St' Hospital
Laurel Neve
Mark Rentschler
Chris Herman
David Sandalo
Kathleen Doherty
Susan Briand
Susan West
Susan Ware
Victor Poullen
5/16/97
Chris Chambell

MEMORANDUM

To: Directors and Alternate Directors SGS97-126

From: Secretary General **Date:** 9 May 1997

Subject: **Ispat Karmet Steel Works Executive Summary of Environmental Impact Assessment**

Attached for information is a memorandum from the First Vice President together with a copy of the Executive Summary of the Environmental, Health And Safety Audit and Assessment prepared for the above project by the Ipsat Karmet Steel Works, the project participant, and its advisors.

Questions relating to this document may be addressed to Charlotte Philipps (Ext 7193) or Aziz Musakhanov (Ext 6070).

- Private Sector Project
- IFC Also involved
- Projected Board Date: August 27, 1997

Distribution:

President
Executive Committee

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MEMORANDUM

To: Directors and Alternate Directors **Date:** 07 May 1997

From: Ron Freeman

Subject: **Ispat Karmet Steel Works Executive Summary of Environmental Impact Assessment**

Attached for information of the Board of Directors are copies of the Executive Summary of the Environmental, Health And Safety Audit and Assessment prepared for the above project by the Ipsat Karmet Steel Works, the project participant, and its advisors. The Environmental Appraisal Unit has categorized the project as 'A/1', requiring an environmental impact assessment and audit.

These documents are circulated to the Board of Directors pursuant to the Bank's Policy on Disclosure of Information (BDS 95-68 (Final)), Environmental Policy (BDS 96-18), and Environmental Procedures (BDS 96-19). Pursuant to these requirements, the EIA and this Executive Summary in Russian have also been released for public review locally and regionally in Temirtau and Karaganda, and in the International Finance Corporation's headquarters in Washington DC. Copies of these documents are also available in the Bank's Business Information Centre in London. It is intended that the above project will be submitted for consideration by the Board of Directors 27 August 1997 after the public consultation process has been completed. Directors should note that, in accordance with the Bank's requirements, the EIA has been made available for public review without the Bank's comment or endorsement. Bank staff are currently in the due diligence phase of the project, including environmental due diligence.

The full environmental documentation submitted for Bank review may be seen in the Business Information Centre. Questions relating to the environmental assessment and audit or this Executive Summary, or concerning the status of the operation's review in the Bank, may be forwarded to Charlotte Philipps and Aziz Musakhanov.

Distribution

The President
Executive Committee

Environmental, Health and Safety Audit and Partial Environmental Assessment ISPAT-KARMET Steel, Power, and Coal Facilities Temirtau/Karaganda, Kazakhstan

- Executive Summary -

for: European Bank for Reconstruction and Development

April 1997

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Attachment: Outline - Public Information Plan

Environmental, Health and Safety Audit and Partial Environmental Assessment ISPAT-KARMET Steel, Power, and Coal Facilities Temirtau/Karaganda, Kazakhstan

- Executive Summary -

April 1997

Prepared for: European Bank for Reconstruction and Development
Dames & Moore Project No.: 29082-007-403

Submitted on behalf of Dames & Moore by:

Raimund Vogelsberger
PROJECT MANAGER

11 April 1997
Date

ISPAT KARMET ИСПАТ КАРМЕТ

April, 16th, 1997

Mr Junichi Marayuma
European Bank for Reconctruction and Development
One Exchange Square
London, EC2A 2EH
UK

Mr Andre Hovaguiman
International Finance Corporation
1818 H Street, NW
Washington, DC 20433

Re: Environmental Assessment ("EA") and Executive Summary for Ispat Karmet JSC Project (the "Project")

Gentlemen,

We hereby confirm that we have no objection to the release by the European Bank for Reconstruction and Development ("EBRD") and the International Finance Corporation ("IFC") to their respective Boards of Directors and to interested parties (which may include the general public) of the EA and the Executive Summary dated March, 1997, pertaining to the Project. Dames & Moore have prepared the EA and Executive Summary and provided copies to us for our prior review. We undertake to implement the recommendations in the EA and Executive Summary.

It is understood that IFC will also place copies of EA and Executive Summary for public availability and dissemination at the World Bank's Public Information Center.

Sincerely,

Malay Mukherjee
16/4/97

47231,Республика Казахстан,Темиртау
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Ispat Karmet

Fax

To: Ms. Charlotte Philipps **From:** M. Mukherjee

Fax: 44 171 338 7590 **Pages:** 1

Phone: **Date:** May 9, 1997

Re: Implementation of Environment Assessment Recommendation **CC:**

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

• **Comments:**

Dear Ms. Philipps,

Ispat Karmet hereby confirms that it will undertake to implement the recommendations in the Environmental Assessment and Executive Summary as agreed between Ispat Karmet and EBRD and IFC and further confirms that subject to the approval of the discussed financing package from the European Bank of Reconstruction and Development and the International Finance Corporation, sufficient funds will be available to implement the project within the agreed time frame.

Regards

Malay Mukherjee
9/5/97
(General Director)

0 Introduction

0.1 Project Overview

This document is an executive summary of the findings of the environmental health and safety (EH&S) audits and partial environmental assessment of the ISPAT-KARMET steel works, Power Plant No. 2, and underground coal mines in Temirtau and Karaganda, Kazakhstan. Three separate reports were prepared by Dames & Moore on behalf of the European Bank for Reconstruction and Development (EBRD); the site work was conducted over a 10-day period in November 1996 in accordance with the EBRD's EH&S audit protocol and reporting procedures.

The environmental reviews are part of the overall due-diligence assessment by the EBRD and the International Finance Corporation (IFC) of a request by ISPAT-KARMET to finance a proposed capital expenditure programme for the modernization of the ISPAT-KARMET steel works. The main focus of the Dames & Moore work was the environmental assessment of the proposed capital expenditure projects with regard to expected overall impacts on the surrounding environment, population and the work force. In addition, EH&S audits were performed of the entire steel works, the Power Plant No. 2 (TEC-2), and the Ispat coal mines. The audits comprised an evaluation of the existing site EH&S conditions in comparison to the relevant site permits, applicable Kazakh regulations, European Union standards and practices, and the policies and guidelines of the EBRD and the IFC/World Bank.

Recommendations are given in an action plan in each report concerning the conformance of all key facilities with the respective permit conditions, international standards and guidelines, as well as with good international practices. The action plans include cost estimates and proposed schedules for implementation; measures to achieve compliance with World Bank guidelines are required by the lenders to be implemented within five years.

The EBRD and IFC lending procedures require that Ispat undertake a formal public information/consultation programme in order to obtain and incorporate public opinion into the project plans. A draft outline of a public information plan (PIP) has been prepared by Dames & Moore for Ispat (see attachment), which includes the provision of relevant project information to the local public and other interested parties, the collection and evaluation of opinions and statements from the public, and the final incorporation of this input into the final plans for the capital expenditure programme and the corresponding EH&S requirements. The Environmental Audit and Assessment reports of the Ispat facilities will only be considered as "final" subsequent to full completion of the PIP process. Ispat already began the public information process in early April with a series of press conferences, newspaper advertisements, and television broadcasts in Kazakhstan.

0.2 Auditing and Assessment Procedures

The auditing and assessment work followed the respective guidelines and standard procedures of the EBRD. The EBRD audit protocol was utilized as a basis for the gathering of relevant EH&S information at the steel works and power plant; all key production and ancillary units were visited by the Dames & Moore audit team, pertinent available documentation was reviewed, and numerous plant personnel were interviewed. Within the available time and scope of the project it was not possible to review all EH&S aspects of the works in detail, however, recommendations are made for further study of certain issues where this was deemed necessary.

The coal mine review covered the following 15 underground mines in the Karaganda region currently owned and operated by ISPAT-KARMET:

- Abaiskaya
- 50 Years USSR
- Karagandinskaya
- Kostenko
- Lenina
- Shakhtinskaya
- Sokurskaya
- Tenteskaya
- Aktaskaya
- Kalinina
- Kazakstanskaya
- Kuzembaeva
- Molodegnaya
- Saranskaya
- Stahanovskaya

Surface visits were conducted by Dames & Moore auditors for all 15 mines on the basis of the EBRD audit protocol (revised as per the specific mine issues), on-site observations, interviews with mine personnel, and review of documentation including the Ecological Passport. Subsurface visits were performed at four mines (50 Years USSR, Karagandinskaya, Kostenko, and Stahanovskaya) which were held to be representative of the range of underground H&S management and control issues. The underground visits focused on mine health & safety issues, and included extensive interviews and discussions with mine management, safety engineers and miners and specific review of practices at the working faces.

In addition to the site work, discussions were also held with representatives of the local environmental and health authorities in Temirtau and at the regional level in Karaganda.

1 Results

1.1 Environmental Assessment of Proposed CAP-EX Projects at Steel Works

Overall, the proposed Cap-ex projects are expected to result in substantial environmental benefits. In the following, a brief synopsis is presented of the Dames & Moore recommendations for each major Cap-Ex project (*the list order does not reflect priority; project numbers are given by Dames & Moore to facilitate cross-references in this Report)*:

PROJECT #1: REBUILD OF COKE OVEN BATTERY NO.7

Dames & Moore recommend as a high priority to invest the remaining planned US$ 30 million (US$ 40 million already invested) to continue rebuilding Coke Oven Battery No. 7, but also to upgrade the rebuild design to include modern air pollution control equipment to international standards (including Larry car, pushing and charging cars). This is expected to increase the proposed costs of the project by US$ 15 million from US$ 70 million to approx. US$ 85 million in total. After start-up of No.7, Ispat should review the possibility of shutting down some of the older coke plants if the capacity is not required. (Related recommendations concerning the coke gas cleaning plants and the reduction of coke demand via coal injection are given for Project #2 and #6.1, respectively).

PROJECT #2: INSTALLATION OF REHABILITATED COKE OVEN GAS CLEANING SYSTEM

Dames & Moore recommend as a high priority to implement the plans to construct the new (Itochu) gas treatment plant as soon as possible in accordance with international pollution control standards. This is estimated to cost approximately US$ 90 million. The construction of a new plant will undoubtedly provide a substantial net benefit to the EH&S situation at ISPAT-KARMET. The new plant is expected to result in significant reduction of SOx and 90% reduction (over 2,000 tons) of toxic emissions.

PROJECT #3: REBUILD OF BLAST FURNACE NO. 3

Dames & Moore recommend that ISPAT-KARMET continues to rebuild Blast Furnace No. 3 as planned (with the appropriate dedusting systems), and that the older BF No.1 be phased out once BF No. 3 comes on-line. ISPAT-KARMET should also carefully assess the potential for phasing out or moth-balling BF No. 2 after BF No. 4 has been re-lined.

PROJECT #4: REBUILD OF PICKLING LINES

Dames & Moore commend the high priority that has been given by ISPAT-KARMET to the on-going installation of the new pickling lines and shut-down of the old lines. We agree with ISPAT-KARMET in their consideration of this project as the number one priority of all proposed projects. Contracts have recently been awarded by Ispat for the execution of this work. We further recommend that the installation of a new acid regeneration system (Project #8) should be performed in parallel with the start-up of the new pickling lines.

PROJECT #5: COMPLETION OF NEW GALVALUM LINE

Dames & Moore have no particular recommendations concerning EH&S issues; it is assumed that the plant design and equipment will reflect modern, international standards.

PROJECT #6.1: REVIEW OF POSSIBLE BF COAL INJECTION

Dames & Moore highly recommend proceeding with planning and implementation of the project for installing coal injection equipment at the blast furnaces as early as feasible to minimize coke demand at the plant. The estimated capital costs of approximately US$ 30-45 million (Ispat/D&M estimate) will in the long-term provide substantial savings in avoiding costs and pollution from coke-making facilities.

PROJECT #6.2: REBUILD OF COKE OVEN BATTERY NO. 6

Ispat have recently announced that previous plans to rebuild Coke Battery No. 6 have been cancelled. Dames & Moore agree with this decision.

PROJECT #7: CONVERTOR GAS ANALYSIS AND COLLECTION

Dames & Moore recommend completing the on-going techno-economic feasibility study and installing the necessary equipment to collect and use the Convertor waste gas as a fuel source in the works. The feasibility study should include a thorough assessment of the works' gas balance (including quality and quantity) to ensure that the gas is used in an optimum manner and that sufficient high virtue fuel is available.

PROJECT #8: INSTALLATION OF ACID REGENERATION SYSTEM AT PICKLING LINES

Dames & Moore strongly recommend that this project be implemented in conjunction with the construction of the new pickling lines (Project #4). With regard to engineering and design, the feasibility of using in-house resources should be carefully assessed in consideration of the numerous on-going projects and the corresponding strains on the in-house capacities. The timing of project implementation should be planned such that the acid regeneration system can go on-line together with the start-up of the new pickling lines. According to Ispat, contracts have recently been awarded for execution of this project.

PROJECT #9: NEW RAW MATERIAL BLENDING AT SINTER PLANT

Dames & Moore recommend that the new blending plant be constructed, which will reduce wastage at the blending plant and also improve the blast furnace efficiency.

PROJECT #10: MISCELLANEOUS EQUIPMENT TO IMPROVE QUALITY AND PRODUCTIVITY:

Project #10.1:	Packaging Improvements in Cold Rolling Mill Areas
Project #10.2:	Purchase of Rollforce, Tension Measurement Load Cells and Levellers
Project #10.3:	Automatic Gauge Control Regulation, Profile Control by Roll Bending of Hot and Cold Strip Mills
Project #10.4:	Purchase of Online Weighing Equipment for Slabbing and Rolling Mill Numbers 1, 2 and 3
Project #10.5:	Purchase of Crane for Convertor Shop
Project #10.6:	"Enco Panel" and Roller Table Modification

Dames & Moore recommend that this equipment be acquired in order to reduce material wastage and damage to product and thereby improve the performance of the works and thus reduce energy consumption and associated pollution.

PROJECT #11: MANAGEMENT INFORMATION SYSTEM (MIS) FOR ADMINISTRATIVE FUNCTIONS

D&M recommend the implementation of the MIS Programme, which is expected to improve the overall efficiency of the plant and thus minimize energy use and environmental pollution. ISPAT-KARMET should consider including the management of relevant EH&S data within the MIS programme. This could be designed to streamline data recording, reporting (both internal and external), and improving the monitoring of critical emission and pollutant data.

1.2 Summary of Impact Assessment - Steel Works

Given the available information and scope and time frame of the assessment, the extent of overall beneficial or detrimental impacts can with few exceptions only be expressed in qualitative terms. In the report, a comprehensive overview is given of proposed capital expenditure projects and other recommended EH&S compliance projects, plus estimates of initial related implementation costs and a preliminary approximation of potential reductions in air pollutant emissions. The total estimated costs to implement the initial recommendations for further studies and pollutant reduction are approximately US$ 32 million (not counting the capital expenditure projects).

It is emphasized, however, that actual costs to achieve conformance with World Bank guidelines cannot be fully estimated at this time, and may be higher than the preliminary estimate.

KEY EMISSION REDUCTION BENEFITS

In general, all of the major proposed cap-ex projects will result in more efficient steel production - both in terms of energy and resource use - and thus yield significant beneficial impacts to the environment and to the health and safety of the workers. In addition to the two urgent projects (rebuild of pickling line and rehab of coke by-products plant), it is the opinion of Dames & Moore that the greatest net long-term environmental benefits with regard to the proposed investments would be gained by placing maximum emphasis on reducing the high specific consumption of coke at ISPAT-KARMET and thereby avoiding the EH&S problems related to coke production and cleaning of coke gases. This means that priority should be given to maximizing the use of coal as an auxiliary fuel in the blast furnaces, as well as optimizing the coke and sinter quality and overall performance of the blast furnaces.

Significant air quality benefits are expected due to the reduction of particulates from TEC-1 Power Plant. Conformance with international guidelines for particulates - or even approaching these values - would result in nearly halving of total works' emissions. Based on the estimates of potential annual emission rates, the implementation of the cap-ex projects and conformance with the relevant World Bank and other guidelines in the steel works and the TEC-1 plant are predicted to yield the following major benefits:

- reduction of total works' emissions of toxic organics and other substancesfrom the assumed baseline quantity of 2,500 tpy to under 100 tpy - chiefly via the construction of the new Coke Byproducts Plant;
- reduction of total works' emissions of particulates from the assumed baseline quantity of 76,000 tpy to approximately 30,000 tpy - a net reduction of 60%;
- emissions of other key pollutant parameters such as SOx, NOx, and CO will also be reduced, although not as dramatically as particulates.

Additional benefits in terms of energy-savings and environmental impacts will be gained by the closure of the Open Hearth furnace (major energy consumer) and the collection and utilization of converter gases as a fuel source.

IMPACTS ON AMBIENT AIR QUALITY

The predicted emission reductions at the Ispat-Karmet steel works are expected to result in corresponding marked improvements to the ambient air quality of the Temirtau region. A quantitative assessment of the potential reduction of these ambient concentrations would require sophisticated modeling of the works' emissions and evaluation of other contributing emitters (e.g. Ispat TEC-2 plant, city's GREC-1 power plant) in the regional air basin, which is beyond the scope of this study. Nevertheless, the following comments can be made concerning the expected improvements in local ambient conditions:

- Phenol and Ammonia

The over 90% potential reduction in emission of "Other" substances includes the parameters ammonia and phenols (plus cyanide, H2S and other toxic compounds). As the Coke By-Products Plant is the primary emission source for these parameters at the steel works - and presumably also in the entire region - the construction of the new By-Products Plant and avoidance of these emissions will significantly lower the ambient concentrations of the subject parameters. The stack heights from the existing Byproducts Plant are relatively low, which means that emissions have a direct effect on the local air quality. It is therefore expected that the reduction of ammonia and phenols will be of sufficient magnitude such that the ambient local concentrations of these parameters will in the future comply with the Kazakh norms.

- Particulates

The net effects of particulate reductions on local ambient conditions are more difficult to assess because of the fact that the largest proportion of particulate emissions are discharged via very tall stacks (e.g. power plant, sinter plants), and the spatial extent and magnitude of the impacts of these emissions depend on the weather and climatic conditions. However, the potential estimated reduction in particulate emissions by 60% from the steel works and TEC-1 power plant should certainly result in a reduction of both local and non-local particulate concentrations. The peak values occuring during local inversion periods would be expected to drop significantly, while the average concentration would also decline, but not to the same extent as the peak value. It may be possible to achieve the ambient World Bank standards - especially in combination with reductions of particulates at the IK TEC-2 Power Plant - but this cannot be fully predicted at this time without further review.

1.3 Summary of Impact Assessment - Power Plant

IMPACT OF MEASURES TO CONFORM WITH INTERNATIONAL GUIDELINES

Based on present information, the attainment of the World Bank criteria of 50 mg/Nm^3 would require improvement of the filter efficiency from the present average of 95 or 96.5% to approximately 99.3%. This efficiency can usually be achieved by electrostatic precipitators (ESPs), but a technical-economic feasibility study would be needed to determine whether the existing ESPs (on four of the six boilers at TEC-2) can be upgraded to this efficiency, or whether a new set of filters would be needed (e.g. the existing blower fans may not be of adequate capacity to handle an increased number of plates). The two wet scrubbing emulgators reportedly achieve their potential efficiency of 99.6%, but further study will be needed to resolve the chronic corrosion problems at these units and to ensure that the high efficiencies can be maintained.

There is also potential to further reduce the raw emissions to the filters by using a higher grade/lower ash coal and by optimizing the combustion efficiency (with corresponding reduction in NOx emissions), which may possibly yield a sufficient reduction in particulate emissions to conform with the guidelines without the addition of new end-of pipe filters.

In any case, the plant will certainly require the installation of modern instrumentation and combustion control equipment, as also recommended in the other reports by the technical consultants for operational reasons.

IMPACTS ON AMBIENT AIR QUALITY

The conformance of TEC-2 emissions with the World Bank guidelines of 50 mg/Nm^3 would reduce particulate emissions by some 75%, or approximately 18,000 tpy (as per the assumed baseline emissions at full output in the future). Even a partial reduction of the potential emission reductions would certainly result in improvements to the ambient air quality of the Temirtau region.

The net effects of particulate reductions on local ambient conditions are difficult to assess because the largest proportion of particulate emissions are discharged via the 250 meter tall stacks, and the spatial extent and magnitude of the impacts of these emissions depend on the weather and climatic conditions. A quantitative assessment of the potential reduction of these ambient concentrations would require sophisticated modeling of the plant emissions and evaluation of other contributing emitters in the regional air basin, which is beyond the scope of this study.

On a qualitative basis, it can be said that a reduction in TEC-2 stack emissions would be expected to yield a marked drop in the peak values of ambient particulate concentrations occurring during local inversion periods, while the average ambient concentration would also decline, but probably not to the same extent as the peak value.

The data show that measured *average* ambient particulate concentrations exceed the World Bank standards by approximately 50%, while the *maximum* concentration is exceeded by nearly a factor of 5. Therefore, it may be possible to achieve the ambient World Bank standards - assuming in combination with reductions of particulates at the TEC-1 power plant - but this cannot be fully predicted at this time without further detailed review and modelling.

1.4 Recommendations - Coal Mines

ISPAT have already developed plans to invest over US$ 1.5 million in reducing air, water, and land pollution (of which US$ 1.2 million designated to complete several waste water treatment plants). The following recommendations are proposed in addition to the ISPAT actions already planned, and summarise the entire package of actions needed to bring the mines up to established international operating practice. The total costs of the proposed recommendations for environmental issues are approx. US$ 5.5 million in initial capital expenditures, plus approx. US$ 3.2 million in recurrent costs for the next 5-10 years. The costs to implement the health and safety recommendations include US$ 52 million in initial capital expenditure, plus approx. US$ 8 million in recurrent costs. It should be noted, however, that the bulk of the capital expenditure (US$ 41 million) is for the purchase and installation of equipment needed for methane extraction and drainage; these costs will actually be incurred over a period of several years, and not all in 1997.

AIR EMISSIONS

- Investigate options to improved stack cleaning technology.
- Introduce and enforce better housekeeping in coal storage areas and boiler houses.
- Ensure adequate worker protection.
- Shield and/or spray, as appropriate, dusty plant.
- Train site staff in air quality monitoring and reporting.

WASTE WATER TREATMENT

- Conduct a full investigation of the current status of waste water treatment at each of the mines and determine priorities for improved efficiencies and rehabilitation.
- Conduct a full investigation of the current condition and limitations of waste water reservoirs and prioritise actions.
- Train site staff in water quality monitoring and reporting.

SURFACE SUBSIDENCE

- Identify and review areas of financial, environmental or economic liability including, but not limited to, compulsory purchase of residential dwellings, irrigation ponds and water abstraction areas.
- Re-prioritise existing plans for restoration based on financial cost and environmental sensitivity.

HAZARDOUS WASTE STORAGE AND DISPOSAL

- Identify volumes and types of hazardous wastes generated and, in particular, mercury lamps.
- Examine feasibility and cost of safe transportation and disposal versus replacement with environmentally-benign alternatives.

FUEL STORAGE AREAS

- Conduct study of exact needs for the improvement of fuel storage and implement where appropriate at mine sites.
- Train operators in usage and benefits of new equipment.

HOUSEKEEPING

- Develop on-site procedures, train and audit performance at the sites.
- Purchase capital equipment including notices, signs, fencing etc.

METHANE RISK ABATEMENT

- Improve technology and investment in forward drainage of methane.
- Improve methane detection technology including personal monitoring equipment.
- Ensure that spare parts are available for surface monitoring (control rooms).
- Capital purchase of vacuum pumps, venting equipment, drilling and pipework etc.
- Reuse/recycling of methane for boiler heating, canteens and banas.
- Increase 'safe' distance of flammables storage around exhaust units to 60 m.
- Improve safety of miners and other lamps, compressor and other equipment with the potential to give off sparks.

ROCK MECHANICS TESTING

- Further research into the use of rock anchors, roof support and grouting to prevent rock falls and rock bursts.
- Improve technology for testing and the face and laboratory analysis.

FIRE AND RESCUE SERVICES

- Improve dust suppression and water sprinkler systems underground.
- Introduce more frequent and more rigorous testing of dust.
- Improve dust housekeeping underground and particularly around conveyors and other moving equipment.
- Replacement of old rescue equipment including self-contained breathing apparatus and stretchers, ropes, emergency signalling equipment etc.
- Improved marking/colour-coding for methane, water and other pipes.
- Improve quality of first aid materials.
- Ensure that worker wages are sustainable for surface medical team.

EXPLOSIVES

- Confirm safe limit of methane percentage beyond which firing activities are stopped.

VENTILATION

- Investment in more efficient ventilation and pre-heating equipment.
- Guarantee back-up power supply to the mines.

DEWATERING ISSUES

- Address the issue of mine dewatering following closure.
- Install pumps to control mine water and prevent floor heave.

EQUIPMENT

- Replace or upgrade as appropriate obsolete PPE and other monitoring equipment including better footwear, self-rescuers, lamps, ear defenders, dust inhalation protection.

TRAINING

- Introduce training for middle management in particular in occupational health and safety issues and conduct underground workshops and hands-on training.
- Train supervisors in general housekeeping.

With regard to reclamation of closed mines, it is recommended that further review of existing reclamation plans be undertaken to ensure that adequate provisions for management of groundwater, methane, and other factors are made. Also, Ispat will need to develop an overall monitoring plan to assess the efficacy of the implemented measures and the extent of any environmental impacts in the mine areas.

1.5 Social Impact Assessment

For the foreseeable near-term, ISPAT is likely to maintain its position as the primary employer in the region, with workers having few options for obtaining employment elsewhere in the public or private sectors. Ispat employs over 70,000 persons in the region, and in some towns the percentage of Ispat workers and families makes up roughly half of the total populations (e.g. Temirtau, Shahtinsk). On average, about one-fourth of the entire regional population of approx. one million consists of Ispat employees and their families. The financial success of the steel works and mines would thus be expected to result in a general 'upswing in the local economies by promoting the growth of indigeneous construction, trade, service and other sectors. There are presently no other major expanding enterprises or new investment projects in the region. The development of the city of Akmola (200 km from Temirtau) as the new Kazakhstan capital would certainly stimulate the regional economy, but it is still questionable if and when this project will actually be realized.

The employment levels have remained relatively steady in the short time since Ispat purchase of the steel works, power plant,and coal mines in 1995 and 1996. Employee reductions have mainly voluntary, or as a result of termination due to consumption of alcohol on the job.

The steel works and mines have historically played key roles in the financing and operation of the public infrastructure and social services in the region, including schools, kindergartens, power and water supply, medical clinics, buses, trams, etc., with the use of these being essentially free of charge to workers. As a result of the privatization of the enterprises and the purchase by Ispat, the responsibility for many of these social institutions was placed into the hands of the local municipal governments. However, Ispat has still maintained the sponsorship of some services, including e.g. the tram system in Temirtau and a children's cultural center.

Ispat pays a social transfer to the local communities, which constitutes about 10% of the city budgets, except for Temirtau where the transfer comprises over 30% of the budget. These social transfers paid by Ispat to the local cities are expected to decrease over time but this will depend on future negotiations. There are no time-bound formal understandings between Ispat and the city administrations. The city governments are in a difficult financial position due to inadequate revenues and high debt, and obviously the Ispat transfers are a significant source of funding.

2 Location and Historical Development

2.1 Project Area Description

The Ispat coal mines are situated in the vicinity of Karaganda, the regional (oblast) capital city, and the steel works and power plant are located in Temirtau, approximately 20 km west of Karaganda. The entire region is in the zone of the Kazakh hummocky topography, represented by alternating positive and negative forms of subdued relief, small bald hills with intermontane depressions. Changes in elevation are up to 50 m per kilometer. The steel works plant site itself and the surrounding areas are generally flat, with an inclination from south to north towards the Samarkand Reservoir. Artificial alterations in topography exist due to creation of the piles of slag, coal residues and ash (up to approx. 50 m in height).

The climate of the region is extreme continental, with very cold winters and hot summers. Absolute temperatures range from nearly -50 deg. C in winter to + 40 in summer, with the average temperature in January at -15 deg, C and in July at +18.6 deg.C. Southwestern winds dominate in winter (31%), whereas northeastern winds prevail in summer. Windspeeds average 3.9 m/s in summer and 5.8 m/s in winter. The annual precipitation is 250-300 mm.

The Karaganda Region is heavily industrialized, with the coal and metals industries playing a large role in the local economies. There are no known areas of particular environmental or cultural sensitivity in the project areas. Karaganda has a population of approx. 560,000 and Temirtau approx. 200,000 persons; together with several smaller towns the total regional population is approx. one million. The Ispat mines and steel works are the largest employers in the region, with a total work force of approx. 71,000.

2.2 Steel works

The original metal works kombinat was first constructed in 1960 on green-field lands in Temirtau, Kazakhstan. The works expanded significantly over the decades, reaching a maximum production output of nearly 6.2 million tons in the late 1980's. During the transition/privatization process from 1990 to 1995 the steel kombinat was operated by several different contracted organizations, while production dropped to about 2 million tons. ISPAT took over the steel works in mid-1995. As of mid-1996, a total of over 30,800 persons were employed at the works (down from nearly 40,000 in the 1980's) with approximately 26,000 in production and 4,800 in administration.

The present ISPAT-KARMET steel works comprise a large main plant adjacent to the town of Temirtau plus a separate plant (bar mill) located within Temirtau. Also, ISPAT-KARMET is owner and operator of the joint industrial/municipal wastewater treatment plant outside of Temirtau. The main ISPAT-KARMET works comprises approximately 700 buildings; the total property, including surrounding landfills and ash piles, has an area of approximately 5,000 ha.

The key production units include coke ovens and coke by-products plant, sinter plant, blast furnaces, steelmelt shops (converters and Martin/open hearth), slabbing mill, hot and cold strip mill, and tin plating mill. Major auxiliary units are the Power Plant No.1 (TEC-1), plus the coal benefication plant, lime calcining plant, foundry, and oxygen plant.

2.3 Power Plant

The TEC-2 power plant is located adjacent to the steel works in Temirtau, Kazakhstan. The TEC-2 plant, built in 1971/72, provides electric power to the steel works and steam to both the steel works and the city's district heating system. During the transition/privatization process from 1990 to 1995 TEC-2 was operated by Karagandaenergo state enterprise. ISPAT took over the steel works in mid-1995 and subsequently acquired the TEC-2 power station in 1996. A total of over 800 persons are employed at TEC-2.

TEC-2 has 6 x 420 tph, pulverized coal-fired boilers, delivering steam at 570°C and 140 bar. The design capacity of the plant is 435 MW, while during the time of the audit the actual load generated was approximately 240 MW, and other consultants report that in early 1996 the generation was as low as 150 MW. The steel works must presently obtain approximately 100 MW from the Kazakhstan grid in order to meet its total electricity needs. The grid system is extremely unreliable and power outages and frequency fluctuations are frequent, resulting in disruption of ISPAT-KARMET operations.

2.4 Coal Mines

The Karaganda coalfield covers an area of approx. 2,000 km^2. The field was discovered in 1833 and first mined in 1856. The mines were nationalised in 1918, and a total of 25 pits were opened between 1931-32. The coalfield commenced full production in the 1930's and reached a peak in the 1950's. Since this period, the Karaganda field has been a major producer of coking coal and, between 1974-87, consistently produced around 43Mt/yr of coal. A small amount of steam coal is also produced.

Since the 70-80s, coking coal production has seen a marked decline due to the withdrawal of government subsidies to coal producers, the persistent use of outdated technology and the collapse of the Russian export market. Although a limited amount of coking coal is still exported to Russia, the majority is used to supply the steelworks at Temirtau. The subject 15 coal mines were acquired by Ispat in July 1996 from Karagandaugol, the state-owned coal mining enterprise. About 32,000 people are employed in the mines and an additional 11,000 in ancillary services.

3 Laws, Regulations and Policies

3.1 Institutional Framework

The federal body for environmental management in Kazakhstan is the Ministry of Environment and Bioresources (MEB). At the regional level, Environment Committees are responsible for environmental permitting and approval and environmental inspections, and civil cases are referred to an Environment Court. The ISPAT facilities come under the jurisdiction of the Karaganda Environment Committee. The Committee sets and enforces charges and fines for environmental pollution which are based on the 'polluter pays' principle whereby industries pay for natural resource usage and emissions (t/yr, cu.m/yr etc) according to a schedule of rates established by the Committee. Payments are made to the Committee for collection in an 'Environment Fund' which is intended for use in environmental protection and scientific research.

At current rates, pollution charges represent a significant cost for the Ispat mines, particularly for raw water usage and wastewater discharge. However, pollution charges are not presently applicable to the Ispat steel works and TEC-2 power plant, as per the Share Purchase Agreement described below.

Health and safety management for mines at the regional level is the responsibility of the Organisation of Government Inspectors of Mines with its head office in Almaty. A Chief Government Inspector of Mines is the delegated authority. In the case of the ISPAT mines, an Inspector is appointed for each mine within the coalfield. The Temirtau and Karaganda offices of the SANEPID inspectorate are responsible for monitoring of health and safety issues at the steel works and power plant.

3.2 Legal Framework

The legal framework for environmental management, including the setting of norms and pollution charges, is provided by the following:

- *Law on Environmental Protection of Kazakhstan, Kazakh SSR Law on Environmental Conservation*, Doc.1.1/A (framework law).
- *Law on Atmosphere Protection of Kazakhstan.*
- *Projects for Achieving Minimum Effluents to the Atmosphere and Water.*
- *Law on State Environmental Expertise*, Kazakh SSR Statute, Doc 1.1/B.
- *(USSR) Provisional Instruction on Use of Assessments of Environmental Impact during*
- *Studies of the Technical-Economic Basis (Feasibility) and Construction of Economic Objects and Complexes*, Provisional Instructions, Doc 1.1/C.
- City Administration *Law on the Use of Natural Resources.*

Norms for environmental quality are included within the framework environmental law and are expressed in terms of ambient (background) levels.

A majority of the laws and regulations pertaining to underground coal mining activities are contained within the *Rules for Safety in Coal and Shale Mines* of the USSR. These rules were incorporated into Kazakhstan Law under the Committee of State Control in 1996 but are yet to be published due to a lack of funds. The regulations are comparable, for the main part, to those of the UK and the USA.

3.3 Environmental Impact Assessment and Public Participation Process

The EIA process in Kazakhstan requires consensus building and negotiation between the various regional authorities. EIA is funded by the project sponsor and is generally required for any activity which may have harmful impacts on the environment; major construction, reconstruction, extension, abandonment; and new technologies, materials and substances. Assessment of health effects may also be required in parallel to the EIA process. Eligibility criteria, as defined by Kazakhstan law, are very broad and most project EIA requirements are discussed on a case-by-case basis during negotiations between the sponsor and regional bodies. Any significant modification to the technological processes at the Ispat facilities as well as mine closure or abandonment and would be subject to EIA. The required form of the EIA is described in the Provisional Instruction. The overall review process must be completed within three months of submission.

Under the existing environmental framework law, public involvement in the project comprises three components:

- public associations can undertake a 'public environment expert examination' the outcome of which may only have the status of recommendations for the project;
- public associations can demand a health/environment review;
- prior to the presentation of documentation for review, the project sponsor and EIA preparer will organise preliminary discussions of the results with representatives of the affected public.

The EIA process and public participation is becoming more common in Kazakhstan, particularly where foreign investors are involved in project development. The permitting and EIA processes have already begun for a number of the key capital expenditure projects at the Ispat steel works.

3.4 Share Purchase Agreement

The compliance situation at the steel works and TEC-2 power plant is strongly influenced by the Share Purchase Agreement (SPA) signed between ISPAT and the central government of Kazakhstan in 1995 upon purchase of the Karmet Kombinat by Ispat. The agreement specifies that the provisional permit limits in effect in 1995 shall continue to be valid for a 10-year period. Furthermore, the SPA specifies that ISPAT-KARMET will not be required to pay the normally required fees for natural resource use and pollutant discharges, but in lieu of this will commit to a programme of continual environmental improvement with a minimum annual investment of 200 million Tenge for pollution reduction measures at the steel works plus another 100 million Tenge for the TEC-2 power plant.

3.5 Policies and International Guidelines

In addition to an evaluation of Ispat facility compliance with applicable laws and regulations, the audits also included a review of conformance with comparable standards of the European Union and international guidelines of the World Bank/IFC. The following World Bank documents served as key references for this project:

- World Bank: *Environmental Guidelines - General* (April 17, 1996);
- World Bank: *Health & Safety Guidelines - General Requirements for New Projects* (February 16, 1996);
- World Bank: *Environmental Health and Safety guidelines - Thermal Power Plants* (October 23, 1996);
- World Bank: *Industrial Pollution Prevention and Abatement - Integrated Iron and Steel Manufacturing* (June 30, 1996).

4 EH&S Management Structure

4.1 Steel Works and Power Plant

The overall responsibility for management of environmental, health and safety issues at the ISPAT-KARMET steel works and TEC-2 Power Plant is held by the Director of EH&S and New Projects, who reports directly to the ISPAT-KARMET General Director. The Environmental Department at ISPAT-KARMET is primarily focused on monitoring and measuring compliance with the regulatory norms and standards, of which air emissions are the most significant.

Meetings are held each morning by the heads of the Safety Departments and the Department of Environmental Protection with the Director of EH&S. Also, there are weekly management meetings chaired by the General Director, Production Chief, and the Head of the Employee's union, which are attended by approximately 150 shop supervisors, foreman, and other managers from throughout the steel works. Reports are made of the latest status of safety and environmental protection (among other topics), and if any accidents or non-compliances have occurred, then an evaluation is made of the causes and potential measures to prevent re-occurrence.

Up until the acquisition of TEC-2 by Ispat, the TEC-2 plant had its own system of environmental management, which appears not to have been well-developed, and as is still evident in the present operations. The chief engineer of TEC-2 coordinates environment protection and oversees a chemical laboratory as well as a planning and technical department. Environmental control issues are not included as part of the functional instructions for workers and specialists of the plant, and so far TEC-2 has no specialists responsible for organization and implementation of measures on environmental control. Steps need to be undertaken to more closely integrate the recently acquired TEC-2 plant into the overall environment health and safety management structure of the steel works.

4.2 Coal Mines

The Ispat Coal Division has appointed an Ecology Director, Ecology Manager (Restoration) and Ecology Manager (Pollution Control) with overall responsibility for the environmental management and compliance of the sites. None of the above have formal training in environmental science, however, the general environmental awareness and appreciation of ISPAT management staff is high. ISPAT has also recently developed an Environmental Policy containing its overall goals for environmental management and a series of Environmental Procedures which follow from the Policy and the relevant regulatory requirements. On-site, environmental management is the responsibility of mine Ecology Managers who report directly to the Technical Director and Mine Director and to the regional authorities through the Karaganda Environment Committee.

The ISPAT Coal Division has developed a corporate Environmental Action Plan (EAP) for 1996-97, which includes provisions for water resource protection, air emissions control, and extensive recultivation/infilling and reclamation works at the 15 mine sites.

Health and safety within the Coal Division is the overall responsibility of the Director of Mine Safety reporting to the Chief Engineer and is administered through a number of departments. All miners, irrespective of seniority, receive safety training before working at an operational mine. Further training certificates must be obtained before workers go underground.

The management system adopted for the 15 mines acquired by ISPAT has retained the same structure as that used by ISPAT's predecessor, Karagandaugol. The directors of each mine are directly responsible to the Senior Directors in the head office in Karaganda and meet every Thursday to discuss all matters of which H&S issues take priority. In addition to the 10-year development programme established for the mines, ISPAT also conduct quarterly forward planning programmes as agreed upon by senior mine managers, and during which H&S issues are given high attention.

5 Key Environmental Issues - Steel Works

5.1 Summary of Regulatory Compliance Status

Overall, the steel works are generally in compliance with the air, water, and waste management permits issued by the responsible authorities. However, the air emissions from a number of sources at the steel works (especially the TEC-1 power plant and sinter plants) are not in conformance with the relevant World Bank guideline values for particulates (50 mg/Nm^3). Several of the major urgent EH&S issues identified at the ISPAT-KARMET steel works are being addressed in the capital investment program; these include in particular the acid leaks from the pickling lines and the very high emissions of toxic air pollutants from the coke by-products plant.

5.2 Environmental Management

Top management shows a keen interest in environmental issues; the lines of reporting authority are clear and the practice of frequent communication and exchange of information between senior managers at ISPAT is commendable. Given the great significance of the ISPAT-KARMET steel works for the city of Temirtau and the unique situation with the Share Purchase Agreement, it is recommended that the company should consider a more pro-active approach to informing the public and the authorities of the proposed investments and past accomplishments on EH&S issues, as will be achieved during the formal public information period of the IFC and EBRD loan requirements.

5.3 Atmospheric Emissions

AMBIENT AIR QUALITY

The data on ambient air quality at the sanitary protection zone for the ISPAT-KARMET plant show that the most serious exceedances of the Kazakh PDK limits are for phenol (2.6 times) and ammonia (nearly 2 times), which are attributable mainly to emissions from the coke by-products plant, while other parameters such as dust and SO_2 are within the Kazakh PDK norms. This is due in part to the use of tall stacks at the sinter plant and power plants for long-range dispersion of the emission plumes.

In comparison with international standards, the ambient concentrations of dust are two- and five-times higher than the average and maximum limits, respectively, of the World Bank guidelines and also several times greater than the European Union average and maximum standards. The observed concentrations for NOx and SO_2 appear to be below the international limits. An exact comparison with international standards cannot be made due to differences in the measurement frequency, analytical procedures and statistical evaluation of data.

STACK EMISSIONS

The emissions from the deteriorated coke gas treatment system and the TEC-1 power plant account for a bulk of the overall emissions of air pollutants. The coke gas emissions contain a wide range of hazardous pollutants and primarily impact the local ambient air conditions, while the plumes from the power plant contain mainly particulates and affect local and regional air quality. Additional emission sources identified in the steel works include the Sinter Plant, Blast Furnaces, Lime Kilns, Foundry, and others. The available data show that the total plant emissions in 1995 were all within the valid 1995 permit limits, (even for the coke by-products plant). However, only a few of the emission sources fully conform with World Bank and other international standards, especially with regard to the typical guideline value for particulate matter of 50 mg/Nm^3 (e.g. average TEC-1 emissions exceed 2,000 mg/Nm^3). It should be noted that the stack emissions from TEC-1 (and most other main emission sources) are not actually measured, but are estimated via calculations made in accordance with the relevant Kazakh norms and based on the quality and quantity of of coal burned in each boiler.

EMISSION REDUCTION POTENTIAL

A key problem with air pollution control at TEC-1 is that the plant has a high raw dust burden and the out-dated wet-ash scrubbers at the 8 boilers are only 87% efficient (on average), which results in emission concentrations over 2000 mg/Nm^3 (versus World Bank guidelines of 50 mg/Nm^3).

In comparison, modern Electrostatic Precipitators (ESPs) can achieve 99.5% and greater efficiencies. Other reasons for the high emissions from the power plant are delapidated boilers and inadequate or broken instrumentation and combustion controls. A lack of more frequent or even continuous stack monitoring makes early detection of problems difficult.

Recommendations are made to undertake more detailed technical and financial feasibility studies to assess the most effective mitigation options for TEC-1 and all other key emission sources. The general recommended approach is to first seek improvements by installing modern instrumentation and monitoring equipment, as well as more rigorous operational discipline, in order to optimize the production processes and thus reduce emissions and energy consumption. At TEC-1, the optimization of the boiler combustion performance can easily be coupled with measures to reduce NOx emissions.

Secondly, the operations of existing pollution control equipment should be optimized, and thirdly, attention should then be focused on any additional end-of-pipe measures that might be warranted in order to further reduce the net emissions of the plant. Additional technical measures to reduce particulates will clearly be needed at TEC-1, however it may not be necessary to install sophisticated SO_2 removal equipment considering that the coal fuel is already relatively low in sulphur. A 5-year timetable is given for implementation of the described measures at TEC-1 with the goal of attaining the World Bank guideline. After the end of the 5-year period, a review will be undertaken of the improved emission status and a determination made if any further measures and investments are required to achieve the World Bank targets. If measures are not feasible to achieve full conformance within another 3 years, then Ispat will be obliged to make plans to close the unit.

5.4 Water and Wastewater

The water supply system for the plant appears to be adequate, and no major problems were identified. Overall, water consumption of the steel works is high. Although significant efforts are made to recycle and re-use huge amounts of process and cooling waters, the overall recycle-ratio of about 40% is well below common international ratios of about 80% or higher. Thus, there is still room for improvement in reducing water use. A major source of process water - and simultaneously a major point of discharge - is the mixing of cooling/process water between the works' cooling pond and the Samarkand Reservoir. The elimination of this mixing/discharge would significantly increase the recycle-ratio and minimize the contamination of the reservoir.

The audit found that the performance of the municipal wastewater treatment plant (MWTP), which serves both the ISPAT-KARMET works and the city of Temirtau, is generally adequate - especially considering the age of the plant - however, a feasibility review is warranted to minimize upsets during power failures (frequent) and to improve compliance with discharge standards.

There have been plans for several years to upgrade the pre-treatment plant for coke area wastewaters (Coke WTP) to reduce the high load of phenols, ammonia, and other toxic pollutants from this plant to the MWTP. However, this upgrade may not be required once the new Coke By-Products Plant is constructed, which is expected to have a much cleaner effluent than the existing system. Therefore, Ispat should review the necessity for the Coke WTP upgrade, and take appropriate steps as necessary to ensure that the discharge of the Coke WTP to the MWTP is of sufficient quality.

5.5 Materials Handling and Storage

This issue has been primarily addressed in the audit from the perspective of occupational health and safety. In general, there were no significant environmental problems observed with regard to this issue; a few recommendations are made to improve the labeling of containers and provision of secondary containment to control spillage.

5.6 Hazardous Materials Management

There are numerous processes throughout the steel works which involve various hazardous materials; this issue was primarily addressed from the perspective of worker safety. The Environmental Department has documentation on such materials, and it is reported that workers receive training and instructions on proper handling techniques. Significant quantities of CFC's are consumed at the plant, and it is recommended to review options for reduction and phase-out (especially for R-12). Also, Ispat should further review the disposal practices of small quantities of hazardous wastes from various sources throughout the works.

5.7 PCB's and Asbestos

ISPAT have documented the PCB-containing equipment at the works, but an assessment of the proposals for phase-out and disposal has not yet been performed. A recommendation is made to follow-up on this issue.

As common to countries of the former Soviet Union, asbestos is widely used throughout the plant as a sealant, insulator, and for fire-protection. Recommendations are made to begin an awareness campaign and to minimize the exposures of workers to asbestos fibres.

5.8 Solid Waste Management

Essentially all solid wastes generated at the IK works are deposited in the dozen or so waste dumps, ponds, and piles located around the outskirts of the main steel plant. Perhaps the area of greatest environmental significance is the "coke tar and acid pit", which also appears to be a receptacle for miscellaneous small quantities of hazardous waste from around the plant. The Environment Department has records of most waste streams, but apparently this does not include all smaller and occasional hazardous waste sources. A follow-up is recommended.

5.9 Energy and Energy Conservation

The realization of a more efficient use of energy within the ISPAT-KARMET facilities represents a highly important opportunity for achieving environmental benefits - in terms of reduced pollution from power production - as well as cost savings for the company. The ISPAT-KARMET Energy Department has already identified a number of potential conservation measures; recommendations are given to review the feasibility of implement these, plus others.

5.10 Waste Reduction

The Department for Use of Secondary Materials has developed a number of proposals for realizing substantial opportunities for recovering and re-using waste materials from the ISPAT-KARMET works. Recommendations are given to review and update the feasibility studies for these measures, as well as to further explore additional opportunities. Waste reduction and recovery offers the benefit of reducing the quantities of wastes to be disposed of, while also being financially lucrative in many cases. Some of the possible applications for re-use of wastes may not presently be marketable, however, given the depressed economic condition of the region, particularly in the construction sector.

6 Key Environmental Issues - Power Plant

6.1 Summary of Environmental Compliance

The key compliance issue addressed in this section is the emission of air pollutants from the TEC-2 operations; other topics are of lesser significance and are addressed more briefly. Issues that are also common to the steel works are described in those relevant parts of the report. In general, the plant emissions are in compliance with the applicable permit limits. However, the emission concentrations of particulates exceed the World Bank guidelines.

6.2 Air Emissions

AMBIENT AIR QUALITY

Refer to Section 5.3

STACK EMISSIONS

Based on a review of available data for 1994, 1995, and 1996 (preliminary), the TEC-2 Power Plant air emissions are in compliance with the presently applicable 1995 permit limits, but do not fully conform with the World Bank guidelines and other international reference standards for particulate emissions. The TEC-2 particulate emissions at an average of 235 mg/Nm^3 (1995) are above the World Bank guidelines of 50 mg/Nm^3. The plant performance in 1996 is reported to have improved over 1994 and 1995 due to the use of higher grade coal (data not available at time of report finalization). It should be noted that the stack emissions from TEC-2 are not actually measured, but are estimated via calculations made in accordance with the relevant Kazakh norms and based on the quality and quantity of of coal burned in each boiler.

The annual air pollution permits also include certain pollution control measures which the authorities require to be implemented. Recent (but pre-Ispat 1995) improvements that were implemented at TEC-2 as part of annual permit requirements include specific maintenance and repairs plus modernization of some burners. Other required improvements have not yet been implemented due to lack of funds and it is not clear if these are still legally required in consideration of the Share Purchase Agreement in 1995.

EMISSION REDUCTION POTENTIAL

A key problem with air pollution control at TEC-2 is that the electrostatic precipitators (ESPs) and wet-scrubbers were reportedly designed for dust burden of 27 g/m^3, but the actual burden is sometimes close to 50 g/m^3. The ESPs at boilers 1, 4 and 5 operate up to 93% efficiency, but also as low as 80%, while the wet-scrubbers at boilers 2 and 3 are up to 98/99% efficient but suffer from corrosion. ISPAT have undertaken a programme to upgrade the ESP plates to improve their performance and to repair the wet scrubbers. Other reasons for the high emissions from the power plant are delapidated boilers and inadequate or broken instrumentation and combustion controls. A lack of more frequent or even continuous stack monitoring makes early detection of problems difficult.

A 5-year timetable is given for implementation of emission reduction measures at TEC-2 with the goal of attaining the World Bank guideline. It may be possible to achieve the World Bank values at TEC-2 by optimizing the combustion controls and by continuing to implement the on-going upgrade of the ESPs. After the end of the 5-year period, a review will be undertaken of the improved emission status and a determination made if any further measures and investments are required to achieve the World Bank targets. If measures are not feasible to achieve full conformance within another 3 years, then Ispat will be obliged to make plans to close the unit.

6.3 Raw Water and Waste Waters

The major source of industrial water to the steel works and cooling water to the TEC-2 plant is the Samarkand Reservoir, in which a partially separated Cooling Pond has been built. The quality of industrial water sources is checked at regular intervals by the ISPAT-KARMET Environment Department. Regulatory quality limits do not apply for the non-drinking water sources.

The Chemical Department of TEC-2 is responsible for the operation of the Chemical Water Treatment Plant, where water is prepared for boiler water make-up and for make-up of the district heating system. The water treatment installations are extensive and a detailed assessment of the treatment efficiency and adequacy of equipment could not be undertaken within the available scope and time-frame of the audit.

The two wastewater discharge points from TEC-2 and the steel works are the Cooling Pond at Samarkand Reservoir and the effluent from the combined IK/Temirtau wastewater treatment plant to the Nura River. The compliance status is described in Section 5.4 and in the Steel Report.

6.4 Hazardous Materials Management

The major hazardous material handled at the TEC-2 facilities include Mazut fuel oil, oils and lubricants for the power plant, plus sulfuric acid, caustic coda and other key chemicals used for treatment of boiler make-up and heating system waters (hydrazine solution, ammonia solution, and trisodium phosphate powder).

The aboveground tanks for mazut (total capacity of 2,000 m^3) and turbine oil (60 m^3) have an earthen bunding and are equiped with a foam quenching system. The tank insulation surface was observed to be significantly contaminated with spilled mazut. was ob

The entire unloading system, pipelines and storage tanks for mazut are steam-heated to keep the mazut in a liquid and pumpable phase, and numerous steam leaks were observed. When repairing turbines at TEC-2, the used turbine oil is gathered and centrifuged; the centifuged residue is then re-used for greasing of machinery in the boiler shop.

There are two unloading gantries for sulfuric acid and caustic soda, one of which was observed to be very rusty and no longer reliable. Four aboveground tanks for sulfuric acid (200 m^3 each) and four caustic soda tanks (200 m^3 each) are situated within a brick and concrete bunded area, which also contains a drainage/catchment pit in the event of accidental spillage or overflow. Although the system is reported to be designed to contain at least one tank volume, this was not obvious based on visual observation during the audit: part of the bunding wall appeared to be unfinished or in any case too low, the slope direction of the floor did not appear to be consistent, and the containment system did not extend to the area beneath the rail cars or the loading gantries. Furthermore, the acid and caustic tanks are located adjacent to each other with no separation walls, and none of the tanks was labelled as to contents or hazard characteristics. The tanks are single-wall, steel construction, and are reportedly tested every year by flaw detection methods, with repair/replacement as needed. Recommendations are made to upgrade the containment integrity and to improve the labeling at these and other tanks in the plant.

The other water treatment chemicals are delivered by truck, with special instructions existing for proper handling and storage and occupational health and safety. According to the plant management, incidents of accidental overflow of acids or alkalis, injury from ammonia vapour, or poisoning by hydrazine were not registered for the past 5 years at TEC-2.

6.5 Oil-Filled Electrical and Hydraulic Equipment (PCBs)

The TEC-2 plant has 10 major outdoor transformers, for which tests for the presence of PCBs in the oils have not been carried out. There were no hazard markings observed on the transformers. Formerly, if the oil quality worsened, it was drained and transported to Karaganda for refining. At present, there is no longer such a procedure and we have no information as to how the used transformer oil is removed. There have been no reports of accidental outflows of transformer oil or fires at transformers at TEC-2. A recommendation is made to check the PCB-content of the oils and to properly dispose of any PCB-containing materials.

6.6 Asbestos, Mineral Dusts, and Fibres

Asbestos-containing materials (ACM) are still used at the TEC-2 for heat insulation. The annual usage of ACM at TEC-2 is reported to be up to 60 tons. There are no regulations banning the application of asbestos as insulation in Kazakhstan and the plant does not have its own specifications regulating asbestos handling. In many places on pipelines, asbestos occurs without a clay coating or other protecting cover. When repairing pipes and other equipment, the insulation (whether ACM or not) is removed without any particular protective measures and transfered into the Ispat works' dump for waste construction products. Recommendations are made to increase worker awareness of asbestos and to minimize exposures to asbestos fibres.

6.7 Waste Management

The main wastes generated at the TEC-2 plant are ashes (bottom ash and filter residues), sludges and lime wastes from water treatment.Ashes and sludges from the TEC-2 Chemical Water Treatment Plant are withdrawn via pipeline system to the ash pond #4; the lime wastes are stored in the Water Treatment Building, and then taken via dump truck to the Ispat trash landfill.

Waste reduction/re-use measures under study which are relevant to TEC-2 include the attempt to recover ashes from Ash Pond #3 for use in brick-making: bench-scale tests have been done on ashes from the TEC-2 power plant, and appear promising. The difficulties in marketing/production lie with depressed construction industry and low demand.

6.8 Housekeeping

A tour of the TEC-2 plant showed that the many areas have deteriorated over the past years, and that investments are required from bottom to top. Beginning in the basement, the situation is severe from a health and safety standpoint, with poor lighting and a high concentration of coal dust due to leaky ducts and pipes (further addressed in Section 8.6).

7 Key Environmental Issues - Coal Mines

7.1 Summary of Environmental Compliance

Compliance with environmental law is regulated at the regional level by the Karaganda Environment Committee. The principal tool for monitoring and enforcement is the Ecological Passport which is required for each industrial enterprise including the mines. At the time of the study, all mines were in possession of valid passports (or were in process of preparation). The passports cover atmospheric emissions, raw water usage and discharge, solid waste generation, land use and natural resources usage charges and are principally an economic tool for environmental management (i.e. as a basis for setting emission fees and penalties). Under current law, normative emissions/abstraction limits for each recorded parameter are set by the Committee on a case-by-case basis.

Payments are incurred for the following:

- pollution rates for atmospheric emissions, waste water and solid waste;
- natural resource usage charges for land, raw water, atmospheric protection and restoration;
- capital repair of fixed environmental assets.

In 1995, the total expenditure for all mines was around US$ 500,000, with most fees for water usage and discharge due to the relative scarcity of groundwater resources. During 1995-96, most mines kept within the normative levels for payment set by the Committee and have effectively created a sinking fund of US$ 2 millions for adjusted charges. More efficient use of water or increased recycling would have a major positive impact on cost reduction.

7.2 Air Emissions

The principal sources of atmospheric emissions at the mines are the coal-fired boiler houses, which account for an average of 94% of all particulate emissions, with the remainder generated mainly from diffuse emissions from coal store houses, loading and unloading areas etc. One-third of the boiler house stacks are fitted with dust-gas cleaning devices. Most of these are old systems based on wet-cleaning cyclone scrubbers with a cleaning efficiency of only 75-85%. At present there is no capital available for the installation of more efficient technology.

The mines are generally in compliance with the emission limits (particulates, SO_2, NOx, CO) given in the air permit for each site (expressed as a total mass emissions per year). Emissions are not actually measured, but are determined empirically given the known quantities of coal burned and the coal properties. A comparison with World Bank guidelines or other international emission standards could not be directly made because the emission concentrations were not able to be calculated within the available time. Nevertheless, the absence of filters in one-third of the stacks is clearly out of conformance with the general guidelines of pollution prevention. With regard to the stacks with scrubbers, additional review would be needed to determine the feasibility of upgrade to higher performance (e.g. via electrostatic precipitators with over 99.5% efficiency).

7.3 Water and Wastewater

The main problem associated with raw water requirements is cost. Water is in high demand and low supply in the region and is therefore an expensive commodity, hence the incentive for recycling. Waste water treatment at the mines varies from direct discharge to the surface (at only one mine) to closed physical/chemical and biological treatment systems. Typically, a four-phase treatment process is involved as follows:

- collection and physical treatment through settlement ponds;
- dechlorination using chemical filters;
- further physical treatment;
- pumping and storage to covered reservoirs or storage lagoons.

In most cases, the pretreated water is then discharged to the local city sewerage system. The 1996-1998 ISPAT EAP incorporates funds for the required construction/improvements of waste water treatment plants (WWTPs) at three mines, namely, Aktaskaya, Kostenko, Stahanovskaya. A secondary problem associated with waste water treatment is the condition of storage reservoirs which have various problems ranging from limited capacity (at two mines), lack of bunding (most mines), to the need for major capital repairs. Capacity problems will be aggravated when deeper working seams are accessed in the future.

The overall effluent quality is usually in conformance with applicable permit limits. The values for suspended solids fluctuate greatly, and are at times in exceedance of World Bank/IFC standards. A number of important parameters (BOD_5 in particular, plus heavy metals) are not measured, but should be, especially where surface waters are affected.

7.4 Structural Subsidence

Under Kazakh law, mines must undertake the compulsory purchase of any privately-owned properties which lie over areas of expected subsidence. In addition, the mines are both legally and financially viable for any unpredicted structural damage. The mines also pay a tax for land use per hectare which can be reduced through the restoration and resale of exhausted mining lands. As of 1995, approximately 2,100 ha have been recultivated, with another 4,000 ha still requiring recultivation for the 1996-97 period. Restoration works are carried out only as and when capital is available at a cost of US$ 1,428/ha. The works are conducted in three phases commencing with the deposition of physical materials including waste rock from the mines, addition of topsoil, followed by the planting of grasses or trees.

7.5 Management of Hazardous Wastes

The storage and disposal of hazardous materials and, in particular, used transformers and other electrical equipment and mercury lamps, is a problem at most of the mine sites. At present, used electrical equipment is shipped to the steel plant for disposal but there are known limitations on ISPAT's capacity to deal with this waste. In some cases, used transformers are dumped along with other waste metals and used working parts in unsegregated heaps at the mine sites. Asbestos is not used extensively at the mines, except for boiler linings, due to high costs. There are no prohibitions concerning asbestos wastes in Kazakh law, but recommendations are given to limit the exposure of employees.

7.6 Fuel Storage

Fuel storage is a problem at several of the mining sites due largely to dilapidated equipment and housing. The principal problems observed on site include the following:

- evidence of leakage of fuel drums and local soil contaminaiton;
- poor storage and drum stability;
- absence of bunding and collection systems for leakages and spills;
- inaccurate mechanical reading equipment;
- absence of no-smoking or hazardous materials signs.

The risks of contamination, spillage and potential explosion are understood by local personnel, however capital funds are lacking to replace old equipment and carry out the necessary repairs. Recommendations are given upgrade the storage areas and minimize the potential for leaks and spills.

7.7 Housekeeping

With few exceptions (notably the showpiece Kostenko Mine), site housekeeping is extremely poor and is not regarded as a matter of priority or urgency by site management. Common problems include the following:

- leaking and damaged overhead pipes and pipe lagging;
- uncovered manholes, pits and other trip hazards;
- damaged electrical cables;
- missing and defective lights and light bulbs;
- blocking of emergency egress and access;
- uncontrolled storage of waste metals, chemical and fuel drums, and disused electrical equipment.

A recommendation is given to improve the overall housekeeping at the mines.

7.8 Solid Waste Management

The principal sources of solid waste from the mines are waste rock (from the coal workings), waste coal, coal required for mixing and ash/slag from the boiler houses. Generally, solid waste is taken off-site by truck and dumped in stock piles at an average distance of 100-200 m from the core mine workings. There is evidence of spontaneous combustion and burning at some mine sites. In addition, there is usually no basal drainage to prevent acid leachate and no visible contouring of slopes or recultivation. Where better quality waste rock is available, material is used for restoration and road surfacing.

Waste metals from the mine are either sold back to the ISPAT-KARMET steel plant or stock-piled on site. There is no systematic segregation of this waste or evidence of efforts to recycle. It is recommended that waste storage be reviewed to minimize potential burning and that waste segregation/recycling rates be increased.

7.9 Radioactive Materials

The only measured source of radioactivity at the mine sites is the ex-pit coal which, in itself, has low radioactive properties. Radiation security is tightly controlled at the sites through the enforcement of the Law on the Environment. Coal extraction from a new area is only possible after the mine has applied for and received a *Certificate on Radiation Security*. Generally, coal radioactivity levels are extremely low; of the mines visited, none have been denied radiation certificates.

7.10 Contamination of Soil/Groundwater

Soil contamination at surface installations is not considered a major environmental issue due to the limited use of hazardous materials and chemicals which are restricted to transformers, paints, diesel and other fuels. The only source of noticeable contamination derives from fuel leakage and spillage around the oil storage areas on site. Contamination could be reduced through the installation of floor drainage and closed collection systems which are present in some mines but in very poor condition.

Contamination of drinking water abstraction sources off-site has occurred at several mines and compensation claims been issued. Although such claims are not common, the mines are legally liable for the costs of remedial actions and compensation. No details were available on the costs of compensation claims. The issue of potential compensation claims should be reviewed in more detail.

8 Key - Health and Safety Issues - Steel Works and Power Plant

8.1 Safety Management System & Training

The ISPAT-KARMET steel plant has a safety management structure and system which is similar to that in comparable European industries.The company makes significant investment in training, and emphasis is placed on safety issues. Managerial and procedural documentation comply with state legislation and standards, which are broadly similar to the relevant health and safety standards in the EU. However, the implementation of the system is highly regimented and prescriptive, and still includes the out-dated approach of punitive measures which tends to de-motivate personnel. Recommendations are made to make the systems more user-friendly and to also incorporate some form of an incentive programme for good safety performance.

8.2 Safety Culture and Ownership

Accident statistics over a period of many years are consistently 20% worse than for comparable plants in the CIS. When compared with statistics for European plants, fatalities and serious injuries at ISPAT are approaching an order of magnitude higher. Days lost due to injury have almost doubled over the last four years (although the injury frequency has remained constant), despite the comprehensive safety management system which exists at the plant. During the audit it was determined that there appears to be a lack of "ownership of safety" by the workforce and an absence of individual and collective responsibility for effective implementation of the safety systems; these comments also apply to elements within the production management and supervisors. Recommendations are made to develop a strategy to promote safety ownership and to instill collective responsibility throughout the workforce, and also for senior management to take on a clear role as spear-headers of safety awareness.

8.3 Occupational Hygiene and Health

Occupational hygiene and health are major issues at a facility of such size and complexity. According to statistics from the local SANEPID inspectorate, a high proportion of the workforce at ISPAT-KARMET is reported to be working in conditions which are at some time below state norms. This is particularly highlighted in cases of exposure to toxic gases, fumes and dust but also applies to a lesser extent to areas of noise and temperature exposure. The most urgent issue is that of acid fume exposure at the pickling lines. Engineering solutions and capital projects have been identified for the medium term and if implemented will substantially improve the gas/fume/dust issues (notably the complete renewal of the pickling lines). However, recommendations are made for urgent action now to mitigate harmful effects (e.g. via proper respiratory protection) until such improvements are completed. ISPAT also needs to develop a clear picture of where other current deficiencies exist across the works and to produce their own plant-wide report on occupational hygiene and health issues. Once this information is documented, a strategy and implementation plan should then be developed for the improvement of working conditions.

8.4 Funding of Support Systems

There are two key support systems at the plant - medical/first aid and the works'fire brigade - which are currently both funded and controlled by external authorities. The medical staff are funded by the Temirtau Local Health Authority and the fire brigade is a quasi-military state organisation. It was established during the audit that funding for the medical staff may not be secure in the medium-term due to budgetary cut-backs at the health authority, and elements of budgets for future equipment replacement for the fire brigade may also not be secure. Recommendations are made for Ispat to ensure that these on/off-site support services are maintained at an effective and durable level in compliance with statutory requirements.

8.5 Emergency Planning/Loss prevention

A number of potential emergency scenarios were identified during the audit involving the release under accident/fault conditions of toxic, flammable or explosive mixture which could impact on the site or the city of Temirtau. The scenarios result from either operations on the site or chemicals handled off-site because of process requirements (e.g. handling of chlorine gas for wastewater treatment). It is recommended that these topics should be considered and any available assessments and contingency arrangements from ISPAT be further reviewed.

8.6 Specific Issues at TEC-2 Power Plant

A plan of emergency measures is available at TEC-2, including situations with accidental leakage of dangerous chemicals. The accident-prevention training is conducted once per quarter in the plant and once a month in the Chemical Water Treatment Shop. Formerly (prior to Ispat purchase of the plant), inspectors from "Karagandaenergo" monitored the practices for the handling of dangerous chemicals; as of October 1996, the first inspection was carried out by the Department of Industrial Hygiene of ISPAT-KARMET. No remarks on the storage of chemicals were made during that inspection.

During the site visit by Dames & Moore it was observed that conditions in the ground floor of the boiler buildings are extremely poor:

- the lighting is very weak, nearly pitch dark,
- high concentration of coal dust in the air,
- numerous slip/trip hazards (compounded by the poor visibility).

It was reported that part of the lighting problem stems from theft of light bulbs and fixtures. In any case, these issues must be given high priority and resolved as soon as possible.

9 Key Health & Safety Issues - Coal Mines

9.1 Health & Safety Compliance

Compliance with mine H&S laws and regulations is strictly monitored and enforced, and penalties for non-compliance are extremely high. For example, all machine operators and a selected sample of workers are tested for alcohol consumption at on-site clinics before every shift. If workers are found to have consumed alcohol, a disciplinary hearing is held

and the worker is liable for dismissal; senior staff are not exempt. Sentencing and penalties for non-compliance are generally more strict in Kazakhstan than in Europe.

9.2 Accident Statistics

By western standards, the accident record at the Karaganda mines is very poor. The number of reportable accidents has remained reasonably steady with an average of over 1,700 during the 10 years 1986-95. The number of deaths has averaged nearly 16 per year, with a maximum of 23 in 1995 (with 13 deaths resulting from an explosion event at the Lenina Mine). There is no doubt that some of the accidents are due to carelessness and poor management procedures, however, a large percentage can be linked directly to the operation of unsafe machinery, poor ventilation and methane drainage equipment. Recommendations are given in a number of the following sections to improve the technical installations and to provide additional training in H&S awareness, which are intended to reduce the overall accident rates.

9.3 Methane Risk

EXPLOSION POTENTIAL

Methane is a serious problem in the Karaganda Coalfield due to the inherent high methane content of the local coal seams, reaching over 50 cu.m/t in the most gassy seams. There has been a history of disasters as a result of methane explosions, with over 52 explosions reported since 1959 at a loss of over 600 lives. The majority of the explosions have occurred at the working face either during drilling or coal cutting. It is understood that there is little methane drainage of the worked out areas, and it is in this aspect and in improved drainage in general that investment is urgently needed. Improvements in detection of methane and to the methane drainage systems are by far the most pressing safety requirements.

METHANE DRAINAGE

The task of dealing with all the problems of gas in the mines in the whole of the Karaganda Coalfield is undertaken by a special degassing organisation called Spetzshakhtomontage-degasatsiyall (SSHMD), which is responsible for the following work:

- underground forward drilling and installation of methane drainage equipment and pipework;
- prediction, prevention and extinguishing of spontaneous combustion fires;
- design of mine ventilation and fire prevention systems;
- at some mines, the supply of methane to surface boilers;
- drilling and maintenance of advance drainage from surface vertical boreholes;

- monitoring of methane at all mines.

Nearly all of the drained methane is vented to atmosphere, with only a few percent being recovered to use as fuel source. The SSHMD organization has recently been bought by ISPAT, but is still also responsible for gas in all of the other mines in the coalfield. The current total budget for all the degassing works is only US$ 2 million/yr, which is not sufficient to maintain the required equipment and personnel. An investment programme has been prepared by SSHMD to address the future requirements. This programme calls for an increase in underground drilling from the present 137 km/yr to 200 km/yr in 1999 with a corresponding increase in surface drilling from llkm to 20 km/yr. In order to reach these targets the SSHMD proposes the expenditure of US$ 16 million for 5 surface drill rigs and 10 underground rigs to replace the present inefficient and out-dated equipment. About a further US$ 25 million will be required for related pipelines, vacuum stations and distribution equipment. This increase in drilling capacity will allow production of coal to increase in a safe manner with forward drilling well in advance of the coal cutting resulting in improved methane drainage.

METHANE MONITORING

During the visits to the mines it was understood that there is a problem with supply of new units and spares for the fixed methane monitoring system. The equipment is rigorously maintained and at each mine there is an operator permanently monitoring methane in all of the mine control rooms. However, the efficiency of the systems is in some cases limited by the supply of new equipment and spares.

SECURITY OF SURFACE INSTALLATIONS

During the mine inspections it was observed that an overall serious problem exists in the security of the surface methane vent stations, with frequent absence of warning signs, use of non-flameproof equipment, and even hot-work being conducted nearby. Under UK regulations, it is not permitted to have any inflammable material within 60 m of a vent stack, while the Kazakhstan regulations stipulate only a 30 m zone. It is recommended that in such a gassy coalfield that Ispat should also adopt a 60 m policy.

9.4 Exploration and Forward Drilling

Surface and underground forward drilling is performed to ascertain the geological structure and to conduct rock mechanic tests on the strata ahead of the working faces, and is a very important part of preventative safety measures. The drilling equipment seen on the mine visits at both the surface and underground was very old and in need of replacement. According to the Chief Geologist, no forward surface drilling has been done for the last two years due to a lack of funds.

Approximately US$ 2 million will be needed to acquire five new surface drilling rigs and about 12 underground rigs in order to meet new production targets and to bring the exploration up-to- date. Also, improved monitoring of groundwater and rock mechanics are needed.

In talks with the Chief Geologist and the Mines Inspectors it was noted that there is also an urgent need for investment (approximately US$ 2 million) in more rock noise monitoring equipment to provide warning of rock falls and rock bursts and temperature-sensing instruments for identifying spontaneous combustion at selected coal faces.

9.5 Fire and Rescue Services

DUST MANAGEMENT

At all mines the equipment and procedures to minimize build-up of flammable coal dust appeared adequate by any world standard. However, there did appear to be a lack of water sprinkler systems and dust suppression was usually carried out with hosepipes attached to the water supply system for fire fighting. Dust analyses are regularly taken for measurement of combustible material especially near working faces and conveyor systems. It is considered that with such high volatile coals as those in Karaganda, the sampling and testing of the dust should be more rigorously undertaken. Housekeeping, and especially the clearance of spillages from the conveyors, was good in some mines but very poor in others, and generally needs to be improved.

RESCUE SERVICES AND EQUIPMENT

The emergency rescue services at each mine were better manned than in Europe with 2 men on permanent standby at each pit and 100 men fully trained in rescue techniques at each mine. The rescue and ambulance stations were also well equipped. Rescue teams are fully-trained and available for all mines with a rapid turnaround. Although some emergency treatment can be carried out on site, more serious cases are diverted to the central hospital at Karaganda. Most mines visited have some self-contained breathing apparatus and stretchers for rescue operations, but the equipment is extremely old. Attention to safety and rescue procedures was excellent in many of the mines.

The self-rescuers provided to each underground worker at the mines were adequate but very cumbersome because of their large size (compared to more modern units now available). Few workers on the coal cutting face were observed wearing them and at some mines it was admitted that there were not enough to supply everyone on each shift. This issue will require immediate attention.

WATER SUPPLY AND FIREFIGHTING EQUIPMENT

The water supply for most mines was provided by the water that was pumped from the mine and then treated and stored in a reservoir as a header tank for underground fire fighting. At most mines the pipework was clearly marked and fire extinguishers provided at regular intervals and nearby to machinery. Fire extinguishers were inspected regularly and also replaced yearly. In mines with poor housekeeping there was an obvious lack of colour coding on pipework. This will require immediate attention.

FIRST AID

First aid boxes were provided at all key intersections in the underground mines, but these were not as well equipped as in the west. The first aid stations and hospitals on the surface were very well equipped and manned. Medical facilities were available at the majority of the mines visited and are usually in the form of small clinics. Most are well-equipped for basic treatment of burns, minor fractures, etc.; however, more serious complaints including traumas are referred to the hospital in Karaganda. The main issue at present is the payment of wages and continual medical supplies; although the supplies are provided by the mines, worker wages are provided by the regional health authorities and there is a common fear that support will stop in the next financial year (refer also to H&S section for steel plant). Ispat will need to take the necessary actions to keep these vital services operational.

9.6 Explosives

The explosives store inspected at one of the underground mines was generally found to be in excellent condition, very secure and well managed. Detonators were stored in a completely separate room with its own security gate and the explosives stored in separate galleries with no more than 400 kg per gallery.

Teams of four men are involved in drilling and shotfiring at the development faces and only one person with the equivalent of a shotfirers certificate is allowed to carry and place the explosives. In general, the regulations related to the handling and use of explosives in the Karaganda Mines appeared to be at least as rigorous and as well observed as those in Europe. No major issues were noted.

9.7 Ventilation

Efficient ventilation is vital in coal mines with such potentially high methane contents as those in the Karaganda coalfield. The actual ventilation capacities at the mines are very good; however, more efficient pre-heating equipment is needed, which is vital in such a cold climate. Apparently there have been several occasions recently where workers have suffered from hypothermia at the coal face, a situation almost unheard of in the international mining community. A recommendation is made to invest in more efficient ventilation and pre-heating equipment.

9.8 Dewatering

In general, the mines of the Karaganda Coalfield are relatively dry by world standards and water is not a particular problem. However, it was noted during visits to some mines that the shaft linings were not as watertight as they should be and several shafts were notably wet. With the recent interruptions to the electricity supply in the Kazakhstan grid there is a serious potential safety problem due to the possibility of the shafts blocking with ice during the winter months if the preheaters in the ventilation system are not working (as described above). This underscores the importance that all mines be selfsufficient in electricity supply and have efficient pre-heating equipment.

On mine closure at any of the mines there is the potential future liability problem of forced methane migration to the surface, caused by rising groundwater on cessation of pumping. This issue is also addressed as part of the methane drainage problem (see section above).

9.9 Equipment

The principal issues associated with equipment at the mines are as follows:

- the lack of availability of spares for foreign-purchased equipment;
- the distinct and sometimes dangerous lack of monitoring equipment including methanometers, self-rescuers, rock noise monitors and temperature probes;
- old emergency signalling equipment, dust and fire prevention equipment;
- old electrical equipment (including transformers >20 years old);
- inadequate methane drainage equipment.

A review of accident statistics shows that obsolete or outdated equipment is the major cause of accidents and deaths at the mines. The Chief Inspector of Mines has compiled a comprehensive list of equipment that needs to be replaced. Recommendations are made to implement replacement as soon as possible.

9.10 Personal Protective Equipment

Recommendations are made to improve the provision and use of ear defenders (none were observed in use underground), to increase the use of steel-toed footwear, and to gradually upgrade the cap lamps, self-rescuers and methanometer equipment in use at the mines. Modern methanometers, e.g., are less cumbersome to carry, easier to use, and have automatic alarms which could avoid the types of accidents that are common in the Karaganda mines.

9.11 Training

During several of the underground mine visits it was evident that there was a lack of awareness in basic safety matters by certain staff , beginning with the level of mine director and downwards. It was found that all staff interviewed during the mine visits were technically very competent and followed safety procedures as best they could, and that there was a distinct enthusiasm for the future prospects of the mines now that they have been privatised. However, it would seem appropriate to begin with a training programme for all middle management (comprising about 4,500 staff) to cover the issues of awareness and communication on all relevant safety matters.

Outline: Public Information Plan for the Modernization Investment Programme Ispat-Karmet, Temirtau, Kazakhstan

1 Introduction

This outline for a Public Information Plan (PIP) has been prepared for Ispat-Karmet by Dames & Moore as part of the overall environmental audit and partial impact assessment performed by Dames & Moore of the Ispat-Karmet steel works, power plants, and coal mine installations in Temirtau and Karaganda, Kazakhstan. The consultation was conducted on behalf of the European Bank for Reconstruction and Development (EBRD) and the International Finance Corporation (IFC) to support the banks' formal review and approval process for the requested loan by Ispat-Karmet to finance a proposed capital expenditure programme at the Ispat facilities.

The banks' lending procedures require that project sponsors prepare a PIP to comply with national legislation and bank policies concerning disclosure to the public of relevant project information, as well as involvement of the public in the decision-making processes, as applicable depending on the complexity of the project. The EBRD has developed a guidance document to assist project sponsors with the preparation of public consultation plans conformance to the Bank policies (see references at end of text).

This document represents a suggested outline and recommendations for the PIP for the Ispat-Karmet capital expenditure projects, as per the EBRD guidance. It is emphasized that the formal PIP will need to be prepared by Ispat-Karmet and submitted to the banks for approval. The PIP must be implemented and completed before the cap-ex loan package can be finalized for approval by the banks' Board of Directors.

2 Background

The lending policies of both the EBRD and IFC include very specific requirements for project sponsors to involve the relevant government authorities in the approval and implementation of the project and to comply with any national requirements for public information and participation.

In addition, the EBRD requires that a minimum public consultation and disclosure program be implemented for so-called "Level A" operations which have potentially significant and diverse environmental impacts which cannot be readily identified and quantified and which may be difficult to mitigate. For Level A operations, the project sponsors must provide comprehensive information to the potentially affected

public and to interested non-government organizations (NGOs) on the nature and scope of the intended project as well as potential environmental impacts. The objective is to allow these individuals and groups to express their views and concerns on the intended project and to influence the final decisions concerning design, location, technological choice, and timing of implementation.

The proposed modernization project at Ispat-Karmet is considered as a Level A operation according to the EBRD project criteria. Ispat-Karmet will be requested to provide the population of Temirtau and other affected communities, as well as any interested NGOs in the region with pertinent, non-confidential project information, including the consultant's Environmental Audit and Impact Assessment (EIA) reports on the proposed capital modernization measures at the steel works, power plant, and coal mines.

The standard procedures of the EBRD and the IFC call for a minimum 60-day public comment period on the draft EIA reports. In the final drafts, Ispat will need to explain to the banks how the public comments have been taken into account, prior to submittal of the lending package to the banks' Board of Directors for consideration. In addition, Ispat will need to ensure that the relevant draft EIA reports are made available to the public in the banks' Business Information Centres (BICs), at the same time that the reports are released for public comment.

3 Objectives

The main objectives of the PIP, in addition to complying with the statutory requirements of Kazakh environmental law and the banks' requirements, are to provide the potentially affected residents of Temirtau, Karaganda and other communities with objective information concerning the scope and potential environmental impacts of the proposed capital expenditures, and to incorporate, where possible, the concerns and suggestions of the public into the final project plans.

It is recognized that the proposed capital expenditure programme by Ispat-Karmet is designed to improve the quality and efficiency of steel production and will consequently yield a number of distinct environmental improvements in the region. Nevertheless, due to Ispat-Karmet's position as by far the largest employer in an economically depressed region, there is expected to be deep concern by the public regarding the possible reduction of employment levels at the Ispat works as a direct or indirect result of the improvement programme. Based on discussions with local residents and Ispat employees by Dames & Moore, it is clear that the concerns over the employment situation far outweigh the level of environmental concern. Therefore, the PIP will need to be particularly sensitive to this issue.

The concept of public involvement and participation in business decision-making has evolved in western countries during the past several decades. Based on this experience throughout many countries, is has been found that the implementation of a PIP can yield a number of important short- and long-term benefits to the project sponsors. Such benefits (as compiled by the EBRD) can include:

- Avoiding/reducing conflicts with the public, by understanding and responding to public concerns at an early stage;
- Improving the profitability of projects, by avoiding delays due to conflicts with regulators or public, and by identifying and mitigating the effects of otherwise unforeseen problems;
- Improving the project bankability with EBRD, IFC, and other institutions;
- Identifying creative solutions via public input;
- Education of public and consensus-building;
- Improving overall relations and image with public, workers, government authorities, NGOs and other involved parties.

4 Developing the PIP strategy

In the following, suggestions are given for developing and implementing the PIP for the Ispat Karmet investment project. The plan must of course also comply with any relevant requirements under Kazakh law, notably the Law on the Protection of the Natural Environment (1991). It should be pointed out, however, that to date there has not been much experience in Kazakhstan with regard to public involvement with private enterprises.

4.1 Establishing the key goals

- To objectively convey relevant information to the public regarding the intended modernization programme, including expected technical and environmental benefits (as per the consultant reports) as well as proposed phase-out of certain units
- To solicit input from the public and interested groups with regard to their particular concerns and opinions of the proposed project, as well as

constructive suggestions for mitigating any foreseen adverse impacts.

The Ispat-Karmet projects do not involve the siting of any new facilities, nor any new production techniques or processes which will yield negative environmental impacts - the types of issues which frequently are the cause of public concern. In fact, according to the results of the Audit and EIA performed by Dames & Moore, the Ispat investments are expected to yield net positive effects on the occupational health of the plant workers and the regional water and air quality.

Therefore, the level of concern over environmental issues is likely to be minimal. As discussed previously, by far the major concern will probably be the potential down-sizing of the workforce due to closure of redundant steel plant units and unprofitable coal mines.

4.2 Identification of Affected Population and Representatives

- workers of the Ispat-Karmet steel works, power plant, coal mines, and related facilities; represented by elected union leaders
- residents of Temirtau, Karaganda, other local towns
- other interested organizations (e.g. NGOs, social groups)
- surrounding land-users (e.g. agricultural enterprises).

It should be noted that in the Temirtau and Karaganda regions there are very few active Non-Government Organizations (NGOs). During the field visit by Dames & Moore in November, 1996, that audit teams were not able to identify and environmental or other NGOs in the region that my be concerned with the relevant environmental or social issues at Ispat-Karmet. In any case, Ispat will need to make a comprehensive effort to identify any such organizations; if necessary, the few nationally-active organizations based in Almaty should be contacted.

In addition, the relevant local and regional (oblast) authorities (Ministry of Ecology and Bioresources, SANEPID, Technadzor,and others) will need to be notified, to the extent that they have not already been involved in the regulatory approvals and EIA-expertise process.

4.3 Identify Challenges to implementing the PIP

Factors which have the potential to pose difficulties for the implementation of the PIP should be anticipated and addressed in the plan. These factors may include:

- expected focus of workers and public on maintaining the employment levels (even at the expense of environmental improvement and technical

efficiency);

- overall economic and social hardships experienced by public and workers during the privatization process and transition from the socialist system of full employment and extensive subsidization of infrastructure and services;

- lack of precedent with such public programmes, and inexperience or inhibition of individuals in voicing their opinions.

As discussed above, the employment issue may be a particular focus of public concern - overshadowing the discussions on environmental issues - and this will need to be addressed objectively by Ispat. However, the public information programme may also be used by some individuals as a platform to voice their general grievances concerning the economic situation in the region, or the overall transition of the economy away from the previous socialist system. Ispat should be aware of such concerns, but these issues are not the focus of this PIP.

4.4 Selection of Plan Methodology

A wide variety of methods have been developed for the purpose of informing and/or directly involving the public in the decision-making processes. The EBRD Guidance Manual on Public Participation provides an overview of the advantages and disadvantages of a number of such methods, as shown in Matrix 3.3a and 3.4a in the manual (copy attached). Also, it should be noted that Ispat publishes a weekly newspaper "Metallurg" for its workers, and operates a television station in Temirtau.

Given the goals and challenges of the PIP for Ispat-Karmet, as discussed above, Dames and Moore suggest that the plan comprise several information methods used in combination, e.g. as described below:

- Newspaper Articles e.g.
  - special articles in Metallurg and other local papers, objectively describing the proposed cap-ex programme and key findings of the consultants;
  - a "Q&A Interview" with a senior Ispat spokesperson, including questions of concern to the public and workers.

- Survey
  - a portion of the Metallurg (and other) newspaper pages can be designed as a "reader survey" with opinion questions concerning the proposed project; the page can then be mailed to Ispat or dropped off at the main entrance gates of the works' for collection.

- Television
  - special news programme objectively describing the proposed cap-ex programme and key findings of the consultants;
  - "talk-show/interview" with senior Ispat management, union leaders, etc. to discuss issues of concern to the public and workers.

- Meetings
  - presentation of proposed cap-ex programme and consultant findings to senior Ispat managers at the weekly management meeting;
  - presentation of proposed cap-ex programme and consultants findings to meetings with invited regulatory and administrative officials.

- Document Display
  - establish one or more convenient locations in Temirtau and Karaganda where a set of relevant documents are on display for review by interested individuals or group representatives.

The contents of the written general notification material should include at least the following information:

- general background data on the project
- overview of the purpose and scope of the Public Information Plan
- name of designated Ispat contact person(s)
- phone, fax, address of contact person(s)
- location of additional information/documents for public review and times available

4.5 Evaluation and Feedback

The written and verbal responses and opinions expressed by the public and interested organizations should be centrally compiled and evaluated to identify the key issues raised and to determine to what extent the proposed investment project should be revised to address the concerns.

Timely feedback to those affected by the proposed project is crucially important. This will help Ispat to demonstrate to the public that their concerns have been duly considered. Feedback can be accomplished via a similar manner as the initial public information, e.g. newspaper "Q&A" articles, television interviews and statements, in-house meetings, etc., as well as direct contacts to those groups or individuals whose specific concerns are not easily addressed by other methods.

4.6 Scheduling

The entire PIP must be implemented and completed before the EBRD and IFC can present the loan package to the respective Boards of Directors for review and approval (presumably in June, 1997). Ispat will need to communicate closely with the banks to ensure that the required timetable is maintained.

References

EBRD/ERM, Manual on Public Participation for Investors in Central and Eastern Europe and the Former Soviet Union, Environment Library 3, December 1995.

EBRD, Environmental Procedures, September 1996.

EBRD, Policy on Disclosure of Information, June 1996.