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Report No: PAD1047

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$88 MILLION

TO THE

REPUBLIC OF KAZAKHSTAN

FOR A

FOSTERING PRODUCTIVE INNOVATION PROJECT

December 1, 2014

Trade and Competitiveness Global Practice
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 29, 2014)

Currency Unit	=	Kazakhstan Tenge
KZT 180.9	=	US$1
US$ 1.48	=	SDR 1

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

BFM	Beneficiary Feedback Mechanism
CIS	Commonwealth of Independent States
CPS	Country Partnership Strategy
CQS	Selection based on Consultants Qualification
DA	Designated Account
DB	Doing Business Report
DC	Direct Contracting
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESVCF	Early stage venture capital fund
FBS	Fixed Budget Selection
FDI	Foreign Direct Investments
FM	Financial Management
FMM	Financial Management Manual
FPIP	Fostering Productive Innovation Project
GAC	Governance and Anti-Corruption Action Plan
GDP	Gross Domestic Product
IC	Individual Consultants
ICB	International Competitive Bidding
ICT	Information and Communication Technology
IDA	International Development Association
IFC	International Finance Corporation
IFR	Interim Un-audited Financial Reports
IMSC	International Material Science Center
IP	Intellectual Property
IPF	Investment Project Financing
ISA	International Standard Auditing
ISP	Implementation Support Plan
JERP	Joint Economic Research Program
JRG	Junior Research Group
LCS	Least Cost Selection
M&E	Monitoring and Evaluation

MID	Ministry of Investment and Development
MOES	Ministry of Education and Science
NATD	National Agency for Technology Development
NCB	National Competitive bidding
NIS	National Innovation System
NPL	Non-Performing Loans
NPV	Net Present Value
PA	Project Account
PCT	Patent and Cooperation Treaty
PDO	Project Development Objectives
PFA	Partnership Framework Arrangement
PFM	Public Financial Management
PMU	Project Management Unit
POM	Project Operations Manual
PSC	Project Steering Committee
PV	Present Value
QCBS	Quality and Cost Based Selection
R&D	Research and Development
SBD	Standard Bidding Documents
SF	Science Fund
SMEs	Small and Medium Enterprises
SSG	Senior Scientist Group
SSS	Single Source Selection
TCP	Technology Commercialization Project
TTO	Technology Transfer Offices

Regional Vice President:	Laura Tuck
Country Director:	Saroj Kumar Jha
Senior Global Practice Director	Anabel Gonzalez
Practice Manager:	Paloma Anos Casero
Task Team Leader:	Karen Grigorian

Fostering Productive Innovation Project

TABLE OF CONTENTS

Page

PAD DATA SHEET

Kazakhstan

Kazakhstan: Fostering Productive Innovation Project (P150402)

PROJECT APPRAISAL DOCUMENT

EUROPE AND CENTRAL ASIA

ECCU8

Report No.: PAD1047

Basic Information		
Project ID P150402	EA Category B - Partial Assessment	Team Leader Karen Grigorian
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]	
Project Implementation Start Date 01-Nov-2015	Project Implementation End Date 31-Dec-2020	
Expected Effectiveness Date 30-Sep-2015	Expected Closing Date 31-Dec-2020	
Joint IFC No		

Practice Manager/Manager	Senior Global Practice Director	Country Director	Regional Vice President
Paloma Anos Casero	Anabel Gonzalez	Saroj Kumar Jha	Laura Tuck

Borrower: Republic of Kazakhstan			
Responsible Agency: Ministry of Education and Science			
Contact:	Mr. Takhir Balykbaev	Title:	Vice Minister
Telephone No.:	77172741580	Email:	t.balykbaev@edu.gov.kz

Project Financing Data (in USD Million)		
[X] Loan	[ ] IDA Grant	[ ] Guarantee
[ ] Credit	[ ] Grant	[ ] Other

Total Project Cost:	110.00	Total Bank Financing:	88.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	22.00
International Bank for Reconstruction and Development	88.00
Total	110.00

Expected Disbursements (in USD Million)

Fiscal Year	2015	2016	2017	2018	2019	2020	2021	0000	0000	0000
Annual	0.00	10.00	25.00	35.00	25.00	14.00	1.00	0.00	0.00	0.00
Cumulative	0.00	10.00	35.00	70.00	95.00	109.00	110.00	0.00	0.00	0.00

Proposed Development Objective(s)

The Project Development Objective (PDO) is to promote high-quality, nationally relevant research and commercialization of technologies.

Components

Component Name	Cost (USD Millions), excluding VAT
Development of the Knowledge Base for Innovations	40.00
Innovation Consortia	35.00
Consolidation of the Technology Commercialization Cycle	24.00
Strengthening coordination of the National Innovation System; Enhancing the Capacity of the Existing Institutional Structures	6.00
Support Project Implementation	5.00

Institutional Data

Practice Area / Cross Cutting Solution Area

Trade & Competitiveness

Cross Cutting Areas

[ ] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits	Mitigation Co-benefits

			%	%
Industry and trade	General industry and trade sector	100		
Total		100		

☑ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Financial and private sector development	Other Private Sector Development	100
Total		100

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]
Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ] No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X] No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04		**X**
Forests OP/BP 4.36		**X**
Pest Management OP 4.09		**X**
Physical Cultural Resources OP/BP 4.11		**X**
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12		**X**
Safety of Dams OP/BP 4.37		**X**
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**

Description of Covenant

The Borrower shall carry out the Project in accordance with the requirements, criteria, organizational arrangements and operational procedures set forth in the POM.

The Borrower shall establish, and thereafter operate and maintain throughout Project implementation, a Project Management Unit (PMU) with functions and responsibilities, staff with qualifications and experience, and adequate resources, all satisfactory to the Bank.

The Borrower shall establish and thereafter maintain a Project Steering Committee with composition, and functions and responsibilities, acceptable to the Bank.

The Borrower shall rely on and shall cause the Science Fund to provide necessary assistance to MOES in the technical aspects of the Project.

The Borrower shall provide to the MOES, promptly, as needed, the funds and other resources for the implementation of Parts 4 and 5 of the Project.

The Borrower shall establish and maintain, at all times during implementation of the Project, the ISCB with staff with qualifications and experience acceptable to the Bank.

The Borrower shall ensure that no activity under Part 3.C of the Project shall be carried out without obtaining the necessary assurances and relevant permits from the relevant authorities of the countries where any activity under Part 3.C of the Project is intended to be carried out, sufficient for the Borrower and the Bank, to carry out any supervision activities.

Conditions

Source Of Fund	Name	Type

Description of Condition

No withdrawal shall be made:

(c) under Category (4), until the Borrower, through the MOES, has provided evidence satisfactory to the Bank of the following: (i) that the ESVC Fund has been established (ii) the ESVC Fund Establishment Agreement has been duly executed by the parties thereto and is legally binding upon each such party in accordance with its terms; (iii) the ESVC Fund Manual has been approved by the MOES, and adopted by the ESVC Fund, all on terms and in a manner acceptable to the Bank.

The MOES has issued an order to establish the PMU, as provided in Section I. A.2. of Schedule 2 to this Agreement.

The Project Operations Manual, satisfactory to the Bank, has been adopted by the Borrower, through MOES

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Karen Grigorian	Senior Private Sector Development Specialist	Team Lead	GTCDR

Yeraly Beksultan	Private Sector Development Specialist	Co-Team Lead	GTCDR
Esperanza Lasagabaster	Practice Manager	Innovation	GTCDR
Christos Kostopoulos	Program Leader	Program Leader	ECCU8
Natasa Vetma	Senior Environmental Specialist	Environment	GENDR
Gabriel Goddard	Senior Economist	Trade and Competitiveness	GTCDR
Lola Ibragimova	Social Development Specialist	Social Development	GURDR
Ramiro Ignacio Jauregui-Zabalaga	Senior Counsel	Legal	LEGLE
Nurbek Kurmanaliev	Procurement Specialist	Procurement	GGODR
Jasna Mestnik	Finance Officer	Finance	CTRLA
Aliya Kim	Financial Management Analyst	Financial Management	GGODR
Ma Dessirie Kalinski	Finance Analyst	Finance	CTRLA
Anara Akhmetova	Procurement Assistant	Procurement	ECCKZ
Marina Batkovic	Senior Finance Assistant	Finance	CTRLA
Gulmira Akshatyrova	Program Assistant	Administrative and Client Support	ECCKZ
Asset Bizhan	Private Sector Development Specialist	Private Sector Development	GTCDR
Tiffany Scott	E T Temporary	Administrative and Client Support	GTCDR

Non Bank Staff

Name	Title	City
Hiran Herat	Project/Regional Implementation	Washington, DC
Robert Hodgson	Innovation Expert	Cambridge, UK
Yevgeny Kuznetsov	Innovation Expert	Washington, DC

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Kazakhstan					

I. STRATEGIC CONTEXT

A. Country Context

1. **Kazakhstan is an upper middle-income resource-rich economy with significant but quite narrowly focused R&D and human capital endowments.** Its main natural resource assets are in mineral (oil, gas, ferrous and non-ferrous metals) and agricultural sectors.

2. **Kazakhstan's economic growth increased from five percent in 2012 to six percent in 2013 driven by stronger private consumption and investment.** At the same time, weaker external demand led to a deficit in the current account in 2013 and to a sharp devaluation of the local currency in February 2014. Despite short-term vulnerabilities accentuated by an uncertain global and regional economic outlook, Kazakhstan's medium-term prospects are positive with strong growth on the back of the expanding oil sector and structural reforms envisioned by the comprehensive long-term "Kazakhstan-2050 Strategy" (The Strategy).

3. **The Strategy foresees the country's transition to the knowledge economy within 10-15 years and joining the top 30 most developed countries by 2050.** Having implemented a number of successful strategic reforms during the last five years, the country has been focusing on diversifying away from the resource-based growth through a major industrialization and innovation support program and a number of Small and Medium Enterprise (SME) development activities. Structural reforms described in the Strategy indicate strong commitment to building a knowledge economy that would drive growth, diversification, and global competitiveness by improving the country's key factor endowments—human capital, infrastructure, and institutions.

4. **The Strategy highlights seven priority areas for action by the government, including the need to improve science potential.** Financing of science is set to reach three percent of GDP, with an objective to increase scientific capacity, accelerate knowledge and technology transfer through Foreign Direct Investments (FDI), and to improve efficiency of the National Innovation System (NIS)[1]. Productive innovation is seen as a key growth factor pervading and effectively linking all areas of economy and society. Understanding of context and use of innovation is very important because the current level of Kazakhstan's economic development limits its ability to translate new-to-the-world technologies into economic returns and increase the country's competitiveness in the global market. Therefore, adapting and efficiently using existing global knowledge and practice would be most cost- and time-effective at this stage, and would boost innovative capacity to the level of critical mass generating a culture of innovative competition in all sectors of the economy and society.

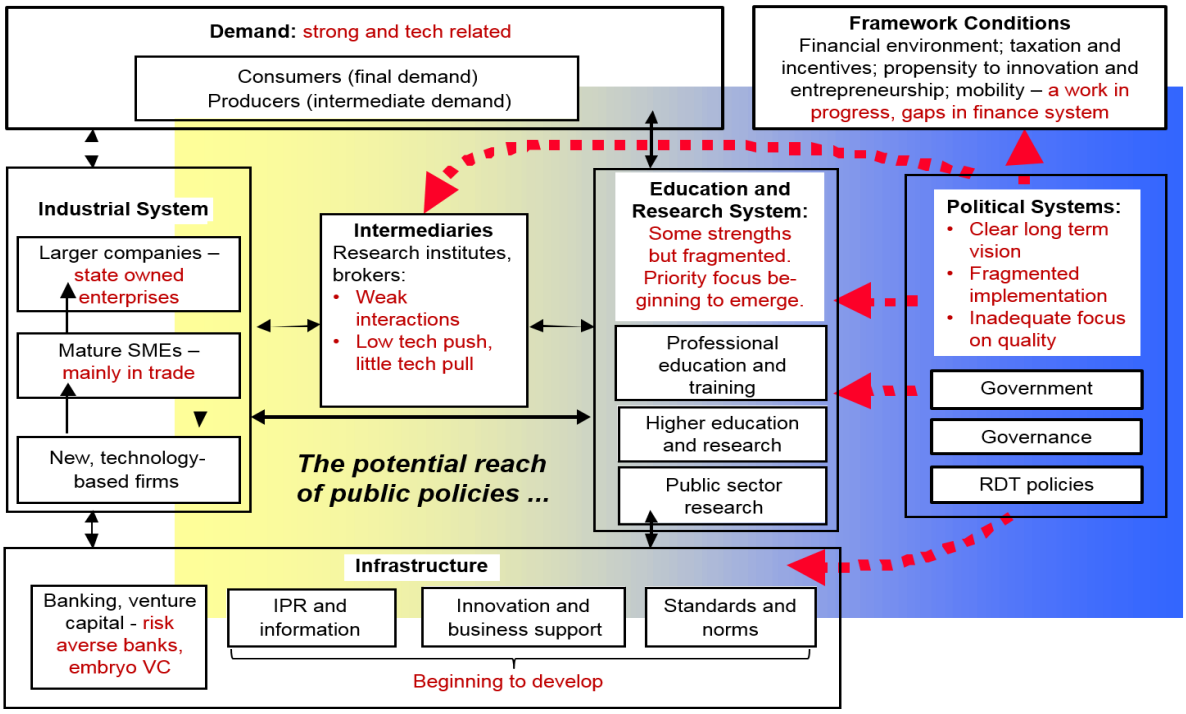
B. Sectoral and Institutional Context

5. **An innovation system consists of a network of organizations, rules, and procedures that affect how a country acquires, disseminates and uses knowledge and technology.** NISs

[1] An innovation system is a network of organizations, rules, and procedures related to the creation, dissemination and knowledge, including enterprise sector firms, universities, research centers, and think tanks. Please see Annex 7 for detailed overview of the National Innovation System of Kazakhstan.

are complex and interactive with many independent actors whose actions need to be coordinated and aligned with strong reinforcing incentives if they are to work well together. Commonly models of NIS stress the interaction of six major components: industrial system, infrastructure, intermediaries, education and research system, framework conditions and political system (see the titles of each box in Figure 1)[2]. The characteristics of current NIS of Kazakhstan are shown in Figure 1 under bullet points on each six NIS components. Figure 1 demonstrates that some of components in the NIS of Kazakhstan are only beginning to emerge and fragmentation (lack of interaction between actors) remains a key priority to address (see Annex 7 for detailed description of Sector Context).

Figure 1. National Innovation System of Kazakhstan



6. **Persistent weaknesses that need to be addressed if Kazakhstan is to achieve the breakthrough changes associated with being an advanced innovative economy relate most notably to:**

i) Coordinated execution of related activities;

ii) Connectivity between the research base and productive enterprises;

iii) Skills in the area of technology transfer and commercialization;

iv) Decision making regarding research grant allocations; and

[2] A well-known example by Nelson, R. (ed.) (1993), National Innovation Systems. A Comparative Analysis, Oxford University Press, New York/Oxford.

v) Linking into international sources in both research and technology sourcing analysis.

7. **From the growth perspective, the main issue of Kazakhstan's innovation is the weakness of dynamic private sector.** However, it is not totally absent. Similarly to some transition economies (China in the 80's, Vietnam, Belarus) it consists of de novo firms created in the recent 20 years in industry, services and particularly agriculture. Technology spin-offs and start-ups (supported by the Technology Commercialization Project) are crucial elements of emerging dynamic private sector, which this project will support.

Government actions for addressing the challenges, including donor financed actions

8. **First, the Government has been undertaking different measures and policies to make innovation a key driver of its economy, including establishment of basic institutions,** launching the State Program of Accelerated Industrial and Innovative Development 2010-2014, Business Road Map 2020, Employment 2020, and the Concept of Kazakhstan's Innovative Development 2020. While being a major effort, these programs so far have yielded mixed results without notable growth of innovative SMEs in non-extractive sectors. This is due, to large extent, to the lack of attention to building productive linkages between different components of the NIS.

9. **Second, approved in 2008, the Government has been successfully implementing the World Bank financed Technology Commercialization Project (TCP, P090695) in three areas:** (i) developing the knowledge base for innovation through research grants, (ii)) establishing a technology transfer officer (Technology Commercialization Office, TCO) and a consortium of laboratories (the International Material Science Center, IMSC) that are likely to become central in the NIS, and (iii) supporting technology startups and spinoffs (see Annex 8).

10. **Third, the Government with the support of the World Bank is preparing the SME Competitiveness and Access to Finance Project (P147705) in parallel.** This project will help build capacity of the private and corporate sector that can then further improve its competitiveness by embedding innovation into its business model and products through the support provided under the Fostering Productive Innovations Project (FPIP). Both projects ignite internal potential of economy through targeted high quality support and exposure to global knowledge and markets.

11. **Fourth, the World Bank and the Government have been involved in activities to support diversification of the Kazakhstani economy, including through the promotion of a modern innovation system, since 2005.** Past activities have included studies through the Joint Economic Research Program (JERP) on topics related to diversification; technoparks; and a supplier development program. In 2010, the World Bank provided intensive capacity building technical assistance to the National Agency for Technology Development (NATD) in technology commercialization, including strengthening its ability to identify critical stages unaddressed by the present day NIS that are associated with various stages of research and technology commercialization.

12. **The World Bank Group remains the main contributor to reform areas in the innovation ecosystem.** Other donors provide ad hoc support to specific initiatives. Similar to the International Finance Corporation (IFC), some bilateral agencies are involved in direct investment financing with the private sector.

Rationale for the World Bank involvement

13. **The rationale for the World Bank's involvement in development of the NIS of Kazakhstan via the FPIP project is threefold.** First, the World Bank actively participated in designing and implementing the TCP in 2007-2015 and is seen as a long-term strategic partner of Kazakhstan in fostering productive innovations in Kazakhstan. The World Bank will be able to draw from the lessons learned in the TCP and similar projects implemented worldwide[3] (Chile, Vietnam, etc.). In particular, the proposed operation will help to leverage the TCP achievements and take this promise and the emerging success to the next level by scaling-up the TCP activities and building on the pilot innovation programs introduced by the government in the recent years to make innovation a more active element of economic growth (see Annex 8). Second, the Bank's involvement will allow Kazakhstan to surmount the common problem of risk-averse approach to spending public funds that rendered many state-funded innovation initiatives inefficient. Third, the World Bank's involvement will enable coordination and synergy between the proposed operation and the World Bank's complementary projects, such as the SME Competitiveness and Access to Finance Project. The proposed project will open up SMEs' access to R&D infrastructure, provide ideas and networking opportunities that will help SMEs overcome some of size disadvantages in achieving competitiveness through innovation. Thus, as a forward-looking complement to the above project, the FPIP will promote its results by addressing market failures and supporting innovative champions in all sectors of economy.

C. Higher Level Objectives to which the Project Contributes

14. **The project aims to support the Government's target of improving Kazakhstan's ranking on the WEF's Global Competitiveness Index from 72nd (out of 139 economies) in 2012 to 50th place by 2020.** It will focus on the Innovation pillar of the index contributing to improvement of such critical areas as: (i) capacity for innovation, (ii) quality of scientific research institutes, (iii) company spending in R&D, (iv) university-industry collaboration in R&D, (v) availability of scientists and engineers, and (vi) PCT patents and applications. In addition, the project was included as one of the instruments in the Science and Innovation Pillar of the Partnership Framework Arrangement (PFA) between the World Bank Group and the Government of Kazakhstan signed in May 2014.

15. **The project is linked to the first pillar of Kazakhstan's Country Partnership Strategy (CPS) FY12-FY17 on improving competiveness and fostering job creation.** The project was not originally contemplated in the CPS because it has emerged from recent policy dialogue on scaling up emerging successes under TCP and fostering translation of technology

[3] e.g. the Millennium Science Initiative Project in Chile, the Fostering Innovation Through Research, Science And Technology project in Vietnam.

commercialization into improved competitiveness of the economy with the Ministry of Education and Science (MOES) and the Prime Minister's Office. Similarly to the TCP, the project will help the country to reach the development goal of achieving competitiveness gains through macro-stability and international integration (in global value chains).

Contribution to the World Bank's Twin Goals

16. **Based on a number of promising projects under the TCP, Component 2 of the project (Innovation Consortia) is expected to result in increased welfare of the poor population through introducing innovation to the agricultural practices,** enhancing access to safe drinking water and improved quality and accessibility of healthcare and education (see Annex 9). This expectation is substantiated by the fact that 10 percent of all titles and licenses owned by Kazakh entities in 2012 were related to agriculture and biotechnology, while about 75 percent of the poor live in rural areas. This indicates existence of high potential for innovative activities in the agricultural sector of Kazakhstan that could reduce poverty through the following direct and indirect effects: (i) permanent increase in productivity of rural labor leading to lower unemployment and/or higher wages in rural areas; (ii) lower food prices due to higher output and production of new varieties of agriculture goods; and (iii) production linkages with non-agriculture sectors. The project will also promote shared prosperity through creation of new jobs with competitive salaries among scientists and support personnel employed by innovative projects and innovation consortia. Further, Component 3 contributes to development of start-up companies, which are believed to be net job creators[4]. Involvement of graduate students in Senior Scientist Groups (SSG) and Junior Researcher Groups (JRG) and PhD research and training as part of the Component 1 of the project will boost social mobility among the youth.

17. **It is clear that inequality does not have only the income dimension.** Inequality in Kazakhstan exists in terms of access to many important public goods, such as safe drinking water, sanitation, healthcare and education, Internet and protection from natural disasters (e.g. see Annex 9, Figure 2). The availability and good quality of such social services and public goods are prerequisites to accumulation and use of human capital, while their absence leads to lower productivity of the bottom 40 percent of the income distribution. The FPIP project, via its inclusive innovations consortia subcomponent, is expected to directly contribute to equal provision of the above-mentioned goods and thus increase productivity of the bottom 40.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

18. The Project Development Objective is to promote high-quality, nationally relevant research and commercialization of technologies.

[4] John C. Haltiwanger, Ron S. Jarmin, and Javier Miranda, 2012, "Who Creates Jobs? Small vs. Large vs. Young", Working Paper No. 16300, National Bureau of Economic Research.

B. Project Beneficiaries

19. **Direct project beneficiaries include: (i) individual senior scientists and junior researchers who receive grants for developing eligible R&D ideas**, (ii) PhD candidates, post-doctoral students, and researchers abroad who receive grants for joint research and training, (iii) Kazakh research institutes, design bureaus, and scientific and engineering laboratories that receive project funds for upgrading their laboratories as part of being members of productive technology consortia in agriculture, extractive industries or manufacturing or inclusive innovation consortia in social services sector, (iv) innovative SMEs that receive public support through a Funding Facility for technology-based enterprises and business development services from innovation brokerage to generate deal flow, (v) entities or individuals that benefit from services of the Technology Acceleration Office abroad, (vi) technology transfer offices in Kazakh universities that receive capacity building and networking assistance, (vii) staff members of the institutions engaged in coordination of the NIS that are trained on project funds; and (viii) key stakeholders of the NIS, including MOES and other relevant authorities and ministries of Kazakhstan. The number of direct number of project beneficiaries has been estimated in Annex 1 and it includes researchers under and Ph.D. holders and students in Component 1 (Development of the Knowledge Base for Innovation). It is not possible to estimate the number of direct beneficiaries (people) under other components because of the multitude of entities that will be involved in the activities.

20. **Indirect project beneficiary is Kazakhstan's enterprise sector.** As Figure 1 indicates, its main focus in the productive sector is sophisticated firms in all sectors of the economy with demand for new technologies and knowledge. Intermediate-level firms (which need help in generating effective demand for domestic technological effort) which may become part of innovation consortia are also focus of this project. Basic-level SMEs (with rudimentary technological capabilities) are the focus of SME Competitiveness Project, being prepared at the same time and coordination with this project.

C. PDO Level Results Indicators

21. **The PDO level results indicators include:**

(i) Number of international publications from Senior and Junior Research Groups in peer-reviewed journals;

(ii) Share of enterprise sector financing of R&D in Senior & Junior Scientist Research Grant Program (%);

Total financing of the consortia (USD);

(iii) Number of technology-based startups created under the project and making commercial sales; and

(iv) Number of Patent Cooperation Treaty Agreements approved for project beneficiaries.

III. PROJECT DESCRIPTION

A. Project Components

22. **Component 1 - Development of the Knowledge Base for Innovation (US$40 million):** The component aims at promoting high-quality, nationally relevant research and development and advanced human capital activities through the provision of Junior Researcher Group Grants, Senior Scientist Group Grants, and PhD Research and Training Grants. The component will finance:

(i) Grants for young researchers and internationally recognized researchers (US$30 million). Based on the TCP, the sub-component will finance two types of grant instruments for eligible R&D ideas: one for young researchers (a continuation of the JRG, Program) up to US$0.6 million each and one for internationally recognized researchers up to US$1.5 million each (a continuation of the SSG, Program).

(ii) PhD research and training abroad in technical areas strategic for Kazakhstan's economy (US$10 million). The grants for PhD research and training will be for joint international research activities and training for PhD candidates, post-doctoral students, and researchers who are already abroad. It will also pilot higher education consortium between Kazakhstan and a relevant Western university of excellence, such as Imperial College in London or Colorado School of Mines.

23. **Component 2 – Innovation Consortia (US$35 million).** The objective is to promote collaboration among existing scientific research institutes and design bureaus and scientific and engineering profile laboratories in Kazakhstan (i) in respect of research and development activities for purposes of improving the productive sectors of the Borrower's economy, through the provision of Productive Sector Consortia Grants, and (ii) in respect of the delivery of social services, including improving the livelihood of the urban and rural population, through the provision of Inclusive Innovation Consortia Grants. The component includes two windows of Calls for Proposals: (i) Productive sector consortia (agriculture, extractive industries, manufacturing; and (ii) Inclusive innovation consortia (health, education, water, urban and rural infrastructure). The consortia projects will be established through a competitive two-stage facilitated selection process which mandates international collaboration and co-funding from users and clients. In the first stage of the process, industry- and R&D-led applications will be assessed against the selection criteria by the International Science and Commercialization Board (ISCB). The ISCB will recommend which applicants proceed to stage two. At stage two, the Board can identify synergies between applicants to ensure that the best combination of participants and support is identified for each consortium application.

24. **Component 3 – Consolidation of the Technology Commercialization Cycle (US$24 million).** The objective is to complement the existing financial instruments and solutions suitable to different stages of start-up company development. The four sub-components envisage promoting the development of start-up companies through:

(i) Establishment of the Early Stage Venture Capital Fund ("ESVC Fund") for purposes of providing ESVC Investments to finance ESVC Subprojects, including provision of management support to (US$10 million);

(ii) Provision of consultants' services to develop technology and innovation ideas into viable commercial projects, through innovation brokerage and deal flow generation activities, pursuant to criteria set forth in the POM (US$2 million).This subcomponent would seek to catalyze a market for specialized business development services that are able to transform technology and innovation ideas into commercial projects acceptable for early stage venture capital or other investors;

(iii) Establishment and operation of Technology Acceleration Offices outside of Kazakhstan (US$2 million). Such offices will provide technology commercialization assistance to firms by providing information on foreign markets and international trends in a given sector, facilitating interaction with partner institutions in markets where the office is located, organizing training event for firms, helping with the recognition of locally advanced technologies in foreign markets, etc, and;

(iv) Establishing the capacity of existing Technology Transfer Offices (TTOs) at major Kazakh universities and enhancing their capacity through the provision of training (US$10 million). This sub-component will establish a coherent network of 5-6 TTOs with a critical mass of technology commercialization and transfer capabilities, build their capacity and thus facilitate more efficient and timely technology transfer within the network.

25. **Component 4 - Strengthening Coordination of the National Innovation System; Enhancing the Capacity of the Existing Institutional Structures (US$6 million).** The objective is to promote better coordination among key stakeholders and relevant authorities and ministries of the Borrower in the NIS, by designing and establishing an Innovation Observatory, consisting of a formal framework to monitor innovation performance of the public and private sectors, through provision of goods, consultants' services, all pursuant to criteria set forth in the Project Operations Manual (POM). The component will finance: (i) the launch of Innovation Observatory (a permanent framework to monitor innovation performance both in productive and public sector) and (ii) awareness raising and coordination activities (to articulate and disseminate an inclusive innovation agenda for Kazakhstan).

26. **Component 5 – Support Project Implementation (US$5 million)**. The Component will support the Project Implementation Unit (PMU) in carrying out the project management, monitoring and evaluation, awareness raising activities, and capacity development.

27. **Main project components (components 1-3) introduce bottom-up competitive selection procedures open to all sectors of the economy which intend to foster dynamic productive sector in the country, particularly a segment of private de novo firms.**

B. Project Financing and Costs

28. **The estimated project financing includes: (i) the proposed Investment Project Financing (IPF) of US$88 million and (ii) Government counterpart funding of US$22 million taking into consideration the practice of similar type of projects negotiated earlier**

in Kazakhstan. The project preparation is included into the ongoing process of Partnership Framework Assessment (PFA) design that will have a separate fast track procedure of including its projects and activities into the Republican Budget. The project financing has been included into the Republican Budget on November 14, 2014.

29. **A summary table of project costs by components and share of IBRD financing is below in Table 1 (see more details in Annex 2):**

Table 1. Project Costs and Financing (of which IBRD percent)

Project Components	**Total**	**IBRD US$**	**percent**
1. Development of Knowledge Base for Innovation	40,000,000	40,000,000	100
2. Innovation Consortia	35,000,000	35,000,000	100
3. Consolidation of the Technology Commercialization Cycle	24,000,000	13,000,000	54
4. Strengthening coordination of the National Innovation System; Enhancing the Capacity of the Existing Institutional Structures	6,000,000		
5. Support Project Implementation	5,000,000		
Total Project Costs	110,000,000	88,000,000	80
Front-End Fees			
Total Financing Required			

C. Lessons Learned and Reflected in the Project Design

30. **The key high-level objective of the project is to induce long-term collaborative projects and a culture of cooperation.** The key lessons of the two major Independent Evaluation Group (IEG) reviews of innovation projects[5] and of recent major World Bank-OECD report (2014) is that establishing such collaborative culture is experimental: it involves mistakes and requires a capability to monitor the experience and learn from it. Flexibility in the project design has proven to be a key success factor for many innovation projects.

31. **The above suggests that is crucial to include feedback loops to reveal and address evolving needs throughout the project implementation.** This lesson is reflected in the Component 4 of the project design suggesting strengthening capacity of institutions that would have the authority to continuously monitor the development of the NIS. The lessons learned showed that realistic monitoring mechanisms should be determined during project preparation and implemented at the start of the project. Periodic beneficiary surveys are needed to track the results of project grants in real time, rather than just at the end of the project. These beneficiary surveys will be conducted more often and the results will be monitored by the institutions engaged in coordination of the NIS, MOES and discussed during project implementation support.

[5] IEG, previously, OED, 1995 and 2013, https://ieg.worldbankgroup.org/evaluations/world-bank-group-support-innovation-and-entrepreneurship.

32. **Clear communication is needed with potential beneficiaries about the availability and characteristics of funding mechanisms.** Communication and diffusion of project activities will be a key activity to be undertaken. This is one of the objectives of Component 4.

33. **The project includes two broad domains of collaborative endeavors: innovation consortia (Component 2) and commercialization cycle resulting in technology startups (Component 3).**

34. **In terms of long-term innovation effort (consortia – Component 2), based on a good practice (EU technology platform, Australia and Russia R&D consortia), the key lesson is the need for active engagement of a government agency leading the effort in both formation and monitoring of consortia.** The government needs to become an informed client in designing and managing the consortia. In practical terms it means adoption of a competitive, two-stage, facilitated selection process. In the first stage of the process, industry- and R&D-led applications are assessed against the selection criteria established by a selection board which then recommends which applicants proceed to the stage two. At stage two, the selection board should seek to identify synergies among applicants to ensure that the best combinations of participants and support are identified for each consortium application. This process may involve an independent facilitator to broker between applicants to negotiate arrangements for the establishment of a single project consortium.

35. **In the Vietnam Fostering Innovation Project through Research, Science and Technology (P117394; approved by the Board in 2013), there is a proxy for such two-stage selection procedure.** The design is two-stage because potential applicants can apply for a grant to design a consortium proposal (Stage 1) and then submit an application through a competitive call for proposal (Stage 2). Yet the early indication from the Vietnam project is that this is insufficient and a more pro-active effort to generate collaboration is desirable. Learning the lesson of this project, this project supposes to adopt a full-fledged two-stage selection procedure, as specified above.

36. **The Bank has been instrumental in a number of cases in creating or realigning a venture capital industry.** A venture capital culture can be promoted by creating a demonstration effect. A positive demonstration effect will attract the right kind of investors and the skills needed to run risky but rewarding operations. Examples from Israel, India, and Turkey indicate that a properly set-up venture capital fund, supported with public funds, can make a useful contribution to the development of technology financing and creation of knowledge-based companies. Public funding for the early stage financing is justified, given that the objective is to create a demonstration effect and to obtain leveraging from private funds. The funds are managed and operated by the private sector. In India, the National Innovation Project (P109065) had a significant positive impact on the development of the venture capital industry and encouraging framing of appropriate policies and incentives. The project's contribution in terms of influencing the culture of risk finance and enabling foreign venture capitalists to enter India, was equal to if not more important than its dollar contribution. Similarly, in Turkey, the Industrial Technology Project (P009073) has supported two venture capital funds, contributing to the creation of a venture capital industry.

37. **Examples from Korea and Russia show that a stable deal flow remains a major challenge to the creation of new technology based startups.** The Korean government launched domestic venture capital industry with a publicly funded venture capital fund back in the 1990s. However, the supply of adequate project ideas has remained low and technical and business idea development, including elaboration of a proof of concept, is lacking. This project aims to avoid such a situation by proposing a comprehensive approach which includes setting up a small group of privately managed deal flow agents who will assist startups in developing ideas into projects suitable for venture capital financing. Establishing such deal generation structures is not easy. The design of this project intends to minimize problems demonstrated in deal flow facilitators in the Argentina Innovation Project. There, most of the consortia became closed rather than open structures -- charging universities for the privilege of working with the consortia. Yet there is at least one successful deal flow consortium (in Cordoba where the tradition of collaboration already existed). Three lessons reflected in the current design are the following: (i) the need for more aggressive promotion; (ii) proactive approach in assembling consortia with the right mix of expertise rather than selecting what comes from a call for proposals; and (iii) simplified, easy to manage remuneration structure.

38. **Another example of a seed fund implementation comes from a productive innovation project in Mexico for the National Research Council (Knowledge and Innovation Project, P044531).** Implementation of the fund was managed through a public agency, and the project suffered from too conservative decision making based on the agency's general aversion to risk. As a result, only four investments reached the milestone of exiting from the fund and only one of those achieved an appreciable capital gain. In contrast, in the Armenian E-Society and Innovation for Competitiveness Project (P115647), the venture capital is managed according to the best practice of the private sector and its early experience is promising.

39. **Specific international lessons on the design of technology transfer offices have influenced the design of Component 3.** These include the need for these offices to be administratively independent to operate in an agile manner and be able to hire and reward professionals with the requisite skills; the need for a critical mass of projects to feed the office's project pipeline; and the importance of linkages across these TTOs.

40. **All those lessons demonstrate that transformation of innovation system (which the project undertakes) is a highly complex process ripe with lags and uncertainty.** Early detection of inevitable mistakes in this process and their correction requires a concerted effort of the client and the World Bank which would be supporting project implementation.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

41. **The proposed Project will be implemented by the Ministry of Education and Science (MOES).** The MOES will be responsible for strategic oversight and technical aspects of project implementation. In addition, a Project Steering Committee (PSC) to be chaired by the Vice-Minister within MOES will be established for strategic project management by the Ministry. The existing Project Management Unit (PMU) of the MOES for the TCP will be engaged into the Project and be responsible for day-to-day project and grant administration. The International

Science and Commercialization Board (ISCB) will provide scientific guidance related to all scientific matters associated with the project.

B. Results Monitoring and Evaluation

42. **The Monitoring and Evaluation (M&E) framework is included in Annex 1**. The PMU will collect data with input from the MOES and the ISCB. Data collection is not expected to be costly or complex; data is obtained directly from project beneficiaries as part of grant and payment conditions and regular reporting; and an annual survey of scientists and entrepreneurs will be carried out to complement this data (see Annex 3). The PMU will produce regular project progress and grant monitoring reports, a mid-term report for the World Bank and key stakeholders and input to the results and a completion report in the end of the project. The PSC will regularly review project M&E data to ensure satisfactory achievement of the end of the project outcomes. The PMU will organize semiannual events chaired by the Vice Minister of the MOES to disseminate project results. In addition to the PMU's monitoring of the project results, an Innovation Observatory - a permanent framework to monitor innovation performance both in productive and public sector will be established under Component 4.

C. Sustainability

43. **The likelihood of sustaining the project objectives beyond the closing date of the project is high. The Government is committed to an ambitious strategy of fostering innovation as a driver of economic growth in the Strategy.** The project will provide important medium-term input to its implementation. The Borrower's commitment to sustaining the objectives is demonstrated through multiple innovation initiatives launched to support the Strategy (see Section I.B). While the main components of the NIS are already in place as a result of the Government's efforts during the last 20 years and the TCP, the proposed project would help to leverage the achievements and build on the pilot programs by developing horizontal linkages between the NIS players and promoting innovation as a more active element of Kazakhstan's economic growth.

44. **In addition to the Government's ownership of the project objectives, sustainability is increased through the project design in the following ways.** The Government plans to improve capacity of existing governing institutions to assure better coordination among the key stakeholders. These institutions will play a key role in promoting the cultural change and advancing horizontal linkages in the NIS – the two high-level objectives to which the project aims to contribute. The project will finance the design and development of Innovation Observatory, and based on the Government's commitment to using innovation as a driver of economic growth and its awareness of the importance of coordinating the innovation activities on a high level, it is expected that the Innovation Observatory along with strengthened institutional mechanisms will be maintained after the project closure.

45. **Besides, the project will support transitioning of the ISCB towards a sustainable long term position.** The ISCB was constituted as part of the TCP with the intention to introduce informed neutrality of decisions on applications for research grants and was vested with the

exclusive authority to determine how the grants are allocated[6]. The Board is still needed in the new project as the decision making process for grant allocation continues to show some weaknesses, even though there is good analytic approach and clear evidence based recommendations. However, the composition of the ISCB and the way it operates need to be updated. This includes adding Kazakh representatives to the Board, conducting trainings on the decision-making for grant allocation, developing a code of ethics, and improving reporting and feedback procedures. These changes should be introduced in the course of project implementation (see Annex 3).

V. KEY RISKS AND MITIGATION MEASURES

A. Risk Ratings Summary Table

Risk Category	Rating
Stakeholder Risk	**M**
Implementing Agency Risk	**M**
- Capacity	**S**
- Governance	**S**
Project Risk	
- Design	**S**
- Social and Environmental	**M**
- Program and Donor	**M**
- Delivery Monitoring and Sustainability	**M**
Overall Implementation Risk	**M**

B. Overall Risk Rating Explanation

46. **The overall implementation risk is moderate.** It is likely that risks related to the PMU's and beneficiaries' capacity and delays in providing counterpart funds can be substantially mitigated through the implementation arrangements and regular trainings of beneficiaries by the PMU. The risk of limited deal flow for Components 2 and 3 is mitigated by the fact that the results of the TCP demonstrated high potential commercial relevance of the Kazakh science (6 out of 21 research groups' projects had sales value). In addition, the proposed two-stage application procedure (e.g. innovation consortia/technological platforms) is designed to be the most important risk mitigation measure for the new instrument of consortia. The project follows a comprehensive approach by including both a pilot private-public venture capital fund and setting up a group of privately managed deal flow agents who will assist grantees in developing ideas into projects suitable for venture capital financing.

[6] The ISCB provides guidance for all scientific matters associated with the TCP, including the selection of the research groups, monitoring of their scientific and commercialization progress, etc.

47. **The overall risk is moderate.** It is expected that the project will be processed smoothly because the Government has demonstrated interest in the speedy launch of the project.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

48. **Results of the economic analysis and sensitivity to key variables:** The principal benefit of the project comes from sustainable development of innovative research and production in Kazakhstan through the following vehicles:

(i) Accumulation of scientific infrastructure and human resources, which are prerequisites for cutting-edge R&D and adoption of scientific knowledge from abroad;

(ii) Establishment of strong industry-R&D linkages and development of the technology commercialization cycle;

(iii) Addressing existing market failures and information asymmetries;

(iv) Building up institutional capacity to support commercially-viable R&D activities;

(v) Increasing attractiveness of a science career among young people, thus contributing to a stable supply of human capital to the NIS of Kazakhstan; and

(vi) Diversifying Kazakhstani economy and increasing the share of production with high value added in the GDP.

49. **Assessment of costs of the Project is straightforward and, in broad terms, is based on two types of costs:** a) direct financial outflows under the project components and b) indirect cost of public funds needed to finance the project. The cost-benefit analysis based on a series of assumptions, available statistical data, and relevant literature indicates the project's net present value (NPV) of US$25.8 million. To test sensitivity of the result to changes in key variables, NPV was recalculated using 7.5 percent discount rate (vs. 5.5 percent in baseline case) and lowering projected social return rate by 10 percentage points to 50 percent (vs. 60 percent in the baseline case). Application of a higher discount rate had a net negative effect, while lowering Project's expected impact on economy reduced benefit streams and did not impact its costs.

Table 2. Comparison of Net Benefits in Base Case and Alternative Scenarios

Scenario	NPV*	BCR*
Baseline	US$25.8 million	1.25
Pessimistic	US$19.0 million.	1.18
Worst-case	US$9.8 million.	1.10

*These results do not include contributions from the private sector (i.e. through matching grants)

Consideration of economic analysis in the FPIP design. The cost-benefit analysis presented in this analysis supports implementation of the FPIP in light of positive net benefits. As an alternative to the FPIP project, expansion of existing TCP project with concentration on

research grants could be considered. Although in this case there would be lower administrative costs and time savings, this avoided cost is much smaller compared to foregone benefits. These foregone benefits include, among other, economies of scope and strong linkages achieved by innovation consortia and matching grants, reduced extreme poverty and increased income equality as well as enhanced institutional capacity aimed by Components 4 and 5.

50. **Use of economic analysis during project implementation.** The PMU will collect information on disbursements by component/subcomponent, cost structure of R&D projects, result indicators (Annex 1), achievements or expected achievements under grants and characteristics of projects (e.g. number of R&D groups, amount of venture funds attracted, etc.). This information will be used to determine at mid-term of project implementation whether the economic analysis needs an update. A full economic analysis will be carried out in the Implementation Results and Completion Summary at the end of the project life to compare with the economic analysis at appraisal.

51. **Project impact on the Government's fiscal situation.** The Project poses no risk to the monetary or fiscal stability of Kazakhstan. A total of US$110 million to be spent in span of 5 years comprises is less than 0.06 percent of the annual GDP of Kazakhstan and 0.26 percent of the total budget spending in 2013 and should not result into inflationary processes or cause a budget deficit.

B. Technical

52. **The project creates two types of synergy effects and thus additionality of this project is two-fold.** First is a synergy effect which stems from design and implementation of a long-term collaborative effort (technology consortia) and helps to resolve a collective action problem. Second is a synergy emerging from the consolidation of various technology commercialization initiatives (both in venture financing and business development) into a commercialization cycle - a coherent set of institutions supporting development of a private start-up.

53. **The project addresses several important areas, including early financing market gap, lack of investment readiness of project ideas by SMEs and young startups; information asymmetries and coordination failures.** The project will provide several schemes that could help innovative SMEs to overcome investment constraints originating from real and/or perceived (i.e. arising from information asymmetries) risks of a commercialization of a technology project. While the proposed project does not address all areas of improvement for doing business, it does contribute considerably to improvement of access to finance, especially for small startups. More specifically, the project aims to develop a set of flexible early financing tools for innovative SMEs bundled with startups-targeted management consulting services to help those firms settle and survive at their seed-stage and to assist them to eventually become more attractive for venture funds and banks. This is of critical importance because, according to the enterprise survey 2013, lack of such early finance tools in Kazakhstan remains the main obstacle for SME growth, and development of a diverse and well-functioning capital market in Kazakhstan will take long time.

54. **Continuation of Senior Scientist and Junior Researcher Grant Program will support creation of companies by scientists willing to commercialize results of their R&D.** Support of technology consortia will provide longer term incentive for a broader range of the NIS players, including productive sector, to build and strengthen industry-science linkages and achieve positive spill-overs. Consolidation of the technology commercialization cycle will allow to better support innovative technology based startups and attract private venture capital. Component 4 will help the Government of Kazakhstan to better coordinate various innovation support initiatives and programs and, importantly, to set areas of focus and make necessary policy adjustments. Technology acceleration offices in world's leading technology centers will link Kazakhstan's science to the best international ecosystems of knowledge transfer. TTO would proactively work with universities and other academic institutions to transform research ideas into intellectual property valued by market (such deals for risk capital investment, patents or licenses).

C. Financial Management (FM)

55. **The project FM assessment established that the FM arrangements existing in the MOES[7] overall meet World Bank requirements, including budgeting and planning, accounting and financial reporting, flow of funds, internal controls, FM staffing arrangements and external audit.** The MOES is experienced with the World Bank financed projects and have satisfactory ratings in general. However, in order to bring the project's FM arrangements in full compliance with the Bank's requirements, the existing PMU of the MOES that is currently implementing the TCP will complete the following actions for capacity building purposes: (i) document the FM procedures including internal controls in the Financial Management Manual (FMM) that is a part of the project POM, (ii) update the Terms of References (TORs) for the Financial Manager and Accountant to reflect responsibilities under the proposed project; and (iii) a module to the existing accounting software will be developed that has a capacity to generate Interim Un-audited Financial Reports (IFRs) and capture the new project's accounts. The Early Stage Venture Capital Fund (ESVCF) will be established during the course of the Project. The FM arrangements of the ESVCF will be monitored closely. The ESVCF will be required to have written procedures for the flow of funds and internal controls. The development of the ESVCF Manual and a Fiduciary Handbook for Subproject Grant Recipients will be conditions of the disbursement for the relevant subcomponents.

56. **"Fiduciary Handbook for Subproject Grant Recipients" means a document prepared and officially approved by MOES,** and acceptable to the Bank that regulates all procurement and financial management procedures and reporting arrangements applicable to the recipients of subproject grant.

57. "**ESVC Fund Manual" means a document developed by the ESVC Fund,** adopted by MOES and acceptable to the bank that regulates all business processes, reporting lines and distributions of responsibilities and accountability, including procurement and financial management of the ESVC Fund.

58. **Two audit reports will be provided annually: the annual audits reports for the project financial statements and the entity audit report for ESVCF after its establishment**.

[7] It is proposed that the MOES will move the PMU as a unit of the MOES. Preliminary assessment of the MOES showed that in general the FM arrangements existing in the MOES meet minimum Bank's requirements..

Both audits will be provided in line with the TOR acceptable to the Bank and the reports will be provided to the Bank within six months after the end of each fiscal year, and also the final one within six months after the project closing. The reports will be made publicly available as per the World Bank Policy on Access to Information, and the terms of the General Conditions, as an integral part of the Loan Agreement. More details on the FM arrangements and Disbursements are provided in Annex 3.

D. Procurement

59. **Project procurement will be undertaken in accordance with the World Bank Procurement Guidelines.** Specifically, procurement will be carried out in accordance with: "Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers, dated January 2011 and revised July 2014; "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers", dated January 2011 and revised July 2014; and the provisions of the Loan Agreement. The October 15, 2006 World Bank Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credit and Grants (revised January 2011) will also apply.

60. **The overall procurement risk for the project is rated High.** The risk rating is based on experience from the past and ongoing Bank-financed projects in Kazakhstan, the general public procurement environment and current MOES capacity in administering procurement. The World Bank's procurement staff will provide hands-on advice and assistance. Wide advance advertising will be carried out for project procurement packages, with proactive search and contact of potential suppliers and consultants. The procurement plan covering the initial 18 months of project implementation has been prepared by the MOES. Detailed procurement arrangements are in Annex 3.

E. Social (including Safeguards)

61. **Involuntary land acquisition or resettlement are not anticipated under the project activities, however due diligence measures are in place.** All subprojects/grants will be screened to ensure: (i) compliance with the World Bank Group (IFC) exclusion list, (ii) that no subprojects with significant impacts of a Category A type are supported, and (iii) that no subprojects/grants will necessitate involuntary land acquisition. Open market purchase of land on a willing seller-willing buyer basis may be used. Any rehabilitation works, such as laboratory upgrades/rehabilitation, if needed, are expected to be within existing facilities. The POM includes check lists for screening of all grants at the application stage to ensure compliance. Due diligence and monitoring is expected to be carried out by the delegated social and environmental staff at the PMU and supported through regular Bank implementation supervision.

62. **The project is expected to have a range of positive social impacts.** For example, the inclusive innovation consortia are expected to have a long-term impact on improvement of social service delivery in various sectors (health, education, water, urban and rural infrastructure). This project will also create additional jobs and is expected to have a positive effect on increasing livelihoods for both rural and urban communities. In addition, it will promote opportunities for local young scholars and talent development of both genders in the country. The call for proposals under the project will encourage female researchers to apply for funding, but the key

criteria are high quality and commercial relevance irrespective of gender. The project will provide opportunities for prospective women entrepreneurs to utilize the innovation space. According to the analysis in Annex 10, persistent prevalence of female students in both undergraduate and graduate classes has not translated into prevalence in Science & Technology/R&D sphere.

63. **To promote the principles of good governance and transparency the POM will reflect detailed operational policies and procedures to insure independent decision-making in award and allocation of all grants.** The grievance procedures will also be publicly available for stakeholder participation and feedback. The Beneficiary Feedback Mechanism (BFM) will be expanded from the currently used model under TCP and include verbal, online and survey channels (see Annex 3).

F. Environment (including Safeguards)

64. **The project triggers Environmental Assessment policy (OP/BP 4.01) and according to the policy is categorized as Environmental Category B.** The project will not have any potential large, significant or irreversible impacts. Only environmental Category B and C sub-projects will be eligible, and projects having large scale impacts (Category A) are excluded as described in the Environmental Management Framework (EMF) prepared for the project. The environmental due diligence procedures identified in the EMF comply both with Kazakhstan national and World Bank environmental safeguards procedures.

65. **Environmental due diligence will be applied through the procedures defined in the EMF for the sub-projects selected by the project institutions.** The EMF outlines the guiding principles of environmental screening, assessment, review, management, and monitoring procedures for two distinctive types of sub-projects: (i) grants supported through Components 1 and 3 and (ii) for smaller rehabilitations expected under Category 1-3. In addition, it describes roles and responsibilities in carrying out the environmental work during the project implementation. The EMF was disclosed in Russian and English language on the MoES website on September 10, 2014 and was publically discussed. The EMF will be integral part of the POM.

66. **According to the EMF, sub-project applicants will be required to carry out adequate type of environmental assessment set in the EMF of the proposed sub-projects and to obtain environmental permits (if required)** as prescribed by the national legislation and comply with the World Bank safeguards policies. The applicants will be guided by the trained environmental personnel in the PMU.

Annex 1: Results Framework and Monitoring

Country: Kazakhstan

Project Name: Kazakhstan: Fostering Productive Innovation Project (P150402)

Results Framework

Project Development Objectives

PDO Statement

The Project Development Objective (PDO) is to promote high-quality, nationally relevant research and commercialization of technologies.

These results are at | Project Level

Project Development Objective Indicators

Indicator Name	Baseline	Cumulative Target Values					
		YR1	YR2	YR3	YR4	YR5	End Target
International publications from Senior and Junior Research Groups in peer reviewed journals (annual) (Number)	7.00	7.00	7.00	8.00	11.00	14.00	14.00
Share of enterprise sector financing of R&D in Senior & Junior Scientist Research Grant Program (annual) (Percentage)	5.50	5.50	5.50	7.00	9.00	12.00	14.00
Total financing of the consortia (annual) (Amount(USD))	0.00	0.00	17467500.00	34935000.00	34935000.00	34935000.00	34935000.00

Technology-based start-ups created under the project and making commercial sales (annual) (Number)	6.00	6.00	6.00	7.00	9.00	12.00	12.00
Patent Cooperation Treaty agreements approved for project beneficiaries (annual) (Number)	0.00	0.00	0.00	0.00	1.00	3.00	3.00

Intermediate Results Indicators

		Cumulative Target Values					
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Grants approved for Senior and Junior Research Groups (annual) (Number)	33.00	33.00	43.00	53.00	63.00	06300	63.00
Ph. D. holders and students engaged in joint research and training (annual) (Number)	0.00	0.00	25.00	50.00	75.00	100.00	100.00
Completed projects with social impact (annual) (Number)	5.00	5.00	5.00	5.00	7.00	9.00	9.00
Applications for financing consortia created based on a	0.00	0.00	25.00	50.00	50.00	50.00	50.00

cooperation agreement (annual) (Number)							
License agreements signed (annual) (Number)	0.00	0.00	0.00	0.00	1.00	3.00	3.00
Total value of the venture capital fund created (cumulative) (Amount(USD))	0.00	0.00	1000000.00	3000000.00	8000000.00	16000000.00	16000000.00
The Innovation Observatory launched (Yes/No)	No	No	Yes	Yes	Yes	Yes	Yes
Direct project beneficiaries (Number) - (Core)	302	302	402	502	602	627	627
Female beneficiaries (Percentage - Sub-Type: Supplemental) - (Core)	10.00	10.00	10.00	12.00	14.00	16.00	18.00

Indicator Description

Project Development Objective Indicators				
Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
International publications from Senior and Junior Research Groups in peer reviewed journals (annual)	The indicator includes publications outside of Kazakhstan. It measures output of the SSG and JRG component against international peer standards and improvement of scientific performance.	Semiannual	Progress reports from beneficiaries to PMU	PMU
Share of enterprise sector financing of R&D in Senior & Junior Research Grant Program (annual)	This indicator measures co-financing provided by any enterprise, including state-owned enterprises, for the research grant program for SSGs and JRGs financed by the project. The private sector is small or non-existent in Kazakhstan and it is more likely to expect financing from state-owned enterprises than private sector. This indicator goes to relevance - enterprise R&D contributing to expand program and to leverage limited public funding.	Annual	Progress reports from beneficiaries to PMU	PMU
Total financing of the consortia (annual)	This indicator includes the project grant and contribution of consortia members, including enterprises. It goes to relevance - enterprise R&D contributing to expand program and to leverage limited public funding. There will be two contests to award several grants- one in the second and one in the third year. In the first year there will be preparation to complete the design of the grant program and to inform all potential applicants.	Semiannual	Progress reports from beneficiaries to PMU	PMU
Technology- based start-	This indicator measures the economic	Semiannual	Progress reports from	PMU

ups created under the project and making commercial sales (annual)	relevance of R&D produced by project beneficiaries under Components 1, 2 and 3.		beneficiaries to PMU	
Patent Cooperation Treaty agreements approved for project beneficiaries (annual)	Patent Cooperation Treaties are patent applications accepted by international patent bodies. This indicator measures commercial relevance of R&D of project beneficiaries under Components 1, 2 and 3.	Semiannual	Progress reports from beneficiaries to PMU	PMU

Intermediate Results Indicators

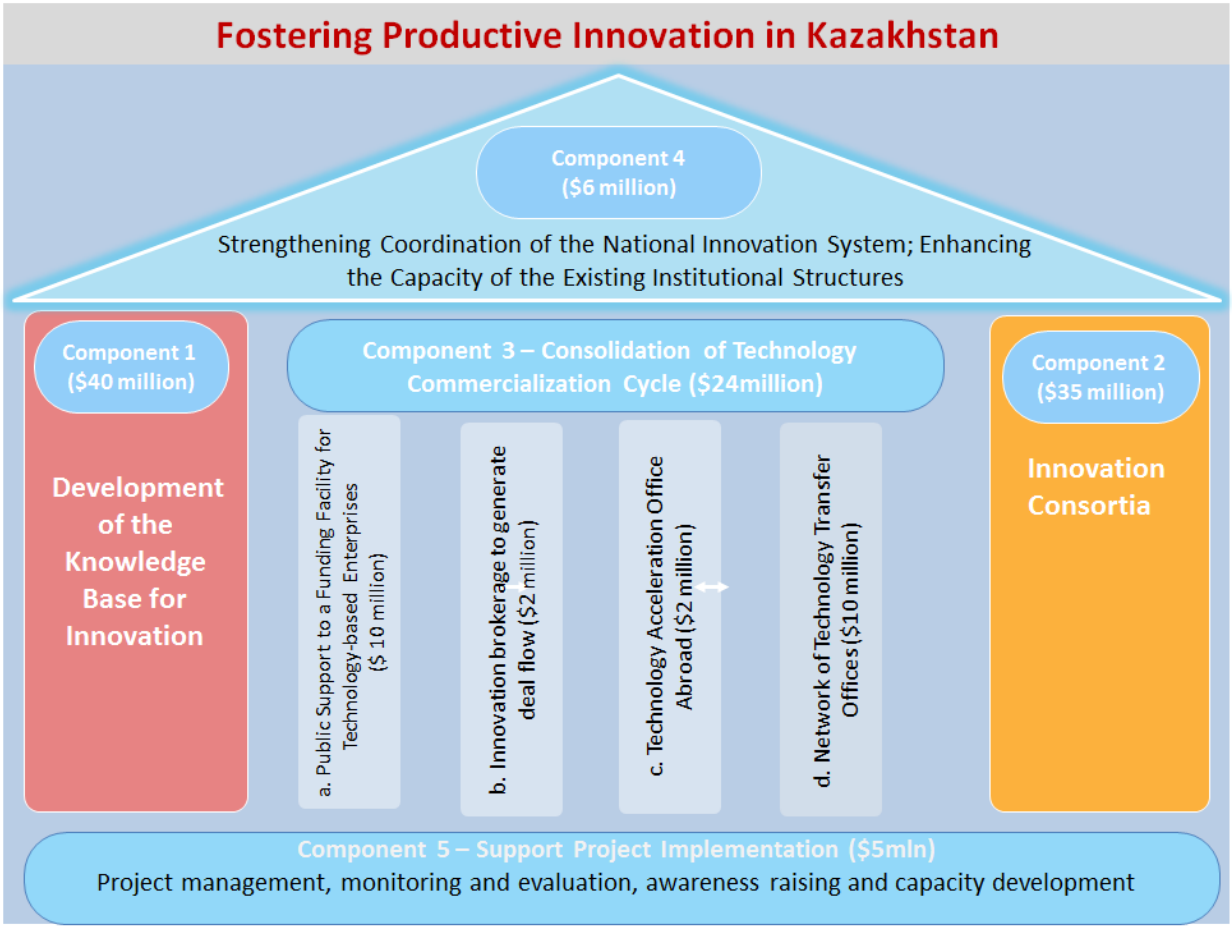
Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Grants approved for Senior and Junior Research Groups (annual)	Grants that went through selection and were approved by ISCB and endorsed by the MOES for financing.	Semiannual	PMU	PMU
Ph. D. holders and students trained abroad (annual)	Ph. D. holders and students pursuing Ph. D. that applied for the grant, were approved a grant and completed training.	Semiannual	PMU	PMU
Completed projects with social impact (annual)	Completed projects improve delivery of social services (health, education, water, urban and rural infrastructure) to increase livelihood of urban and rural population implemented under Components 1, 2 and 3.	Semiannual	Progress reports from beneficiaries to PMU	PMU
Applications for financing consortia created based on a cooperation agreement (annual)	Applications received for a grant for consortia. A cooperation agreement is a document included to the application package. It is between the members of consortia (research teams and enterprises) and is registered with the MOES.	Semiannual	PMU	PMU
License agreements	This indicator includes national and	Semiannual	Progress reports from	PMU

signed (annual)	international licensing deals of project beneficiaries. The indicator measures economic relevance of R&D of project beneficiaries under Components 1, 2 and 3.		beneficiaries to PMU	
Total value of the venture capital fund created (cumulative)	The venture fund will be created together with a private partner with the project contribution of US$10 million.	Semiannual	Progress reports from beneficiaries to PMU	PMU
The Innovation Observatory launched	This indicator is achieved when a government resolution is issued to launch the Innovation Observatory. Success of its activities will be determined based on the number of decisions that were implemented by respective entities for further development of the NIS of Kazakhstan.	Semiannual	PMU	PMU
Direct project beneficiaries	Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value: Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage.	Semiannual	PMU	PMU
Female beneficiaries	Based on the assessment and definition of direct project beneficiaries, specify what percentage of the beneficiaries are female.	Semiannual description provided.	PMU.	PMU.

Annex 2: Detailed Project Description

KAZAKHSTAN: Fostering Productive Innovation Project

1. The PDO is to promote high-quality, nationally relevant research and commercialization of technologies. The Project components and cost allocations are proposed as follows:



2. A breakdown of costs by sub-components and activities is shown below:

Table 1. Breakdown of Project Costs by Sub-Components and Activities

Project Components Sub-components/Activities	Total Project Costs (IBRD&Government)	IBRD financing	percent of IBRD
1. Development of the Knowledge Base for Innovation	**40,000,000**	**40,000,000**	**100**
a. Grants to research teams	30,000,000	30,000,000	
b. Grants for PhD research and training	10,000,000	10,000,000	
2. Innovation Consortia	**35,000,000**	**35,000,000**	**100**
Consultant services for Design of a Productive Sector Consortia Program (1-2 experts)	*20,000*	*20,000*	

Consultant services for Design of an Inclusive Innovation Consortia Program (XYZ experts)	*35,000*	*35,000*	
a. Grants for Technology Consortia	17,467,500	17,467,500	
b. Grants for Technology Consortia	17,467,500	17,467,500	
Consultant services to facilitate technology consortia establishment	*10,000*	*10,000*	
3. Consolidation of Technology Commercialization Cycle	**24,000,000**	**13,000,000**	**54**
a. Establishment of the Early Stage Venture Capital Fund	10,000,000	10,000,000	100
Consultant services for Design of the Funding Facility (1 expert)	*20,000*	*20,000*	
Contribution to the VC Fund	*9,980,000*	*9,980,000*	
b. Innovation brokerage to generate deal flow	2,000,000	2,000,000	100
Innovation brokerage team	*2,000,000*	*2,000,000*	
c. Establishment and operation of Technology Acceleration Offices Abroad	2,000,000	1,000,000	50
Operational expenses	*1,600,000*	*600,000*	
Staff: International experts (1-2) and Kazakh experts (2-3)	*400,000*	*400,000*	
d. Technology Transfer Offices Network	10,000,000		0
Capacity building (training and related operating costs)	*10,000,000*		
4. Strengthening coordination of the NIS; Enhancing the Capacity of the Existing Institutional Structures	**6,000,000**		**0**
Consultant services for Innovation Observatory	*3,000,000*		
Operational costs and training	*3,000,000*		
5. Support Project Implementation	**5,000,000**		**0**
PMU Staff (10 people)	*1,500,000*		
PMU Operational costs	*1,900,000*		
Consultant services for strengthening the legal and regulatory framework (firm)	*100,000*		
Consultant services for project awareness raising (firm)	*500,000*		
International Science and Commercialization Board	*1,000,000*		
Total Project Costs	**110,000,000**	**88,000,000**	
Front-End Fees			
Total Financing Required			

3. **Component 1 - Development of the Knowledge Base for Innovation (US$40 million):** The objective of the component is to assure high-quality, nationally relevant R&D and advanced human capital for the Innovation Consortia Component (2) and Technology Commercialization Cycle Component (3). Building on the TCP, this component will continue to supply the pipeline for the deal flow in order to facilitate interaction between intermediaries and industrial system (Component 2) and develop the new financing instruments in the NIS (Component 3). It will finance:

(a) Grants to research teams (US$30 million). Based on the TCP, the sub-component will finance two types of grant instruments for eligible R&D ideas: one for young researchers (a continuation of the Junior Researcher Group, JRG, Program) up to US$0.6 million each for 3 years and one for internationally recognized researchers up to US$1.5 million each for 3 years (a continuation of the Senior Scientist Group, SSG, Program). The eligibility criteria would include new features, such as emphasis on proven interest/partnership of private/corporate sector in the proposed research, researcher/company co-financing. The grant could finance laboratory equipment, workshops, visiting scholars and other works and goods necessary for completion of the approved R&D activities in compliance with applicable World Bank requirements. Grantees must incorporate themselves as companies. Semiannual research progress will be monitored by the ISCB through field visits. The PMU will organize regular trainings for researchers on procedural requirements related to grant financing, financial management and procurement in line with POM, EMF and applicable World Bank guidelines how to fill in applications, grant payment requests, which will help avoid implementation delays. The outputs include grants approved for SSGs and JRGs and their outcomes will be measured through two PDO indicators: (i) "International publications from Senior and Junior Research Groups in peer reviewed journals" which measures output of Component 1 against international peer standards and improvement of scientific performance; and (ii) "Share of enterprise sector financing of R&D in Senior Scientist & Junior Research Groups" which signifies commercial relevance of the proposed research.

(b) Grants for PhD research and training – grants for PhD holders and students abroad in technical areas strategic for Kazakhstan's economy (US$10 million). The grants for research and training will be for applicants in the country for a joint international research activities with Western researchers and Kazakhstan's researchers who are already abroad and to pursue training of PhD candidates and post-doctoral students. It will pilot higher education consortium between Kazakhstan and a relevant Western university of excellence, such as Imperial College in London or Colorado School of Mines. The sub-component will finance tuition fees, insurance, travel, and accommodation and consulting services for building international consortium. The outputs include the number of PhD holders and students trained abroad whose joint international research project was supported by grant; this will signify stronger Kazakhstani scientific capacity and R&D. The sub-component will complement and expand the Bolashak education program that was established to provide educational grants for Kazakhstani students to pursue Master's, PhD, residency and internships in foreign universities based on an approved list of priority education areas/specialties.

4. **This component is a repeated activity of the TCP, and the reasons for its selection are the following.** With regards to linking science to markets, Kazakhstani science and related government support policies still build on a linear model of R&D results' commercialization that does not consider market needs until a prototype is developed. Such approach bears an intrinsic risk of developing products and applications that might be brilliant from a scientific point of view, but useless to the general consumer. In fact, this risk has already realized in several Kazakhstani research institutes that now virtually sit on inventions that are of no interest to the market. Some of the current technology commercialization support policies try to build on this "collection of prototypes" and find market for them, obviously, with little success. This project aims to change this obsolete technology commercialization concept suggesting that research should be based on a preliminary market analysis and carried out using regular feedback loops which help to maintain the right focus throughout entire process. Such change cannot be achieved easily and requires specialized expertise and skills.

5. **With regards to R&D finance, Kazakhstan has recently introduced a competitive grant process with a good selection mechanism based on international expertise.** However, while addressing quality of research, this system does not set any requirements regarding commercialization of research results. As a consequence, the blind development of prototypes continues. The grant financing suggested by this project will be strictly oriented to commercialization of research results through competition conditions and the requirement to submit an initial commercialization plan together with the grant application.

6. **Component 2 –Innovation Consortia (US$35 million):** The objective of this component is to promote collaboration among existing scientific research institutes and design bureaus and scientific and engineering profile laboratories in Kazakhstan (i) in respect of research and development activities for purposes of improving the productive sectors of the Borrower's economy, through the provision of Productive Sector Consortia Grants, and (ii) in respect of the delivery of social services, including improving the livelihood of the urban and rural population, through the provision of Inclusive Innovation Consortia Grants. One of the internationally recognized instruments to achieve this is to establish technology consortia. The technology consortia will provide a demonstration effect of private-public collaboration that takes the effort to the commercialization stage. The component finances consulting services for program design and grants for consortia. The component includes two windows of Calls for Proposals:

(a) Productive sector consortia: consortia in productive sectors of the economy - agriculture, extractive industries, manufacturing; and

(b) Inclusive innovation consortia: long-term collaborative effort to improve delivery of social services (health, education, water, urban and rural infrastructure) to increase livelihood of urban and rural population.

7. **Following an established global good practice (EU, technology platforms, long-term consortia in the UK, Australia and Russia),** the consortia projects will be established through a competitive two-stage facilitated selection process which mandates international collaboration and co-funding from users and clients. In the first stage of the process, industry- and R&D-led applications will be assessed against the selection criteria by the International Science and Commercialization Board (ISCB). The ISCB will recommend which applicants proceed to stage

two. At stage two, the Board can identify synergies between applicants to ensure that the best combination of participants and support is identified for each consortium application. This process may involve an independent facilitator to broker between applicants to negotiate arrangements for the establishment of a single project consortium. In each case, the MOES will select, with advice from the Board, an independent facilitator based on the following criteria:

(i) the facilitator is independent from any potential project consortia partners or associated parties;

(ii) the facilitator has sufficient understanding of and has a demonstrated connection to the selected industry; and

(iii) the facilitator has the organizational, communication, and negotiation skills required to broker the development of the project consortia agreement.

8. **The winner would receive a grant for upgrading to international standards while pursuing the declared R&D goals.** The grant conditions would allow purchase of additional equipment, renovation, and would require adoption of good laboratory practices, international certification. It is expected that up to 10 user-driven innovation clusters would be developed between major Kazakh and global companies, including multinationals involved in oil and gas drilling in the country. The IMSC is one example of such consortium in the TCP, although institutional configurations of consortia are expected to vary.

9. **This component would be monitored in terms of applications for financing consortia created based on a cooperation agreement and its results would be measured through the PDO indicator "total financing of the consortia" that measures the size, scale, and output of consortia.** With regards to the risks related to the character of the corporate sector in Kazakhstan (mainly SOEs) and lack of interest from international laboratories, it is assumed that the SOEs motivation and behavior are not radically different from the behavior of private sector firms, and that the ISCB as advisors will provide necessary assurance that the agreed procedures, transparency of process, and feedback mechanism are in place. At the same time, while the component design is based on implementation of consortia in other countries, it is novel in Kazakhstan and there are uncertainties about how the project will be received by various stakeholders, and what obstacles to implementation may appear. Activities of Component 4 will facilitate horizontal linkages and collaboration between agents of the NIS and this will contribute to encouraging the development of consortia. Additionally, the PMU will organize regular trainings for researchers on how to fill in applications, grant payment requests, etc., which will help avoid implementation delays. The proposed two-stage application procedure (e.g. innovation consortia/technological platforms) is designed to be the most important risk mitigation measure for the new instrument of consortia.

10. **Component 2 is a complementary commercialization activity to Component 3 built on the successes of the TCP.** The reasons for selecting the component are the following. The Government of Kazakhstan has invested significant resources into national infrastructure. It has built twenty modern laboratory facilities. Although of predictably variable quality, twenty national laboratories are active in various fields of scientific enquiry. It is critically important to promote collaboration between these laboratories and to link them to leading innovation centers in the world through, for instance, R&D and technology consortia. The present system of R&D

laboratories is characterized by large internal diversity but it is also quite fragmented[8]. (This is not an issue specific to Kazakhstan or even to post-socialist economies; all middle-income economies suffer from this problem.) Two problems are central, though. The first one is fragmentation: high quality research is done in small teams distributed around the system each lacking critical mass to sustain a significant program of international quality research. There is successful experience of overcoming the fragmentation problem in various countries, and the proposed project uses this extensively. The second problem is lack of focus on national priorities: the research agenda is often influenced by the interests of individual researchers in centers that do not coordinate with each other. The project would finance grants only for national priorities.

11. **The second window is of particular relevance for Kazakhstan, given its need to find new solutions to improve social services, particularly to the rural population in remote regions of the country.** This would require particularly intense promotion and coordination efforts. Role of the government's coordination mechanisms and institutions governing NIS strengthened under Component 4 will be central both in generating awareness of the domain of inclusive innovation and in helping relevant ministries (Health, Regional Development, and others) to collaborate for establishment of inclusive innovation agenda for Kazakhstan.

12. **Component 3 – Consolidation of the Technology Commercialization Cycle (US$24 million):** The objective of this component is to complement the existing financial instruments and solutions suitable to different stages of start-up company development to foster the creation of new knowledge-based companies.

It would include four sub-components and finance the following activities aimed to promote the development of start-up companies:

(a) *Establishment of the Early Stage Venture Capital Fund ("ESVC Fund") for purposes of providing ESVC Investments to finance ESVC Subprojects, including provision of management support to (US$10 million):* Although a limited number of VC funds exist in Kazakhstan, there have been minimal transactions for early stage and technology-based companies. Availability of early stage finance remains problematic. The sub-component attempts to make early stage financing available for technology start-ups and provide a demonstration effect of commercial viability of these investments. This demonstration effect is expected to attract other VC companies and therefore would allow a critical mass of early stage and venture capital to evolve.

This component would pilot an ESVC Fund (the Fund) that would comprise a limited public contribution - up to US$10 million or up to one half of the total fund equity. The project will also provide an up to 50 percent subsidy towards the management fee of the fund. While the exact management structure is to be further explored, the management fee is estimated at approximately US$250,000 for four years of

[8] See, for instance, UNECE assessment Kazakhstan National Innovation System done in 2012 http://www.unece.org/fileadmin/DAM/ceci/publications/icp5.pdf

operation. It will be provided on a sliding scale basis (from 50 percent in year 1 to 10 percent in year 4).

The project will fund up to 50 percent of the total funds required ESVC investments. The remaining part is expected to be attracted on matching basis from private investors selected by the ESVC Fund managing company. The matching investments for the ESVC from the private investors (and sources of funds) will be approved by the Bank. Criteria and process of selecting managing company are detailed in the POM. Compliance of the ESVC Fund to match project funds with minimum 5o percent matching financing from private investors will be ensured through relevant reporting mechanisms in the ESVC Fund Manual, through monitoring by the PMU and through Bank supervision during implementation support missions as well as through a mandatory independent financial audit. This pilot fund would provide a demonstration effect of the commercial viability of early stage funds[9] for technology and high value-added start-ups helping to attract other VC companies and creating a critical mass of early stage investments and market agents. The legal framework for technology VC funds is sound. The project design takes into account lessons learned from many OECD countries that have implemented similar initiatives to "kick-start" an early stage VC industry as well as from other World Bank operations in India, Armenia, Croatia and Mexico.

The Fund would be privately managed. The selection process for the private management company for the new early stage fund is envisaged to take place in two phases. The MOES would conduct a competitive tender that would include as one of its key criteria the amount of private money the management company proposes to bring to match public funds. Using this and other criteria covering, for example, the qualifications and experience and terms of reference of the proposed management company a ranking of bids would be developed in the first round. The first ranked bid would then be invited to negotiate on the detailed conditions of the management contract. This second stage is likely to be necessary because there are likely to be different conditions proposed in the bids from the different parties. Usually a period of three weeks is set for the negotiations and, if agreement is not reached, then the second ranked bidder is invited to negotiate.

Representatives of the MOES or its delegated agency, along with other private sector investors would participate in a steering board of the ESVC Fund according to the share of equity investments. The day-to-day operations would be handled by an ESVC Fund Investment Committee, managed by the private sector provider, whose activities would be reported to the steering board for information. Additionally the steering board would receive reports from an independent audit that would have the responsibility to ensure that the service agreement is being followed and that

[9] Although no universal definition exists, early-stage deals are reviewed as first and second rounds of institutional funding for companies less than 5 years old and not part of a larger business group. They are typically small, rarely exceeding US$200,000 of value and thus generate disproportionately large transaction costs justifying initial public subsidy.

transparency, within the limits of commercial sensitive disclosure, in information and decision criteria is being achieved.

The management company of the ESVC fund would be responsible inter alia for f actively seeking ESVC Subprojects, presenting them to the ESVC Fund Investment Committee, monitoring performance of ESVC Fund Investments, and regularly informing the ESVC Fund Steering Board on the ESVC Fund's performance. The investment guidelines would follow commercial practices common to technology venture capital funds; contain financing limits per company, and restrictions on lending to related parties. The annual independent audit, which is common practice in the VC industry, would also help the World Bank´s monitoring of the ESVC fund. Subprojects financed by the ESVC Fund would have to comply with commercial practices acceptable to the World Bank, environmental and social safeguards and the negative list contained in the operational manual.

The ESVC fund would be liquidated after having created commercial returns, which according to international experience is expected to happen in 8-10 years, meaning after the project is closed. After this period, equity contributions and its commercial gains would be returned to investors. The draft by-laws and investment guidelines of the ESVC fund would be developed by MOES with the help of investment committee and cleared by the World Bank. Up to US$3 million could be advanced to the Designated Account managed by the MOES once the private managing company of the fund has been selected. These resources or the corresponding amount could flow to the bank account once the draft by-laws and investment guidelines have been cleared by the World Bank, the VC has been incorporated, and the private investors have disbursed the committed resources to the fund.

(b) *Innovation Brokerage to Generate Deal Flow (US$2.0 million):* This sub-component would seek to catalyze a market for specialized business development services that are able to transform technology and innovation ideas into commercial projects acceptable for early stage venture capital or other investors. The key lesson from other countries that have attempted to introduce early stage funding pinpoints to the need for additional assistance that will facilitate the availability of "deal flow" i.e., investment ready projects. Recognizing this, the sub-component would support the formation of an *innovation brokerage team* that would assist an entrepreneur in all stages of the incubation cycle. More specifically, the functions of the "deal flow" promoters would comprise (in) assessing the technological viability of the project; (ii) estimating the commercial potential of the innovation; and (iii) generating, presenting and marketing new information about the project.

By contrast to existing incubation structures, the *innovation brokerage team* would be remunerated on a combination of a flat-fee and a success-fee basis, providing the incentives for agents to actively seek out and nurture technological ideas with commercial potential and identify external finance.

The innovation brokerage team would be selected through a competitive bidding process in line with World Bank procurement requirements. The evaluation committee would include both international and local expert(s).

To simplify contractual arrangements, deal flow generation in Kazakhstan will consist of the following elements/ principles:

(i) A basic flat management fee for running the project management facility of US$300,000.

(ii) A success fee based on (example for illustration and could be adjusted based on the financing model):

1. Funded business plans: a fee per each business plan prepared and funded by investors (e.g. US$20,000 per proposal to be financed by the project or other sources), but not more than for 5 business plans per year.

2. Raising investments: e.g. 12 percent of total investment committed to a deal, but not more than US$250K per year. This success fee does not preclude innovation brokers' participation in the equity of the company created and participate in any other way in the upside potential of the company.

(iii) Contracts generated between businesses and research institutions (universities and public research institutes) in the amount of 10 percent of the contract size not to exceed US$100,000 per year.

(iv) The total amount of the public remuneration consultants receive for the deal flow facility cannot exceed US$850,000 during the life time of the project.

It is expected that two such facilities will be established: one in Almaty, another in Astana. To assure diversity of management models, the Astana facility could be linked to major university (e.g. Nazarbaev University), while the Almaty facility could be created and managed by a private experienced VC company (such as Centras).

(c) *Technology Acceleration Office Abroad (US$2 million*): to enhance marketing and technological capabilities of technology companies. There will be two such offices: one located at one of the recognized centers of excellence in technological innovation of the West - in the USA (Silicon Valley, CA, Austin, TX) and another in a major technology power of the East, most likely in China. The guiding principle is to establish such "antenna" offices in locations where it clearly benefits Kazakhstan's innovation system (hence focus on USA and China) rather than the strength of existing contacts or friendliness and hospitality of the country in question.

(d) *Network of TTOs at major Kazakh universities (US$10 million).* This sub-component will enhance capabilities of existing TTOs with an objective to reach a critical mass of technology commercialization and transfer capabilities within a coherent network of about 5-6 capable TTOs. Operating in concert with sub-components (b) and (c), this sub-component will facilitate an adequate deal flow for the ESVC fund (sub-component (a). It will finance services (training, study tours) to upgrade capacity of TTOs.

13. **This component would be monitored in terms of total value of the venture capital fund created and its outcomes would be measured in terms of Patent Cooperation Treaty agreements approved for project beneficiaries and license agreements signed.** With regards to the risk that experienced companies would lack interest to assume management of the venture funds, it is anticipated that strengthening capacity of institutional mechanisms engaged in coordination of the NIS will foster long-term interests of companies and hence their contributions to the ESVC fund. It is anticipated that the risk of supply of commercially relevant ideas is mitigated by the TCP performance (6 out of 21 research groups' projects have sales value) and the strong focus of the proposed project on commercial relevance as the eligibility criteria for R&D.

14. **This component draws on the activities of the TCP, and will utilize results of the technology audit, technology commercialization grants program and comprehensive R&D regulatory framework review, and of technology commercialization support programs developed by the National Agency for Technological Development (NATD) and other government agencies.** The specific reasons for selecting this component are as follows. Similarly to the situation with underdeveloped financial markets, Kazakhstan lacks such important elements of providing financial instruments and solutions suitable to different stages of start-up company development. As a result, many technology startups fall below the radar of few venture capitalists present in Kazakhstan. Building such comprehensive system is a difficult task that requires maturity of market players. At the same time, there is evidence that appetite for risky investments is gradually growing and creation of proper vehicle would potentially bridge several financing gaps described earlier. For example, a public-private fund providing seed funding and comprehensive management and business support could grow the promising innovative startups through equity financing, with buyout option at later stages when those young companies become more sustainable and attractive for venture capital.

15. **Component 4 - Strengthening coordination of National Innovation System; Enhancing the Capacity of the Existing Institutional Structures (US$6 million):** The objective of the component is to enhance, in line with national priorities of Kazakhstan, the capacity of institutional structures engaged in coordination of the NIS. The component will finance activities ensuring better coordination between key stakeholders of the National Innovation System, including relevant authorities and ministries of the Borrower. The component will support the following functions/capabilities of institutional structures and, to this end, will finance consulting services for designing an Innovation Observatory and operational costs and training for:

(a) Innovation Observatory - a permanent framework to monitor innovation performance both in productive and public sector; and

(b) Awareness raising and coordination - to articulate and disseminate inclusive innovation agenda for Kazakhstan.

16. **Institutions engaged in coordinating the NIS would benefit from collaboration and advice from the International Science and Commercialization Board established under the TCP.** This component draws on the experience of inter-agency Innovation Councils in such countries as Chile and Finland. The reason for selecting this component is the following. As already noted, the government's effort of the past 20 years and the current TCP created a complex set of organizations. The priority at this stage is consolidation, coordination, and achievement of synergy between these organizations in order to re-focus the country's research and development sector to goods and services valued by market. Strengthening of the capacity of institutional structures engaged in coordination of the NIS will contribute to the high-level objectives of the project, namely to the cultural change in the NIS, development of the NIS in line with international standards, and streamlining the functioning of the NIS. This would mitigate the potential future risk that, due to growing interest in the innovation system and because innovation is a cross-cutting area, various institutions in different sectors will take actions that negatively affect the NIS and undermine the reform efforts of the project. The results of the ongoing TCP are already having a demonstration effect that will contribute to changing the culture to be more supportive of innovation.

17. **Component 5 – Support Project Implementation (US$5 million):** This component will finance the day-to-day PMU functions (project administration, procurement, financial management, disbursement, M&E, safeguards, program management, public awareness, and capacity development) and assessments of the legal and regulatory framework. It will finance PMU staff, consultant services for strengthening the legal and regulatory framework and project awareness, as well as operational costs.

Annex 3: Implementation Arrangements

KAZAKHSTAN: Fostering Productive Innovation Project

Project Institutional and Implementation Arrangements

Project administration mechanisms

1. **The proposed Project will be implemented by the Ministry of Education and Science (MOES).** The MOES will be responsible for supervising overall project implementation and providing strategic oversight of the implementation of key Project activities.

2. A **project Steering Committee (CPSC) to be chaired by the Vice-Minister** of the MOES in charge of Project implementation and will be established for strategic project management by the Ministry.

3. **The existing Project Management Unit (PMU) of the MOES for the TCP will be engaged with resources and terms of reference satisfactory to the Bank**, including a director, a procurement specialist, a financial management specialist, a monitoring and evaluation specialist, a safeguards specialist, and an accountant. The PMU will be responsible for day-to-day project administration, including procurement, financial management, disbursement, M&E and safeguards. The PMU will also be responsible for M&E, procurement and financial management administration for research and other grant programs.

4. The **International Science and Commercialization Board (ISCB)** will provide scientific guidance related to all scientific matters associated with the project, including the selection of the Groups, participating in the two-stage selection of consortia, and monitoring of their scientific progress and achievements.

5. The following main principles will be applied for clarifying management and coordination of project implementation, as well as segregating duties and responsibilities of parties:

6. **The MOES** will provide policy guidance and advice to the PMU.

7. **The PSC** will be established to ensure smooth implementation of the project. The PMU will work under the overall guidance of a PSC composed of members of the main entities facilitating implementation of the project (e.g., *inter alia*, Department of Finance of the MOES, Legal Department of the MOES, Head of the PMU, among others). The PSC will be chaired by the Vice-Minister of the MOES in charge of the project implementation. The scope of work of the PSC will include: (i) strategic guidance for overall project implementation; (ii) development and approval of annual plans for project activities, project budget, and procurement plan, as well as regular review of project M&E data to determine progress and make adjustments, if need be, to ensure satisfactory achievement of the end of the project outcomes; (iii) coordination and consensus building among key stakeholders on key policy issues related to implementation; and (iv) monitoring of broad issues related to implementation of reforms.

8. **The Science Fund of Science Committee of MOES (and any its successor) will be responsible for the technical aspects of the project,** including, inter alia, preparing and

monitoring technical aspects of implementation plans (work programs and budgets), drafting technical aspects of terms of reference, participating in selection processes of Subproject Grant recipients, monitoring the technical aspects of performance of Subprojects, and collecting technical data on Project monitoring indicators, all pursuant to the POM.

9. **The existing PMU of the MOES for the TCP will serve as the implementation unit for the project**. It will manage the project according to the detailed rules and procedures agreed with the World Bank and outlined in the Project Operations Manual (POM). The PMU will assist the MOES in selecting the final winners of the Senior Scientist and Junior Researcher Program and winners of Technology Consortia Program, based on the shortlist of the ISCB prepared in consultation with peer reviewers.

10. **The PMU will be responsible for day-to-day project administration.** This includes such activities as (i) procuring the specialists who will administer the implementation of programs to be supported by the project; (ii) overseeing procurement of all goods and services required by the Groups, and other entities to be established under the project to ensure that the procurement procedures comply with all applicable World Bank rules and regulations; (iii) organizing the competition to select Groups, Consortia, ESVC Fund, Innovation Brokerage Team, Technology Transfer Offices and other entities competitively selected under the project; (iv) liaising with the Steering Committee, MOES and the ISCB, bringing matters to their attention where appropriate, and implementing their decisions; (v) carrying out project M&E activities; (vi) ensuring that individual project activities comply with all applicable World Bank fiduciary and environmental requirements; and (vii) liaising with the World Bank for routine, day-to-day implementation of legal, procurement and financial management matters.

11. **The PMU has extensive experience in fiduciary and safeguards work related to implementing World Bank-financed projects.** The financial management arrangements of the PMU have been reviewed periodically as part of the existing TCP project implementation support activities and have been found satisfactory. They will be replicated for the new project. The assessment of the financial management and procurement capacity of the PMU was initiated in April 2014 and found to be partially satisfactory. The project will finance training to PMU staff to continue to increase their skills.

12. The International Science Commercialization Board (ISCB). The ISCB will be comprised of at least five distinguished scientists from different parts of the world, two international level venture capitalists/technology commercialization experts and at least two local scientists with international experience. The research community of Kazakhstan has the characteristics of a small world – that is in any subject area the number of researchers is so few that they are all known to each other and often have interlocking interrelationships. As part of the TCP, the ISCB was constituted with the intention of introducing informed neutrality of decisions on applications for research grants and was vested with the exclusive authority for determining grant allocations. Alongside the independence of the ISCB a decision methodology, with clear evidence base and predefined criteria, systematic approaches and transparent decision making was introduced in line with best international practice.

13. **Since its introduction there has been a broad acceptance of the benefits of this international practice and much progress has been made by the agency responsible for**

determining domestic research grant allocations in following the evidence based approach. There remains a need for the ISCB because there are still weaknesses evident in the decision making phase of grant allocations even with a good analytic approach and clear evidence based recommendations.

14. **However, there is also a need to evolve the composition and role of the ISCB to move towards a sustainable long term position.** The steps in this evolution include:

(a) Kazakh representation on the ISCB – an appropriate long term position is of a majority of the decision making board being made up of reputed Kazakh researchers with an international presence to ensure benchmarking against international standards;

(b) Adoption of a code of ethics in the conduct of research covering the selection and allocation of grants, the conduct of the research and the reporting of findings;

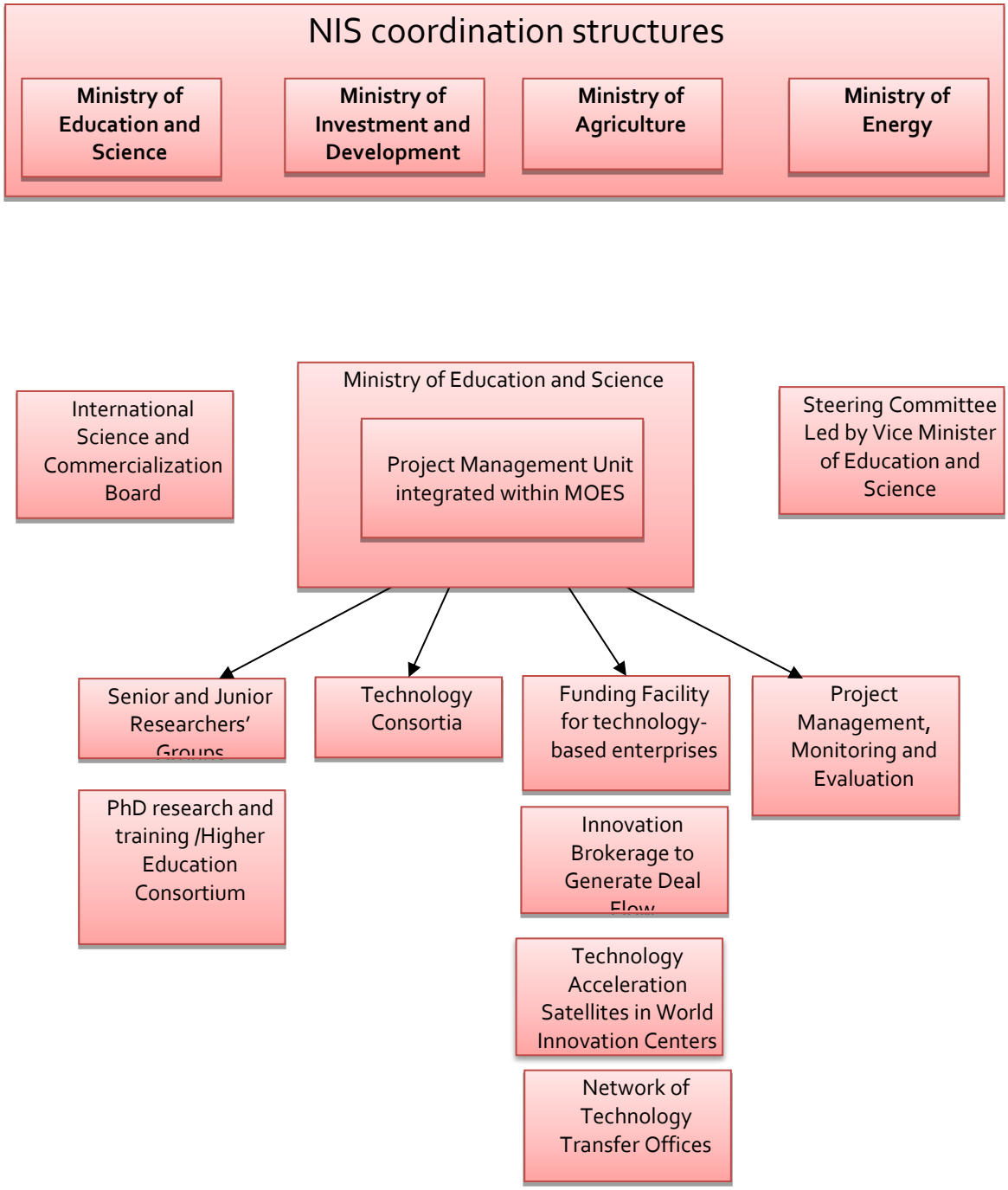
(c) Additional training in the decision phase of grant allocations to embed the approach of the ISCB which at present has many of the characteristics of a 'Black Box' in the sense that decision making is not justified externally merely the outcome reported; and

(d) Improved feedback and reporting of decisions to build acceptance and credibility of the evolved ISCB.

15. **Over the duration of the follow-on project these changes should be introduced.** There may be merit in the ISCB being retained in an international advisory capacity to strengthen the connectivity of Kazakh research with the global research community. This has particular legitimacy in relation to the International Materials Science Center but may also have a broader application across the research system.

16. **It is proposed that ISCB follows the practice established under the TCP and represents the fields of scientific expertise that are of strategic importance for Kazakhstan** including Physical Chemistry, Geophysical sciences (important for proposals in oil and gas and metallurgy), Engineering, Mathematics, Biomedical or bioengineering, Ecology, IT/electronics, and Materials Science. Candidates for the ISCB will be selected from lists of candidates solicited from such prominent international scientific organizations as the Royal Society, the US National Academy of Sciences, the US National Science MOES, the European Science Foundation, the Inter-Academy Council, the Third World Academy of Sciences, and the Nobel Committee and similar scientific organizations in Asia. The lists will present scientists from a large variety of technologically-advanced countries, including Europe, North America and Asia. The lists will contain names of distinguished scientists with both academic as well as industrial research backgrounds. Their recommendations will then be submitted to the World Bank for no objection, which will formally invite the scientists to serve on the ISCB.

17. Institutional reporting responsibilities for the proposed project's implementation are summarized below:


NIS coordination structures
Ministry of Education and Science
Ministry of Investment and Development
Ministry of Agriculture
Ministry of Energy
International Science and Commercialization Board
Ministry of Education and Science
Project Management Unit integrated within MOES
Steering Committee Led by Vice Minister of Education and Science
Senior and Junior Researchers' Groups
Technology Consortia
Funding Facility for technology-based enterprises
Project Management, Monitoring and Evaluation
PhD research and training /Higher Education Consortium
Innovation Brokerage to Generate Deal Flow
Technology Acceleration Satellites in World Innovation Centers
Network of Technology Transfer Offices

Financial Management, Disbursements and Procurement

Financial Management

18. **The MOES through the existing PMU be responsible for the implementation of the financial management (FM) function of the project including,** the flow of funds, planning and budgeting, accounting, financial reporting, internal controls, and auditing.

19. **There are however, some actions that the PMU needs to complete for capacity building purposes.** These are: (i) updating TORs for the Financial Manager and Accountant to reflect responsibilities under the proposed Project; (ii) documenting financial management arrangements in the financial management section of POM; and (iii) updating the existing automated accounting software to capture the new project's accounts and generate IFRs.

20. ***Strengths and Weaknesses:*** There are no major weaknesses at the PMU that is currently implementing the TCP and that will be engaged in the FPIP. The significant strengths that would provide a basis for reliance on the project financial management system include: (i) FM arrangements similar to existing projects being implemented currently and found to be adequate; (ii) no significant issues arisen in the audits of the active project being implemented by the PMU MOES; and (iii) experienced FM staff.

21. ***Budgeting and Planning*.** The PMU will prepare annual budgets for the project based on procurement plans and project implementation plans. The budget procedures will be described in the FM Manual and will also follow the budgeting procedures of the Government. The link between the budget and project activities will be established in the quarterly interim un-audited financial reports, and variances will be reported and monitored therein. The Finance Department of the MOES is responsible for overall annual plans and execution of the budget and the PMU will also collaborate with the finance department staff.

22. ***Accounting.*** The existing accounting software is adequate for project accounting and reporting. However it needs to be tailored for this project.

23. ***Internal Controls.*** The PMU is already operating under the adequate internal control framework defined by the regulations of the Ministry of Finance for budget organizations as well as specific procedures described in the POM for the other project it is implementing. The PMU will have a separate POM for this project and it includes a FM section covering key internal control mechanisms to be followed by the staff in the application and use of project funds, with specific focus on ensuring completeness of accounting transactions, reliability of accounting data, safeguarding of project assets, including safe custody of cash and other assets, proper monitoring of contracts, proper authorization and documentation of all project expenditures, and adequate segregation of functions, job descriptions for staff with different authority levels, as well as the flow of funds to support project activities, including proper manual management of the disbursement function, contracts management and documentation flow. The Manual also describes procedures for regular financial reporting to ensure close monitoring of project activities. A separate Manual for ESVCF and Fiduciary Handbook for Subproject Grant Recipients will also be developed. These will be disbursement conditions for relevant subcomponents. These conditions will be included into the Legal Agreement and Disbursement Letter.

24. ***Financial Reporting*.** Project management-oriented Interim Un-audited Financial Reports (IFRs) will be prepared under the project. PMU will produce a full set of IFRs every quarter throughout the life of the project. The format of IFRs were agreed during negotiations (incorporated into the FMM). These financial reports will be submitted to Bank within 45 days of the end of each calendar quarter. The first quarterly IFRs will be submitted after the end of the first full semester following the initial disbursement.

25. ***External Audit.*** The audit of the project will be conducted by independent private auditors acceptable to the World Bank, using International Standards on Auditing (ISA). The auditor will be engaged on standard terms of reference acceptable to the Bank. Audit of the financial statements under the project will be included into the bulk audit of the whole portfolio of the donor-financed projects in Kazakhstan. Procurement of such audit is responsibility of the Borrower, through the MOES. Cost of the audit is covered by the funds of the Republican Budget outside the project's costs. Sample audit TORs will be agreed with the World Bank and to be attached to the FMM, and the annual audited project financial statements will be provided to the World Bank within six months since the end of each fiscal year, and for the project also within 6 months after the closing of the project. If the period from the date of effectiveness of the loan to the end of the borrower's fiscal year is no more than six months, the first audit report may cover financial statements for the period from effectiveness to the end of the second fiscal year. The Government will have to disclose the audit reports for the project within one month of their receipt from the auditors, by posting the reports on the website. Following formal receipt of these reports from the Government, the World Bank will make them publicly available according to World Bank Policy on Access to Information.

26. ***The ESVC Fund financial statements will also be subject to annual audit*.** The cost of such audit will be covered from the Loan funds. The audited Financial Statements of the Fund will be furnished to the Bank not later than six months of the end of the fiscal year/reporting period after the first deposit into the Fund is made, and also for the reporting period when the Project was closed. The applicable reporting standards for the ESVCVF are the International Financial Reporting Standards.

27. The following table identifies the audit reports that will be required to be submitted by the Borrower, through MOES, together with the due date for submission.

Audit Report	**Due Date**
1. Project financial statements (PFS). The PFS include Sources and Uses of Funds, Uses of Funds by Project Activity, DA Reconciliation Statement, SOE Withdrawal Schedule, and Notes to the financial statements	Within six months of the end of each fiscal year and also within 6 months after closing of the project
2. Continuing Entity financial statements– ESVC Fund The financial statements include (i) Statement of Financial Position, (ii) Statement of Comprehensive Income, (iii) Statement of Changes in Equity, (iv) Statement of Cash Flows, and (v) notes, comprising a summary of significant accounting policies and other explanatory information.	Within six months of the end of each fiscal year/reporting period after the first deposit into the Venture Fund is made, and also for the reporting period when the project was closed

Disbursements

28. **The PMU staff has knowledge and experience of the World Bank's disbursement procedures.** Moreover, the existing project has recently transferred to e-Disbursements facility that will be used for the proposed project as well.

29. **The MOES will open and manage a Designated Account (DA) specifically for this project, in a commercial bank agreed with the World Bank[10].** The project account (PA) will be opened in the Treasury for transfer of Government Counterpart Funding. Project funds will flow from:

a. the Bank, either via DA, which will be replenished on the basis of documentation specified in the Disbursement Letter, or by using the direct payment method or the Special Commitment. Further details on this are provided in the Disbursement Letter; and

b. counterpart funds will flow via the Treasury.

30. Both World Bank and Government funds will be managed by the MOES with support from the PMU at the MOES.

Procurement

31. **Procurement for the project will be carried out in accordance with Bank's Guidelines. Specifically, procurement will be carried out in accordance with:** (i) "Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers", dated January 2011 and revised July 2014; (ii) "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers", dated January 2011 and revised July 2014; and (iii) the provisions stipulated in the Loan Agreement. The World Bank Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credit and Grants dated October 15, 2006 and revised on January 2011, would also apply.

32. **The MOES through the existing PMU will be responsible for implementation of procurement function to support beneficiary entities. In addition to the procurement process management, the PMU will provide**: (i) logistical and administrative support for training, conferences, seminars, workshops and study tours; and (ii) other project communications and outreach support (e.g. project webpage, project newsletter, training of officials in beneficiary agencies and other key stakeholders, communications, advertisements, travel, basic office equipment, bank charges, etc.).

33. **The risk assessment rating for the entire project was done through the Procurement Risk Assessment and Management System (P-RAMS).** Identified risks and proposed mitigation measures are described in Table 1 at the end of this section. The procurement risk is rated as High. The procurement risk is rated as High before mitigation measure and after

[10] It is a possibility that the designated account will be moved to the Treasury at some stage during the project implementation, in which case it will be applicable to this Project as well.

mitigation measures are implemented, the residual risk would be Substantial. A Procurement Section of the POM has been prepared (acceptable to the Bank) to foster national competition, wide and advance advertising will be carried out, and proactive search and contact of potential suppliers and consultants will be ensured for implementation of the project. The POM specifies transparency requirements for selection of grant recipients. A separate Fiduciary Handbook has been prepared (acceptable to the Bank) for grant recipients. The Handbook will include the procurement and financial management arrangements to be followed by grants recipients.

34. **The procurement plan covering the first 18 months of project period was prepared by the MOES.** The procurement plan includes Technical Assistance packages for: (i) Technology Transfer Offices Network, Capacity Bldg.; (ii) Innovation Observatory including trainings; and (iii) Innovation brokerage services; and other small-value packages. The procurement plan will be updated at least once per calendar year and each update will be subject to the Bank's prior review. The initial procurement plan together with the subsequent updates will be published on the Bank's external web site in line with the requirements of the Bank's Guidelines. A General Procurement Notice covering the project procurement activities has been prepared and published. Specific Procurement Notices will be published for all International Competitive Bidding (ICB) and National Competitive Bidding (NCB) procurement, as well as for all consulting services contracts as required under the respective Guidelines.

35. ***Procurement of Goods.*** Goods contracts above US$500,000 equivalent will be procured under ICB procedures using the Bank's SBD for procurement of goods. The NCB method will be applicable for procurement of goods contract with the estimated budget of less than US$500.000. The ECA Sample NCB bidding documents shall be used taking into account the NCB conditions set forth in the Loan Agreement. Goods contracts with an estimated budget less than US$100,000 equivalent may be procured using Shopping procedures on the basis of at least three written price quotations obtained from qualified suppliers. The list of suppliers to be invited to submit quotations should be defined by an evaluation committee.

36. ***Selection of Consultants***. The methods for selection of consultants will include Quality and Cost Based Selections (QCBS), Fixed Budget Selection (FBS), Least Cost Selection (LCS), Selection based on Consultants Qualifications (up to US$300,000), Single Source Selection in compliance with Paragraph 3.8 of the Bank's Consultant Guidelines, and Individual Consultants (IC). Contracts estimated to cost above US$300,000 equivalent will be advertised through United Nations Development Business (UNDB), the Bank's website and local media (one newspaper of national circulation or the official gazette, and the MOES's website). Shortlists of consultants for services estimated to cost less than US$300,000 equivalent per contract may be composed entirely of national consultants under the provisions of paragraph 2.7 of the Bank's Consultant Guidelines.

37. ***Operating Costs*.** The expenses of the FPIP PMU would include communications, translation/interpretation, bank charges, office supplies, cost of advertisements, mail and business trip expenses of government officials and other experts. Such costs will be financed by the project based on the annual budget prior reviewed and agreed by the Bank. Purchases will be carried out in accordance with the MOES's internal administrative procedures. Operating costs will not include salaries or allowances of civil servants.

38. ***Training and Study Tours.*** Training and study tours will be carried out based on the annual training/study tours program and budget to be prepared by the Borrower and reviewed and agreed by the Bank. The institutions for training/study tours would be selected considering the availability of such services, duration of training/study tour and reasonableness of cost.

39. ***Governance and Anti-Corruption Action Plan (GAC)***. The project will follow the Bank Group's Anti-Corruption policies as set forth in the Guidelines: On Preventing and Combating Fraud and Corruption in Projects financed by IBRD Loans and IDA Credits and Grants (current edition). The Bank team intends to maintain close oversight and will carry out prior review of all major contracts according to the thresholds that will be regularly reviewed and adjusted as needed in the procurement plan. The following measures will be carried out to mitigate corruption risk:

Training of fiduciary staff starting from project launch and periodically thereafter; training will be customized to the procedures and methods that would be required for the next 12 month periods. The relevant project staff shall attend the Central Asia Regional Procurement Workshops organized by the Bank on a regular basis.

Prior review: There will be close supervision by the Bank's procurement accredited staff. In addition, all contract amendments will be subject to prior approval by the Bank.

Publication of Advertisements and Contracts: All publications for advertisements and contract awards, including the results of the awards, will be done in accordance with the Procurement Guidelines and published in the Bank client connection system and on external websites, i.e., UNDB and Bank websites.

Debarred Firms: Appropriate attention will be given to ensuring that debarred firms or individuals (to be verified from the Bank's external website) are not given opportunities to compete for Bank-financed contracts.

Temporarily *suspended firms*: Appropriate attention will be given to ensuring that temporary suspended firms or individuals (to be verified through client connection) are not given opportunities to compete for Bank-financed contracts.

Complaints: All complaints by bidders will be diligently addressed and monitored in consultation with the Bank.

Tender Committee: If required, the Bank will review qualifications and experience of proposed members of the evaluation committee(s) with a view to avoiding nomination of unqualified or biased candidates. All members will be required to sign a confidentiality/impartiality form.

Monitoring of contract awards: All contracts are required to be signed within the validity of the bids/proposals and, in case of prior review contracts, promptly after the Bank's "no objection" is issued. Procurement plan format shall include information on actual dates (of "no objections" and award) and will be monitored for cases of delay which will be looked at on a case-by-case basis to identify the reasons. The MOES will maintain up-to-date procurement records available to the Bank staff and auditors.

Monitoring of payment vs. physical progress: Monitoring reports prepared for the Bank will be customized to include a form to monitor physical progress compared to payment installments to avoid upfront-loaded payments.

Timeliness of payments: Payment to contractors, suppliers and consultants will be monitored through semi-annual IFRs to ensure timely payments. The MOES will maintain a system/database to ensure payments to the suppliers and contractors are paid without delay according to the conditions of the contract.

Table 1: Summary of Procurement Risk Assessment

Risk	Rating Before	Mitigation	Rating After
MOES staff lack capacity to undertake the proposed procurement work under the project, particularly regarding Bank procurement guidelines.	High	Qualified procurement consultant will provide on-the-job training to MOES staff and to bid evaluation committee members. Consultant will provide assistance in the preparation of bidding documents, bid evaluation reports and contract agreements. Training in procurement under Bank guidelines will also be provided by Bank staff during the project launch workshop.	Substantial
Bid evaluation committee members are not familiar with international procurement procedures, and may obstruct or delay the procurement process, especially the evaluation of bids and proposals.	High	Consultant will provide assistance in the preparation of bidding documents, bid evaluation reports and contract agreements. The risk may continue to be high as some of the evaluation committee members may not agree with the consultant assessment.	Substantial
Lack of awareness of procurement opportunities available in the project for goods and services.	Medium	Carry out public awareness programs using various media, such as newspapers, brochures, radio, TV, project website, etc.	Low
Average Risk	High		Substantial

Frequency of Procurement Supervision: Initially, procurement supervision will include prior review of contracts and procurement implementation support missions (part of project supervision missions) once every six months. Once the capacity of the MOES is strengthened, frequency of procurement supervision missions and prior review thresholds may be revised.

Post Review: 20 percent out of all contracts not subject to prior review will be post reviewed. There will be a number of shopping contracts.

Prior Review Thresholds: The following methods of procurement shall be used for procurement under the project. It has been agreed that if a particular invitation for bid comprises of several packages, lots or slices, and invited in the same invitation for bid, then the aggregate value of the whole package determines the applicable threshold amount for procurement and also for the review by the Bank. The NCB conditions will be part of Financing Agreement.

40. Prior review thresholds will be set up in the project procurement plan and will be generally based on the following requirements:

All contract awarded through ICB Goods (>US$500,000).

All consulting contracts for firms >US$100,000 and contracts with individual consultants estimated to cost US$50,000 equivalent or more.

All direct contracts, single-source contract and amendments are subject to the Bank's prior review.

Table 2: Thresholds for Procurement Methods and Bank's Prior Review

Expenditure Category	Contract Value Threshold (US$)	Procurement Method	Contracts Subject to Prior Review
Goods	>= 500,000	ICB	All ICB contracts
	<500,000	NCB	First 2 NCB contracts
	<100,000	SH	First contract
	NA	DC	All DC contracts
Consultant Services (including training)	Shortlist may be composed entirely of national consultants for assignments of less than US$300,000 equivalent per contract	QCBS/QBS/LCS/ FBS CQS	• >=US$100,000 for firms • All SSS • All TORs
	NA	SSS	
	NA	IC	• >=US$50,000 for individuals • All SSS • All TORs

ICB – International Competitive Bidding
NCB – National Competitive Bidding
SH – Shopping
DC – Direct Contracting
QCBS – Quality and Cost Based Selection
QBS – Quality Based Selection
LCS – Least Cost Selection
FBS – Fixed Budget Selection
CQS – Selection Based on Consultants' Qualifications up to US$300,000 depending on the nature of assignment.
SSS – Single Source Selection
IC – Individual Consultants

41. The prior review thresholds will be periodically reviewed and revised as needed during project implementation based on risk assessment, procurement post-review reports and improved capacity of the MOES.

42. ***Disclosure:*** The following documents shall be disclosed in the MOES website: (i) procurement plan and updates, (ii) invitation for bids for goods and works for all ICB and NCB contracts, (iii) request for expression of interest for selection/hiring of consulting services, (iv) contract awards of goods and works procured following ICB/NCB procedures, (v) list of contracts/purchase orders placed following shopping procedure on quarterly basis, (vi) short list of consultants, (vii) contract award of all consultancy services, (viii) list of contracts following

DC or CQS or SSS on a quarterly basis, (ix) monthly physical and financial progress of all contracts and (x) action taken report on the complaints received on a quarterly basis.

43. **The following details shall be sent to the Bank for publishing in the Bank's external website and UNDB:** (i) invitation for bids for procurement of goods and works using ICB procedures, (ii) request for expression of interest for consulting services with estimated cost more than US$300,000, (iii) contract award details of all procurement of goods and works using ICB procedure, (d) contract award details of all consultancy services with estimated cost more than US$300,000, and (iv) list of contracts/purchase orders placed following SSS or CQS or DC procedures on a quarterly basis.

Environmental including safeguards

44. **The existing PMU under MOES** will be responsible for day-to-day project administration, including environmental safeguards management. Currently, the TCP PMU has a person in charge for environmental issues. Nevertheless, the capacity of project institutions and applicants for implementation of the EMF will be constantly built during the project cycle to successfully follow project implementation. For all technical PMU members and other stakeholders working or associated with the project and first round of applicants, the World Bank environmental specialist will organize workshop on environmental compliance and implementation of the EMF. The World Bank environmental specialist will closely monitor screening process to support the client. The training will be repeated during the course of the project if required and other types of training would be offered to the PMU staff.

45. Table 2 below briefly describes the responsibilities of PMU, Sub-Project Beneficiaries and the Bank in the implementation process.

Table 2. Implementation Responsibilities

Participant	Activity	Supporting Documentation
Sub-Project Beneficiary	• Submission of sub-project concept to PMU • Arranging and financing of environmental due diligence documents • Obtaining required permits/licenses • Implementing and financing of environmental due diligence	• Copies of permits, licenses • Clearance statement • Periodic reports and sub-project completion report • Environmental due diligence documents
PMU	• Distribute operational manual to Sub-Project Beneficiaries • Finalize the environmental screening form, assign the environmental category • Review of sub-project application package for required environmental documentation and licenses/permits from the State authorities • Maintain complete files of environmental documentation for review by WB • Monitoring compliance with mitigation plans	• Include environmental information with sub-loan application • Include environmental monitoring / supervising information in regular portfolio reporting to the Bank • Include environmental documentation in normal PMU records • Periodic monitoring / supervising reports (if necessary)

	(if necessary) • Report on Implementation of EMF	
World Bank	• Organize training for PMU staff and first round of applicants regarding environmental review procedures and other due diligence • Carry out prior and post reviews • Identify of problems/ issues and propose solutions • Carry out field supervision	• Provide assistance • Document status of project implementation in Implementation Status and Results reports and the mission Aide-Memoires

46. **Environmental screening of sub-project proposals will be essential to ensure that sub-projects are properly categorized and environmental review is carried out.** The initial step of screening will exclude all sub-projects supporting: (i) any activities involving the involuntary taking of land resulting in relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood; or (ii) any activities likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented, that would be classified as 'Category A' in accordance with the Banks policies and procedures, and (iii) any activity identified on non-eligible project list presented in the EMF.

47. **According to EMF, grant sub-projects might range from low to high Category B projects, implying possible preparation of various due diligence documents like:** Environmental Impact Assessment (EIA), Environmental Management Plan (EMP), and different type of EMP checklist prepared for the project, for which criteria will be defined in the EMF. For smaller rehabilitation expected under Components 1-3, site specific EMP checklist for rehabilitation will be prepared and template will be part of the EMF. The status of environmental compliance will be reported by beneficiaries to PMU on a regular basis and the PMU will provide this information to the World Bank as a part of general progress reporting.

Social (including safeguards)

48. **While the project does not directly target vulnerable groups, it is expected that given experience with innovation grant scheme under TCP and the project emphasis on the market demand and commercialization, the range of research proposals will target the demand for services by vulnerable groups.** For example, currently, the voice recognitions and recording program is requested by the national association of blind under the TCP innovation grant scheme.

49. **To promote proper transparency, the beneficiary grievance redress and feedback mechanism used in the ongoing TCP will be maintained in the proposed project and complemented with some new mechanisms.** The existing mechanisms include verbal (almost daily) and written feedback from grantees (21 groups) to the PMU of the TCP on the processes and procedures (also to the MOES and sometimes to the World Bank); semiannual consultations chaired by the Vice Minister of the MOES with the grantees in the presence of the PMU on the grant programs and PMU's efficiency; provision of feedback by grantees in quarterly progress reports to the PMU, to the International Science and Commercialization Board (ISCB), the

advisory group of the MOES, during its semiannual visits and engagement with civil society, and to the implementation support missions of the World Bank during their semiannual visits; the web-site of the Technology Commercialization Center (TCC) on the small innovation grant programs under the TCP; and small surveys with the grantees. In response to the feedback and grievances, the PMU director consults the grant program managers to decide on the implementation of the feedback.

50. **The proposed project will include these beneficiary feedback mechanisms and introduce some new ones.** The MOES will organize public consultations twice a year on transparency and clarity of procedures and processes. Beneficiary feedback and grievances will be monitored based on an indicator. The above beneficiary feedback mechanisms has been described in the POM.

Monitoring & Evaluation

51. **Coverage and use of M&E.** The M&E arrangements cover data collection, reporting, dissemination and use of the M&E data for decision-making. The M&E work will enable Government policy makers to compare the performance of Groups with the performance of research institutes operating under the old rules and procedures and to expand the Senior Scientist and Junior Researcher Programs if warranted by the statistical evidence. M&E data can also be used for identifying recommendations for policy changes and mid-course corrections, subject to World Bank approval.

52. **M&E Capacity.** The PMU of the ongoing TCP in the MOES, including its M&E staff, will be responsible for monitoring progress towards the PDO. To evaluate the results, the PMU will receive assistance from the ISCB. The M&E staff of the PMU includes a number of technology commercialization project managers that will obtain data from beneficiaries and one full-time M&E person that will consolidate the data and prepare reports. This is deemed sufficient to begin with. The PMU will receive input from the MOES that will also collect project monitoring indicators. In addition to the PMU in the MOES, component 4 (Strengthening Coordination of the National Innovation System; Enhancing the Capacity of the Existing Institutional Structures) is envisioned to launch an Innovation Observatory - a permanent framework to monitor innovation performance both in productive and public sector. Component 4, as a new collaborative approach, would facilitate development of the NIS in line with international good standards and contribute to streamlining the functioning of the NIS, including based on the M&E work through the Innovation Observatory.

53. **M&E data.** The progress towards the PDO will be tracked based on the result framework (Annex 1). The PMU will use the existing monitoring procedures and templates in use in the TCP (the current PMU uses Excel to collect and process data), but will also automate them. The result framework data can be obtained fairly easily and at low cost. For comparison, the project will obtain the baselines and current values on relevant indicators on the national level and in the TCP. Current data will be collected directly from project beneficiaries, including SRGs and JRGs, consortia members, technology transfer offices at universities and entrepreneurs as part of grant and payment conditions and regular reporting. The reliability of the data will be verified by the PMU based on documentary evidence and regular on-site visits with the grantees. The ICSG, an advisor of the MOES, will complement the PMU's monitoring efforts through semiannual visits with the grantees. To complement the generally available indicators with project-specific

data, the PMU will conduct an annual survey of scientists and entrepreneurs. The survey will be distributed yearly to a representative group of respondents. The survey will also be publicly available on the project web-site to be established.

54. **The PMU will produce the following reports: (i) semiannual updates of the indicators in Annex 1 with a summary of results, issues and actions, as well as and grant implementation;** (ii) an annual progress report integrating the results of all M&E activities, plus its own evaluation of the project progress (these may contain recommendations for policy changes, subject to World Bank approval); (iii) a mid-term report that will sent to the World Bank and key stakeholders (these may contain recommendations for mid-course corrections, subject to World Bank approval), and (iv) input to the results and completion report in the end of the project. The PMU will organize semiannual events chaired by the Vice Minister of the MOES to disseminate project results. The PSC will regularly review of project M&E data to determine progress and make adjustments, if need be, to ensure satisfactory achievement of the end of the project outcomes. This monitoring program will enable Government policy makers to compare the performance of Groups with the performance of research institutes operating under the old rules and procedures and to expand the Senior Scientist and Junior Researcher Programs if warranted by the statistical evidence.

55. **The POM includes a plan for collecting the required input from beneficiaries for the result framework, frequency of data collection, and report templates for reporting to various stakeholders.** The procedures and processes for project components will describe the data collection and reporting requirements. Component 5 will allocate funds for M&E work, including automation of M&E system based on needs, M&E training of project staff and beneficiaries.

Annex 4: Operational Risk Assessment Framework (ORAF)

Kazakhstan: Fostering Productive Innovation Project (P150402)

Project Stakeholder Risks

Stakeholder Risk	**Rating**	**Moderate**				
Risk Description: 1. The risk is that frequent ministerial changes may undermine the ownership of the proposed reform and delay project implementation. 2. The risk is that the Government's internal processes may delay project preparation and launch of its activities. 3. The risk is that other government agencies may offer grant financing schemes that may duplicate efforts of this operation and undermine the objectives of this project.	**Risk Management:** 1. The Bank team will engage with the counterpart in the Ministry of Education and Science (MOES) on a technical level to keep the project ongoing in spite of the possible ministerial changes. The team will identify ministerial changes that may affect the project and engage proactively with the CMU to minimize the disruption seeking CMU's engagement when high level government support is required following the ministerial changes. The MOES is expected to play an important role in implementation of the project and, in an unlikely event of unexpected political appointments that may lead to lower ownership, the delegated function of MOES will help to continue project implementation smoothly.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Both	In Progress	Both	☑		CONTINUOUS
	Risk Management: 2. The Government has strong ownership of this project (the Government requested the Bank to prepare the project fast and the MOES approved in principle). The Project was included into the PFA which is being developed in fast track mode. The project has been included into the Republican Budget on November 14, 2014.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	In Progress	Both	☑		CONTINUOUS
	Risk Management:					
	This is a low risk.					

	Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
	Client	In Progress	Both	☑		CONTINUOUS

Implementing Agency (IA) Risks (including Fiduciary Risks)		
Capacity	**Rating**	**Substantial**

Risk Description:

1. The risk is that the integration of the PMU within the MOES will be delayed and that the MOES will not be able to increase the PMU capacity fast enough in procurement or, in general, will not be able to manage the larger grant programs under this project and that.

2. The risk is that the beneficiaries do not know how to fill out the requests for grant payments (beneficiaries include Senior and Junior Research groups, members of the consortia).

3. Reflecting the design and expected impact, the implementation arrangements for the project involve old and new entities and mechanisms. Adopting these structures into the existing ministerial setup may take considerable time taking into consideration similar issues with the Technology Commercialization Project

Risk Management:

1. (a) The existing PMU is integrated within the MOES and the accumulated expertise of the TCP PMU will be transferred to the new PMU, and it is proposed that additional experts will be financed by the project; the MOES will provide input to the PMU on technical aspects of the project; the modified and improved external advisory board (the International Science and Commercialization Board, ISCB) will continue to provide advice to the MOES/PMU on technical quality of project activities; and the Project Steering Committee chaired by the Vice Minister of the MOES will monitor project implementation towards the PDO. These arrangements will provide better operational environment for implementing the project, ensure better working conditions, timely salary payments and better benefits for PMU, and ensure more staff resources.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Client	In Progress	Both	☑		continuous

Risk Management:

2. The PMU will organize regular training to beneficiaries on applications and payment requests. Based on the TCP experience, the PMU has created an open atmosphere whereby beneficiaries feel free to contact the PMU frequently to seek guidance.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Client	Not Yet Due	Implementation	☑		continuous

Governance	Rating	Substantial				
Risk Description: 1. The risk is that the MOES will not provide counterpart funds on a timely basis. 2. The risk is that the MOES has cumbersome internal processes and poorly defined roles and responsibilities in the finance and technical departments that may lead to delays in making decisions affecting contracts and payments.	**Risk Management:** 1. The PMU will initiate preparation of the annual Feasibility Study (de facto, the annual budget that authorizes disbursement for project activities) and advance its preparation by the MOES until it is submitted to the MOF on time to avoid delays.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	Not Yet Due	Implementation	☑		Yearly
	Risk Management: Risk 2. The POM will provide detailed description of internal processes, as well as lay our specific roles and clear responsibilities of parties.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	Not Yet Due	Implementation	☑		continuous
	Risk Management: Risk 2. The existing TCP PMU is integrated within the MOES and the accumulated expertise of the TCP PMU can be transferred to the PMU to better facilitate the internal processes. The Project steering committee will provide a forum for resolving project management and implementation issues since it will include members of the main entities facilitating implementation of the project (e.g., Department of Finance of the MOES, Legal Department of the MOES, Head of the PMU, and the National Agency for Technological Development, among others). The POM will provide detailed description of internal processes, as well as lay out specific roles, clear responsibilities of parties and timeline for each approval step.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	In Progress	Both	☑		continuous
	Risk Management:					

	Ring-fencing of project activities will be implemented, including additional reporting requirements and independent audits of the project financial statements by auditors satisfactory to the Bank.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Bank	In Progress	Both	☑		continuous

Project Risks

Design	Rating	Substantial

Risk Description:

1. The risk is that a small portion of the project design (e.g. innovation consortia/technological platforms) is novelty in Kazakhstan and there are uncertainties about how the project will be received by various stakeholders and what obstacles to implementation may appear.

2. The risk is that there is no commercial relevance for research that the project finances under C1. Thus, the C2 and C3 will not get good input unless commercially viable R&D projects are found outside the project.

3. The risk for establishing industry-R&D consortia is that, since the corporate sector constitutes of state-owned enterprises (SOEs), the Government may influence their decisions and the SOEs may not be interested in commercialization or that research teams and members of consortia do not attract interest from international laboratories for establishing a technology consortium. The other risk to establish them is that they do not focus on national goals or that the pursuit of good scientific research on an agenda that is heavily influenced by the interests of the researchers in each of the isolated labs.

Risk Management:

1.The novel design is based on lessons of implementation of similar World Bank projects in other countries (for example, Vietnam S&T project, Mexico and Argentina innovation projects, Armenia Innovation and E-society for Competitiveness projects). The proposed two-stage application procedure (e.g. innovation consortia/technological platforms) is designed to be the most important risk mitigation measure for the new instrument of consortia.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Client	Not Yet Due	Implementation	☑		continuous

Risk Management:

2. The eligibility criteria for R&D grants will emphasize commercial relevance as an eligibility criterion. The results of the TCP have demonstrated the potential commercial relevance of Kazakh science (6 out of 21 research groups' projects have sales value). It will done during implementation.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Client	In Progress	Preparation	☐	Oct 31, 2015	

Risk Management:

3. It is assumed that the SOEs motivation and behavior are not radically different from

<table>
<tr><td>4. The risk is that experienced companies will lack interest to assume management of the venture funds. There is a lack of deal flow.

5. Complexity of design may cause implementation delays in terms of setting up deployment framework, institutional and capacity setups.</td><td>the behavior of private sector firms. Based on the commitment of the Government, it is likely that the Government will ask them to support the project. In addition, the Government intends to maintain the ISCB which will provide necessary assurance that the agreed procedures, transparency of process, feedback mechanism are in place.
<table>
<tr><th>Resp:</th><th>Status:</th><th>Stage:</th><th>Recurrent:</th><th>Due Date:</th><th>Frequency:</th></tr>
<tr><td>Client</td><td>Not Yet Due</td><td>Implementation</td><td>☑</td><td></td><td>continuous</td></tr>
</table>
Risk Management:
Risk 4. The activities under Component 4 will foster long-term interests of companies and hence their contributions to the VC fund.
<table>
<tr><th>Resp:</th><th>Status:</th><th>Stage:</th><th>Recurrent:</th><th>Due Date:</th><th>Frequency:</th></tr>
<tr><td>Client</td><td>Not Yet Due</td><td>Implementation</td><td>☑</td><td></td><td>continuous</td></tr>
</table>
Risk Management:
Risk 4. The proposed project follows a comprehensive approach by including both, a pilot private public venture capital fund as well as the setting up of privately managed deal flow agents to assist in developing ideas into projects suitable for venture capital financing.
<table>
<tr><th>Resp:</th><th>Status:</th><th>Stage:</th><th>Recurrent:</th><th>Due Date:</th><th>Frequency:</th></tr>
<tr><td>Client</td><td>In Progress</td><td>Preparation</td><td>☑</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Social and Environmental</td><td>Rating Moderate</td></tr>
<tr><td>Risk Description:</td><td>Risk Management:</td></tr>
<tr><td>Environmental: The risk is that screening of the project and implementation of the EMF will not be done properly due to the envisaged large number of projects and insufficient number of staff in PMU.</td><td>Environmental: Currently there is one person in TCP PMU in charge for the environmental issues. For other technical staff working on the project and first round of applicants, the WB environmental specialist will organize workshop on environmental compliance and implementation of the EMF at the beginning of project implementation. The WB environmental specialist will closely monitor screening</td></tr>
</table>

<table>
<tr><td>Social:
Risk 1: There is a risk that the selection and award of grants can be perceived as non-transparent by applicants.

Risk 2: There is a risk that some land acquisition could take place for the implementation of sub- grant activities without due diligence process.</td><td>process to support the client. To mitigate risk, the WB environmental specialist will perform: a) prior review and clearance of all sub-projects falling in B+ requiring a EIA and EMP, as well as other potentially sensitive sub projects and b) post review of screening of all other projects. During project implementation based on the quality of the EMF implementation, the WB environmental specialist might organize additional trainings and intensify supervision and recommend if needed additional staffing

Social:
Risk 1: The project will promote the principles of good governance and transparency. These will be outlined in the Project Operational Manual reflecting detailed operational policies and procedures to insure independent decision-making in award and allocation of all grants. The grievance procedures will also be publicly available for stakeholder participation and feedback. The Beneficiary Feedback Mechanism (BFM) will be expanded from the currently used model under TCP and include verbal, online and survey channels.

Risk 2: The Project Operational Manual includes a check lists for screening of all grants at the early application stage to ensure due diligence. All subprojects/grants will be screened to ensure: (i) compliance with the World Bank Group (IFC) exclusion list, (ii) that no subprojects with significant impacts of a Category A type are supported, and (iii) that subprojects/grants will not necessitate involuntary land acquisition. Open market purchase of land on a willing seller-willing buyer basis may be used. Any rehabilitation works, such as laboratory upgrades/rehabilitation, if needed, are expected to be within existing facilities. Monitoring will be carried out by the delegated social and environmental staff at the PMU and also supported through regular Bank implementation supervision.
<table>
<tr><th>Resp:</th><th>Status:</th><th>Stage:</th><th>Recurrent:</th><th>Due Date:</th><th>Frequency:</th></tr>
<tr><td>Client</td><td>Not Yet Due</td><td>Implementation</td><td>☐</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Program and Donor</td><td>Rating Moderate</td></tr>
<tr><td>Risk Description:

The risk is that donor funded programs may offer grant financing schemes that may duplicate efforts of this</td><td>Risk Management:

The World Bank team will continue close collaboration with relevant authorities emphasizing donor collaboration to identify potential conflicts at concept or early</td></tr>
</table>

operation and undermine the objectives of this project.	stage to able to respond to them on a timely basis.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Bank	In Progress	Both	☑		CONTINUOUS
Delivery Monitoring and Sustainability	**Rating**	**Moderate**				
Risk Description: The risk is that the PMU lacks enough capacity for monitoring grant implementation and there will be delays in developing the M&E system for the project due to complex, innovative nature of the project activities.	**Risk Management:** This risk will be mitigated through project implementation arrangements. The existing PMU is integrated within the MOES. The project will hire more staff and Consultants help the PMU to design the operational procedures building on and complementing the procedures designed for the TCP. The MOES and the ISCB will assist the PMU by collecting data on project implementation. The Project Steering Committee will be established and one of its functions will be to monitor progress against the agreed indicators and other data.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	In Progress	Both	☑		CONTINUOUS
Other (Optional)	**Rating**					
Risk Description:	**Risk Management:**					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
				☐		
Other (Optional)	**Rating**					
Risk Description:	**Risk Management:**					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**

				☐		

Overall Risk		
Overall Implementation Risk:	**Rating**	**Moderate**

Risk Description:

The key risks during implementation are capacity & governance and design risks, namely that (a) the PMU will not adjust to the new arrangement quickly enough to manage implementation of the grant programs in the proposed project; (b) the Borrower will not provide counterpart funds on a timely basis; (c) the grant program under Component 1 will not deliver commercially viable R&D projects in time to provide inputs to Components 2 and 3, research teams will not attract sufficient interest from international laboratories to establish a technology consortium (Component 2), and Kazakh business will not generate enough demand for investing in them; and (d) that grant beneficiaries will not have capacity to prepare applications and payment requests correctly.

Annex 5: Implementation Support Plan

KAZAKHSTAN: Fostering Productive Innovation Project (P150402)

Strategy and Approach for Implementation Support

1. **This implementation support plan (ISP) describes how the World Bank will help the client achieve the expected results.** It has been developed based on the risks and risk mitigation measures identified in the ORAF (Annex 4). The ISP puts particular emphasis on (a) monitoring and evaluating results on the ground; (b) facilitating the timely implementation of the risk management measures identified in the ORAF, and (c) providing the necessary technical advice to the client to build capacity, bringing international experience and good practices when appropriate.

2. The implementation support strategy for the proposed project would include regular dialogue with the Government, joint review of the project implementation and regular exercise of fiduciary oversight throughout implementation.

a. ***Regular dialogue with the Government and MOES*** would facilitate early identification of problems, obstacles and risks that could delay implementation. Dialogue would focus on monitoring inputs, outputs, results and risks based on the procurement plan, result framework (Annex 1) and ORAF and enable the timely provision of technical advice and support to remove obstacles. This would help to identify issues as they emerge and address them through advice and support in an expeditious manner, without waiting for joint reviews. Dialogue would be carried out through regular implementation support missions, video and audio conferences.

b. ***Joint reviews*** would take place twice a year, aimed at examining the progress in achieving agreed targets and results. The Bank Task Team would participate in the reviews with representatives of the Government. During each review, the type of implementation support that is needed would be identified, followed by joint decisions on necessary assistance.

c. ***Fiduciary oversight*** would enable the Bank to fulfill its fiduciary obligations and ensure compliance with its fiduciary standards through the ongoing supervision of the Project's financial management and procurement arrangements and results.

Implementation Support Plan

3. The project has designed the following implementation support at different stages:

Table 1. Main Focus in Terms of Support to Implementation

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months (November 2014-September 2015)	Loan signing, effectiveness, project launch, facilitation of internal processing within Government agencies	TTL and operational staff	16SW	MOF, MOES process Government's internal approvals
	Help with institutional set up for smooth transition of the existing PMU to new PMU arrangement, plus organize during supervision mission trainings, seminars on success stories around the world related to project specific activities. Fiduciary team will help with systems set-up.	TL Innovation Experts Procurement and Financial Management specialists	20SW 6SW	
	Support preparation of TORs to engage consultants, review of technical specifications for procurement of software and hardware, clear relevant procurement documents for the first year (additional PMU staff)	TL Procurement specialist	0.5SW	
	PMU staff training on fiduciary issues	Procurement and Financial Management specialists	0.5SW	
	Risk-based FM IS mission within a year of the project effectiveness. Support IS missions with regards to FM issues and review the regular IFRs and annual project audit reports	Financial Management specialist	3SW	

	For PMU environmental specialist, other technical staff working on the project and first round of applicants, the WB environmental specialist will organize workshop on environmental compliance and implementation of the EMF at the beginning of project implementation.	Environmental & Social Specialist		
12-48 months (October 2015 – September 2017)	For all components, provide implementation support ranging from design of a particular financing window/instrument, review/assess the implementation of selected programs/activities. Risk-based FM IS mission at appropriate intervals. Review the regular IFRs and annual project audit reports. Review procurement documents	TL Innovation Experts Financial Management specialist Procurement Management	16SW 2 SW 2SW	

Table 2. Skills Mix Required (over the total 24-month period)

Skills Needed	***Number of Staff Weeks***	***Number of Trips***	***Comments***
Task Team Leader	32SW	2 x yrs.	
Co-Task Team Leader	32SW	-	Based in Astana
Sector Leader	1SW	1	
Operational staff	12SW	2	
Project Implementation Consultant	8SW	-	Based in Astana
Innovation Expert	10SW	2	
Innovation Expert	10SW	2	
Financial Management Analyst	3 SW	2	

Procurement Specialist/Analyst	3 SW	2	Based in Astana
Environment Development Specialist	1.5SW	1	
Social Development Specialist	3 SW	-	

Table 3. Partners

Name	***Institution/Country***	***Role***
Tahir Balykbaev	*MOES VM*	*Chair of the steering committee*
Daniyar Doskarayev	*PMU*	*PMU Director*
Glenn Schweitzer	*ISCB*	*Chairman*
Zhumatay Salimov	*NATD*	*Deputy Chairman*
Erlan Sagadiev	*MID*	*Vice-Minister*

Annex 6: Economic and Financial Analysis

KAZAKHSTAN: Fostering Productive Innovation Project (P150402)

Overview

1. **This economic analysis follows the World Bank guidance note on economic analysis of investment project financing and uses ex-ante cost-benefit analysis framework to assess and monetize costs and benefits of implementation of the proposed project (FPIP) and associated externalities.** In particular, it looks into direct (financial) costs associated with implementation of FPIP and indirect costs associated with deadweight losses due to collection of taxes and possible environmental damages. On the benefits side, the analysis covers financial and economic revenues generated by innovative activities facilitated by the FPIP. The analysis arrives at Net Present Value of US$ 25.8 million in the baseline case.

2. **Public rationale**. Public intervention in fostering productive innovation in Kazakhstan is justified by two well-known features of R&D investments: 1) information asymmetries and coordination failures that prevent efficient private investments and 2) economies of scope and other positive externalities of establishing strong industry-R&D links and innovation consortia that cannot be captured in form of private returns and thus require public investments. Although examples of venture fund financing as an alternative to public funding can be found worldwide, existing experience in Kazakhstan shows that venture funds and industry are not eager to commit significant funds before basic concept is demonstrated, prototype developed and tested.

3. **World Bank's value added. World Bank actively participated in designing and implementing the Technology Commercialization Project in 2007-2015,** and is seen as long-term strategic partner of Kazakhstan in fostering productive innovations in Kazakhstan. The World Bank will be able to draw from the lessons learned of the TCP and similar projects implemented worldwide (Chile, Vietnam, etc.).

4. **Standing.** The analysis is carried out from the national perspective of Kazakhstan. The parties with standing are:

a. **Kazakh taxpayers** since reimbursement of the World Bank's loan allocated to the FPIP would be financed from the state budget. Kazakh taxpayers are thus affected in two ways: increased direct tax burden and deadweight loss due to distorted decisions caused by taxes. At the same time, this group will benefit from increased innovative production, increased exports of high-value-added products and enhanced capacity for innovative activities.
b. **Research institutes, universities, R&D groups and laboratories** will benefit from direct financial inflows and indirect externalities in form of innovation-enabling environment, increased presence of venture capital, diversification of sources of financing S&T/R&D activities.
c. **Kazakhstan Ministry of Education and Science and subsidiary agencies** will bear indirect expenditures in the form of increased workload of the personnel and/or direct expenditures to hire new employees to maintain activities in the frame of the FPIP.

d. **Kazakh residents receiving PhD research and training grants** abroad or fellows of the Bolashak scholarship that are already abroad engaging in international research activities in the frame of the FPIP.
e. **Kazakh technology firms** and existing TTOs that would receive equity investments and technological upgrade.
f. **Kazakh companies and individuals** involved in design and implementation of the project would receive benefits in form of rents and salaries.

5. **Assumptions**. The economic analysis will consider costs and benefits of the FPIP project based on following assumptions:

(i) Funds allocated on the project will be disbursed within the period of 2016-2021 (the planned lifetime of the FPIP);
(ii) Funds allocated to Components 1, 3 and 5 of the project will be disbursed relatively evenly across the period of 2016-2020;
(iii) Expenditures for establishment of the innovation consortia under Component 2 and the strengthening coordination of National Innovation System under Component 4 of the project will be distributed between years 1-5 of the project's lifetime with main share of disbursements skewed towards years 2, 3 and 4. This assumption is based on expectation that spending on selection procedures (selection of members of innovation consortia) will be negligible in the first year of the project's lifetime;
(iv) Cost allocation of innovation projects to be implemented in the frame of the FPIP is approximated by available aggregated data on the structure existing R&D expenditures of the private sector in Kazakhstan; and
(v) The base case considered by the cost-benefit analysis will take 5.5 percent social discount rate (based on refinancing rate of the National Bank of Kazakhstan) for calculating present values of future costs and benefits as proposed by Government of Kazakhstan (GoK)[11].

6. **However, the latter assumption will be altered to calculate net benefits in the pessimistic case and the worst case scenarios for sensitivity analysis.** The timeline of the analysis is limited to 10-year period of 2016-2025, including time period of 2016-2021 of implementation of the project and 2021-2025 when major benefits of the project are expected to appear. Limitation of timeline of the analysis to 10-year period is dictated by presence of a large number of contingencies, including possible changes in macroeconomic, demographic and legal environment of the country in the long-run, influence of foreign actors, uncertainties related to nature of innovation projects to be implemented in the frame of the FPIP. In particular, projects launched in the frame of the FPIP may range from innovations in public service or social protection (with relatively lower private returns) to innovations in mineral extraction (with relatively lower social returns) that have differing rates of return. All present values presented in the analysis are in terms of 2014 US dollars, rounded to nearest decimal, unless noted otherwise.

[11] As articulated in the joint order of Minister of Economic Development and Trade of the Republic of Kazakhstan of July 1, 2010 No. 102 and the Chairman of Agency of the Republic of Kazakhstan for construction and housing and communal services of June 30, 2010 No. 276. No. 6345. Registered in the Ministry of Justice of the Republic of Kazakhstan on July 23, 2010

All sums in national currency were translated into US dollar equivalent using official exchange rate of National Bank of Kazakhstan.

Calculation of Costs and Benefits

7. **The potential costs and benefits of the FPIP project can be divided into two groups:** 1) direct costs and benefits associated with launch and administration of the project and 2) side effects (externalities) of the project. These are presented in Table 1 below.

Table 1. List of potential impacts of FPIP

COSTS		
Group with standing	**Component**	**Description**
Kazakhstan taxpayers (individuals and firms)	Component 1	Direct financial outflows on grants to research teams and PhD research and training
	Component 2	Direct financial costs of establishing and maintaining innovation consortia: administrative expenses, overhead, salaries of consortia employees, grants to upgrade laboratory facilities.
	Component 3	Direct financial outflows on funding technology-based enterprises
		Direct financial outflows on innovation brokerage to generate deal flow. Expenses on formation and remuneration of innovation brokerage team.
		Direct financial outflows on establishment of Technology Acceleration Offices abroad.
		Direct financial outflows on selecting and upgrading Technology Transfer Offices
	Component 4	Operating costs of strengthening capacity of institutions engaged in coordination of NIS: hiring additional workforce institutions; upgrading office equipment; travel/lodging, remuneration expenses of members of the International Science and Commercialization Board; expenditures on inter-agency communications etc.
	Component 5	Direct financial outflows related to project implementation and institutional capacity building.
	All components	Distortionary cost of taxation.
	Components 1,2,3	Environmental impact of upgrading existing laboratories and implementation of innovative projects in frame of FPIP.
Research institutes, universities and R&D groups	Components 1, 2, 3	Administrative expenses incurred by R&D groups during application for grants, preparing business plans and performance reports, expenses related to compliance with formal requirements.
Ministry of Education and Science, other state agencies	All components	Indirect expenditures in form of increased workload of their personnel and/or direct expenditures in form of hiring new employees to maintain activities in frame of FPIP.
Kazakh technology-based enterprises, TTOs	Component 3	Administrative expenses incurred by technology-based firms and existing TTOs during application for equity investments, preparing business plans and performance reports, expenses related to compliance with formal requirements.
BENEFITS		
Kazakhstan taxpayers	All components	Increased access to innovative goods and services, increased employment in industries with high value-added, establishment of innovation-enabling environment

Research institutes, universities and R&D groups	All components	Increased rents (through enhanced innovative capacity).
Ministry of Education and Science, other state agencies	All components	Increased institutional capacity for fostering innovations.
Kazakh residents obtaining PhD training in frame of FPIP	Component 1	Increased income in form of wages in underemployed R&D market
Low-skill workers employed in frame of FPIP and consecutive innovative projects.	All components	Increased income in form of wages of otherwise unemployed low-skill workers.
Real estate firms, landlords	All components	Increased rents. Welfare gains due to increased value of land and real estate objects
Kazakh technology-based firms, existing TTOs	Component 3	Increased goodwill due to investments into capital stock, human resources and intangibles.

8. **As Component 1 of the FPIP is an expansion of the TCP project, grants to research teams under this component is largely an adaptation of already existing instruments of the TCP.** Thus, it can be assumed that Component 1 of the proposed project has passed the stage of design and regulatory clearance and current analysis will consider costs related to teething stage of the component (costs related to increasing public awareness about research grants, identifying and formalizing application procedures, searching/hiring/training project coordinators, etc.) as sunk.

Calculation of Costs

9. ***Component 1.*** Based on the TCP project, the component will finance two types of grant instruments for eligible R&D ideas: one for young researchers (a continuation of the Junior Researcher Group Program) up to US$0.6 million each and one for internationally recognized researchers up to US$1.5 million each (a continuation of the Senior Scientist Group Program). A grant could finance laboratory equipment, workshops, visiting scholars, etc. In all, US$30 million would be allocated on research grants. Also, a total of US$10 million would be allocated on PhD research and training and/or a pilot higher education consortium between Kazakhstan and a relevant Western university of excellence.

10. **The primary costs of this component are associated with direct financial outflows in form of grants to research teams and grants for PhD research and trainings.** Here it is assumed that disbursement mechanisms have already been established well in frame of the TCP project and Kazakh S&T community is aware of availability of research grants. Since the MOES already operates the Bolashak scholarship program, PhD research and trainings are also expected to kick start from first year of the project. Thus, expenditures under Component 1 are relatively evenly spread between first 5 years of FPIP lifetime.

11. **Direct cost of grants for PhD research and training is US$10 million that will be spent on tuition fees, insurance travel and lodging of scholars abroad.** Since a negligible proportion of this sum is expected to be spent in Kazakhstan, 100 percent of this sum is counted as cost.

12. **Indirect costs of the component include spending of research teams on incorporating themselves as companies and semiannual field visits by the ISCB needed for monitoring research progress.** Available data suggests that establishing a company in Kazakhstan will take 12 worker days and about KZT 10,000-12,000 in registration fees[12]. As of May 2014 the average monthly salary in Kazakhstan comprised KZT 120,479 or KZT 5,238 per working day. Thus cost of establishing a company is KZT 74,856 (US$410). Assuming that 50 research groups will receive grants, cost of establishing 50 companies would total to US$20,500.

13. **The analysis does not incorporate cost related to semiannual field visits by the ISCB, applications of research teams for grants and applications of scholars for PhD research and training grants for following reasons:** a) predicting such cost may be unreliable due to many contingencies (location of research facility, number of days spent on a visit etc.); b) the final number is expected to be negligible compared to scale of the project; and c) most part of such costs are pure transfer of funds and can be discarded from the analysis.

14. **Taking into account all above-mentioned assumptions and given 5.5 percent social discount rate (SDR), present value (PV) of total costs of Component 1 is US$ 32.1 million**.

15. **Component 2.** This component will finance establishment of innovation consortia to promote collaboration among the existing scientific research institutes and design bureaus (US$ 35 million.). Selection of suitable laboratory facilities in Kazakhstan to form a consortium will be done through open competition which mandates international collaboration and the co-funding of users and clients as prerequisites. The grants would be awarded for consortia addressing strategic problems relevant for Kazakhstan's future (related to energy, minerals, metallurgy and agriculture). The winners would receive MOES grants for upgrading to international standards. The grant conditions would allow purchase of additional equipment, renovation and, among others, would require adoption of good laboratory practices, international certification. It is expected that up to 10 user-driven innovation clusters would be developed between major Kazakh and global companies.

16. **Due to contingencies related to institutional configuration of would-be innovation consortia as well as absence of relevant literature, cost structure of this component is not analyzed in detail here.** However, it is known that expenditures made under this component will primarily be allocated on upgrading winning laboratories to international standards. At the same time, it is assumed that the equipment required to upgrade laboratories would be imported with no transfer of funds to local firms and residents. Also, cost of applying for grants is considered negligible and is not counted for. Thus, taking into account above assumptions and SDR of 5.5 percent, PV of costs of Component 2 amount to US$29.1 million.

[12] Doing Business 2013, World Bank Group. Accessed online May 5, 2014 http://www.doingbusiness.org/data/exploreeconomies/kazakhstan/starting-a-business

17. Component 3. This component would include the following four subcomponents and finance the following activities:

(i) *Public Support to a Funding Facility for technology-based enterprises* (US$10 million) to pilot an ESVC-fund (the Fund) that would comprise a limited public contribution -up to US$10 million and up to one half of the total fund equity. The project will also provide an up to 50 percent subsidy towards the management fee of the fund. While the exact management structure is to be further explored, the management fee is estimated at approximately US$250,000 for four years of operation. It will be provided on a sliding scale basis (from 50 percent in year 1 to 10 percent in year 4).

(ii) Innovation Brokerage to Generate Deal Flow (US$2.0 million) to support the formation of *innovation brokerage team* that would assist an entrepreneur in all stages of the incubation cycle. More specifically, the functions of the "deal flow" promoters would comprise (i) assessing the technological viability of the project; (ii) estimating the commercial potential of the innovation; and (iii) generating, presenting and marketing new information about the project.

(iii) Technology Acceleration Office Abroad (US$2 million) to enhance marketing and technological capabilities of technology companies. There will be two such offices: one located at one of the recognized centers of excellence in technological innovation of the West: in the USA (Silicon Valley, CA, Austin, TX) and another in a major technology power of the East, most likely in China.

(iv) Network of TTO at major Kazakh universities (US$10 million). This sub-component will enhance capabilities of existing TTOs with an objective to reach a critical mass technology commercialization and transfer capabilities within a coherent network of about 5-6 capable TTOs. Operating in concert with sub-components (b) and (c), this sub-component will facilitate an adequate deal flow for the venture fund sub-component (a). It will finance goods and services (training, study tours) to upgrade capabilities of TTOs.

18. **Current analysis does not count for costs of companies co-financing technology firms and equity investments.** Counting of these costs is avoided due to uncertainty about proportion of domestic and foreign firms (that do not have standing in current analysis) expected to participate in consortia as well as form of their participation (direct financial or in-kind participation). Costs of applying for equity investments and TTO upgrades are considered negligible and are not counted here as well. Thus, taking into account above assumptions and SDR of 5.5 percent, PV of costs of Component 3 amounts to US$19.9 million.

19. **Component 4.** Strengthening coordination of the National Innovation System to assure better coordination of the Innovation System between key stakeholders (US$6 million). The component would finance Technical Assistance to increase capacity of institutional structures and related operating costs. Apart from direct cost of US$6 million, the component has indirect cost in the form of increased workload of the personnel of state agencies and/or spending on hiring new employees to maintain activities in the frame of the component. In all, four ministries (Ministry of Education & Science, Ministry of Investment and Development, Ministry of

Agriculture, and Ministry of Energy or their successors) and subsidiary agencies are expected to take part in activities of Component 4. It is assumed hereby that these ministries will not increase workload of current employees, but rather hire 5 new employees to maintain activities of the Component. Thus it is assumed that four ministries and their subsidiaries would hire a total of 20 new full-time employees due to Component 4. As of May 2014 the average monthly salary in Kazakhstan comprised KZT 120,479, which implies KZT 28 million (US$154 000) to be spent on average on 20 new employees per year. Over the course of 4 years (2016-2019) this sums to PV of US$512, 000.

20. **Based on previous assumption that financial outflows under this component will start in second year of the project's lifetime and will be evenly distributed across four years,** PV of costs of Component 4 amounts to US$5.3 million.

21. **Component 5.** Project management, monitoring and evaluation, awareness raising and capacity development (US$5 million.). It is expected that the component will not have indirect costs. Based on previous assumption that financial outflows under this component will mainly take place in years 1, 2 and 3 of the project lifetime, the Present Value (PV) of costs of Component 5 amounts to US$4.1 million.

22. **The FPIP project may also cause negative impact on environment due to possible emergencies at R&D sites, wastes generated by laboratories, field trials of new products and substances, etc.** However, 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 will emerge during the course of project implementation. Based on previous experience with the TCP project, it is expected that safeguard measures in frame of the project would comply with World Bank safeguard policies and procedures and with best international practices 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. Thus, potential environmental impact of the project is expected to be modest and is not quantified in this analysis.

23. **A considerable negative externality of the project is the deadweight loss resulting from distorted decisions of economic agents due to collection of taxes to finance the project.** Existing literature on distortionary impact of taxes is extensive and estimates of this negative externality to range from 2.5 cents to 30 cents per dollar of public funds raised through taxation[13]. The current analysis takes the median of this range at about 16 cents per 1 dollar of tax revenue. Another simplification, which is required here due to uncertainty at this stage of the project, is that taxes will be collected at last year of the project lifetime. Given these assumptions, PV of distortionary impact of taxes amounts to US$12.1 million.

[13] Martin Feldstein, Tax Avoidance and the Deadweight Loss of the Income Tax, 81(4), Review of Economics and Statistics (1999), at p. 674; and Charles L. Ballard, John B. Shoven and John Whalley, The Welfare Cost of Distortions in the United States Tax System: A General Equilibrium Approach, National Bureau of Economic Research Working Paper No. 1043.

Calculation of Benefits

24. The principal benefit of the project comes from sustainable development of innovative research and production in Kazakhstan through following vehicles:

a. Accumulation of scientific infrastructure and human resources – prerequisites for cutting-edge R&D and accommodation of scientific knowledge from abroad;
b. Establishment of strong industry-R&D linkages and developing technology commercialization cycle;
c. Addressing existing market failures and information asymmetries;
d. Building up institutional capacity to support commercially-viable R&D activities;
e. Increasing attractiveness of scientific career among young generation, thus contributing to stable supply of human capital to NIS of Kazakhstan; and
f. Diversifying Kazakh economy and increasing share in GDP of production with high value-added.

25. **This is an incomplete list of extremely important positive externalities of the proposed project, though barely quantifiable.** This is mainly due to uncertainties related to the scope and scale of expected innovation activities, e.g. commercialization of R&D ideas in vast array of sectors ranging from production of new milk starters to oil drilling to space & defense will impact different groups of population with differing scale at different time horizons. Also, Component 2 of the Project envisages Calls for Proposals to establish inclusive innovation consortia: a long-term collaborative effort to improve delivery of social services (health, education, water, urban and rural infrastructure) to increase livelihood of urban and rural population. Such activities are expected to reduce extreme poverty and its perennial satellites - extremism and political instability. Given lack of relevant literature and data, monetization of these benefits will also require a large vector of assumptions and simplifications. Thus, monetary value of possible benefits put at micro level is doomed to be highly imprecise. Instead, current analysis tries to analyze macro-level impact of the proposed project based on available literature.

26. **The well-known cross-country comparative study conducted by Lederman and Maloney (2004),** shows that the social return rate of R&D in such middle-income country as Kazakhstan approaches 60 percent on average. That is each dollar spent on R&D in Kazakhstan is expected to generate gross gain of 1.60 dollars. Meanwhile time lag with which R&D expenditures impact economy is also important for cost-benefit analysis. Goto and Suzuki (1989) estimated the private and social return rates in various industrial sectors in Japan, and found that not only is there a lag in the impact of R&D activities but that the lags also vary depending on the industry. Specifically, they showed that the impact takes an average of two years in the case of electrical machinery, electronic and communication equipment parts, and mechanical machines. This is a substantially different period than that for drugs and medicines whose lag period exceed five years. The authors suggest that this heterogeneity is explained by

technological differences between sectors or by different employee skill levels and competition[14]. Following conservative approach of estimation, current analysis assumes time lag between expenditures and impact to be 5 years and that social return of the project will be evenly produced during 5 years after completion of the project.

27. **Certain components of the project will also generate benefits in form of new jobs and payments to budget.** The analysis incorporates wages and training of personnel as benefit on the basis of assumption that remuneration offered to the personnel engaged in innovation projects in the frame of the FPIP are higher than wages they would otherwise receive (especially true for regions outside Almaty and Astana). According to the Statistical Agency of Kazakhstan, on average, about 45 percent of R&D expenditures of private entities represent transfers in form of salaries (40 percent), payments to budget (4 percent) and training of the personnel (1 percent). Also, data of the agency suggest that on average about 10 percent of private entities' R&D personnel are foreign residents, who do not have standing in current analysis. Assuming that private entities offer two times higher salaries to foreign R&D specialists, the analysis should count 80 percent of spending on salaries toward benefit. This benefit should further be divided into two to incorporate opportunity cost in form of salaries the personnel could be receiving if they were not engaged into the project (thus it is assumed that salaries offered in frame of the project are twice the average salary the personnel would otherwise receive). To summarize, 17 percent of financial outflows on research and funding of technology-based entities in the frame of Components 1, 2 and 3 (excluding subcomponents 1.B and 3.C) represent benefits in form of salaries and training of the personnel. Subcomponent 3.D envisages expenditures on training and study tours of the personnel of Technology Transfer Offices. Assuming that 50 percent of spending under this subcomponent will be in the form of training, this will bring additional benefit of nominal value of US$5 million. Also, on average 4 percent of financial outflows in the frame of all components of the project would be payments to budget (excluding subcomponents 1.B and 3.C). These benefits are assumed to be evenly spread over the project's entire lifetime.

Calculation of Net Present Value of the Project

28. **Tables 2 below presents Net Present Value (NPV) of costs and benefits of the FPIP from the perspective of Kazakhstan from 2015 through 2024.** All benefits and costs have been discounted by 5.5 percent SDR over the course of 10 years. According to the results shown in the table, NPV of the FPIP and associated activities is US$ 29.3 million in positive benefits (refer to Table 4 below to see a summary of nominal values distributed across 10 years).

[14] José Benavente, José De Gregorio, Marco Núñez, Rates of return for industrial R&D in Chile (2006). Accessed online May 5 2014, http://www.econ.uchile.cl/uploads/publicacion/796a2879-df18-45a1-9dca-4a9023c5b7c7.pdf

Table 2. Present Values of costs and benefits of the FPIP project, baseline case

COSTS		
Group	**Description**	**Value (mm of 2014 USD)**
Direct financial outflows		
Kazakhstan taxpayers	Component 1	32.11
	Component 2	28.14
	Component 3	19.89
	Component 4	4.85
	Component 5	4.15
Administrative costs		
Research groups	Cost of applying for R&D grants (Subcomponent 1.A)	0.02
Research institutions	Cost of applying for grants to establish consortia (Component 2)	Negligible
Technology firms and universities	Cost of applying for equity investments and TTO upgrade (Subcomponents 3.A and 3.D)	Negligible
Kazakhstan taxpayers	Increased workload of implementing agencies (Component 4)	0.48
Negative externalities		
Kazakhstan taxpayers	Negative impact on environment (Components 1,2,3)	not counted
	Distortionary impact of taxes (all components)	12.09
	Total costs	101.7

BENEFITS		
Group	**Description**	**Value (mm of 2014 USD)**
Direct benefits		
Kazakhstan taxpayers	Tax revenue (all components)	3.99
The personnel engaged in projects in frame of FPIP	Welfare gains in form of wages and training (Subcomponents 1.A, 2, 3.A and 3.B)	14.52
Scholars engaged in PhD research and training in frame of FPIP	Welfare gains in form of wages and increased social mobility	not counted
Positive externalities		
Kazakhstan taxpayers	Social return of the project	109.01
	Total Benefits	127.53
	Net Benefits	25.8

Sensitivity Analysis

29. Although the base case calculations show more than US$29 million of net benefit, this figure may change in following scenarios:

a. a higher SDR is applied;

b. expected impact of the project on economy is in lower end of estimated range.

30. **To test viability of the project against these arguments, the analysis recalculates present values of costs and benefits by using 7.5 percent SDR (vs. 5.5 percent in base case) and lowering projected social return rate by 10 percentage points.** Application of a higher SDR has net negative effect as all costs of the FPIP project occur within first 5 years of the analysis' timeline, while the bulk of benefits associated with growth of economy occur at a later stage. Meanwhile, lowering expected impact on the economy reduces benefits from the project and do not impact its costs.

31. **Based on these assumptions, two alternative scenarios of evolution of costs and benefits are calculated.** One scenario is entitled "Pessimistic Case" and includes only lowering expected impact of the project on economy. The second scenario is entitled "Worst Case" and includes lowering expected impact of the project on economy and increasing SDR. Results of the alternative scenarios along with base case calculations are presented in Table 3 below.

Table 3: Comparison of net benefits in base case and alternative scenarios

Costs (in millions of 2014 dollars)			
	Base case (5.5 percent SDR, 60 percent social rate of return)	Pessimistic case (50 percent social rate of return)	Worst case (50 percent social rate of return, 7.5 percent SDR)
Direct financial outflows	89.14	89.14	82.88
Cost of applying for R&D grants (Subcomponent 1.A)	0.02	0.02	0.02
Increased workload of the MOES and other state agencies (Component 4)	0.48	0.48	0.45
Distortionary cost of taxation	12.09	12.09	10.61
Total costs	101.74	101.74	93.95
Benefits (in millions of 2014 dollars)			
Tax revenue (all components)	3.99	3.99	3.72
Welfare gains in form of wages and training (Subcomponents 1.A, 2, 3.A 3.B and 3.D)	14.52	14.52	13.51
Social return of the project	109.01	102.2	86.51
Total benefits	127.53	120.72	103.74
Total net benefits	25.79	18.98	9.79

32. **As seen from Table 3, the FPIP brings positive net benefits in case of lower economic impact and higher SDR.** Net benefits of the base case amount to US$25.8 million, the pessimistic case value is positive US$19 million, and the worst case scenario gives positive US$9.8 million. The main cause of lower NPV in two alternative cases is the significant decrease in social or economic return.

33. **Other considerations.** Due to time considerations and presence of large number of contingencies this cost-benefit analysis did not analyze in detail the "butterfly effect" of fostering innovation in Kazakhstan on long-run employment and diversification of the economy beyond year 2024. The analysis neither included possible negative impact of the project on environment. Calculation of impacts on micro-level like rents to landlords, construction companies and service providers were also forgone as payments for their services and goods are expected to be negligible and equal to their opportunity cost.

34. **Policy recommendations.** The cost-benefit analysis presented in this analysis supports implementation of the FPIP in light of positive net benefits. As an alternative to the FPIP project, expansion of existing TCP project with concentration on research grants could be considered. Although in this case there would be lower administrative costs and time savings, this avoided cost is much smaller compared to foregone benefits. These foregone benefits include, among other, economies of scope and strong linkages achieved by innovation consortia and matching grants, enhanced institutional capacity aimed by components 4 and 5.

Table 4. Summary of nominal values distributed across 10 years

Description	PV	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Direct financial outflows	89.1	12.0	27.0	37.0	22.0	11.0	1.0	0.0	0.0	0.0	0.0
Cost of applying for R&D grants (Subcomponent 1.A)	0.02	0.004	0.004	0.004	0.004	0.004	0.0	0.0	0.0	0.0	0.0
Increased workload of implementing agencies (Component 4)	0.5	0.154	0.154	0.154	0.154	0.154	0.0	0.0	0.0	0.0	0.0
Distortionary cost of taxation	12.1	0.0	0.0	0.0	0.0	0.0	17.6	0.0	0.0	0.0	0.0
Total costs	101.7	12.2	27.2	37.2	22.2	11.2	18.6	0.0	0.0	0.0	0.0

Description	PV	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tax revenue (all components)	43	0.4	1.3	1.2	0.7	0.3	0.03	0.0	0.0	0.0	0.0
Welfare gains in form of	14.5	1.5	3.7	5.8	2.5	1.1	0.05	0.0	0.0	0.0	0.0

wages and training (Subcomponents 1.A, 2, 3.A and 3.B)											
Social return of the project	109	0.0	0.0	0.0	0.0	0.0	24.2	22.9	21.7	20.6	19.5
Total benefits	127.5	1.9	5.0	7.0	3.2	1.4	24.3	22.9	21.7	20.6	19.5

Annex 7: Sectoral and Institutional Context

KAZAKHSTAN: Fostering Productive Innovation Project (P150402)

Enabling Business Environment for Innovation

1. **Recent progress.** Kazakhstan's enabling business environment is beset with issues typical to many countries in the Commonwealth of Independent States (CIS) and the government is actively seeking its own solutions to them with increased interest towards the global best practice. In the past few years, the government of Kazakhstan has been making significant efforts for improving overall business environment and investment climate. There is already a notable progress achieved in a number of areas, as measured by the Doing Business (DB) Report.

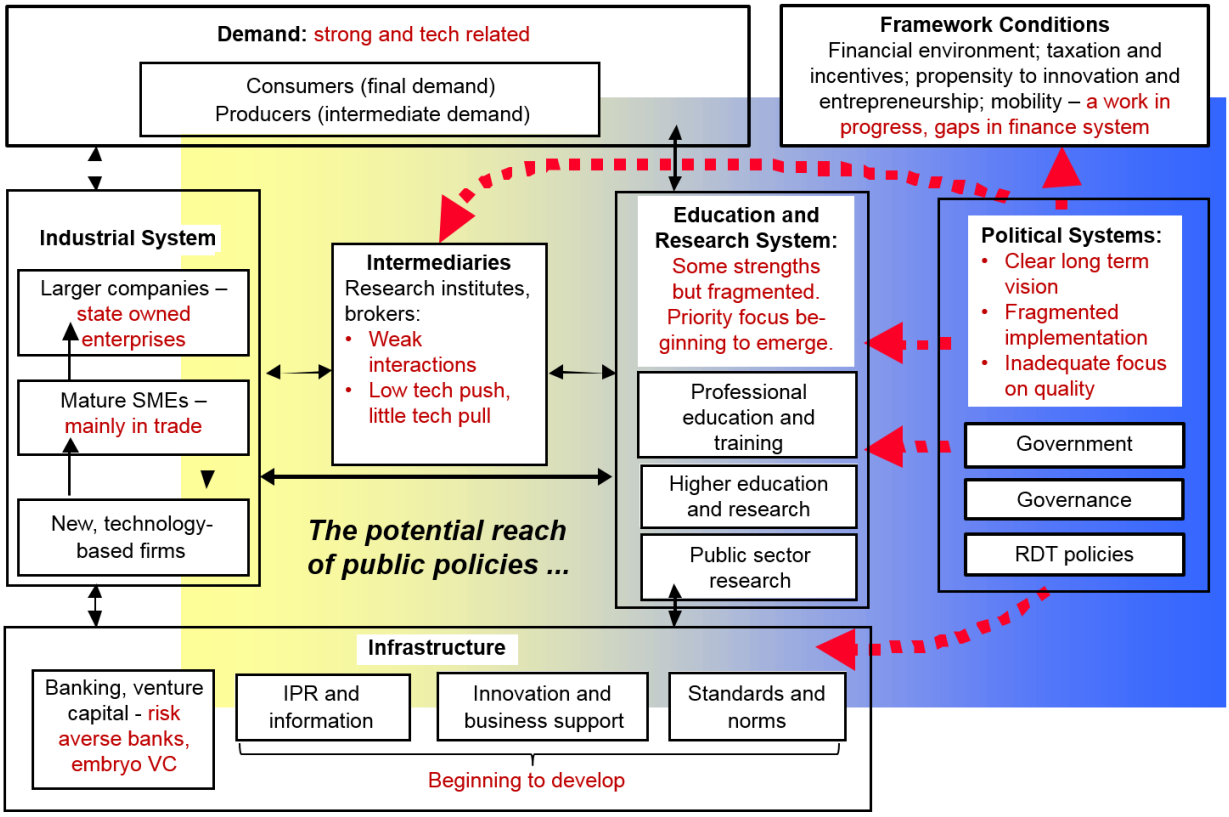
2. **Areas that need strengthening.** According to the feedback from foreign investors (EUROBAK, E&Y Attractiveness Survey), there is a need to continue improvements beyond the DB indicators. The corporate sector highlighted legal and regulatory transparency and stability as an area that needs improvement, and proper engagement of businesses in shaping regulatory policies remains a challenge to be addressed. The limited stock of research and development capabilities, cautious entrepreneurship, complex tax administration and compliance, inconsistent and outdated foreign workforce employment regulations are other broad areas that need attention. These shortcomings are reflected in the BEEPS 2013 results that indicate corruption, informality and inadequately educated workforce as top three problems for businesses in Kazakhstan.

3. **Enabling environment for R&D is supportive.** While the government is advancing reforms to overcome the highlighted shortcomings, these reforms have almost no direct influence on the quality and relevance of the Kazakhstani R&D sector due to its low level of integration with business and industry. The Pragmatic Innovation Assessment conducted by the team as part of the project preparation showed that although the business and investment environment is affected by existing obstacles, it is 'good enough' to carry out the project's activities.

Overview of the National Innovation System (NIS)

4. **Elements of the NIS.** Figure 1 depicts elements of Kazakhstan's innovation system. It demonstrates that some of its elements are only beginning to emerge and it shows fragmentation (lack of interaction) between actors. The following paragraphs describe the characteristics of each element and highlight key issues.

Figure 1. Kazakhstan's NIS – Based on Model from Richard Nelson



Source: Nelson, R. (ed.) (1993), National Innovation Systems. A Comparative Analysis, Oxford University Press, New York/Oxford

5. **Political systems.** To address the issue of strengthening linkages at high-level, the authorities established in late 2011 an advisory entity entitled Technological Policy Council and chaired by the prime minister. The council identifies perspective technologies that will receive targeted budget support. The council consists of about 40 members representing public offices, industrial associations and large enterprises from mining, energy, agriculture, ICT, oil & gas and other industries. Decisions of the council are made by a simple majority. The heavy presence of large enterprises and SOE in the council may lead to state support of innovations that serve narrow agenda of large enterprises that already possess resources to conduct innovative activities without state support.

6. **Demand for innovations.** The social unrest in western Kazakhstan in late 2011 highlighted acute need for diversifying and increasing productivity in small and medium size towns that host 10 percent of the country's population. Currently there are 27 small and medium size towns with one large enterprise or industry (mainly oil, metallurgy, coal) being single employer. Such concentration of economic activities leads to outflow of workforce from other sectors (except for retail) and their subsequent extinction as well as volatile unemployment. The authorities acknowledged existence of such issues by adopting in 2012 a program on inclusive development of mono-industrial towns. One of the main aims of the eight-year program is to diversify economy of mono-industrial towns through 2-3 innovative "anchor" projects in each town that utilize their natural/geographical advantages and innovative capacity. Yet implementation of the

program is carried out separately by each regional administration/isolated socio-commercial (state-backed) corporations leading to lack of coordination of already scarce innovative capacity of small and medium size towns. The Government's attempts to boost activity of SMEs in these towns through privileged loans end up with commercial bank lending to/refinancing "traditional" sectors of retail and construction that are least prone to innovations. At the same time, there is a strong demand for innovations that would revive depressed social infrastructure, create jobs and retain working age population in such towns in a sustainable way.

7. **Education and research sector.** The NIS of Kazakhstan has been demonstrating unsatisfactory performance in several dimensions for a number of recent years. According to the World Economic Forum's Global Competitiveness Report in 2012-2013, Kazakhstan was ranked 50th competitive among 148 countries. Such relatively high ranking was largely due to better indicators related to Institutions, Health and Primary Education and Labor Market Efficiency. At the same time, indicators related to Innovation were among the worst worldwide. In particular, the quality of scientific research institutions in Kazakhstan (GDP/capita in 2012 US$11,773) was scored 3.2 out of 7 (ranked 102nd worldwide), which is comparable to similar score of Madagascar (GDP/capita US$451) and lower than scores for Mongolia (GDP/capita US$3,627) and Botswana (GDP/capita 9,398), despite the fact that Kazakhstan has higher GDP per capita. The same report ranks the availability of scientists and engineers in Kazakhstan as 98th, the university-industry collaboration in R&D as 79th. All in all, the overall Innovation indicator has the lowest score (3.1 out of 7) of the 12 indicators that constitute the Global Competitiveness Index of Kazakhstan. According to Table 1 below, following 4 years of deterioration the situation has somewhat improved in 2013, yet such unsatisfactory innovation-related indicators signal that serious problems still exist in NIS of Kazakhstan.

Table 1. Innovation Indicators for Kazakhstan

Innovation indicators	2012-2013		2011 - 2012	2010 - 2011	2009 - 2010	2008 - 2009
	Score (out of 7)	Rank	Rank	Rank	Rank	Rank
Capacity for innovation	3.5	74	101	75	50	50
Quality of scientific research institutions	3.2	102	121	112	80	58
Company spending on R&D	3	77	107	84	60	62
University-industry collaboration in R&D	3.4	79	119	111	77	64
Gov't procurement of advanced tech products	3.6	58	93	83	62	59
Availability of scientists and engineers	3.6	98	106	91	74	83
PCT patents, applications/million pop.*	1.2	67	81	81	85	72
* - Indicator that is not derived from the Executive Opinion Survey			Source: WEF Global Competitiveness Reports			

8. **Looking into causes of poor innovation indicators of Kazakhstan compared to rest of the world, several internal factors interrelated with each other can be proposed**:

a) Outdated infrastructure. A study among Kazakh scholars and academicians revealed that poor equipment of research entities is a major problem of the National Innovation System of Kazakhstan[15]. This problem leads to not only poor quality of research, but also longer periods of research work and, as a result, protracted introduction of innovations into market;

b) Low proportion of research works that translate into competitive services and products was also quoted as third major problem of NIS of Kazakhstan after low salaries and outdated infrastructure[16]. Apparently the problem stems from traditional reliance of research institutions, especially in the sphere of exact sciences, on public funds. Such reliance on public funds results in absence of managerial and entrepreneurial skills of research workers, a prerequisite for successful commercialization of scientific studies;

c) Public funds are mainly used to finance research organizations as a whole, not financing particular research project. In the absence of an established market for innovative research and fixed wages in traditional research institutions, the main measure of professional success for Kazakh scholars is obtainment of academic degrees, not attaining marketable scientific research results[17];

d) Such weak linkage between science and industry may explain poor availability of scientists and engineers as indicated in global competitiveness ranking of Kazakhstan (see Table 2).

Table 2. The number of R&D workers by sector of employment

	2008	2009	2010	2011	2012	2013
Total number of R&D workers (persons)	16,304	15,793	17,021	18,003	23,712	20,404
Share of total employed by public sector and universities	70%	68%	69%	63%	73%	70%
Share of total employed by private sector	28%	23%	22 %	29%	21%	23%
Share of total employed by non-profit organizations	2%	8 %	9 %	8 %	6 %	7 %

Source: Kazakh Statistics Agency

9. **Intermediaries**. The backbone of scientific activities in Kazakhstan is made of R&D in universities (in most cases state-funded universities) and scientific research institutes, the majority of which are isolated from production. As of 2012 the combined share of universities and scientific research institutes amounts to 35 percent of all entities engaged in R&D, more than doubling since 2000. The share of industrial enterprises and engineering organizations (in total number of entities engaged in R&D) has also increased between 2000 and 2012, but in absolute terms their quantity remains extremely low.

[15] BISAM Central Asia research center, *Report on current state and problems of science in Kazakhstan: an outward glance*, http://www.bisam.kz/en/reports-and-publications/otcheti/item accessed on June 26, 2014.
[16] Ibid.

10. **It is widely believed that design and engineering divisions of industrial enterprises are one of the main links between R&D/S&T system and real sector of economy.** It is these organizations that provide translation of research results into design documentation, prototypes and carry out complex work of introducing innovations into mass production and thus are the most important segment of modern innovative economies. The share of such organizations in Kazakhstan in 2012 made up only 7 percent of total number of organizations engaged in R&D/S&T activities.

11. **It appears that nonexistence of such intermediaries between purely scientific and commercial activities stems from sharp decline of stable demand for R&D/S&T activities.** The economic crisis of the 1990's hit all sectors of the Kazakh economy and had a devastating impact on large industrial enterprises and numerous design and engineering organizations connected with production. The booming economy of the mid-2000 failed to provide large-scale and stable demand for domestic (commercially viable) R&D/S&T activities as large industrial entities preferred to import ready-to-use equipment and technologies. In contrast, R&D/S&T activities in developed countries are concentrated in hands of large industrial companies seeking to attain competitive advantage through innovations.

12. **It should be mentioned, however, that the authorities are taking measures to nurture bridge organizations capable of creating links and connections between academia and the real sector, and between the parts of a fragmented innovation system.** One example is the Technology Commercialization Project that led to establishment of two such organizations – Technology Commercialization Office (TCO) and International Material Science Center (IMSC). The latter in particular is specifically established as a bridge organization to facilitate access of outside researchers to modern equipment of research laboratories created by the government in recent years. After significant teething problems, these organizations are now accumulating capabilities quite rapidly. The TCP also introduces competitive allocation of research funding – a procedure now emulated in the country. A survey conducted among beneficiaries of the TCP in late May 2014 indicates strong unmet demand for such bridge organizations.

13. **Financing infrastructure.** In general, the Government supports innovation through two ministries: the Ministry of Education and Science (MOES) and the Ministry of Investment and Development (MID). The MOES tries to stimulate innovative R&D through a competitive grant program open for both institutions and individuals. Selection process incorporates independent international peer reviewers; however, stiff limitation of priority areas (energy, deep processing, ICT, life sciences, national intellectual potential) and additional selection layers on the national level largely undermine the original intention. In addition, this grant program does not put any requirements in terms of commercialization potential of the proposed research and basically continues encouraging scientists to do science for science. Other two types of financing are provided for: (a) supporting scientific infrastructure; and (b) doing targeted research for public authorities. Both are for research institutes and universities and have no relevance to innovation. On the other hand, the MID leads the country's industrial innovative development agenda and tries to release the economy from natural resource dependence through attempts to develop new industries and stimulate technology transfer and growth of innovative firms. The National Agency on Technological Development (NATD, formerly the National Innovation Fund) is the MID's subordinate organization developing and offering a range of financial tools in support of company level innovation and technology commercialization. The NATD offers nine types of

reimbursement type matching grants (that apparently makes them useless for small start-ups) to support proof of concept, prototype development, patenting, technology adaptation, training, etc. In addition, the NATD also has shares in several national and international venture funds. In both areas, results are seriously hampered by the lack of a deal flow due to funding commercially irrelevant science and incapability of companies to find innovative ideas that are commercially interesting.

14. **NATD is one of most active actors of the NIS of Kazakhstan.** Since its establishment in 2003, the agency established 9 regional science and technology parks, 4 industrial design bureaus, 2 international technology transfer centers, 15 commercialization offices, 4 commercialization centers, invested into equity of 7 domestic and 7 international venture funds.

a) **Science and technology parks.** Establishment of regional science and technology parks started in 2004 in various regions of the country. As of 2012, the total area of science and technology parks was 30,973 square meters, including 19,988 square meters of usable space, and hosted 161 tenants.

Table 3. Science and Technology Parks

Name	Location	Year of establishment
Technopark Algorithm	Uralsk, West Kazakhstan Region	2004
Technopark saryarka	Karagandy Region	2004
Technopark of National Technical University after K.Satpayev	Almaty	2004
Almaty Regional Technopark	Almaty	2005
Astana Regional Technopark	Astana	2005
Regional Technopark of South-Kazakhstan Region	Shymkent, South-Kazakhstan Region	2008
Regional Technopark of Altay	Ust-kamenogorsk, East-Kazakhstan Region	2008
Regional Technopark Kyzylzhar	Petropavlovsk, North-Kazakhstan Region	2009 (in process of winding up)
Technopark Alatau	Almaty	2012

Source: natd.gov.kz

A science and technology park in Kazakhstan is basically a set of services intended for development and implementation of innovative projects by means of technological business incubation. Thus, science and technology parks in Kazakhstan provide small start-ups with cheap facilities, means of communication, office equipment and other necessary equipment. Such business incubators render a range of other services - administrative, accounting, legal, financial advisory services - and consult on market entry.

Starting from 2010, NATD launched the Technological Business Incubation program aimed to support innovative projects through grants on development of business plans, conducting marketing research, development of prototypes and launch of productions. In 2010 about US$1.1 million were allocated on such innovative grants. Of 105 applications submitted in 2010, 36 projects (34 percent of all applications) with the average budget of KZT 4.2 million (US$30,000) were financed. The scope of these projects included construction sector, machinery engineering, pharmaceutics and medicine, ICT, agriculture, chemistry etc. In all, 209 applications were submitted in frame of the business incubation program in 2011, of which 40 projects were financed for total amount of US$1.6 million. In 2012, 20 applications out of 153 submitted were approved for financing (for total amount of US$1.6 million). In 2013 the program financed 27 applications (out of 140) for total sum of US$4.9 million. The above data shows existence of strong demand for financing; however dynamics of financing shows reduction of the number of financed applications.

b) **Industrial design bureaus.** Industrial design bureaus are aimed to assist innovative industrial companies in developing new machinery production through transfer of technologies, acquisition, adaptation and development of design-technology documentation for further sale to innovative companies as well as rendering services necessary for the organization of production of goods on basis of such design-technology documentation. Currently there are four industrial design bureaus (Table 4). As of 2012, industrial design bureaus acquired 64 and developed 362 design-technology documentation sets. Domestic companies launched production of 177 new products with the help of industrial design bureaus.

Table 4. Industrial design bureaus

Name	Location	Year of establishment
Design bureau of transport engineering	Astana	2009
Design bureau of mining and metallurgy equipment	Ust-kamenogorsk, East-Kazakhstan Region	2010
Design bureau of oil&gas equipment	Petropavlovsk, North-Kazakhstan Region	2010
Design bureau of agriculture engineering	Astana	2012

Source: natd.gov.kz

c) **Technology transfer centers.** The Kazakh-French center for transfer of technologies was jointly established in 2009 by NATD and French company CEIS. Another international technology transfer center was established in 2011 by NATD and South Korea's Innopolis Fund. The Kazakh-Korean technology transfer center has offices in Astana and Taejon (S.Korea). As of beginning of 2013, there were 7 joint projects (medicine, ICT, alternative energy, weather monitoring, agriculture, space) being implemented in frame of the two international technology transfer centers. Following two project were successfully launched in commercial mode in frame of the Kazakh-Korean technology transfer center:

Table 5. Technology transfer centers

Project name	Kazakh partner	Korean partner
Transfer of technologies for production of 3D golf simulators	BF Intelligence LLP	Hanaro Screen Golf
Development of a business plan of creation of Engineering Center	JSC Nazarbayev University	Innopolis Fund

Source: natd.gov.kz

In 2012 NATD and Norwegian company International Development Norway signed an agreement on joint activities in the sphere of transfer of technologies.

d) **Commercialization offices.** A total of 15 commercialization offices and 4 regional commercialization centers were established in the country in 2011 and 2012 (Table 6). These offices received 222 applications, of which 56 were selected for proof of concept and 27 were selected for further commercialization.

Table 6. Commercialization offices

#	Name of university, scientific research institute	Location	Year of establishment	Application received	Applications short-listed for proof of concept	Projects selected for commercialization
Commercialization offices						
1	East-Kazakhstan State University	Ust-Kamenogorsk, East-Kazakhstan Region	2011	6	2	2
2	Almaty Technology University	Almaty	2011	17	6	3
3	South-Kazakhstan State University	Shymkent, South-Kazakhstan Region	2011	27	9	5
4	Karagandy State University	Karagandy, Karagandy Region	2011	16	2	2
5	Institute of the organic catalysis and electrochemistry	Almaty	2011	10	2	1
6	Kazakh National University after Al-Farabi	Almaty	2011	20	7	0
7	Karagandy State Technical University	Karagandy, Karagandy Region	2011	10	2	1
8	West-Kazakhstan Agriculture and Technical University	Uralsk, West Kazakhstan Region	2011	7	2	2
9	Institute of biology and biotechnology of plants	Almaty	2011	26	6	1
10	National Center of Biotechnology	Astana	2012	5	5	4

11	Eurasian National University	Astana	2012	5	2	0
12	East-Kazakhstan State Technical University	Ust-Kamenogorsk, East-Kazakhstan Region	2012	6	3	3
13	Kazakh National Agricultural university	Almaty	2012	4	0	0
14	Innovational Eurasian University	Pavlodar, Pavlodar Region	2012	5	2	2
15	Kazakh-British Technical University	Almaty	2012	16	2	0
Commercialization centers						
1	Physics Institute	Almaty	2012	0	0	0
2	Karagandy State Technical University	Karagandy, Karagandy Region	2012	0	0	0
3	West-Kazakhstan Agriculture and Technical University	Uralsk, West Kazakhstan Region	2012	0	0	0
4	East-Kazakhstan State University	Ust-Kamenogorsk, East-Kazakhstan Region	2012	0	0	0

Source: natd.gov.kz

e) **Venture funds.** According to statistics of the Integrated Securities Registrar, currently there are 22 funds of risky investments, the majority of which are portfolio investment funds working on stock exchange markets. Of 22 funds, eight are venture funds created with the help of government and designated to invest into innovative production.

Table 7. Venture Funds

Name	Headquarters	Capital stock/ US$/mln	Number of projects in Kazakhstan	Scope of projects	Partnerships
The Areket Hi-Tech Fund	Almaty, Kazakhstan	3	data n.a.	data n.a.	National Agency for Technological Development, JSC TuranAlem Securities, Investment Group Alan
The Advant venture fund	Almaty, Kazakhstan	14	3	IT, telecom, media	National Agency for Technological Development, Kazakhstan Development Bank
The Centras venture fund	Almaty, Kazakhstan	14	8	Retail, IT, production of bicycles, energy, construction materials, metallurgy	National Agency for Technological Development, Centras Capital
The Glotur Technology Fund venture fund	Almaty, Kazakhstan	14	1	Electronics, telecom	National Agency for Technological Development, JSC Glotur

JSC Almaty venture capital	Almaty, Kazakhstan	14	1	Construction materials	National Agency for Technological Development, Almaty Business Group
JSC Logycom perspective innovations	Almaty, Kazakhstan	13	data n.a.	data n.a.	National Agency for Technological Development, JSC Logycom
Central Asia Small Enterprise Fund	Almaty, Kazakhstan	4.2	1	Business leasing	National Agency for Technological Development, Small Enterprise Assistance Funds
The venture fund Tabys	Kurchatov, East-Kazakhstan Region	5.7	data n.a.	Nuclear and associated technologies, alternative energy sources, SMEs of the town of Kurchatov	Nuclear Technologies Park, Centras Securities, the fund is owned by GoK
Eagle Kazakhstan Fund	Almaty, Kazakhstan	EUR 33 million	data n.a.	Food, paint factory, telecom, water refining	European Bank for Reconstruction and Development
AIG Silk Road Fund	Almaty, Kazakhstan	data n.a.	data n.a.	data n.a.	European Bank for Reconstruction and Development, AIG Capital Partners

Source: natd.gov.kz, other open sources

Available data and comments of market participants outline two problems related to operation of venture funds in Kazakhstan. First, there is significant presence of government in equity capital of venture funds and the latter are expected to provide repayment of budget funds despite the very nature of risky venture investments. Second, venture funds tend to finance expansion of productive capacity of existing companies, rather than financing innovative start-ups, which probably is a result of the former problem. Apart from these problems, state financing of innovative projects is plagued by cases of corruption and fraud. In particular, the law-enforcement recently launched several criminal cases over embezzlement of budget funds allocated on construction of aircraft factory in Karagandy Region, tablet PC plant in Mangistau Region, and embezzlement of venture funds allocated to construction of a factory of heat-insulating materials in Almaty.

15. **The financial sector in Kazakhstan is dominated by banks. Extremely high level of Non-Performing Loans (NPLs) and weak capacity to serve SMEs makes them focus on relatively more successful and stable retail and construction sectors.** Multinationals are able to obtain cheaper credit globally and barely use local banks. Despite government programs on subsidizing interest rates, banks continue crediting only those companies that are either known or

are capable to provide sufficient collateral. SMEs often lack collateral and new companies lack both collateral and track record. According to the survey of Kazakh enterprises in 2013[18], lack of such early finance tools in Kazakhstan remains the main obstacle for SME growth, and development of a diverse and well-functioning capital market in Kazakhstan will take long time.

16. **Industrial system.** The economy is heavily dominated by SOEs, and existing protective measures (i.e., national content regulations) severely limit competition from foreign companies, which does not create sufficient motivation for company level innovation. SMEs are mainly concentrated in retail and services that have little demand for innovation due to generally short-term nature of business and a lack of capital. Larger companies mainly rely on public and quasi-public sector purchases and are not exposed to competitive pressure sufficient to motivate innovation. In addition to this, small businesses in the country will often prefer to remain small to avoid moving to a different, more complicated tax and regulatory regime (almost the same as for large companies). In summary, the private sector in Kazakhstan is very thin and the large corporate sector dominated by the SOEs is basically an extension of the public sector. There are examples of globally competitive SOEs, and there might be a possibility to increase international or at least regional competitiveness of some Kazakhstani SOEs, especially in strong sectors. The MID has this in plans, but instruments and incentives are yet to be identified with the new industrialization program being developed at the moment.

17. **The absence of sustainable demand from small and medium enterprises and domination of SOE in the private sector resulted into volatile (and decreasing) non-public R&D investments.** Thus, internal R&D spending comprised 0.18 percent of GDP in 2013, down from 0.23 percent in 2009. And 52.2 percent of this amount is spent by the public and higher education sectors, with 40.3 percent of corporate sector (that includes and is dominated by SOEs) expenditures indicating a very low share of R&D funded by private companies.

[18] Kazakhstan Business Environment and Enterprise Performance Survey 2013, available at www.enterprisesurveys.org

Table 8. Gross internal R&D expenditures

	2010	2011	2012	2013
Gross internal R&D expenditures (KZT bln)	40	43	51	62
Share of public sector (percent)	36%	25%	23%	30%
Share of universities (percent)	15%	16%	29 %	31%
Share of private sector (percent)	37%	52%	40%	29%
Share of non-profit organizations (percent)	12%	7%	7%	10%

Source: Kazakh Statistics Agency

18. **On top of such decreasing role of private sector in investing into R&D infrastructure and human resources, the number of organizations conducting research decreased from 424 in 2010 to 345 in 2012.** The number of IP protection applications, a clear indicator of innovative activity, decreased from 1850 in 2010 to 1468 in 2012, or 85.3 patents per million population which is significantly lower than 196 in Russia and 583 in Germany. This data indicates a problem of a persistent R&D commercialization gap that the NIS has so far been unable to tackle. The government recognizes that closing this gap is a priority area for the reform efforts to allow effective translation of R&D investments into growth and global competitiveness of the entire economy. A few countries with endowments similar to those in Kazakhstan present an experience of successfully managing this process.

19. **Prioritization of R&D and innovation in the Government's agenda.** Kazakhstan has put in place an ambitious strategy to foster economic diversification and knowledge-driven development. The new policy places significant emphasis on the promotion of innovation as a driver of economic development and diversification. Multiple innovation initiatives, including large-scale, multi-year programs have been introduced, and a range of new policy instruments is being used to drive their implementation. The authorities have also come up with a range of related policy initiatives targeting improvement in firms' innovation performance, innovation at the regional level, and boosting the demand for innovation. A number of policy measures are focused on the establishment of the NIS and, in particular, creation of public innovation-support institutions. Judging from the number and variety of institutions that have already been established, the main components of the NIS are already in place.

Key challenges facing the NIS

20. **Lack of horizontal linkages in the NIS.** The key remaining task for the authorities is now to set the conditions for the NIS to operate effectively and efficiently. So far, public interventions have been focused mainly on the institutional build-up of the NIS, while systemic issues such as linkages between its components have been somewhat neglected. The proliferation of the initiatives in the innovation area has stressed the need for coordination across policy actions and institutions. Consistency at the level of the overall program goals, mechanisms for coordination of development initiatives, and implementation remain weak. The effectiveness of public intervention is also often limited by the underdevelopment of innovation services and intermediaries, and market infrastructure. There is a need to further develop the NIS, emphasizing linkages between its elements, including those going beyond the primary focus on

technological forms of innovation. This area should remain in the focus of policy makers for the foreseeable future.

21. **Constraints in R&D collaboration.** Kazakhstan needs to find its own way for competitive integration into global value chains by building on its unique set of endowments. While there are examples of excellent R&D, scientific capacity is scattered in different small research teams that do not collaborate. R&D funding is mostly public and is neither sufficient nor contains incentives for building larger and stronger research teams. This bears at least two risks to long-term development of innovative production in the country. Firstly, the dispersion of research workers across large number of independent entities may lead to lack of academic collaboration and loss of institutional knowledge. Secondly, as fundamental sciences do not produce immediate commercial outcome, rational private sector tends to concentrate on applied research. This, in turn, jeopardizes development of NIS of Kazakhstan in the long term as the pipeline of innovative ideas for innovative production will be limited to results of existing fundamental research and existing technologies. So there exists a need to expand the knowledge base for innovation in Kazakhstan. Current public R&D funding system lacks focus on areas of strategic relevance for Kazakhstan that could be addressed by collaborative effort of larger number of players including corporate/multinationals through larger funding and other incentives to engage strategic partners.

22. **Incomplete R&D financing cycle.** In 2013 the private sector spent KZT 18.2 bln on internal R&D. Of this sum, only about 2.2 percent (KZT 405 million) were financed by bank loans and 1.6 percent (KZT 290 million) were financed by non-bank entities. Of those KZT 405 million, only about 10 percent (KZT 41 million) were in the form of privileged loan. This implies that the majority of bank loans on R&D are charged existing high market interest rates, which makes the financial sector in Kazakhstan an ineffective tool for development of the NIS. Also, Kazakhstan's system of competitive grant financing of R&D does not set any requirements regarding commercialization of research results. As a consequence, the development of prototypes without good prospects for commercialization continues. To compound the problem, Kazakhstan lacks important elements of providing financial instruments and solutions suitable to different stages of start-up company development. As a result, many technology startups fall below the radar of the few venture capitalists present in Kazakhstan. In other words, there is a problem of creating critical mass of R&D capacity that could have enough spillover effects to generate missing productive innovation linkages and start bridging the described gap.

23. **Priority challenges to focus on.** To respond to this key challenge of economic growth would mean addressing the following two key challenges:

(a) *Lack of productive sector involvement.* More than a half of (quite small) R&D expenditures are executed by public research institutes and universities. Backward linkages from extracting industries and metallurgy are very limited. There is little history of collaborative projects between enterprises of the productive sector, research institutes and higher education. The persistent lack of trust between these three major stakeholders of the NIS constitutes a vicious cycle. Nevertheless, enterprises of the productive sector are pragmatic and at least some of them are interested in collaborating with national research organizations in order to solve technological problems. In other words, they are

interested in problem-solving. The science establishment has been encouraged to collaborate with industry but has little knowledge of how to do it. One needs a capable intermediary to broker a joint collaborative effort, particularly of a longer-term nature.

(b) *Underdeveloped and fragmented commercialization cycle.* Kazakhstan science and related government support policies still build on a linear model of commercialization of R&D results that does not relate to market needs up until the prototype is developed. As a result, several Kazakh scientists and research institutes have accumulated a number of inventions that are not of interest to the market. Due to the same linear approach, existing public technology commercialization support tools do not match the needs and capabilities of new technological enterprises.

Annex 8: Linkages with Technology Commercialization Project (TCP)

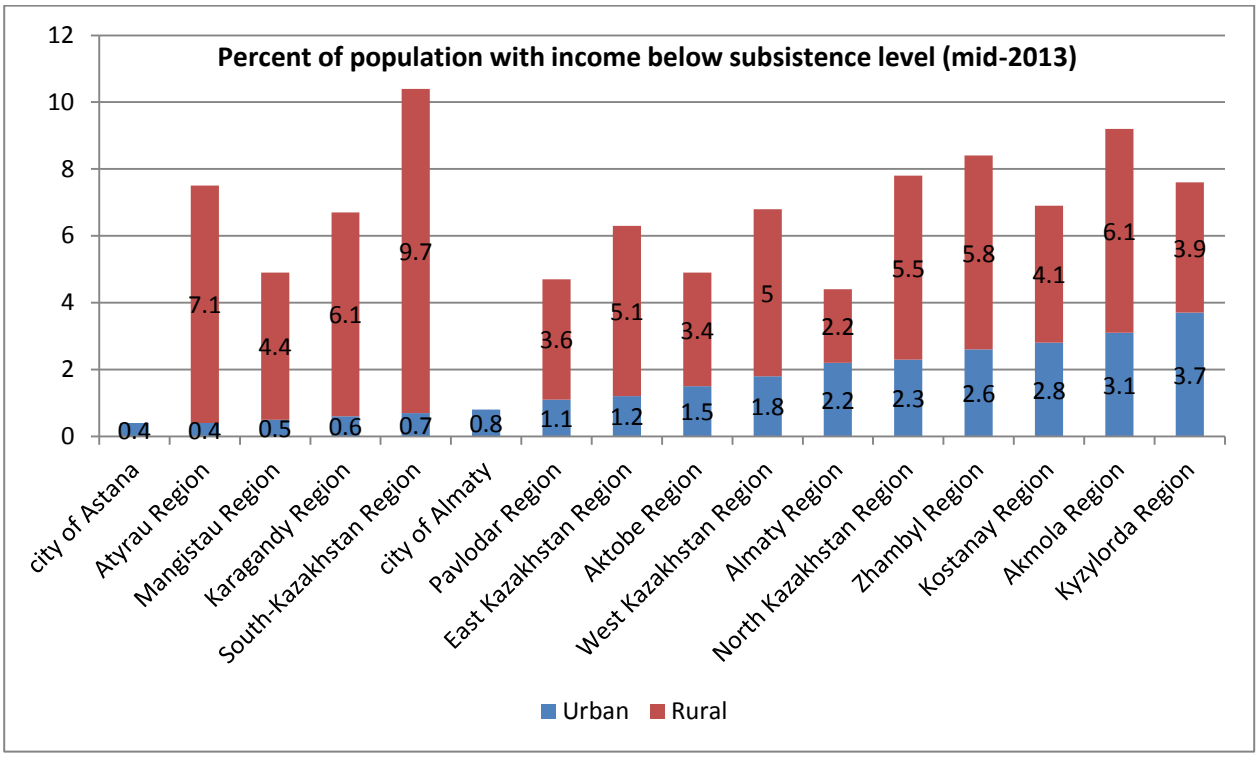
FPI project: Title of Component	Objective	Corresponding activities of the TCP and other government programs
1. Development of the knowledge base for innovation: --Grants for R&D teams --Advanced PhD-level research and training in critical areas	To prepare a pipeline of project ideas and advanced human capital for commercialization	Three rounds of competition for Junior and Senior Scientists research teams which revealed substantial talent in the country. The need to continue and scale up this grant funding. Role of international referees (ISB) who assure impartial selection is crucial. How to include local stakeholders in the selection? Bolashak program which focused so far mainly on Master-level training. Need to complement it to consortia-type agreements/ collaboration between Kazakh and Western universities
2. Innovation consortia – technology platforms and engineering centers	To open up and internationalize Kazakhstan R&D labs, and assure its linkages with industry.	International Material Science Center (IMSC) – housed in Karaganda Technical University – as an institutional platform for collaboration Between national R&D labs and the TCP's research. It revealed both the need and difficulties of such long-term collaborative projects. In the FPI project, such long-term collaborative projects are innovation consortia. Role of international referees (ISCB) who assured impartial selection of the winner was crucial. How to include local stakeholders in the selection of future technology consortia?
3. Development of the technology incubation cycle Technology acceleration office abroad Funding program for innovative SMEs -- Early Stage VC Fund Technology Transfer Offices	To provide early stage support for commercialization of R&D results To provide matching equity at the early stage of incubation of a firm	Technology Commercialization Office (TCO) – a pilot program of TCP. It revealed availability of commercializable technologies in the country and the need for a funding mechanism (early stage VC) to finance it. Rounds of competition for technology commercialization on a pilot basis: An initiative of NATD (National Agency for Technology Development) The need to adjust design of this initiative on the basis of relevant good practice
4. Strengthening coordination of the National Innovation System	To assure better coordination of the Innovation System	No direct counterpart in the TCP project. A large portfolio of innovation initiatives of the government reveals the need for strengthening coordination vehicles.

Annex 9: Contribution to the World Bank's Twin Goals

KAZAKHSTAN: Fostering Productive Innovation Project (P150402)

1. **As of mid-2013, the proportion of population with income below subsistence level, an indicator of extreme poverty, was on average more than four times as high in rural areas of Kazakhstan as in the cities (see Figure 1 below).** With most of the poor population employed in agriculture, promotion of innovation in this area would have the highest value added in achieving the World Bank's objective of reducing extreme poverty. The ongoing TCP project has already demonstrated some promising cases of emergence of innovative startups in agriculture, healthcare and access to safe drinking water (see Box 1 below). As to the potential innovative activities, the proportion of patents and technology licenses related to biotechnology and agriculture constituted 10 percent of all titles and licenses owned by Kazakh entities in 2012. This indicates existence of high potential for innovative activities in the agricultural sector of Kazakhstan that would reduce poverty in rural areas through following direct and indirect effects: (a) permanent increase in productivity of rural labor leading to lower unemployment and/or higher wages in rural areas; (b) lower food prices due to higher output and production of new varieties of agriculture goods; and (c) production linkages with non-agriculture sectors.

Figure 1. Percent of Population with Income below Subsistence Level (mid-2013)



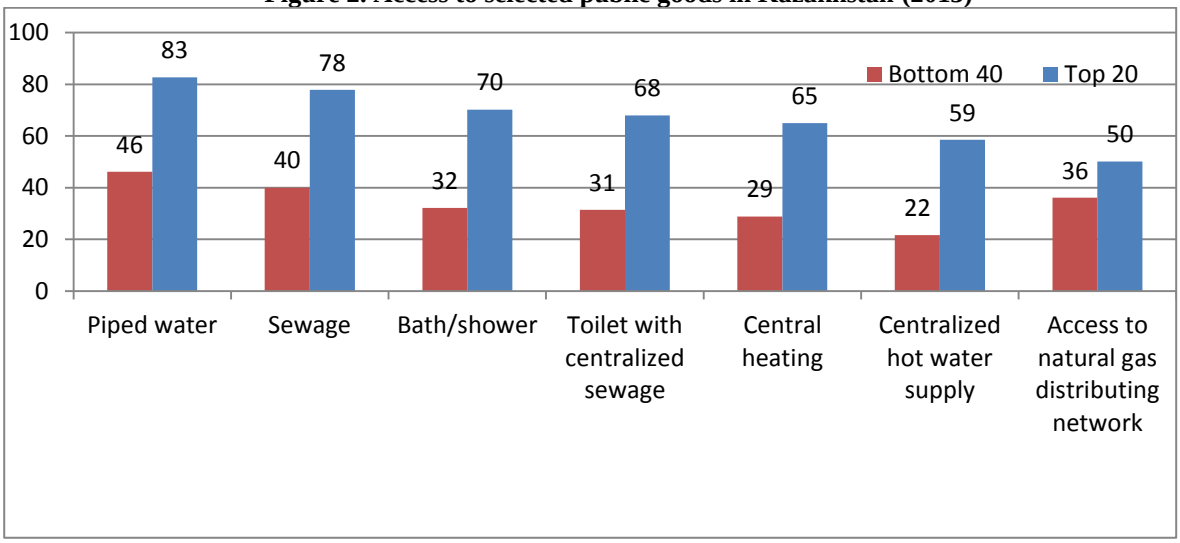
2. **While reducing extreme poverty in rural areas, lower food prices will also alleviate poverty in urban areas, where the poor in general do not have access to subsidiary husbandry.** Thus, depending on the nature of innovative activity and characteristics of a

particular geographic location, the project may contribute to poverty reduction among both urban and rural poor, agriculture wage workers and small farmers. Besides its direct effects, the project may also contribute to alleviation of poverty as activities through creation of jobs for low-skilled labor on sidelines of innovative activities. As of 2012, 6.8 percent of those engaged in R&D activities were maintenance personnel without tertiary education. Taking into account the fact that unemployment is in general higher among unskilled labor, low-skill jobs created by the project will not have opportunity cost for those employed and will not lure away labor from other sectors.

3. **The project will also promote shared prosperity through creation of new jobs with competitive salaries among scientists and support personnel employed by innovative projects and innovation consortia.** Besides, involvement of graduate students in Senior Scientist Groups (SSG) and Junior Researcher Groups (JRG) and PhD research and training as part of the Component 1 of the project will boost social mobility among the youth.

4. **It is clear that inequality does not have only the income dimension. Inequality in Kazakhstan exists in terms of access to many important public goods, such as safe drinking water, sanitation, healthcare and education, Internet and protection from natural disasters (e.g. see Figure 2).** The availability and good quality of such social services and public goods are prerequisites to accumulation and use of human capital, while their absence leads to lower productivity of the bottom 40 percent of the income distribution. The FPIP project, via its inclusive innovations consortia subcomponent, is expected to directly contribute to equal provision of the above-mentioned goods and thus increase productivity of the bottom 40 percent of the income distribution. Another mechanism, through which the project will address the issue of shared prosperity, is establishment of links between science, markets and universities. This will make tertiary education more relevant to demands of the market. This in turn will increase returns to education creating incentives for households, including the bottom 40 percent of the income distribution, to invest into human capital.

Figure 2. Access to selected public goods in Kazakhstan (2013)



Note: "Bottom 40" refers to the bottom 40 percent of the income distribution
"Top 20" refers to the top 20 percent of the income distribution

5. **To sum up, the proposed project would contribute to the Twin Goals by leading to increased welfare of rural households through introducing innovation to the agricultural practices and raising their efficiency, creating new jobs, increasing and diversifying outputs, and, potentially, reduction of food prices.** The project will also promote shared prosperity by stimulating sustainable growth of Kazakh economy and through creation of highly competitive R&D jobs.

Box 1: Promising Research Teams from TCP: Technology Commercialization

In the TCP, there few groups which are close to successful commercialization of their final products. In addition to the grant financing itself, the main benefit for the grantees comes from the Technology Commercialization Center office consultations on how to commercialize the projects.

Group #53: The project is aimed to start the production of portable water filters based on trek membranes. The group's "KazTrekTechnology" LLP signed a contract with the Russian water filet manufacturer "Naqwa" company. The Naqwa will supply them with filter parts, and the group will produce filters in Astana. The agreement includes exclusive rights to produce and sell in Kazakhstan. The production line is going to be installed soon.

Group #23: Research and development enterprise "Antigen" LLP. The project goal is to start industrial production of starters for traditional Kazakh milk products, such as Kumys and Shubat. The starters are really unique for the local market. Different private companies and farms have already shown their interest and signed preliminary agreements. The starters will allow producing standardized milk products with great quality at industrial scale and will not depend on usual external factors, such as seasonality, time, and expectations. The company is planning to start commercial production in the coming spring.

Group #56: "Uniline Group" LLP. The group makes Kazakh speech synthesis software, which will allow to type and play texts in Kazakh. The company has already created an interactive website and now developing a mobile application as well. Moreover, the company has also realized the potential in Speech to text software. The research in general is going well and the company is planning to receive a governmental contract upon the project's completion.

Group #184: «AimLab», LLP. The group establishes prototype production of nanostructured carbon materials for chemical technologies. The group has already launched a pilot production with a capacity of 200 tons of technical carbon per year. A pilot sale is anticipated to the Kazakh enterprise KazFosfat.

Group #36: "General Genetics" LLP. The project is about creating a DNA test kit, which will help to prescribe a correct dosage of Warfarin and Plaviks medicine, for patients with heart diseases. Their unique test is targeted specifically at local central Asian population's genotype. This project has a great social impact, as well as well enough commercial potential. The company is looking to license their technology to a pharmaceutical company, but it is yet to be decided when and to whom and already has contracts with medical institutions for conducting a standard genetic tests.

Source: Compiled list on the basis of PMU information

Annex 10: National Innovation System of Kazakhstan and Gender

KAZAKHSTAN: Fostering Productive Innovation Project (P150402)

1. **Although gender issues in S&T/R&D sphere have not been studied in Kazakhstan, basic statistical data is available and implies possible existence of gender imbalances.** Tables 1 and 2 below indicate that, while schools are naturally filled by male and female students equally, more female students tend to engage in tertiary education compared to their male counterparts. About 60 percent of students in undergraduate classes are female. The proportion of female graduate students is even larger. Thus, one would expect larger proportion of female workers in S&T/R&D sphere.

Table 1. Proportion of female students

Year	Primary Education	Secondary education	Tertiary education
2008	49 %	49 %	58 %
2009	49 %	49 %	58%
2010	49%	49 %	58 %
2011	49%	49 %	58 %
2012	49 %	49 %	58%

Table 2. The number of students as of academic year 2012-2013, by type of education

	Female	Male	Female	Male
Bachelor courses	330200	241500	58 %	42 %
Master courses	17500	9600	65 %	35 %
PhD courses	1000	600	63 %	38 %

2. **At the same time, persistent prevalence of female students in both undergraduate and graduate classes has not translated into prevalence in S&T/R&D sphere.** Female scholars and researchers constituted about 50 percent of R&D personnel at Kazakh entities and university faculty (Table 3 and 4).

Table 3. Gender and R&D activities of entities in Kazakhstan

	2008	2009	2010	2011	2012
Number of entities performing R&D	421	414	424	412	345
The number of R&D personnel	16,304	15,793	17,021	18,003	20,404
of which female	53%	51%	51%	51%	50%
including					
researchers	10,780	10,095	10,870	11,488	13,494
of which female	51%	48%	49%	50%	49%

Table 4. The number of faculty members in universities, academic year 2012-2013

Academic degree				Academic title			
Doctor of science		Candidate of science		Professor		Associate professor	
Female	Male	Female	Male	Female	Male	Female	Male
1,363	2,433	8,840	6,321	903	1,957	4,086	3,578
36 %	64%	58 %	42 %	32 %	68 %	53 %	47 %