ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR A PROPOSED LOAN IN THE AMOUNT OF US$ 22.5 MILLION TO THE REPUBLIC OF KAZAKHSTAN FOR A TECHNOLOGY COMMERCIALIZATION PROJECT November 5, 2007

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<td>Environmental Assessment</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>Environmental Management System</td>
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<td>ESSF</td>
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<td>IC</td>
<td>Instrumentation Contractor</td>
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<td>IMSC</td>
<td>International Materials Science Center</td>
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<td>IP</td>
<td>Intellectual Property</td>
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<td>ISCB</td>
<td>International Science and Commercialization Board</td>
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<td>MoEP</td>
<td>Ministry of Environmental Protection</td>
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<td>MoES</td>
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<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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<td>RPF</td>
<td>Resettlement Policy Framework</td>
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<td>S&amp;T</td>
<td>Science and Technology</td>
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1. EXECUTIVE SUMMARY

Project Description

The Government of Kazakhstan, with assistance from the World Bank, is preparing to implement a Technology Commercialization Project. The objectives of the project are to help Kazakhstan’s national innovation system function more effectively and efficiently in a highly competitive global market environment so that Kazakhstan’s legacy of scientific excellence, its still-impressive stock of scientific knowledge, and its educated citizenry can be converted into a long term, sustainable resource for generating wealth, improving national competitiveness, diversifying the economy, and raising standards of living.

Chart 1: Project Structure
FOR PUBLIC DISCLOSURE

The Project will be administered by:

- The Ministry of Education and Science (MoES), the counterpart appointed by the Government of Kazakhstan for implementing the Project. The MoES will establish a Project Management Unit (PMU) that will be responsible for day-to-day project implementation.

- The International Science and Commercialization Board (ISCB), which will provide guidance related to all scientific and commercialization matters associated with the project, including the selection of the Groups, monitoring their scientific progress and achievements, and management and operation of the International Materials Science Center (IMSC) and an internationally peer reviewed journal.

**Project Structure**

The project will consist of the following 3 components:

1. Competitive financing to strengthen Kazakhstan’s science base by supporting high quality R&D in competitively selected Groups and a world class IMSC; and

2. Technology commercialization activities that will link Kazakh science to local and international technology markets; and

3. Support for the establishment of the PMU.

**Technology Commercialization Project Structure Chart**
COMPONENT 1 – STRENGTHENING KAZAKHSTAN’S SCIENCE BASE

With its ageing cadre of scientists and ageing stock of physical equipment, Kazakhstan’s existing science and technology (S&T) base is depreciating rapidly, in most instances generating revenues from past scientific achievements rather than new scientific breakthroughs. Immediate action is needed to stanch the decline, rebuild Kazakhstan’s S&T legacy, and put the S&T system on a more sustainable and modern path of renewal so it can once again serve as a resource for economic growth and competitiveness.

Therefore, this component will finance: (i) the establishment of the International Science and Commercialization Board (ISCB); (ii) the Senior Scientist & the Junior Researcher Programs that will conduct world class research and (iii) an International Materials Science Center (IMSC) furnished with modern, up-to-date laboratory equipment.

As mentioned above, this component will also finance the establishment of the IMSC. The IMSC is most likely to be established in the greater Almaty area in order to provide access to state-of-the-art scientific equipment to support research by the selected Groups and to the larger scientific community.

The IMSC will be this world class laboratory. The precise list of equipment that will be purchased for the IMSC will be determined in consultation with the International Science commercialization Board and will be based on a review of the equipment requisitions submitted by the winners in the Groups competition. IMSC would also be equipped with access to up-to-date electronic scientific journals and enhanced ICT capability.

Initially a single contractor with experience managing similar world class laboratory facilities will be selected through a competitive bidding process to manage the International Materials Science Center. The Instrumentation Contractor (IC) will be authorized to enter into subcontracts with other consulting firms to provide specialized services in order to maintain, service, upgrade and provide training for the use of IMSC equipment on a continuous basis. Kazakh staff will be appointed by the MoES to work in the IMSC. Kazakh staff would work side-by-side with the foreign experts and observe and participate in IMSC activities. When sufficiently experienced, Kazakh staff would assume full responsibility for managing the IMSC.

An appropriate budget will be allocated for the establishment of the International Materials Science Center. The IMSC will be located in an existing building, preferably in proximity to the relevant Groups. New constructions will not be financed by the project.

COMPONENT 2: LINKING KAZAKH SCIENCE TO MARKETS

Even if Kazakhstan improves the quality and relevance of its scientific output, Groups will not generate the expected economic benefits unless these Groups are connected to domestic and global technology markets. Unfortunately, too many Kazakh research institutes, universities and even some high tech enterprises operate largely in a “commercial vacuum.” They do not know how to find investors, find customers, or determine whether they are selling an invention embodied in a concrete product or their capacity to solve complex technical problems and conduct high quality research in response to orders from domestic and international customers.
The objective of this component is to provide the expertise required to link Kazakh science more closely to domestic and international markets. Initially, a technology commercialization contractor (TCC) will be hired through international competitive bidding process to establish and manage all the activities of this component including:

(i) technology audits the goal of which is to identify, structure, and make accessible Kazakhstan’s national scientific competences;

(ii) technology commercialization office that would provide a wide range of complementary technology commercialization services, including coaching scientists and entrepreneurs in how to talk to investors, how to commercialize technology, marketing identified technology, providing expertise to techno-parks and incubators and using the results of the technology audits to: inform policy-makers of existing and potential innovation assets of the country, help scientists to review their comparative position in terms of commercial potential, disseminate opportunities and competences to the national and international business community, and create links between scientists working in different technology areas;

(iii) technical assistance and advisory services to review existing laws, rules and regulations framework for industrial innovation and S&T, R&D financing, protecting IP and other items and recommend changes to bring Kazakhstan’s legal framework into conformity with OECD practice;
(iv) technical assistance to design and administer the following grant programs which will be financed by GoKZ: pre-commercialization grant program, joint research with industry, joint research with international research partners, international patenting and industrial internships for scientists.

Initially, a technology commercialization contractor (TCC) will be hired through international competitive bidding process to establish and manage all the activities of this component within the MoES structure. (See Chart 3 above). However, from the inception of the project the contractor’s foreign experts will train staff hired by the MoES to manage and operate the technology commercialization activities, and administer all four sub-components. In order to eventually replace foreign staff within reasonable period of time Kazakh staff will go through comprehensive on-the-job training and will work in close partnership and proximity with the foreign expert staff.

COMPONENT 3 – PROJECT MANAGEMENT UNIT

The project will fund the purchase and renovation of building that will house the IMSC, TCO and the office of the PMU. The purchase of the building will be financed by the Borrower. In addition, the project will finance the salaries of PMU staff, operating costs and any consultants required to supplement the PMU staff to successfully implement the project. Importantly, the PMU will oversee the implementation of a public relations campaign surrounding the project, including a comprehensive consultation and dissemination process of the call for proposals, grant selection, project results, etc.

Safeguard Policy Issues

In light of the type of future research projects anticipated under the Technology Commercialization Project, World Bank Operational Policy 4.01 on Environmental Assessment will apply. Research projects conducted by the Groups that could potentially trigger policies on Safety of Dams, Natural Habitats, Forestry, Pest Management, Cultural Property, Indigenous People, Involuntary Resettlement, Projects on International Waters and Projects in Disputed areas will not be funded under the project.

OP 4.01 Environmental Assessment

This policy requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the research projects supported by the Kazakhstan Technology Commercialization Project. The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and trans-boundary and global environmental aspects.

The environmental and social impacts will come from the activities of the research projects that the Technology Commercialization Project will be financing as well as from the proposed rehabilitation works related to the existing building that will host the IMSC, the TCO and the PMU. The EA process calls for the Government of Kazakhstan to prepare an Environmental Management Plan (EMP), which will establish a mechanism to determine and assess potential environmental and social impacts of the research projects under the proposed Groups as well as of the rehabilitation works, and then to set out mitigation, monitoring and institutional measures to be taken during implementation and operation of the research projects to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.
The OP 4.01 further requires that the EMP be disclosed as a separate and stand-alone document by the Government of Kazakhstan and the World Bank as a condition for Bank Appraisal of the project. The disclosure should be both in Kazakhstan where it can be accessed by the general public and local communities and at the Infoshop of the World Bank. The public disclosure of this EMP was done via the MoES website in Astana on November 5, 2007. A public disclosure of a similar document was held in Almaty in mid-April 2006. Records of this meeting are attached in Annex 2.

The OP 4.01 policy additionally calls for the project as a whole to be environmentally screened to determine the extent and type of the EA process. The Kazakhstan project has thus been screened and assigned a Category B status. Category B projects have the potential to cause adverse environmental impacts on human populations or environmentally important areas – including wetlands, forests, grasslands, and other natural habitats – and are less adverse than Category A projects. These impacts are site specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. The EA for Category B subprojects examines the potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. Therefore, this EMP sets out to establish the EA process to be undertaken particularly for those research projects under the proposed Groups which, after they are being identified, will have an environmental impact according to the completed Environmental and Social Screening Form.

Potential Environmental Concerns and Screening and Mitigation Measures

The key environmental safeguard policy issues associated with the project are: (i) laboratory safety and safe disposal of wastes; and (ii) potential environmental issues arising in connection with the possible rehabilitation of existing laboratory space (existing building). Hence the project has been screened and assigned a Category B status.

(i) The grant winners for research projects will be selected through a competitive process. The competition will determine to a great extent the equipment that will be purchased and installed in the International Materials Science Center and possibly the nature of the experiments conducted by the research groups. Therefore, it is not possible to know beforehand precisely what research disciplines will be supported under the auspices of the project and the precise, detailed environmental compliance issues that will emerge during the course of project implementation. Therefore, the EMP also describes the environmental screening process that will be employed as well as the institutional responsibilities for conducting the screening. The results of the screening process will determine the precise environmental safeguard processes that will be required for each research activity supported by the project. Although the potential environmental impact is expected to be modest in most cases, the EMP provides for the broadest range of situations.

The Groups component will support approximately 5 Senior Scientist Groups and 5 Junior Researcher Groups during the first phase of the program. The majority of these will involve relatively small teams (10-12 individuals) working in relatively small laboratories. Total waste generation, therefore, will be comparatively small. The nature of the research to be conducted will also keep the potential environmental impact of the project relatively modest. For example, the project will most likely not fund any research in such environmentally-sensitive areas as clinical medical research or field trials of genetically-modified organisms. Several research projects could also be in areas (e.g., mathematics) where no other than domestic waste will be generated. The other subprojects will most likely concentrate on areas of research that generate hazardous wastes in small amounts and of the kind that can be treated and disposed of with routine care and procedures. Nevertheless, to err on the safe side, the EMP provides for extraordinary cases as well as the most likely ones.
(ii) A key component of the project will be the provision of funds to purchase scientific equipment. As such, it is expected that any construction that does occur will be primarily to rehabilitate existing buildings to accommodate new laboratory equipment. This may involve the construction of ventilation systems, the addition of laboratory bench and storage space, or the rehabilitation of electrical systems to run larger equipment.

Environmental effects of the project, if any will be minor and short-term. Identified environmental impacts will relate principally to civil works during the proposed rehabilitation activities including impacts at the respective building site resulting from: (i) noise, dust, and the re-direction of traffic, if necessary, during the execution of works; (ii) the quarrying of stone and gravel; (iii) removal of construction related waste materials; and (iv) alteration of drainage and potential soil erosion during the construction period. However, these possible impacts could be managed through supervision of environmental aspects and use of adequate technical construction standards. An EMP checklist that covers typical mitigation approaches to common civil works contracts with localized impacts and related monitoring actions that are compatible to the Bank safeguard requirements would be directly usable and applicable in bidding documents and as an integral part of contract documents for the respective civil works (Annex 4).

In addressing these environmental safeguard issues, all screening, monitoring and remedial measures will have to comply with Kazakh rules and regulations. In addition, the safeguard measures should comply with World Bank safeguard policies and procedures and with best international practice for laboratory safety, waste disposal and operating procedures. Many existing Kazakh laboratories do not currently comply with best international environmental and safety practices. Therefore, in addition to helping to rebuild Kazakhstan’s research and scientific capacity, this project will help to introduce world class safety and environmental procedures to Kazakhstan and ensure that those facilities supported by the project serve as a model for other facilities.

A research and laboratory safety expert from the Howard Hughes Institute of Biomedical Research in Bethesda, Maryland created an in-depth digest of international best practice standards for laboratory safety and waste disposal. These standards cover all classes of physical, chemical, biological, and radioactive hazards. They discuss procurement and transport, storage, protocols and facilities for use in research, training of personnel, segregation of waste types, and disposal of wastes. The standards also describe core processes for establishing functioning environmental management systems within laboratories, including development of training for personnel, designation of responsibility for environmental management, performance of needs assessment and waste stream assessment, installation and maintenance of appropriate equipment, treatment processes, and safe transport. These best practice standards were incorporated into the Kazakh EMP so that they would serve as the environmental standards and procedures that will be employed by scientists working in the Groups supported under Component 1.2 and the International Materials Science Center supported under Component 1.3.

Monitoring Responsibility

The PMU will have overall responsibility for ensuring that the provisions of the EMP are implemented. However, the Scientific Directors and Director of the International Materials Science Center will be responsible for ensuring that their individual activities comply fully with the provisions of the EMP. Ministry of Environmental Protection (MoEP) would be expected to work in partnership with the PMU to ensure that all project activities comply with Kazakh laws and regulations.

The EMP will accompany the Project Operational Manual. This will ensure that environmental requirements are integrated with other requirements which Groups must satisfy prior to receiving grant contracts.
All laboratories and research facilities supported by the Project will be required to (i) identify *ex-ante* the environmental, social, and safety impacts of proposed research and research wastes generated; (ii) submit a plan for minimization, mitigation, and proper disposal for review and approval of both national authorities and the PMU; and (iii) keep appropriate records and submit to periodic third person monitoring of safety and waste disposal practices.
2. INTRODUCTION

A vigorous debate is taking place in Kazakhstan over the strategic use of its growing oil revenues and the challenge of ensuring sustainable and broad-based economic growth. So far, economic growth has been driven mainly by oil production, which makes the country particularly vulnerable to fluctuating oil prices. Additionally, high value-added activities in the oil sector are dominated by foreign firms. Kazakh industrial firms are relegated to relatively lower skill and lower value-added activities. Moreover, despite its Soviet legacy of scientific excellence, Kazakh firms account for a miniscule world market share of high and medium tech products. Kazakhstan is still primarily an exporter of unprocessed raw materials.

Several new public institutions have been established in Kazakhstan to aid the implementation of economic reform and diversification programs. These include the National Innovation Fund, the National Investment Fund, the Center for Marketing and Analytical Research, the Engineering and Technology Transfer Center, and the Development Bank of Kazakhstan. However, these new institutions lack the extensive experience and know-how necessary to design and implement effective innovation, industrial diversification, and technology commercialization programs. Therefore, the Ministry of Industry and Trade, and later the Ministry of Education and Science, requested the World Bank to design concrete, specific programs and policies that could be implemented under the auspices of the Industrial Innovation Program.

In response to this request, the World Bank assembled three teams of international experts who visited Kazakhstan in October and November, 2004 and provided the Ministry of Industry and Trade with a series of detailed policy recommendations and program designs. The Government subsequently adopted most of these recommendations in its Program of Developing the National Innovation System, approved in December 2004. In addition, the Government instructed the Ministry of Industry and Trade to begin preparations of a World Bank Technology Commercialization Project.

The Kazakhstan Technology Commercialization Project is designed to help the Government implement key components of its National Industrial Innovation Strategy. It will aim to accomplish this objective by bringing Kazakh science closer to world class levels of quality and economic relevance and by making Kazakh science a resource for sustainable economic growth, diversification, and rising standards of living. The Kazakh Government currently spends approximately $100 million per year on research and development. Unfortunately, this spending generates few scientific, social, or economic benefits for Kazakhstan. The quality of scientific output in most disciplines remains below world class levels. Current Government R&D spending does little to improve the competitiveness of Kazakh industry, to help Kazakhstan diversify the economy away from its near total dependence on unprocessed natural resources, or to move Kazakhstan towards a more knowledge-based economy producing higher value-added goods and services.

The Technology Commercialization Project will improve the efficiency of Government spending on R&D and ensure that they generate tangible social and economic benefits for Kazakhstan, and link Kazakh R&D to domestic and global markets. This, in turn, is expected to generate high paying jobs in Kazakhstan, help to diversify the economy, and establish Kazakhstan’s reputation as a leading center for high quality R&D.

All projects financed by the World Bank must comply with World Bank Safeguard policies. This document describes how the Technology Commercialization Project would comply with the World Bank Safeguard Policy, particularly OP 4.01 on Environmental Assessment. The World Bank’s Operational and Procedural Policies as well as Kazakhstan Law on Environmental Protection require the Government to prepare an Environment Management Plan, EMP. The purpose of this report is to establish the mechanisms to determine and assess potential
environmental impacts stemming from the activities of component 1 that envisage refurbishment of an existing facility for a laboratory and research sponsored by awarded grants under the project, and to set out appropriate mitigation, monitoring and institutional measures. The mechanisms will ensure that during implementation adverse environmental impact is offset or reduced to acceptable levels.

This EMP serves as a framework document since the specific research activities to be funded through the project have not been identified as yet. The World Bank OP 4.01 further requires that the EMP be discussed and further disclosed as a separate and stand alone report by the Government of Kazakhstan and the World Bank as a condition for Bank Appraisal of the Kazakhstan Technology Commercialization Project. The disclosure will be both in Kazakhstan in locations where it can be accessed by the general public and local communities and at the Infoshop of the World Bank in Washington, D.C. and the date for disclosure must precede the date for appraisal of the project.

In this context, the EMP is presented as follows:

(i) The detailed description of the project is presented in the executive summary
(ii) Essential background is provided in sections 2 & 3.
(iii) Section 4 identifies policy, legal and administrative framework of Kazakhstan on laboratory safety and disposal of laboratory wastes as well as World Bank safeguards policies triggered by the project.
(iv) Section 5 discusses baseline conditions in Kazakhstan, including existing rules and current practice on laboratory safety and waste disposal. This section also discusses international best practices for safety and waste management in research laboratories.
(v) Section 6 identifies potential environmental impacts, establishes the mandatory screening process for laboratory safety and the disposal of wastes to be used in the Project. This screening process will identify potential environmental impacts of sponsored research projects (also referred to as “Groups”) and ensure that principal investigators incorporate adequate provisions and relevant mitigation measures into subproject design.
(vi) Section 7 establishes the mandatory screening process for potential modernization or refurbishments of laboratory facilitates that may potentially be undertaken to facilitate that implementation of the subprojects.
(vii) Section 8 proposes monitoring and evaluation guidelines for subprojects, makes recommendations as appropriate, to increase capacity at universities and research institutions to implement the proposed screening process and mitigation measures, including training needs and cost.
(viii) Section 9 discusses institutional responsibilities and proposed capacity building for universities and research institutions to implement the proposed screening process and mitigation measures.
(ix) Section 10 describes implementation schedule and respective cost estimates.
3. BACKGROUND

The overarching objective of this project is to help Kazakhstan’s national innovation system function more effectively and efficiently in a highly competitive global market environment so that Kazakhstan’s legacy of scientific excellence, its still-impressive stock of scientific knowledge, and its educated citizenry can be converted into a long term, sustainable resource for generating wealth, improving national competitiveness, diversifying the economy, and raising standards of living. To accomplish this objective, Kazakhstan will need to create the right incentives for students to study science and to remain and work in Kazakhstan, using their talents and education for the development of the country.

The project’s specific development objective, therefore, is to rebuild, strengthen and restructure Kazakhstan’s scientific base so that it can become a resource for economic growth and development and to link that rejuvenated scientific base more effectively to national and international technology markets.

If the project is successful, five to ten years in the future Kazakhstan will have developed a new competitive, inter-disciplinary, internationally peer-reviewed model of financing excellent, economically relevant scientific research. Kazakh science will have closer links to domestic and international private enterprises as evidenced by the fact that the scientific institutes supported by the project are generating close to 30% of their income from contracts with private enterprises or other competitive funding sources. Research activities will be performed in close collaboration with the international science community and on an interdisciplinary basis rather than in the sealed silos that characterize so much of the current system. And perhaps most importantly, a new generation of young, talented scientists will be attracted to conduct science in Kazakhstan at the state-of-the-art scientific laboratory supported by the project and under guidance and supervision of eminent Kazakh and international scientists.

The Kazakhstan Technology Commercialization Project aims to revive and rebuild Kazakhstan’s R&D capacity by concentrating government R&D funding in competitively selected Groups. The Groups would be selected on a competitive basis by international peer review panels comprised of eminent scientists, policy makers and business executives. The Groups would be selected on the basis of their capacity to produce world class, economically relevant research. The project would also establish a technology commercialization office that would provide a range of services all designed to link Kazakh scientists to international technology markets and the research priorities of domestic and foreign firms. The process for selecting the Groups is described in section 3, but the specific subprojects themselves will only be identified during project implementation. Mitigation measures set out here will then be tailored to the specifics of the research subprojects if necessary. Therefore, the EMP will serve as a framework document to ensure that all project components abide by the World Bank Safeguards as described in Operational Policy 4.01.
4. DESCRIPTION OF THE PROPOSED PROJECT

COMPONENT 1 – STRENGTHENING KAZAKHSTAN’S SCIENCE BASE

With its ageing cadre of scientists and ageing stock of physical equipment, Kazakhstan’s existing S&T base is depreciating rapidly, in most instances generating revenues from past scientific achievements rather than new scientific breakthroughs. Immediate action is needed to stanch the decline, rebuild Kazakhstan’s S&T legacy, and put the S&T system on a more sustainable and modern path of renewal so it can once again serve as a resource for economic growth and competitiveness.

Therefore, this component will finance: (i) the International Science and Commercialization Board (ISCB); (ii) the Senior Scientist & the Junior Researcher Programs that will conduct world class research and (iii) an International Materials Science Center (IMSC) furnished with modern, up-to-date laboratory equipment.

Sub-component 1.1 – The International Science and Commercialization Board

The ISCB will provide scientific guidance and commercialization related to all scientific matters associated with the project, including the selection of the Groups under sub-component 1.2, monitoring of their scientific progress and achievements, and oversee operation of the IMSC under sub-component 1.3. The ISCB will be comprised of 5 international distinguished scientists and 2 commercialization experts, and will represent the fields of scientific and commercialization expertise that are of strategic importance for Kazakhstan. The ISCB will represent scientists and commercialization experts from a large variety of technologically-advanced countries, including Europe, North and South America and Asia. In addition, under this sub-component, funding will be provided for the establishment of an internationally-peer reviewed journal.

Sub-component 1.2 Senior Scientist and Junior Researcher Programs

Grants for the Senior Scientist and Junior Researcher Programs will provide funding to identify leading Kazakh scientists and talented young researchers motivated to conduct R&D at international standards. This sub-component will support 2 types of grant programs: (i) Senior Scientist Groups (SSGs) and (ii) Junior Researcher Groups (JRGs). These Groups would be selected on the basis of the following criteria: (i) their potential for conducting world class scientific research, i.e. scientific merit; (ii) relevance of their research for current or future scientific, economic and industrial development of Kazakhstan, including the possibility of forging research partnerships with local or foreign business firms; (iii) plans for mentoring graduate and undergraduate students and to provide training fellowships aimed at nurturing the next generation of scientists; (iv) their potential for and interest in conducting multidisciplinary research, and (v) their proposals for outreach activities to universities, secondary schools, and the general public.

The grant programs’ objectives will be achieved by financing the following activities:

- Purchase and maintenance of modern laboratory and pilot plant equipment and facilities.
- International cooperation scientific projects with research teams outside Kazakhstan.
- Funding for doctoral students and post-doctoral scholars to conduct research with SSGs to encourage a younger generation of scientists to pursue scientific careers in areas supported by the Groups.
- Grants to attract visiting professors from outside Kazakhstan to teach and conduct research at the Programs. These visiting professors could be either expatriate Kazakh scientists currently living and working outside Kazakhstan or foreign scientists.
Organization of conferences and workshops in Kazakhstan and funding for Kazakh scientists to attend international conferences and workshops outside Kazakhstan.

**Senior Scientist Group (SSG):** Approximately ten Kazakh scientists of advanced standing will form an SSG to perform research in one or more cutting-edge fields. One senior scientist would lead each SSG as Scientific Director. Each SSG can receive up to $500,000 per year for three years. The precise amount of funding per SSG will vary based on scientific discipline and the nature of the research proposal. Generally, resources will be commensurate with those allocated to analogous groups in developed countries. The SSG proposals will be market-oriented and internationally competitive scientifically. Relevant disciplines could include new materials development, environmental remediation e.g. of the Caspian Sea, renewable energy development, energy efficiency solutions, metallurgy, biotechnology, etc.

**Junior Researcher Group (JRG):** A smaller group of promising young researchers displaying the potential to graduate to senior scientist status will form a JRG. The Research Director of each JRG will have recently received her/his postgraduate degree. Each JRG can receive up to $200,000 per year for three years. The exact amount of resources will be defined based on the scientific field and activities planned. The selection process will be similar to that of SSGs and the merit of the proposals is paramount.

**Call for Proposals (CFP):** There will be 2 CFPs. The first round will be conducted just after effectiveness and a second round will be organized during the project’s second year of operation. The second CFP will be adjusted based on the lessons learned from the first round. Over the course of the project it is envisioned that up to 10 SSGs and 10 JRGs will be financed; with 5 SSGs and 5 JRGs financed per CFP. Pending success of the programs, the Government may finance subsequent programs with its own resources. Thus, the primary role of the Bank under this subcomponent is to usher in a competitive selection mechanism to finance the initial Groups and facilitate their access to world class instrumentation to conduct R&D.

**The Selection Mechanism** will be based on the following principles:

1. The competition will be open to scientists from all disciplines. There will not be any attempt to pre-judge the eligible fields or to limit the competition to scientists from a select few disciplines.
2. The CFP will specify the eligibility requirements and selection criteria.
3. Scientists and researchers wishing to compete for funding will complete a short application.
4. The ISCB will review the applications and rank them according to scientific merit and commercial feasibility.
5. The best proposals will then be invited to submit a much more detailed application.
6. The ISCB will review detailed applications in consultation with at least three international peer reviewers identified by them. The ISCB will create the shortlist of 12 proposals per CFP and submit these to the World Bank for No Objection to ensure that the research topics to be financed are in accordance with Bank and Borrower interests.
7. The MoES PMU will select the 10 finalists from among the 12 proposals short-listed by the ISCB. During this last phase of the selection process, the PMU can take additional factors such as strategic importance for Kazakhstan into consideration. Selection will be limited to 10 out of 12 proposals certified by the ISCB as acceptable in terms of scientific excellence and commercial relevance.
Sub-component 1.3 - International Materials Science Center (IMSC)

This component will finance the establishment of the International Materials Science Center. Much of the laboratory equipment in Kazakhstan is either obsolete, worn out, or both. Most scientific instruments are obsolete and date to the 1960s or 1970s. The material base for modern science simply does not exist in Kazakhstan today. Moreover, many of the existing laboratories in Kazakhstan do not comply with international standards either for good laboratory practices or for waste management.

The Groups will be procuring laboratory equipment specific to their own research. The Government wants to avoid duplication and underutilization of equipment. The Government also wants to avoid a situation in which isolated pieces of modern equipment are housed in third rate laboratories. The Government wants to ensure that at least one world-class modern instrumentation center exists with (i) state-of-the-art specialized scientific equipment and pilot plant facilities; (ii) world class laboratory management practices; and (iii) world class standards for environment protection and waste disposal.

The real dilemma therefore, is not between geographic concentration and dispersion of laboratory equipment, but between scattering new equipment in obsolete laboratories vs. concentrating it in one, modern center where international scientific experimental procedures, facilities, and hazardous waste disposal practices will be observed. The existence of the instrumentation center would, in turn, serve as a model and benchmark for other Kazakh laboratories. It is envisioned that a modern IMSC would foment the environment where scientists can meet, network and collaborate on cutting-edge ideas and in time help break down the rigid disciplinary silos that currently characterize Kazakh science.

An experienced international contractor will be selected through a competitive bidding process to manage the IMSC, and be coupled with qualified Kazakh specialist trainees. Kazakh staff would work side-by-side with the foreign experts and observe and participate in IMSC procurement and maintenance activities. Once sufficiently experienced, Kazakh staff would assume full responsibility for managing the IMSC. The IMSC will be authorized to enter into subcontracts with other consulting firms to provide specialized services in order to maintain, service, upgrade and provide training for the use of IMSC equipment on a continuous basis.

The precise list of equipment for the IMSC will be determined in consultation with the ISCB following the review of the equipment requisitions submitted by the CFP finalists. Scientists from all SSGs and JRGs as well as from other laboratories, research centers, and universities would be eligible to use the IMSC facilities, with priority given to Project grantees. The IMSC would also be equipped with access to up-to-date electronic scientific journals and modern information and communication technologies.

COMPONENT 2 – LINKING KAZAKH SCIENCE TO MARKETS

Even if Kazakhstan improves the quality and relevance of its scientific output, the Groups will not generate the expected economic benefits unless they are connected to domestic and global technology markets. Unfortunately, too many Kazakh research institutes, universities and even some high tech enterprises operate largely in a “commercial vacuum.” They do not know how to find investors, find customers, or determine whether they are selling an invention embodied in a concrete product or their capacity to solve complex technical problems and conduct high quality research in response to orders from domestic and international customers.

Many Kazakh scientists mistakenly believe that Kazakhstan has a large stock of inventions that can be easily commercialized, especially if venture capitalists can be induced to invest in the country. Unfortunately, most Kazakh scientists, like most scientists around the world, do not
know how to commercialize their inventions nor do they have the connections to global markets and venture capitalists that would be needed to mount a successful commercialization effort. Last but not least, Kazakhstan does not have the necessary commercialization institutions that can assist early stage entrepreneurs and scientists. To be sure, many individual pieces such as techno parks and incubators, and numerous innovation support institutions are present in one form or another, but they neither operate efficiently nor act as a coherent, effective system. As long as this piece of the status quo remains unchanged, Kazakhstan will never realize its full technology commercialization potential. Therefore, the objective of this component is to provide the expertise required to link Kazakh science more closely to domestic and international markets.

A Technology Commercialization Contractor (TCC) will be employed to establish and manage all the activities envisioned under this component. (See chart below.). However, from the beginning the foreign contractor’s experts will train Kazakh staff hired by the PMU to manage and operate the technology commercialization activities, and administer all four sub-components. In order to replace foreign staff within a reasonable period of time Kazakh staff will go through comprehensive on-the-job training and will work in close partnership and proximity with the foreign expert staff.

Sub-component 2.1 – Technology Commercialization Office

This sub-component will finance the activities of a pilot Technology Commercialization Office (TCO) that would provide a wide range of complementary technology commercialization services. The TCO will be staffed with an international contractor and Kazakh specialists selected
on a competitive basis who will receive on-the-job training from the TCC. The TCO will work initially with the Groups established under the auspices of Component 1. Later, the office will expand to work with other research institutes and universities, and additional commercialization offices could be formed if demand grows.

The services provided by the TCO will include the following items:

- developing a commercialization strategy – licensing, joint venture, strategic partnership, etc. – primarily for SSGs and JSGs, but may also extend these services on a fee-basis to firms in existing incubators, techno parks, scientists or researchers in academic and industrial research institutes;

- coaching and training of Group Directors and entrepreneurs on how to work with investors;

- conduct essential business skills training for SSG Scientific Directors, JRG Research Directors - but may also extend these trainings on a fee-basis to university and scientific institute managers, techno parks and incubators - on how to commercialize technology, negotiate joint ventures, look for strategic partners and other essential business skills;

- bridging the “exploitation gap,” – the gap between the number of inventions that are created and the number that are actually put to commercial use – on behalf of the project Groups, institutes and educational institutions by applying for domestic and foreign patents, paying the necessary patent application and annual patent maintenance fees, licensing the patented IP, enforcing ownership rights against alleged infringement, collecting royalties from license holders, and distributing royalties according to a pre-determined formula between the TCO (to cover administrative expenses), the Groups, institute or university where the IP was invented, and the inventor(s);

- marketing the identified technologies at international technology fairs and helping to establish linkages between SSGs, JRGs, and may also extend these services on a fee-basis to local research institutes and private companies/international research institutes operating in similar fields, etc.

- using the results of the technology audits to inform policy-makers of existing and potential innovation / technology transfer assets of the country help scientists to review their comparative position in terms of commercial potential, disseminate opportunities and competences to the national and international business community, and create links between scientists working in different technology areas.

- designing and implementing the grants program.

The technology commercialization contractor is expected to have professional ties with established technology commercialization offices in the USA, EU, or other technologically-advanced Asian countries, and could serve as:

- “market-making” foreign hubs for Kazakh technologies and ventures;

- clearinghouses for partnership and joint venture opportunities; and

- brokers for foreign companies interested in conducting business with Kazakh companies represent Kazakh companies wishing to do business abroad. Kazakh companies may finalize foreign business deals in this facility or in other foreign countries with assistance from the business development team.

Although decentralized TCO structures may be an ideal that the project should strive to achieve in the long term, this Project will start by establishing one centralized TCO under the
management of the MoES PMU. However, as the quality and relevance of the scientific output increases over time and the demand for TCO services rises accordingly, additional TCOs could be created. However, the subsequent expansion will not be financed by this project. Thus, decentralization will be achieved gradually and in line with demand for TCO services.

**Sub-component 2.2 – Technology Audit & Forecasting**

The goal of this sub-component is to identify, structure, and create access to and for Kazakhstan’s national scientific competences and predict its capacity to join the forefront of global scientific research trends. It will entail identification of:

- scientific capabilities in universities and research institutes,
- inventions and technologies available in universities and industries,
- technology capabilities within and demand from industry,
- capacity for change, including attitudes of research managers and champions,
- Capacity to absorb external R&D.

Upon completion of the audits, the TCO will:

- Inform policy-makers about the innovation assets of the country (existing and potential),
- Help scientists review their comparative position in terms of commercial potential,
- Disseminate opportunities and competences to the national and international business community,
- Create links between scientists working in different technology areas

Other expected results should include:

- Mapping Kazakhstan’s scientific and technological capabilities as compared to the rest of the world.
- Identifying scientific sectors worth investing in for the future growth of the country.
- Helping in possible privatization or commercial orientation of non-strategic R&D sectors with strong commercial potential.
- Creating clusters of excellence.
- Responding to complex demands from large domestic and foreign enterprises.
- Marketing Kazakhstan’s R&D assets.

An audit may include additional due diligence on selected commercial opportunities identified by the audit. Included could be possible contractual agreements with other research or industry partners based on the IP discovered through the audit, filing for patent protection, licensing possibilities, spin-off firm creation, or other commercial arrangements. Experts familiar with the particular know-how or technologies would carry out such due diligence evaluations.

Because foreign firms currently do not know what capabilities exist in Kazakhstan, a marketing tool is direly needed to attract technology brokers, industrial research partners and foreign research institute partners (both of whom can be supported by the grants for joint research). The audit, database and portal will help provide Kazakhstan with a marketing tool which can be used to match corporate needs and Kazakh resources. The portal should be designed for easy access by potential users of Kazakh expertise and R&D results, including domestic and foreign enterprises, and other generators of research.
A knowledge map database will be created and maintained by conducting regular follow-up technology audits. A web-based portal will network companies, industrial research centers, universities, science parks, and other generators of knowledge with the firms and industrial partners that demand this knowledge and technological know-how.

*Sub-component 2.3 – Policy, Legal and Regulatory Framework*

Improving the quality of research will not generate economic benefits for Kazakhstan if the legal and regulatory environment impedes technology commercialization and innovation. Unfortunately, many existing government policies, laws, rules, and regulations inherited from Soviet times do, in fact, impede achievement of these objectives. Therefore, this sub-component would provide TA and advisory services to review existing laws, rules and regulations and highlight those that are at variance with OECD best practice. The review would cover such item as *inter alia*, the legal and regulatory framework for industrial innovation and S&T, R&D financing, technology commercialization, protecting intellectual property generated by scientists working in Kazakh research institutes, universities and private research laboratories, quality, standards, metrology, and incentives for technology adoption by industry. The PMU will be responsible for identifying international expert consultants and implementing this sub-component.

The objective of this sub-component is to develop a consistent legal and regulatory policy framework and institutional regime that fosters industrial innovation, high quality R&D, the effective protection of Kazakh inventions in domestic and foreign markets, and technology commercialization.

*Fostering industrial innovation and R&D*

This sub-component would provide TA and advisory services to:

- Review current Kazakhstan legislation related to technology commercialization, industrial innovation, venture capital and financing.
- Review tax and other legislation regarding research grants, industrial internships, joint research with industry and innovative-based businesses.
- Indicate areas where, based on OECD lessons of experience, changes in existing legal and regulatory provisions might reasonably be expected to improve the effectiveness and efficiency of Kazakhstan’s NIS.
- Advise on regulatory structures and incentives that might impede the ability of a Programs to attract foreign experts or visiting professors

*Intellectual Property Protection*

Current Kazakh IP legislation may actually deter, rather than encourage and facilitate, technology commercialization. For example, laws stipulate that unless there is a contractual agreement which provides otherwise, i) the state owns the IP created in whole or in part with budget funds and has the exclusive right to commercialize the invention, ii) the inventor receives author rights but not a share of the commercialization proceeds, and iii) the research institution receives an exclusive right to use the invention but not to commercialize it or retain even a portion of the commercialization proceeds. As a result, there is no incentive for universities, research centers, and scientists to obtain patents and commercialize inventions. This, in turn, deters private enterprises and foreign research institutes from entering into joint research projects with Kazakh research institutes and acts as an impediment to venture capital investments.

Kazakh rules governing the application for foreign patents is also excessively restrictive. Kazakh individuals and legal entities (i) must first file for domestic patent in Kazpatent (or current name
the National Institute of Intellectual Property, NIIP) and, after waiting 3 months, may apply for foreign patents only through NIIP unless it is provided otherwise by an international agreement; or (ii) they may apply through NIIP for foreign patents before 3 months only after receiving confirmation that their invention does not contain any state secret.

Obtaining a Kazakh patent can be a lengthy and cumbersome procedure since under Kazakh law there are no time restrictions for consideration of patent applications and complete registration (preliminary patent procedures, expertise and complete patent could take up to two years). NIIP is under-funded and needs modern equipment and databases to perform search and evaluation of patent applications. The staff of NIIP is small and needs more training on IP protection issues, registration of patents and copyright infringements.

The judicial system does not effectively prosecute IP related cases and Kazakhstan judges do not have adequate experience in the area of IP protection and litigation. Judges, public officials, NIIP officials (Kazpatent) and staff of Programs, techno parks, and incubators need training on a whole range of IP issues so that they understand how to identify, assess and develop IP assets as well as how to evaluate proposals for transferring and licensing IP.

This sub-component would also provide advice and technical assistance to:

- Review Kazakh innovation and science-related laws and regulations, intellectual property legislation;
- Evaluate current Kazakh intellectual property legislation to see whether it adequately protects Kazakh inventions and at the same time facilitates joint research projects with private entities and foreign research institutes;
- Indicate areas where, based on studies funded under the study and in line with OECD best practice, changes in existing legal and regulatory provisions might reasonably be expected to improve the effectiveness and efficiency of practices and policies surrounding science management, technology commercialization, as well as intellectual property rights regime, and R&D institute restructuring (to be done by mid-term review, June 15, 2010).

Sub-component 2.4 – Design and Implementation of Grant Programs

The TCC contractor will design and administer, with approval of the PMU, grant programs envisioned under this sub-component. The TCC will also devise training programs such as immersion foreign language programs, particularly English; training in communication with industry, business plan writing, etc. that are targeted especially at senior scientists.

This sub-component will provide technical assistance to the PMU to design and administer the following PMU-financed grant programs:

- **Pre-Commercialization Grant Program.** The objective of the pre-commercialization grants is to determine the commercial feasibility of ideas and to convert research into commercial applications. The program will provide grant financing to enable scientists to demonstrate the technical feasibility of their laboratory discoveries and also to enable them to develop a business plan and detailed marketing strategy. The grants will be awarded in three phases to support: (i) development of a commercially-interesting scientific idea at a concept stage, (ii) investigation of the feasibility of the idea, and proof of concept, and (iii) full R&D and prototype development. The grants will be awarded on a competitive basis to small businesses engaged in R&D, and also partnerships between small businesses and research entities such as research institutes and universities. Grant applications will be peer reviewed by Kazakh and international experts in the area of science and technology related to the proposal.
• **Joint Research with Industry.** The purpose of this grant program is to promote joint research with both domestic and foreign industry. Kazakhstan’s research institutes and universities need help in obtaining contracts for joint research with industry, outsourced corporate R&D, and new product development. This program would provide grants to research consortia from universities, research institutes, and private industrial companies undertaking collaborative R&D, and research training, in areas of importance to Kazakhstan industrial development. The private industry and public sector agencies involved in the consortia will be required to make in-kind and cash commitments to support these cooperative activities.

• **Joint Research with International Research Partners.** Kazakhstan’s research institutes and universities need help in establishing partnerships and obtaining contracts for cooperative research with international partners. The foreign participant would generally be expected to fund all their own expenses. Kazakh institutions generally do not have the funds to finance their share of the joint research project. The joint research grant program would be used to defray these costs. The technology commercialization contractor will assist the PMU to develop clear, transparent eligibility criteria and systems to ensure accountability for the use of funds. This program will have a simplified selection process, since the fact that a legitimate foreign partner is financing a portion of the project cost will provide some sort of de facto quality control.

• **International patenting.** The objective of this grant program is to help defray the cost of patenting inventions with commercial potential in North and South America, the EU, and Asia. For the pilot phase of this program, grant applications would be restricted to inventions generated by SSGs and JRGs, proposals supported by the pre-commercialization grant program, and proposals generated by projects supported by TCO. Protection in high growth markets of the IP underpinning successfully commercialized Kazakh inventions is essential if global markets are to be accessed by Kazakh technology-based companies and research institutes, with sales of resulting products in these markets.

• **Industrial Internships for Scientists.** The purpose of this grant program is to help Kazakh scientists obtain economically relevant, first hand, on-the-job experience in how companies convert research into new products and services. They would obtain this experience by working for a short period of time alongside experienced industrial scientists in foreign company research laboratories. Most importantly, the program would help scientists develop professional contacts with industrial research laboratories. Experience shows such relationships are the most effective and fruitful source of technology commercialization deals.

Initially, the Technology Commercialization contractor will establish and manage the TCO within the MoES structure. However, from the inception of the TCO the contractor’s foreign experts will train staff hired by the MoES to manage and operate the TCO, and administer all four sub-components. In order to eventually replace foreign staff within reasonable period of time Kazakh staff will go through comprehensive on-the-job training and will work in close partnership and proximity with the foreign expert staff.

**COMPONENT 3 – PROJECT MANAGEMENT UNIT**

The project will fund the purchase and renovation of building that will house the IMSC, TCO and the office of the PMU. The purchase of the building will be financed by the Borrower. In addition, the project will finance the salaries of PMU staff, operating costs and any consultants required to supplement the PMU staff to successfully implement the project. Importantly, the PMU will oversee the implementation of a public relations campaign surrounding the project,
including a comprehensive consultation and dissemination process of the call for proposals, grant selection, project results, etc.

Policy, Legal and Administrative Framework

A comprehensive review of Kazakh environmental laws and regulations pertaining to laboratory safety, quality, and waste management standards is currently underway in collaboration with the Kazakhstan Ministry of Environmental Protection in Astana. Kazakhstan legislation that has been identified as most relevant to this project, include the Law on Environmental Protection and the Law on Ecological Audit. This section will be updated as soon as the detailed list becomes available.

A preliminary survey of relevant environmental legislation includes: the 2004 Decree of the Government of Kazakhstan No. 1449 of 2004, which contains the latest provisions giving the Ministry of Environmental Protection the mandate to regulate and issue guidelines for activities that may have an environmental impact. A number of laws, codes, constitution and President’s decrees govern the work of this Ministry and its authority.

The Ministry of Environmental Protection is responsible for enforcing regulations that pertain to hazardous waste management, storage and movement, equipment maintenance and mounting, licensing for waste disposal and environmentally hazardous activities, qualifications of personnel dealing with hazardous materials, training of personnel on questions of technical exploitation and safety when working with ozone layer modifying substances and persistent organic pollutants. In principle, the State cadastre of waste is charged with regulating agencies to keep track of information on waste utilization. The Ministry of Environmental Protection is also authorized to conduct planned or random inspections to identify incompliance with established rules and regulations by organizations undertaking environmentally hazardous activities.

Kazakhstan is also a signatory to several international treaties which pertain to environmental protection, including:

- 1998: Vienna Convention on protection of the ozone layer;
- 1998: Montreal Protocol on substances that deplete the ozone layer;
- 2003: the Basel Convention on cleaner production, hazardous waste minimization and controls on the movement of these wastes.

In international cases where Kazakhstan legislation conflicts with abovementioned international conventions, the latter prevail. Similarly, where environmental standards laid out by Kazakhstan regulations are discovered to provide weaker protection for laboratory safety and waste management standards, World Bank Safeguards policies will prevail. The World Bank Safeguard Policies include:

1. Environmental Assessment OP 4.01
2. Natural Habitats OP 4.04
3. Forestry OP 4.36
4. Pest Management OP 4.09
5. Cultural Property OP 4.11
6. Indigenous Peoples OD 4.20
7. Safety of Dams OP 4.37
8. Projects on International Waters OP 7.50
9. Projects in Disputed Areas OP 7.60
In light of the type of future research projects anticipated under the Technology Commercialization Project, World Bank Operational Policy 4.01 on Environmental Assessment will apply. Research projects conducted by the Groups that could potentially trigger policies on Safety of Dams, Natural Habitats, Forestry, Pest Management, Cultural Property, Indigenous People, Involuntary Resettlement, Projects on International Waters and Projects in Disputed areas will not be funded under the project.

**OP 4.01 Environmental Assessment**

This policy requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the research projects supported by the Kazakhstan Technology Commercialization Project. The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and transboundary and global environmental aspects.

The environmental and social impacts will come from the activities of the research projects that the Kazakhstan project will be financing as well as from the civil works associated with the rehabilitation of the existing building that will host the new lab(s), the TCO and the PMU. The EA process calls for the Government of Kazakhstan to prepare an EMP, which will establish a mechanism to determine and assess potential environmental and social impacts of the research projects under the proposed Groups, and then to set out mitigation, monitoring and institutional measures to be taken during implementation and operation of the research projects and the rehabilitation works to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.

OP 4.01 further requires that the EMP be disclosed as a separate and stand-alone document by the Government of Kazakhstan and the World Bank as a condition for Bank Appraisal of the project. The disclosure should be both in Kazakhstan where it can be accessed by the general public and local communities and at the Infoshop of the World Bank.

The policy additionally calls for the project as a whole to be environmentally screened to determine the extent and type of the EA process. The Kazakhstan project has thus been screened and assigned a Category B status.

**Category B** projects have the potential to cause adverse environmental impacts on human populations or environmentally important areas – including wetlands, forests, grasslands, and other natural habitats – and are less adverse than Category A projects. These impacts are site specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. The EA for Category B subprojects examines the potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Therefore, this EMP sets out to establish the EA process to be undertaken particularly for those research projects under the proposed Groups which, after they are being identified, will have an environmental impact according to the completed ESSF form.

**OP 4.12 Involuntary Resettlement**

The Kazakhstan Technology Commercialization Project will not allow the funding of research through Groups that could involve involuntary resettlement, loss of assets or rights of access to land, or have an impact on livelihood.
5. BASELINE CONDITIONS

At present no single Government agency systematically collects information from laboratories, whether through annual reports or audits, regarding safety procedures and waste management practices in research laboratories across the country. The public research institutes in Kazakhstan have inherited a network of rapidly dilapidating Soviet style research centers that are not maintained or monitored according to international good laboratory practices. Accounts from several leading Kazakh scientists confirm that most laboratories function under dismal safety and particularly waste management standards.

Ministry of Environmental Protection (MoEP) is mandated to inspect laboratories. It should be noted that laboratories are not referred to as a separate category but rather included in the general term of nature users which pertains to the fact that they use natural resources are affected in the industrial process. In other words these entities may have environmental impact by generating waste and polluting the air, water, and soil.

Additionally the MoEP on its website describing its typical activities on enforcing the environmental laws puts a clear emphasis on visiting foreign companies in the oil and gas sector who seem to be contributing most to the environmental pollution in Kazakhstan.

The technical and human capacity of MoEP does not keep up with the growing number of laboratories in Kazakhstan as mentioned by an official of the MoEP. During the last reporting period 181 laboratories have been inspected which is not sufficient for more comprehensive enforcement. A violation laboratories get fined for is typically exceeding the limit of pollution. Of these 181 laboratories more than 50% were in such violation. Due to the lack of facilities for ecological examination Atyrau and Akmola oblasts have not been conducting adequate work to control and analyze environmental impact from companies’ operations. Hard and software equipment of international standard is currently being utilized but it is not sufficient.

There are sixteen ecological examination laboratories and only four of them have gone through certification process. Some of their own laboratories do not comply with basic standards such as water, sewage and ventilation systems. General lack of office space for their units of analytical control has been a big problem for the officials of MoEP’s territorial departments. These sixteen laboratories are subordinate to the Territorial Departments of the MoEP. The MoEP and Territorial Departments are separate entities under the same Ministry. However, the distinction of mandate in relation to inspecting private laboratories between the MoEP and these Territorial Departments is not clear.

In the information provided by the same official from the MoEP in Astana a great deal of attention is also paid to the weakness of the legislative base which sometimes creates conflict situations between the inspecting authorities and the enterprises. Some of the normative documents have not been developed yet which limits the work of ecological examination officials. In such circumstances the enterprise in question may call upon ecological examination services of independent auditors who then conduct a joint examination together with the MoEP officials. However, in 2006 the GoKZ was planning to approve an Ecological Code aimed at harmonizing Kazakhstan environmental legislation with leading international stipulations, moving it up to higher standards and improving government regulation system.

Thus, given that territorial departments of the MoEP faces such problems as lack of facilities for conducting ecological examinations, constantly growing number of private laboratories, prevailing allocation of resources to inspecting foreign oil and gas companies, and the weakness of the normative base it is almost unreasonable to expect full enforcement of good practice laboratory standards from the MoEP’s perspective. At the same time laboratories will continue
violating environmental legislation or international standards unless they are held fully accountable.

Nonetheless, the key inference is that the International Materials Science Center will follow environmental, safety, and quality standards, in accordance with global best practices to set a precedent and serve as a model research laboratory in this regard.

**Standard Best Practice**

The standard practice for research laboratories is to adhere to practices that protect human health and environmental safety through an *Environmental Management System (EMS)*. The EMS for any particular laboratory is generally embedded in a larger EMS system or systems that involve institutional, municipal, national and international regulations and protocols for laboratory safety and waste disposal. At each level, an EMS is normally composed of five elements or procedure sets: (i) policy; (ii) planning; (iii) implementation; (iv) quality assurance and control; and (v) management review. Although the “front line” is any particular lab, laboratory safety, pollution prevention, and waste minimization are most effective when EMSs are coordinated vertically.

The key environmental issues in laboratory safety and waste management pertain to special waste, such as:

(i) Sharps
(ii) Hazardous Biological Waste
(iii) Radioactive Waste
(iv) Hazardous Chemical Waste
(v) Air Emissions
(vi) Water Discharges
(vii) Toxic Substances

A more comprehensive List can be found in Table 1.

**Table 1: Hazard Types**

<table>
<thead>
<tr>
<th>Physical</th>
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<tbody>
<tr>
<td>• Compressed Gases</td>
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<tr>
<td>• Nonflammable cryogens</td>
</tr>
<tr>
<td>• High-pressure reactions</td>
</tr>
<tr>
<td>• Vacuum work</td>
</tr>
<tr>
<td>• Ultraviolet, visible, and near-infrared radiation</td>
</tr>
<tr>
<td>• Radiofrequency and microwave hazards</td>
</tr>
<tr>
<td>• Electrical hazards</td>
</tr>
<tr>
<td>• Magnetic fields</td>
</tr>
<tr>
<td>• Fires</td>
</tr>
<tr>
<td>• Sharps</td>
</tr>
<tr>
<td>Risk Group 1 – no or low individual and community risk – a microorganism that is unlikely to cause human or animal disease</td>
</tr>
<tr>
<td>Risk Group 2 – moderate individual risk, low community risk – a pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock, or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventive measures are available and the risk of spread of infection is limited</td>
</tr>
<tr>
<td>Risk Group 3 – high individual risk, low community risk – a pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available</td>
</tr>
<tr>
<td>Risk Group 4 – high individual and community risk – a pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available</td>
</tr>
<tr>
<td>Risk groups are based on organism pathogenicity, mode of transmission and host range of the organism, local availability of effective preventive measures, and local availability of effective treatment</td>
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For animal facilities, consider:
• Nature of animals in terms of aggressiveness and tendency to bite and scratch
• Their natural endo- and ecto-parasites
• The zoonotic diseases to which they are susceptible
• Possible dissemination of allergens

Radioactive
• Alpha particles – not highly penetrative (easily shielded) but can cause great damage inside the body
• Beta particles – shielded by thin metal foils or one-quarter inch of plastic; usually stopped by the skin but can cause serious damage to skin and eyes
• Gamma rays and x-rays – extremely energetic; dense materials such as lead required to shield against these penetrating forms of radiation
• Neutrons – shielded by materials such as water and concrete

Detailed specific protocols exist for the management of each category of substance. Biologically active substances have an explicitly developed risk assessment system designed to differentiate routine and reasonably innocuous substances from highly infectious agents and other substances that pose serious threats to human health. Exact concerns of any given laboratory will be determined by the exact nature of the research undertaken. Some labs will have complicated EMS procedures, while others will work with substances that are environmentally benign.

Best international practice for EMSs also involves a set of a core processes. Development of training programs for laboratory staff, designation of a responsible individual for environmental management, performance of needs assessment or waste stream assessments are some of these. Typical strategies for proper environmental management include installation and maintenance of appropriate equipment and storage facilities (ventilation hoods, biologically safe cabinets, etc.), classification and segregation processes, storage and treatment processes, and safe transport of hazardous materials.
6. POTENTIAL ENVIRONMENTAL CONCERNS

The project is not expected to have any major environmental impact and is not expected to trigger World Bank Safeguard Policies related to Natural Habitats, Pest Management, Involuntary Resettlement, Indigenous People, Forests, Safety of Dams, Cultural Property, Projects in Disputed Areas or Projects on International Waterways (including aquifers).

At this stage, the Kazakhstan Technology Commercialization Project is classified as Environmental Category B according to OP/BP 4.01. Category B projects have some potential environmental impacts that require attention, but generally do not pose significant risks for the environment. Potential environmental impacts of Category B projects are likely to be site specific and reversible through the application of appropriate mitigation and monitoring measures.

The key environmental safeguard policy issues associated with the project are: (i) laboratory safety and the safe disposal of wastes; and (ii) potential environmental issues arising in connection with the potential rehabilitation of existing laboratory space.

In addressing these environmental safeguard issues, all screening, monitoring and remedial measures will have to comply with Kazakhstan rules and regulations. In addition, where Kazakh legislation should provide insufficient safeguards, the Groups and the National Instrumentation center will comply with World Bank safeguard policies and procedures and with best international practice for laboratory safety, waste disposal and operating procedures. Many existing Kazakhstan laboratories do not currently comply with best international environmental and safety practices. Therefore, in addition to helping to rebuild Kazakhstan’s research and scientific capacity, this project will help to introduce world class safety and environmental procedures to Kazakhstan and ensure that those facilities supported by the project serve as a model for other facilities.

A research and laboratory safety expert from the Howard Hughes Institute of Biomedical Research in Bethesda, Maryland created an in-depth digest of international best practice standards for laboratory safety and waste disposal. These standards cover all classes of physical, chemical, biological, and radioactive hazards. They discuss procurement and transport, storage, protocols and facilities for use in research, training of personnel, segregation of waste types, and disposal of wastes. The standards also describes core processes for establishing functioning environmental management systems within laboratories, including development of training for personnel, designation of responsibility for environmental management, performance of needs assessment and waste stream assessment, installation and maintenance of appropriate equipment, treatment processes, and safe transport. These best practice standards were incorporated into the Kazakh Framework EMP so that they would serve as the environmental standards and procedures that will be employed by scientists working in the Groups supported under Component 1.2 and the International Materials Science Center supported under Component 1.3.

The grant winners for research projects will be selected through a competitive process. This will also determine to a great extent the equipment installed in the International Materials Science Center and the nature of the experiments conducted in those facilities. Therefore, it is not possible to know beforehand precisely what research disciplines will be supported under the auspices of the project and the precise, detailed environmental compliance issues that will emerge during the course of project implementation. However, corresponding changes will be made to the mitigation measures in this document if current ones are not sufficient to remedy the environmental impacts from any research activity which are beyond the scope of the current EMP. These new measures will be documented and introduced to the research group, the laboratory and other parties if necessary.
In the meantime, the EMP describes the environmental screening process that will be employed as well as the institutional responsibilities for conducting the screening. The results of the screening process will determine the precise environmental safeguard processes that will be required for each research activity supported by the project. Although the potential environmental impact is expected to be modest in most cases, the EMP provides for the broadest range of situations.

The Groups component will support approximately 5 Senior Scientist Groups and 5 Junior Researcher Groups during the first phase. The majority of these will involve relatively small teams (10-12 individuals) working in relatively small laboratories. Total waste generation, therefore, will be comparatively small. The nature of the research to be conducted will also keep the potential environmental impact of the project relatively modest. For example, the project will most likely not fund any research in such environmentally sensitive areas as clinical medical research or field trials of genetically-modified organisms. Several subprojects could also be in areas (e.g., mathematics) where no waste other than domestic waste will be generated. The other subprojects will most likely concentrate on areas of research that generate hazardous wastes in small amounts and of the kind that can be treated and disposed of with routine care and procedures. Nevertheless, to err on the side of caution, the EMP provides for extraordinary cases as well as the more likely cases.

The PMU is responsible for ensuring that the provisions of the EMP are implemented. However, the principal investigators and Contractor of the International Materials Science Center will be responsible for ensuring that their individual activities comply fully with the provisions of the EMP. The Kazakhstan Ministry for Environmental Protection will also be expected to work in partnership with the MoES to ensure that all project activities comply with Kazakh laws and regulations.

The EMP will also be incorporated into the Project Implementation Plan/Operational Manual. This will ensure that environmental requirements are integrated with other requirements that Groups must satisfy prior to receiving grant contracts.

All laboratories and research facilities supported by the Project will be required to (i) identify ex-ante the environmental, social, and safety impacts of proposed research and research wastes generated; (ii) submit a plan for minimization, mitigation, and proper disposal for review and approval of both national authorities and the Project Team; and (iii) keep appropriate records and submit to periodic third person monitoring of safety and waste disposal practices.

A key component of the project will be the provision of funds to the International Materials Science Center, and in certain limited instances to research groups, in order to purchase scientific equipment. As such, it is expected that any construction that does occur will be strictly limited to the rehabilitation of existing buildings to accommodate new laboratory equipment. This may involve the construction of ventilation systems, the addition of laboratory benches and storage space, or the rehabilitation of electrical systems to run larger equipment. Environmental Impact Assessment legislation and the World Bank’s Environmental Assessment policy will cover these rehabilitations and any related minor construction. Again, as research activities are not pre-defined, it is not known with certainty whether any such activities will in fact be undertaken. Therefore, this EMP describes the mitigation measures to be pursued if rehabilitation or minor construction does, occur.
7. SCREENING AND MITIGATION MEASURES FOR LABORATORY REFURBISHMENT

Some minor construction work, including rehabilitation and expansion of laboratories and classrooms, under the project might have an impact on the physical and social environment. However, as already indicated, the scope of the potential impact will be modest and will most likely only involve minor modifications to existing buildings.

| Potential Environmental Issues arising from potential refurbishment of Laboratories |
|---------------------------------|-------------------------------------------------|------------------|
| Category                        | Potential Negative Impacts                      | Level of Significance |
| Laboratory refurbishment        | • Rivers and Lakes Ecology                      | Low               |
| and modernization               | • Protected areas                               | Low               |
|                                 | • Geology and Soils                             | Low               |
|                                 | • Landscape/Aesthetics                          | Low               |
|                                 | • Land Acquisition                              | Low               |
|                                 | • Loss of Crops, Fruit Trees and Household Infrastructure | Low               |
|                                 | • Noise pollution during refurbishment          | Moderate          |

The Bank will ensure that the Government’s standards requirements for these constructions meet the Bank’s requirements and policies.

As noted above, possible environmental issues might arise during the proposed rehabilitation activities of the building that will host the new lab. Environmental effects of the project, if any will be minor and short-term.

The site specific screening and review would carefully assess the following issues:

① Dust, noise and vibration due to the demolition and construction;
② Risk of damage to unknown historical and archaeological sites;
③ Dumping of construction wastes and accidental spillage of machine oil, lubricants, etc.;
④ Risk from inadequate handling of waste; and
⑤ Potential requirements, if any, for involuntary resettlement or temporary relocation of a limited number of affected persons during construction activities.

Short-term impact from noise, dust, and vibration during the execution of civil works is inevitable. Noise levels will increase significantly due to movement of construction machinery. This impact will be minimized under the project by (i) specifying in the project contract(s) the responsibility of contractor to undertake appropriate work site mitigation actions as a part of their management of work sites, and (ii) the supervision of compliance of contractor by the Supervision Engineer/PMU. Mitigation measures may include the following actions: use of sprinklers to wash down roads and suppress dust emissions during soil transport; cover vehicles to prevent spills and transport borrow materials during daytime only; reduce noise by using noise absorbing/protecting building materials, provide workers with ear plugs and helmets and generally prevented from prolonged exposure to high noise levels, etc.
Construction related waste - Technical specifications should require the collection and containment of all waste materials with bituminous content in specific landfills. The contractor would be required to conform to local environmental regulations and practice relating to proper waste disposal. The identification of the disposal site to be used and the appropriate quantities for each site are to be included as part of the documentation of the rehabilitated building. All valuable materials (doors, windows, sanitary fixtures, etc) should be carefully dismantled and transported to the storage area assigned for the purpose. Valuable materials should be recycled within the project or sold. Wood waste will be stored separately and arranged to be recycled instead of disposing it. Open burning and illegal dumping will not be permitted. Proper sites for earth/clay and sand disposal will be determined and prior approval from relevant authority for disposal will be obtained. Stockpiling of construction debris on site will be avoided and waste will be disposed of on a regular basis at the authorized government dumping ground.

Groundwater pollution - It is also required to create necessary conditions for safe removal of sewage during the rehabilitation and renovation and observe the ecological and sanitary regulations during the rehabilitation of sanitary and technical equipment, sewage pipes and purifying constructions.

Cultural Property Resources - Rehabilitation may uncover archaeologically or culturally significant findings. Consideration of such concerns is provided in the works contracts that will include requirements that the contractor is obliged to look for chance finds and immediately stop the construction work at the contested location and alert the MEST Specialist and the responsible authorities in case of chance finds.

Use of proper construction materials - All materials should have appropriate permissions on quality and safety (appropriateness certificate and sanitary-epidemiologic conclusion). Priority should be given to products meeting standards for recognized international or national symbols. Water-based interior nontoxic, no allergenic paint for drywall or plaster surfaces is preferable to latex or oil-based paints from a respiratory standpoint.

Safety of construction site - Construction sites should be fenced off in order to prevent entry of public, and general safety measures will be imposed. Temporary inconveniences due to construction works should be minimized through planning and coordination with contractors, neighbors and authorities.

Contracts and bill of quantities will include clauses for appropriate disposal of unacceptable construction material and disposal of construction waste. Procurement documents will specify that no environmentally unacceptable materials will be used. Bidding documents will include rehabilitation of adequate sanitary facilities, including appropriate disposal of wastewater and sewerage. The environmental management checklist including a monitoring plan is included in Annex 4. This checklist should be provided to contractors engaged in civil works under the Project, and should be made an integral part of the civil works contracts.

The site inspector’s monitoring report would be a condition for full payment of the contractually agreed remuneration, the same as technical quality criteria or quantity surveys. To assure a degree of leverage on the Contractor’s environmental performance an appropriate clause will be introduced in the works contracts, specifying penalties in case of noncompliance with the contractual environmental provisions, e.g. in the form of withholding a certain proportion of the payments, its size depending on the severity of the breech of contract.

Principles

The Kazakhstan Technology Commercialization Project will not allow the funding of research projects through the Groups that involve involuntary resettlement, loss of assets or rights of access to land, or an impact on livelihood, as per the World Bank’s Resettlement Policy.
Exact modernization protocols for the project will be devised when the IMSC venue is identified. They will adhere to the following principles:

- Kazakhstan national legislation and regulatory bodies will be used to regulation and oversight of rehabilitation projects. Where Kazakhstan legislation and standards would deviate substantively from practices and standards as described in the World Bank’s Pollution Prevention and Abatement Handbook, the World Bank’s provisions and standards will prevail. Where technical assistance is required, it will serve the dual purpose of addressing specific EMS-related issues while strengthening the capacity of the Kazakhstan authorities to exercise the proper authority over these matters in the long term.

- Modernization, laboratory rehabilitation or extensions, etc would be implemented through the MoES based on designs adhering to international best practice and standards. The modifications will be done by local contractors, funded by the project, supervised by MoEP and the World Bank.

- The MoES and the World Bank will review plans for all subprojects, along with any comments from the ISCB, the International Materials Science Center Contractor, and any relevant research review committees.

- If views diverge on the adequacy of the plans, the MoES and the World Bank shall seek to resolve these through the ISCB.

**Procedures**

As part of the application process, all short listed research groups will be required to complete the Environmental and Social Screening Form (ESSF) in Annex 3 of this EMP. Groups with a research project that would include any kind of refurbishment would have to check them against key environmental and social issues as highlighted above. Research projects that answer question (f) of the ESSF in the affirmative will imply involuntary resettlement, or loss of assets or rights of access to land, or an impact on livelihood, and will not be considered for further evaluation by the selecting International Science Advisory Board (ISCB) and Policy Committee (PC).

<table>
<thead>
<tr>
<th>Application Stage</th>
<th>Grounds for Procedure</th>
<th>Resolution Procedure</th>
<th>Involved Parties</th>
</tr>
</thead>
</table>
| 1. Application Submission | -Involuntary resettlement  
-Loss of assets  
-Loss of rights to access land  
-Impact on livelihood  | Application will not be considered for further evaluation | N/A                                    |
| 2. Application Review | Ambiguity in refurbishment/modernization plans in the application | Engagement of expert consultants for opinions on any aspect of the planned refurbishment or modernization | ISCB, and any relevant review committee |
| 3. Grant Agreement Finalization | Divergent views between the ISCB, Groups, or Instrumentation Contractor | Mutual consultation. Any decisions on the planned refurbishment and specific responsibilities will be | ISCB, Groups, Instrumentation Contractor |
### FOR PUBLIC DISCLOSURE

<p>| | | |</p>
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<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>incorporated into the grant agreement.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Implementation</td>
<td>Untruthful statement that no involuntary resettlement, or loss of assets or rights of access to land, or an impact on livelihood</td>
<td>Responsibility for the consequences will be borne by the host Groups and the MoES.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groups, MoES, ISCB</td>
</tr>
</tbody>
</table>

| 5. Implementation | Potential incompliance with EMP mitigation measures | Occasional extraordinary supervision visits focused on rehabilitation compliance |
|   |   | World Bank supervision missions, MoES, Ministry of Environmental Protection |

All costs of refurbishments will be covered by project. The MoES project implementing unit will designate a construction supervisor that would work closely with the research team for the project. Responsibility for observance of ESMF procedures lie with the MoES. Any consequences of untruthfully stating that no involuntary resettlement, or loss of assets or rights of access to land, or an impact on livelihood are involved, will equally fall fully to the host Groups. Compliance of construction with the ESMF mitigation measures will be a routine part of subproject supervision. The Groups will make provision for occasional extraordinary supervision visits focused on rehabilitation compliance.
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8. MONITORING AND EVALUATION

The environmental monitoring and evaluation guidelines for the Groups were developed to monitor performance and process (to track the lessons learned to include for subsequent grant applications). These guidelines provide clear and functional environmental/social issues monitoring and evaluation roles and responsibilities, and provide monitoring indicators in order to measure the success of the mitigation measures.

Responsibilities for Monitoring and Evaluation of the Mitigation Measures would be assigned as follows:

The MoES and the PMU will be responsible for overall monitoring of the implementation of mitigation measures of all Groups.

A Scientific Director of a Senior Scientist Group along with the PMU staff will be responsible for implementation of the EMS under each project.

The Ministry of Environmental Protection will perform an enforcement monitoring role supported by their locally represented department of environmental protection with particular focus on monitoring the cumulative impacts of the subprojects and to ensure that individual subproject mitigation measures are effective. The International Materials Science Center Contractor would primarily achieve this objective taking the overall responsibility for coordinating and implementing the Training Program and for technical assistance and backup services to the subprojects.
9. INSTITUTIONAL RESPONSIBILITIES AND PROPOSED CAPACITY BUILDING

Capacity building for environmental and social management

Proposed Training Program                                      Duration
For Finalists:

Environmental and Social Assessment process               1-2 day
  • Screening process
  • Rationale for using Environmental and Social Screening Form
  • Review of Standards for special laboratory waste
  • Review of Screening Mechanism for rehabilitation and modernization issues
  • Preparation and designing of EMS

For approved projects with special waste categories:

Environmental and Social policies, procedures and sectoral guidelines 2 days
  • Review and discussion of Kazakhstan’s environmental policies, procedures, and legislation
  • Review and discussion of the Bank’s safeguards policies
  • Review of EMS
  • Collaboration with institutions at the local, regional and national levels.

For approved projects with construction categories:

Selected topics on environmental protection 1 day each
  • Flexible module covering any of the particular issues that might be affected by the particular constructions (Rivers and Lakes Ecology, Protected areas, Geology and Soils Landscape/Aesthetics, Historical, archaeological or cultural heritage, Resettlement and/or Land Acquisition, Loss of Crops, Fruit Trees and Household Infrastructure, Noise pollution during Construction)

In order to assist the universities/research institutes in strengthening their environmental assessment capacity, it will be necessary to recruit qualified service providers to be funded under component 1 of the project.
10. MITIGATION MEASURES IMPLEMENTATION SCHEDULE

The following implementation schedule of mitigation measures involving various parties is proposed as a basis for initiating supervision; this plan will be modified according to progress in the implementation of the Project Implementation Manual.

Environmental Management Framework for International Materials Science Center

<table>
<thead>
<tr>
<th>Possible Environmental Issues</th>
<th>Mitigation Measures</th>
<th>Monitoring Strategy and Contingency Measures</th>
</tr>
</thead>
</table>
| 1. Air Emissions               | • Lab staff will be provided with information and training on methods to minimize air emissions.  
• Procurement of equipment which is ODS free (refrigerator, A/C, fire extinguisher, etc.) and proper servicing of ODS containing equipment.  
• List of hazardous air pollutant sources and emissions and category will be provided to the laboratory.  
• A list of actual and potential emissions in the lab (fumes foods, stacks vents, etc.) will be prepared.  
| • Biannual exposure assessment of air pollutants will be developed.  
• Periodic verification of control systems will be undertaken  
• Records of emissions will be kept and reviewed periodically by Bank supervision team and any other relevant authorities. It will be responsibility of EMS In charge for annual certification.  
• Regular inspection and maintenance of ventilation system.  |
| 2. Waste Water Discharges     | • A comprehensive listing of sources and location of wastewater discharge will be prepared and maintained.  
• Appropriate operating procedure will be undertaken for minimization of wastewater (such as neutralizing predisposal treatment, etc.)  
• On-site septic tank systems or appropriate waste water treatment system depending on the waste water characteristics will be encouraged for implementation. After proper treatment waste water will be discharged in to existing municipal sewer line.  
• Lab personnel will be trained in minimization and management of  
| • Periodic maintenance will be undertaken of the sewer system.  
• Periodic testing of lab procedures will be carried out to ensure compliance with regulatory measures.  
• Regular training will be provided to ensure waste minimization.  |
| 3. Hazardous and Radioactive Waste | • Different types of hazardous waste stream such as unused chemicals, spent solvents, etc. will be identified for appropriate collection, transportation and disposal system.  
• Special segregation and disposal method will be adopted for used lead acid batteries and alkaline batteries  
• Training and awareness program will be imparted to laboratory staff for safe handling of hazardous waste.  
• Waste minimization procedure will be developed and followed.  
• Biannual assessment will be undertaken for hazardous and radioactive waste.  
• 4 times/year periodic medical surveillance will be conducted for all employees.  
• Records of waste generation and disposal will be kept and reviewed on regular basis by the laboratory. |
|---|---|
| 4. Handling of Hazardous Chemicals | • Required precautionary measures (such as hand gloves, masks and apron) as per manufacturer requirements/recommendations for handling different types of chemicals to minimize potential chemical exposure when working with hazardous chemicals.  
• Appropriate labels for all hazardous chemicals, e.g. flammable and combustible material, oxidizing material, poisonous material, for clear identification of risks and precautionary measures to be taken.  
• Selection use and maintenance matrix for personal protective equipment will be developed for preventing direct contact with corrosives, carcinogens and irritants.  
• During reconstruction of proper ventilation/exhaust system will be designed to avoid exposure to vapors and fumes of hazardous chemical.  
• Appropriate radiation protection devices will be procured and used to work with radioactive chemicals.  
• Suitable spill containment procedure will be developed for different types of hazardous chemicals.  
• Periodic personal exposure assessment will be undertaken for chemicals. Simultaneously, periodic medical surveillance program will be undertaken for all employees.  
• Periodic visual inspection of all labels, symbols and signs will be designed, followed and recorded by the laboratory.  
• Compliance with regulatory measure will be undertaken by the Laboratory in charge.  
• Periodic maintenance and validation schedule will be prepared for checking effectiveness of the engineering control devices mitigation measures.  
• Records of all incidents/events related to handling of hazardous chemicals will be kept and reviewed periodically by the lab. |
| 5. Storage of Hazardous Chemicals | • Training on First Aid measures will be organized to all employees.  
• Training on handling of hazardous chemicals will be provided to the laboratory staff. ‘Train the trainers’ program will be undertaken.  
• Procedure for segregation of chemicals will be developed and followed according to chemical classes and compatibility criteria.  
• Minimum inventory storage procedure of every hazardous chemical will be prepared.  
• Proper storage criteria for flammable, combustible and volatile chemicals will be identified. Filled and empty chemical containers will be segregated accordingly.  
• During reconstruction proper ventilation/exhaust system will be designed to avoid exposure to vapors and fumes of hazardous chemical.  
• Training program will be organized on proper storage and health effect for all employees.  
• Periodic inspection criteria and regular visual inspection schedule to be developed and implemented.  
• Periodic review will be carried out to procure safer alternatives for highly toxic, carcinogenic, reactive or mutagenic material. If available.  
• Periodic checks will be done of the ventilation system by the lab. |
| --- | --- |
| 6. Disposal of Hazardous Chemicals | • Hazardous chemical/waste will be segregated at source and treated appropriately and stored in separate container.  
• Appropriate waste management system will be defined.  
• Lab personnel will be trained in proper waste management procedures.  
• Periodic monitoring of waste treatment and disposable procedures will be done by the local environmental protection authorities (TBC). |
| 7. Fire and Explosion | • Proper selection and installation of fire fighting equipment in effective locations will need to be implemented. Required new technology (smoke sensors, thermocouple, and fire alarms, as required) will be installed.  
• Periodic inspection of fire prevention equipment will be established.  
• Emergency response plan will be upgraded periodically. |
| 8. Sustainable Practices | • Water conservation measures will be taken to reduce water consumption.  
• An energy and water inspection will be carried |
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<table>
<thead>
<tr>
<th>Practices</th>
<th>taken to reduce water consumption.</th>
<th>out to identify current equipment use and associated cost by the laboratory in cooperation with the local authorities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Minimum energy utilization measures will be implemented.</td>
<td>• Laboratory employees will be education and motivated in energy and water management practices.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

- The monitoring strategy and contingency measures will be undertaken by organization or center involved in occupational health and safety appointed by the competent authority.

- External audit will be carried out by the authorized competent organization.

During the rehabilitation works for the proposed building the environmental monitoring plan attached in Annex 4 will be implemented by the Contractor and supervised by the PMU.
11. PUBLIC DISCLOSURE

This draft EMP was publicly disclosed on the MoES website on November 5, 2007 and in Washington, DC at the World Bank Infoshop on November 15, 2007. Public comments, if any, will be endorsed in the final EMP document.
Annex 1. International Best Practice in Safety of Research Laboratories

### Procurement / Transport

- Minimize acquisition / quantity of hazardous materials, minimize storage time needed
- Identify mechanism of waste disposal before acquisition
- For chemicals, have Material Safety Data Sheets (MSDSs) accessible/confine deliveries to areas that are equipped to handle them (and train relevant personnel)
- Ensure container is intact and appropriately labeled (US regulations detail how hazardous materials have to be identified, packaged, marked, labeled, documented and placarded)
- Transport in appropriate (secondary) containers
- Use triple packaging system for infectious and potentially infectious substances
- Adhere to international air transport regulations

### Storage / Management

- Inventory should have name as printed on the container
- For chemicals: include molecular formula for further identification and to provide a simple means of searching chemicals; include CAS (Chemical Abstract Service) registry number for unambiguous identification of chemicals despite the use of different naming conventions
- Source
- Size of container
- Hazard classification, as a guide to safe storage, handling, and disposal
- Date of acquisition, to ensure that unstable chemicals are not stored beyond their useful life, and Storage location

### Procedures

- Dispose of materials anticipated to not be needed within a reasonable time frame
- Use approved containers; make sure storage containers remain intact and sealed
- Dispose of chemicals prior to expiration date, monitor reactive chemicals
- Replace deteriorating labels before information is obscured or lost
- Follow regulations for safe storage in stockroom or lab
- Avoid storing chemicals on bench tops or lab hoods
- Store volatile chemicals in ventilated cabinet (near hood)
- If ventilation is not required, store in closable cabinet or on shelf with lip to prevent sliding
- Do not expose stored chemicals to heat or direct sunlight
- Observe all precautions regarding the storage of incompatible chemicals
- Provide vented cabinets beneath hoods for storing hazardous materials
<table>
<thead>
<tr>
<th>Protocols / Facilities for Use in Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Use chemical storage refrigerators for storing chemicals</td>
</tr>
<tr>
<td>☑ Have fire protection system (sprinklers)</td>
</tr>
<tr>
<td>☑ Follow storage limits for flammable and combustible liquids</td>
</tr>
<tr>
<td>☑ Restrict access to storage facility</td>
</tr>
<tr>
<td>☑ Wear appropriate personal protection materials to minimize exposure</td>
</tr>
<tr>
<td>☑ Wash hands</td>
</tr>
<tr>
<td>☑ Reduce the possibility of creating splashes or aerosols</td>
</tr>
<tr>
<td>☑ Contain in biological safety cabinets operations that generate aerosols</td>
</tr>
<tr>
<td>☑ Use good housekeeping</td>
</tr>
<tr>
<td>☑ Use mechanical pipetting devices</td>
</tr>
<tr>
<td>☑ Promptly decontaminate work surfaces</td>
</tr>
<tr>
<td>☑ Never eat, ring, smoke, handle contact lenses, apply cosmetics, or take medicine in the lab</td>
</tr>
<tr>
<td>☑ Take special care when using sharps</td>
</tr>
<tr>
<td>☑ Keep lab doors closed when experiments are in progress</td>
</tr>
<tr>
<td>☑ Use secondary leak-proof containers to move or transfer cultures</td>
</tr>
<tr>
<td>☑ Decontaminate infectious waste before disposal</td>
</tr>
<tr>
<td>☑ Post appropriate warning signs</td>
</tr>
<tr>
<td>☑ Mark emergency equipment, maintain it, inspect it; list telephone numbers to call in case of accident</td>
</tr>
<tr>
<td>☑ Control access</td>
</tr>
</tbody>
</table>

For Radioisotopes

| ☑ Use only in designated areas |
| ☑ Allow the presence of essential staff only |
| ☑ Use personal protective equipment |
| ☑ Monitor personal radiation exposures |
| ☑ Use spill trays lined with disposable absorbent materials |
| ☑ Limit radionuclide quantities |
| ☑ Shield radiation sources |
| ☑ Mark radiation containers with the radiation symbol, including radionuclide identity, activity, and assay date |
| ☑ Use radiation meters to monitor working areas, protective clothing, and hands after completion of work |
| ☑ Use appropriately shielded transport containers |
Remove radioactive waste frequently from the working area
Maintain accurate records of use and disposal of radioactive materials
Screen dosimetry records for materials exceeding the dose limits
Establish and regularly exercise emergency response plans
In emergencies, assist injured persons first
Clean contaminated areas thoroughly
Write and keep incident reports

For Animal laboratories
Require good microbiological techniques
Establish policies and protocols for all operations and for access to vivarium
Establish appropriate medical surveillance program and supervision for staff
Prepare and adopt safety or operations manual
Post warning signs
Decontaminate work surfaces after use
Use appropriate biological safety cabinets or isolator cages; handle and decontaminate animal bedding and waste materials appropriately
Transport material for autoclaving or incineration safely, in closed containers
Treat, report, and record injuries

Training of Personnel
Employer develops Chemical Hygiene Plan containing (models available from U.S. government and from some professional societies)
Employee information and training about the hazards of chemicals in the work area:
  - How to detect their presence or release
  - Work practices and how to use protective equipment
  - Emergency response procedures
Circumstances under which a lab operation requires prior approval from the institution
Standard operating procedures for work with hazardous chemicals
Criteria for use of control measures
Measures to ensure proper operation of fume hoods and other protective equipment
Provisions for additional employee protection for work with select carcinogens and toxins
Provisions for medical consultations and examinations for employees
Labs should establish their own safety groups at the department level (include students and support staff)
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- Labs should provide training in safety and waste management for all lab workers, including students in laboratory classes.
- Labs should incorporate institutionally supported lab and equipment inspection programs into their overall health and safety programs.
- Review exit / evacuation routes.
- Know how to report fire, injury, chemical spill, or summon emergency response.
- Know first aid.
- Know location and use of emergency equipment such as safety showers and eyewashes.
- Know location and use of fire extinguishers and spill control equipment (have appropriate kits readily available).
- Lab personnel should establish ongoing relationships and clear lines of communication with emergency response teams.
- Include information on safe methods for highly hazardous procedures commonly encountered by lab personnel that involve:
  - Inhalation risks
  - Ingestion risks
  - Risks of percutaneous exposures
  - Bites and scratches when handling animals
  - Handling of blood and other potentially hazardous pathological materials
  - Decontamination and disposal of infectious material

<table>
<thead>
<tr>
<th>Segregation / Triage of Waste</th>
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</thead>
<tbody>
<tr>
<td>Multihazardous waste – goal is reduction of waste to a waste that presents a single hazard.</td>
</tr>
<tr>
<td>Consider frequency and amount of waste generated; assess risk.</td>
</tr>
<tr>
<td>Identify / characterize waste:</td>
</tr>
</tbody>
</table>
  - Physical description
  - Water reactivity
  - Water solubility
  - pH and possibly neutralization information
  - Ignitability / flammability
  - Presence of oxidizer
  - Presence of sulfides / cyanides
  - Presence of halogens
  - Presence of radioactive materials
  - Presence of biohazardous materials
  - Presence of toxic constituents |
Minimize waste’s hazards
Determine options for management of hazards
If appropriate, take steps to neutralize waste or render it non-hazardous
When possible, select a single management option
Establish procedures for dealing with unstable waste, or waste that requires special storage or handling
Store safely:
  - Designated room or facility modified to contain the waste (with ventilation and effluent trapping)
  - Protect workers
  - Minimize risk of fire or spill
  - Minimize radiation levels outside of area
  - Consider compatibility of materials being accumulated (e.g., aqueous and non-aqueous waste should be separated)

- Give particular attention to the handling or cleaning of radioactive laboratory ware, and to the proper disposal of sharps.
  - Non-contaminated (non-infectious) waste can be reused or recycled or disposed of as general waste
  - Contaminated (infectious) sharps – collect in puncture-proof containers fitted with covers and treated as infectious; autoclave if appropriate
  - Contaminated material for decontamination by autoclaving and thereafter washing and reuse or recycling
  - Contaminated material for direct incineration

### Disposal

No activity should begin unless a plan for the disposal of hazardous waste has been formulated

- Use appropriate disposal method for each category of waste
- Use appropriate containers
- Label and securely close waste containers
- Separate wastes as appropriate

For low level radioactive waste, options include

- Storage time for decay and indefinite on site storage,
- Burial at a low-level radioactive waste site,
- Incineration, or
- Sanitary sewer disposal
For biological waste, options include

- Disinfection
- Autoclaving
- For liquids, disposal in sanitary sewer; putrescible waste disposed of by incineration; needles and sharps require destruction, typically by incineration or grinding

Collection and storage of waste

- At satellite area near lab:
  - should be clearly identified, ventilated if necessary
  - determine whether to recycle, reuse, or dispose
  - hold here for less than one year; when containment volume limits reached, move to central accumulation area – package appropriately

- At central accumulation area:
  - separate according to compatibility, commingle solvents when appropriate
  - label clearly, store in appropriate containers
  - limit storage time to 90 days
  - (ensure that employees are trained to handle waste materials as well as contingency planning for emergencies)
  - When transporting, make provisions for spill control in case of accident; have internal tracking system to follow movement of waste
  - Ensure that all necessary records have been generated (Quantities and identification of waste generated and shipped; Documentation and analyses of unknown materials; Manifests for waste shipping as well as verification of waste disposal; Any other information required to ensure compliance and safety from long-term liability)

- Disposal options:
  - Incineration – is method of choice for most wastes, but is most expensive
  - Normal trash – only where appropriate, must be clearly identified and appropriately labeled
  - Sanitary sewer – not commonly used; solutions must be aqueous and biodegradable, or low toxicity inorganics – make sure sewer doesn’t drain into water supply inappropriate for waste disposal, and make sure waste is highly diluted
  - Release to the atmosphere – not acceptable; fume hoods must have trapping devices to prevent discharge to atmosphere

- If hazardous and non-hazardous wastes are mixed, entire waste volume must be treated as hazardous
- Preparation for transport to a treatment, storage, and disposal facility (TSDF)
- Waste generator must obtain assurance (in terms of documentation, permits, records) that provider is
reliable

*For infectious material*

- Decontaminate, autoclave, or incinerate in lab
- Package appropriately (for incineration or for transfer to another facility for incineration)
- Protect against hazards to others to those who might come in contact with discarded items
Annex 2. Comments and Records of Public Consultations

Minutes from the Public Consultations on the Environmental Management Plan (EMP) for the Technology Commercialization Project in Kazakhstan

Held at 5 pm on April 19, 2006 in the conference room of the World Bank Regional Office in Almaty and in the Country Office in Astana.

The public consultations were attended by 40 persons. A video conference was organized with the World Bank office in Astana so that stakeholders in Astana had a chance to participate in the public consultations. Representatives of the mass media were also invited to the consultations for which press invitation and press release were prepared.

A copy of the EMP, an executive summary and an agenda were distributed to the participants for their convenient referencing. The executive summary can be found in the opening section of the EMP. Agenda is provided below.

Aslan Sarinzhipov, Operations Officer of the World Bank office in Almaty opened the event by thanking everyone for their participation. Aslan made a short presentation of the Technology Commercialization Project and passed the word to Diyas Myrzakozha, Vice President of the Center for Technology Transfer and Engineering under the Ministry of Industry and Trade. Diyas introduced the Environmental Management Plan. The floor was then open for discussion.

Bubentsov of Krisanalyt, seller of lab equipment:

1. Who is going to do the environmental assessment considering weak capacity of the regulating agencies in terms of their technical and institutional aspects?

Myrzakozha replied that the Project Implementation Team will work closely with the Ministry of Environmental Protection and its territorial departments to make sure that proper assessment is conducted.

Aknazarov of Kazakh State University and Ecological Forum of Nonprofit Organizations:

1. Suggested making an initial environmental assessment of the environment around the International Materials Science Center (IMSC) and then compare the existing indicators with those acquired regularly at later stages of its work.

Permenev of Infracos Ecos State Enterprise:

1. Suggested having the IMSC, including equipment purchased for the IMSC, go through the proper accreditation, certification and metrology attestation procedures, so that future research conducted utilizing the IMSC and its equipment is considered legitimate and valid based on Kazakhstan and international standards.

2. Also suggested having World Bank environmental management standards ratified by the Parliament of the Republic of Kazakhstan.

3. Also suggested having more details on what kind of waste research is going to generate and in what amounts to which the project team replied that it is impossible to determine such details before seeing grant proposals.

Sarinzhipov assured him that a Loan Agreement will serve as an approval of these standards because the project with all its components is going to be reviewed by the Parliament before the Loan Agreement is signed. Myrzakozha cleared up for the audience that the EMP is rather about being prepared to screen, prevent, minimize and mitigate any environmental impact than indicating what kind and how much waste is going to be generated. That these principles of preparedness are going to guide the IMSC in its day-to-day operations.
Svetlana Spotar of the Green Salvation environmental nonprofit organization:

1. Commented on World Bank environmental standards being lower and less tough than those of Kazakhstan.

Sarinzhipov requested providing more detailed information indicating a list of standards that could undermine the environmental impact of the project for further review by the project team or contacting Bulat Utkelov, the environmental expert of the WB in Astana office.

The discussion also included questions on the project itself which the moderators tried to encourage minimizing. Due to their irrelevance to the purpose of the consultations the discourse if not included in the minutes.

Consultations finished at 7 pm.

Enclosed:
- List of Participants
- Agenda for Public Consultations
- Press Invitation
- Press Release
- Website Message
- Invitation Letter

Table 1. List of Participants

<table>
<thead>
<tr>
<th>#</th>
<th>Organization</th>
<th>Participant Name</th>
<th>Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Center for Sustainable Production and Consumption</td>
<td>Zikrina Z.A., Isaeva G.T.</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Eastern Kazakhstan State Technical University</td>
<td>Sokolov</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Kazakh Academy of Transport and Communications</td>
<td>Karsybaev, Kuatbaeva</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Kazakh National Technical University</td>
<td>Absametov, Shaumburg, Kulekov</td>
<td>3</td>
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<tr>
<td>5</td>
<td>Kazakh National University</td>
<td>Sadykhanova, Kuatbaeva</td>
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</tr>
<tr>
<td>6</td>
<td>Institute of High Technology JSC</td>
<td>Akhmetov, Batyrshaeva</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Mir Kachestva (World of Quality) Newspaper</td>
<td>Baigozha</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Kazakh British Technical University</td>
<td>Bakenov</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Institute of Economy, Ministry of Education and Science of the RK</td>
<td>Sabden, Ismagulova, Barylgaeva</td>
<td>3</td>
</tr>
</tbody>
</table>
### Figure 1. Agenda for Public Consultations

**Government of Kazakhstan and World Bank**

**Technology Commercialization Project**

**Agenda**

*Presentation of the project and the Environmental Management Plan*

17:00-17:10  Aslan Sarinzhipov, Project Coordinator, Central Asia Regional Office of the World Bank

17:10-17:40  Diyas Myrzakozha, Vice President, Center for Technology Transfer and Engineering, Ministry of Industry and Trade

*Public Consultations*

17:40-19:00  Questions, comments of the audience. Discussion of the EMP.

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<tbody>
<tr>
<td>10</td>
<td>InfraKos Ekos</td>
<td>Permenev, Alekseeva</td>
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<td>Altai Technopark</td>
<td>Goltsev</td>
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<td>12</td>
<td>National Center for Examination and Certification</td>
<td>Ivleva</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Green Salvation Ecological Society</td>
<td>Spotar</td>
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<td>14</td>
<td>National Innovation Fund</td>
<td>Kusainova A.M., Karibaeva</td>
<td>2</td>
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<tr>
<td>15</td>
<td>Panorama newspaper</td>
<td>Bektiyarova</td>
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<td>16</td>
<td>Interfax</td>
<td>Kruglova</td>
<td>1</td>
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<tr>
<td>17</td>
<td>Biosphere Ecology</td>
<td>Aknazarov</td>
<td>1</td>
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<tr>
<td>18</td>
<td>KEGOC JSC</td>
<td>In Astana Dzhagipirova</td>
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<td>19</td>
<td>KazAtomProm JSC</td>
<td>Iskakov</td>
<td>1</td>
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<tr>
<td>20</td>
<td>KazMunaiGas JSC</td>
<td>In Astana Keshubaev</td>
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<td>21</td>
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<td>Gizatova, Steve Moore</td>
<td>2</td>
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<td>22</td>
<td>Krystal Analyt</td>
<td>Bubentsov</td>
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<tr>
<td>23</td>
<td>Financial Center Regulating Agency</td>
<td>Kaligazin</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>Center for Technology Transfer and Engineering</td>
<td>In Astana Sartbaev, Mukhamediarov, Aubakirov</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>Kazakhstan Temir Zholy</td>
<td>In Astana Venediktova, Esenbaev</td>
<td>2</td>
</tr>
</tbody>
</table>
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Note: Please introduce yourself and the organization you are representing before your speech.

Your comments and questions will be considered and a finalized version of the EMP will be posted on the following websites: www.nif.kz and www.t2.kz

Thank you for your participation!

Figure 2. Press Invitation

Contacts:
Almaty: Elena Karaban, tel: (3272) 980-580, ekaraban@worlbank.org

INVITATION FOR PRESS
ENVIRONMENTAL MANAGEMENT PLAN PUBLIC CONSULTATION
TECHNOLOGY COMMERCIALIZATION PROJECT

World Bank and National Innovation Fund with its Center for Technology Transfer and Engineering are announcing a public disclosure of the Environmental Management Plan which will take place on April 19, 2006 in Almaty. Environmental Management Plan identifies Kazakh environmental protection legislation, studies baseline conditions and establishes mitigation and screening measures for the International Materials Science Center that is expected to open within the framework of the Technology Commercialization Project. Public officials from environmental protection and standardization agencies as well as representatives of the private sector, civil society and academia from Kazakhstan will discuss the environmental management plan and provide their comments on how to improve it.

Public consultations will be chaired by Mr. Aslan Sarinzhipov, Operations Officer, World Bank. The Environmental Management Plan will be presented by Mr. Diyas Myrzakozha, Vice President, Center for Technology Transfer and Engineering, Ministry of Industry and Trade.

Journalists are invited to attend public consultations on April 19, 2006 at 5:00PM.
Public consultations will take place in Conference Room of the World Bank office at 41A Kazybek bi Str., 3rd Floor, Almaty

Figure 3. Press Release

ENVIRONMENTAL MANAGEMENT PLAN FOR THE NIC IN KAZAKHSTAN

Almaty, April 19, 2006 – Public Consultations on Environmental Management Plan (EMP) are being held in Almaty on April 19, 2006 within the framework of the Technology Commercialization Project. The Government of Kazakhstan represented by the National Innovation Fund and Center for Technology Transfer and Engineering together with the World Bank is preparing to implement this project. Representatives from relevant government agencies, private sector, civil society organizations and academia are discussing issues touched upon in the EMP.
According to the World Bank policies preparation of any project requires an environmental assessment aimed at identifying potential impact of the project upon the environment. The Technology Commercialization Project will entail opening of the world class International Materials Science Center (IMSC) where grant recipients, Groups, will conduct research on an as needed basis. As a result, research conducted at the IMSC will cause environmental and social impact caused by generating various types of waste. Additionally, rehabilitation of a building that will host a laboratory can also lead to waste generation and insignificant environmental impact. Thus, the project received a category B status and according to the World Bank requirements, a borrower (Government of Kazakhstan) must prepare an Environmental Management Plan and disclose it publicly. The environmental assessment of Category B projects examines the potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

The EMP prepared by the National Innovation Fund and the World Bank identifies Kazakh environmental protection legislation, studies baseline conditions and establishes mitigation and screening measures for research projects to be conducted in the International Materials Science Center. Unfortunately, accounts from several leading Kazakh scientists confirm that most laboratories function under dismal safety and particularly waste management standards. Thus, this document will help the International Materials Science Center practice laboratory and waste management based on best international and national standards and set an example for other research facilities in Kazakhstan.

Following the World Bank EMP public disclosure requirements the document is currently posted on www.t2.kz and www.nif.kz for public viewing. Comments and questions raised during the public consultation will be reflected in the EMP and a finalized document will be reposted on the abovementioned websites for a period of two weeks.

Diyas Myrzakoza, Vice President of the Center for Technology Transfer and Engineering introduced the EMP to the audience. The event will be co-chaired by Aslan Sarinzhipov, Operations Officer of the World Bank. The floor was then open for comments and questions from participants.

For more information on World Bank activities in Kazakhstan please visit:
www.worldbank.org.kz

Figure 4. Website Message

Dear Visitor!

The Government of Kazakhstan represented by the National Innovation Fund together with the World Bank is preparing to implement Technology Commercialization Project, which will introduce new mechanisms for science financing in Kazakhstan. One component of the project will entail opening a world class International Materials Science Center where recipients of research grants funded by the project as well as other scientists doing research in Kazakhstan will have up to date laboratory equipment for their research. The National Instrumentation Center will provide Kazakhstan with at least one world-class modern laboratory with (i) state-of-the-art specialized scientific equipment; (ii) world class laboratory management practices; and (iii) world class standards for environment protection and waste disposal.

The National Innovation Fund and the World Bank have prepared an Environmental Management Plan which identifies Kazakh environmental protection legislation, studies baseline conditions and establishes mitigation and screening measures for the International Materials Science Center. Please take a moment and review this document. If you have any comments or questions please
send them directly to Gulmira Kalauova, World Bank, tel: 3272-980-580 or gkalauova@gmail.com or Diyas Myrzakozha, Center for Technology Transfer and Engineering, tel: 3172-214-340 or d.myrzakozha@t2.kz.

On April 19, 2006, the National Innovation Fund and World Bank will convene a public hearing in Almaty where you can express your opinion about the issues outlined in the EMP. The precise time and location of this public hearing will be announced separately.

Thank you for valued input!

Figure 5. Invitation Letter

April 9, 2006

Dear…

The Government of Kazakhstan represented by the National Innovation Fund together with the World Bank is preparing to implement Technology Commercialization Project which will introduce new mechanisms for science financing in Kazakhstan. One component of the project will entail opening a world class International Materials Science Center where recipients of research grants funded by the project as well as other scientists doing research in Kazakhstan will have up to date laboratory equipment for their research. The International Materials Science Center will provide Kazakhstan with at least one world-class modern laboratory with (i) state-of-the-art specialized scientific equipment; (ii) world class laboratory management practices; and (iii) world class standards for environment protection and waste disposal.

The National Innovation Fund and the World Bank have prepared an Environmental Management Plan which identifies Kazakh environmental protection legislation, studies baseline conditions and establishes mitigation and screening measures for the International Materials Science Center. The EMP is currently posted on www.t2.kz and www.nif.kz where you can download the EMP in Russian, Kazakh and English languages. Please take a moment and review this document. For your quick reference we are also attaching an executive summary of the EMP.

Thus, to let you provide your comments or ask questions regarding the EMP, we would like to invite you to public consultation, which will take place on April 19, 2006 at 17:00 in the World Bank Almaty office on 41A Kazybek bi, 3rd Floor Conference Room.

Please confirm your attendance by calling Gulmira Kalauova, World Bank, at 3272-980-580.

Sincerely,

National Innovation Fund

World Bank
Annex 3. Environmental and Social Screening Form

The Environmental and Social Screening Form (ESSF) has been designed to assist in the evaluation of research projects applying for funding under the Kazakhstan Technology Commercialization Project. The objective of the form is to provide information on potential environmental and social impacts and their possible mitigation measures, if any, can be identified and/or that requirements for further environmental analysis be determined.

The ESSF contains information that will enable an informed decision to be made before final grant approval to research projects.

Name of Research Project:
Research Area of Project:
Name of Senior Researcher:
Name of University or Research Institute:
Name of Faculty/Department:
Name of Head of Faculty/Department:

Name, job title, and contact details for the person who is responsible for filling out this form.
Name:
Job Title:
Telephone number:
Fax number:
E-Mail address:
Date:
Signature:
FOR PUBLIC DISCLOSURE

1. Brief Project Description

Please provide information on the type and scale of the research project (project location, if indoor research or field research, kind of material used under the project, are constructions carried out under the project, etc.)

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

2. Research Environment and Laboratory set-up

(a) Describe the area (urban, rural), topography and vegetation at the research site

_____________________________________________________________________
_____________________________________________________________________

(b) Describe the set-up of the laboratory and/or workshop (size, amount of sinks, windows, ventilation arrangements, etc.) in which the research will take place

_____________________________________________________________________

(c) Is there any kind of special waste (specify below) that would be produced by the research project? Yes_____ No_______

(i) Sharps [all sharp objects that could cause a cut or puncture (whether infectious or not) including hypodermic needles, suture needles, injector tips, scalpels, lancets, knives, blades, razors, pipettes, and broken glass, etc.]. Yes_____ No_______

(ii) Hazardous Biological Waste [body fluids, blood, organs, body tissue, culture dishes, microbiological slides and cover slips, etc.] Yes_____ No_______

(iii) Radioactive Waste [Solids, liquids and gaseous waste contaminated with radionuclides and all radioisotopes] Yes_____ No_______

(iv) Hazardous Chemical Waste [Any substance, liquid or solid, with at least one of the following properties: explosive, flammable, toxic, corrosive, locally chafing, reactive or genotoxic (carcinogenic, mutagenic, teratogenic) including cytotoxic drugs. Also, all containers contaminated by these substances.] Yes_____ No_______

(v) Air Emissions Yes_____ No_______

(vi) Water Discharges Yes_____ No_______

(vii) Toxic Substances Yes_____ No_______

(viii) Others (describe). Yes_____ No_______

(d) If you answered “Yes” to question c above, please attach a detailed Environmental Management System (EMS) that will become an essential part of the further evaluation of your proposal by the International Science Advisory Board.

The EMS should include:

- the nature of the hazardous substances to be used and wastes to be generated
- procedures to be followed for safe storage and use
• waste segregation and “triage” procedures
• on site treatment, neutralization, and disposal methods to be used
• storage, accumulation, and transport protocols
• staff training procedures
• quality assurance and control measures

2. Rehabilitation / Modernization of Laboratories

Will there be any construction (including rehabilitation and extension) under the research project?
Yes_____ No______

If you checked “Yes”, please also answer questions a-h below.

(a) Rivers and Lakes Ecology

Is there a possibility that the constructions will adversely affect the river and lake ecology? Attention should be paid to water quality and quantity; the nature, productivity and use of aquatic habitats, and variations of these over time.
Yes_____ No______

(b) Protected areas

Does the construction occur within/adjacent to any protected areas designated by government (national park, national reserve, world heritage site etc.)?
Yes_____ No______

If the construction is outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected area areas (e.g., interference with the migration routes of mammals or birds)
Yes_____ No______

(c) Geology and Soils

Based upon visual inspection or available literature, are there areas of possible geologic or soil instability (erosion prone, landslide prone, subsidence-prone)?
Yes_____ No______

Based upon visual inspection or available literature, are there areas that have risks of large scale increase in soil salinity?
Yes_____ No______

(d) Landscape/aesthetics

Is there a possibility that the construction will adversely affect the aesthetic attractiveness of the local landscape?
Yes_____ No______

(e) Historical, archaeological or cultural heritage site.

Based on available sources, consultation with local authorities, local knowledge and/or observations, could the constructions under the project alter any historical, archaeological or cultural heritage site or require excavation near same?
(f) Resettlement and/or Land Acquisition.

Will involuntary resettlement, loss of assets or rights of access to land, or an impact on livelihood be caused by the construction?

PLEASE NOTE: if your answer to this question is positive, your proposal will not be considered for funding. Any consequences of untruthfully answering the question will rest on your host institution.

Yes_____ No_____

(g) Loss of Crops, Fruit Trees and Household Infrastructure

Will the construction result in the permanent or temporary loss of crops, fruit trees and household infra-structure (such as granaries, outside toilets and kitchens, etc)?

Yes_____ No_____

(h) Noise pollution during Construction.

Will the noise level exceed the allowable noise limits?

Yes_____ No_____
Annex 4. List of References Available Upon Request

2. The Project Feasibility Study
3. The Draft Project Appraisal Document
4. The approved Integrated Safeguards Data Sheet
5. Mission Aide Memoires
6. Kazakhstan relevant environmental laws and regulations
7. World Bank Safeguards Policies
Annex 5: EMP Checklist for Rehabilitation Activities

Construction and Rehabilitation Mitigation Measures Checklist

For low-risk topologies, such as school and hospital rehabilitation activities, the ECA safeguards team developed an alternative to the current EMP format to provide an opportunity for a more streamlined approach to preparing EMPs for minor rehabilitation or small-scale building construction, in the health and education sectors. The checklist-type format has been developed to provide “example good practices” and designed to be user friendly and compatible with safeguard requirements.

The checklist-type format attempts to cover typical core mitigation approaches to civil works contracts with localized impacts. It is anticipated that this format provides the core element of an Environmental Management Plan (EMP) or Environmental Management Framework (EMF) to meet World Bank Environmental Assessment requirements under OP 4.01. The intent that this checklist would be directly usable and applicable in contractor’s bidding documents or used as an integral part of bidding documents for contractors carrying out civil works under Bank-financed projects.

The checklist has three sections, Part 1 includes the descriptive part that describes the project specifics in terms of the institutional and legislative aspects, the project description, inclusive of the need for a capacity building program and description of the public consultation process. This section could be up to two pages long. Attachments for additional information are requested if needed. Part 2 includes the environmental and social screening in a simple Yes/No format followed by mitigation measures for any given activity. Part 3 will include the monitoring plan for activities during project construction and implementation. It retains the same format required for current EMPs. It is the intent of this checklist that Part 2 and Part 3 be included as bidding documents for contractors.

<table>
<thead>
<tr>
<th>PART 1: INSTITUTIONAL &amp; ADMINISTRATIVE</th>
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<tbody>
<tr>
<td><strong>Country</strong></td>
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<tr>
<td><strong>Project title</strong></td>
</tr>
<tr>
<td><strong>Scope of project and activity</strong></td>
</tr>
<tr>
<td><strong>Institutional arrangements</strong></td>
</tr>
<tr>
<td><strong>Name &amp; Contacts</strong></td>
</tr>
<tr>
<td>Team Leader</td>
</tr>
<tr>
<td>Natasha Kapil</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Implementation arrangements</strong></td>
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<tr>
<td><strong>Name &amp; Contacts</strong></td>
</tr>
<tr>
<td>Safeguard Supervision</td>
</tr>
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<td>Local Inspectorate</td>
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<td>Supervision</td>
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<table>
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<tr>
<th>SITE DESCRIPTION</th>
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<tbody>
<tr>
<td><strong>Name of site</strong></td>
</tr>
<tr>
<td><strong>Describe site location</strong></td>
</tr>
<tr>
<td><strong>Who owns the land?</strong></td>
</tr>
<tr>
<td>Geographic description</td>
</tr>
<tr>
<td>------------------------</td>
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<tr>
<td><strong>LEGISLATION</strong></td>
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<td><strong>INSTITUTIONAL CAPACITY BUILDING</strong></td>
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## PART 2: ENVIRONMENTAL / SOCIAL SCREENING

Will the site activity include/involve any of the following:

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<thead>
<tr>
<th>Activity</th>
<th>Status</th>
<th>Additional references</th>
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</thead>
<tbody>
<tr>
<td>A. Building rehabilitation</td>
<td>[ ] Yes [ ] No</td>
<td>See Section B below</td>
</tr>
<tr>
<td>B. New construction</td>
<td>[ ] Yes [ ] No</td>
<td>See Section B below</td>
</tr>
<tr>
<td>C. Individual wastewater treatment system</td>
<td>[ ] Yes [ ] No</td>
<td>See Section C below</td>
</tr>
<tr>
<td>D. Historic building(s) and districts</td>
<td>[ ] Yes [ ] No</td>
<td>See Section D below</td>
</tr>
<tr>
<td>E. Acquisition of land&lt;sup&gt;1&lt;/sup&gt;</td>
<td>[ ] Yes [ ] No</td>
<td>See Section E below</td>
</tr>
<tr>
<td>F. Hazardous or toxic materials&lt;sup&gt;2&lt;/sup&gt;</td>
<td>[ ] Yes [ ] No</td>
<td>See Section F below</td>
</tr>
<tr>
<td>G. Impacts on forests and/or protected areas</td>
<td>[ ] Yes [ ] No</td>
<td>See Section G below</td>
</tr>
<tr>
<td>H. Handling / management of medical waste</td>
<td>[ ] Yes [ ] No</td>
<td>See Section H below</td>
</tr>
<tr>
<td>I. Traffic and Pedestrian Safety</td>
<td>[ ] Yes [ ] No</td>
<td>See Section I below</td>
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</table>

### ACTIVITY PARAMETER MITIGATION MEASURES CHECKLIST

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>PARAMETER</th>
<th>MITIGATION MEASURES CHECKLIST</th>
</tr>
</thead>
</table>
| A. General Conditions   | Notification and Worker Safety | (a) The local construction and environment inspectorates and communities have been notified of upcoming activities  
(b) The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites (including the site of the works)  
(c) All legally required permits have been acquired for construction and/or rehabilitation  
(d) All work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment.  
(e) Workers’ PPE will comply with international good practice (always hardhats, as needed) |

<sup>1</sup> Land acquisitions includes displacement of people, change of livelihood encroachment on private property this is to land that is purchased/transfered and affects people who are living and/or squatters and/or operate a business (kiosks) on land that is being acquired.

<sup>2</sup> Toxic / hazardous material includes and is not limited to asbestos, toxic paints, removal of lead paint, etc.
<table>
<thead>
<tr>
<th>B. General Rehabilitation and /or Construction Activities</th>
<th><strong>Air Quality</strong></th>
<th><strong>Noise</strong></th>
<th><strong>Water Quality</strong></th>
<th><strong>Waste management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>masks and safety glasses, harnesses and safety boots)</td>
<td>(a) During interior demolition use debris-chutes above the first floor</td>
<td>(a) Construction noise will be limited to restricted times agreed to in the permit</td>
<td>(a) The site will establish appropriate erosion and sediment control measures such as e.g. hay bales and / or silt fences to prevent sediment from moving off site and causing excessive turbidity in nearby streams and rivers.</td>
<td>(a) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities.</td>
</tr>
<tr>
<td>(f) Appropriate signposting of the sites will inform workers of key rules and regulations to follow.</td>
<td>(b) Keep demolition debris in controlled area and spray with water mist to reduce debris dust</td>
<td>(b) During operations the engine covers of generators, air compressors and other powered mechanical equipment should be closed, and equipment placed as far away from residential areas as possible.</td>
<td>(b) Mineral construction and demolition wastes will be separated from general refuse, organic, liquid and chemical wastes by on-site sorting and stored in appropriate containers.</td>
<td>(b) Mineral construction and demolition wastes will be separated from general refuse, organic, liquid and chemical wastes by on-site sorting and stored in appropriate containers.</td>
</tr>
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<td></td>
<td>(c) Suppress dust during pneumatic drilling/wall destruction by ongoing water spraying and/or installing dust screen enclosures at site</td>
<td></td>
<td>(c) Construction waste will be collected and disposed properly by licensed collectors</td>
<td>(c) Construction waste will be collected and disposed properly by licensed collectors</td>
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<tr>
<td></td>
<td>(d) Keep surrounding environment (side walks, roads) free of debris to minimize dust</td>
<td></td>
<td>(d) The records of waste disposal will be maintained as proof for proper management as designed.</td>
<td>(d) The records of waste disposal will be maintained as proof for proper management as designed.</td>
</tr>
<tr>
<td></td>
<td>(e) There will be no open burning of construction / waste material at the site</td>
<td></td>
<td>(e) Whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos)</td>
<td>(e) Whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos)</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>PARAMETER</td>
<td>MITIGATION MEASURES CHECKLIST</td>
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</table>
| C. Individual wastewater treatment system | Water Quality | (a) The approach to handling sanitary wastes and wastewater from building sites (installation or reconstruction) must be approved by the local authorities.  
(b) Before being discharged into receiving waters, effluents from individual wastewater systems must be treated in order to meet the minimal quality criteria set out by national guidelines on effluent quality and wastewater treatment.  
(c) Monitoring of new wastewater systems (before/after) will be carried out. |
| D. Historic building(s) | Cultural Heritage | (a) If the building is a designated historic structure, very close to such a structure, or located in a designated historic district, notify and obtain approval/permits from local authorities and address all construction activities in line with local and national legislation.  
(b) Ensure that provisions are put in place so that artifacts or other possible “chance finds” encountered in excavation or construction are noted, officials contacted, and works activities delayed or modified to account for such finds. |
| E. Acquisition of land | Land Acquisition Plan/Framework | (a) If expropriation of land was not expected and is required, or if loss of access to income of legal or illegal users of land was not expected but may occur, that the bank task Team Leader is consulted.  
(b) The approved Land Acquisition Plan/Framework (if required by the project) will be implemented. |
| F. Toxic Materials | Asbestos management | (a) If asbestos is located on the project site, mark clearly as hazardous material.  
(b) When possible the asbestos will be appropriately contained and sealed to minimize exposure.  
(c) The asbestos prior to removal (if removal is necessary) will be treated with a wetting agent to minimize asbestos dust.  
(d) Asbestos will be handled and disposed by skilled & experienced professionals.  
(e) If asbestos material is be stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately.  
(f) The removed asbestos will not be reused. |
<table>
<thead>
<tr>
<th>ACTIVITY</th>
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<th>MITIGATION MEASURES CHECKLIST</th>
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</table>
| Toxic / hazardous waste management | (a) Temporarily storage on site of all hazardous or toxic substances will be in safe containers labeled with details of composition, properties and handling information  
(b) The containers of hazardous substances should be placed in an leak-proof container to prevent spillage and leaching  
(c) The wastes are transported by specially licensed carriers and disposed in a licensed facility.  
(d) Paints with toxic ingredients or solvents or lead-based paints will not be used | |
| G. Affects forests and/or protected areas | Protection | (a) All recognized natural habitats and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities.  
(b) For large trees in the vicinity of the activity, mark and cordon off with a fence large tress and protect root system and avoid any damage to the trees  
(c) Adjacent wetlands and streams will be protected, from construction site run-off, with appropriate erosion and sediment control feature to include by not limited to hay bales, silt fences  
(d) There will be no unlicensed borrow pits, quarries or waste dumps in adjacent areas, especially not in protected areas. | |
| H. Disposal of medical waste | Infrastructure for medical waste management | (a) In compliance with national regulations the contractor will insure that newly constructed and/or rehabilitated health care facilities include sufficient infrastructure for medical waste handling and disposal; this includes and not limited to:  
① Special facilities for segregated healthcare waste (including soiled instruments “sharps”, and human tissue or fluids) from other waste disposal; and  
② Appropriate storage facilities for medical waste are in place; and  
③ If the activity includes facility-based treatment, appropriate disposal options are in place and operational | |
<table>
<thead>
<tr>
<th>by construction activities</th>
<th>limited to</th>
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<tbody>
<tr>
<td>① Signposting, warning signs, barriers and traffic diversions: site will be clearly visible and the public warned of all potential hazards</td>
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<tr>
<td>② Traffic management system and staff training, especially for site access and near-site heavy traffic. Provision of safe passages and crossings for pedestrians where construction traffic interferes.</td>
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<tr>
<td>③ Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement</td>
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<tr>
<td>④ Active traffic management by trained and visible staff at the site, if required for safe and convenient passage for the public.</td>
<td></td>
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<tr>
<td>⑤ Ensuring safe and continuous access to office facilities, shops and residences during renovation activities, if the buildings stay open for the public.</td>
<td></td>
</tr>
</tbody>
</table>
## PART 3: MONITORING PLAN

<table>
<thead>
<tr>
<th>Phase</th>
<th>What parameter is to be monitored?</th>
<th>Where is the parameter to be monitored?</th>
<th>How is the parameter to be monitored?</th>
<th>When is the parameter to be monitored?</th>
<th>Why is the parameter being monitored?</th>
<th>Cost</th>
<th>Who is responsible for monitoring?</th>
</tr>
</thead>
<tbody>
<tr>
<td>During activity preparation</td>
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<td>During activity implementation</td>
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<tr>
<td>During activity supervision</td>
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</tr>
</tbody>
</table>

Example of Environmental Monitoring Plan for construction rehabilitation works

**ENVIRONMENTAL MONITORING PLAN**

<table>
<thead>
<tr>
<th>Phase</th>
<th>What parameter is to be monitored?</th>
<th>Where is the parameter to be monitored?</th>
<th>How is the parameter to be monitored?</th>
<th>When is the parameter to be monitored?</th>
<th>Why is the parameter being monitored?</th>
<th>Cost</th>
<th>Institutional responsibility for monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Noise disturbance and vibrations</td>
<td>noise levels (dB); equipment</td>
<td>At and near work site</td>
<td>Inspection and supervision; according to once a month or on complaint;</td>
<td>minimal</td>
<td>Contractor through approved monitoring agency; Supervision</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>Main Details</td>
<td>Frequency</td>
<td>Inspections</td>
<td>Enforcement</td>
<td></td>
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<tr>
<td>Dust/air quality</td>
<td>air pollution (solid particles, CO, NO2, Pb (random sampling))</td>
<td>At and near work site</td>
<td>inspection</td>
<td>every 2 months; unannounced inspections during material delivery and construction; minimal</td>
<td>Contractor through approved monitoring agency; Supervision Engineer</td>
<td></td>
<td></td>
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<tr>
<td>Traffic disruption during construction activity; Vehicle and pedestrian safety</td>
<td>existence of traffic management plan; traffic patterns</td>
<td>At and near work site</td>
<td>inspection; observation</td>
<td>before works start; once per month at peak and non peak periods; minimal</td>
<td>Contractor; Supervisor Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and soil pollution from improper material storage, management and usage</td>
<td>water and soil quality (suspended solids, oils, pH value, heavy metals)</td>
<td>runoff from site, material storage areas; wash down areas of equipment</td>
<td>inspection; observation</td>
<td>during material delivery and construction, especially during precipitation (rain, snow, etc); minimal</td>
<td>Contractor; Supervision Engineer, Regional Inspectorate of Environment and water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and soil pollution from improper disposal of waste materials</td>
<td>water and soil quality (suspended solids, oils, pH value, )</td>
<td>depository site</td>
<td>inspection; observation</td>
<td>once every 4 months during construction and on complaint; minimal</td>
<td>Contractor, Supervision Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential contamination of soil and water from improper maintenance of equipment</td>
<td>water and soil quality (suspended solids, oil, lubricants, fuel, pH value)</td>
<td>At work site; construction equipment place</td>
<td>unannounced inspection</td>
<td>once per month during construction, on complaint, and in case of spillage; minimal</td>
<td>Regional Inspectorate of Environment and water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff safety</td>
<td>protective equipment</td>
<td>At work site</td>
<td>inspection</td>
<td>unannounced inspections; minimal</td>
<td>Supervision Engineer</td>
<td></td>
<td></td>
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</tbody>
</table>