Large Infrastructure Projects—The TANAP Case Study

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ABBREVIATIONS AND ACRONYMS

AIIB	Asian Infrastructure Investment Bank
BAP	Biodiversity Action Plan
bcma	billion cubic meters per annum
BP	British Petroleum
BOS	Biodiversity Offset Strategy
BOTAŞ	Boru Hatları İle Petrol Taşıma Anonim Şirketi
BTC	Baku-Tbilisi-Ceyhan
EBRD	European Bank for Reconstruction and Development
ESIA	Environmental and Social Impact Assessment
ESMS	environmental and social management system
EUNIS	European University Information Systems Organization
HSSE	health, safety, social, and environment
IFC	International Finance Corporation
IFI	international financial institution
km	kilometer
MOC	Management of Change
RAP	Resettlement Action Plan
SGC	Southern Gas Corridor
SOCAR	State Oil Company of the Azerbaijan Republic
TANAP	Trans-Anatolian Natural Gas Pipeline
TAP	Trans-Adriatic Pipeline



Acknowledgments

This case study on the Trans-Anatolian Natural Gas Pipeline (TANAP) is a part of an effort to document and demonstrate how good environmental and social practices can contribute to positive environmental outcomes and increased benefits for the people impacted by World Bank financed projects. When sound environmental and social performance is integrated into the overall project design and project management, large projects have the potential to create developmental benefits that go beyond environmental and social risk management.

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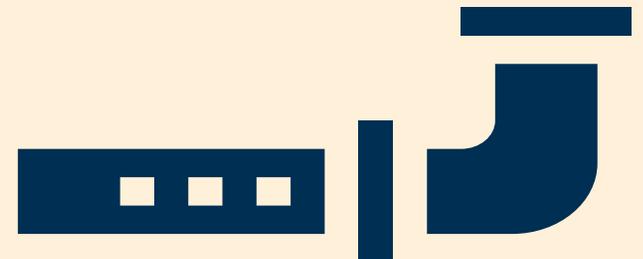
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Summary

This publication is a part of an effort to document and demonstrate how good environmental and social practices can contribute to positive environmental outcomes and increased benefits for people impacted by World Bank financed projects. TANAP's environmental and social practices reflect its management's strong commitment to establishing a system with dedicated resources for adaptive risk management. TANAP integrated environmental and social performance into the overall project design and project management, which contributed to its overall development impact. A strong environmental and social management system, a comprehensive environmental and social impact assessment, the use of a Management of Change procedure, robust stakeholder engagement throughout all phases of the project, and a comprehensive local investment program are among the key success factors that can serve as a model for large infrastructure projects around the globe in and beyond the energy sector.



1. Introduction and Background

The Trans-Anatolian Natural Gas Pipeline (TANAP) is the largest segment of the 3,500 kilometer (km) Southern Gas Corridor (SGC), a regional project of strategic significance spanning the entire length of Türkiye that provides a direct export link from the Shah Deniz gas field in Azerbaijan through Georgia, Türkiye, Greece, and Albania to Italy and the rest of Europe (see figure 1.1). The TANAP project began construction of the pipeline in 2015, and main construction works were completed at the end of 2019.

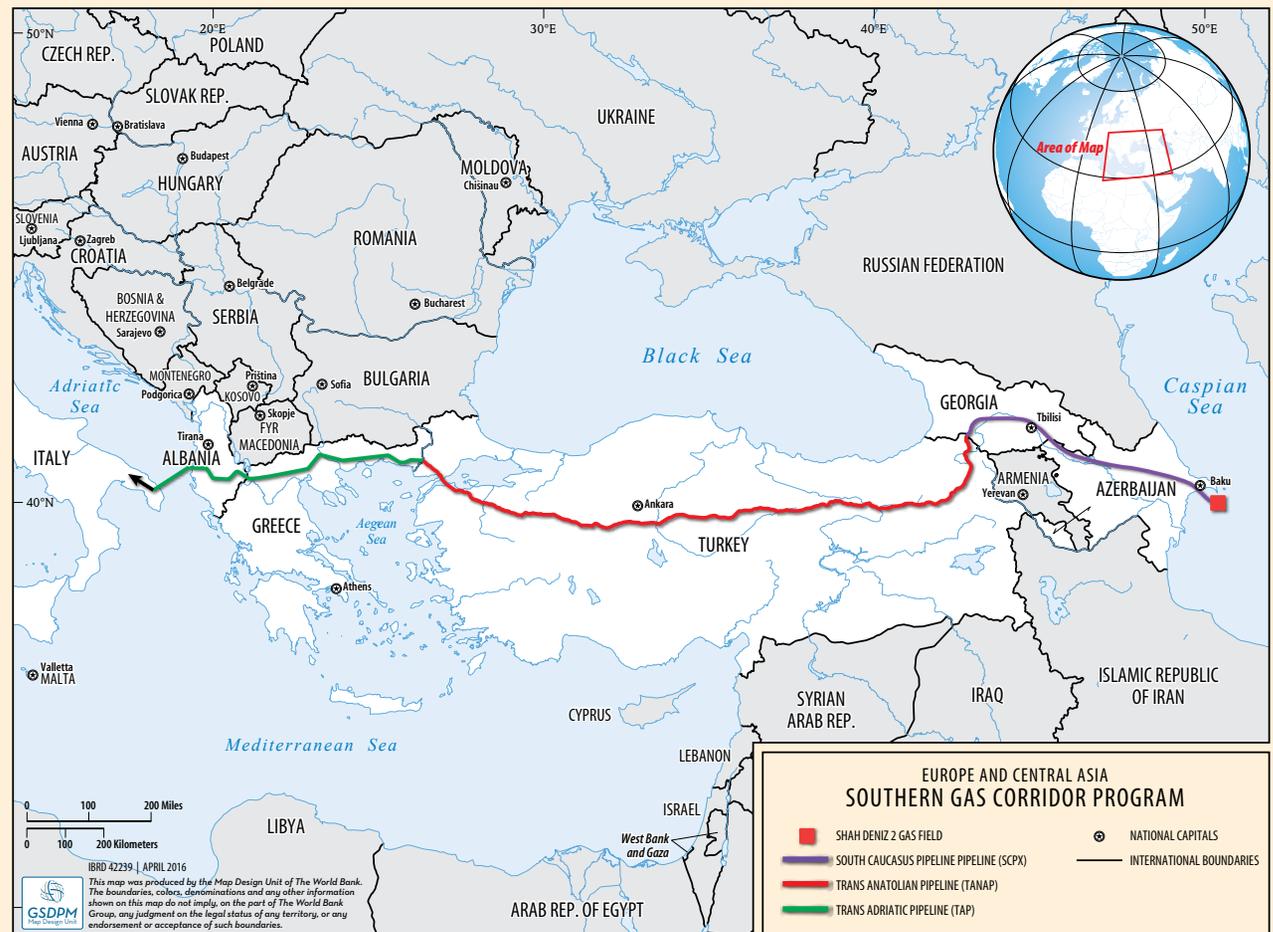
An infrastructure project of this scale involves diverse and complex environmental and social challenges with potential political and cultural implications. The construction of this magnitude of pipeline infrastructure displaces huge amounts of topsoil and can disrupt fragile ecosystems. Both groundwater and marine life in offshore areas are at risk of contamination. As sites of neolithic civilizations and of the Hittite, Roman, Byzantine, and Ottoman Empires exist throughout Türkiye, digging at sufficient depth almost guarantees an encounter with ancient ruins and artifacts.

Moreover, linear infrastructure requires vast land acquisition on both a temporary and permanent basis, which can disturb local agricultural livelihoods and especially impact society's most vulnerable. Finally, the establishment of large bank contracting

works brings the challenges of managing waste disposal, ensuring community and occupational health and safety, and negotiating local employment expectations. Owing to TANAP management's commitment to actively engage with these risks at all

phases of construction, as well as to hire top talent in environmental and social risk management, the project implementation resulted in positive environmental outcomes as well as benefits to local communities.

Figure 1.1. The Southern Gas Corridor



TANAP, a World Bank financed project, was designed to meet the environmental and social standards of several international financial institutions (IFIs). In certain cases, TANAP management implemented good international practices that went beyond current national and IFI requirements. This case study highlights some of the environmental, social, and project management practices employed by TANAP that can benefit future large-scale linear infrastructure projects.

The Southern Gas Corridor comprises three pipelines and one gas field: The South Caucasus Pipeline Expansion, which transports natural gas from the Shah Deniz 2 field in the Caspian Sea through Azerbaijan and Georgia; TANAP, which traverses Türkiye; and the Trans-Adriatic Pipeline (TAP),

which goes through Greece, Albania, and under the Adriatic Sea, finally reaching Italy. Türkiye is the host country of the TANAP gas pipeline, which was developed by the TANAP Natural Gas Transmission Company, a special purpose company established to build and operate the TANAP pipeline system.

Türkiye's national gas company, Boru Hatları İle Petrol Taşıma Anonim Şirketi (BOTAŞ), has a 30 percent share in TANAP. The government of Azerbaijan and the State Oil Company of the Azerbaijan Republic (SOCAR) established the Southern Gas Corridor Closed Joint Stock Company (SGC) as their joint investment vehicle for the Southern Gas Corridor. SGC has a 51 percent share and SOCAR Turkey Energy A.Ş. (STEAS) has a 7 percent share in TANAP, with the remaining 12 percent share held

by British Petroleum (BP) Pipelines Limited, a subsidiary of the international oil and gas company BP plc. Gas deliveries to Türkiye commenced in June 2018, while deliveries to Europe via TAP began on December 31, 2020.

Through financing to its two largest shareholders, SGC and BOTAŞ, the TANAP project received support from several IFIs, including \$800 million from the World Bank, \$500 million from the European Bank for Reconstruction and Development, \$600 million from the Asian Infrastructure Investment Bank, and \$270 million from the European Investment Bank. The Multilateral Investment Guarantee Agency was involved during the due diligence process and approved guarantees against commercial loans. However, a portion of these guarantees were later canceled. The World Bank approved financing for the project in December 2016.¹

When construction began, TANAP's \$8.6 billion price tag and 1,850 km length made it the largest gas pipeline construction project in the world. The pipeline system consists of a 56-inch pipeline to the offtake station that delivers gas to Türkiye, a 48-inch pipeline to TAP, and a dual 36-inch pipeline that crosses the Marmara Sea. The system is designed to transport natural gas in required quantities at specific times, starting with 16 billion cubic meters per annum (bcma) in the initial phase and increasing to a high-flow capacity of 31 bcma during the last phase. The pipeline delivers 6 bcma to BOTAŞ for use in Türkiye and 10 bcma to Europe via the TAP.



TANAP's successful project and contractor management resulted in a final cost of \$6.3 billion and a final route length of 1,811 km. Figure 1.2 presents a detailed timeline of major project milestones from the signing of the intergovernmental agreements through the first gas delivery to TAP.

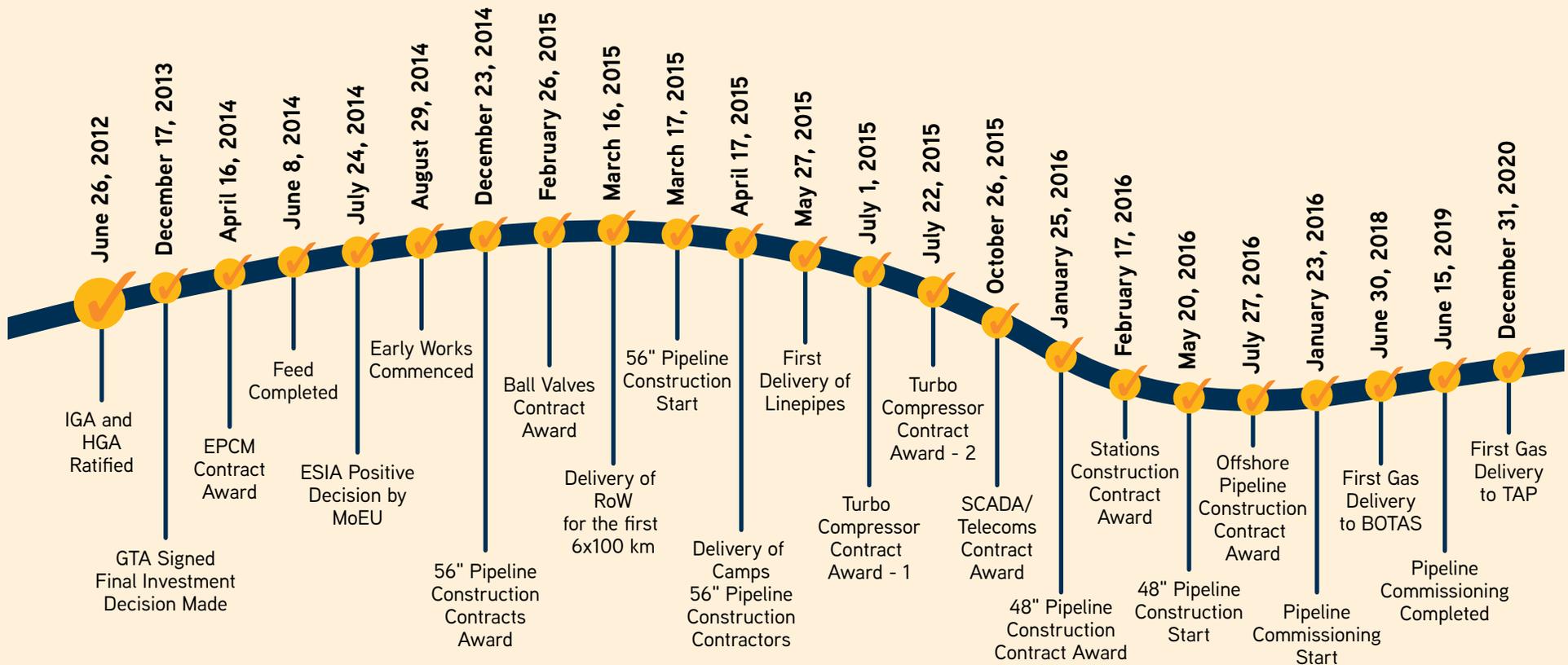
The TANAP pipeline is buried along most of its length but includes an 18.7 km offshore section that crosses the Marmara Sea. Constructed works also

include above-ground installations: two compressor stations, four metering stations, 11 pigging stations, 49 block valve stations, and two offtake stations that supply Türkiye's national-level natural gas network.² Construction of the pipeline was divided into four lots, with one contractor company responsible for the construction of one lot. Other companies, including one lot contractor, constructed the metering system, the compressor, offtake stations, and

the offshore section. Multiple vendors and suppliers were also contracted directly by TANAP for associated services.

The TANAP project built on lessons learned from the earlier Baku-Tbilisi-Ceyhan (BTC) pipeline project in Türkiye, Azerbaijan, and Georgia, which was financed by the International Finance Corporation (IFC). Many TANAP project staff brought with them experience from working on the BTC pipeline and

Figure 1.2. Timeline of Major Milestones



other similar national and international projects. The TANAP project further enhanced and improved many of the successful practices and systems implemented under the BTC project.

This case study is part of an effort to document and demonstrate how good environmental and social practices can contribute to positive environmental outcomes and increased benefits for the people impacted by World Bank financed projects. When sound environmental and social performance is integrated into overall project design and project management, large infrastructure projects have the potential to create developmental benefits that go beyond environmental and social risk management.

This case study analyzes the effectiveness of implemented practices under TANAP to manage social and environmental risks and challenges that emerged during pipeline construction, as well as efforts to contribute to local development. The project began with a thorough environmental and social assessment that informed its environmental and social management system. It engaged in active environmental management, including bioremediation, soil management, workers camp management, and archaeological and biological scientific research, as presented in the following sections. The project worked with national, regional, and community leadership to maintain engagement and transparency and to ensure fair land acquisition, fair labor and working conditions, gender equity, and

livelihood restoration, as necessary. The study also examines practices around contractor selection, contract management, procurement, and technical design that contributed to the project's success.

Due to a strong commitment by management, a competent staff, and a dedicated budget, TANAP's performance met stringent IFI environmental and social requirements, performing well above compliance standards in some areas. The project established a Resettlement Action Plan (RAP) Fund to provide livelihood assistance and other types of compensation to project-affected people, a benefit not mandated by Turkish law. TANAP initiated the Social and Environmental Investment Program, which invested in basic social and economic infrastructure and livelihood opportunities for local

people and communities. It also established appeals committees as a part of its community and stakeholder grievance resolution mechanisms, which included experts and other individuals trusted by their respective communities. By using a mitigation hierarchy—a best practice in environmental and social management—TANAP avoided physical resettlement and minimized the project's impact on sensitive biodiversity areas.

As a result of these efforts, the project did not face any community unrest, work stoppages, or delays caused by local tension or dissatisfaction—atypical for a project of this magnitude and broad geographic coverage. The TANAP project subsequently won several international awards for corporate social responsibility in the gas sector.



2. Environmental and Social Management System

KEY LESSONS

- TANAP organized its environment, social, and health and safety units into one directorate, with one director reporting directly to TANAP's general manager. This direct reporting mechanism played a critical role in expediting internal communication and decision making. It enabled urgent messages to reach senior management much more quickly, clearly, and directly.
- TANAP hired experienced talent in the areas of health, safety, and environmental and social management to effectively implement its environmental and social management system.
- TANAP instituted a Management of Change procedure, which enabled continuous improvement and adaptive management during construction.

Challenge. TANAP traverses diverse geological terrain, ecosystems, and socioeconomic regions. It begins at the border of Georgia and Türkiye in the far eastern mountains, spans the plateaus of central Anatolia, then crosses under the Marmara Sea and continues to the Thrace region near the Aegean Sea. The pipeline, above-ground installations, and access roads impacted over 28,000 parcels of land mainly used by local households across 67 districts, principally in rural areas, as well as some public lands. This required the establishment of a comprehensive environmental and social management system (ESMS) to effectively manage TANAP's evolving environmental and social challenges.

Effective implementation of the environmental and social management system. The ESMS was structured to address the findings of the Environmental and Social Impact Assessment (ESIA) and the impacts register, and it did so by including a comprehensive set of mitigation measures in the management plans (see box 2.1). The ESMS provided a set of rules that governed any contractor working, supplying materials, or providing services for the project. TANAP communicated ESMS requirements during bidding procedures and obliged each contractor to establish its own ESMS in compliance with the requirements of ISO 14001 and TANAP project's ESIA and Biodiversity Action Plan.

Box 2.1. ESMS Plans

- Biodiversity Action Plan (BAP)
- Resettlement Action Plan (RAP)
- Livelihood Restoration Plans (LRPs)
- Stakeholder Engagement Plan (SEP)
- Environmental and Social Management Plan (ESMP), including:
 - Environmental Action Plan
 - Environmental Monitoring Plan
 - Social Action Plan
 - Social Monitoring Plan

Strong management commitment. Management ownership of a project's environmental, health, safety, and social commitments is key to an effective ESMS. While health, safety, environment, and social teams were initially mapped to three separate departments, TANAP reorganized them into one integrated directorate and appointed a director of Quality, Health and Safety, Social and Environment (QHSSE) who reports directly to TANAP's general manager. In this way, QHSSE-related concerns were directly represented at senior management meetings, along with financial, construction, and other technical issues. This approach enabled close coordination and risk management between construction and the health, safety, social, and environment (HSSE) teams. TANAP also established a system of coordination and oversight that integrated headquarters- and site-based HSSE staff with their contractor counterparts. This system of coordination was in place for issues related to HSSE and construction management. Such an approach demonstrated a strong commitment by TANAP management to treat HSSE issues on an equal basis with other aspects of project management and financial concerns during pipeline construction. TANAP management also allocated adequate financial resources to support the implementation of the ESMS, one of the key factors to the project's success.

Robust health, safety, social, and environment team. TANAP hired proficient HSSE teams, including members with experience working on other gas pipeline or large-scale infrastructure projects financed by IFIs. Hiring top talent proved crucial to the success of the project as it faced numerous challenges. The teams were able to develop prompt, innovative, and effective solutions to the environmental and social challenges that emerged during the various phases of construction. TANAP management recognized the need to strengthen and expand the HSSE team, which grew to include additional specialists, especially those working on land acquisition, livelihood restoration, and stakeholder engagement. During construction, TANAP actively encouraged the efficient transfer of knowledge among its experienced staff. As the construction of the pipeline progressed and a tight finalization timeline had to be achieved, TANAP focused additional efforts on the completion of the final lot, Lot 4, reassigning experienced engineering, construction, and environmental and social staff from the other lots. In this way, experienced staff could quickly address remaining issues and thereby help complete the pipeline on time.

Management of Change. An essential aspect of the ESMS for such a complex project was its Management of Change (MOC) procedure, which enabled continuous improvement and adaptive management throughout construction by utilizing internal reviews,

feedback from lenders, and independent monitoring. During the ESIA stage, TANAP established MOC procedures that allowed for timely adaptations of environmental and social policies and procedures to reflect the changing risks and circumstances on the ground during construction, including significant changes to health, safety, environmental, and social conditions that led to alterations in design, engineering, and construction methods. MOC procedures required management to consult various project disciplines and assess and document the implications of these changes. TANAP management adopted MOC early on, as it was aware that new risks could emerge and evolve during construction. It recognized the need for adaptive management to address any new challenges, including those with cost implications.

Legal agreements obliged TANAP to inform its international lenders of any significant changes with environmental and social implications as well as mitigation measures. For example, when archaeological experts suggested the need for a new route to preserve archaeological sites, TANAP's teams evaluated the feasibility of this approach from engineering, technical, contractual, scheduling, cost, environmental, and social perspectives, in accordance with MOC standards. TANAP then informed its partner IFIs about the rerouting of the pipeline as well as any environmental and social impacts associated with the newly selected route.

3. Environmental and Social Assessment

KEY LESSONS

- TANAP successfully applied a mitigation hierarchy during the selection of the pipeline route to avoid, minimize, mitigate, and offset environmental and social impacts.
- Rigorous baseline studies helped inform the design of detailed mitigation measures for the project, especially regarding the preservation of biodiversity.
- TANAP conducted the environmental and social impact assessment according to international good practices and assisted multiple IFIs coordinate their due diligence and agree on a common approach to environmental and social risk management and monitoring.

Challenge. TANAP impacted about 7,000 hectares of land along its 36-meter corridor—the equivalent of 10,000 football fields. If not effectively managed, the construction of such a long pipeline can have significant impacts on the environment and on local communities. Much of a project’s work therefore must occur before the first shovel hits the soil. Responsible management needs to know everything it can about the lay of the land. It must master the region’s topography and geology, of course, but it must also understand the fine distinctions among endangered species, agricultural practices in different climates, the signs of an archaeological find, and many other elements. Restoring the topsoil, ecosystems, and biodiversity along a pipeline traversing a diverse geographic area poses many challenges.

Managing transactions and relationships with 115,000 pipeline-affected landowners requires solid contextual local knowledge. Sophisticated research informing advanced planning is required to keep a project’s impact to the absolute minimum. A comprehensive understanding of the environment and the people affected by the pipeline was crucial to the prevention and minimization of unexpected events during the construction of the pipeline.

Mitigation hierarchy. In 2012, at the very start of the project, TANAP adopted an environmentally and socially responsible approach to both its construction and operation phases, requiring a comprehensive ESIA at the project’s inception as well as subsequent technical and economic feasibility studies. In addition, TANAP conducted additional

environmental and social studies throughout implementation to identify any unforeseen impacts and to monitor the effectiveness of mitigation measures.

TANAP sought to identify a technically feasible pipeline route with limited impact on the environment and people, including minimizing overall land use and avoiding the physical displacement of families and communities. TANAP adopted a mitigation hierarchy approach to reducing environmental and social impacts—a common international best practice. This approach organizes a project’s risks and impacts into a hierarchy of responsible actions with the aim of reducing them. Where total avoidance is not possible, the mitigation hierarchy seeks to reduce risks and impacts to acceptable levels and mitigates remaining impacts. Areas where significant residual



impacts remain require technically and financially feasible compensation or other appropriate offsets.

Route selection. TANAP management narrowed six initial route options to the final preferred pipeline route alignment using an extensive environmental and social analysis alongside technical and geological feasibility, safety, and security priorities. TANAP actively sought to avoid any route that would cross settled population centers, agricultural lands, biodiversity and protected areas, and sites with cultural heritage. For example, a section of the pipeline in the eastern part of Türkiye was routed in the same corridor as the existing Baku-Tbilisi-Ceyhan and BOTAS pipelines, which prevented any new impacts in that region. To minimize the impact of construction on surrounding populations, management aimed to route the pipeline away from existing transportation infrastructure, where possible. Once TANAP had selected the most technically and financially feasible route, the project designed a comprehensive set of mitigation and offset measures.

Habitat classification. TANAP conducted one of the most comprehensive environmental baseline studies to date for an infrastructure project in Türkiye. Using international criteria, the project identified and categorized all animal and plant species detectable in a 500-meter-wide local study area along the pipeline route. A team of qualified experts created a map of the pipeline route and its impacts on biological habitats along the corridor using the European University Information Systems

Organization (EUNIS)³ habitat classification methodology. This process identified all environmentally sensitive areas along the pipeline route, including ecological, soil, and water resources. These studies were so extensive that biologists working on the ESIA discovered nine previously unknown fauna species and three new flora species (see box 3.1). Research on these newly discovered flora and fauna species has been published in scientific journals.

To manage biodiversity preservation during the construction and operation phases, TANAP prepared a Biodiversity Action Plan (BAP) and a Biodiversity Offset Strategy (BOS)⁴ based on the analysis conducted in the ESIA. These studies identified 67 critical terrestrial habitats and 27 critical water habitats, according to EUNIS classifications, as well as flora and fauna species of conservation concern that require protection.

Archaeology scouting. TANAP engaged archaeologists in the ESIA process, which led to the discovery of 106 archaeological and cultural heritage sites during the ESIA baseline studies. A thorough assessment during the planning stage guided TANAP's pipeline routing to avoid identified cultural sites. As a result, contractors ran into fewer chance finds and therefore experienced fewer work stoppages during construction.

Box 3.1. TANAP's New Species

During the initial environmental and social impact assessment and a postconstruction monitoring study for TANAP conducted in 2019, a total of 12 new species were discovered: nine arthropods and three plants. They were introduced in scholarly articles published in various scientific journals.

Among the new arthropods discovered were three dance flies (*Hilara ardahanensis*, *Hilara elifae*, and *Hilara hasbenlii*) and two new crane flies (*Tipula tanap* and *Tanap cinar*). The latter represent an entirely new genus in the *tipulidae* family of insects, which now bear the name of TANAP. The crane fly, sometimes referred to as a mosquito hawk or daddy longlegs, is a common insect in the *tipulidae* superfamily of flies, which contains more than 15,000 species. *Tanap cinarp*, according to the entry in a relevant scientific journal, is distinguished from other species in its family by a projection just behind the base of the antenna.



Two of the newly discovered fauna species—*Hilara elifae* and *Tanap cinar*



Communication materials by TANAP introducing the newly discovered flora

The discovered plants include *Verbascum ekicii*, *Astragalus askaleensis*, and *Dianthus dumanii*. *Verbascum ekicii* was discovered during the environmental and social impact assessment process on a field trip to collect plant materials along the TANAP route in the Bursa province in western Türkiye. After scientists cross-checked the specimens with existing descriptions and species of *Verbascum*, they realized that they did not match any previously described species. They carried out further field studies to collect more specimens. *Verbascum ekicii* is closely related to *Verbascum alyssifolium* but differs in that it has purple-violet hairs on the two filaments inside the flower.

These remarkable discoveries demonstrate the rigorousness of the environmental baseline studies conducted by TANAP's team of leading plant biologists and entomologists from Turkish universities.

Figure 3.1. TANAP's route across Turkey with examples of discovered archaeological artifacts



Social impact studies. Large infrastructure projects carry significant social risks and can profoundly impact people, their livelihoods, their health, and their safety. Managing such impacts on people's lands and livelihoods over vast geographic areas is a complex challenge. TANAP's ESIA included extensive social baseline studies to assess the broad range of social impacts and risks associated with the project. The project also placed a special emphasis on

engaging all stakeholders during the baseline studies. A team of social experts interviewed members of affected communities and other stakeholders during public participation meetings and meetings with civil society organizations. They also collected a broad range of socioeconomic data in baseline surveys, such as household characteristics, sources of income, types of livelihoods, access to services and credit, and personal or social characteristics

that make people vulnerable. ESIA studies assessed the project's anticipated impacts on infrastructure and mobility, economy and employment, community health and safety, demography and migration, intangible cultural heritage and archaeology, and ecosystem services; and TANAP identified corresponding mitigation measures. TANAP also identified disadvantaged and vulnerable groups based on specific project-induced impacts, such as women-headed households, persons with disabilities, elderly populations in rural areas, and landless households. The project committed to providing additional support to groups that would be impacted by land acquisition and to improve their livelihoods. TANAP carefully determined the locations of project worker camps. Management wished to situate them at equidistant points along the pipeline and establish them at an appropriate distance from settlements and roads. It also needed to manage water scarcity in each area and the potential risks related to a labor influx. Extensive stakeholder engagement granted local communities the opportunity to express their views about the potential location of camps in their vicinity.

Coordinating international financial institution requirements. Multiple IFIs financed the construction of TANAP and the associated South Caucasus Pipeline Expansion and Trans-Adriatic Pipeline, as well as the Shah Deniz 2 gas field outside Türkiye. If not well managed, coordination among multiple lenders to such large projects can pose significant obstacles. The project would not have been



manageable if every lender had imposed different environmental and social standards and requirements. Anticipating that the project would need to meet multiple IFIs standards, TANAP conducted its ESIA according to international good practice

and following IFC Performance Standards Performance Standards. IFIs such as the World Bank and the European Bank for Reconstruction and Development (EBRD) conducted their own due diligence upon their entry and made joint recommendations

to bridge any gaps with their environmental and social requirements. While each IFI followed its own requirements for due diligence, they all agreed on a common approach to an environmental and social management system for TANAP and other Southern Gas Corridor projects. The IFIs coordinated and exchanged information during the due diligence phase and often relied on the others' assessments. For example, the Asian Infrastructure Investment Bank relied on the appraisal conclusions of the World Bank because it had already begun its due diligence process. The World Bank also shared its assessments with EBRD. All IFI parties agreed on an external monitoring plan with a unified set of monitoring reports. Throughout project implementation, TANAP continued to incorporate IFI recommendations to modify and improve its environmental and social management system. The IFIs recommended hiring an independent international ESIA monitoring firm to confirm that the mitigation measures proposed during the planning stage were effectively applied during construction and to recommend steps for any unanticipated impacts. TANAP had already mobilized a local external ESIA monitoring firm to produce reports every three months. The international independent monitoring firm complemented these efforts, delivering monitoring reports every six months to TANAP and all of the lenders. All reports by the independent monitoring firms were also disclosed on the TANAP website.

4. Labor and Working Conditions

KEY LESSONS

- TANAP engaged third-party monitors to ensure that construction contractors provided all workers with fair and safe working conditions. When monitoring uncovered concerns, TANAP promptly designed and implemented remedial action plans to resolve them.
- TANAP closely monitored occupational health and safety indicators and provided incentives to improve safety practices. The Project Health and Safety Recognition Program honored teams that exercised safe behavior and reported safety concerns at sites.
- TANAP created 14,000 employment opportunities, about 40 percent of which were for people from project-affected provinces and communities.

Challenge. No project of this scale can be completed without mobilizing and coordinating a huge workforce. Over the course of its construction, TANAP created about 14,000 employment opportunities, a majority of which were for contracted and subcontracted workers. While scheduling and organizing a hierarchy of necessary skills for the complex task at hand, TANAP made an earnest effort to ensure that workers enjoyed healthy and safe working conditions and labor rights in line with national laws and good international industry practices.

Third-party monitoring. Contractors were legally obliged to provide fair terms of employment and a safe working environment, and TANAP took steps to confirm that this was the reality on the ground.

Management engaged a third-party monitoring company to verify that construction companies and their subcontractors complied with Türkiye's labor and social security laws. Monitors reviewed salary payments and other statutory social contributions monthly, interviewed a sample of workers at construction camps, and did spot checks of payment slips. TANAP used these audits to promptly identify any gaps in compliance with national laws and to request that contractors address these gaps and implement time-bound remedial actions.

Working hours action plan. Large infrastructure projects can often be under immense pressure to complete works on time and to prevent any cost overruns, which can sometimes cause construction

workers to work long overtime hours, thereby increasing the risk of accidents. During the due diligence stage, the World Bank team observed in monitoring reports that contractors regularly exceeded standard limits for worker overtime. TANAP closely monitored the situation and ensured that this work was paid as required under national law. In addition, the World Bank worked with TANAP to develop a working hours action plan, which provided measures for TANAP to gradually reduce overtime hours and maintain them at manageable levels over the life of the project.

The action plan included a detailed analysis of working hours for selected positions and overtime mitigation measures such as adequate rest

breaks, more efficient use of crews, and more efficient management of idle time while waiting for equipment to arrive. TANAP management worked closely with contractors to implement these measures and to bring overtime hours within the legally prescribed limits. A dedicated action plan to monitor and manage working hours and overtime work helped TANAP actively manage the risk of overtime hours. Other IFIs joining the financing consortium recommended a fatigue management plan to complement these efforts at managing working hours. TANAP implemented a plan that regularly screened the risk level of workers performing work under increased fatigue. TANAP gave additional rest time or days off to workers who were determined to be under such risk. While a medical doctor conducted the screenings, the site health and safety manager had the overall responsibility to implement preventive actions.

Management and worker relations. The project was committed to establishing and fostering a sound relationship between management and workers. TANAP held training sessions explaining workers' rights under national labor laws as a regular part of employment induction training. Workers also had access to a grievance mechanism, which each contractor operated and TANAP monitored. Contractors usually addressed worker complaints in a timely manner. TANAP regularly ensured that contractor management addressed workers' outstanding concerns. When one construction lot



started receiving an increased number of worker grievances related to working conditions, TANAP carried out an employee survey to identify specific areas of concern and recommended actions to address them. Six months later, a follow-up survey indicated that the workers' problems with conditions had been resolved. While such employee surveys are common practice in large corporations, they are not often carried out for large construction projects. The TANAP experience shows that such

surveys can serve as a useful tool for identifying and resolving widespread worker concerns in a timely manner.

Labor influx. TANAP also succeeded at maintaining a good relationship with local communities and proactively managing any labor influx risks. In large projects, the arrival of workers to local communities can create risk as workers bring competition for local social and health services, public infrastructure, and water resources. Worker influxes

can also create social tensions due to differences in social norms and behaviors among workers and local communities, and they can increase the risk of the spread of communicable diseases. TANAP included social awareness training sessions in job induction exercises. The training provided workers with information about the local social and cultural context in the region where they were working and encouraged ethical behavior in this context. At the very start of their employment, workers signed a code of conduct, which was also visibly exhibited in all recreational and rest facilities. Local communities did not report any concerns about the workers' behavior during the construction of the pipeline.

Occupational health and safety. TANAP closely recorded and monitored, on a monthly basis, a set of safety metrics, including total recordable incident rate and lost-time incident. *Lost-time incident* is a safety measure that tracks injuries or incidents that result in the loss of productive work. The *total recordable incident rate* provides insight into the project's past safety performance by calculating the number of recordable incidents per 1,000,000 hours worked during the construction period. These indicators, developed based on international industry good practices, went beyond the requirements of national law. This close monitoring enabled TANAP to improve safety initiatives by

tracking these metrics year-on-year and setting targets for improved performance. Good occupational health and safety policies and procedures are often insufficient to ensure worker compliance. TANAP sought to foster a corporate culture of safety and influence workers' behavior as one of the key aspects of its health and safety program. TANAP established the monthly Project Health and Safety Recognition Program and the Health and Safety Incentive Program, which modeled safe behavior for project teams and construction contractors. The Project Health and Safety Recognition Program honored teams that exercised safe behavior and reliably reported any safety concerns at sites. The program did not include any material rewards, focusing on public recognition of safe behavior. The Health and Safety Incentive Program awarded non-monetary rewards such as jackets and backpacks. These two safety award programs created aspirational goals for teams and workers, and many teams strived to be recognized. As they were not required by national legislation or IFI standards, TANAP introduced these behavioral safety programs as a good international practice.

Early in the project's design, TANAP adopted a detailed incident investigation process that instructed managers and workers on steps for collecting and analyzing all necessary data after an incident. The investigation methodology was grounded in the Comprehensive List of Causes approach.⁵ Initially, TANAP and the contractors' occupational health



and safety experts performed the investigations. At the recommendation of the World Bank, TANAP started engaging independent, competent, and reputable occupational health and safety experts from the oil and gas industry, on a case-by-case basis, to participate in the investigation and reporting process. This approach improved the quality of the investigation reports and provided more detailed content in line with international standards. When an accident occurs during construction, it is crucial to adjust existing operating procedures to prevent similar future incidents. TANAP regularly integrated lessons learned from incidents and accidents into site operating procedures and method statements, organized training for site health and safety managers to prevent the reoccurrence of similar events, and shared these lessons with workers during regular toolbox talks.

Local employment opportunities. Large infrastructure projects often create expectations in local communities about new jobs and employment opportunities. TANAP anticipated these expectations and planned to provide employment opportunities specifically for people from affected settlements. Early in the project design, TANAP carried out a local skills analysis study to assess the availability of a local workforce with the necessary skills for pipeline construction. This analysis determined that men hired from local communities could mainly participate in unskilled and semiskilled construction

jobs, while women could work in worker camps as catering and maintenance staff. TANAP set different local employment targets for different types of jobs and developed procedures for hiring and training local workers in its local employment and training plans. Management also clearly communicated the temporary nature of construction jobs. At the peak of construction in 2017, TANAP engaged

almost 14,000 contracted and subcontracted workers, almost 40 percent of whom were from districts and provinces in the TANAP right of way. Throughout the project lifespan, TANAP maintained at least 5 percent female employment in the contractors' workforce (see box 4.1), rising to 13 percent as construction neared completion and the male worker numbers tapered.

Box 4.1. Women-Friendly Facilities, Women-Friendly Jobs

In large infrastructure projects, attracting female workers is often challenging due to the types of jobs offered, cultural factors, the remoteness of locations, and safety considerations. While large construction projects provide opportunities for local employment mainly to men, TANAP aimed to provide these opportunities to women as well. In many ways, TANAP made a concerted effort to reach out to women to ensure that they also benefitted from the project and to enable them to feel comfortable in seeking employment at TANAP. Conditions at worker camps provide significant evidence of this effort. The facilities had separate accommodations and lavatories for women and were well lit for safety. Further, before the project works began, TANAP and the contractors went to every village near the camps and distributed job applications directly to women rather than just leaving them with village headmen.

Due to the nature of the work, most available jobs were in construction, but TANAP introduced a 5 percent female employment target for the contractors' workforce. Women were employed to work in offices, dorms, kitchens, and camp maintenance, resulting in more stable jobs for women: on average, women worked for 2.6 years, while men worked an average of one year based on peak times for construction tasks. Women had access to a safe working environment beginning with their departure from home. Contractors arranged daily morning and evening transportation for female workers to commute from their communities to worker camps.

5. Land Acquisition and Livelihood Restoration

KEY LESSONS

- TANAP used the pipeline route selection process to avoid any physical displacement across the vast 7,000 hectares of impacted land.
- TANAP completed all land acquisition and livelihood restoration activities on time and within budget, without any construction stoppages or delays. A strong multidisciplinary social impact and land acquisition team with well-defined roles as well as a dedicated resettlement budget made this achievement possible.
- TANAP systematically and continuously monitored the land acquisition and livelihood restoration process and adaptively managed evolving impacts and challenges.

Challenge. TANAP's massive land acquisition program of 7,000 hectares included 4,500 hectares of private land, impacting 115,000 landowners—yet the project did not physically displace a single household. Large infrastructure projects are often delayed or significantly exceed their budgets due to land acquisition and resettlement issues. TANAP managed to avoid these issues with careful planning, an extensive land acquisition budget, and an experienced social and resettlement team in place.

Avoiding physical displacement. TANAP planners eliminated five of six initial route alternatives with the aim of avoiding urban areas, settlements, and agricultural lands, ultimately choosing the one that best achieved this goal. This fact alone reflects TANAP management's acknowledgment

that their task was not solely a feat of engineering. This achievement required a great deal of social research, engagement, and support. Beyond merely preserving physical homesteads, TANAP publicly fulfilled its commitment to understand the needs of the communities around the pipeline and to compensate landowners, users, and families with impacted livelihoods. And TANAP went further, investing in the social development of the region's surrounding communities with its Social and Environmental Investment Program (see details in section 7 on stakeholder engagement).

The resettlement action plan. Even before TANAP had obtained international lenders, its management decided to apply IFI standards to land acquisition and resettlement, allocating an additional

budget to cover the gaps between the requirements of national laws and international standards. As a result, the land acquisition and social impact teams at TANAP collaborated to prepare a Resettlement Action Plan (RAP) for the project at an early stage. When lenders such as the World Bank and other IFIs agreed to finance the project, they conducted an initial RAP audit to determine if there were any gaps between IFI standards and the proposed mitigation measures in the RAP. They proposed specific corrective actions to bridge these gaps, including a key recommendation to further strengthen the RAP implementation team and hire dedicated experienced professionals.

TANAP was quick to implement these recommendations. The RAP team consisted of social impact



and land acquisition specialists and consultants at TANAP and specially assigned land acquisition staff at BOTAŞ. At the peak of land acquisition activities, the team included about 150 people. The BOTAŞ land acquisition staff were assigned to nine branch offices along the pipeline, about 150 km apart. Each branch office housed about 10 staff, including lawyers, survey engineers, and title deed officers. Beyond the TANAP and BOTAŞ teams, the contractors engaged social specialists on construction sites. TANAP also hired a group of resettlement experts to externally monitor RAP activities, as well as social development experts to plan, implement, and monitor livelihood restoration activities. These factors contributed to TANAP completing its land

acquisition and livelihood restoration on time, within budget, and in line with IFI requirements.

The RAP Fund. TANAP established a fund to complement its budget for land acquisition under Turkish national requirements, to address gaps between IFI standards and national law, and to respond to changing needs during project implementation. Turkish expropriation law does not mandate compensation for certain losses that IFI resettlement and land acquisition standards require. For example, the Turkish law does not require compensation for loss of use of communal grazing lands, loss of informal use of state-owned land, loss of fishing grounds, or the cumulative impact of multiple pipelines. It does not require the provision of transitional allowances,

livelihood restoration, or additional allowances for disadvantaged and vulnerable groups. TANAP established the RAP Fund as a source of funding to achieve the objectives of international standards. In the end, the fund benefited over 6,000 people. It covered payments to informal land users for use of public lands, transportation costs for absentee owners, land registration and land consolidation costs, temporary loss of crops on unviable lands, the replacement of affected community assets, and transitional allowances due to reduced income and multiple-pipeline impacts.

TANAP maintained a dynamic approach to RAP Fund allocations during project implementation. Management made several small local alterations to the route during construction, changing the size of plots needed, the assets impacted, and the number of people affected by the project. Moreover, some initial budget assumptions at the planning stage did not reflect the on-the-ground reality. For example, during the construction phase, TANAP discovered that it needed more land in some areas than the initial plans called for, in some cases increasing the cumulative impact on landowners already affected by the Baku-Tbilisi-Ceyhan and BOTAŞ pipelines. Since TANAP was the third pipeline to pass through this land, it assumed the responsibility of appropriately compensating owners and farmers.

During land acquisition planning, the RAP team developed a detailed entitlement matrix outlining the

types of eligible losses and compensation amounts. The TANAP team soon recognized that the pipeline would have additional impacts not included in the initial entitlement matrix, such as cumulative ones caused by multiple pipelines, as mentioned earlier. Additionally, the widely differing socioeconomic needs of people living along the pipeline required a more detailed operational manual: the *RAP Fund Management Procedure*. This procedure followed the compensation principles of the entitlement matrix but provided more concrete guidance to calculate compensation and a detailed description of eligibility criteria for each RAP Fund category. Respecting the principle of fairness, TANAP developed a scaled method for calculating compensation for the transitional allowance proportionate to the magnitude of land impacts. TANAP also established the RAP Fund Management Evaluation Committee to settle complex disputed compensation claims according to the procedure. Affected households could raise such claims at consultations and negotiations with TANAP during the valuation process or through the grievance redress mechanism. TANAP widely distributed a brochure among affected communities along the pipeline that detailed the basic eligibility criteria and entitlements, as well as additional support criteria defined in the improved entitlement matrix.

Livelihood restoration. TANAP recognized that planning and budgeting for livelihood restoration is a dynamic process. The initial livelihood restoration plan focused on providing support and compensation

Box 5.1. Livelihood Restoration for Fishermen

The TANAP pipeline crosses the Dardanelles Strait in western Türkiye on its way to the border with Greece. At the planning stage, potential livelihood impacts on fishermen during construction were included in the Resettlement Action Plan and the entitlement matrix. Initially, the principle for compensation was the temporary loss of livelihoods for the number of days that fishing vessels would not be able to go out to sea. In practice, the construction of the offshore pipeline section across the Dardanelles lasted only a brief period and only prevented small-scale fishing vessels from accessing small areas around the construction. The fishing vessels therefore needed to travel farther out to catch fish during this period of construction, but their fishing was not interrupted.

During normal times, fishing yields vary considerably based on the season, the weather, and the area that the fishing boats operate on any given day. Calculating a benchmark market price for their losses therefore proved difficult. In addition, the fishermen had differing and complex ways of revenue sharing, which were dependent on fishing roles and seniority. It was challenging to calculate the loss of livelihoods for each household during the construction period as vessels continued to fish farther from the coast.

The solution was to compensate each fishing vessel for additional fuel expenses. A total of TL 180,000 fuel support was delivered to the fishermen meet the fuel costs of operating 44 small-scale fishing vessels. TANAP monitored the livelihoods of the fishermen and confirmed that households were at least able to maintain their incomes during this time.

to landowners and users who permanently lost their land to above-ground installations and fishermen whose work was disrupted during the pipeline construction across the Dardanelles Strait in western Türkiye (see box 5.1).

Based on quantitative and qualitative monitoring of beneficiaries and their communities, TANAP provided a second round of individual livelihood and community-based social and livelihood support

targeted at people and families at risk of being unable to restore their livelihoods. It provided additional assistance to augment the potential of individuals and communities to improve their standard of living. TANAP management continued to monitor the livelihoods of affected households during the project to assess if additional support was needed, and it delivered additional assistance during the project's later phases.

Whenever TANAP developed new eligibility criteria, compensation categories, or procedures, management informed and consulted stakeholders, including landowners and users, in a participatory and inclusive manner. This demonstrated TANAP's desire to be transparent and accountable and to foster a sense of fairness and equity among affected households. When the RAP Fund Management

Evaluation Committee made decisions on certain allowances and compensation, TANAP communicated its reasons to affected households.

Vulnerable groups. TANAP identified particularly disadvantaged and vulnerable stakeholders along the pipeline corridor, including women-headed households, the elderly, people with disabilities, and farmers who rent land. During the early stages of

implementation, however, TANAP broadened its categories. Disadvantaged and vulnerable groups typically include people with preexisting or pre-project vulnerabilities. Yet there were additional groups that experienced project-induced vulnerabilities as well as some in intersecting categories (see box 5.2). As a result, TANAP developed a much broader matrix for vulnerable groups during

Box 5.2. Commitment to the Empowerment of Women

TANAP provided targeted support to women through the land acquisition and livelihood restoration programs. A common challenge in large infrastructure projects is to ensure women's equal access to project benefits. Broad or general engagement and outreach mechanisms can exclude women. TANAP identified all women landowners and land users and registered them in its comprehensive beneficiary database. Targeted efforts were made to announce all eligibility and compensation criteria to women landowners in the TANAP right of way, livelihood restoration beneficiaries, and vulnerability support beneficiaries. TANAP's community facilitators worked with women beneficiaries to collect necessary documentation or to aid in filling out applications. Women without bank accounts were assisted in opening them in order to receive compensation payments.

The effort to reach these women required multiple house visits as many were often busy with various household responsibilities. Staff on the ground also facilitated culturally appropriate conversations with male relatives in the households, explaining that compensation for legal land rights and certain other allowances would be deposited in the bank accounts under the women's names as legal owners, per the national expropriation law. As TANAP staff became familiar with women beneficiaries after multiple visits



and dedicated women-only meetings, they were also better able to guide them on decisions about the various livelihood restoration options.

For the livelihood assistance provided directly to communities, TANAP learned about the needs and requests of men and women separately to ensure that women's priorities were considered in community livelihood investments. Based on women's requests, TANAP supported the building of a walking track, the building and renovation of playgrounds, the purchase of sports equipment for local children, and the repair of a common village furnace. Many women commented that the livelihoods support empowered them financially. One beneficiary of agricultural equipment remarked, "Thanks to this animal feed mixer, our milk yield increased by 10 percent. This machine saved a lot of time; now we can work less. And I have become the one who brings money into the house."

the construction phase, including shareholder land users, people affected by multiple pipelines, people who were temporarily employed during construction, informal land users, households headed by single adults (women or men), and people with multiple vulnerabilities. Standardized eligibility criteria and parameters for compensation and assistance were developed for each category. TANAP conducted extensive stakeholder engagement to finalize and communicate these vulnerable categories and entitlements for compensation.

Contractor compliance. TANAP made sure to highlight in bidding documents to contractors the project's relevant environmental and social commitments and required staffing. When the construction contractors began work, the TANAP environmental and social impact team provided extensive training to contractor personnel to inform workers interacting with project-affected people of its environmental and social commitments and procedures. Since project-affected households were dispersed across Türkiye, it was difficult to ensure that the contractors' behavior was consistent with environmental and social requirements in every region. TANAP therefore introduced land entry and exit protocols for all contractors. Before entering any affected land, the contractor and the land users signed a land entry document agreeing on the land's condition and characteristics prior to the project. TANAP



required contractors exiting the land to obtain signatures from at least 60 percent of landowners in the respective pipeline lots attesting that their land had been returned to them in its original condition. This process was a precondition of payment for contractors.

These protocols worked to effectively ensure that contractors did not damage the land and that they reinstated topsoil to its preconstruction condition. The contractors had difficulty locating some landowners at the end of work for plots with multiple landowners or when they were absent or had migrated for work. In such cases, if the contractor could demonstrate a reasonable effort at reaching

the landowners, TANAP agreed that village headmen could sign the land exit forms. In the end, landowners did not sign the exit protocols for only about 1,000 of approximately 18,000 private parcels along the pipeline route.

At the IFI lenders' recommendation, TANAP hired an independent panel of experts to monitor land acquisition and livelihood restoration throughout RAP implementation. The independent experts were selected based on their experience and expertise in the oil and gas sector and in Türkiye, and they included a balance of male and female experts. TANAP management and the external monitoring team functioned in a complementary relationship, with the panel actively detecting problems and proposing solutions throughout the project lifespan. Some of the panel's recommendations adopted by TANAP include:

- Hiring additional social experts as consultants at the peak of RAP implementation;
- Fine-tuning eligibility criteria and compensation categories for livelihood restoration;
- Conducting an independent assessment of compensation valuation methodology;
- Improving grievance management by instituting quality monitoring; and
- Delivering eligibility letters to absent RAP Fund beneficiaries through village headmen.

6. Environmental Management

KEY LESSONS

- TANAP carefully preserved and reinstated topsoil and subsoils that were unearthed during excavation, protecting the productivity of the soil for livelihoods and conserving biodiversity.
- TANAP prepared a Biodiversity Action Plan to identify all protected and critical terrestrial and freshwater habitats as well as species of conservation concern along the pipeline corridor. It implemented regionally tailored actions to conserve biodiversity. TANAP committed to a biodiversity offset strategy to mitigate any long-term residual impacts of the pipeline.
- With robust archaeological chance-find procedures and Management of Change procedures, TANAP rerouted the pipeline in response to chance finds during construction. When rerouting was not possible, careful salvage excavations unearthed over 1,000 archaeological objects.
- TANAP successfully managed worker camps at each step of the process. Extensive stakeholder engagement determined the selection of camp locations. Camp construction and the resulting facilities followed international good practices for safe and sanitary camps. Water use and waste disposal in camps did not affect local communities. Stakeholder engagement also shaped camp closure plans and infrastructure/facility transfers to local administrations.

Challenge. Building TANAP meant temporarily interrupting the normal flow of human and natural life across the entire Anatolian peninsula. TANAP's management set their ultimate goal as preserving and restoring that flow—mitigating impacts during construction and returning the land to its original condition to the greatest extent possible. During construction, TANAP implemented a comprehensive and robust set of environmental mitigation

measures to preserve the biodiversity and fertility of agricultural land and to protect Türkiye's cultural heritage.

Soil management. Among the most significant impacts of pipeline installation is the necessary removal of topsoil and subsoils, as well as other changes to the landscape along the pipeline corridor. TANAP's environmental and social impact assessment (ESIA) recommended conserving and

reinstating topsoil and subsoils after construction, allowing impacted farmers to return to their land with restored and productive soil and conserving the biodiversity of impacted natural areas.

There were several phases to the soil management process. Contractors hired soil experts to supervise and manage the entire process. First, an initial excavation of soil allowed for the laying down of the pipes in trenches. All of the topsoil and

Figure 6.1. Soil Management during and immediately after construction



subsoil in the construction area was stripped and preserved in dedicated areas. After the pipes were laid, contractors refilled the ground with the original subsoil and reinstated the original topsoil with the aim of returning soil productivity to its original condition. This measure also minimized excavation and construction waste (see figure 6.1). Some subsoils are not suitable for laying on pipes, as they can be corrosive. In such cases, the contractors supplied soil of suitable quality to refill the ground and then reinstated the topsoil on the surface level. Any subsoil that could not be used for refilling was transported to registered dump sites designated by the relevant Turkish authorities. In addition, soil management had an important social aspect. TANAP

established land entry and land exit protocols for contractors, requiring the signatures of landowners to certify that the contractors had followed the correct mitigation measures and returned their land to its original condition.

Biodiversity conservation and restoration. TANAP prepared a Biodiversity Action Plan (BAP) and a Biodiversity Offset Strategy (BOS), which proposed various measures to restore flora in the excavated pipeline corridor to its original condition.

Biodiversity Action Plan: The BAP identified all of the species and habitats in the 36-meter-wide right of way to determine area-specific actions to conserve biodiversity during the construction, operation, and decommissioning phases of the project. A team

of experts determined the presence of natural habitats along the right of way, highlighting protected or conservation areas and ecologically sensitive species. They carried out field studies over different seasons to identify specific critical terrestrial and freshwater habitat sections and specified each related species under these critical habitats. The studies conducted in the BAP framework assessed 23 natural terrestrial and two natural freshwater habitat types, according to the European University Information Systems Organization (EUNIS). In these habitats, they targeted for conservation 53 flora types belonging to 22 families, three mammalian species belonging to three families, seven bird species belonging to five families, three reptilian

Figure 6.2. *Neolycaena Soezen* and *Hilara Ardahanensis*



species belonging to two families, one amphibian species belonging to one family, 14 arthropod species belonging to 10 families, nine fish species belonging to five families, and one freshwater macroinvertebrate species. In almost all cases, when the proposed pipeline route crossed critical habitats where species of conservation concern were present, TANAP changed the pipeline route to avoid them. For example, the final revised right of way avoided critical habitats where *Neolycaena soezen* and *Hilara ardahanensis* lived (see figure 6.2).

Thirteen of the 91 identified species of conservation concern in TANAP's BAP—eight plants, one bird, one reptile, and three fish—were identified as critically endangered according to the International Union for Conservation of Nature Red List

of Threatened Species. The BAP included avoidance and mitigation measures to guarantee that there would be no significant long-term or permanent impact on these critically endangered species, such as a decrease in population size or habitat modification.

During construction activities across rivers, for example, TANAP halted all works during the spring-time reproduction period of some identified species of conservation concern. Prior to the excavation activities on land, contractors collected the seeds or bulbs of endemic and nonendemic flora in the area, which were preserved in gene banks. After the topsoil was reinstated, the preserved seeds were used for revegetation and biorecovery of the natural habitat. Similarly, to protect certain birds of special

conservation concern, specialists carried individual birds and their nesting materials into nearby appropriate habitats prior to the excavation works. They also provided and stored food in appropriate closed areas in these nearby habitats, which served as transitional nesting areas for the birds during construction.

The BAP included a *Bio-restoration Monitoring Plan* to monitor the success of the biorecovery of affected areas, as far as practicable, to their pre-construction state. This five-year plan tracked the biorecovery activities performed both in critical terrestrial and freshwater habitats as defined in the BAP, including wetlands, river crossings, and karstic and marl areas. Other areas that required biorecovery included topographical slopes on the right of way as well as access roads, dump sites, and camp sites that are not in the right of way but are disturbed by project activities. Biorecovery monitoring tracks progress on vegetation cover and species diversity as well as the success of pre- and postconstruction mitigation measures for species of conservation concern in each critical habitat.

Biodiversity offset strategy. The BOS was established to calculate net habitat losses and gains and to identify offset measures for residual impacts not covered by the ESIA or the BAP. The BOS followed the European Bank for Reconstruction and Development and the IFC's *Biodiversity Conservation and Sustainable Management of Living Natural Resources*

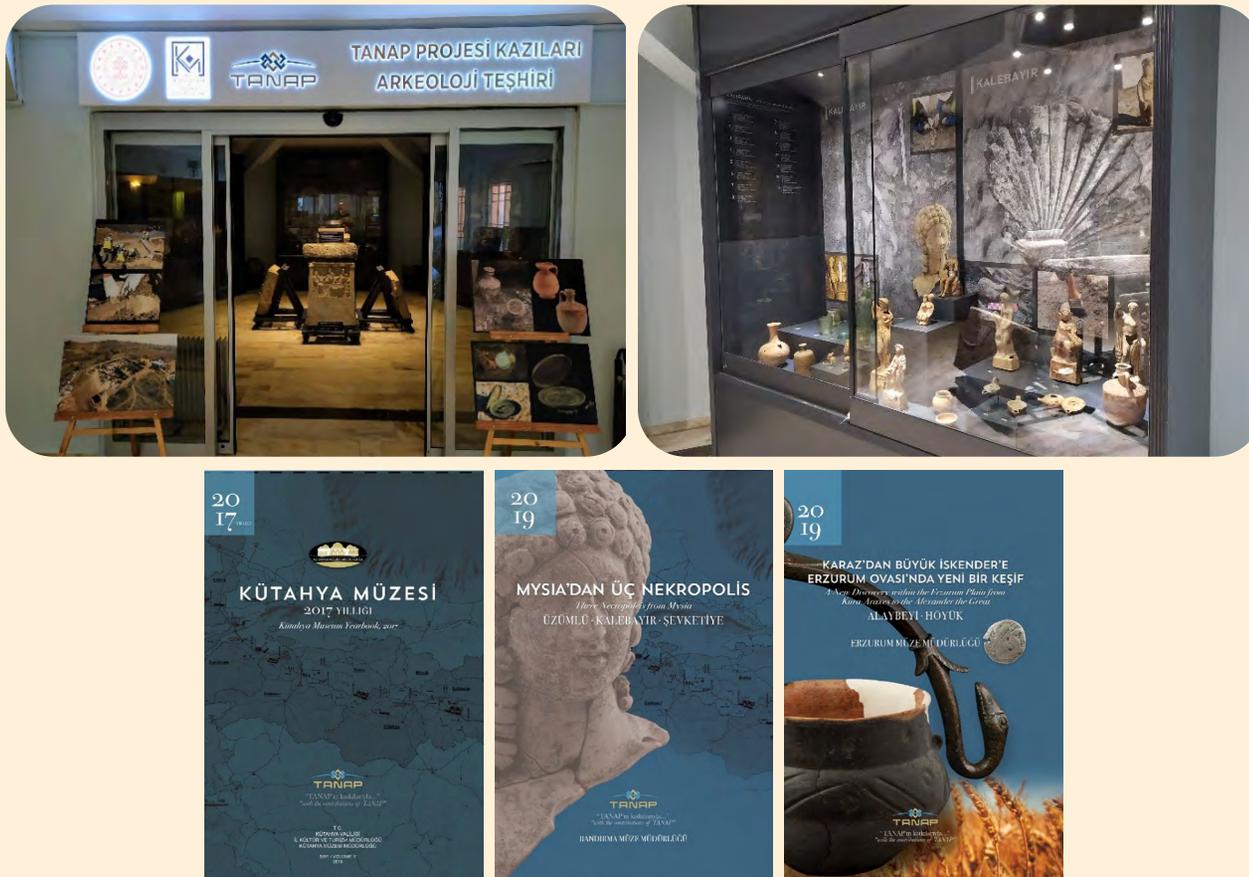
standards. Because the TANAP pipeline traverses a large geographic area with varied biodiversity, environmental specialists divided the project into ecoregions to ensure that losses and gains resulting from offset actions were applied to the appropriate species, natural communities, and environmental conditions present in the ecoregions. After calculating and quantifying the residual effects, the BOS mandated steps for the identification and evaluation of offset

opportunities and proposed an offset management and monitoring plan to implement the entire offsetting program by 2040. The proposed arrangements include creating protected areas where biodiversity may be at risk, strengthening policy and management capacity within protected areas, arresting the ongoing degradation of biodiversity caused by sources other than TANAP, and improving the biodiversity value of degraded habitats. These goals will

be achieved through rehabilitation, invasive species management, livestock management, sustainable agricultural rotations, and the reintroduction of species of conservation concern.

Archaeology and cultural heritage. During construction, TANAP discovered an additional 48 chance finds beyond the sites identified during the ESIA, resulting in a total of 154 found archaeological or cultural heritage sites. In addition to the archaeologists employed by TANAP, construction contractors engaged archaeologists at each lot in accordance with requirements in the bidding documents. After a chance find during construction, all work stopped until archaeologists and the relevant local museum authorities of the Turkish Ministry of Culture and Tourism arrived at the site to inspect it. To limit damage to chance finds, TANAP made rerouting decisions using Management of Change procedures and adjusted mitigation measures to include any new environmental or land acquisition impacts. When rerouting was not possible, TANAP hired a specialized company to carry out salvage excavations. These operations unearthed over 1,000 archaeological objects during construction. TANAP sent these valuable cultural finds to museums for display, dating, and further research. The Bandirma Museum opened a new exhibition hall for the sole purpose of displaying the findings from the TANAP project. TANAP released three books compiling the scientific articles published

Figure 6.3. Archaeological Finds and Publications Compiling Them, Published by TANAP



on the archaeological finds during the excavations (see figure 6.3). Among the most stunning chance find sites was the Alaybeyi archaeological site with artifacts dating from 4720 B.C. to 4553 B.C. (see box 6.1).

Worker camp management. Worker camps, if not well managed, can create a number of challenges, such as tensions with the surrounding communities and harm to the environment. The selection of locations for the eight TANAP worker camps was

based on an extensive assessment and stakeholder engagement. TANAP constructed the facilities at the majority of camps and provided safe, spacious, and comfortable dormitories, sanitary facilities, cafeterias, recreational areas, and medical facilities at

Box 6.6. Alaybeyi Archaeology Site

During excavations in Lot 1 near Erzurum province, the TANAP team discovered the Alaybeyi archaeological site, which is helping historians rewrite the history of the region. Excavations uncovered numerous tombs and tomb gifts alongside archaeological structures. Using carbon dating, the TANAP team, along with government and university archaeologists, dated the oldest settlement in Alaybeyi as 4720–4553 B.C., in the Chalcolithic Period, also known as the Copper Age.

By studying the bones discovered at the Alaybeyi site, archaeologists verified that this Mediterranean-type population lived on a carbohydrate-weighted diet. Some tooth diseases and *thalassemia* (Mediterranean anemia) were common. Findings show that the Alaybeyi Mound is the oldest known settlement in Northeast Anatolia. This discovery represents a significant contribution to the historical knowledge of burials, architectural remains, and the region's pottery techniques during that era.

In addition, the excavation offered a new perspective on the existence of a mother goddess cult in the Kura-Araxes culture, marking the transition from the Copper Age to the early Bronze Age in Eastern Anatolia. Tombs show that the Alaybeyi people were often buried with their horses, which is similar to Central Asian burial traditions.

During the excavations, over 1,000 artifacts were salvaged and transferred to Turkish museums, including oil lamps, coins, statues, mother goddess idols, tear bottles, daily use cups, kitchen cups, bronze artifacts, ornaments, and jewels. The photos on the right show an aerial view of the Alaybeyi excavations (top) and the excavated pottery from the Kura-Araxes culture (bottom).



each one. The worker camps provided accommodation facilities in line with IFC's and EBRD's Workers' Accommodation: Processes and Standards guidelines, considered international good practice. Communities had identified water scarcity as a potential issue at some of the designated worker camp locations. TANAP carried out groundwater sustainability assessments, factoring in the additional demand that could be placed on groundwater, surface water, and municipal water supplies as the camps would use these sources for daily consumption. When the assessment found that the water use by the worker camps could create water scarcity and interfere with the water usage of the local communities, TANAP organized water tankers to bring water from outside the immediate area of the camps. This prevented worker camp water consumption from negatively impacting local water usage. Each camp established a central waste accumulation area and separated hazardous, nonhazardous, and recyclable waste. Regular monitoring found that, in most cases, waste separation and disposal was conducted in an orderly manner during construction. TANAP contracted an environmental waste management firm to transport the different waste types to licensed areas for proper disposal.

On average, TANAP contractors used worker camp sites for three years. As part of the process for demobilizing the camps, TANAP conducted a camp closure impact assessment. It engaged

stakeholders surrounding each camp to understand their needs and to seek their feedback on how the camp sites could be used after pipeline construction. Some structures and fixtures in the camps, such as air conditioners, beds, and containers, were donated to local institutions or national state authorities that

expressed interest and need. Depending on the camp location, the facilities themselves were transferred to local municipalities, disaster response and preparedness agencies, and other local state authorities for use as training centers and other needs.



7. Stakeholder Engagement and Information Disclosure

KEY LESSONS

- The TANAP social team trained all TANAP workers on stakeholder engagement to unify messaging around TANAP's commitment to neighboring communities.
- TANAP maintained a robust information management system to track, analyze, and report stakeholder engagement and grievances.
- TANAP invested in sustainable local development through its Social and Environmental Investment Program.

Challenge. Building one of the world's longest pipelines was not merely a task of digging dirt and welding steel—it also required the effective management of one of the biggest news events in Türkiye in several years. Engaging with hundreds of thousands of stakeholders, tailoring messages and outreach activities to individual communities, and responding to incoming grievances created numerous challenges at various stages of the project.

Strong stakeholder engagement team. From the early stages of the environmental and social impact assessment, TANAP was committed to informing and engaging affected communities, the Turkish public at large, and other stakeholders on every aspect of the project, including decisions regarding the location of the right of way and worker camps

and the calculation of livelihood assistance. TANAP developed a Stakeholder Engagement Plan after engaging in an extensive and detailed stakeholder mapping. This engagement strategy emphasized the creation and maintenance of a constructive relationship with stakeholders at all levels by maintaining sufficient frequency of engagement while avoiding stakeholder fatigue. The TANAP social team invested significant time and effort in training all TANAP workers on stakeholder engagement. They conducted information campaigns and training sessions for all TANAP employees, the BOTAŞ land acquisition team, contractor personnel, and supervision engineer staff. This ensured their mutual understanding of TANAP's commitments to its stakeholders so they would convey the same

message when interacting with the public. Bidding documents required contractors to employ social experts and community liaison officers on site, with whom TANAP management worked in close coordination. The TANAP social team led and managed the overall stakeholder engagement process (see box 7.1). Contractors and supervision engineer staff understood the limits of their responsibilities for stakeholder engagement, and they referred the most formal engagement tasks to the TANAP social team. TANAP staff were responsible for reaching out to provincial governors rather than the contractors' community liaison officers. The careful delineation of roles and responsibilities and strong internal communications allowed the TANAP social staff to lead stakeholder engagement efforts while

Box 7.1. Women Talking with Women

Reaching out to and engaging with women often requires tailored efforts, especially in remote and rural locations where men dominate the public dialogue and engagement with authorities. TANAP management understood that proactive efforts were needed to reach out to women and make them feel comfortable about attending stakeholder engagement meetings. As a result, half of the community liaisons hired by TANAP to carry out consultations were women. Therefore, for every village consultation held at a local coffeeshop, there would also be a focus group with women held at a local home. The project team also reached out to women's civil society organizations in each of the 20 provinces that the pipeline crossed to listen to feedback about local women's issues and concerns about the project.

ensuring that all TANAP and contractor staff working along the pipeline could accurately communicate with stakeholders.

Stakeholder data management. During the stakeholder mapping, determination of land acquisition beneficiaries, and grievance management phases, TANAP collected a significant volume of stakeholder data, which needed to be recorded, summarized, analyzed, and reported. TANAP contracted a company to set up and customize a web-based data collection, management, and reporting system for the project. The database was accessible to and continuously updated by people at various levels and with differing privileges at TANAP and by its contractors. Most importantly, the social team analyzed and aggregated this data for monitoring, troubleshooting, and reporting. The database was a core element of TANAP's stakeholder engagement

and grievance management process. Moreover, TANAP took multiple measures to protect personal data by storing them on TANAP's private servers in accordance with Türkiye's privacy laws.

During the construction phase, TANAP received 5,266 complaints, 5,194 (98.6 percent) of which were resolved and closed. The five most common categories of grievances were: damage to land and crops (24 percent), damage to infrastructure or community assets (20 percent), improper soil reinstatement (19 percent), Resettlement Action Plan (RAP) Fund allocations (8 percent), and damage to other property (5 percent). TANAP developed a grievance management system with multiple submission channels, and it advertised the grievance procedure to the public, explaining the usual length of time users waited for acknowledgment and resolution of their grievances, its governing structure,

and the decision-making process. TANAP would accept grievances through a toll-free phone number, an online submission, in writing to the village headman, or in person to a contractor or TANAP employee. All grievances were then passed on to the relevant social staff and recorded in a database within two days. Grievances were evaluated within 10 days, with the aim of resolving them and informing the complainants within 30 days. If possible, TANAP sought to resolve all grievances at the level they were lodged. For example, a grievance about increased dust on someone's land during construction would preferably be resolved by the relevant contractor because the investigation, coordination of different actors, resolution, and reporting would generally occur at the local level at the site in question.

Grievance appeals committees. The World Bank recommended that TANAP establish a grievance appeals committee that aligned with international good practices for large infrastructure projects; management responded by developing a novel and innovative solution for the Turkish energy industry. TANAP created four committees of local experts who assumed active roles in resolving complaints when claimants and TANAP could not agree on a resolution. TANAP assembled these committees for the four construction lots of the pipeline, with different experts appropriate for the social and cultural characteristics of each lot. For example, in the eastern lot of the pipeline near Georgia, the livelihood expert

on the committee was an established beekeeper while in the lot bordering Greece, the expert was a member of the chamber of rice farmers. TANAP also selected reputable experts from local universities, institutes, and nongovernmental organizations. TANAP referred grievances to the appeals committees when they were not resolved at other levels, such as on site by social staff, at headquarters by the social team or management, or by the RAP Fund management evaluation committee. Twenty-five grievances were referred to appeals committees during the pipeline construction phase. In 75 percent of the cases, the complainants accepted their recommendations.

Social and Environmental Investment Program.

To develop a good relationship with surrounding communities and support community development projects along the pipeline route, TANAP launched the Social and Environmental Investment Program in 2015. This broadened the scope of TANAP's interventions from risk and impact mitigation measures targeted toward affected households to interventions that contributed to the economic and social development of local communities more broadly. Social priority areas included tourism services; rural educational and recreational facilities for youth; rural health services; vocational centers; and agricultural product diversification, including

the production of local artisanal products. Environmental priority areas included the sustainable management of natural resources, the development of renewable energy resources, the management of environmental infrastructure, the breeding of traditional medical and aromatic plants, and the protection of biodiversity and ecosystems. TANAP disbursed over \$51 million to over 1,000 projects for diverse needs through different mechanisms under the Social and Environmental Investment Program. This budget represents about 0.8 percent of the entire project cost of \$6.3 billion.

As a result of two calls for proposals, 850 grants were awarded to farmers, cooperatives, unions, municipalities, villages, schools, universities, and nongovernmental organizations that were directly or indirectly affected by the pipeline. With the Social and Environmental Investment Program, TANAP supported projects that involved:

- Access to education for children with autism and cerebral palsy;
- Organic poultry farming and beekeeping activities;
- Reforestation efforts;
- Procurement of ambulances for local health care facilities;
- Drinking water infrastructure;
- Small-scale irrigation and water facilities; and
- Solid waste management facilities.



8. Project Planning and Management

KEY LESSONS

- TANAP carefully selected construction companies through a competitive bidding process with proven specific engineering capabilities and technical expertise. At the onset of project planning, TANAP carried out a market analysis to understand the companies in the pipeline construction industry and to advertise the project globally.
- TANAP planned and constructed worker camps in parallel with principal contractor bidding, saving the project a construction season.
- Innovative sequencing of contracted work and careful monitoring achieved time savings at both the start and end of construction.

Challenge. If project design, procurement, and construction are not carefully managed, large infrastructure projects often risk costing more and experiencing delays in completing construction, which can cause problems for investors and project proponents. Despite TANAP's large scale and complexity, its management was able to implement the social and environmental protections analyzed in this case study and to deliver the project on time and on budget by using best practices in project management. From inception, the project followed rigorous contract, procurement, and contractor management modeled on international financial institution (IFI) requirements. During the project's lifespan, TANAP management integrated the recommendations of new stakeholders as they became

involved, reflecting its commitment to continuous improvement.

TANAP divided the project into two phases and four construction lots to distribute the risk and address the constraints of cost, time, and quality. Management planned a one-year gap between Phase 0 and Phase 1. Phase 0 pipeline construction contracts were divided into three lots of different lengths to evenly distribute geographic and topographic challenges. All bidders were requested to submit separate technical and commercial bids for each lot to foster the awarding of the most advantageous combination of contracts.

Prequalification process. Managing contractors for large projects involving numerous companies is challenging. A main concern among many project

sponsors is the hiring of qualified companies that can complete the work on schedule and within budget. Prior to the bidding process, TANAP carried out a market analysis to collect more in-depth information about the companies with the required technical capabilities. This study enabled TANAP to better understand market conditions and advertise the TANAP project to international contracting firms. TANAP then developed detailed and strict prequalification criteria designed to precisely execute the necessary works, including very specific requirements for technical expertise and human resources needed for the works. For example, one prequalification criterion was experience in constructing a 48-inch-diameter pipeline with a minimum length of 200 kilometers.

TANAP management placed announcements in national and international media for all construction contracts, including pipelines, stations, off-shore construction, and supervisory control and data acquisition (SCADA) implementation. The TANAP procurement team thoroughly checked the past experience of contractors. Moreover, information provided by interested companies during the prequalification phase was not taken at face value during the evaluation process. In addition, the bid evaluation process strongly emphasized contractors' engineering capabilities. These factors contributed to effective project management and the completion of complex construction works on time.

Site management. TANAP management appointed delivery managers as its principal representatives at each construction lot. Delivery managers monitored quality, health, safety, social, environmental, contractual, project control, construction, and engineering issues. By centralizing the management of all aspects at each site, TANAP facilitated the efficient management of site works and enabled the delivery of works on time.

Worker camp provision. The construction of worker camps for Phase 0 in Lots 1–3 occurred in parallel with the bidding of the construction contractors, saving the project considerable time. Once the bidding was complete, the contractors started work on the pipeline immediately after mobilization without having to construct worker camps themselves,

saving an entire construction season. Finally, the careful placement of worker camps allowed the contractors to start works in any of the sections on their assigned right of way.

Innovations in contract management. TANAP completed construction work on schedule thanks to innovative solutions from the earliest to the final stages of project management. It awarded early works contracts for ground preparation, fencing, access roads, camps, and stockyards/laydown areas, which allowed work to start on the main infrastructure soon after the awarding of contracts for Phase 0 pipeline construction, stations, and Telecom/SCADA. Toward the end of the project, continuous reviews revealed potential delays in pipeline backfilling operations. A detailed analysis determined that some

locations needed more equipment, while others had to revise the capacity of available equipment to match terrains and soil types. At some locations, materials from nearby quarries were brought in for backfilling.

Provisional acceptance requirements for contractors. TANAP closely monitored contractors' completion of punch items (a checklist of completed tasks necessary for the acceptance of work) to expedite the site handover to TANAP Operations. Management organized regular progress meetings and conducted site visits to monitor the closure of remaining punch items by the contractors, including the resolution of all social and environmental issues, in a safe and efficient manner prior to provisional acceptance.



9. Summary and Conclusion

KEY LESSONS

- This case study identified critical elements behind the successful implementation of a complex project, including a strong environmental and social management system (ESMS) supported by experienced personnel and financial resources; a comprehensive environmental and social impact assessment; the use of a Management of Change procedure; and robust stakeholder engagement throughout project preparation and implementation.
- TANAP established a strong ESMS to identify and manage risks to the environment, local communities, and worker health and safety. Strong support by management, dedicated financial resources, and highly skilled staff underpinned ESMS implementation.
- A comprehensive ESIA informed detailed mitigation measures and enabled TANAP to successfully apply the mitigation hierarchy, which led to biodiversity conservation and prevented the physical displacement of any households.
- The Management of Change procedure instituted by TANAP was effective at adaptive management during pipeline construction to respond and manage changes and unanticipated circumstances on the ground.
- A robust two-way stakeholder engagement program helped TANAP monitor and address impacts along the pipeline corridor and in local communities. TANAP moved beyond risk management to create sustainable environmental and social development opportunities.
- Environmental and social issues were integrated into the overall project design and project management, which generated environmental and social benefits beyond risk management.

This case study analyzed the many environmental, social, and technical risks faced by a large linear infrastructure project traversing radically diverse terrain. The first step with such a task is to learn about the physical, biological, cultural, and social facets of

the land, drawing on expertise spanning the various scientific and social disciplines. Moreover, management must be flexible and adaptable, as the nature and scope of anticipated risks may change during project implementation, continually presenting

project teams with new sets of challenges. Finally, as the public becomes more interested in this type of project and as implementation increases, sophisticated stakeholder engagement and a higher standard of corporate social responsibility is needed to

listen to and promote the well-being of workers and the welfare and development of affected populations. For TANAP, the following practices were key.

Environmental and social management system and talented team. TANAP's robust environmental and social management system was vital to identifying and managing risks to the environment, local communities, and worker health and safety. TANAP's ESMS was effective due to strong leadership, senior management support for environmental and social issues, and a highly skilled environmental and social technical staff with previous experience working on similar pipeline and/or large-scale infrastructure projects financed by international financial institutions. Further, ESMS implementation was supported with the necessary financial resources. Without these essential factors, TANAP's successful implementation would not have been possible.

A comprehensive environmental and social assessment. Rigorous site-specific baseline studies and community engagement allowed the TANAP team to understand different regional contexts across the pipeline. This helped inform and design context-specific mitigation measures in biodiversity preservation, soil management, worker and camp management, livelihood restoration measures, and grievance management. Using these baseline studies, TANAP applied a mitigation hierarchy to the route selection of the pipeline to avoid, minimize, mitigate, and offset environmental and social impacts. Land acquisition for the pipeline affected



over 115,000 landowners and 7,000 hectares of land, but absolutely no households were physically displaced due to the careful route selection process.

Environmental experts identified all terrestrial and freshwater habitats, protected and critical, as well as species of conservation concern along the pipeline corridor, and TANAP implemented area-specific actions to conserve biodiversity. Staff biologists and archaeologists made discoveries that led to published scientific research. At worker camps, TANAP managed site-specific risks at every stage. Extensive stakeholder engagement allowed for the selection of the most suitable camp locations, where water usage and waste disposal did not affect local communities. Stakeholder engagement also shaped camp closure plans and infrastructure and facility transfers to local administrations.

Adaptive management. TANAP demonstrated flexibility in adapting to changing circumstances and risks by responding to stakeholder feedback and with continuous internal and independent external

monitoring. On the ground, this flexibility resulted in adjustments to the pipeline route to prevent any physical resettlement, to preserve species of critical concern, and to avoid significant impacts to cultural heritage sites. TANAP completed all land acquisition and livelihood restoration activities on time and within budget and without any construction stoppage or delays. This was possible due to a strong team, a dedicated resettlement budget, systematic monitoring, and adaptive management to respond to evolving impacts and challenges.

TANAP's successful management of labor risks engaged third-party monitoring of working conditions at construction sites, providing all workers with fair and safe working conditions. When monitoring revealed some concerns, TANAP promptly designed and implemented remedial actions to resolve them.

Stakeholder engagement and community investment. TANAP's most innovative work involved the mitigation of the impacts of construction in terms of social management, going beyond the requirements of Turkish law and international lenders. A robust two-way stakeholder engagement program helped TANAP monitor impacts on the ground and respond in a timely manner. This dialogue with communities surrounding the pipeline right of way helped inform the restoration of agricultural land, the provision of employment opportunities and livelihood assistance, and many other matters. With careful attention to the needs of affected communities, management expanded the categories of disadvantaged and



vulnerable project-affected people who were eligible for livelihood assistance. TANAP social experts made special efforts to communicate with women in affected communities about both assistance and employment. The team also recruited local resident experts in their regions' agricultural and economic conditions to serve as members of expanded grievance appeals committees in each of the four project lots.

Finally, TANAP used its Social and Environmental Investment Program to help individual farmers and entire communities along the pipeline improve their standard of life, demonstrating a regional- and national-level commitment to building a productive long-term relationship with its neighbors. These

efforts comprehensively shifted the project's focus from environmental and social risk management to sustainable environmental and social development along the pipeline corridor. TANAP's environmental and social practices reflect its management's commitment to establishing a system with dedicated resources for adaptive risk management and continuous quality improvement. TANAP's efforts to integrate environmental and social performance into the overall project design and management contributed to the project's overall development impact. These lessons learned and applied practices can serve as a model for large infrastructure projects around the globe in and beyond the energy sector.

Endnotes

1. The World Bank's environmental and social safeguards operational policies were applied to the TANAP project. When the World Bank began its due diligence process, the Environmental and Social Impact Assessment (ESIA) report was already prepared for the project and approved by the national authorities. The tender processes for all major construction and procurement contracts were completed, and relevant contracts were already executed in accordance with TANAP's own rules and procedures. However, after detailed due diligence by the World Bank, its new risk-based procurement framework enabled financing for the project's goods, works, and other nonconsulting and consulting services. This case study also integrated lessons learned and findings from the *World Bank Implementation Completion Report: Europe and Central Asia—Trans-Anatolian Natural Gas Pipeline Project* (English). Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/982341644259185834/Europe-and-Central-Asia-Trans-Anatolian-Natural-Gas-Pipeline-Project>.
2. These are the main components of the technical infrastructure necessary for the delivery of gas to the network and end users. They maintain the flow and pressure of the natural gas and enable various sections of the pipeline to be isolated for inspection and maintenance.
3. The EUNIS habitat classification is a comprehensive pan-European system for habitat identification. The classification is hierarchical and covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine. The habitat types are identified by specific codes, names, and descriptions.
4. TANAP prepared the Biodiversity Offset Strategy in line with EBRD Performance Requirement 6 on *Biodiversity Conservation and Sustainable Management of Living Natural Resources*.
5. *Comprehensive List of Causes* is a methodology for the root-cause analysis of accidents and incidents, commonly used by the oil and gas industry.



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