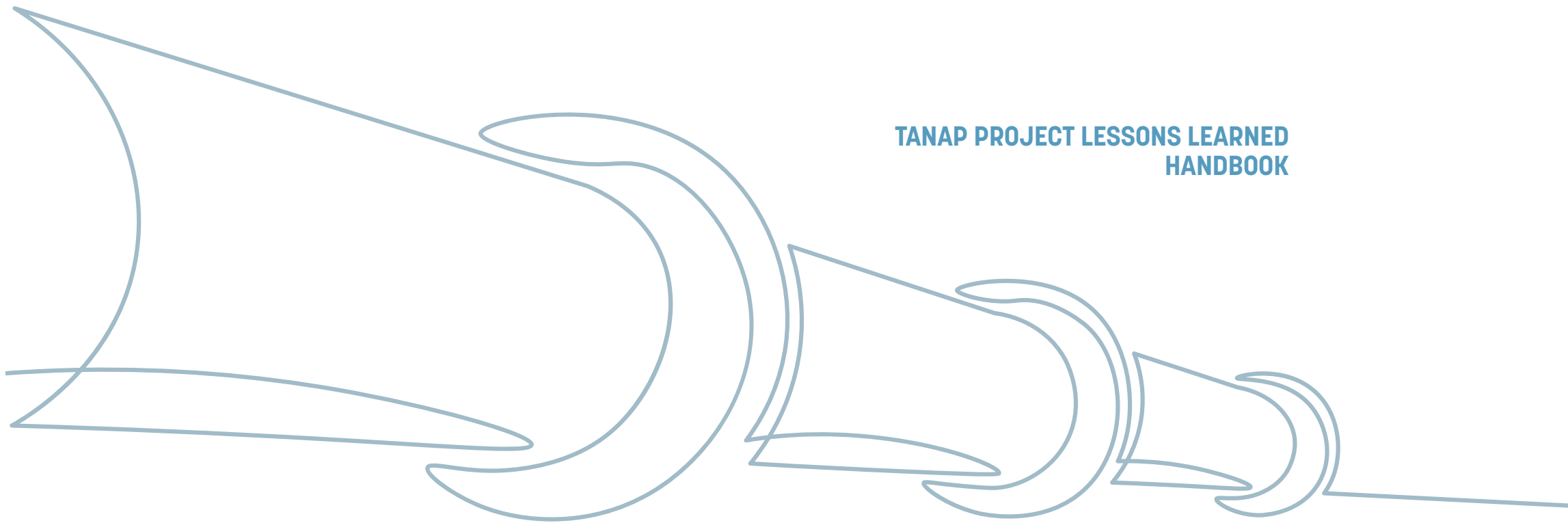


TANAP PROJECT LESSONS LEARNED HANDBOOK



TRANS ANATOLIAN NATURAL GAS PIPELINE PROJECT

**TANAP PROJECT LESSONS LEARNED
HANDBOOK**





■ Rövnag ABDULLAYEV



Dear Colleagues,

We are honored and delighted to have successfully completed Trans-Anatolian Natural Gas Pipeline Project (TANAP) – a highly challenging mega project that will be the most critical part of the Southern Gas Corridor. TANAP aims not only to boost the energy security of Turkey and Europe, but also to contribute to the region by bringing Azerbaijan, Turkey and the European Union closer, and by reshaping the geopolitical global energy map. TANAP is a unique and highly successful project, not to mention the longest and largest-diameter natural gas pipeline in Turkey, the Middle East and Europe.

The TANAP Project is also an excellent example of effective project management in the sector considering its scale and the complexities involved, such as the diverse geographical conditions, seasonal variations, constructability and different interfaces that can be counted among the many challenges faced. The project has been completed by fully matching the specified quality standards and specifications with the project schedule, and under the initial estimated budget.

Throughout the entire TANAP project, the people and the environment were our main priorities, and it is a delight to see that in light of the project objectives, budget and achieved standards, the project has been completed successfully to the highest satisfaction of all those involved. Consequently, the TANAP project team has gained the complete trust of all the stakeholders through its constancy, integrity and ethical business practices.

In recognition of our hard work and dedication, it was with great pleasure that we were granted many prestigious international awards, including the “2020 Project of the Year” by PMI Institute.

On behalf of the TANAP Board of Directors, I would like to express my gratitude and congratulations to the TANAP team for their great devotion and commitment to the realization of the project in line with our clear business values.

Sincerely,

Rövnag ABDULLAYEV

Chairman of the Board of Directors



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■ ABBREVIATIONS

AIMS	<i>Asset Integrity Management System</i>	LRE	<i>Land Right Entity</i>
AUT	<i>Automatic Ultrasonic Testing</i>	LRP	<i>Livelihood Restoration Plan</i>
BAFO	<i>Best and Final Offer</i>	LTJ	<i>Lost Time Injury</i>
BTC	<i>Baku-Tbilisi-Ceyhan Pipeline</i>	MCC	<i>Main Control Center</i>
BVS	<i>Block Valve Station</i>	NDT	<i>Non-Destructive Tests</i>
CAMS	<i>Competency Assurance Management System</i>	NGO	<i>Non-Governmental Organizations</i>
CFA	<i>Consultancy Framework Agreement</i>	O&M	<i>Operations and Maintenance</i>
CMMS	<i>Computerized Maintenance Management System</i>	OPLC	<i>Onshore Pipeline Construction Contractor</i>
CMT	<i>Completions Management Tool</i>	PA	<i>Provisional Acceptance</i>
CoD	<i>Commercial Operations Date</i>	PAP	<i>Pipeline-Affected Parties</i>
CTO	<i>Chief Technical Officer</i>	PMS	<i>Pipeline Monitoring System</i>
DMS	<i>Document Management System</i>	PTW	<i>Permit to Work</i>
DVR	<i>Division of Responsibility</i>	RoW	<i>Right of Way</i>
ECA	<i>Engineering Critical Assessment</i>	RT	<i>Radiographic Testing</i>
EPCM	<i>Engineering Procurement Construction Management</i>	RTA	<i>Road Traffic Accident</i>
ESIA	<i>Environmental and Social Impact Assessment</i>	SCC	<i>Station Construction Contractor</i>
FAT	<i>Factory Acceptance Test</i>	SEIP	<i>Social and Environmental Investment Program</i>
FEED	<i>Front-end Engineering Design</i>	SSI	<i>Social Security Institution</i>
HSE	<i>Health and Safety, Environmental</i>	SOB	<i>Safety Observations</i>
ICSS	<i>Integrated Control and Safety Systems</i>	TCC	<i>TANAP Contracts Committee</i>
IFI	<i>International Financial Institution</i>	ToR	<i>Terms of Reference</i>
IPMT	<i>Integrated Project Management Team</i>	TRI	<i>Total Recordable Injuries</i>
KPI	<i>Key Performance Indicator</i>	TSC	<i>Telecom/SCADA Contractor</i>
LD	<i>Liquidated Damage</i>	WP	<i>Worley Parsons</i>
LLI	<i>Long Lead Item</i>		

An aerial photograph of a vast, flat, brown landscape, likely a dry lake bed or a desert. The terrain is characterized by horizontal bands of different shades of brown and tan, suggesting varying soil compositions or perhaps a dried-up body of water. A dark, straight line, possibly a road or a canal, runs diagonally from the bottom right towards the center. The sky is a clear, pale blue. On the left side of the image, there is a large, semi-transparent blue rectangle that partially obscures the landscape. The word "TANAP" is written in white, bold, sans-serif capital letters within this blue rectangle.

TANAP



THE TRANS-ANATOLIAN NATURAL GAS PIPELINE PROJECT (TANAP)

■ ABOUT TANAP

The Trans-Anatolian Natural Gas Pipeline (TANAP) Project is among the most crucial and successful cooperation projects conducted by Turkey and Azerbaijan to date in the field of energy. The project further underlines the historical bonds of brotherhood between the two countries and the “One Nation Two States” spirit, and can be considered the signature of the two countries, Turkey and Azerbaijan, on Anatolia.

The Trans-Anatolian Natural Gas Pipeline (TANAP) constitutes the foundation of the 3,500-kilometer energy corridor that runs from Azerbaijan to Europe. TANAP is the most important component of the Southern Gas Corridor (comprising three pipelines: The South Caucasus Pipeline (SCP), TANAP and the Trans-Adriatic Pipeline (TAP), and not only enhances the energy security of Turkey and Europe, but also contributes to peace and stability in the region by bringing the Caspian region, Turkey and the EU closer together. It also has potential for expansion through the corridors it creates to all other natural gas-producer countries in the region, effectively reshaping the global geopolitical energy map.

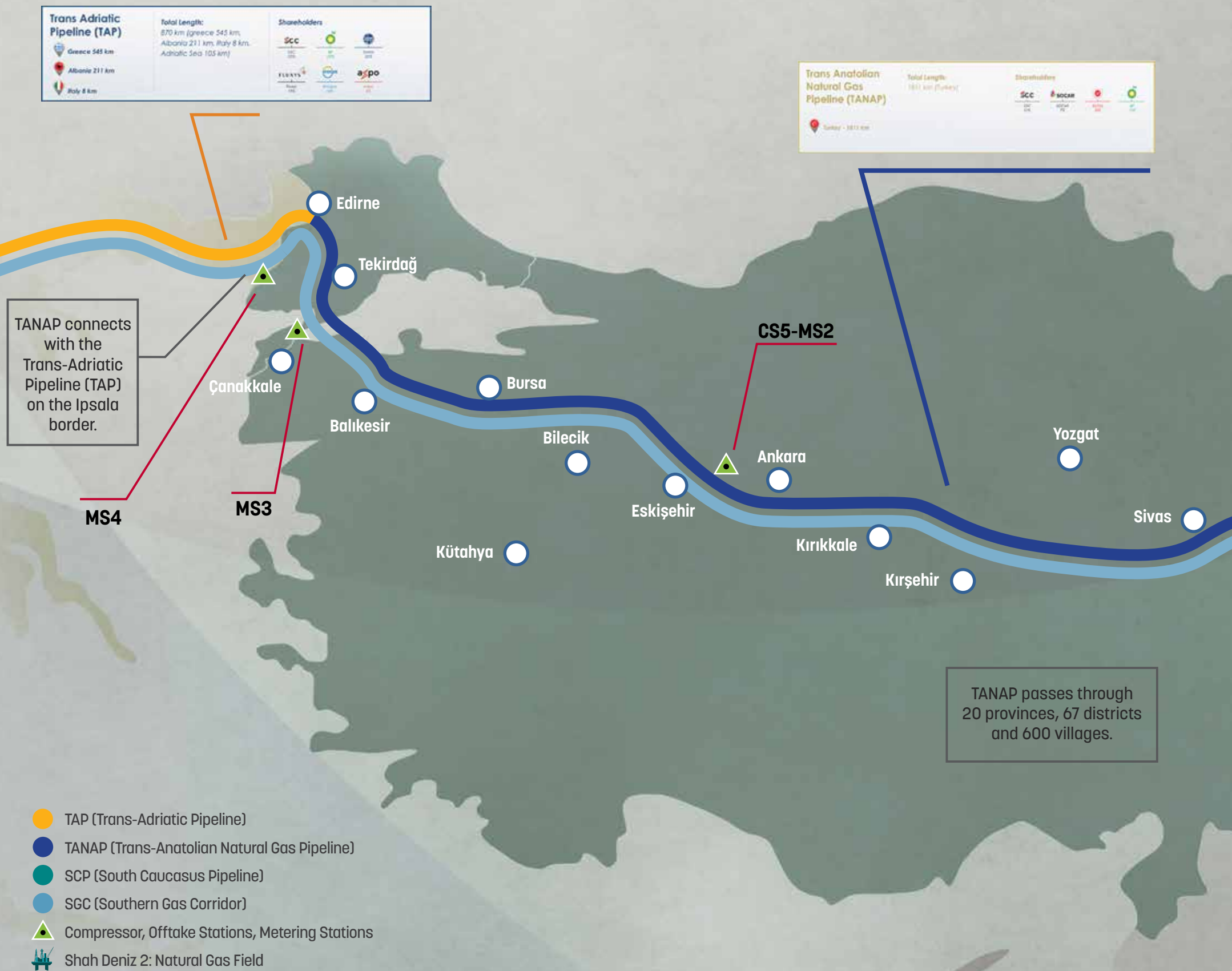
■ HISTORY OF THE TANAP PROJECT

The “Intergovernmental Agreement between the Government of the Republic of Turkey and the Government of the Republic of Azerbaijan on the Trans-Anatolian Natural Gas Pipeline System”, and its attached “Host Government Agreement”, signed on June 26, 2012 in Istanbul constitute the legal basis of the project. The Host Government Agreement was amended and re-signed on May 26, 2014 and was approved by the Turkish Parliament on September 10, 2014 as revised.

The groundbreaking ceremony, marking the start of construction of the pipeline, was held in Kars on March 17, 2015.









TANAP PROJECT SCOPE

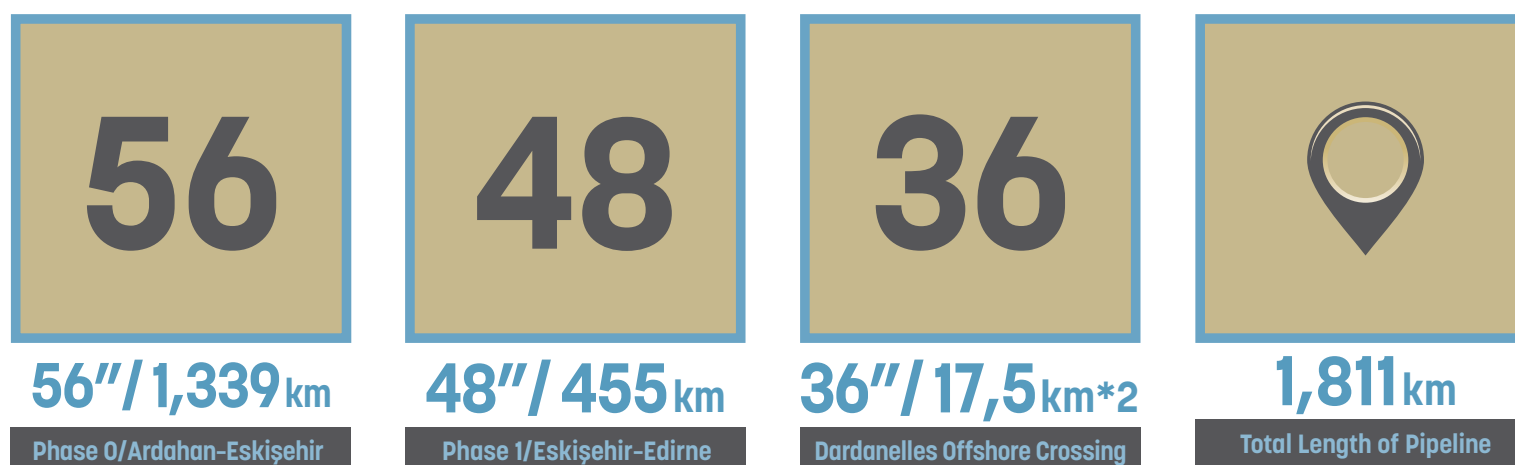
TANAP starts from the Turkish village of Türkgözü in the Posof district of Ardahan on the border with Georgia, and runs subsequently through 20 Turkish provinces, including Kars, Erzurum, Erzincan, Bayburt, Gümüşhane, Giresun, Sivas, Yozgat, Kırşehir, Kırıkkale, Ankara, Eskişehir, Bilecik, Kütahya, Bursa, Balıkesir, Çanakkale, Tekirdağ and Edirne. After meeting the Greek border in the İpsala district of Edirne, it connects to the TAP Pipeline which will convey the natural gas to Europe.

There are two off-take stations within Turkey where TANAP is connected to the national grid - one in Eskişehir and the other in Trakya. TANAP comprises approximately 1,811 km of pipeline and a number of above-ground installations, details of which are given below:

- 4 Metering Stations (2 Stations connecting to the natural gas network of Turkey and 1 connecting to the natural gas network of Europe)
- 2 Compressor Stations (the number of compressor stations will be increased to 7 once capacity is increased to 31 bcm)
- 11 Pigging Stations
- 49 Block Valve Stations

The entire pipeline system, aside from the above-ground installations, has been designed to be buried. The pipe diameter running from the Georgian border to Eskişehir is 56", where it reduces to 48" for the section running to the Greek border. The Dardanelles Offshore Pipeline Crossing consists of a twin pipeline system with a diameter of 36".

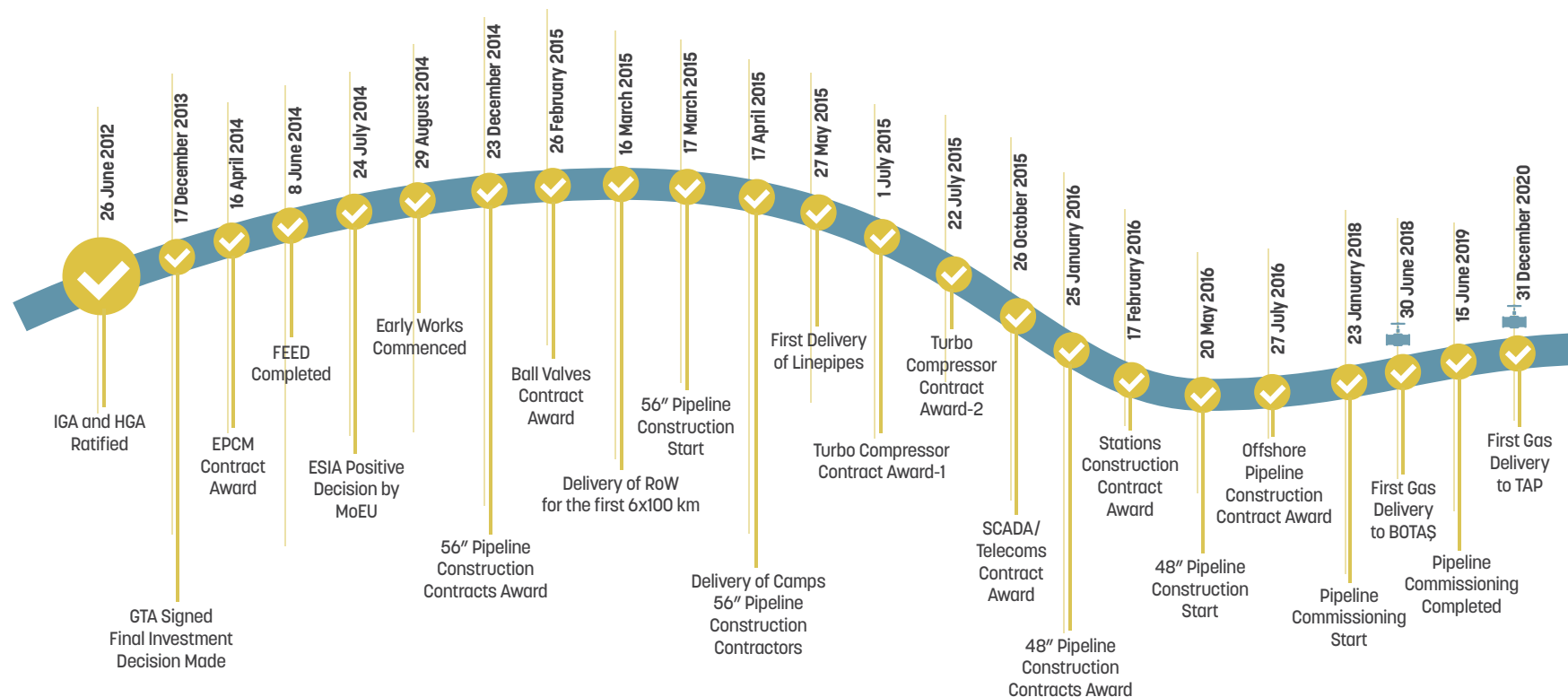
An initial amount of 16 billion cubic meters of natural gas is being transported, of which 6 billion cubic meters is being utilized in Turkey. The pipeline diameter has been selected to allow the capacity of the TANAP System to be increased to 31 bcm through the installation of additional units at the existing stations and/or the construction of new compressor stations at predefined locations.



TANAP PROJECT MAJOR MILESTONES

The inauguration ceremony for Phase 0 of the TANAP Project, covering the leg between Ardahan and Eskişehir, was held on June 12, 2018 at the CS5-MS2 site in the province of Eskişehir, and the commercial supply of gas to Turkey as part of Phase 0 has been continuing since June 30, 2018.

The inauguration ceremony for Phase 1 (European connection) of the Project, extending from Eskişehir to Edirne-İpsala, was held on November 30, 2019 at the MS4 site of TANAP in Edirne/İpsala, Turkey. Commercial operations enabling gas supply to Europe under Phase 1 of the Project commenced on December 31, 2020.







TANAP IN FIGURES



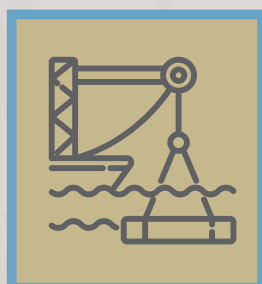
Highest Point on P/L:
2,760 m
KP 621 (Red Mountain)



Longest river crossing
by HDD in Europe:
1,107 m
(Sakarya River)



No of
correspondences
made:
168,850



Time for 2x36" (35 km)
offshore pipe laying,
incl. above water tie-ins:
51 days



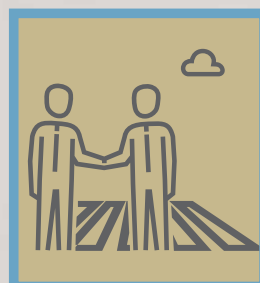
No of pipes welded
131,620
(1.31 M tons)



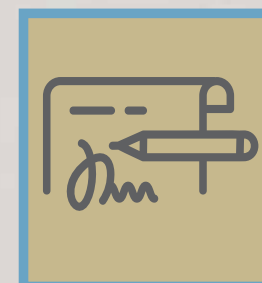
Steepest Slope:
30° KP 14
(Ilgar Mountain)



No. of permits
obtained
7,368



No of landowners:
115,466



No of land entry
protocols signed:
21,759



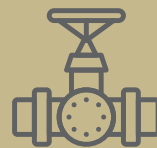
Deepest Point on P/L:
- 67.5 m
(Dardanelles)



No of crossings appr.:
7,000



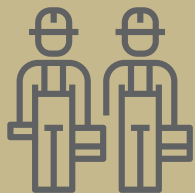
Total length of
56" P/L section
laid in
one month: **120 km**



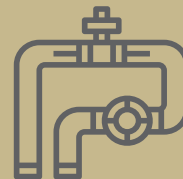
Time between first pipe
weld in Phase 0 and linefill
(1,339 km 56" dia.) P/L:
887 days



Most **36"**
offshore pipe joints
welded in one day:
136 joints
(1,670 m/day)



Man/hours worked:
115,365,753



No of **56"**
pipe joints welded in
one day by one welding team:
145 joints (2,000 m/day)



No of documents
produced:
229,790



Volume of soil excavated
50,908,400 m³



Longest **56"**
P/L section laid in
one day: **10km**



No of acquired
land parcels:
21,242 private
7,701 public

AWARDS





Project of the Year Award

TANAP received the “Project of the Year” award on October 20, 2020 from the Project Management Institute (PMI), which supports the development and implementation of professional standards in project, program and portfolio management. The “Project of the Year” award was given in recognition of TANAP’s excellent project management, and the delivery of the Project on time and under budget, with focus on safety and quality, as well as the social, economic and cultural values that were promoted throughout the project, meeting in full the PMI project management standards.

Communitas Award

In early April 2019, TANAP’s social and environmental initiatives, were recognized with a “Communitas Award” in the category of “Leadership in Community Service and Corporate Social Responsibility” for its exemplary efforts in giving back to the communities along the Pipeline route. A worldwide prestigious award that recognizes companies that bring benefit to local communities, Communitas Awards were given to a total of 15 companies in 2019 – 11 in the United States and four in the rest of the world.

International CSR Excellence Award

Following the Communitas Award, TANAP won a prestigious “International CSR Excellence Award” in the “Sustainability” category, receiving the award at a ceremony held at the Royal Academy of Dramatic Art (RADA) on July 22, 2019 in recognition of its investments and the development projects implemented along its route. The International CSR Excellence Awards are presented to conscientious companies that use their privileged position to help their colleagues, communities, customers, suppliers, the environment and the less fortunate. The award program, owned and operated by the Green Organisation, which has a worldwide reputation and with its independent jury, assesses the most successful projects in the area of public service. TANAP was invited to the CSR World Leaders Ceremony as a “CSR World Leader” on November 25, 2019 in the Houses of Parliament, Palace of Westminster, London.

The Green World Awards

In further recognition of its efforts, TANAP received an international Green World Award in August 2019 from The Green Organisation, UK in the “Best Environmental Practice” category for the various initiatives and achievements related to the environment conducted during the course of the Project, winning the award ahead of more than 500 other nominations. The Green World Awards are one of the world’s most prestigious recognition campaigns, assessing and rewarding the endeavors of commerce, industry and governments that have a beneficial impact on the environment and that improve sustainability. The presentation ceremony was held in Vietnam on September 30, 2019. Furthermore, TANAP, as a “Green World Ambassador” (helping others to help the environment), was invited to another prestigious ceremony in the Houses of Parliament, Palace of Westminster, London, on November 25, 2019 where it was presented with a trophy and certificate honoring its achievements.

IBA (International Business Awards)

TANAP received “The Stevie® Award” in the category of “Corporate Social Responsibility Program of the Year – in Europe” in August 2019. Honoring and generating public recognition of the achievements and positive contributions of organizations and working professionals worldwide, the Stevie® Awards are the world’s premier business awards, with recipients being selected by a panel of judges that includes many of the world’s most respected executives, entrepreneurs, innovators and business educators.

PR Daily’s Corporate Social Responsibility Awards

Adding to its achievements, TANAP was recognized with a reputable “PR Daily’s Corporate Social Responsibility Award” in the category of “Community Affairs” in late August 2019. The PR Daily Award Program celebrates the most successful campaigns, initiatives and teams working in the communication, PR and marketing sectors. The US-based PR Daily’s Corporate Social Responsibility Awards reward communicators, teams and agencies who create and cultivate best practices, and who know how to deliver powerful messages about how their organizations – or the organizations they represent – are doing their part to make the world a better place.



European Excellence Awards

In another achievement in recognition of the exemplary social and environmental practices it has conducted along its route, on November 29, 2019 TANAP was granted a reputable "European Excellence Award" in the category of "Turkey". The European Excellence Awards, which are hosted by Quadriga - a Berlin-based knowledge hub of excellence in education, information, networking and business IT solutions - honor outstanding performances in the field of PR and communications. With in-depth categories that cover everything from internal communications to public relations, the Awards open a window onto the most exceptional examples of this field in Europe.

The Peer Awards for Excellence

TANAP was handed a double award by the UK-based "Peer Awards" in early 2020 in the categories of "Corporate Responsibility" and "Corporate Responsibility - Practical Community Projects". The Peer Awards recognize those who deliver great business value and transformational impacts through their innovations and implementations, serving as a powerful platform for the showcasing of interesting projects and for the sharing of best practices with one's peers, who may be hugely inspired by being able to learn from one another.

GBO Awards 2020 (Global Business Outlook)

TANAP was honored in July 2020 with the "Company of the Year - Turkey 2020" award, granted by the UK-based publication "Global Business Outlook", which is dedicated to providing an overview of the vital industrial sectors and developments in the business world.

World Commerce & Contracting, Innovation and Excellence Awards

The most recent achievement of TANAP, in December 2020, was its receipt of an "EMEA - Delivering Social and Economic Benefit Award" and a "Global - Delivering Social and Economic Benefit Award" by the US-based "World Commerce & Contracting, Innovation and Excellence Awards", which recognize organizations who engage in initiatives that deliver meaningful change and impact, and that achieve the highest standards in the field of commercial and contract management.



LESSONS LEARNED





- The TANAP Mega Project is the centerpiece of the Southern Gas Corridor - a priority project for the EU that envisages the transportation of gas from the Caspian Sea through Georgia and Turkey to Europe.

The TANAP Project, with its initial CAPEX estimate of USD 11.7 billion, is one of the longest and largest diameter gas pipelines ever built in Turkey, all the facilities of which were constructed in a very difficult terrain in a very short period of time. The schedule-driven project had to be delivered in two phases, and great a vast majority of the work had to be completed in just three construction seasons.

There were 31 different packages of Client Supplied Materials with a total cost of USD 1.6 billion, including 1.2 million tons of line pipe and pipe bends, more than 1,000 different types and sizes of valves/6 turbo compressor units 4 main metering systems, 5,552 km of fiber optic cable, auxiliary systems, etc., all of which had to be procured and delivered to the Construction Contractors on time by TANAP.



TANAP LESSONS LEARNED WORKSHOP



Despite its large scope and deep complexities, the TANAP Project was able to be delivered on time and under budget through the application of international project management standards, different methods/techniques and an effective change management system, in which focus was on safety and quality, as well as social, economic and cultural values.

Leading companies in the engineering and construction field took part in the project stages of TANAP, in which highquality engineering, designs, materials and construction methods were applied. The contracts signed with vendors, contractors and service companies made a considerable contribution to markets. An analysis of the Final Contract prices, the payments made to companies operating in Turkey during the TANAP project investment period contributed approximately 50% of added value to the domestic market.

Also, respect for the environment, society and humanity were fundamental principles followed in the TANAP Project, and all activities were carried out according to the principles of transparency and accountability. The Project supported the socio-economic development of the local population, and contributed to sustainable development, while also providing concrete benefits through its efforts to preserve biodiversity and cultural heritage along the entirety of its route.

During the construction stage of the TANAP Project, approximately 15,000 employment opportunities were created, providing decent working conditions and labor rights to employees in line with national labor legislation and best international practices. Early in the Project design, a local skills analysis study was conducted to assess the local workforce and the availability of specific skills to meet the needs of the Project. After an assessment of the results of the study, people from local communities were employed primarily in unskilled and semi-skilled roles, while women from the local communities worked in the workers' camps as catering and maintenance housekeeping staff.

Following the completion of the Project, our goal was to bring all the lessons learned during the project lifecycle together, and to share these unique and valuable findings with all the stakeholders, and make them available for the use of any future projects. For this purpose, a multidisciplinary workshop was held on October 31, 2019 involving separate sessions for each Project stage, such as Pre-FEED, FEED, Detailed Engineering, Procurement, Construction and Commissioning, during which detailed discussions were held and experiences/ findings were listed. During the TANAP Lessons Learned Workshop, not only positive findings, but also areas for potential improvement were captured and recorded for the TANAP Lessons Learned Register. We give special thanks to all of the stakeholders who contributed to the success of this program, and express our pleasure at being able to share the TANAP Lessons Learned.





TANAP LESSONS LEARNED WORKSHOP



ID 1

Contractor Selection Methods

Process / Discipline
Contracts and Claim

Project Phase
Phases 0 and 1

Type
Well

Brief Description of the Issue

A “Horses for Courses” approach was adopted during the Project Contractor Selection Process.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The development of well-elaborated and carefully planned assessment criteria considering the specific technical and geographical challenges led to the selection of the most suitable contractor for each part of the project. While deciding upon the pre-qualification criteria and the process, the benefits of experience gained in previous similar Projects were promoted. Accordingly, much stricter selection criteria were applied, supported by certain knock-out criteria prior to the scoring exercise. Hence if any applicant failed to meet any of the pre-defined knock-out criteria, no further scoring exercise was implemented for that applicant. To provide clarity and to demonstrate the differences in the applied approach, the following examples are given:

- In many of the prequalification processes applied in similar projects, experience in pipeline construction is sought and scored. However, considering that TANAP is a large diameter pipeline (mainly 56”) featuring lengthy sections (or lots), a knock-out criterion was defined for experience in the construction of pipelines in 42” diameter or above for a length of at least 200 kms. Hence, greater confidence was obtained in the management of the difficulties associated with the welding and laying of 56” pipelines when compared to those of smaller diameters.

- Similarly, in the stations prequalification package, instead of simply qualifying the applicants based on past experience in industrial or above-ground projects, the applicants’ past project details were checked one-by-one and compared with the complexity of the TANAP

stations, including the power criteria. Through this approach, applicants with past experience in only one industrial project with a low established power when compared to TANAP were eliminated before scoring, leaving the applicants with sufficient experience for scoring.

- In addition to the construction and commissioning capabilities of the construction contractors, their engineering and procurement capabilities were also subjected to in-depth analysis, considering that these two areas are usually the weakest links in the structures of construction contractors. The construction engineering aspect of projects and the related procurement activities are frequently underestimated in projects similar to TANAP, where the client conducts the detailed design and free issues the long lead items. Apparently, such misinterpretations were correctly managed in TANAP upon early recognition of the engineering and procurement workload over the contractors.

Considering all of the above, Contractors with the necessary qualifications were carefully selected by evaluation committees of personnel with deep experience in their respective disciplines, who were then reviewed and approved by the Shareholders.



Metering Station 1 Posof / Ardahan

ID 2

Unique Contract Management

Process / Discipline
Contracts and Claim

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Bespoke contracts were used to ensure a better Project Contract Management Process.

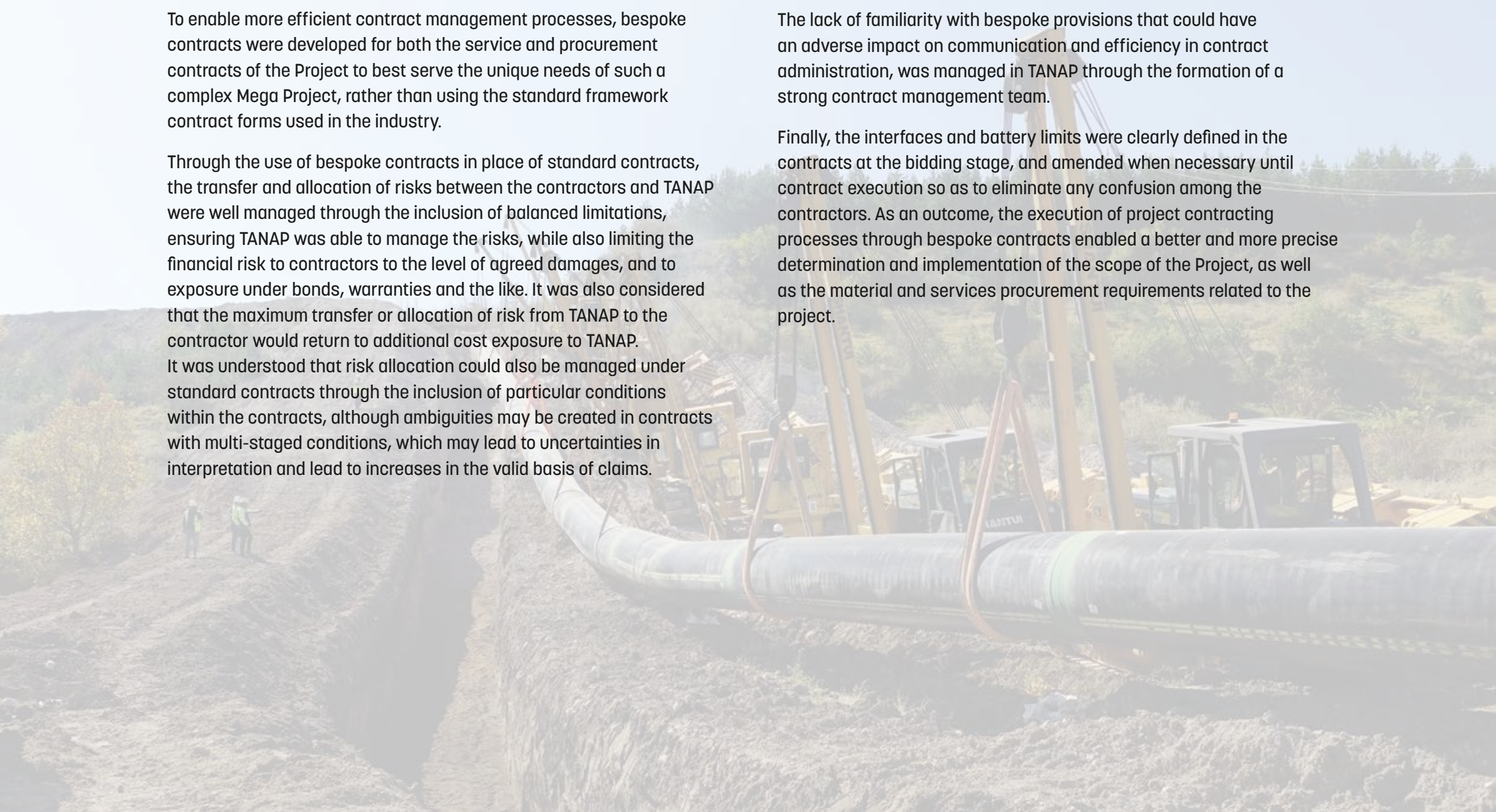
Lessons Learned and Actions Taken / Measures / Improvement Opportunities

To enable more efficient contract management processes, bespoke contracts were developed for both the service and procurement contracts of the Project to best serve the unique needs of such a complex Mega Project, rather than using the standard framework contract forms used in the industry.

Through the use of bespoke contracts in place of standard contracts, the transfer and allocation of risks between the contractors and TANAP were well managed through the inclusion of balanced limitations, ensuring TANAP was able to manage the risks, while also limiting the financial risk to contractors to the level of agreed damages, and to exposure under bonds, warranties and the like. It was also considered that the maximum transfer or allocation of risk from TANAP to the contractor would return to additional cost exposure to TANAP. It was understood that risk allocation could also be managed under standard contracts through the inclusion of particular conditions within the contracts, although ambiguities may be created in contracts with multi-staged conditions, which may lead to uncertainties in interpretation and lead to increases in the valid basis of claims.

The lack of familiarity with bespoke provisions that could have an adverse impact on communication and efficiency in contract administration, was managed in TANAP through the formation of a strong contract management team.

Finally, the interfaces and battery limits were clearly defined in the contracts at the bidding stage, and amended when necessary until contract execution so as to eliminate any confusion among the contractors. As an outcome, the execution of project contracting processes through bespoke contracts enabled a better and more precise determination and implementation of the scope of the Project, as well as the material and services procurement requirements related to the project.



ID 3

Bonus Scheme

Process / Discipline
Contracts and Claim**Project Phase**
Phases 0 and 1**Type**
Well**Brief Description of the Issue**

A Bonus Scheme was introduced to Construction Contractors to motivate them to achieve Key Mechanical Completion Milestones on time and/or earlier than the Contractual Date

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The Contractors were entitled to bonus payments, calculated based on the specific percentages in the original Contract price if they achieved Key Milestones before the contractual completion dates. In order to be entitled to such bonuses, and ultimately, to meet the Project targets, the Contractors were encouraged to review and revise their construction schedule by mitigating inefficiencies and delays, as well as by increasing their equipment and workforce. The Bonus Scheme was introduced following a detailed cost-benefit analysis by the Project Management Team, and led to a minimization of schedule risk, enhanced project planning and prompt project completion.

The Bonus Scheme motivated the Construction Contractors to take the necessary actions to meet the interim key contractual milestone dates, with the ultimate goal of achieving Mechanical Completion milestone on or earlier than the contracted dates. In cases where the key milestones were achieved early, but Mechanical Completion was not achieved on time, no bonus payments were made.

The Bonus Scheme proved to be an effective approach to the motivation of Contractors to achieve their contractual targets through the provision of additional resources and improvements in efficiency in a schedule-driven project like TANAP.



ID 4

Delay Liquidated
Damage Philosophy

Process / Discipline
Contracts and Claim

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

A Delay Liquidated Damage (LD) philosophy applied not only for the final, but also for the interim milestones.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The strict use of delay liquidated damages when Contractors failed to meet their Key Contractual Milestones was one approach to ensuring the timely completion of the Project.

The applied LD amount was withheld from the Contractor’s payments, but if the Contractor achieved their next key milestone in accordance with Contractual targeted dates, the LD amounts that had previously been withheld were released to the Contractor.

Unlike typical contract management philosophies, more detailed milestones and LD mechanisms were put in place to manage and monitor Contractor performance involving the application of interim milestones, which served as an auto control for the Contractors and ensured the achievement of both interim and ultimate goals.

It is important to include delay LD provisions in contracts, although such provisions should not only penalize the Contractors, but should also motivate them to achieve their interim and final contractual milestones.

ID 5

Effective and Constructive Claim Evaluation

Process / Discipline
Contracts and Claim

Project Phase
Phases 0

Type
Well



Brief Description of the Issue

The Construction Contractor's claims were evaluated and settled during the project execution process rather than leaving them until the contract close-out.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

All Construction Contractors claims were evaluated and settled during the project execution phase. To accelerate and accurately assess the Contractor's claims, detailed assessments were performed by the relevant departments and the results were submitted to the TANAP Higher Claim Evaluation Committee for review and endorsement. This committee was chaired by the TANAP CTO and included multi-disciplinary Senior Managers who independently reviewed the claims and the assessments of the relevant TANAP departments.

This enabled the timely resolution of claims and avoided unnecessary disputes between parties. The Contractors were thus motivated, and were able to concentrate on the delivery of their contractual responsibilities rather than being confrontational with the Client.

Assessing Contractors' claims during the contract execution process serves to prevent confrontations between parties, and motivates Contractors to achieve their contractual obligations.



ID 6

Agile Project Leadership

Process / Discipline

Overall Project Management

Project Phase

Phases 0 and 1

Type

Well

**Brief Description of the Issue**

An agile project management approach was implemented during the project lifecycle, and was continuously communicated with the Project Stakeholders.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

For large and complex projects of the scale of TANAP it is essential for the Project Management Team to adopt an agile leadership approach, i.e. to receive and assess feedback, and to develop/revise/implement plans for the best outcome. The TANAP Project Management Team continuously promoted and implemented such an approach and took incremental steps toward the completion of the project while keeping the ultimate goal of the project in mind.

Site Delivery Managers were assigned to monitor the Contactors' works closely and provide continuous feedback to the Project Management Team. Based on such inputs, incremental steps were planned and

implemented to speed up progress, while keeping the ultimate project goals unchanged. Maintaining active lines of communication between project parties allowed rapid decision-making involving the weighing-up of the available options and choosing the best course of action for the project. TANAP was one of the first Projects to implement an agile project management approach, the popularity of which has been increasing since 2018/2019.

It is vital to implement iterative work planning, which is based in principle on monitoring progress, analyzing delays and challenging activities, as well as revising implementation plans.

ID 7

Effective Stakeholder Management

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Effective stakeholder management was conducted with all Project Stakeholders throughout the Project Lifecycle.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Maintaining effective and continuous communication lines with the Key Stakeholders enabled the more swift evaluation and endorsement of new plans and/or changes developed to resolve the challenges encountered during the Project lifecycle. Many platforms were established to ensure effective communication with the Pipeline Affected Parties, Project Stakeholders, Shareholders, Shippers, International Financial Institutions (IFIs), etc.

In all processes within the Project, including those related to land acquisition, TANAP adopted a strategic and structured approach to stakeholder relations with the aim of establishing and maintaining constructive relations with all stakeholders. A Stakeholder Engagement Plan was developed that explained in detail the interaction between TANAP and Stakeholders. TANAP consulted the relevant public institutions along the route of the pipeline, organized public engagement meetings on a district basis, and held consultation and dissemination meetings with national and international NGOs in order to inform interested parties and other stakeholders that may be affected by the project, and to ensure their engagement in the project.

The TANAP Project leadership and management methodology were based on close interaction among the Project Team and TANAP Shareholders via mutual practical and effective platforms for the review of project activities and decisions with the Shareholders and such key partners as the TANAP Technical Advisory Committee, the Audit Committee, the Finance Committee and the Contract Committee that were established by TANAP, and the Shareholder representatives established pursuant to the TANAP Shareholders Agreement. Efficient and regular communications were maintained with the Shareholders to benefit from their valuable experience, and as a consequence, new plans and/or changes in concerns that occurred during the Project lifecycle were able to be discussed and evaluated swiftly, and could thus be addressed by the Project Team in a timely manner.

Effective stakeholder management planning should be carried out in the initial phase of the project, being one of the most critical factors contributing to success in a project.





Akdere Yaylası / Kars

ID 8

Special Platforms for Contractual Decisions

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue
TANAP Contracts Committee (TCC), the members of which are appointed by the Shareholders, was established to discuss and make decisions that will have contractual impacts on the TANAP Stakeholders.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

In addition to the TANAP internal review processes, any contracts exceeding certain budget limits were subject to review and endorsement by the TCC, established in line with the TANAP Shareholders Agreement. This additional process ensured oversight and endorsement, and while it brought benefits to evaluation and control, it also had an adverse effect on the Project bid schedule. The time required for such additional Stakeholder review and endorsement stages should be taken into account during the bidding process.

The amount of contractual and/or change limits subject to review and endorsement of the Shareholders Committees should be defined as a proportion of the overall project budget to expedite an approval processes.

ID 9

Project Management Structure

Process / Discipline

Overall Project Management

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

Change in Project Management Philosophy by integrating the EPCM resources into an Integrated Project Management Team (IPMT), under the management of the TANAP Project Management Team.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Upon completion of the FEED, an Engineering Procurement Construction Management (EPCM) contractor was selected to manage the project activities on behalf of TANAP. During the initial stages of the Project, several problems occurred related to the management of the project contractors and the work schedule. The TANAP Project Management Team analyzed the issues and identified root causes towards the end of 2015. Following a detailed assessment and careful planning, the TANAP Project Management Team proposed, and the TANAP Board of Directors agreed, to integrate the EPCM resources into an Integrated Project Management Team (IPMT), under the management of the TANAP Project Management Team. In August 2016, the EPCM Contract was amended and two new but separate Consultancy Framework Agreements (CFA) were signed with the EPCM Contractor and its Consultant. Under these CFAs, the CFA parties were to provide manpower for the IPMT. The modification to the Project Management Philosophy, i.e. the establishment of the IPMT, was driven by the problems related to the management of the work and the slow progress.

The main goal was to clearly communicate the project goals to all the stakeholders, to assign accountabilities to the appropriate authorities, and to motivate the project personnel and Contractors. The integrated approach fostered collaboration and assisted in the identification and allocation of critical resources to the right positions, which further motivated all the stakeholders. The close and direct involvement of the TANAP Management Team in all aspects of the project works and the support provided by the project Shareholders had a positive effect on project progress, and resulted in the timely achievement of key milestones and significant savings in the budget.

Creating an open and collaborative work environment in which the team members can communicate cooperatively, share their views and focus on achieving the project goals enables the successful delivery of a project.

ID 10

Contractual Performance Monitoring

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Contractual Key Milestones were used to set specific targets, while control mechanisms applied during the Project implementation phase to observe progress allowed any necessary actions to be taken before it is too late, and motivated the Construction Contractors to achieve the interim and ultimate targets of the Project on time.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Contractual Key Milestones were introduced to the Construction Contractors. Contracts and interim control mechanisms were established to monitor the progress of critical activities:

- Completion of 30% of the Welding,
- Completion of 60% of the Tie-In and Back-Fill,
- Completion of 70% of the Hydrotesting,
- Mechanical Completion,
- 80% of All Detailed Design Drawings Complete,

The above-listed milestones were planned in alignment with the Overall Project Schedule, and served to motivate the Construction Contractors to achieve the Project goals.

If any Key Milestone was not completed and approved by TANAP on, or prior to, the date due for completion, Delay Liquidated Damages (LD) were applied to the relevant Contractor as per the applicable provisions of the contract. The goal, however, was not to penalize the Contractors, but to motivate them to complete the project on time.

The application of such an interim milestone structure enables progress to be observed, and allows the necessary actions to be taken and the project goals to be met on time.



ID 11

Clashes of Interfaces

Process / Discipline

Overall Project Management

Project Phase

Phases 0 and 1

Type

Need for improvement



■ Brief Description of the Issue

No effective interface between the Project stakeholders in the early stages of the Construction phase was established by the Engineering Procurement Construction Management (EPCM) prior to the establishment of the Integrated Project Management Team (IPMT).

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

An interface between the Onshore Pipeline Construction Contractors (OPLC), the Station Construction Contractor (SCC) and the Telecom/SCADA Contractor (TSC) managed by the EPCM during the initial phase of the project was insufficient, leading to a misalignment of priorities, as well as a delay in the schedule.

The lack of a clear definition of interface management, as well as the division of responsibilities between TANAP's Major Contractors (OPLC, SCC, TSC) had a negative impact on the management and coordination of the Contractors. The EPCM was not sufficiently effective for the management of the interface between the Contractors and other Project stakeholders.

The project priorities were not clearly understood by the EPCM Management, and messages from TANAP were not conveyed to the Contractors in a correct and timely manner.

The Integrated Project Management Team (TANAP IPMT), established in August 2016, started managing the Contractors directly under the responsibility of TANAP. The relationships, liabilities and boundaries were re-defined as per the contractual obligations and the scope of works, and documented accordingly. The project priorities and deadlines were clearly communicated to the Contractors, and the implementation of the works was followed up closely, and any areas requiring

attention were discussed and resolved with the Contractors as required.

The managerial strategies defined in the initial phase of the project should be open to change in line with the experiences encountered during the execution phase. In projects with many interfaces, such as TANAP, the battery limits should be determined clearly, and a management strategy should be determined accordingly. In addition, the performance in the management of all these interfaces should be closely monitored, and corrective actions should be taken when necessary.





Compressor Station 1 Damal / Ardahan

ID 12

Robust Interface Management

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

The interfaces and coordination of the Engineering Procurement Construction Management (EPCM) Contract, the Long Lead Item (LLIs) Supply Contracts, and the Construction and/or EPC Contracts were well managed.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The interface management of the Construction Contractors, Vendors, Subcontractors, etc., was of vital importance, and was a major factor in the structure. The TANAP interface management structure served to promote project stability while identifying interfaces between the involved parties. One of its missions was to ensure transparency through process control and communication among the TANAP project teams, the Construction Contractors, Vendors and Subcontractors, and the support thereof. With the involvement of the project leadership (through Periodical Interface Meetings, Monthly Process Meetings, Site Leadership Visits, etc.), the interfaces were effectively managed.

Furthermore, the timely detection and elimination of issues that arose between parties, arising mainly from the division of responsibilities on site, were ensured. Interface Management provided a rather well-established environment for the clarification of the pre-determined roles of each party (despite the complex structure), and it was also designed to reduce and even nullify disparities and any conflicting authority demands encountered by individual contractors and subcontractors during the project execution, particularly on site.

Interface management is very important for the achievement of major project targets in terms of scope, cost and schedule. A well-designed interface management approach ensures that all project parties work toward the project goals and objectives with a principle of integrity. As such, the project parties and their roles and responsibilities should be clearly defined and interface management should be planned based on these elements. The functioning of this system, should be monitored continuously throughout the project lifecycle, making use of such tools and techniques as periodic meetings, DVRs (Division of Responsibility Matrices), interface registers, etc.

ID 13

Early Bird Gets the Worm

Process / Discipline
Overall Project Management

Project Phase
Phases 0

Type
Well



Brief Description of the Issue

Early Works contract(s) were awarded before the Construction Contracts.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Awarding Early Works Contract(s) for the ground preparation, fencing, access road, camp establishment and stockyards/laydown area works before awarding the EPC and the construction contracts had a highly positive impact on the overall Project delivery. The Pipeline Construction Contractors were provided with camps and stockyards that allowed efficient time management for the preparatory construction works.

Awarding Early Works Contracts for preparatory construction works effectively speeds up the mobilization of Construction Contractors, and accelerates the commencement of works in such schedule-driven projects as TANAP.



Lot 3 / Polatli Camp Site

ID 14

Closure of Punch Items

Process / Discipline

Overall Project Management

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

The handover of facilities from the Construction Contractors to TANAP Operations before Provisional Acceptance (PA) enabled better control of operational systems, but delayed the closure of punch items.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Project sites were handed over to TANAP Operations and Maintenance (technical handover) prior to Provisional Acceptance (PA), and the Contractors were contractually obliged to close the remaining punch items prior to PA. This facilitated the establishment of control over operations through the implementation of the TANAP Permit to Work process, but at the same time caused delays in the closure of the remaining punch items due to the application of stricter control measures.

Although early site handover is an effective way of integrating operating systems and teams into the sites, Construction Contractors need to be monitored for the closure of the remaining punch items.

The Contractors' performance should be monitored continuously through regular progress meetings and site visits to ensure the remaining punch items are closed in a safe and efficient manner.



ID 15

Close Monitoring and Timely Interventions

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue
Progress was monitored closely, and the necessary actions were taken on time – regardless of their severity

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

During the implementation of the Project, there were several instances in which the Project Management Team had to take urgent action that in later stages of the Project proved to have had a critical positive effect on progress. The Project Management Team, after having reviewed the pros and cons of such changes, decided on shifts of scope among the Contractors (in construction as well as in material deliveries). Given the delicacy and the potential for undesirable outcomes of such decisions if not managed carefully, the Project teams demonstrated considerable courage in taking such critical actions after evaluating all aspects of the change, and communicating all the details to the Project Shareholders to obtain their support.

The Project Management Team monitored the progress of all Contractors very closely and noted that some Contractor continued to fail to deliver the required outcomes, even during the summer season when the greatest progress was expected. Despite the support and guidance provided by the Project Management Team, it was evident that one of the Contractors was not taking necessary actions, and the risk of failure in achieving Mechanical Completion on time was increasing day by day.

To mitigate this considerable risk had the potential to jeopardize the completion of the Project on time, and taking into account all possible risks and consequences of the postponement of the Mechanical Completion Date, the Project Management Team evaluated all possible alternatives, including the termination or partial termination through a reduction of scope. It was decided in the end that the best approach for the maintenance of the overall Project Schedule and contractual commitments would be to engage another of the existing Contractors to complete a portion of the works assigned to the Contractor causing the delay.

The benefit of utilizing one of the existing Contractors for the execution of outstanding works related to their familiarity with the project environment, including the technical specifications and procedures, gained through their previous involvement in the implementation of works under the Project.

ID 16

Materials Management System

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

The materials management system should be well established at the outset of the project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

It was not possible to establish an effective materials management system in the initial stages of the Project, leading to delivery and storage-related problems. Some of the materials required for the latter stages of the project were delivered to the sites much earlier than required, leading to a need to construct additional storage facilities to ensure the proper preservation of the materials.

A robust and comprehensive materials management system that takes into account the design requirements, procurement process, material delivery schedules, construction planning, etc. should have been established at the outset of the Project to ensure the delivery of materials to the sites for use when needed.

A materials management system, an applicable management plan and a specific/dedicated organization should be established at the beginning of projects to avoid concerns/problems during the execution of the project.



ID 17

Level End Boss = Special Task Forces

Process / Discipline
Overall Project Management

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Special task forces were established with the formal approval of the Project Management to handle specific issues arising during the implementation of the Project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

These task forces were comprised of selected project team members, who were appointed based on their experience and knowledge and given clearly defined roles and responsibilities, with specific targets to deliver to a certain schedule. This allowed smaller tasks to be tackled in an efficient and timely manner, without a need for the creation of larger teams and without additional resources or outsourcing. As an example, a special Task Force was established to oversee activities related to the delivery of metering skids to

the site, which could have a direct impact on the Project schedule.

The establishment of special task forces involving a dedicated team recruited from the Project participants proved to be a very effective method for the achievement of specific targets or for the resolution of issues with the potential to affect the project schedule and/or costs.



ID 18

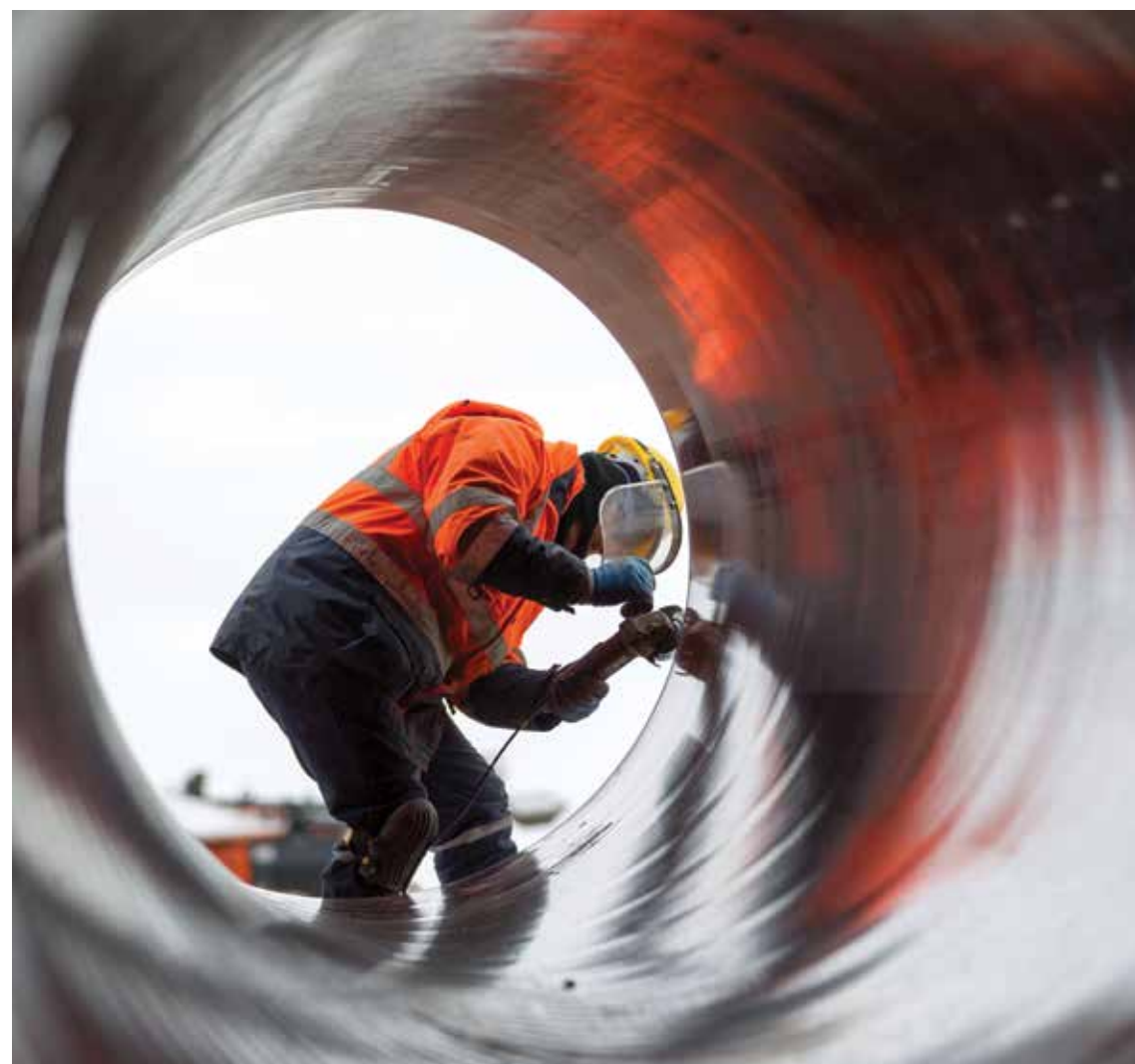
**Early Commencement of
Design and Procurement****Process / Discipline**
Overall Project Management**Project Phase**
Phases 0**Type**
Well**Brief Description of the Issue**

Commencement of the detailed design of the onshore pipeline and the procurement of Long Lead Items (LLIs) as early as possible.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The early start of the pipeline and facilities design and procurement had a positive impact on the project schedule. Starting the procurement of LLIs as soon as sufficient information is received from the FEED (Front-end Engineering Design) facilitated the creation of a shorter overall schedule and allowed the earlier commencement of the onshore pipeline construction.

Starting the design and procurement works as soon as possible offers a considerable advantage in terms of time-saving, especially in schedule-driven projects such as TANAP with a wide scope and with many interfaces.



ID 19

In-house Organizational Resources

Process / Discipline
Overall Project Management

Project Phase
Phases 1

Type
Well



Brief Description of the Issue

Linefill and Commissioning Activities were managed by the Projects' Own Human Resources.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

TANAP Project Directorate decided to use existing Project team members for the management of the linefill, commissioning and completion works. Using experienced Construction team members ensured a smooth transition from the construction to the commissioning phase. Moreover, involving the Operations personnel in these activities provided them with an opportunity to gain a familiarity with the facilities prior to the start of commercial operation.

The team developed the necessary plans and procedures, had them verified by an independent third party and managed all the works, without a need for outsourcing. This resulted in faster mobilization and set up, as well as effective coordination among the teams. The utilization of personnel from the Construction teams allowed the transfer of project knowledge to the commissioning team, while the utilization of personnel from the Operations Department allowed them to become familiar with the facilities and to understand the working principles in a relatively safe environment, i.e., prior to the start of actual commercial operations.

Drawing upon the lessons learned during the Phase 0 linefill and commissioning works, the Completions and Commissioning Group was restructured to align with the Phase 1 linefill and commissioning activities' needs and requirements, which led to a much smoother and faster completion of the tasks. As a substantial portion of the mechanical works had been completed and pre-commissioning works had been launched at various compressor stations, dedicated project teams from the construction and operational organizations were assigned to manage the Phase 1 commissioning works.

The creation of all necessary documents and a clear definition of roles and responsibilities, as well as the communication of such roles and responsibilities with relevant personnel before the commencement of activities, serve as a solid example of an improvement made during the transition from Phase 0 to Phase 1.

ID 20

Project Documents

Process / Discipline

Overall Project Management

Project Phase

Phases 0 and 1

Type

Need for improvement



■ Brief Description of the Issue

Although the Project's official language was English, it was necessary to issue bilingual project documents to ensure efficiency in the execution of the works.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Due to the shareholder structure and international nature of the Project, the official language of the TANAP Project was English, and so all Project documents were generated in English. However, as the Project was implemented in Turkey and the vast majority of the site personnel were local people with a limited command of English, some critical documents had to be translated into Turkish to ensure all staff understood the procedures. At times, the site management teams had to explain the content of critical documents to the project personnel with insufficient English skills to ensure they understood all of the requirements of relevant procedures.



Taking this lesson learned into account, and based on previous operational experience, all Operational Procedures were produced in both English and Turkish.

In multi-national projects such as TANAP, the documentation language should be bilingual to ensure a better understanding.

ID 21

Encouraging Health and Safety Applications

Process / Discipline
Health and Safety

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

The TANAP Project Health and Safety Recognition Program and the Health and Safety Incentive Program were introduced to encourage the Project Team and Project Contractors to comply with Project Health and Safety Principles on site.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Project Health and Safety Recognition Program and the Health and Safety Incentive Program were applied to encourage the Project Team and Project Contractor employees to comply with the TANAP Golden Rules of Health and Safety.

Within the scope of the TANAP Project Recognition Program, Project personnel who complied with the principles successfully were recognized as “the personnel of the month” by e-mail to the entire Project Team. Moreover, within the scope of the Health and Safety Incentive Program, a rewards system was applied in which successful Project sites were rewarded by TANAP based on their LTI (Lost Time Injury Frequency), RTA (Road Traffic Accident Frequency), TRI (Total Recordable Injuries Rate), number of man/hours without LTI and number of recorded Safety Observations (SOB).

The Health and Safety Incentive Program not only motivated the Project Team to comply with the TANAP HSE (Health and Safety, Environmental) standards and principles, but also ensured the completion of the Project with high HSE performance.





Compressor Station 1 Damal / Ardahan

ID 22

Comprehensive Incident Investigation Procedure

Process / Discipline
Health and Safety

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

A comprehensive Incident Investigation Procedure was developed and applied by TANAP and all Contractors to prevent the recurrence of incidents.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The Comprehensive Incident Investigation Procedure and principles were developed as per the Project requirements and shared with all on-site Contractors. The Contractors were instructed by official letter to implement all principles of this procedure in the event of the occurrence of an incident, and emphasis was on finding the root cause of the incident so as to prevent recurrence. The purpose was not to single out the guilty, but to gather data that could lead to corrective actions, and to prevent systematic failures.

In mega construction projects such as TANAP, priority should be given to safety, and Incident Investigation Procedures should be carefully applied to ensure the root causes of any incidents are investigated in detail, and actions are taken to prevent reoccurrence.

ID 23

Road Safety Management

Process / Discipline
Health and Safety

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

Road Safety Management was established at the beginning of the Project and implemented by all parties throughout the project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Cross-country pipeline projects are linear projects that extend over long distances. Due to the nature of the works, a significant amount of human and material transportation is unavoidable, making it critical to have well-defined Road Safety Management plans and procedures in place. The TANAP Road Safety document was created at the outset of the Project and shared with the Construction Contractors.

Accordingly, during the bidding and contract award processes, road safety-related requirements were well-defined and included in the Construction Contractors' contracts, and so the implementation of road safety requirements was standardized among the Contractors and TANAP.

Developing an Advanced Road Safety System sets a standard and can help organizations reduce, and ultimately eliminate, the incidence and risk of fatalities and injuries resulting from road accidents.



ID 24

Early Commencement of Design and Procurement

Process / Discipline
Legal Affairs

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

The TANAP Legal Affairs Directorate team has maintained a strong connection with other project departments throughout the Project lifecycle, ensuring considerable know-how.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Legal Affairs Directorate was involved in negotiations, communications and agreements from day one, and maintained a strong interface with the commercial, administrative, technical and financial departments, all of which generated tremendous know-how within the TANAP Legal Affairs Directorate.

Armed with such valuable know-how, the dedicated in-house legal team was able to provide legal services in line with its previous practices and experience, which proved to be valuable in increasing efficiency, ultimately benefiting TANAP and its shareholders. Through the effective use of such know-how, the legal team has been able to provide legal opinions in a timely manner without disrupting TANAP's operations. Such experience has also benefited other departments in terms of time efficiency.

This approach proved to be advantageous particularly in commercial operation contracts, which constitute the basis of TANAP's operations. Strict attendance to the technical negotiations on commercial operation contracts, in addition to discussions on legal terms, ensured better coordination between the legal and commercial operation teams, and ensured an effective understanding of commercial operation contracts, resulting eventually in a smoother finalization of the contracts and an integrated approach to the contracts, as well as the minimization of disputes.

ID 25

Well-Structured Bidding Steps

Process / Discipline

Procurement and Materials Management

Project Phase

Phases 0 and 1

Type

Well



■ Brief Description of the Issue

Well-structured steps, including Pre-qualification, Bid Update and Best and Final Offer (BAFO), were applied during the bidding processes

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

During the bidding process for the procurement of services and materials, the following well-structured steps were applied:

■ **Market research:** This step was applied for the critical material and service packages, such as the line pipes, line valves and onshore pipeline construction contractors. As a result of this study, the capabilities and capacities available in the global market were identified at the earliest stage of the Project, and strategies were re-evaluated and set based on real market conditions rather than academic knowledge. No vendors/contractors were eliminated for any reason at this stage, although the Project's awareness level was increased considerably, which contributed to the following stages.

■ **Pre-qualification/screening:** This step was publicly announced to increase the number of applicants. The study was used to screen and officially qualify potential bidders who would then be invited to submit bids for the relevant packages. As in ID no. 1 above, strict requirements were set in various categories, including financial aspects, QA/QC, HSE and certification, experience record, project management/execution strategies, policies, plans and procedures and current contractual commitments/works in progress, etc. to prevent inappropriate entities from submitting bids.

■ **Bid Update:** Due to parallel development of the detailed design at the time of the bidding stage, bid updates were made efficiently to allow bidders to update their bids based on the bidding process clarifications, to allow the incorporation of the changes into the design or to satisfy any other requirements of TANAP. This process ensured the avoidance of many of the claims that would otherwise be encountered after the execution of the contracts.

■ **Best and Final Offer (BAFO):** This step was applied once all of the technical issues under the proposed contract had been clarified with the shortlisted bidders, and allowed them to provide their best and final offers against the agreed and normalized scope (i.e. offers with different scopes were adjusted). It is worth mentioning that a one-line compliance statement and/or the confirmation of a bidder to TANAP's requirements were not considered satisfactory. Indeed, during the evaluation stage, all requirements of TANAP were mutually discussed, and the necessary explanations were made and minuted with the shortlisted bidders prior to the collection of their BAFO's to reduce/eliminate any ambiguities that may lead to additional costs related to unforeseen risks.

ID 25

Well-Structured Bidding Steps

The application of such bidding steps as pre-qualification and bid update (followed by a BAFO) during the Project bidding processes resulted in a competitive bidding process, contributing to the financial success of the Project Contract and successful Procurement Management.

Competitive bidding serves to identify the most appropriate contractors/vendors of particular goods and services. It ensures transparency and equal opportunities, and ensures the outcome represents the best value. A transparent and robust procurement process is one of the most critical factors in the success of a project, ensuring the selection of the most suitable contractor/vendor.



ID 26

Client Supplied Materials Delivery Schedule

Process / Discipline

Procurement and Materials Management

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

The Client-Supplied Materials Delivery Schedule was not compatible with the schedule defining when the materials need to be on site.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Due to a lack of close interaction between different departments under a single discipline that combines and closely monitors trends in the overall Project schedule, and that considers the impact of such trends under the dynamic schedules of various packages, it became apparent that accurate and effective planning was not possible when arranging the Delivery Schedule of Client-Supplied Materials at the time of the execution of the contracts and thereafter during the expediting process. Some of the Client Supplied Materials were thus delivered to sites earlier than the required-on-site dates (especially Phase-1 items).

While early deliveries avoided any claims of delays by the Construction Contractors and maximized flexibility in the sequence of construction activities, which positively supported the overall completion schedule of the Project, it caused storage and preservation difficulties at the worksites.

In some cases, the correction of defects resulting from inappropriate preservation adversely affected progress during pre-commissioning and commissioning activities. Furthermore, additional storage areas had to be arranged for the storage and preservation of materials delivered ahead of time.

The delivery of materials should be scheduled with a margin of safety before the required-on-site date, and construction schedule trends should be closely monitored and managed to avoid the need for additional storage facilities, and to minimize the preservation risks related to seasonal conditions at the relevant sites.

ID 27

Scope of Vendor Contracts

Process / Discipline
Procurement and Materials Management

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue
All requirements (e.g., spare parts provision, supervision during installation and commissioning, maintenance during initial operation, etc.) should be clearly detailed in the Vendor Contracts.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

TANAP encountered various issues in the provision of supervision services during the project execution process. Sourcing equipment from foreign manufacturers led to prolonged service times, and visa and transportation difficulties associated with the supervisory services.

Accordingly, a schedule of the services that will be requested from Vendors during the Project execution phase should be defined during the contract negotiation phase, even tentatively, and included in the Vendor contracts. Furthermore, the notice periods for the requirement and arrival of Vendor supervisors should be well-defined, and remedies shall be available to TANAP in the Vendor contracts to be applied in the event of the Vendor failing to comply with the arrangements of their supervisors. In this way, disputes arising out of the provision of Vendor supervision services could be minimized.

Furthermore, the lack of detailed information regarding the requirements for the provision of maintenance services and spare parts under the Vendor contracts emerged as an issue when such services were needed in the early stages of the operation period. The provision of such services upon re-negotiations with the Vendor led to losses of time.

To overcome such problems, maintenance and spare part requirements should be negotiated during the bidding stage, and options should be included in the procurement contract.

In any event, the procurement of equipment from domestic vendors that meets international standards may eliminate many of the problems related to the provision of supervision and maintenance services. Hence, local content should be maximized to the maximum extent possible, and a certain cost margin may be considered in the bidding stage to support the achievement of such maximization efforts.



CS5 / MS2 Eskişehir

ID 28

Client Supplied
(Free Issue) Materials

Process / Discipline
Procurement and Materials Management

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue
The number of Client-Supplied (Free Issue) Materials should be balanced considering the level of Vendor data input into the detailed design, construction planning and the delivery of materials for the Project, as well as the management resources.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Although the procurement of critical equipment by the Client may facilitate advancement in the completion of the detailed design, the number of Client-supplied items should be limited to long-lead items and items for which early Vendor design is required for inclusion in the detailed design, to avoid impacting on the Construction Contractors' work plans. Too many Client-Supplied Materials increase the need for interface management between the Contractors and Vendors, and cause delays in the overall engineering processes.

The need for data from certain Vendors (ICSS, WP, SCC, etc.) led to additional delays. In this respect, the procurement of items should be left to the Contractors as much as possible to eliminate additional interfaces, and also to avoid potential claims related to delays in material deliveries.

Client-Supplied Materials should be optimized in line with the needs of the project.



CS5 / MS2 Eskişehir

ID 29

Key Performance
Indicators (KPIs) for
Engineering Activities

Process / Discipline
Engineering and Design

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

Key performance indicators related to detailed engineering activities should be clearly defined and included in the Engineering Procurement Construction Management (EPCM) contract.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Key performance indicators related to detailed engineering activities were not defined, which led to a lack of motivation or any mechanism for the evaluation of the EPCM Contractor’s performance. As a consequence, there were problems in the management of engineering deliverables, which was carried out based on the idiosyncratic experiences of the Project Management Team.

Key Performance Indicators would allow the close monitoring of the detailed design activities, and would prevent changes. For detailed engineering activities, indicators on which performance measurements are based should be determined and defined in the relevant contract. In addition, to help monitor progress in the provision of engineering deliverables, an overall design and engineering schedule with defined milestones should be prepared considering all details, such as third-party inputs (e.g., Vendor requirements) and their timing and impacts.

ID 30

Location Selection of Project Facilities

Process / Discipline
Engineering and Design

Project Phase
Phase 1

Type
Need for improvement



Brief Description of the Issue

A thorough review of the selected locations of such facilities as Compressors, and Metering and Block Valve stations, should be made involving experts who are familiar with the local environmental and geographical conditions.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The location selected for CS1 has significant surface and underground water problems, which led to a delay and complications in the construction activities. Improvements had to be made to the temporary and permanent drainage systems on the site, and the same infrastructure concerns were experienced with the location of BVS 49, which led to a change in its location. The site selection criteria should be

improved, considering the infrastructure in the identified location.

A detailed site investigation should be carried out not only of the site, but also in the surrounding area. The design should not be finalized based on desktop studies. Additional construction measures had to be taken during the construction of some of the stations located on flood plains.



ID 31

Encouraging Health and Safety Applications

Process / Discipline
Construction

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

The Pipeline Construction Contractors’ Key Contractual Milestones for the “Achievement of the Mechanical Completion Date” had to be planned to be achieved by the end of the year, which led to difficulties in the implementation of the completion and commissioning activities during the winter period.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

To meet the commitments of the commercial arrangements, the mechanical completion and commissioning activities were planned for the winter months following the Key Contract Milestones and the Project Schedule. Seasonal difficulties necessitated the planning of additional works and the acquisition of additional resources for the construction completion and commissioning stages, for which prioritization studies were carried out.

Within the scope of the construction and commissioning activities, the Mechanical Completion Milestones should be determined with due attention paid to seasonal conditions.

While deciding on the Commercial Operation Date (CoD), technical, seasonal and construction challenges should be taken into consideration when planning the project milestones.

ID 32

Robust Site Organization

Process / Discipline
Construction**Project Phase**
Phases 0 and 1**Type**
Well**Brief Description of the Issue**

A Single Point of Accountability was assigned for the site works.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The management of sites by the assigned authorities ensured integrity and discipline in the delivery of the task. The Delivery Managers were the Single-Point Accountable persons on their respective sites, and were responsible for the management of all TANAP works, and also for the management of the Contractors' works. The Delivery Managers ensured high standards in Quality, Health and Safety, Social, Environmental, Contractual, Project Control, Construction and

Engineering issues, and were assigned to manage the works delivered by all disciplines, and to coordinate between their site and the Headquarters.

The centralization of the management of all disciplines, on one hand, and the representation of all disciplines on all sites facilitated the efficient management of site works and enabled the delivery of the task on time.



ID 33

Value-Adding
Construction Practices

Process / Discipline
Construction

Project Phase
Phase 0

Type
Well



Brief Description of the Issue

Value-adding Construction Practices, such as Constructability Reviews, Pipeline Lowering Optimization, the Use of Correct Equipment in Correct Quantities for Backfilling.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Project Management Team continuously reviewed project progress, assessed delays, and discussed improvement options with all the relevant parties.

Constructability Reviews: Typically, alignment workshops should have been conducted involving the Construction Contractors during the detailed design phase, which would have allowed a better understanding and clarification of fabrication techniques, connection designs, standard details, penetration/sealing details, materials, finishes and methods, as well as construction philosophies among the architectural, civil engineering and structural engineering teams, ensuring their alignment with the Contractors. As the design of the onshore pipeline was on the whole completed prior to the awarding of the construction contracts, to save time in the project schedule, no constructability reviews were carried out with the involvement of contractors. To close this gap, the TANAP Engineering and Construction Departments, working in close cooperation, were able to successfully resolve the technical queries and deviation requests raised by the construction contractors related to materials and construction techniques. Where applicable, TANAP put forward optimization alternatives for the consideration of the Construction Contractors, which contributed to construction progress.

Optimization of Pipeline Lowering: The length of the pipe sections to be lowered into the trenches was optimized considering the geographical conditions and pipeline integrity. Where possible, to reduce the need for tie-in welding in the trench and to improve lowering-in performance, smaller sections were welded together prior to the start of the lowering-in activities. Furthermore, reducing the number of tie-in activities in the trench minimized the risk to health and safety.

The use of the correct equipment and materials in the right quantities for Backfilling: on-site progress was continuously reviewed, delays were assessed and improvement options were discussed with the Construction Contractors. During these reviews, delays in pipeline backfilling operations were considered, and potential improvements were evaluated. The selection of numbers, as well as the capabilities of backfilling equipment, is important for the efficient and timely backfilling of large diameter pipelines. A detailed analysis was conducted to identify the causes of delay in backfilling. At some locations, the equipment had to be increased, while in other locations the size/capacity of the equipment to hand had to be revised to align with the site conditions in terms of terrain and soil type, whereas at some other locations, materials from nearby quarries were imported for backfilling.



ID 34

Resource Utilization in Construction Works

Process / Discipline
Construction - Pipeline

Project Phase
Phase 1

Type
Need for improvement



Brief Description of the Issue

Identifying the Level of Effort and Obtaining the Right Resources for the Job is essential in ensuring the implementation of the works as planned.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Planning and mobilizing an adequate number of construction crews in a timely manner is essential in ensuring the implementation of the works as planned. Pipelines are linear projects in which works are implemented in certain sequences. The right type and amount of resources should be mobilized to ensure the works can be performed at the right time so as to avoid the delay of all other relevant works.

The Construction Contractors lacked sufficient crews for back-end activities (padding, backfilling and tie-in welding), which led to a risk of long lengths of unburied pipeline sections in the trench, and around 4,000 awaiting tie-in in the final construction season. Furthermore, when the number of crews for back-end activities was significantly increased, additional effort was required for the efficient management of these resources. In large-scale projects such as TANAP, resource planning and utilization requires significant management effort.

A cost-benefit analysis should be carried out before identifying the quantities of resources considering performance, workload and project needs, as well as the management effort required.



ID 35

Maximum Limits for Safe Construction

Process / Discipline
Construction - Pipeline

Project Phase
Phase 0

Type
Need for improvement



Brief Description of the Issue

Contracts define the maximum limits to ensure the implementation of works safely, and without major impact on the surroundings.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Contracts define the maximum limits for every step of work, e.g. the max length of trench that can be opened before backfilling, the max length of welded pipe above ground awaiting lowering into the trench, etc. These were established to ensure that the works are implemented safely, and to prevent impacts on the effected parties along the pipeline route.

The Pipeline Construction Contractor welded long sections of pipes at remote locations to facilitate rapid progress, however, adverse weather conditions prevented the pipes from being lowered into the trenches. The Contractor thus had to take additional safety measures in such cases when they could not lower all of the long welded sections due to adverse weather conditions.

The back-end activities need to be planned carefully to avoid leaving long welded sections awaiting lowering for extended periods of time. Moreover, in cases where the pipe sections cannot be lowered for any reason, and being left above the ground for a long period of time, such sections should be carefully supported and closely monitored to avoid movement.



ID 36

Site-Based Activity Schedule

Process / Discipline
Construction - Stations

Project Phase
Phase 0

Type
Well



Brief Description of the Issue

Detailed Site-based Activity Schedules for specific site tasks were prepared.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Some critical activities, such as piping works may have a significant impact on the overall progress of the Project, while the commencement of such works may be dependent on the completion of previous tasks, such as engineering and material procurement. The commencement and progression of piping activities were affected by delays in the completion of earlier tasks, such as engineering and procurement.

The Project Level 3 (L3) schedule was inadequate for tracking the details of such activities as piping scope. This made it difficult to monitor overall progress and to identify delays that could lead

ultimately to delays in mechanical completion. Therefore, such details should be included and managed via more detailed site-specific work plans, i.e. Level 4 (L4) and more detailed site/task-specific execution schedules.

Level 4 (L4) and, where required, more detailed execution schedules have to be developed, as this will allow a clearer understanding of the details of the task and a better determination of the critical path, which in turn would allow the implementation of alternative methods.



ID 37

Integration of Vendor Packages

Process / Discipline

Construction - Telecom, Scada, Instrumentation & Electrical

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

Control Systems Design: Integration of Vendor Packages into overall Integrated Control and Safety Systems (ICSS)

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

In major projects, a significant number of vendor packages are required to be integrated into the overall system. The integration of such equipment into the overall facility design, and most importantly, the overall control system, is always a challenge as most vendors finalize the design of their control systems towards the end of the design/manufacturing process. This adversely affects the finalization of the overall ICSS design, construction and commissioning and, if not managed carefully, causes delays and reworks in the ICSS. These problems get worse if orders for vendor packages are placed late. Most vendor control systems (Unit Control Panels) were finalized and signals were made available for the ICSS upon the completion of Factory Acceptance Tests (FAT), which led to a delay in the ICSS design/engineering works. The sequence of works was rescheduled, where possible, to allow room for separate UCP FAT's, as well as signal integration.

The ICSS design should be considered when performing an overall facility design, and ICSS engineers should be involved in the design when defining the requirements for the vendor packages, while also participating in the contract negotiations and clarification phases.

Moreover, equipment purchase orders for vendor packages should be finalized before the completion of the overall ICSS design to prevent delays and reworks of the ICSS.



Metering Station 4

ID 38

Specialized Equipment Installation

Process / Discipline

Construction - Telecom, Scada, Instrumentation & Electrical

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

The Project integrated baseline schedules should have been developed to include the requirements of all project works (e.g. installation of specialized equipment) and the interfaces between them.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

One of the major and important interfaces in pipeline projects is an interface related to the design, procurement, installation, and commissioning of control systems.

The installation, completion and commissioning of specialist equipment, such as control systems (by the Vendor) and Supervisory Control and Data Acquisition (SCADA) systems (by the Telecom and SCADA Contractor) require careful work planning and interface management with the Construction Contractors responsible for the completion of the construction work. Equipment installation dates should be coordinated taking into account such factors as site readiness, and power supply and UPS availability, site access dates and plans, etc.

As the work plan contained no detailed plans for specialized equipment (e.g., control systems by the Vendor, SCADA by the Telecom and SCADA Contractor), and the installation and pre-requisites that were required to be completed prior to such installations, TANAP asked the Telecom and SCADA Contractor to develop a Level-4 (L4) detailed schedule for critical areas such as the Admin and Control, Substation and Back-up Control Center buildings.

These detailed schedules, including the pre-requisites for specialized equipment installation, were added to the overall project schedule and shared with the contractors to allow them to align their site activities accordingly.

ID 39

Pipeline Monitoring System (PMS)

Process / Discipline

Completions & Commissioning

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

The Pipeline Monitoring System (PMS) was established in the early stages of the Project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The establishment and deployment of the PMS in the early stages of the Project contributed to safe and efficient pipeline operation, particularly during the pipeline linefill activities. Pigs were monitored from the MCC (Main Control Centre) and the Stations Admin Control Buildings remotely during the linefill operations.





Main Control Center

ID 40

Scope Prioritization Studies

Process / Discipline
Completions & Commissioning

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Scope prioritization (Definition of Minimum System Requirements for Commissioning Works) studies were conducted to identify the minimum system requirements, and facilitated the launch of operations in a timely and safe manner.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

To enable safe linefill and commissioning operations, detailed Scope Prioritization Studies (Minimum System Requirements) were conducted, during which the essential systems required for the safe and efficient initiation of linefill and commissioning works were identified, with efforts focused on their completion. This facilitated the on-time realization of such major milestones as Gas to Turkey (Phase 0) and Gas to Europe (Phase 1).



ID 41

Completions Management Tool (CMT)

Process / Discipline
Completions & Commissioning

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

The use of a Completions Management Tool (CMT) for the management and record-keeping of all stages in the completion and commissioning works.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The use of purpose-built software for the management and keeping of records of every stage in the completion and commissioning works was important in ensuring traceability as well as the transfer of such critical information to the Operations Team. However, the CMT, when first introduced, was overcomplicated and not user-friendly, and the management of such a complicated tool required the allocation of additional resources. TANAP Project Management Team reviewed the structure of the CMT and optimized the number of forms/checklists with the aim of monitoring and recording value-adding information.

To meet the demands on resources, the Construction and Quality teams provided support to the Completions and Commissioning team in process management by assigning some of its site personnel to the task. The specific personnel has to be assigned for the CMT actions.

Considering the complexity of the CMT structure and the number of check sheets, a sufficient number of employees should be assigned on-sites for the CMT activities.

ID 42

Division of Responsibilities in Commissioning Activities

Process / Discipline

Completions & Commissioning - Linefill

Project Phase

Phase 0

Type

Need for improvement



Brief Description of the Issue

The Division of Responsibilities in Commissioning Activities was not clearly defined in the Construction Contracts.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The scope of involvement of the Construction Contractors in commissioning works was limited to “support activities” in the contracts. Consequently, significant effort had to be spent defining and clarifying roles and responsibilities within a limited timeframe, immediately before the start of the commissioning activities. Consequently, the commissioning phase was affected by contractual debates between TANAP and the Construction Contractors.

Prior to the commissioning activities, any concerns or uncertainties relating to commissioning support were managed by the Commissioning Task Force team established by TANAP. Considering the contractual disputes with the Construction Contractors that occurred during the implementation of the pipeline commissioning support activities, the station commissioning activities were managed by TANAP itself. Method statements for commissioning activities and interfaces with the SCC (Station Construction Contractor) were defined in detail to avoid disputes during hot commissioning operations, and the station commissioning operations were thus carried out in an efficient and coordinated manner.

Roles and responsibilities in commissioning activities should be clearly defined at the outset of the Project, and the relevant philosophy should be clearly reflected in the contracts.



ID 43

Operational Readiness Process

Process / Discipline
Operational Readiness

Project Phase
Operational Readiness

Type
Well



Brief Description of the Issue

Operational Readiness Process was effective and well organized.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Operational Readiness activities, including KPIs for the recruitment of personnel, and the development of training plans and operating procedures, had been defined, set, and periodically monitored during the execution phase of the project.

During the construction phase, TANAP Operations and Maintenance (O&M) personnel were recruited and mobilized to their respective work locations after the completion of initial training, in accordance with the TANAP Recruitment and Mobilization Plan and as part of the adaptation process, enabling a smooth handover of the facilities and launch of commercial operations.

This application also increased the quality of the Operations Procedures and the efficiency of training.

The planning and implementation of a well-planned operations readiness process allows a smooth transition to operations, improves the quality of documentation and provides familiarization opportunities to personnel.



Metering Station 3

ID 44

Operations
Management Tools**Process / Discipline**
Operational Readiness**Project Phase**
Operational Readiness**Type**
Well**Brief Description of the Issue**

Establishment and utilization of operations-related work management systems at the execution phase of the Project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

All software systems, such as Computerized Maintenance Management System (CMMS), PTW (Permit to Work) System, Competency Assurance Management System (CAMS), and Asset Integrity Management System (AIMS) to be used during the operations phase were procured, installed and commissioned, and were all fully operational prior to the transition to the operations phase. All of the training in the use of the software was also completed during the operational readiness process, ensuring a smooth transition to the operations phase.

The establishment and utilization of operations management tools prior to the operational start-up phase is important in creating a base for the smooth adoption of operational working practices and start-up operations.



ID 45

Internationally
Recognized Applications

Process / Discipline
Finance

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

TANAP was conducted with internationally recognized applications that met the requirements of International Financial Institutions (IFIs).

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Shareholders decided to obtain financial support from International Financing Institutions (IFIs) for the later stages of the Project. TANAP acted as the Implementing Entity, and was required to pass a very detailed due diligence process. The IFIs (such as World Bank, EBRD, AIIB) were largely satisfied with the existing systems established by the TANAP Project Management Team, and concluded that almost all systems, procedures and reports were satisfactory. There were no major issues identified by the IFI representatives during the reviews/audits carried out in the Project implementation phase.

As a result, Shareholders were able to obtain a large amount of financial support from IFIs. Furthermore, the TANAP Project Team applied for and received several grants from the INEA of the European Commission.

Having an experienced Project Management Team as the Implementing Entity, as well as well-established management systems and procedures and high-quality and transparent reporting mechanisms helped the project Shareholders to secure financial support from such major IFIs as World Bank, EBRD, AAIB, etc.

ID 46

Keeping Risks
Under Control**Process / Discipline**

Project Control - Reporting, Risk & Services

Project Phase

Phases 0 and 1

Type

Well



■ Brief Description of the Issue

The TANAP Corporate Risk Committee was established to monitor risk management activities, in line with the TANAP Risk Management Procedure.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Project Risk Committee was established in 2015 by the Project's High-Level Management as per the Terms of Reference (ToR) document, and was tasked with identifying and reviewing project risks (threats and opportunities), setting and evaluating proposed mitigation measures, and ensuring the allocation of the necessary resources for the management of possible risks.

The Risk Register, generated as per the TANAP Risk Management Procedure, was reviewed and updated monthly by all departments. Identified risks were assessed and risk rankings were assigned by the relevant departments under the guidance of the TANAP Risk Representative. Upon an update of the Master Risk Register, high-risk items were submitted to the TANAP Corporate Risk Committee for further review and evaluation. The Risk Committee also reviewed the proposed mitigation plans and evaluated their effectiveness.

Committees such as the Risk Committee allow the senior management to closely monitor and own risk management activities in the Project, and to contribute to raising the awareness of the project team in risk management matters.



ID 47

Schedule of Price in the Contracts

Process / Discipline

Project Control - Cost Management

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

The Price Schedule in the contracts should be sufficiently detailed.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The failure to elaborate on the Price Schedule within the scope of the Construction Contractors and Vendor contracts based on activity and service led to disputes between the contractors and TANAP during change management processes. The Contract Price Schedule should be broken down in detail to ensure effective change management

processes. Potential disagreements related to undefined costs were resolved by an effective change management process.

It is recommended to elaborate the schedule of price meticulously during the negotiation process and add it to the Contracts to reduce additional workload and change management.



Metering Station 1

ID 48

Look Ahead Schedules

Process / Discipline
Project Control - Planning

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Development and continuous update of Look Ahead Schedules.

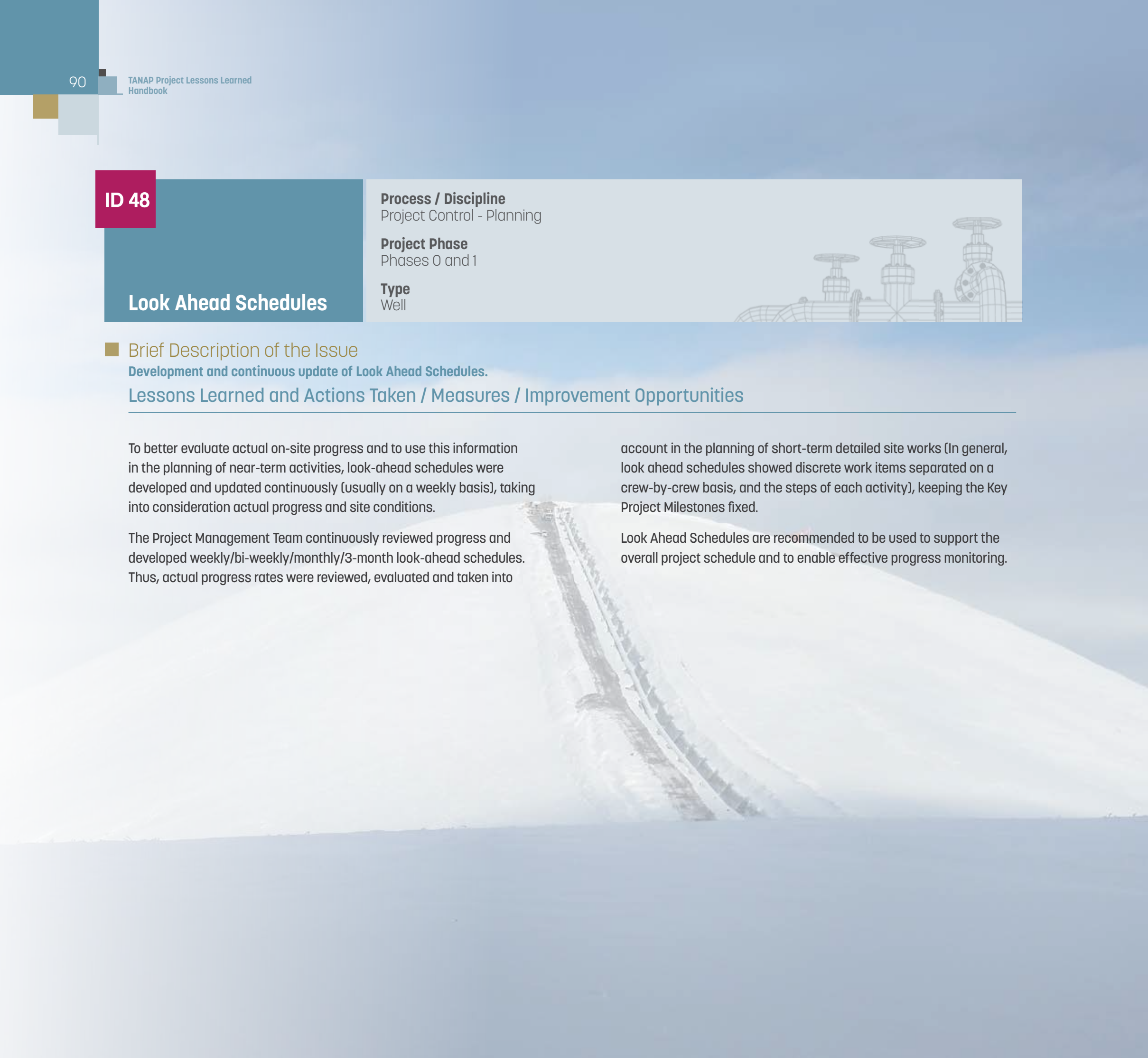
Lessons Learned and Actions Taken / Measures / Improvement Opportunities

To better evaluate actual on-site progress and to use this information in the planning of near-term activities, look-ahead schedules were developed and updated continuously (usually on a weekly basis), taking into consideration actual progress and site conditions.

The Project Management Team continuously reviewed progress and developed weekly/bi-weekly/monthly/3-month look-ahead schedules. Thus, actual progress rates were reviewed, evaluated and taken into

account in the planning of short-term detailed site works (In general, look ahead schedules showed discrete work items separated on a crew-by-crew basis, and the steps of each activity), keeping the Key Project Milestones fixed.

Look Ahead Schedules are recommended to be used to support the overall project schedule and to enable effective progress monitoring.



ID 49

Project Integrated Schedule

Process / Discipline
Project Control - Planning

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

Development of a Detailed (Level 3) Project Schedule

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

In large-scale and fast-track projects such as TANAP, the development of comprehensive, detailed integrated schedules may not be possible. Some activities or even phases, e.g. completion and commissioning phases, may not be fully populated in the early stages of planning, as may be only limited information about such phases until a certain level of progress has been achieved in construction. TANAP Contractors struggled to develop their schedule for similar reasons, and this affected the development of a detailed Project Integrated Schedule. To mitigate this, TANAP advised the Contractors to develop schedules that included details of the

activities that are already available, and noting other activities in blocks/phases for detailing when more information is obtained.

The remainder of the project activities (such as Construction and Commissioning) were incorporated into the master Level-3 schedule as information became available.

In addition, the Contractors were advised to submit construction/installation schedules within 30 days of the contract awards, which supported the development of the Overall Project Schedule in as much detail as possible in the relatively early stages of the Project.

The development of a detailed project schedule as early as possible would facilitate the better planning and management of activities and resources throughout the project lifecycle.



ID 50

Fit for Purpose Methods for Non-Destructive Tests (NDT)

Process / Discipline

Quality Assurance & Quality Control

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

Fit for purpose methods were selected for Non-Destructive Testing (NDT)

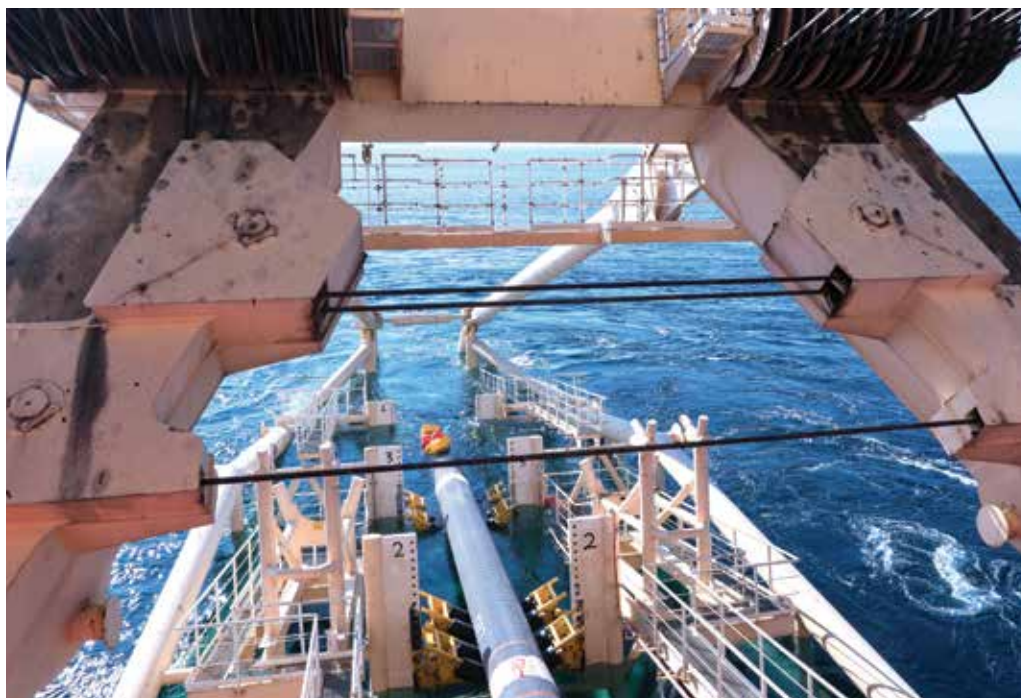
Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Radiographic Testing (RT) is widely utilized in the pipeline construction industry for the non-destructive testing of pipeline welds. “Workmanship criteria”, which utilizes information obtained by RT, although historically proven as safe in practice, does not quantitatively support the severity of the defect for safe pipeline operations, and often results in unnecessary repairs. As the completion of assessments using RT required time and slowed construction progress, it was decided to use alternative NDT methods, such as Automatic Ultrasonic Testing (AUT).

Using AUT instead of RT as a non-destructive testing method allowed the application of Engineering Critical Assessment (ECA) as an alternative, safe, environmentally friendly (no chemical consumables and no radiation hazard) and faster non-destructive testing methodology. The benefits of AUT were assessed, and especially the shorter time required for the validation of AUT results, and Project Management Team decided to proceed with AUT. The results of the AUT were assessed using an Engineering Critical Assessment (ECA) method based on fracture mechanics, requiring advanced weld inspection techniques, higher strength and tough weld metals, and stricter welding controls.

More importantly, the results of the AUT were assessed immediately to identify the root causes of defects and to prevent re-occurrence, consequently reducing the number of repairs, resulting in increased construction progress.





ID 51

Proactive/Effective Salvage Program

Process / Discipline
Environmental

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

A Proactive/Effective Salvage Program was developed and implemented to protect the fauna in the construction areas.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The Fauna Protection Program was developed and implemented successfully through the provision of adequate training and effective management.

The program was implemented to identify, protect or relocate fauna from the construction sites. Any injured fauna was delivered to the nearest Wildlife Care Centers for treatment, after which they were released back into their natural habitats.



ID 52

Critical Habitats

Process / Discipline
Environmental

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue
All animal and plant species along the pipeline route were identified and categorized based on international criteria.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

As part of the studies within the scope of the TANAP Project Environmental and Social Impact Assessment (ESIA), a total of 94 critical habitats (67 terrestrial habitats and 27 aquatic habitats) were discovered along the pipeline route. Construction activities were subsequently scheduled in such a way that the impact on these ecologically vulnerable regions would be minimized. Measures were put in place to prevent any adverse impact on vulnerable species and their natural habitats, to protect the soil structure

on the sea bed and to protect marine species during offshore activities.

To protect critical habitats and to avoid delays in project progress, ecologically vulnerable regions should be identified and considered during the development of the construction schedule.



ID 53

Protection of Cultural
Heritage

Process / Discipline

Environmental

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

During the construction activities a number of chance finds and archeological sites were discovered and added to the cultural heritage within the scope of the project activities.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

During on-site construction activities, despite the risk of delaying the project schedule, salvage excavations were carried out for archeological sites rather than changing the route, thanks to which 154 new archaeological assets, including necropoli, tumuli, various archaeological settlements and around 1,000 archaeological artifacts were added to the nation's cultural heritage over the course of the 5 years of construction works.



To avoid any impact on the project schedule, significant planning was put in place by the site teams, and within the scope of these activities, the TANAP team and the relevant Construction Contractors worked in close cooperation with Museum Directorates and a 3rd-party company.

Protecting cultural heritage should be the primary objective of projects such as TANAP.



ID 54

Online Stakeholder Interaction Database

Process / Discipline

Social Impact

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

TANAP established an Online Stakeholder Interaction Database (as part of its Stakeholder/Grievance Management efforts) for the keeping of records of stakeholders, register, review and close out any grievances received from stakeholders.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

In order to maintain effective and transparent relations with the people affected by the Project and other stakeholders, TANAP implemented a Complaint Management Procedure through which communities and individuals affected by the Project could formally communicate their concerns, complaints and grievances, with the aim being to come up with solutions that were acceptable by all parties.

A web-based “Online Stakeholder Interaction Database” was established featuring a systematic interface for the keeping of records of stakeholders, register, review and close out of any grievances

received from these stakeholders allowed to collect and manage grievances and concerns in a joint software.

A single and systematic database that can be used not only by TANAP, but also by the key Project stakeholders (Contractors, Vendors, etc.) was developed.

A web-based system accessible by all stakeholders can be useful in the provision of effective stakeholder management.



ID 55

Unique Implementation and Monitoring Design of Livelihood Restoration Plan

Process / Discipline

Social Impact

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

“Livelihood Restoration Plans” were developed for people affected by the Project living in small-scale agriculture, livestock or fishing regions to enable them to maintain their means of living upon the completion of the Project.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

An ability to manage and meet the different demands and expectations of stakeholders related to the Project impact is one of the key factors contributing to the success of a project. Accordingly, detailed and careful Vulnerability and Economic Unit Analyses were conducted to correctly identify all possible vulnerable project-specific groups, and to assist them through the provision of the most beneficial livelihood support in an effort to improve their lives in a sustainable manner.

Another key to success was providing Pipeline Affected Parties (PAPs) with easy access to the TANAP LRP Implementation Team throughout the process, and to be responsive and maintain transparent communication with the PAPs.

Key features of the LRP Implementation and Monitoring process:

- Give priority to the creation of a multi-disciplinary collaborative working environment, supported by an in-house management modality
- Don't adopt standardized definitions or cookie-cutter approaches when developing the action plan
- Start on time: neither too early nor too late!
- Adopt fairness, transparency and accountability as core principles.
- Establish a close and ongoing communication-based monitoring system rather than a one-time or issue-driven one.
- Maintain an adaptive management approach throughout the Process.



ID 56

Exemplary Social Assessment Study Report

Process / Discipline
Social Impact

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

The Social Assessment Study Report was remarkably well-designed.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

An exemplary social assessment study report that was remarkably well-designed and comprehensively prepared related to the impacts of pipeline-based land acquisitions on the livelihood of landowners/users, and more specifically, the vulnerable people living along the pipeline route, was developed.

As a collaborative effort of the Land Acquisition and Social Impact Departments, a comprehensive social assessment was successfully undertaken following a multi-dimensional analysis of various social data.



ID 57

TANAP RAP Fund

Process / Discipline

Social Impact

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

TANAP established a Resettlement Action Plan (RAP) Fund for the provision of several types of additional livelihood support

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

To bridge the gaps between national legislation and the international social standards of IFIs (International Finance Institutions) with respect to the recovery of economic losses resulting from land acquisitions, TANAP established a RAP Fund for the provision of different forms of additional livelihood support, some of which are the good and unique practices such as payments for multiple pipelines impact and transitional allowance. Furthermore, a RAP Fund Management Evaluation Committee was established by TANAP to ensure the fair assessment of Pipeline Affected Parties (PAPs) seeking support, and to protect TANAP from the unjustified/unreasonable requests of landowners/users, while avoiding making these people's lives worse.

The allocation of such resources in terms of budget, staff and documentation is a key factor in the success of the Project's commitments to the IFIs' Social Standards on Land Acquisition, Restrictions on Land Use and Involuntary Resettlement. The managers of the RAP Fund reviewed the effectiveness of the resources, defined the implementation principles in timely and appropriate manner, and improved the implementation methodology when necessary. This successful implementation is a result of the proactive and adaptive management approach of TANAP.



ID 58

TANAP Project Social and Environmental Investment Program (SEIP)

Process / Discipline
Investment Programs

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

The TANAP Project Social and Environmental Investment Program (SEIP) was developed with the aim of supporting communities along the pipeline route.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The TANAP Project Social and Environmental Investment Program (SEIP) was developed with the aim of supporting communities along the pipeline route. Following site visits along the pipeline route to meet with local stakeholders, a Needs Analysis Report was compiled to identify the communities in need, and a program was implemented to increase the socio-economic development of these communities. Project Affected People (PAP) living along the pipeline route, as well as disadvantaged groups such as those with disabilities, women, children and people in need were prioritized to increase the socio-economic development of these communities. The TANAP Project prioritized the disadvantaged people living along the pipeline route, including housewives or families with only one breadwinner, people with disabilities, isolated elderly people, illiterate people with no income, as well as members of the public with monthly incomes below the minimum wage.

As a result of these efforts, the TANAP Project provided support to 20,115 children, 6,909 women and 4,310 people with disabilities. The TANAP Project also contributed to the maintenance of economic and social development and the preservation of natural resources along the pipeline in 20 cities, 47 districts and 600 villages. The provision of grants to around 1,000 projects with a total budget of US\$ 84 million was evaluated by an independent 3rd party company and carried out through three main funding mechanisms, namely Program Contributions, Direct Investment and Direct Grants. This Program had a positive effect on the reputation of the Project among its stakeholders.



ID 59

Land Acquisition and Permitting Processes

Process / Discipline

Permits

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

Land Acquisition and Permitting processes were carried out in a timely and effective manner.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The Land Acquisition and Permitting Process was managed in coordination with the Land Right Entity (LRE), and was launched well in advance of the mobilization of Construction Contractors to site. The early commencement of the permitting process permitted the smooth mobilization of Construction Contractors to site and helped in the timely completion of the construction

works at 3rd-party crossings (e.g. road, river, existing pipeline, railway, etc. crossings)

Over 50 percent of the land was acquired amicably, indicating how efficiently and sensitively the process was managed by TANAP.



ID 60

Pipeline (Right of Way) Route Selection Studies/ Process.

Process / Discipline
Land Acquisition

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

**Sufficient time should be allocated for Pipeline (Right of Way [RoW])
Route Selection Studies/Process.**

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

A lack of sufficient time for the route selection studies during the Pre-FEED and FEED phases led to route changes during the FEED, Detailed Engineering and Construction phases of the Project. Accordingly, 56 changes were made in the Pre-FEED, 107 in the FEED and 98 in the construction phase, mostly due to archeological findings identified during the RoW opening and excavation works.

These changes were managed without any impact on Project progress through agile construction planning and effective change management applications.

Enough time should be devoted to RoW selection studies to minimize the number of route changes during the project construction phase.



ID 61

Encouraging Amicable Agreements during Land Acquisition

Process / Discipline
Land Acquisition

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

Additional implementations, such as meetings, payments etc. performed during the Project’s land acquisition process increased the amicable agreement ratio.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

In line with the Project’s commitments to ensuring international social safeguard standards throughout the Resettlement Action Plan (RAP) Implementation - as described and disclosed in the entitlement matrix of the Project’s RAP - additional land acquisition process-related payments, such as travel costs for absentee owners, power of attorney costs and

land right transfer costs in the title deed offices for shareholders were covered by the Project. It was noted that such additional supports were a positive factor that led to an increase in the amicable agreement rate by nearly 2%.

ID 62

In-House Management Modality

Process / Discipline

Land Acquisition

Project Phase

Phases 0 and 1

Type

Well



Brief Description of the Issue

The development of methodologies to cover some of the specific losses of Pipeline Affected Parties' (PAPs) and the related implementation strategies should be undertaken in-house rather than contracting them to outside companies.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Considering the competency and experience of the Project employees, and their close communication and face-to-face relations with PAPs during the construction works and operation of the Project, it will be remarkably effective to establish an in-house management modality for the management of land loss-induced social impacts rather than outsourcing them.

The in-house development of methodologies to cover the specific losses of PAPs will be much faster, and more applicable and practical if undertaken directly by Project experts rather than being contracted out to an outside company.

The Evaluation Report on Multiple Pipeline Impacts on the same project-affected parcels prepared by TANAP experts is a good example of this, while the RAP Fund Management Procedure prepared by TANAP experts is another good and unique example that eases implementation and ensures transparency, accountability and fairness, as well as the efficient and effective use of the budget.

The cost of consultancy services for such a huge scale project may be considerably higher, and may result in a decrease in the budget allocated for delivery to PAPs if the task is outsourced. Such a process should be designed taking into account the scale and magnitude of the project impact, with the ultimate aim being to mitigate the adverse impacts on PAPs from land acquisitions, compensating for their losses and, preferably, aiding them in improving their livelihoods.



ID 63

Knowledge Sharing

Process / Discipline

Human Resources

Project Phase

Phases 0 and 1

Type

Need for improvement



Brief Description of the Issue

Interdisciplinary knowledge sharing was encouraged throughout the project lifecycle.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Throughout the project, the Project team was able to share their knowledge and experience on various platforms. The TANAP Training Department arranged Interdisciplinary Knowledge Sharing Sessions for new starters and junior team members, and on-the-job training was provided by experienced TANAP construction personnel throughout the Project.

During these sessions, the Project Team was informed about the project activities by experienced team leaders, and these sessions also facilitated knowledge-sharing and capacity-building among the project personnel. As an additional benefit, the adaptation process of new starters on the project was accelerated.

The Project Management Team and the Human Resources Department should facilitate continuous knowledge sharing, as a crucial approach to capacity-building among employees.



ID 64

Recruitment Durations

Process / Discipline


Human Resources

Project Phase

Phase 0

Type

Need for improvement



Brief Description of the Issue
The direct management of the project personnel recruitment process by TANAP led to effective resource management, and reduced the duration of recruitment process.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Large-scale projects such as TANAP require large-scale and competent teams for the management of the works, and the need for such experienced personnel was particularly urgent due to the fast-track nature of the Project. Consequently, if routine recruitment processes (such as separate technical and HR interviews, screening, notice periods, etc.) are followed, the recruitment of competent personnel may be delayed.

During the initial stages of the project, when the recruitment process for site operatives was managed by the Engineering Procurement Construction Management (EPCM), the CVs of potential candidates were sent to TANAP for review and approval, after which candidates who were deemed to have the relevant experience for the position were invited for an interview.

After the completion of the interviews, the results were sent to TANAP for final approval and final acceptance before beginning the offer/ recruitment process, which proved to be a time-consuming process. Upon the transfer of the recruitment authority to the TANAP Integrated Project Management Team (IPMT), the duration of the recruitment process was reduced considerably with the involvement of the TANAP Human Resources department.

To meet the resource needs of a project, an expeditious recruitment process should be established for the recruitment of experienced personnel in a timely manner for fast-track projects.

ID 65

Labor Audit

Process / Discipline
Human Resources

Project Phase
Phases 0 and 1

Type
Well



Brief Description of the Issue

A Labor Audit was carried out to assess whether the Contractors’ employees were employed in accordance with the relevant local and international laws and regulations.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

The audit was conducted by a third-party company each month for each Contractor and their subcontractors, and monthly reports were submitted. In respect of the subject and scope of the audit, and taking into consideration issues such as the accuracy and reliability of the information obtained during the audit, a number of employment-related documents (such as the SSI employment and leave document, salary/severance payment records, etc.) were inspected and interviews were conducted with the employees. Based on an inspection of relevant documents, conclusions were reached based on information collection, verifications and comparisons, checking and analytical analysis approaches.

During the site audits, interviews were conducted with randomly selected employees or with those encountered on the site in an unscheduled and unplanned manner, when issues regarding work, such as working hours, rest breaks, weekend leave and overtime work, etc., were raised.

The client is responsible for ensuring that the employment of personnel at all levels, including Contractors and sub-contractors, for the project is in accordance with local and international laws and regulations. This was noted to also motivate and increase the sense of ownership of the Project among the personnel.

ID 66

Document Management System

Process / Discipline

DCC

Project Phase

Phase 0

Type

Need for improvement



Brief Description of the Issue

Professional Document Management System Software was developed.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

Document / Data management plays a significant role in the recording of the vast amount of information produced during the implementation of a Project. In major complex projects such as TANAP, it is important to make use of a purpose-built professional Document Management System from the beginning of the Project to ensure proper data management. In application, however, this area was not given enough attention due to other more immediate priorities.

Considering the importance of the matter, once the Project started to ramp up, the Project Management Team decided to improve the Document Management System, and to bring in a professional contractor to develop a more robust system that would permit more convenient and efficient document management.

Subsequently, a professional software company was contracted to establish the TANAP Document Management System, integrated with well-known and proven software.

An Enterprise Document Management system that meets the project needs should be established at the outset of the project.

ID 67

Project Glossary

Process / Discipline
DCC

Project Phase
Phases 0 and 1

Type
Need for improvement



Brief Description of the Issue

The Project Glossary should be kept up to date throughout the Project lifecycle.

Lessons Learned and Actions Taken / Measures / Improvement Opportunities

A Project Glossary Document was developed at the outset of the Project, although many new definitions and abbreviations were introduced during the implementation of the Project were absent from the glossary. The Project Glossary should be kept as a live document and should be updated from time to time to ensure the inclusion of newly introduced definitions and abbreviations. The timely and regular updating of the Project Glossary would facilitate effective communication and coordination among the project parties.

The Project Glossary Document should be generated in the initial phase of the Project and updated periodically throughout the project execution.

THANKS





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DOĞAL
GAZ
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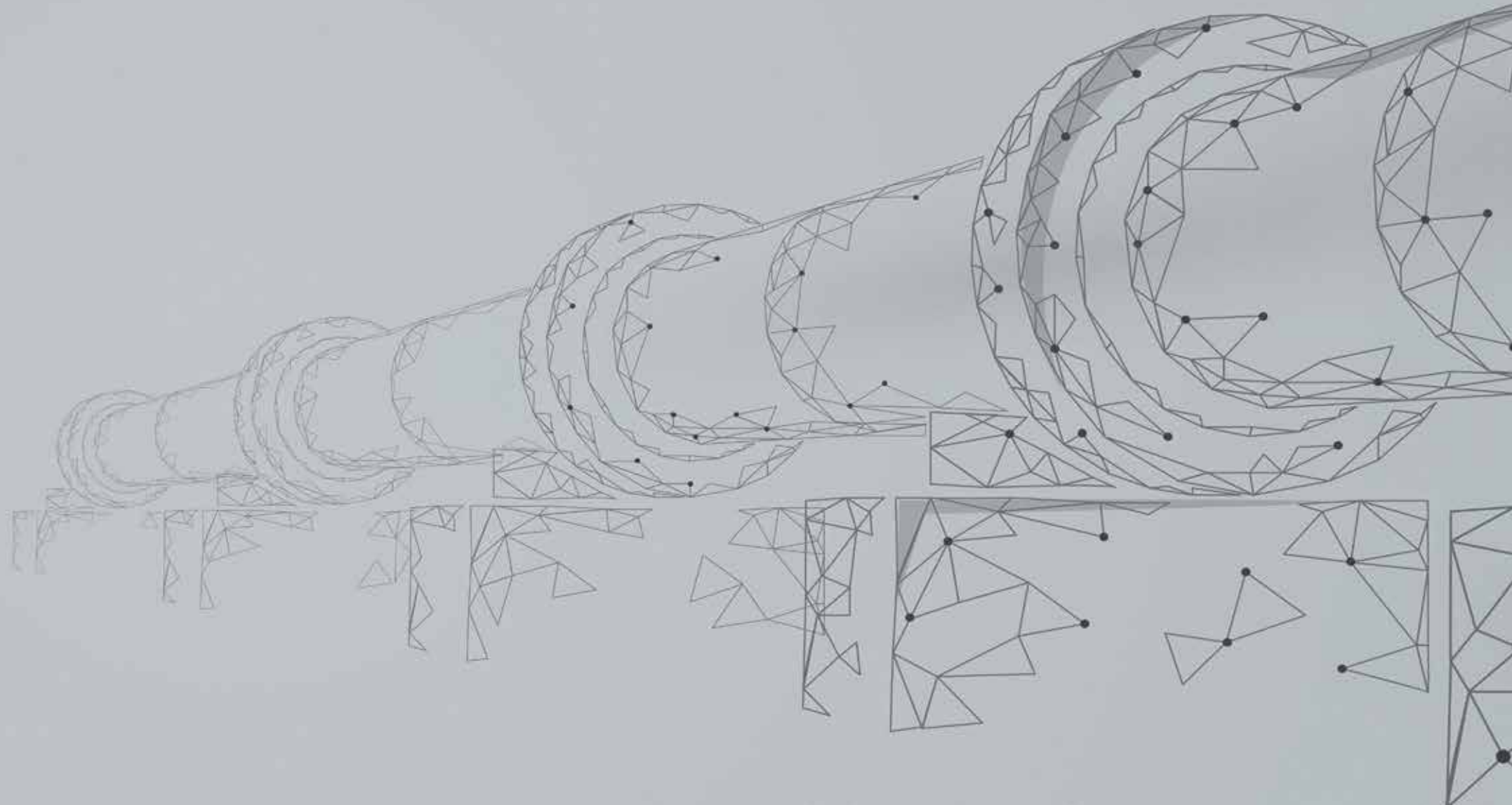
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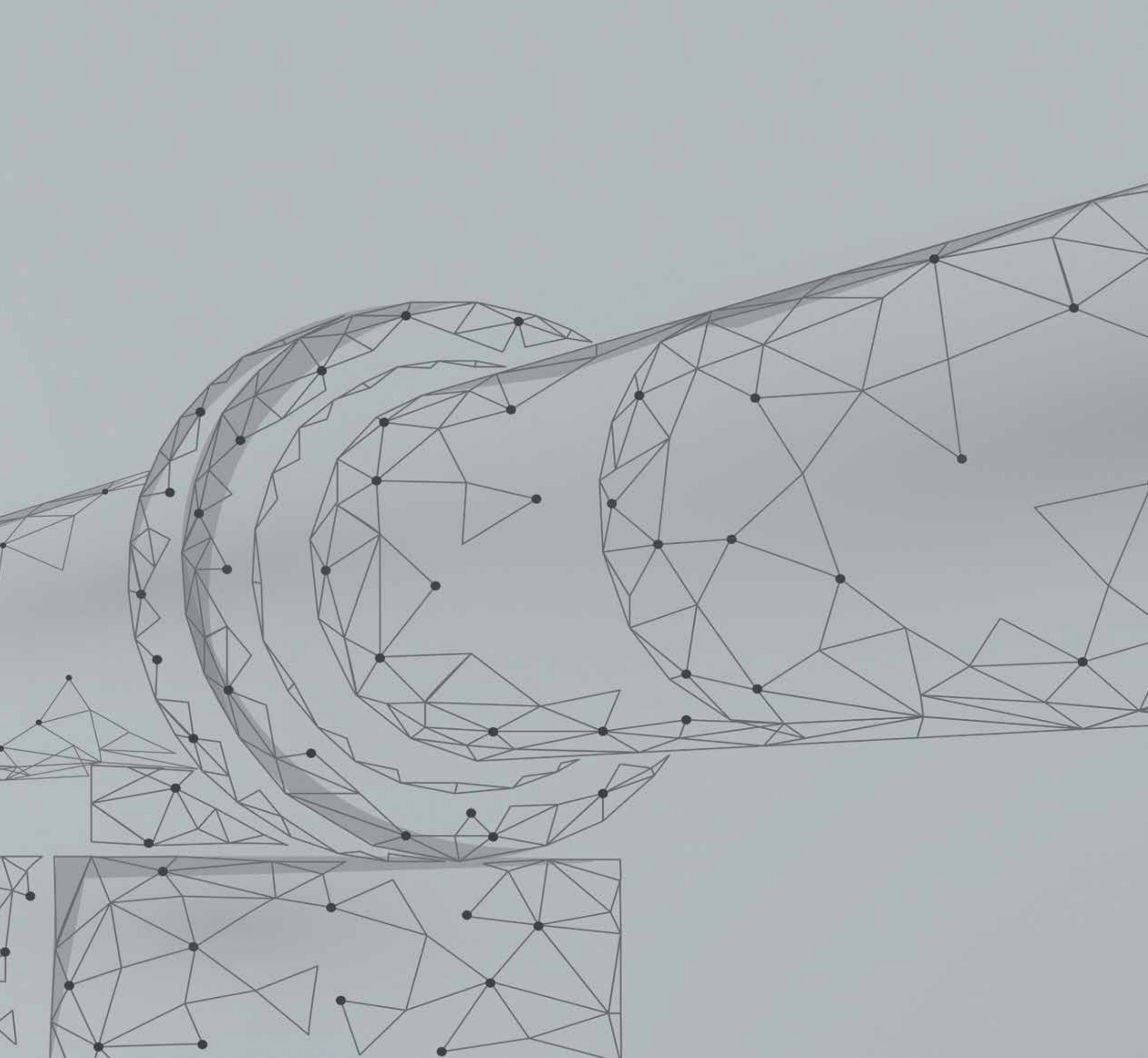
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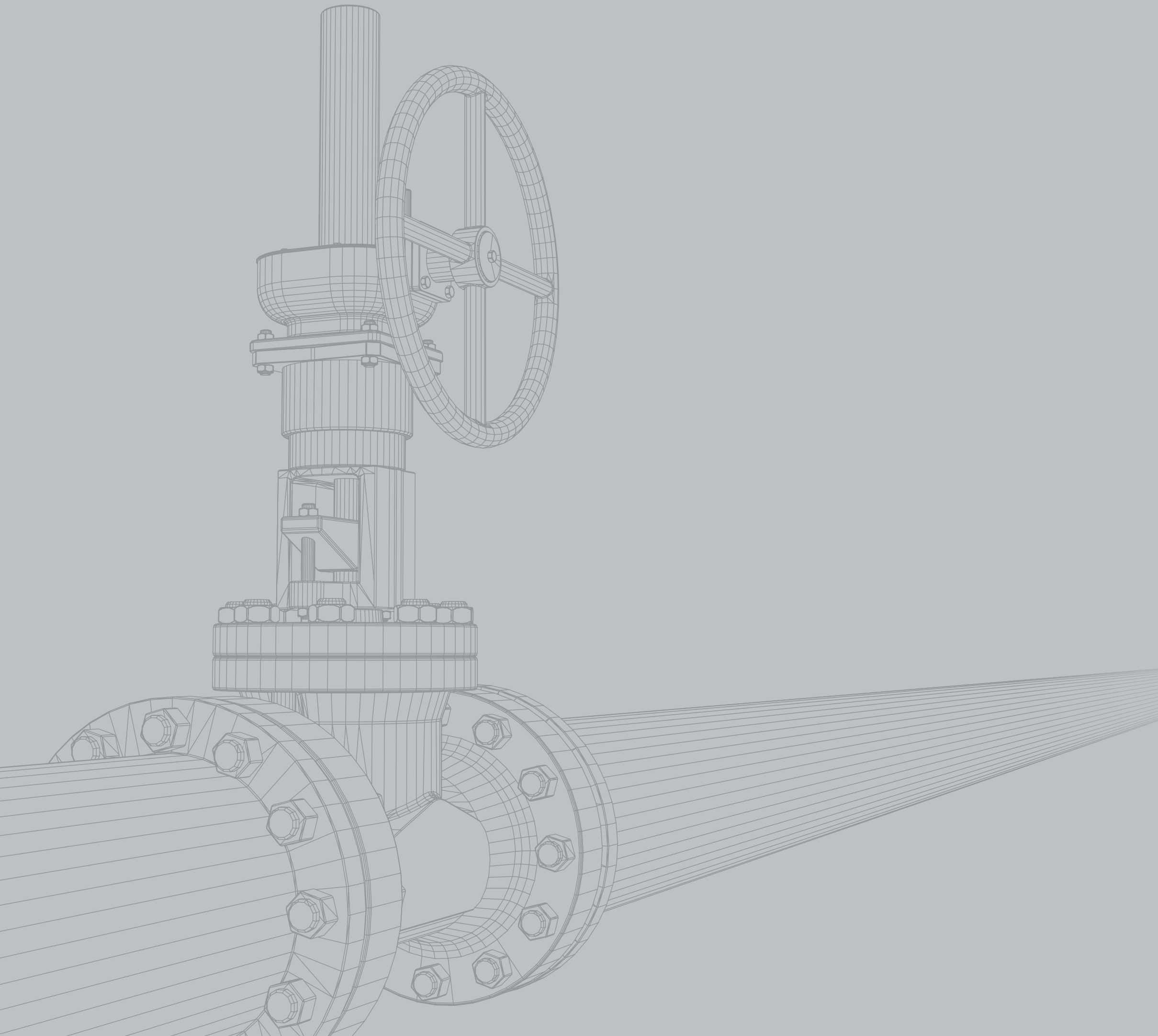
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