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# Ex-post Evaluation Study on the project on the Improvement of Mine Safety Technologies and on the Individual Expert Dispatched


Prepared by:

Gönül Ertürer
Alper Acar


*January 2005*

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# Summary

**Evaluation conducted by: JICA Turkey Office**

| **1. Outline of the Project** | | |
|---|---|---|
| **Country:** Turkey | | **Project title:** |
| **Issue/Sector:** Mine Safety | | **Cooperation scheme:** |
| **Section in charge:** | | **Total cost:** ____**yen** |
| **Period of Cooperation** | September 8, 1995-October 31,2000 | **Partner Country's Related Organization(s)：**<br>**Supporting Organization in Japan：** |
| **Related Cooperation** | | |

**1-1. Background of the Project**

Hard coal deposits are largely located only in Zonguldak province in Turkey. The production of hard coal in Zonguldak is one of the main income resources for the local people. Turkish Hardcoal Enterprise (TTK) is the main state run enterprise in the region that extracts processes and sells the hard coal. There are several hard coal mines that belong to TTK in Zonguldak two of which are Armutcuk mine and Kozlu mine. Two big gas/coal dust explosions occurred in Zonguldak area; one was Armutcuk mine disaster with 103 causalities in 1983 and the other was Kozlu mine disaster with 263 causalities in 1992. This latest disaster reminded the Government of Republic of Turkey the importance of mine safety and measures to be taken for the prevention from mine accidents. Upon request from the Government from Turkey, the Government of Japan, through JICA, provided assistance within the scope of the Project on the Improvement of Mine Technologies. The project duration was 5 years, between 1995-2000. As a follow-up to the project, an expert was dispatched between 2002-2004. The Japanese expert assisted in various aspects of the safety system such as analysis of accidents, development of training methodologies, combat with underground fires, use of reflective materials, improvement of underground traffic conditions, making the gas monitoring systems IBM compatible, upgrading of the ventilation system, introduction of the gas chromatographs into the system, and translation of training video tapes into Turkish and dissemination of the CD copies to all other quarries.

**1-2. Project Overview**

The project focused on the Kozlu colliery as the pilot project area, and brought in the appropriate technologies for central monitoring, going in-and-out checking, ventilation control, underground communication, spontaneous combustion prevention, gas and/or coal dust explosion prevention, mine fire prevention, degasification, breathing apparatuses, gas detectors, flame-proof machinery and appropriate safety and rescue education program and its materials. Counterpart engineers were trained in Japan, and were responsible for disseminating their knowledge and experience through courses and seminars back in Turkey.

**Overall Goal**

To reduce coal mine disasters in the Republic of Turkey.

**Project Purpose**

To improve the technologies for prevention of coal mine disasters of TTK.

**Outputs**

a) The safety control technology is improved.
b) Technology of disaster prevention is improved.
c) The maintenance management technology for the safety equipment is established.
d) Education and training technology is improved.

**Inputs** (as of the Project's termination)
Japanese side
- Long-term experts 8
- Short-term experts 14
- Trainees received 14
- Equipment 276 million yen
- Local cost 17 million yen

Turkish side
- Counter-parts 37
- Land, facilities and equipment
- Local cost approx. 152.4 billion Turkish Lira (approx. 18 million yen)

**2. Evaluation Team**

| | | |
|---|---|---|
| **Members of Evaluation Team** | JICA Turkey Office<br>Commissioned to Ms. Gönül Ertürer, Mr. Alper Acar (independent consultants) | |
| **Period of evaluation** | 17 November 2004 - 25 January 2005 | **Type of Evaluation:** Ex-Post Evaluation |

**3. Results of Evaluation**

**3-1. Summary of Evaluation Results**

**(1) Impact**

The technology for mine safety in Kozlu was improved along with the new equipment installed and the trained safety staff. However, there are a number of other factors that contribute to the decrease in number of accidents as well as occurrence of occupational diseases since the completion of the project. Therefore, despite the available statistics, only a qualitative interpretation pertaining to the project can be made, based on the observations and focus group meetings. Although effective safety systems were established in Kozlu before the project , the project a accomplished a more systematic management of safety in the mine. The difference in the views of focus groups show that they are affected from the project at different levels. On the overall, awareness of engineers and mine workers increased significantly as regards the safety measures. No negative impact related to the Project was reported or observed during the whole study period.

**(2) Sustainability**

Despite that project sustainability s secured through regular and extensive trainings, it is limited by the constraints in repair and maintenance of installed equipment. Problems have already been confronted in repair due to unavailable equipment parts.

Another bottleneck is the low level of dissemination of technology in other collieries of TTK. Although Kozlu is well-equipped in terms of mine safety, the same can not be said for other collieries, mainly due to financial factors. Though, the staff control system for going in-and-out checking is installed in other collieries as well.

The trained staff is very motivated for further developing the system and disseminating their knowledge. As a means of sustaining the efforts of the Japanese expert, TTK has been working on establishing an accident data-base. Various issues such as the number of occupational diseases, participation of workers in the trainings, the level of dust emissions, etc. are planned to be included in this data-base.

**3-5. Recommendations**

- Training materials produced in the project are disseminated in other collieries of TTK, however not used as extensively as in Kozlu. Efforts should be concerted in spreading the knowledge through such materials in other collieries as well. A regular training program for all the engineers (other than Counterparts) about the new safety regulations and safety technologies should be organized. The counterparts should take more incentives to disseminate their knowledge to a wider range of collieries and engineers. The administrative structure of TTK allows the enterprises to work independently. Therefore, the Counterparts should also promote in the enterprises to set up their own safety system and should give advice to the enterprises.
- Safety systems other than staff control system (going in-and-out checking) have not been extended to other enterprises and their collieries. The procurement and use of these technologies should be promoted.
- Project knowledge and know-how is observed to localize at the Safety Department of TTK. Sharing of this know-how among as many engineers as possible should be secured for sustainability of project outcomes.
- Sustainability of a project could only be achieved by the sense of ownership of the staff. In this case, the ownership and respect to the JICA-TTK project is only in a group of staff, mainly in the group of counterparts and managers. The project could be designed, implemented and followed up by sharing the experience, the bottlenecks and the vision with the pertinent staff.
- TTK should build up a team for the repair and maintenance issues, which is crucial for the sustainability of the installed safety systems. As an alternative to this option, local distributor/dealer of the Japanese equipments should be promoted to serve TTK immediately whenever necessary and/or in a compensable way.
- Focus Group of counterpart engineers recommend that regular visit of a Japanese expert in 2-year periods would be very effective in control and maintenance of the established safety systems.
- The focus group of engineers agrees that the project technologies are outdated today. New projects are needed to improve the established technologies. Training of a specific “maintenance staff” could be a particular project.

**3-6. Lessons learnt**

- The Japanese technology brought some problems with it. Although it was the most developed one in the mining sector, TTK is facing and will face serious problems in repair and maintenance issues. This arises from TTK’s institutional limitations (in terms of human resources and finance) and from the equipment itself. This also may lead the institution to resist disseminating the similar technology because they are facing difficulties in use of the systems.
- It should be emphasized that the institutional set-up and technical capacity of TTK is very strong. The officials are very proud of their duties and aware of their essential function in the safety of the mine. The technical support should have supplemented with some basic information sharing activities. As it was stated that the seminars/trainings of the Japanese experts was requested with broad participation, it could only be realized with limited participants. This may lead to feel the remaining staff to be excluded from the project/activities.
- A training plan should have been made covering the whole enterprises/collieries of TTK. The use of the prepared training materials is in the disposal of the officials of the collieries.

**3-2. Factors that have promoted the project**

Training of counterpart engineers in Japan has created a high level of commitment in the Safety Department of TTK for further improving the project technologies and disseminating the project knowledge and experience.

The Japanese expert dispatched to Turkey in 2002 after 2 years of project completion has been very effective in promoting the project sustainability. Currently, TTK managers are motivated and focused on creating new financial resources for upgrading the safety technologies in the Kozlu colliery and extending the systems to other mines as well. Ministry of Energy and Natural Resources promotes establishment of safety technologies in other mines through TTK.

The Safety Department of TTK made contract with a private company for regular maintenance of the existing equipment and repairs upon need.

**3-3. Factors that have inhibited project**

Financial constraints limit extending the project outcomes and thus inhibit project sustainability. It needs more lobbying on the side of TTK to raise finance for new investments.

**3-4. Conclusions**

- Before the project, TTK was strong in technical capacity regarding the safety issue with plans for a number of investments, and the project triggered TTK in implementing its plans for improving the existing systems.

- Impacts of the project can be conceived at the level of management staff and safety staff, but not at the level of engineers at the production line and mine workers. It is understood that the production engineers were not included in the project planning process and flow of information to the engineers was insufficient. This has caused a lack of sense of ownership toward the project on the side of the production engineers. This contradicts with the managers' new holistic vision of safety and production as a whole. TTK managers could have been encouraged to attain a more participatory manner, as production engineers and workers are the beneficiaries and users of the safety systems.

- TTK's reputation for having the best available mine safety technology in the country does not owe only to the project. Therefore, a clear answer can not be given for the part of the project in reduction of accidents and decrease in occupational diseases since implementation of the project. Certainly, the safety systems established with the project have also contributed to efficiency in production, and it is another fact that the production has been going through a decrease in quantity since the commencement of the project.

- Training courses and seminars have been considered by TTK as effective means of disseminating the project outcomes. Wider participation could have been attained to achieve an extensive dissemination. The managers explain this with the limited institutional capacity of TTK. It is also likely that TTK did not give much priority for including the production staff in the trainings on safety issues.

- Sustainability of the project is limited by the institutional structure and capacity of TTK, with limited financial resources and dependence on the government in its investments. The catalytic effect of the project can no longer be continued after the project is over, while there is need for new investments for upgrading and improving the mine safety system.

- Supply of spare parts and equipment for maintenance and repair is the main bottleneck as regards the sustainability of the project. All stakeholders are now aware that this should have been considered at the project planning stage. Although the Safety Department of TTK has made contract with a private company for regular maintenance, supply of equipment from Japan is necessary, which restricts on-time measures.

事後評価調査結果要約表

評価実施部署：トルコ事務所

<table>
<tr><td colspan="3">１．　案件の概要</td></tr>
<tr><td colspan="2">国名：トルコ</td><td>案件名：鉱山保安技術向上</td></tr>
<tr><td colspan="2">分野：その他エネルギー</td><td>協力形態：プロジェクト方式技術協力（現：技術協力プロジェクト）</td></tr>
<tr><td colspan="2">所轄部署：経済開発部　第二グループ<br>資源・省エネルギーチーム</td><td>協力金額：</td></tr>
<tr><td rowspan="2">協力期間</td><td rowspan="2">1995 年 11 月 1 日から 2000 年 10 月 31 日まで（プロジェクト方式技術協力）<br>2001 年 3 月から 2003 年 3 月まで<br>（個別専門家派遣）</td><td>先方関係機関：トルコ石炭公社（TTK）</td></tr>
<tr><td>日本側協力機関：R/D 締結時の名称（現名称）</td></tr>
<tr><td colspan="3">他の関連協力：</td></tr>
</table>

１－１　協力の背景と概要

トルコ政府は国内の電力不足に対応するため、石炭開発政策を進めている。しかし、国内の炭鉱では 1983 年に死者 103 名を出したガス、炭塵爆発事故をはじめ、名年 20 名ほどの死亡災害事故を繰り返している。1992 年 3 月には、ゾングルダック地区のトルコ石炭公社(TTK)コズル炭鉱においてガス･炭塵爆発事故が発生し、死者 265 名を出す大惨事となった。

このため、TTK は重大災害の低減と炭鉱労働者の安全確保を目的に、地質条件が類似し高度の炭鉱保管技術を有するわが国に対した、1992 年 6 月にプロジェクト方式技術協力を要請した。

１－２　協力内容

（１）上位目標

トルコ国における炭鉱災害が低減する

（２）プロジェクト目標

TTK の炭鉱災害防止技術が向上する

1. 保安管理技術が改善される
2. 災害防止技術が改善される
3. 保安用機器の保管･管理技術が確立される
4. 教育･訓練技術が改善される

（３）アウトプット（成果）

1. 安全管理技術が向上された
2. 災害未然防止技術が向上された
3. 安全機器の管理体制が確立された
4. 教育訓練技術が向上された

（４）投入（プロジェクト終了時）

日本側：

| | | | |
|---|---|---|---|
| 長期専門家派遣 | 8 名 | 機材供与 | 2.76 億円 |
| 短期専門家派遣 | 14 名 | ローカルコスト負担 | 0.17 億円 |
| 研修員受入 | 14 名 | その他 | 億円 |
| | | | 総額　2.93　億円 |

相手国側：

カウンターパート配置　37 名　機材購入　＿＿＿現地通貨＿＿＿億円

土地・施設提供　ローカルコスト負担＿＿1.524 億トルコリラ＿現地通貨0.18億円

その他

２．　評価調査団の概要

| | |
|---|---|
| 調査者 | （担当分野：氏名、所属先、職位）<br>ギュヌル・エツルール、アルパー・アジャー（個人コンサルタント） |
| 調査期間 | 2004 年 11 月 17 日～2005 年 1 月 25 日 |
| 評価種類：事後評価 | |

３．評価結果の概要

３－１　評価結果の要約

（１）インパクト

・プロジェクト実施により炭鉱での安全対策管理がシステマティックに実施できるようになり、炭鉱技術者、労働者の安全に対する意識が向上された。

・技術面として、同プロジェクトで使用した坑内通信機材、ガス検出器等の安全対策機器は有効に使われ、これらの技術的経験をもとに現在でも当時の技術を使っている。

・炭鉱夫の安全に対する意識向上として、１９９２年炭鉱爆発事件以前はほとんどガスマスクを使用していなかった。しかし、プロジェクトにより TTK 幹部への安全意識向上により炭鉱夫のガスマスク使用頻度が高くなった.

・組織運営面の改善として、生産は安全のもとに築かれているという認識がプロジェクトを通して行われた。特にカウンターパートはプロジェクトを通じて自分達の安全確保への誇りと自信を持ち、独自で安全を確保する意識を高めた。

（２）自立発展性

・プロジェクトの実施によりカウンターパートを中心に、炭鉱保安のための情報収集データベースを構築するなど独自の計画されている。

・トレーニングを通じての技術の普及として、カウンターパートが中心となってセミナー、オンザジョブトレーニングを実施しながら職場関係者に技術を普及させた。また安全週間を１年に一度実施することにより安全への意識を高めた。現在は、安全対策意識普及のために、日本のオーディオビジュアル材料をもとにトルコ側が作成しようとしている。

・技術の普及として、TTK は民間企業など自社以外へプロジェクトで習得した技術を普及している.

・坑内事故のデータベース作成について、プロジェクト期間中に実施した坑内事故データベースを作成することにより事前に発生する坑内事故件数を減少させることができ、またこのデータベースを他の炭鉱にも普及させることにより全国の炭鉱事故発生率を減少させることができた.

３−２　プロジェクトの促進要因
（１）インパクト発現を促進した要因
関係者一同の安全対策に対する意識の改善
（２）自立発展性強化を促進した要因
カウンターパートの積極的な保安に対する意思向上
（３）その他の促進要因
TTK での安全対策に対する改善をプロジェクトのカウンターパートが中心となり民間企業に普及したことによりトルコ内の坑内事故発生率が減少した。
３−３　プロジェクトの阻害要因
（１）　インパクト発現を阻害した要因
資金的な制約により機材の恒常的な更新、メンテナンスが困難となった
（２）自立発展性強化を阻害した要因
カウンターパートの技術習得の抱え込みによる他の鉱山への知識拡大の抑制
（３）その他の阻害要因

３−４　結論
日本の協力により炭鉱管理者、安全管理者への安全に対する意識が大きく向上した。炭鉱管理者は炭鉱労働者・技術者の安全に対する意識改善のため参加型形式で意識の向上を図った。
上位目標であるトルコ国における炭鉱災害は低減し、また TTK カウターパートを中心として民間企業にもノウハウを普及するなど自立発展性が認められた。

３−５　提言（当該プロジェクトに関する具体的な措置、提案、助言）
プロジェクトで技術を移転したカウンターパートだけで留まらず、カウンターパートが積極的に他の鉱山に安全保安についての技術を広めることができた。このような技術の普及をトルコ政府として、財政的な支援、技術的な支援を行うべきである。
また、プロジェクトで投入した機材は日本製であったため、現地でのメンテナンスに困難が生じた。このため、現地に適応した機材を供与する必要がある。

３−６　教訓（当該プロジェクトから導き出された他の類似プロジェクトの発掘・形成、実施、運営管理に参考となる事柄）
日本の先端機器を導入したため将来メンテナンスの問題が生じる可能性がある。また、国内で技術を広めようとしても先端機器を導入したため拡大は困難である。今後は現地に適応した機器が導入されるべきである。
従って上位目標達成や自立発展性を確保するためにはカウンターパート機関のキャパシティ（人的・資金的な観点からの受け入れ能力）を十分考慮したうえで、移転されるべき「適正技術」を検討する必要がある。

３－７　フォローアップ状況
日本製コンピュータ及びソフトは日本語表示となっていたため、カウンターパートによって更新することが困難であったが、日本から技術者が派遣され英語版に変更されたことにより、問題は解決している。なお、日本製機材の代理店はトルコ国内に存在するためスペアパーツ等入手ルートは確立している。

**Ex-post Evaluation Study**
**on the project on the Improvement of Mine Safety Technologies**
**and on the Individual Expert Dispatched**

**CONTENTS**

# 1 INTRODUCTION

## 1.1 Project Background

West Black Sea Region of Turkey is abundant with hard coal. The production of hard coal in Zonguldak area has a very long history and this became identical with the region. That's why; hard coal production is one of the main income resources for the local people. Turkish Hard Coal Enterprise (TTK) is the main state run enterprise in the region that extracts, processes and sells the hard coal. There are five institutions belong to TTK in Zonguldak area two of which are Armutcuk mine and Kozlu mine. Two big gas/coal dust explosions happened in Zonguldak area; one was Armutcuk mine disaster with 103 causalities in 1983 and the other was Kozlu mine disaster with 263 causalities in 1992. This latest disaster reminded the Government of Republic of Turkey the importance of mine safety and measures to be taken for the prevention from mine accidents.

Hence, TTK decided to request a technical support to the Japanese government in the field of mine safety, and improvement of productivity as well. The Government of the Republic of Turkey filed an official request to the Government of Japan for mine safety in June 1992. In response to the request, the Government of Japan, through JICA, dispatched the Preliminary Study Team (November 21 – December 3, 1994) followed by the Expert Survey Team (May 22 – June 18, 1995) and Implementation Study Team (August 30 – September 11, 1995) to discuss and agree with the Turkish side authorities concerning the framework of the project implementation. The Record of Discussion (R/D) was then signed in September 8, 1995. In accordance with the R/D, a five-year technical cooperation started on November 1, 1995.

A terminal evaluation was undertaken 5 months before the project ended its cooperation. It found out that TTK mine engineers have become competent and knowledgeable on mine safety technology. The project is expected to fully achieve its objectives by the end of the project period.

Following the termination of the project on October 31, 2000, upon the request from the Government of Republic of Turkey, the Government of Japan, through JICA, dispatched an Individual Expert for two-year period (February 7, 2002 – February 6, 2004) in the field of improvement of mine safety technologies and productivity. During the 2-years work time of the Japanese expert, efforts were concerted on continuation of project outcomes. In this period, various tasks were conducted under the supervision and guidance of the Japanese expert. These tasks included analysis of accidents, development of training methodologies, combat with underground fires, use of reflective materials, improvement of underground traffic conditions, making the gas monitoring systems IBM compatible, upgrading of aeration system, introduction of the gas chromatographs into the system, and translation of training video tapes into Turkish and dissemination of the CD copies to all other quarries.

This study is an Ex-Post Evaluation both for the project implemented and the expert dispatched. The results contribute to better-informed decision-making based on the lessons learnt, and promote greater accountability, and will be shared by counter-part organization (TTK), Ministry of Energy and Natural Resources, and Japanese tax payers.

## 1.2 Project Overview

Period of Cooperation: 1 November 1995 – 31 October 2000

Project Site: Zonguldak province

Implementing Organization: Turkish Hard Coal Enterprise (TTK)

Overall Goal: Coal mine disasters in the Republic of Turkey are decreased.

Project Purpose: The technology for prevention of coal mine disasters of TTK is improved.

Outputs:

- The safety control technology is improved.
- Technology of disaster prevention is improved.
- The maintenance management technology for the safety equipment is established.
- Education and training technology is improved.

Inputs:

Japanese side

| | |
|---|---|
| - Long-term experts | 8 |
| - Short-term experts | 14 |
| - Trainees received | 14 |
| - Equipment | 276 million yen |
| - Local cost | 17 million yen |

Turkish side

| | |
|---|---|
| - Counter-parts | 37 |
| - Land, facilities and equipment | |
| - Local cost | approx. 152.4 billion Turkish Lira (approx. 18 million yen) |

## 1.3 Study Objectives

The main target of this evaluation is to verify whether the outcomes of the project are being continued after a certain period of time since the end of the cooperation, and the results of these evaluations are being fed back to similar JICA projects in the planning phase. The study will enable drawing lessons and making recommendations for the improvement of the country program in mining safety sector. Results of the evaluation study will also be used to provide information to the tax payers in Japan and ensure JICA's accountability.

## 1.4 Scope of Work

The evaluation study is designed to assess the impact and sustainability of the implemented project and the expert dispatched, as observed 4 years after the completion of the project. Context of evaluation is summarized in the Evaluation Grid presented in Annex-1.

# 2 EVALUATION STUDY APPROACH

## 2.1 Methodology

The evaluation study is conducted through the following steps:

a. Review of the project context
b. Preparation of the Evaluation Grid
c. Structuring of interviews with TTK managers
d. Preparation of question sets for focus group meetings
e. Focus group meeting with counterpart engineers
f. Focus group meetings with mine engineers and mine workers

## 2.2 Evaluation Grid

The evaluation grid forms the basis for the interviews and the questionnaires conducted. The evaluation grid is divided into two main components as defined by the two evaluation criteria: impact and sustainability. Each criterion is assessed under main questions and respective sub-questions whether issues of concern are achieved or not. The grid also indicates the achievement criteria, data needed to assess the degree of achievement, data sources and data collection methods for each sub-question. However, although the Evaluation Grid is prepared as an evaluation and monitoring tool, as noted in the next section, the conduct of field surveys have shown that the grid remains rather narrow with respect to the dynamic conditions in the mine.

The evaluation grid is used in order to pre-structure the interviews with managers and counterpart engineers. The questions are organized with respect to main issues as defined below:

- Project design and implementation
- Impacts and sustainability related with the mine safety technology/equipment
- Impacts and sustainability related with the trainings
- Impacts on the institutional capacity
- Policy impacts at national and regional levels
- Budgetary issues affecting project impacts and sustainability
- Impacts on the local people
- Cooperation with JICA

Questions regarding the project impacts are aimed to perceive the benefits accomplished through the project, achievements of the counterparts from the project and their recommendations for better outcomes. Questions regarding the project sustainability are mainly designed to perceive the level of ownership of the project and initiatives for continuation or further development of the project outcomes.

## 2.3 Implementation

The evaluation is implemented through desk-top studies and field studies.

Desk-top studies include review of the prior evaluation reports, minutes of meetings for the pertinent evaluations, statistics and documentation such as TTK activity reports, etc.

Field studies include interviews and focus group meetings with counterparts, mine engineers in the production line and mine workers. The focus group discussions were pre-structured based on but not limited with the evaluation grid. Questions posed in the interviews and focus group discussions are presented in Annex-2. Interviews have been made with the managerial staff at Kozlu premises of TTK. The list of interviewed staff is provided in Annex-3. In order to support the interviews, the sets of questions were given to the interviewees and answers were collected back.

Focus groups consisted of 11 engineers from Kozlu enterprise and 11 engineers from Department of Work Safety were facilitated. 44 workers in total participated in the discussions as 3 focus groups (13 workers in 1st, 12 in 2nd and 19 in 3rd focus group). Additionally, 20 workers were also interviewed during their shift entrances or exits. The focus group meetings with the workers were not very effective in terms of the impacts of the project on mine safety. Though, conclusive remarks can be taken from general discussions regarding the working conditions in the mine.

The question sets used in the focus group meetings are presented in Annex-3. Focus group discussions were facilitated by a surveyor who facilitated discussions with mine workers and engineers in the form of focus group meetings. List of participants to these focus group meetings are presented in Annex-6.

It should be pointed that the evaluation pertains to a qualitative assessment as project outcomes are integrated with external factors outside the project scope and the evaluation is based on the views of different focus groups. Conclusive remarks point to the conflicts between the views of these groups, eventually revealing the hidden constraints for sustainability of the project outcomes.

# 3 RESULTS

Results of the evaluation study are based on the interviews with the managers and counterparts as well as focus group meetings with mine engineers and mine workers. Ideas, remarks and comments of the interviewees and focus groups are summarized in the following sections. Meetings with the managers and questionnaires are supplemented and verified by focus group meetings with the mine engineers and underground workers. These meetings were conducted by a surveyor, Mr. Özgür Çetinkaya.

## 3.1 Impact of the project

### 3.1.1 Extent of Achievement of Goals

The project benefits can mainly be categorized as the established work safety systems and the training methodology and materials.

Safety measures were definitely increased with the project. The project included the components such as analyses of the ventilation network, mask performance tests, upgrading of the central gas monitoring system, continuous gas analysis system, staff safety system, gas alarm equipment tests, upgrading of underground communication technologies, upgrading of quarry fire combat systems, and training.

Although the managers and counterparts stating that the goals of the project were achieved, there are some limitations in dissemination of the knowledge and trainings because of financial and institutional capacity of TTK. Taking of safety measures and rising of awareness of the workers and engineers were achieved not only through JICA-TTK project but also with the supplementary efforts of TTK, such as giving priority to mine safety issues and conducting different studies with other countries (i.e. England and Hungary) after 1992 accident.

Among the 8 counterparts that participated in the focus group discussions, 5 engineers have agreed that the project reached its overall goals of “improved technologies for preventing mine accidents” and “decreased mine accidents in the country”. Only one engineer stated that the project goal was not reached and another stated that the project goal was “relatively” accomplished. The two engineers stated that factors other than the project are also effective in decrease in accidents.

On the other hand, the mine engineers did not agree with the proposition that the Project contributed to TTK as the organization with the best mine safety technology. They believe that TTK had an effectively working safety system before the Project, particularly upon the lessons learnt from the 1992 accident. The project triggered the efforts of improving the mine safety systems by overcoming financial constraints and bureaucratic procedures.

The mine engineers expressed that they did not benefit from the counterparts’ works in general. They owe it to the fact that dissemination of knowledge by counterparts through activities such as seminars and reports did not include all engineers although it was originally planned in the project documents. This was explained by the managers with

"limited capacity" of the organization. Some of the mine engineers were not even informed about the counterparts' training in Japan. They learnt about their colleagues' experience in Japan only through personal conversations. Although some of the mine engineers in the focus group participated in the training seminars given by the counterparts, it is conceived that they were not explained about the relevance of the seminar contents with the Project.

The mine engineers evaluated the project as partially beneficial; the project has been effective with other factors related with mine safety. They appreciate the significance of the project components as positive and necessary, but do not relate the decrease in accidents directly with the Project. They consider that the main factor for the decrease in accidents is the devastation due to decreased coal production. They mention the factors contributing to decreased accidents as decreased number of mine workers, decreased intensity of workers at production stage, the change in production pattern, decreased production and increased level of knowledge and awareness of mine workers. They do not relate the decrease in occupational diseases with the Project. Engineers have also noted that another factor can be the change in TTK's approach to mining and mining engineers after the accident that occurred in 1992. They have stated that statistics in this aspect can be misleading.

Mine engineers explain the medium grade effectiveness of the project with the strong technical capacity of TTK before the Project: TTK had better knowledge and skills, and the number of safety processes was higher when compared with the Japanese. Nevertheless, the existing gas monitoring and ventilation systems were upgraded and improved through the Project, as a significant outcome. Engineers who have rated the project with low grade effectiveness refer to the inefficient communication system and the ventilation system, lack of staff for detection and immediate repair of technical disorders and problems with the supply of spare parts. Engineers who rate the Project with medium grade refer to the very effective operation of the laboratory.

Engineers also express that despite the very well-planned structure of the Project, problems are faced in implementation. The reason for this can be that institutional capacity of TTK was not well analyzed.

- Reduction in Accidents

Analysis of the impacts of the project on work and mine accidents and occupational diseases is rather complicated and outside scope of this evaluation, as the change in occurrence of accidents and diseases varies with a number of factors outside the scope of the project.

When the staff and accident numbers are analyzed in general scope (not limited to the project), there is no significant reduction of the deadly accidents while there is an increase in the accidents with injuries. For this analysis, total (underground + aboveground) worker numbers and accident numbers are used. This situation, however, is complex because the ratio of accidents is influenced by diverse factors such as reduction of workers, reduction of production, closing of some collieries etc. Please see Annex-5.

According to the counterparts, although it is hard to express an exact value, they observe that occupational diseases and accidents were decreased with the project implementation. Disease prevention has significantly increased with the use of standard dust masks. On the other hand, mine engineers stated that the decrease in the occurrence of diseases is not the direct results of the TTK-JICA project only. There are supplementary precautions that TTK has taken after 1992. The most common occupational disease that the workers have is related with the respiratory system.

- Technology for Safety Measures and Equipment

The safety equipment provided and installed within the context of the project in the Kozlu colliery was the best available and most recent technology at the time of the project. It is still the most developed system compared to other collieries of TTK despite the 4 years times over the completion of the project. Safety systems of Kozlu colliery as well as the laboratories are examples of how the safety management should be.

Mine communication equipment and gas detectors are the equipment that workers use for safety. They are fully aware of the significance of the gas monitoring system. For some workers, existence of the safety systems underground gives a feeling of safety.

The focus group of counterpart engineers indicate that the facilities accomplished through the project, such as the mask test laboratory and gas chromatographs are used effectively, and the engineers continue to implement their knowledge and experience from the project.

Engineers in the focus group did not know how to use the safety systems established with the Project, as this was not in their job description. However, they think that the technology of these systems have changed, and has to be upgraded as soon as possible. They note that problems are faced in repair and maintenance, especially in conditions of breakdown. This is underlined by the lack of trained staff in repair and maintenance of the Project equipment. The Japanese system, which is different from the European standards, is difficult to cope with. These problems limit the effective use of the safety technologies. Language was a problem at the beginning since Japanese characters were used on the equipment, but this was later solved with the works of the dispatched Japanese expert. Engineers also emphasized that the “technology” refers to the Project safety systems, but not the laboratory that serves the whole country very effectively.

- Level of Awareness

Besides safety control measures, increased level of awareness of TTK managers and Department of Work Safety and Training was an important outcome of the project. Before the project, issues different from production were accepted as secondary work. The project created awareness about mine safety within the institution and therefore the production works are now backed up with safety measures.

Mine workers are aware of the importance of the gas masks that are obligatory to use after the 1992 accident. However, workers are not very comfortable to use the dust masks as they feel “narrowed” and they find it difficult to use during production. Therefore, use

of dust masks is not much high. It has been observed during the site visit that most of the workers did not wear dust masks.

Workers' awareness about the safety measures is best described with their attention to the warning signs and labels both underground and above the ground. It is conceived that despite their vital importance some measures are ignored from time to time. For instance, gas measurement by an inspector before production is sometimes neglected. Workers are aware that the safety systems are vital for them despite that they do not know that they are installed as a result of cooperation with JICA. The mine workers with 15-20 years experience in the Kozlu colliery can compare the situation before and after the 1992 accident, and evaluate the current situation as more orderly and having more control.

### 3.1.2 Institutional Capacity and Management Aspects

Before the project, work safety and training were not given priority as aspects different from production. The project has changed this attitude and replaced with an approach where production should be supported by safety and training measures. This has become an institutional policy of TTK. They have adopted the "zero accident" concept of the project as their organizational goal.

Training was one of the most important components of the project, which contributed to institutional capacity development. 15 engineers, the so-called "counterparts" were trained in Japan, and rest of the technical staff was trained in seminars and courses. The counterparts were trained as future trainers. Counterpart engineers particularly gained knowledge and skills in use of ventilation softwares and computer technologies, while the mine workers have become relatively more aware of the significance of safety control measures. Regular trainings are conducted in various topics related with accidents, mask usage, emergency situations, etc.

Counterpart engineers have expressed that they have increased their knowledge and skills in safety systems. They were highly motivated with the training in Japan and opportunities of learning new technologies. They are proud that they are the only engineers in the country with such knowledge in mine safety. They express their ownership of their organization and professional authority, which they accomplished as a result of the project. They state that they have a new vision and approach in their work, and this leads them to higher levels in their profession.

18 technical staff is trained on the topic of "ventilation" by the Japanese expert who worked in Zonguldak. 3 engineers were sent to Japan among these 18 trainees. Some of them are appointed to other works with higher ranks. However, significance is paid to keep the trained staff working in the same subject to improve their specialization. Some engineers were promoted as a result of their improved knowledge and skills in the project. The project has had impacts on the vision of the engineers in their professional lives. They are very motivated to learn more new technologies and to be promoted.

Training in Japan gave counterparts the opportunity to observe different kinds of mine safety measures. The overall management is also positively affected because of the broadened vision and increased self-confidence among the project participants. Hence the work efficiency of technical staff is increased.

As an input to institutional capacity development, basic solutions of the Japanese expert was very effective for practical safety issues such as improvement of fire extinguishing measures in mine galleries. The training materials and papers of JICA experts are also collated and printed as a guide book. These guides are still used in the trainings.

The Kozlu colliery is relatively better as compared with other mines in terms of work safety, and TTK is currently in a position to fulfill the requirements of EU legislation on work safety that requires determination of risks and implementation of appropriate safety measures.

### 3.1.3 Financial Impacts

A significant impact of the project can be expressed in financial terms. As the TTK managers express, TTK had the opportunity to install the most recent technological safety equipment that was hardly possible to provide with their own budget.

As an indirect financial impact, the mask testing laboratories established through the project serve not only TTK, but also the public and private mine enterprises. TTK charges a certain amount of fee for these tests. Although the charges are relatively low, it creates an additional fund for TTK.

Another indirect financial benefit can be mentioned in terms of decreased accidents and secured continuation of production.

### 3.1.4 Side impacts

Although, some of the counterparts have stated that safety measures do not contribute to production efficiency, they noted that the impact of the project on production is rather indirect. As the loss of work power due to accidents is decreased, improvement of safety measures is reflected on production as well.

Another side impact of the project can be interpreted in terms of increased standards in the country. The Turkish producer of dust masks is the Machinery Chemistry Industry (MKE) that has dropped its production unit after failing of the test results conducted in TTK Laboratories.

### 3.1.5 Social and Economic Impacts

The main impact of the project in socio-economic terms according to TTK managers and counterparts is that the local people in Zonguldak area and especially the families of miners respect TTK's measures on work safety. This has increased the trust towards TTK. However, this statement can not be totally verified by discussions with the inhabitants of Zonguldak. The inhabitants gave diverse answers in the discussions, which makes evaluation hardly possible.

The project has not only contributed in improving the safety system, but also has provided an opportunity to exchange cultural values between Turkish and Japanese staff as well as residents of Zonguldak. The vision and self-confidence of the counterparts are increased by working together with foreign experts and having the chance to know a different culture.

## 3.2 Sustainability of the project

### 3.2.1 Sustaining of project Benefits

- Sense of Ownership

The most important factor for the sustainability of the project is that it has increased the sense of ownership in the engineers for their institution. In other words, counterpart engineers are proud of working in TTK as the only organization in the country, having laboratory with its world standards. Turkish Coal Enterprise (TKI) and other private enterprises are sending their equipment to TTK laboratory, and TTK is trying to extend its service area to the whole country. They currently aim at accreditation of the laboratory to get registered on international basis.

- Dissemination of Knowledge through Trainings

Training is one of the most important means of disseminating the knowledge gained through the project. The counterparts who were trained by the Japanese experts started giving seminars to the relevant technical staff, and conducted on-the-job trainings with the mine workers. Furthermore, a 1-week seminar is organized each year besides the regular training activities in the "Work Safety Week". The training materials provided by the Japanese experts are extensively used for the trainings.

Dissemination of knowledge from the project is mainly accomplished through seminars and distribution of CDs containing training issues. The audio-visual training material provided by JICA is distributed to all the enterprises and used in the trainings. TTK has also produced its own training materials based on the Japanese CDs. They are now planning to produce similar training materials on each subject if they can secure sufficient financial resources. However, it is not clear whether the training materials are actively used.

Among various trainings compulsory for the workers, use of gas and dust masks and mine safety measures are also included. Workers have stated that the trainings have had an effect on their approaches to their work. They appreciate the trainings which were not frequent before the 1992 accident as today.

- Dissemination of Technology

TTK can guide, assist and provide consultancy services to other public and private mine establishments, as well. TTK has already assisted Mihalıççık Mine on safety equipment provision and training issues.

- Maintenance and Repair

As an important means of sustaining the project results, some problems were faced in maintenance of equipment brought with the project. Particularly, the Japanese gas monitoring equipment was not compatible with the "western", and the computer systems were not IBM-PC compatible. In repair and maintenance (R&M) cases, Japanese service providers and spare parts were needed. Therefore, the systems were upgraded to as IBM compatible. Currently, the R&M services can be handled by local representatives of the Japanese producer.

Gas measurement equipment is currently out of order, and has to be replaces with a new one as soon as possible. It is not easy to supply the installed equipment and the spare parts, which inhibits intervention on time. The Safety Department of TTK made contract with a private company for regular maintenance of the existing equipment and repairs upon need. This should also be secured in the Kozlu colliery as well.

They recommend that systems that are easy to operate and easy to access should better be brought in. For instance, failures have been faced in the gas monitoring system after its use for 2 years. Mine engineers have been told that some of the equipment parts can not be repaired and have to be replace (i.e. the digital screen in the gas monitoring system).

- Other Means of Sustainability

As a means of sustaining the efforts of the Japanese expert, TTK has been working on establishing an accident data-base. Various issues such as the number of occupational diseases, participation of workers in the trainings, the level of dust emissions, etc. are planned to be included in this data-base.

TTK has extended the staff control system provided by JICA to all the collieries of TTK. The relevant software is redesigned to use in all collieries.

Particular concern is given on further developing the safety systems, rather than maintaining the established utilities and facilities. In this respect, TTK has continued its efforts for enhancing the project outcomes. One major effort was improvement of the test equipment that was primarily installed for controlling the gas masks, to test the dust masks as well. For this, TTK used supplementary devices provided within the scope of the project.

- Financial and Institutional Factors

According to TTK managers, sustaining the project outcomes did not face many problems. Budget is not a major concern for repair, maintenance and procurement of spare parts. Moreover, as the equipment provided through cooperation with JICA included the spare parts necessary for 5 years, it has not been deemed necessary to supply some spare parts yet. However, procurement of new equipment has to be secured through governments' annual investment plans (through State Planning Institute - DPT) which take time. JICA provided most of the safety equipment of TTK. Inclusion of other essential safety equipment is under consideration in the investment plans of the government. However, it should be underlined here that the safety equipment other than staff control system has not been installed to the other 4 collieries of TTK.

### 3.2.2 Government Policies

The project did not contribute to the government policies yet. However, through conducting the project, TTK is now capable to fulfill the EU work safety requirements which are much stricter than the Work Safety Law in force. Their capacity lets them give advice on policy and legislative changes if required.

### 3.2.3 Other Financial Donors

One of the financial donors that TTK cooperated before the Project was the World Bank. The Bank provided 70 million USD fund for procurement of various underground equipment such as locomotives within the scope of a "rehabilitation project". The project was realized between 1989-90, with an overall objective of improving the production technology of TTK.

TTK has continued its efforts for improving its safety systems and continuing training events for improving its technical capacity. In this respect, TTK received a loan from the European Union in 1997, to train skilled mine workers. In the framework of the project with a total budget of 3,4 million Euro; (i) improvement of the training colliery by procurement and establishment of new equipment, (ii) establishment of training rooms and procurement of audio-visual and other training equipments, and (iii) training of trainers has been done. The main target group of this project was training of mine workers. All the abovementioned activities are undertaken by different groups, namely the underground equipments were provided by a German company, the training equipment was supplied from France and the trainings were conducted by IMCL, England.

## 3.3 Conclusions

Conclusive remarks regarding the evaluation study can be outlined as follows:

- Before the project, TTK was strong in technical capacity regarding the safety issue with plans for a number of investments, and the project triggered TTK in implementing its plans for improving the existing systems.

- Impacts of the project can be conceived at the level of management staff and safety staff, but not at the level of engineers at the production line and mine workers. It is understood that the production engineers were not included in the project planning process and flow of information to the engineers was insufficient. This has caused a lack of sense of ownership toward the project on the side of the production engineers. This contradicts with the managers' new holistic vision of safety and production as a whole. TTK managers could have been encouraged to attain a more participatory manner, as production engineers and workers are the beneficiaries and users of the safety systems.

- TTK's reputation for having the best available mine safety technology in the country does not owe only to the project. Therefore, a clear answer can not be given for the part of the project in reduction of accidents and decrease in occupational diseases since

implementation of the project. Certainly, the safety systems established with the project have also contributed to efficiency in production, and it is another fact that the production has been going through a decrease in quantity since the commencement of the project.

- Training courses and seminars have been considered by TTK as effective means of disseminating the project outcomes. Wider participation could have been attained to achieve an extensive dissemination. The managers explain this with the limited institutional capacity of TTK. It is also likely that TTK did not give much priority for including the production staff in the trainings on safety issues.

- Sustainability of the project is limited by the institutional structure and capacity of TTK, with limited financial resources and dependence on the government in its investments. The catalytic effect of the project can no longer be continued after the project is over, while there is need for new investments for upgrading and improving the mine safety system.

- Supply of spare parts and equipment for maintenance and repair is the main bottleneck as regards the sustainability of the project. All stakeholders are now aware that this should have been considered at the project planning stage. Although the Safety Department of TTK has made contract with a private company for regular maintenance, supply of equipment from Japan is necessary, which restricts on-time measures.

# 4 RECOMMENDATIONS AND LESSONS LEARNT

## 4.1 Recommendations

The following recommendations are made as a result of the analysis of project impacts and constraints on its sustainability. In making these recommendations, views of the managers and focus group members are also reflected.

- Training materials produced in the project are disseminated in other collieries of TTK, however not used as extensively as in Kozlu. Efforts should be concerted in spreading the knowledge through such materials in other collieries as well. A regular training program for all the engineers (other than Counterparts) about the new safety regulations and safety technologies should be organized. The counterparts should take more incentives to disseminate their knowledge to a wider range of collieries and engineers. The administrative structure of TTK allows the enterprises to work independently. Therefore, the Counterparts should also promote in the enterprises to set up their own safety system and should give advice to the enterprises.
- Safety systems other than staff control system (going in-and-out checking) have not been extended to other enterprises and their collieries. The procurement and use of these technologies should be promoted.
- Project knowledge and know-how is observed to localize at the Safety Department of TTK. Sharing of this know-how among as many engineers as possible should be secured for sustainability of project outcomes.
- Sustainability of a project could only be achieved by the sense of ownership of the staff. In this case, the ownership and respect to the JICA-TTK project is only in a group of staff, mainly in the group of counterparts and managers. The project could be designed, implemented and followed up by sharing the experience, the bottlenecks and the vision with the pertinent staff.
- TTK should build up a team for the repair and maintenance issues, which is crucial for the sustainability of the installed safety systems. As an alternative to this option, local distributor/dealer of the Japanese equipments should be promoted to serve TTK immediately whenever necessary and/or in a compensable way.
- Focus Group of counterpart engineers recommend that regular visit of a Japanese expert in 2-year periods would be very effective in control and maintenance of the established safety systems.
- The focus group of engineers agrees that the project technologies are outdated today. New projects are needed to improve the established technologies. Training of a specific “maintenance staff” could be a particular project.

## 4.2 Lessons Learnt

The following lessons can be referred in planning and conducting similar projects of JICA.

- The Japanese technology brought some problems with it. Although it was the most developed one in the mining sector, TTK is facing and will face serious problems in repair and maintenance issues. This arises from TTK's institutional limitations (in terms of human resources and finance) and from the equipment itself. This also may lead the institution to resist disseminating the similar technology because they are facing difficulties in use of the systems.
- It should be emphasized that the institutional set-up and technical capacity of TTK is very strong. The officials are very proud of their duties and aware of their essential function in the safety of the mine. The technical support should have supplemented with some basic information sharing activities. As it was stated that the seminars/trainings of the Japanese experts was requested with broad participation, it could only be realized with limited participants. This may lead to feel the remaining staff to be excluded from the project/activities.
- A training plan should have been made covering the whole enterprises/collieries of TTK. The use of the prepared training materials is in the disposal of the officials of the collieries.

**ANNEXES:**

Annex-1: Evaluation Grid
Annex-2: Questions Sets for the Interviews and Focus Group Discussions
Annex-3: Agenda of Interviews
Annex-4: List of Counterparts
Annex-5: Trends of Occupational Accidents
Annex-6: List of Focus Group Meeting Participants

## ANNEX-2

*1. Question Set used in the Focus Group of Mine Engineers*

**IMPACTS**

**Project Benefits**

1. Were the technologies for preventing mine accidents prevented as a result of the project?
2. Is there a decrease in mine accidents with the implementation of the project supported by the Japanese Government?
3. Is there an increase in the work safety measures as a result of the project?
4. Is there a decrease in occupational diseases?
5. Are there other factors effective in decrease of accidents?
6. Did the safety measures contribute to increase in production?
7. Have there been accidents with death since the implementation of the project?
8. Was the work of the Japanese expert who stayed between2002-2004 useful?
9. Do you know about the new safety systems established in Kozlu?
10. Do you think that these new technologies have been useful?
11. Have you ever confronted problems or difficulties in operation of the systems installed in the project? How did you handle these?
12. Did you make use of the works of the counterparts?
13. How many times did you participate in the trainings?
14. Do you practice/implement the knowledge you learnt in the trainings?
15. Are there any constraints for implementing such knowledge? (equipment/finance/staff/legislation)
16. Do you think whether the project contributed to local development? In which aspects?
17. Is the equipment supplied with the project used effectively?

18. Do you think the project was successful? (1-5 grading)

19. Was the project well-planned? (timing/activities/organization/other)

20. What could be done for better results? (Roles of JICA and TTK)

**SUSTAINABILITY**

**Level of Ownership of the project**

1. In which topics were the Japanese experts involved?

2. Do you agree with the proposition that TTK owns the most advanced mine safety technology as a result of the project?

3. Do you think that you work in a safer situation after the project?

4. Do you agree with the proposition that the technology and knowledge gained through the project resulted in increase of production efficiency?

**Institutional Aspects**

5. Is the project equipment maintained regularly?

6. Do you participate in TTK's trainings regularly?

7. Are there any difficulties in supply of spare parts or in the maintenance of project equipment? What kind of difficulties? How do you handle these?

2. *Question Set used in the Focus Group of Counterparts*

**IMPACTS**

**Project Benefits**

21. Do you think that the Project objectives "Mine accidents in Turkey are reduced" and "Technologies for preventing mine accidents are improved in TTK" have been achieved?

22. Are the safety measures increased as a result of Project implementation?

23. Is there a decrease in accidents as a result of the Project?

24. Is there a decrease in occupational diseases?

25. Are there any other factors for the decrease in accidents?

26. Did the Project contribute to increase in production?

27. Has there been any deadly accident since the Project implementation? What were the reasons?

28. What was the job description of the Japanese expert that worked between 2002-2004? What were your expectations from his works?

29. Did he accomplish the anticipated inputs?

30. Were there factors that inhibited the Japanese expert's works?

31. What kind of tasks did he undertake?

32. Did you make use of his knowledge and experience?

**Roles of Counterparts in Project impacts**

33. Do you use the knowledge and experience that you accomplished in the Project?

34. Are there any obstacles in implementing your knowledge? (equipment/finance/staff/legislation)

35. Do you think that the Project had an effect on local development?

36. Is the Project equipment used effectively?

37. Do you use the knowledge that you accomplished in Japan effectively?

38. Did you face difficulties in conduct of the Project? Were you affected by these difficulties?

39. Was your work interrupted by your participation in the Project?

40. What are the factors that mostly motivate you in your role in the Project?

41. Do you think technologies were improved in mine safety, accident prevention, repair and control, and training as a result of the Project?

42. Which project topics were use specialized?

43. Would you be willing to take part in a similar Project? Why?

**Professional accomplishments**

44. Did you improve yourself as a result of your participation in the Project?

45. Was there any promotion in your position? What is your new position?

46. Were you affected economically by your participation in the project?

47. What are your plans for your future professional life?

**Recommendations/Lessons learnt**

48. Do you think the Project was successful? (1-5 rating)

49. Was the Project well-planned? (timing/activities/organization/other)

50. What could be done for better results? (Roles of JICA and TTK)

**Policy-based and institutional benefits**

51. Did the Project have an impact on mining policy in Turkey or in the Zonguldak basin?

52. Did the Project bring an economic benefit for TTK?

53. Did the Project have impacts on TTK's mining Technologies?

54. Can you compare the budget that TTK allocate for work safety equipment before and after the Project?

55. Were the Project outputs extended to the other collieries of TTK? If not, why?

56. Did the Project have any negative impacts?

**SUSTAINABILITY**

**Level of ownership of the Project**

8. What was the goal of the project?

9. Do you think that the project goal was accomplished?

10. Do you agree with the proposition that TTK owns the most advanced mine safety technology as a result of the Project?

11. Do you agree with the proposition that the technology and knowledge gained through the Project resulted in increase of production efficiency?

**Initiatives for sustaining and improving project outcomes**

12. What kind of activities do you plan to take in the light of the project?

13. Do you share these plan with the managers?

14. Are there obstacles or difficulties in realizing these plans?

15. What do you recommend to overcome these obstacles/difficulties?

16. Do you wish that a new cooperation would be made between JICA and your organization? Which issues? (technology transfer/training/other)

**Institutional**

17. Is the project equipment maintained regularly?

18. What is the financial dimension of accidents that occurred in 1983 and 1992?

19. What is the contribution of the project to TTK in financial terms?

20. Were the safety equipment maintained and disseminated in other collieries? If not, why?

21. Is there sufficient government resources allocated for mine safety systems?

22. Has there been a governmental policy change after the project regarding mine safety?

23. Is new staff trained, and are trainings regularly continued?

24. What kinds of efforts were concerted to disseminate the project outcomes?

25. Do you confront with difficulties in supplying spare parts in maintenance and repair of the project equipment? What kind of difficulties?

*3. Question Set used in the Focus Group of Mine Workers*

1. Do you know about the JICA-TTK Improvement of Mine Safety Technologies Project?
   ☐Yes (*i.* what?, *ii.* what activities are done?)

   ☐No

2. Is your family or neighborhood aware of improvements in mine safety?

3. How many years are you working as a miner?
   ☐Yes before 1995 ☐ Yes after 2000 ☐ Yes in 2004
   ☐No, other

4. How did the mine safety change before and after the project?
   ☐Working style
   ☐Working equipment
   ☐Working environment
   ☐Others (please specify)

5. During and after the project did you receive any training? How many workers? Did other workers you know receive training?

6. Do you work more aware/conscious after the trainings?

7. Do the accident number decreased after the trainings?

8. Did your diseases decreased after the precautions taken?

9. Did the trainings are given to all the workers or just the seniors?

10. Did the trainings given periodically or just once for each worker?

11. According your opinion, were the trainings capable to secure the mine safety?

12. Did the same training applied to the new workers? How many?

13. Does your opinion/awareness changed after the trainings?
   ☐Old and new habits
   ☐Awareness level
   ☐Working environment
   ☐Others (please specify)

14. How did you benefit from the project? (Trainings, use of masks, training materials, inspection and monitoring systems, aeration systems etc.)

15. Do you use the knowledge given in the trainings?

16. Do you use the dust and gas masks?

17. What types of safety equipments are installed?

18. Does this equipment useful?

19. Do you obey the safety rules?

20. Do you know how to use these equipments? Do you use them?

21. What kind of accidents happened before the project? (similarities/differences)

22. What kind of accidents happened after the project?

23. How the mine safety measures did affect the inhabitants?

24. Did the diseases caused by working in the mine changed (decrease or increase)?

25. To opinion the more successful part of the project is …..

26. It would be good if the project could …

27. How the condition of workers in other collieries of TTK?

28. Did they benefit from the project and trainings?

## ANNEX-3: Agenda of Interviews

December 9, 2004, Thursday

Meeting with:
- Mesut Öztürk, TTK Head of Safety and Training Center
- Çetin Onur, TTK Deputy General Manager
- Rıfat Dağdelen, TTK General Manager

Focal point meeting with the C/P's[1]:
- K. Reşit Kutlu, *Kozlu Enterprise*
- M. Şeref Altan, *Mine Technician*
- Ms. Şükran Bozkurt, Deputy Head of Data Base Management Division
- Ali Özkan, *Chief Engineer*
- Ejder Erbay, Chief Engineer - Laboratory
- Ramazan Karaaslan, Head of Research and Development Unit
- Orhan Dalahmetoğlu, Chief Engineer - Ventilation and Dust
- Mesut Öztürk, Head of Safety and Training Center

December 10, 2004, Friday

Meeting with:
- Kazım Eroğlu, Director of Kozlu Enterprise

**Ayhan Baylan, Deputy Director of Kozlu Enterprise**

- Aslan Yazıcı, Deputy Director of Kozlu Enterprise
- K. Reşit Kutlu, *Kozlu Enterprise*
- Ramazan Karaaslan, Head of Research and Development Unit

- Visit to Kozlu Colliery Nr.2

Meeting with:
- Ramazan Karaaslan, Head of Research and Development Unit
- Mesut Öztürk, Head of Safety and Training Center

[1] İlyas Yazıcıoğlu, Ali Yorulmaz are retired, Nurettin Eren is appointed to General Directorate of Mining Affairs, Cengiz Burma is deceased.

December 28, 2004, Tuesday

Meeting with:
- Mesut Öztürk, TTK Head of Safety and Training Center
- Kazım Eroğlu, Director of Kozlu Enterprise
- Kemal Reşit Kutlu, Fazlı Uncu

Focus Group Meeting
- 1st focus group meeting with engineers in Kozlu colliery
- 1st focus group meeting with mine workers in Kozlu colliery
- Evaluation of both focus group meetings with Kemal Reşit Kutlu and Mesut Öztürk

December 29, 2004, Wednesday,

Focus Group Meeting
- 2st focus group meeting with engineers and officials of Safety and Training Center
- 2nd and 3rd focus group meeting with mine workers in Kozlu colliery
- Evaluation of focus group meetings with Mesut Öztürk

- Discussions with underground workers

December 30, 2004, Thursday

- Visit to Kozlu Colliery Nr.2
- Discussions with underground workers
- Closing discussion with Mesut Öztürk

## ANNEX-4: List of Counterparts

| | | |
|---|---|---|
| 1. | Ertuğrul Sözer, | *Armutcuk District* |
| 2. | Vedat Yücel, | *Kozlu District* |
| 3. | Muzaffer Şeref Altan, | TTK Department of Safety and Training |
| 4. | Ali Özcan, | TTK Department of Safety and Training |
| 5. | Ejder Erbay, | TTK Department of Safety and Training |
| 6. | Cengiz Burma | (*deceased*) |
| 7. | Kemal Reşit Kutlu, | *Kozlu Colliery* |
| 8. | Halim Bultan, | *Kozlu Colliery* |
| 9. | Ms. Şükran Bozkurt, | Department of Research, Planning & Coordination |
| 10. | İlyas Yazıcıoğlu | (*retired*) |
| 11. | Nurettin Eren | (*appointed*) |
| 12. | Orhan Dalahmetoğlu, | *Kozlu Colliery* |
| 13. | Mesut Öztürk, | TTK Department of Safety and Training |
| 14. | Ramazan Karaaslan, | TTK Department of Safety and Training |
| 15. | Ali Yorulmaz | (*retired*) |

## ANNEX -5: Occupational Accidents

| Year | In The Mine (Pit) | | Out Of The Mine | | Total | | Nr. of Workers (Total) | % of staff died in accidents | % of staff injured in accident |
|---|---|---|---|---|---|---|---|---|---|
| | Dead | Injured | Dead | Injured | Dead | Injured | | | |
| 1980 | 9 | 1.358 | | 169 | 9 | 1.527 | 45.824 | 0,02 | 3,33 |
| 1981 | 30 | 6.540 | 1 | 1093 | 31 | 7.633 | 43.988 | 0,07 | 17,35 |
| 1982 | 26 | 6.628 | | 1328 | 26 | 7.956 | 42.795 | 0,06 | 18,59 |
| 1983 | 9 | 1.139 | 1 | 208 | 10 | 1.347 | 42.475 | 0,02 | 3,17 |
| 1984 | 17 | 7.155 | 1 | 1205 | 18 | 8.360 | 41.278 | 0,04 | 20,25 |
| 1985 | 35 | 7.231 | | 901 | 35 | 8.132 | 42.073 | 0,08 | 19,33 |
| 1986 | 19 | 6.044 | 4 | 674 | 23 | 6.718 | 40.158 | 0,06 | 16,73 |
| 1987 | 31 | 5.877 | 2 | 608 | 33 | 6.485 | 40.172 | 0,08 | 16,14 |
| 1988 | 31 | 6.514 | 1 | 741 | 32 | 7.255 | 40.202 | 0,08 | 18,05 |
| 1989 | 19 | 6.133 | 1 | 691 | 20 | 6.824 | 39.031 | 0,05 | 17,48 |
| 1990 | 22 | 6.194 | | 622 | 22 | 6.816 | 38.279 | 0,06 | 17,81 |
| 1991 | 15 | 5.169 | 1 | 481 | 16 | 5.650 | 34.578 | 0,05 | 16,34 |
| 1992 | 275 | 4.931 | 1 | 403 | 276 | 5.334 | 32.450 | 0,85 | 16,44 |
| 1993 | 14 | 4.423 | | 244 | 14 | 4.667 | 31.386 | 0,04 | 14,87 |
| 1994 | 12 | 2.957 | | 159 | 12 | 3.116 | 28.505 | 0,04 | 10,93 |
| 1995 | 11 | 2.248 | 2 | 125 | 13 | 2.373 | 26.006 | 0,05 | 9,12 |
| 1996 | 4 | 2.417 | | 143 | 4 | 2.560 | 24.596 | 0,02 | 10,41 |
| 1997 | 9 | 2.425 | 13 | 136 | 22 | 2.561 | 22.444 | 0,10 | 11,41 |
| 1998 | 11 | 2.057 | | 62 | 11 | 2.119 | 20.896 | 0,05 | 10,14 |
| 1999 | 4 | 1.766 | | 57 | 4 | 1.823 | 19.222 | 0,02 | 9,48 |
| 2000 | 8 | 4.159 | 1 | 70 | 9 | 4.229 | 25.173 | 0,04 | 16,80 |
| 2001 | 5 | 4.195 | | 79 | 5 | 4.274 | 22.983 | 0,02 | 18,60 |
| 2002 | 7 | 2.582 | 1 | 71 | 8 | 2.653 | 20.371 | 0,04 | 13,02 |
| 2003 | 3 | 1.210 | 1 | 35 | 4 | 1.245 | 18.341 | 0,02 | 6,79 |

## ANNEX -6: List of Focus Group Participants

### *Mine Engineers*

*Group 01, Mine Engineers in TTK Kozlu Colliery*[2]

| | Name-Surname | Age | Duty | Years with TTK |
|---|---|---|---|---|
| 1 | Mustafa Keskinpala | 41 | Head Engineer/Work Safety | 17 |
| 2 | Aygün Ekici | 43 | Head Engineer/Work Safety | 21 |
| 3 | Aydın Kasapoğlu | 43 | Head Engineer/Work Safety | 18 |
| 4 | Tayfun Kılıç | 42 | Enterprise Engineer | 1 |
| 5 | Sadık Yücel | 41 | Enterprise Engineer | 14 |
| 6 | Ali Murat | 32 | Enterprise Engineer | 7 |
| 7 | İbrahim Erbay | 35 | Mine Engineer | 7 |
| 8 | Fazlı Uncu | 41 | Mine Engineer/ Production | 18 |

*Group 02, Engineers and officials in TTK Head of Work Safety Department*[3]

| | Name-Surname | Age | Duty | Years with TTK |
|---|---|---|---|---|
| 1 | Hasan Tuncay Çelik | 44 | Aboveground Staff | 21 |
| 2 | İdris Baş | 51 | Head Engineer/ Work Safety | 29 |
| 3 | H. Ali Aksekü | 55 | Mine Engineer | 30 |
| 4 | İsmail Çetin | 36 | Mine Technician | |

[2] 11 engineers participated to the meeting among which 8 of them filled the participants form
[3] 11 engineers participated to the meeting among which 4 of them filled the participants form

***Mine Workers***

*Group 01, Mine Workers in Kozlu Colliery, December 28, 2004*

| Nr. | Name-Surname | Age | Education | Years as a mine worker |
|---|---|---|---|---|
| 1 | | 32 | Secondary School | 5 |
| 2 | | 30 | Secondary School | 5 |
| 3 | Bahattin Altıntaş | 28 | Secondary School | 5 |
| 4 | Fedai Top | 30 | Primary School | 5 |
| 5 | Zafer Oktopçu | 32 | High School | 5 |
| 6 | Cemil Ergene | 34 | Primary School | 5 |
| 7 | Ercan Karaçam | 34 | Primary School | 5 |
| 8 | Murat Kara | 33 | Primary School | 5 |
| 9 | Rıza Yeşilkurt | 47 | Primary School | 24 |
| 10 | | 30 | High School | 5 |
| 11 | | 32 | High School | 5 |
| 12 | | 28 | Primary School | 5 |
| 13 | Veli Gürleyen | 45 | Primary School | 20 |

*Group 02, Mine Workers in Kozlu Colliery, December 29, 2004*

| Nr. | Name-Surname | Age | Education | Years as a mine worker |
|---|---|---|---|---|
| 1 | Ekrem Türkmen | 29 | Secondary School | 5 |
| 2 | Yılmaz Mutlu | 35 | Primary School | 5 |
| 3 | Suat Başoğlu | 34 | Secondary School | 5 |
| 4 | Yusuf Çelik | 45 | Secondary School | 17 |
| 5 | Erol Taşçı | 44 | Secondary School | 17 |
| 6 | Ersin Yener | 32 | Primary School | 5 |
| 7 | Nevzat Akarsis | 32 | Primary School | 5 |
| 8 | Satılmış Demiroğlu | 44 | Primary School | 16 |
| 9 | Dursun Özoğlu | 44 | Primary School | 14 |
| 10 | Cengiz Akar | 33 | Primary School | 5 |
| 11 | Olcay Çayıroğlu | 28 | Secondary School | 5 |
| 12 | Kadir Bozacıoğlu | 40 | Primary School | |

*Group 03, Mine Workers in Kozlu Colliery, December 29, 2004*

| Nr. | Name-Surname | Age | Education | Years as a mine worker |
|---|---|---|---|---|
| 1 | Alaattin Altuntaş | 45 | Secondary School | 21 |
| 2 | Mehmet | 44 | Primary School | 12 |
| 3 | | 31 | High School | 5 |
| 4 | Nihat Ulukoz | 28 | Primary School | 5 |
| 5 | Recep Yazgan | 49 | Primary School | 17 |
| 6 | Muhittin Aydın | 49 | Primary School | 20 |
| 7 | Husamettin Terzi | 31 | Primary School | 5 |
| 8 | Yakup Özbay | 49 | Primary School | 14 |
| 9 | Nazım Korkmaz | 39 | Primary School | 16 |
| 10 | Hakan Özçul | 42 | High School | 17 |
| 11 | | 47 | Primary School | 20 |
| 12 | Nizamettin | 43 | Primary School | 13 |
| 13 | | 32 | Primary School | 5 |
| 14 | | 29 | Primary School | 5 |
| 15 | Rıza Bükrücü | 50 | High School | 22 |
| 16 | Sabahattin Şen | 47 | Primary School | 17 |
| 17 | | 47 | High School | 17 |
| 18 | | 35 | Primary School | 20 |
| 19 | Bayram Duyar | 34 | Primary School | 17 |