

Facilitation of Innovative  
Entrepreneurship  
Through Technoparks

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**Final Report**

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# Table of Contents

<b>BACKGROUND</b> .....	<b>3</b>
<b>PART I: IMPROVEMENT OF EXISTING TECHNOPARKS</b> .....	<b>7</b>
1. Introduction .....	7
2. Assessment of Existing Technoparks.....	9
3. International Best Practice .....	19
4. Operating Programs.....	24
<b>PART II: REGIONAL ANALYSIS FOR FUTURE TECHNOPARKS</b>	<b>36</b>
5. Theoretical Framework to Regional Analysis .....	36
6. Regional Macro Endowment Analysis .....	39
7. Firm Orientation Survey .....	53
<b>References</b> .....	<b>59</b>
<b>Appendix A: Best practice workshop Alatau IT City technopark May 15-16 2008</b> .....	<b>61</b>
<b>Appendix C: Example of an 18-Month Technopark Strengthening and Capacity-Building Program for Kazakhstan</b> .....	<b>64</b>
<b>Financial Plan Example for an 18-Month Technopark Strengthening and Capacity-Building Program</b> .....	<b>69</b>
<b>Appendix D: Firm Orientation Survey Template</b> .....	<b>70</b>

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## BACKGROUND

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### Current Challenges to Kazakhstan's Economy

In light of an economy dominated by the extraction sector, the Kazakhstan government has decided that the country must make the transition from producing and exporting primarily unprocessed raw materials to producing and exporting more knowledge-intensive value added goods and services. However, the pace of economic diversification has not met expectations and productivity in manufacturing and services remains low. Oil and mining represented more than 80 percent of exports in 2005, and excluding the metal sector, manufacturing exports remained almost constant from 1995 to 2005.<sup>1</sup> The Kazakhstan Country Economic Memorandum (CEM) notes that national labor productivity trends are not encouraging (World Bank, 2005). While, labor productivity<sup>2</sup> in manufacturing has improved relative to the EU8 during the strongest period of reform (1996-2001) and reached half the level of the EU8 in 2001, it has remained stagnant at this level since 2001.

The CEM lists the slow pace of technological change as a key determinant of labor productivity trends in Kazakhstan. Despite a good scientific legacy that has remained in the country since Soviet times, there is evidence of low levels of innovation and technology absorption in the productive sector. In 2005, R&D expenditures as a percentage of GDP was of 0.29 percent in Kazakhstan,<sup>3</sup> lagging behind Turkey (0.79 percent) and far behind South Korea (2.98 percent).<sup>4</sup> Kazakhstan's low level of investments in R&D has led to weaknesses in the national innovation system. In 2005, only two USPTO patents were issued to Kazakhstan, compared with 4591 for South Korea.<sup>6</sup> This measure of innovation placed Kazakhstan marginally ahead of Turkey, and an order of magnitude behind South Korea in terms of the output and efficiency of its national innovation system (Table 1). Moreover, only one quarter of the R&D in Kazakhstan is funded by the private sector, where it is most likely to respond to the needs of the market. In OECD countries, this share is closer to two-thirds. Indeed, with research and educational institutions employing as much as 88% of

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<sup>1</sup> UNCTAD Handbook of Statistics

<sup>2</sup> measured as dollar value added per worker

<sup>3</sup> Agency for Statistics, Republic of Kazakhstan, 2007

<sup>4</sup> OECD Main Science and Technology Indicators, 2007/2

<sup>5</sup>It is important to note that a comparison of resources spent on innovation between Kazakhstan, Turkey and South Korea needs to be taken in perspective given the predominant contribution of extractive industries to Kazakhstan's GDP, industries which are not typically R&D-intensive. While the economies and geographies of Kazakhstan and South Korea differ, a comparison between the two highlights the importance of the gap between Kazakhstan and a technology leader.

<sup>6</sup> U.S. Patent and Trademark Office at [www.uspto.gov](http://www.uspto.gov)

researchers in Kazakhstan,<sup>7</sup> versus 30% in South Korea,<sup>8</sup> it is not surprising that the pace of technological change in the productive sector has been slow.

Table 1: Patents granted in 2005

	Innovation Output: Number of USPTO patents per \$100 Billion of GDP	Innovation Efficiency: Number of USPTO patents per \$100 Million of R&D Expenditures
Kazakhstan	3.5	0.81
South Korea	580.4	14.39
Turkey	2.75	0.23

Source: U.S. Patent and Trademark Office; and Agency for Statistics, Kazakhstan.

Factors limiting private sector innovation in Kazakhstan include weak linkages within the national innovation system, between research, education, domestic businesses and foreign businesses, weak entrepreneurial skills, and an unfavorable investment climate (see World Bank 2005, World Bank 2006, UNDP 2006 and National Research Council of the National Academies 2007). Concerning this last point, the country ranked 131<sup>st</sup> in the 2007 Doing Business indicators, signaling a large scope for institutional improvement.

In 2003, the government of Kazakhstan introduced the Innovative Industrial Strategy for Development with the hope of reducing the economy's dependence on the extraction sector. The Strategy includes technoparks as one of among a number of measures to promote innovation in Kazakhstan.<sup>9</sup> At present, four technoparks have been established with support from the Ministry of Industry and Trade (MIT)<sup>10</sup> and another four technoparks are being planned by MIT.<sup>11</sup>

## Technoparks as Instruments of Innovation and Entrepreneurship

The International Association of Science Parks defines a science park, also known as a technopark, as “an organization managed by specialized professionals, whose main aim is to

<sup>7</sup> RK National Center for Scientific and Technical Information, 2006, cited in UNDP (2006)

<sup>8</sup> UNESCO, 2005

<sup>9</sup> Other measures include the establishment of an innovation fund, a development bank, an investment fund and the creation of the engineering and transfer of technology center.

<sup>10</sup> LLP Technopark Algorithm (Uralsk), LLP Technopark UniScienTech (Karaganda), LLP Almaty Regional Technopark and IT Park - Alatau IT city.

<sup>11</sup> technoparks are to be established in Astana, South-Kazakhstan oblast, North-Kazakhstan oblast and East-Kazakhstan oblast.

increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a [technopark] stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.”<sup>12</sup>

Policy interventions to support technoparks as tools of economic development take their root in the national innovation system (NIS) literature. While the neoclassical approach to innovation policy focuses on correcting market failures at the level of individual and isolated units within the economy (Arrow, 1962), the NIS approach emphasizes the fact that firms do not innovate in isolation but with continuous interactions with other organizations in the system (Edquist, 1997; Lundvall, 1992). According to the NIS approach, the government should intervene in those areas where two conditions are fulfilled: firstly, the system is not operating well, that is, areas where there are systemic problems; secondly, the state has the ability to solve or mitigate the problem (Chaminade, forthcoming). Government support for technoparks attempts to address four systemic problems:

- infrastructure provision: technoparks typically offer tenants physical, information and communication technologies (ICT) and scientific infrastructure superior to that available outside the technopark;
- network problems: technoparks can correct for coordination failures and strengthen linkages in the NIS;
- institutional problems: tenants in some technoparks benefit from special policies to create a favorable business environment;
- capability and learning problems: technoparks often provide consulting or training services to increase firms’ abilities in accessing or creating new knowledge or in transforming knowledge into innovations;
- complementarity problems: technoparks can be developed or managed such that they facilitate geographic proximity and agglomeration economies, and thus enable knowledge spillovers and connections between complementary competences of the system (sources of research, sources of finance, labor, suppliers, etc.).

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<sup>12</sup> International Association of Science Parks (IASP) International Board, 6 February 2002

## Objectives of the Report

The Joint Economic Research Program (JERP) between the Government of Kazakhstan and the World Bank was established in 2002 and has been developed and implemented under the Technical Cooperation Agreement between the World Bank and the Government of Kazakhstan. The FY08 Annual Program of Technical Cooperation included a subtask concerned with the development of mechanisms to support innovation and entrepreneurship through technoparks, under the responsibility of the Ministry of Industry and Trade (MIT)

The objectives of this report are:

- a) to carry out a general diagnostic review of the technopark infrastructure under the supervision of MIT, as well as to review regions where new technoparks may be potentially located;
- b) to present international experience in the area of technoparks;
- c) to propose a program to increase the effectiveness of existing and planned technoparks.

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# PART I: IMPROVEMENT OF EXISTING TECHNOPARKS

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## 1. Introduction

Part I summarises the findings and recommendations of a research study into the standing of the technopark development strategy in Kazakhstan. The technopark initiative is a major national policy plank in efforts to improve the technology competence of Kazakhstan's industry and attempts to utilise better the strong national science and technology base of the country. It has, therefore, a strong "science push" element in its design while recognising the need to foster a stronger pull from the users.

The study involved two field visits to operating technoparks and discussions with the Centre for Engineering and Technology Transfer (CETT) who have been charged with the supervision of the national investment in Kazakhstan's technoparks. Related agencies dealing with investment in science and innovation and the creation of the Kazakhstan venture funding industry were also visited as were several universities.

The observations provided by both these visits were drawn together into progress reports and then used to organise a two-day workshop where selected good practice from international experience was also introduced. The final stage was the drafting of this report which summarises the analysis, findings and recommendations of the study.

Part I is organised into the following sections:

- Assessment of Existing technoparks: a commentary on the present status of the operating technoparks that were visited during the field work, including the following four technoparks under the responsibility of CETT
  - UniScienTech technopark, Karaganda
  - Alatau IT City, Almaty region
  - Kazakh National Technical University named after Satpayev technopark, Almaty
  - Uralsk technopark

In addition, one technopark outside of the responsibility of CETT was analyzed as a benchmark:

- Ust Kamenogorsk technopark, which has been developed by a local consortium of interests including academic and regional government sponsorship

- **International Best Practice:** a commentary on international best practice which was presented at a two-day workshop. Power Point slides, some of which were used during the workshop, are annexed to the report
- **Operating Programs:** a set of recommendations on the way forward for both the individual technoparks and the overall support system for innovation in Kazakhstan.

During the workshop on international best practice there were announced a further four locations where new technoparks are to be developed. With this expansion there is the possibility of a more mutually supportive expansion of the network of technoparks – especially with respect to skills development in the governance and management of the technoparks.

In addition, the workshop coincided with a visit from the Italian Association of Science and Technology Technoparks which both enlivened the discussion and offered an opportunity to develop directly international partnerships between individual Kazakhstani and Italian technoparks. While the experience of such networks is mixed, every effort should be made to capitalise of the interest and to seek to build sustainable partnerships with these technoparks.

## 2. Assessment of Existing Technoparks

Two field visits – one in November 2007 and a second in March 2008 were made to Kazakhstan during which five technoparks were visited. All but one of the technoparks were under the responsibility of the Ministry of Industry and Trade, the exception being in Ust Kamenogorsk which had been developed as the result of a local/regional initiative. In this section of the report a commentary is made on the characteristics found at each technopark and some general observations about their achievements to date and the challenges they face for the future.

The technopark model as implemented to date in Kazakhstan falls into two main types albeit with distinct characteristics within each of the main types. The first is modelled on the European Business Innovation Centre – a single unit that houses a rich service offer to new technology projects and seeks to take them from the original conception stage, usually brought forward by members of the academic faculty, to a fully fledged business. The single buildings also offer initial premises for the emerging businesses so in operational terms resemble a pre-incubator and incubator facility. Three operations of this type were visited – the first in Karaganda, the second in Almaty at the Technical University and the third at Uralsk – and notes of what was observed follow below.

The second model is a land intensive special zone that seeks to cluster a significant number of independent businesses in a shared community that benefits from business and technology development services as well as high class infrastructure and facilities. This model is aligned to the mainstream S&T technoparks of Western Europe and the Special Economic Zones that have been used extensively in Asia, most notably in China in recent years. Two zones of this nature were visited: Alatau IT City, which is modelled directly on the land intensive special zone idea, and Ust Kamenogorsk, which has a strong technical university at its core, so presents an additional applied research dimension. The observations on their status also follow below.

## Technopark Descriptions

### UniScienTech technopark, Karaganda region

This technopark is housed in a converted production building in the vibrant industrial city of Karaganda. The refurbishment of the building is only recently completed and activities are at an early stage of development. The building standard after refurbishment is good – offering facilities that place it at the premium end of the local market as well as offering services that distinguish it from other locations in the city and so identifying the initiative as a prestige development.

Several of the early tenants are developing related regional regeneration strategies and appear to have some synergies with the core technopark management team albeit also with some social overtones. So, care needs to be taken not to create a public/agency enclave and a strong balance of commercially oriented activities must be housed to provide the dominant base of the community. This is essential to creating the right buzz and culture for success.

The new business development model is oriented round a process that seeks to identify technology ideas with commercial potential that can be pulled through into the market. A strong interest in process technologies and new developments to upgrade the technology levels and productivity in existing manufacturing firms in the region is also present. The management team scouts for projects and uses an external committee as a reference or sounding board to select those ideas to be taken forward. This works like a filtering exercise to ensure that the risks – technology, personal and commercial – are managed through the business development process.

The process seems to be well structured but the offering is if anything too oriented to the technology potential and while addressing the commercial dimension it is given a lower weighting in project selection. The key questions here are what does the technology do and how can it prove beneficial while in a good practice international model they focus on who will buy it, what will they pay and can it be made at a price that enables a profit to be made so is it commercially viable.

#### Overall judgement

- 1 a suitable building well refurbished and appropriately positioned in the market
- 2 a need to attract some hard commercial tenants to build the right community
- 3 a well structured business development process
- 4 needs a stronger commercial orientation to the project selection process

## Alatau IT City, Almaty

This development is the closest of those visited to a mainstream science and technology (S&T) technopark in other countries in that it is planned to cover a total of 340 hectares when fully developed and to accommodate a number of independent businesses in freestanding premises. A full scale master plan has been completed by the Singapore based Jurong consultancy and when developed along the envisaged lines it will be a significant location for high technology based firms, focussing primarily on information technologies.

Its initial phase of development has been a single complex of buildings on a 7 ha site in the ownership of the Alatau technopark authority. This complex is in three interconnected parts: – first, a central office style reception and services area with lettable space for smaller tenant companies; and connected to the central core by covered corridors two large production spaces that offer flexible closed space for a variety of possible uses. It is this complex that the present technopark management is operating and seeking to create a sustainable financial position by covering its operating costs from rental income from lettings.

As it stands, there is little likelihood of this being achieved. The buildings only make operational sense if they form part of the much larger whole of the overall technopark development and so are configured as a service core rather than designed to be self sustaining through lettings. Additionally the quality of construction is manifestly poor – in spite of the high costs incurred in its development. Several elements were reported never to have worked and others are showing faults that are proving costly to put right as well as taking up considerable management time.

As yet there is no agreement to transfer the other part of the site, most of which is in public ownership, to the technopark authorities so development of the next phase of the overall technopark is for the moment stalled. There is only one additional building on the first 7 ha site that is under construction

An additional constraint on development is the capacity of the electricity sub-station that serves the present development. Its current capacity is fully allocated to the adjacent urban area and the completed single complex so there is no spare capacity to service any potential additional development on the remainder of the site. Nor, we were informed by the acting General Manager of Alatau IT City, are there yet investment commitments made by the appropriate authorities to expand the capacity and in view of the long lead time in developments of this nature this is likely to be a binding constraint on development at Alatau for the foreseeable future.

## Overall judgement

- 1 good conception and attractive master plan
- 2 attractive location with potential to create a knowledge based business cluster
- 3 rather isolated from business services so appealing to mature companies
- 4 management and implementation weaknesses undermining viability
- 5 physical development constraints preclude additional development

## Kazakh National Technical University named after Satpayev technopark, Almaty

This facility is located on an academic campus in the city centre of Almaty. It is in the classic business innovation centre mould with a management team that seeks to facilitate the commercialisation of technology emerging primarily from the faculty base of the associated university and offering accommodation in an incubator style environment to fledgling and new companies. It is housed in a converted science faculty building located on the city centre campus so enjoying an enviable position as well as suitable accommodation for new companies.

Presently it is somewhat hidden because of the lack of a street frontage and poor signage but if this is put right it could become a major hub in the Almaty technology business community. To achieve this it needs active programmes to promote footfall – and a better meeting room facility to attract events.

Three tenant companies were visited and there is an attractive mix of new technology potential being utilised. Two of the fledgling businesses have spun out from the university and a third is an international venture that was attracted by the location and service offering. All are at the incubation stage and require support alongside the premises offer from the technopark management team and its associates. The present team is slim but appropriate and while learning on the job is showing strong signs of developing the right service culture that is a mark of success elsewhere.

The location of the technopark on the campus is both a strength and a weakness and needs to be managed actively to ensure the strengths come through strongly. A structured recruitment programme and a clear business oriented relationship need to be developed between the Technopark and the University to build faculty support, enhance legitimacy and maximise the potential mutual benefits.

### Overall judgement

- 1 good facilities and attractive location
- 2 university relations need to be structured and actively managed
- 3 visibility needs improving and a strategy to increase footfall
- 4 skills enhancement is a priority to accelerate its development
- 5 city wide role needs to be developed and supported

## Uralsk Technopark

The technopark at Uralsk is housed in an attractive new building in a relatively quiet neighbourhood in the city which is some way from either commercial or industrial zones. It is based on the Business Innovation Center (BIC) model (technical services aiming at accelerating new business ideas coming to market and offering early stage accommodation to new technology firms). It is therefore similar to two of the other technoparks which were visited during the first mission. It has an added ingredient which is at an early stage of development of a regional technology centre with an emphasis on rapid prototyping services.

The building has been developed to a high standard with meeting rooms and exhibition space on the ground floor and more office style units on the upper floors. The design of the building has created a lively space but not one suited to maximising the revenue potential from subletting to firms even though the units are available in a variety of sizes for firms to occupy. A growing number of firms are choosing to locate in the building alongside some public development services making a good mix of public private users. There is still space available in the building and the new financial targets of self funding are putting pressure on the management team to fill the space in order to generate income.

The technopark is well staffed with specialists who are organised along discipline and service orientations. It has the capacity and competences needed to fulfil its work responsibilities at a higher volume than is currently being demanded so has the potential to expand services further. Again, so far the focus has been on building the supply side and more attention needs to be paid to stimulating the demand from the region's businesses for the services being offered.

The new rapid prototyping centre is just being set up with the current focus on installing the equipment and completing the hands on training of the centre's staff in its use. There is strong optimism that the local companies will find the services attractive but there has not yet been any marketing done to attract clients.

### Overall judgement

- 1 an attractive building well suited to project a modern technology image
- 2 a growing business occupancy providing income to cover operating costs and a possibility of day to day contact with technology businesses
- 3 significant capacity to grow services and expand operations
- 4 rapid prototyping adds a further challenge to marketing

### Ust Kamenogorsk Technopark

The technopark of Ust Kamenogorsk is sponsored by the regional authorities and the Technical University, and has introduced to Kazakhstan a third type of model of technopark. It is located on the extensive campus of the university as part of a larger plan to accommodate both independent research units and technology based businesses. This larger plan is in development terms similar to Alatau IT City albeit smaller in scale. The location on the campus of a technical university adds a strong applied research aspect. The predominant occupants of the existing technopark building are applied research units of the University, which is a resource not present in Alatau IT City. Leadership of the project is being taken by the Rector of the Technical University with a clear vision of a technology based cluster of economic and social activity to accelerate the development of the region.

The technopark component is housed in a single building which includes both teaching and applied research centres. These centres, predominantly but not exclusively scientific, are seeking to make more accessible the strong technical competences in the University's faculty to potential users in both business and government communities. Faculty are being encouraged to apply their knowledge and to initiate development ideas based on their research interests. Being on campus there are strong linkages to other facilities being installed to further enhance research activity in the University's main teaching buildings.

The technopark building is of good standard and the culture is welcoming of interest for applications of the University's research. There is no intention to offer accommodation to firms in the current building, which is already well occupied, but there is expected to be joint development projects with firms who are looking to use the competences in research and technology that are housed in the centre, for example, through services in joint research or new product development.

The technopark is still young and there are some early signs of interest but it is predominantly a science push facility with few current clients for the services being offered among the local and regional business community. Marketing for the technological services offered by the technopark and for the development opportunities offered by the expanded site needs to receive even greater attention to build a balance on the demand side to match the commitment on the supply side.

On a campus adjacent to that of the Technical University is situated a second university. The innovation effort here is being focussed on new means of teaching with course material being prepared in digital form to be accessible at all times by students through a university intranet. This university is also developing its own variant of a technopark in a reconverted building some way outside the main campus where it has installed a first applied research

team in the biotechnology field. It is expected that the building will accommodate additional research teams and will give rise to exploitable intellectual property.

#### Overall judgement

- 1 the project benefits greatly from the clear leadership of the University Rector
- 2 plans for the larger technopark on the University land offers a good prospect for a high tech cluster to develop
- 3 the supply side offer of technical services is not yet matched by an equally strong demand side interest
- 4 marketing needs to be stepped up to attract demand for both the services and the development land

## Central Support

Support for the technopark initiatives – including the flow of public funds for their establishment - comes through the Centre for Engineering and Technology Transfer (CETT). They commission feasibility analyses of the potential of different regions and when approval is granted they allocate resources for their development. The Centre also provides a central oversight of the implementation and sets the operating parameters for the technoparks.

In recognition of the need to provide additional instruments to foster technology commercialisation and the introduction of new technology into Kazakh manufacturing businesses there has been put in place a national innovation fund. This fund is seeking to foster venture funding and related services at the national level and to foster strong linkages to international centres of technology oriented venture funding activity. This fund currently operates almost totally independent from the technoparks although in design the two initiatives are intended to be mutually supportive. This gap needs to be bridged.

## Core Challenges

The use of a technopark instrument is commonplace in national and regional strategies to upgrade usage of technologies by industry and the development of new higher technology businesses from the academic base. There are distinctive characteristics in each country that shape their implementation even though the core model relies on a similar logic. The following list contains some of the main challenges that are commonly faced by technology upgrading initiatives and from the initial observations of this field visit are also relevant to the Kazakhstan situation.

- 1 Integration of instruments – the separation of venture funds and technoparks is legitimate but seems to have become too great a divide to be a mutually supportive. In part this may have arisen because the innovation fund was premature but the divide needs to be remedied if the two instruments are to achieve their joint intended purpose
- 2 Commercial perspective – needs to be strengthened across the board if the economic impact is to be felt in the short and medium term as well as the viability being achieved of the technopark model

- 3 Skill base for operators – needs to be enhanced through structured training, mentoring and exchanges with established international centres as well as a national network approach to specialisation fostered to build a national programme in appropriate niches
- 4 Dynamic linkages to next steps – if a well articulated technology business development momentum is to be built a stronger market linkages has to be central to the project development process
- 5 Sustainability of business model – has to be better articulated to ensure the potential of the property based revenue is realised and the costs of the public good element are well managed.
- 6 The public goods elements include:
  - awareness programmes – S&T in business, deal flow/ferrets, tech commercialisation in academia to build the right dynamic processes
  - pre-incubation – to filter out those ideas with real potential and to eliminate those without
  - seed stage – where business value is built but commercial returns not yet realised so needing sustained support
  - property from industrial restructuring – an investment that may in the long term prove financially viable but likely to be slow in being realised
- 7 Commercial participation – in the new business development processes and the adoption of more advanced technologies in Kazakh industries must be enhanced if they are to become central to business strategies.

### 3. International Best Practice

Benchmarking the technoparks of Kazakhstan against international best practice was the objective of the next stage of work. This was to provide reference points for the management of the technoparks to identify where their own practices could be improved and where their skills could be developed so as to improve the performance of both the individual technoparks and the network of technoparks as a whole. It was also to assist CETT to develop more robust models of how they could both strengthen their supervision and improve the standards of performance of existing technoparks and plan the development of new technoparks.

Best practice is usually found not by examining a single case but through the combination of the experience of several comparators which have excellent elements for part of their operations and we have followed that practice here. The sources we have used have been drawn from several specific technology technoparks with which we are familiar from previous project work and all have been visited during the last few years. They include:

- Cyberpark, in Ankara Turkey;
- TUBITAK Marmara Technology Technopark and Free Zone, Turkey;
- Forskiningsparken, in Oslo Norway;
- Manchester Science Technopark, in Manchester UK;
- Advanced Manufacturing Technopark, Sheffield in UK;
- Pays Vasco network of technology technoparks in Spain;
- Isfahan Science City and Pardis Technopark near Tehran in Iran;
- Moscow State University Science Technopark, in Russia;
- Technology Technoparks in various States in Malaysia;
- plus elements from other technoparks in more than 25 countries around the world.

This material was drawn together into coherent topics that were relevant from the review of Kazakhstan's existing technoparks and addressed the issues raised in the prior section of this report. A two-day workshop was planned to cover the material with technopark managers and CETT officials. The format and material prepared for the workshop, which includes additional material to be eventually presented, is set out in Appendix A.

In broad terms the format for the workshop was divided into three parts:

- Part 1: presented the findings from the visits to the technoparks and encouraged responses and extended discussions on the challenges ahead
- Part 2: presented a compilation of best practice and the lessons that had been learned from mistakes made elsewhere in establishing technoparks that were selected to be relevant to the challenges in Kazakhstan
- Part 3: more specific topics were covered that picked out key aspects of good practice in areas crucial to the success of the technoparks, including the following:
  - Land and estate management: where the emphasis was on creating the real estate in a way to sustain the operations of the technopark and satisfy the needs of the companies settling on the technopark. The variety of models stressed the choices relating to funding, development strategy, estate management and revenue generation.
  - New firm formation, which is the core value added aspect of the technopark model and the mechanisms needed and used in the case studies were described in a way to emphasise the choices that need to be made on both strategy and delivery. A fuller treatment was also made of the new firm formation challenge and the many pitfalls that need to be overcome.
  - Value added services, where the differentiation of the successful higher level technoparks is largely in the way they offer value added services over and above the core estate management and initial business support services. Again, different strategies were contrasted to highlight the choices and alternatives for provision through in-house capabilities and external partnerships.
  - Regional technology networks, which introduced the broader issues about technoparks contributing to and benefiting from a regional level technology commercialisation network. Describing and discussing specific cases and approaches enabled the technopark to be developed as a hub of a network with a strong transactional value to both firms resident in the technopark and technology based firms across the region.

The main messages from the presentations were:

- 1 Complexity from multiple objectives. technoparks are complex initiatives with at least three components which must each be successful. The first is the real estate and facilities offer which must match the needs of the target population and be delivered to the best standards in the local and regional market. The second is the operations and

basic services offered by the management team of the technopark which must be of the highest standard and make a real difference to the benefit of the occupants of the technopark. The third is a wider offer of specialist services that are most often delivered through strategic partnerships with the best agencies available in the region to be of real help to the technology firms that are located on the technopark.

- 2 Designed to be fit for purpose. The design of the technopark must be closely modelled on its core purpose, be related to the market potential and be developed within a clear long term plan that takes a perspective of at least 10 years in its design. The core buildings must be capable of meeting the needs of technology-based businesses, which means they must enjoy the best standards of telecoms infrastructure as well as being perceived as a premium location at which to do business. Buildings must be capable of generating income to sustain operations and any specialist facilities must have a funding plan that takes a realistic view of their revenue generating potential from client services and the need for long term support funds to sustain their operations.
- 3 Long term support essential. In addition to building the infrastructure equal attention needs to be given to the creation of long term support from the three key constituencies whose support and active engagement is essential to the success of the technopark over the long term. The three constituencies are business, universities and government and each needs to be involved in the strategic governance of the initiative and to take responsibility for sustaining support over at least a decade and usually longer. Management of the technopark needs clear consistent and stable operating guidelines from the constituencies but then to be given the freedom to get on and do a good job without unnecessary operational interference.
- 4 International competition is intense. There are quite limited mobile technology based investments and competition for them to select any particular location is severe so the offer, if external investment is the target, has to be very attractive including strong incentives and high quality real estate and infrastructure offers. This applies particularly to larger technopark type models rather than the BIC model but has implications for both in terms of design, promotion, marketing, sales and operations.
- 5 Quality of management is crucial. As with many other complex initiatives the quality of management is crucial to their success and close attention has to be paid to the development of skills and sharing of experiences to ensure the technopark system is of the best standard. Running and marketing real estate, offering business services,

participating and managing technological networks locally and internationally are all parts of the job and demand an unusual range of skills. Many can be learned through a mix of formal training and experience placements while others must rely on learning from experience. Systems that encourage entrepreneurship and high quality performance are also needed with good monitoring and remedial action should satisfactory standards not be met.

- 6 Services are the main differentiator. The services that are offered to client entrepreneurs and businesses are the main differentiator of technoparks from other good quality locations for premium businesses. With good and cheaper information technology there has been a migration away from the benefits of shared services that were primarily designed to reduce costs and an emphasis on higher value services that are specially needed by technology businesses. These include access to project and new firm finance, especially risk capital, services around intellectual property and technology management and information as well as international business development services. The management team of the technopark is unlikely to have such specialist skills in house so must develop strategic partnerships with good suppliers to ensure they are available to technopark companies.
- 7 Integration to innovation system and networks should be strong. The objective of the technopark management should be to promote their technopark as a central hub in the technology development and innovation infrastructure of their region. To achieve this there has to be alliances with research and development performers – universities and research units – and with specialist agencies with complementary roles in the innovation system – venture capital, technical training, technology information service providers, marketing specialists and legal and business support agencies among others. All of these must be encouraged to become regular participants in technopark events and be available to technopark companies to benefit their businesses and help them to grow and prosper.
- 8 Supporting institutions and tools also need to be high quality. Because the technopark relies on these other participants in the innovation system there is a need to ensure they are of equally high quality to the technopark and that they work successfully together. This is a shared responsibility and draws heavily on the sustained support of the promoters of the technopark to ensure the necessary high quality service and facilities are available to sustain the technology upgrading and that new firm development efforts are successful. Mutually supportive development strategies

need to be designed with long term shared strategic goals in mind even though each agent also acts independently and pursues its own core purposes.

- 9 Government has several essential roles. Achieving success as a property schemes can give some financial independence from public budget funds in the medium term but the core developmental purpose of the technoparks means that there are non commercial activities that need to be supported over the long term. Different means have been used to provide resources for these longer term developmental efforts but continuing targeted support from government funds has been the norm. Government has other contributions to make to the technology development agenda including as a client for more innovative goods and services, as a facilitator of innovative practices, as an evaluator of performance and as a celebrant in success. All of these roles mean a strong interaction with public agencies even when the technoparks are established as private entities.
- 10 Dynamic models require multiple sites. Most regions recognised as innovative and having a rich technological emphasis in their industries have several technoparks in their regions. The first has to be supported as the pioneer but in the medium to longer term there should be an expectation that there will be several technoparks in the region and that private property investors will play a full part. The first technopark is usually a general purpose technopark while the following technoparks often adopt a specialist theme to add something different to the region's infrastructure. Some target early stage companies while other offer premises more suited to larger established companies but they all interact and should be developed in a way that ensures they are mutually supportive rather than too overtly competitive.

A very strong theme that emerged from the discussions at the workshop was the presence of a body of experience in the skills and knowledge of the current managers of the Kazakhstan technoparks and the need to share that experience for mutual benefit. An equal appreciation was expressed of the benefits of looking regularly at international peer technopark professionals to benefit from their experience and learn from the lessons that had been learned from international experience. An important role was expected to be played in fostering linkages by CETT and the protocol signed with the Italian Association of Science Technoparks was seen as a valuable contribution to the process.

## 4. Operating Programs

### Overview

In this section of the report the themes that have been discussed about the challenges for Kazakhstan's technoparks and the lessons that have been learned elsewhere through the world technopark movement are drawn together into an action programme for upgrading operations and management. It is organised by topic and addresses in order:

- Central support, which emphasises the role of CETT in sponsoring new technoparks, monitoring performance, developing skills, sponsoring networks and experience sharing plus lobbying for additional support from government and complementary agents working in the innovation arena
- Innovation tools, which particularly emphasise the contribution of an effective domestic venture funding market, the stimulation of demand from industry and the approaches to preparing new ideas so that they are investment ready
- Technopark development, where the emphasis is on an improved process of identifying and commissioning new technoparks and the development of a sustainable local support community with long term perspectives to support the technopark once established
- Technopark management, where a more systematic and higher quality operations approach is needed plus the development of strategic alliances for service provision and local, national and international networks
- Key processes, where a systematic approach needs to be taken to incubation, technology upgrading and activities to combine and link different knowledge sources in the regions in which technoparks are operating
- Development programme which puts a time frame on the achievement of the full range of upgrading tasks.

### Central Support

Here the main tasks are to develop the role of CETT in sponsoring new technoparks, monitoring performance, developing skills, sponsoring networks and experience sharing plus lobbying for additional support from government and complementary agents working in the innovation arena.

## Sponsoring New Technoparks

The CETT has been successful in getting an allocation of new investment capital for a further expansion of the technopark network with four new technoparks in the pipeline for development. At the workshop a couple of these were described by the promoters and their cases appeared to be strong even though there was no time to go through the detailed analysis. Inevitably, when the style of analysis is primarily competitive to capture essentially public sector investments there is a mix of political and operational elements taken into account. However, to be successful (which as a minimum at the moment means to be financially sustainable without further budget support) there has to be a much more sound analysis and systematic approach taken to the decision.

From practice elsewhere there is three step methodology which could be adopted with benefit in Kazakhstan. The three steps are: first a pre-feasibility study which reaches a judgement on the availability of the necessary ingredients in a particular region to make a success of the potential investment in a technopark. The second is a viability study which explores the shape and focus of the particular technopark and identifies the resources that need to be brought together to be successful and the commitment in the region to make a success of the technopark when it will probably require support over at least ten years to stand a chance of building a sustainable foundation for the future. Finally, the third step is the preparation of a master plan which is a much more detailed exercise in exactly what is to be developed, when and within which institutional framework and with what policies of management and operations.

## Monitoring Performance

This is one of the core tasks of CETT in its role as a major shareholder in the technoparks of Kazakhstan. While in institutional form it is a private investment agent, in reality it is an investment arm through which a major public policy initiative is managed so there are responsibilities that are broader than that of a private shareholder. Nevertheless, it is important that it establishes clear key performance indicators that are relevant to the main purpose of the technoparks and monitors these closely. They might, for example, relate to the amount of investment made in new technologies; the number and value of new businesses established with the technopark's help; and the activity generated in network events to foster innovation networks in the region. Financial viability is also crucial but must be a realistic goal given what stage the technoparks have currently reached and be matched by the delivery of the additional assistance that will be needed for the technoparks to achieve it.

## Developing Skills

There is a common need across all the technoparks to develop to a higher level the skills of the management team and analysts. It is appropriate for CETT to take the lead in organising training to achieve this. There are a variety of strategies that should be encouraged to achieve the skill upgrading including: formal courses on professional topics; experiential learning opportunities across the network where leading technoparks can help newer colleagues through placement and professional exchanges; and secondments to and exchanges with leading technoparks internationally. This is an urgent matter and some short term exchanges and secondments would be an appropriate early response. In the medium to longer term there should be established a national centre, probably located at one or more universities, for the training of technopark managers and the development of professional standards for this important new area of professional practice.

International models should be explored and after suitable adaptation should be adopted in Kazakhstan.

#### Sponsoring Networks

The central position of CETT makes it an ideal candidate for the task of building national innovation networks and ensuring the role of the technoparks as the central hub of these networks. Some of the networks should be focussed on the development of a technopark professional and operational community and emphasise experience sharing and development of common approaches that improve internal performance and success. Some need to be with other actors in the innovation system to ensure the technoparks are able to build the right relationships to be successful and develop sustainable support to achieve common goals. Some need to be with the international community of technoparks and build on the start made with the Italian technoparks where the protocol signed during the workshop needs to be built upon.

#### Lobbying for Support

This is an important task which CETT has been pursuing successfully to gain allocations of new investment resources from national budget sources. It is likely that this will remain an important task for the foreseeable future as support for the technoparks will need to be sustained for at least another decade. Importantly, this comment relates to operating costs as well as investment resources as several of the activities that technoparks are being asked to undertake will never be commercially viable as they are essentially developmental in nature. This is especially the case if they are to play a full role in the innovation infrastructure of the country and to go out and stimulate engagement from the players who are currently reluctant to get involved, not least of which is the private manufacturing sector.

Lobbying is also about creating the right level of celebration about what has been achieved and building a realistic view about how long it takes to make a material difference. Persistent special pleading is not attractive but the right balance of celebration and information about progress can help build the sustained support that is a necessary condition for the technoparks to succeed.

## Innovation Tools

Where three important and related areas of work must be developed to a higher level of performance. These are in the contribution of an effective domestic venture funding market, the stimulation of demand from industry and the approaches to preparing new ideas so that they are investment ready.

### Venture Funding

At present the venture funding market in Kazakhstan is very limited and there is a disconnect between the efforts of the technoparks to develop new product and process technologies and the availability of early stage risk finance. In part this is an understandable consequence of the weakness of the investment deal flow from domestic sources but in part it is also a consequence of the gap in understanding between the finance and technology oriented communities and a key development agenda item must be to close this gap. Strategies that have proved helpful elsewhere include training of both communities to foster a better understanding of their respective needs and opportunities; special events to display in appropriate terms the investment opportunities that are available (see investment readiness section below); and promotional events to raise the visibility of deals done to encourage more to come forward. Additionally there is a lot of experience of schemes to make available capital at early stage for technology ventures, subsidising the cost of transactions and accelerating the flow of investment ready ideas which needs to be introduced to Kazakhstan.

This is a big subject in its own right but a concerted effort is needed by the technopark community to close the gap from their side to ensure appropriate finance is available.

### Demand for Innovation and Technology Upgrading

Working with the business community, particularly the manufacturing sector, on stimulating the level of demand for technology upgrading and innovative approaches that will raise productivity and profits is a necessary complement to the work of the technopark

management to stimulate the supply side of new technology ideas. Different countries have used cluster approaches to target priority topics, a variety of shared cost grant schemes to encourage early adoption of new technologies, investment incentives to encourage firms to bring forward their plans and information services to ensure there is a better awareness of the opportunities for adoption of new technologies.

Technoparks need to position themselves as the central point in the networks and become the hub where these activities are concentrated so that they are in the best position to promote their technology offer.

### Investment Ready Ideas

The language of the finance community is different from that of the technology community and in order to connect the two – new technology ideas with investment money – the ideas have to be prepared in a way that answers all the concerns of the potential investors. This is what is meant by making projects investment ready and involves more commercially relevant aspects with a fuller analysis of the risks and rewards of the investment and less on the novelty of the technology. More training is needed to prepare projects to be investment ready and the finance community should be involved in the delivery of the training. A series of events is also needed to display to potential investors the projects that have been so prepared to alert them to the opportunities that they are currently ignoring. Being properly prepared does not guarantee investment but it does significantly increase the chances of success.

The technopark managers and analysts should be working with training providers to bring forward appropriate courses and organising events to display the opportunities available.

## Technopark Development

Here the emphasis is on an improved process of identifying and commissioning new technoparks and the development of a sustainable local support community with long term perspectives to support the technopark once established.

### Process for New Technoparks

This has already been covered in outline in the section on central support but is elaborated upon in a little more detail here. The process was described as in three stages and the main characteristics of these stages are as follows:

- Stage 1: pre-feasibility study

Here we are concerned to establish if all the necessary ingredients are present and if a sufficiently committed sponsor group exists to sustain the project over the medium to longer term (10 years and more). Stage 1 deliverables are a pre-feasibility report describing the main lines of the proposal with judgements about each of the main ingredients and the likely success of the overall proposal. The work of stage 1 can be achieved in an intensive week to 10 days with a team who have previous experience of pre-feasibility analyses plus good local support.

Four outcomes are possible to arise: first, all ingredients are available of sufficient quality plus local support in favour of the scheme with the outcome that a rapid move onto stage 2 and 3 is likely to be agreed. Second, some of the key ingredients are missing but there is enthusiastic local support which will lead to a strategy to fill the missing gaps and set a timetable to move on to stage 2. Third, some ingredients are missing and there is weak local support which leads to the preparation of a strategy to build local support and to then start to fill the gaps so delaying going on to stage 2 until support is built. Fourth, few of the necessary ingredients are available so go back to the drawing board to find a different strategy to achieve the desired outcome.

- Stage 2: viability analysis

Here the questions revolve around the shape, scale and focus of the Technology Technopark and include estimates of capital costs, likely financial and economic return, target market /cluster, identification of site, detailed functionality, review of organisational and institutional options, arrangements for the preparation and delivery phases and support needed. Many of the key choices of design and institutional form are taken at this stage. Stage 2 deliverables are a viability report with reasonable detail on the planned scheme with its scale, emphasis, ingredients and financial needs. The work of stage 2 typically takes 6-8 weeks, again with a similarly experienced team working with local support.

Again the next step depends on the outcome: first, if everything is positive then go on as soon as feasible to stage 3 and begin to build support for an early implementation. Second, overall viability is demonstrated but there is not a local appetite to commit the resources to develop the scheme so that implementation cannot be ensured (a key here is the likely allocation of land as a necessary resource

commitment). The outcome here should be to delay moving on to stage 3 until there is an improved likelihood of the resources for implementation being available. Third, there is no viable scheme that can be developed so again go back to the drawing board to plan alternative strategies.

- Stage 3: master plan

Developing a physical, economic, financial and institutional plan at a greater level of detail to guide the development of the scheme and to persuade those who need to commit resources that the Technology Technopark is a good investment and should go ahead with their capital contribution and operational support is the objective at this stage. Stage 3: deliverables are a fully detailed master plan including layouts, design guidelines, institutional form, funding, phasing of development and expected return in financial and economic terms. Stage 3 depends greatly on the scale, focus and location of the proposed Technopark but is likely to take 3-4 months with a professional input including design and land development specialists

Unless new information undermines viability or dissuades support for the scheme then the next stage is to go through the formal approval stages and begin to commit resources to implementation.

### Building Local Support

Sustained local support is essential to the success of technoparks as they need to work closely with other institutions in the region if they are to achieve their objectives of introducing new technologies into Kazakhstan's businesses. Support is needed from the region's technology generators, from potential technology users, from other agents working to accelerate the adoption of new technologies, from the promotional agencies looking to attract investment in the region, from the business community to offer the highest level of business services to the technopark clients and from the finance sector to link money for new investment to the emerging technology ideas.

A proportion of this support has to be integrated into the institutional framework at a governance level as that is the best way to ensure sustained support, a proportion has to be developed through alliances that encourage joint activity and a proportion has to be through a more social and cultural dimension to create the right innovative environment in the host region. Key to success is the sustained effort to keep the levels of joint activity high and the interchange rich and different technoparks need to develop the skills and tools to ensure this is given high priority in their day to day work.

## Technopark Management

Four aspects are stressed here: first the development and updating of an operations manual; second, the development of international linkages; third, the selection and performance monitoring of service providers; and finally the construction of local and regional technology oriented upgrading networks.

### Operations Manual

Each of the technoparks visited is different and is seeking to adapt the offer to the potential of the region where they are located and with the partners that they each have. However, they all need to adopt similar management practices and service delivery tasks so there is merit in developing an operations manual that can provide a basic framework for the technopark management to fit into and to build upon in those areas where they have a distinctive offer. The manual can cover such aspects as financial management, standard real estate models, personnel management, business offer and policies for engagement with clients. In this way a coherent model can be developed for the technopark's of Kazakhstan and they can be marketed as a network, develop consistent relationships with businesses and present a professional partner for others involved in the technology upgrading of the country.

Individual technopark managers can be charged with the development of different aspects of the operational model and become a repository of best practice in particular areas which will add content to the network and linkages being developed between them.

### International Linkages

In this area a start has been made and the need is for individual technoparks to respond positively to the opportunities on offer. This is a necessary complement to the work of CETT in setting up opportunities. Efforts should be focussed on building linkages at a business to business level as these are likely to be the most sustainable and beneficial.

### Service Partners

The range of specialist services that technoparks are required to offer is growing and necessitates a move to the development of links to high quality service partners rather than a strategy of seeking to build an internal team that is capable of meeting all the needs from their own resources. In some areas where the skills are in short supply – venture funding and intellectual property legal services are typical areas – there may be merit in the first instance

in developing relationships at a national level (if not international for very specialist areas, where for example Norwegian Science Technoparks look to London for specialist IP services in the biotechnology field).

Eventually the objective is to ensure the services are available at the regional level but the scale of demand needs to be built to the level where it can be sustained commercially and this will take some time to achieve. Strategic partnerships where technoparks develop a first choice supply relationship helped to build this sustainable business relationship and is a good intermediate step to the eventual outcome of a vibrant competitive market service.

### Local Technology Networks

The role of the technoparks in stimulating the demand for new technologies from the manufacturing sector is in its infancy in Kazakhstan and needs to be accelerated if they are to improve their productivity and remain internationally competitive. Local networks that promote this task and help to bring together the supply of knowledge with the demand have proved crucial elsewhere and need to be developed in Kazakhstan and centred on the technoparks. These should be geared to delivering things the local technology business community judge they need in order to incentivise them to participate. Other innovation tools have already been mentioned and these should also be promoted through the networks to build a mutually supportive strategy.

These activities are entropic – ie they need a constant and persistent input of energy if they are to continue to perform – so have to be developed with a long term commitment in mind rather than a quick fix programme to just get things started.

### Key Processes

Three aspects are stressed: the incubation process for new firm formation; working with priority clusters or sectors in their technology upgrading; and building activities that attract external participants to visit and work with the technoparks.

#### Incubation

Stimulating the flow of new businesses based on new technologies is the lifeblood of technoparks and a key operational area where the processes needs to be of the highest standards. Incubation is a process that goes from the initial identification of a new idea to the development of a growing sustainable business that no longer need external support to survive.

First some basic principles in relation to business start ups:

- Entrepreneurs make sustainable businesses by producing goods or services that meet their customer's needs at acceptable costs with sufficient profits to reward their efforts – incubation processes need to focus on helping this to happen
- Entry into a new business venture requires skills and know-how of both technical and commercial types either within the management team or readily available to it – incubation seeks to help meet these requirements
- Capital is also needed for equipment and to cover operating costs until a stream of revenue sufficient to achieve profit is achieved – again, helping to meet this need is crucial to the rate of formation and pace of growth of new businesses
- Usually, new entrepreneurs lack sufficient collateral to give comfort to formal financial sources that loans are secure and sufficient security that any lease has a strong covenant for a sufficient duration to be attractive – which leads to the request for special property and easy-in easy-out terms alongside seed capital.

As a consequence incubation usually, but not always, has several components including: promotion programmes to attract new entrepreneurs; training in a wide range of business related skills; business plan assistance; mentoring of entrepreneurs; accommodation on “easy in - easy out” terms; seed and startup funds; animating events to share experience; graduation policies and celebrations of success; plus aftercare and alumni programmes. An incubator within a technopark is usually a place in which incubation services are focussed on a resident population of new businesses. It needs a sufficient scale for visibility, cluster benefits and viability to be a realistic goal.

This is an ideal area where a common approach can be developed and where experience sharing across the technopark network can bring significant benefits.

#### Priority Clusters

One of the dangers of technoparks is that they try and meet the technology needs of everyone and so fail to develop deep expertise in those areas where they can add greatest value and where there is the greatest need. The widely used cluster approach encourages a focus of effort on to priority areas where the technoparks can help in creating a globally competitive group of high value technological activity in Kazakhstan. Initially the tendency is just to be available to any idea that comes through the door – responding to the willing

partner. However, to be strategically effective there has to be a more selective approach and this needs to be developed for each of the regions as well as nationally.

### Attracting Footfall

Being a high visibility initiative there is a high probability that technoparks will be faced with two dangers. First, are unrealistic expectations that they can make a material difference over too short a timescale. The second is that as they continue with their work too few people will be aware of what they are doing and what is being achieved. To combat these there has to be a strong emphasis given to the attraction of meaningful visitors to work on the technoparks and to benefit from what they are offered there. A range of events – courses, marketing and business promotion, exhibitions and conferences – must be organised on the technoparks and used as opportunities to promote what is being achieved. Facilities for small and medium sized meetings need to be part of all the technoparks and actively promoted among the business, academic and government communities.

### Development Programme

Here there is set out a development programme for the suggested improvements with targets for three timeframes: immediate, to be completed within the coming three months; short term, to be completed in the coming year; and longer term, to be completed in the coming three years. While this characterisation is helpful in identifying priorities there are several of the tasks that will be ongoing and even though they are put in the category of longer term they will be a constant part of the effort for the foreseeable future.

#### Immediate Priorities

The actions that have the highest priority are in our view the following:

- Central support – develop skills
- Innovation tools – investment ready approaches
- Technopark development – building local support
- Technopark management – create an operation manual
- Technopark management – build local technology networks
- Key processes – develop footfall strategy

### Short Term Actions

Once the short term priorities are well underway it would be appropriate to shift attention onto the development of the following:

- Central support – monitor performance
- Central support – sponsor new technoparks
- Innovation tools – venture funding
- Innovation tools – demand stimulation
- Technopark development – process for new technoparks
- Technopark management – develop service partnerships
- Key processes – develop incubation strategy

### Longer Term Initiatives

Here broadening the role of technoparks and building on the strong foundations laid by completing the short and medium term initiatives are as follows:

- Central support – sponsor networks
- Central support – lobby for continuing support
- Technopark management – develop international linkages
- Key processes – focus on priority clusters

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## PART II: REGIONAL ANALYSIS FOR FUTURE TECHNOPARKS

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### 5. Theoretical Framework to Regional Analysis

In the framework of the Innovation Industrial Development Strategy and the Program for Formation and Development of the National Innovation System, the Government of Kazakhstan has undertaken a number of initiatives to promote innovation, including the establishment of technoparks. The Government is now considering next stage investment in technoparks, possibly in existing or new structures in one of the four candidate locations, namely Astana, Ust-Kamenogorsk, Shymkent, and Petropavl. Part II is part of a first stage effort to review and analyze regions where planned investment may be located.

Instead of analyzing the results and success factors of technoparks as a homogenous group, a growing volume of literature recently starts to make distinction among different models and development paths of technoparks. Kang (2004) categorizes research parks according to their objectives, the corresponding park requirements, and their economic development benefits. “R&D Centered parks” focus on conducting R&D on high technologies. Services needed to conduct research and university partnerships are provided in the park, though manufacturing is typically discouraged. This type of park has been criticized for making low contribution to regional development. “Technology innovation-centered parks” and “technology based formation parks”, similar to incubator centers, aim to make start-up and existing firm innovative and to establish a regional technology base through attracting research institutions. They demand high quality universities and create high value-added jobs, though scale of employment is typically small. “Industrial restructuring-oriented parks,” of which Taiwan’s Hsinchu Industrial Park is an example, places more emphasis on production than research and aims to restructure industrial composition of the region. Radosevic and Myrzakhmet (2006) mentions types of technoparks vary widely and can be divided into business parks, incubators, science parks, and industrial parks.

One key distinction drawn among these various model is the dominance of laboratory research versus industrial application. It can be conceptualized that models of R&D, technology and science parks place relatively more emphasis on invention of a technology, primarily house research teams and laboratories, and draw substantial direct economic benefits from patents. Industrial parks tend to attract actual production and manufacturing operations onto the park, and emphasize development and application of technologies to

current processes. There is also a strong distinction between R&D parks and technology parks, with the former aiming to draw research activities (eg. the laboratory division of a giant manufacturer) and the latter attracting technology companies, often to conduct their daily activities, which include research as well as production and services (eg. a business process outsourcer).

In light of these widely different models and their economic benefits and prerequisites the Government of Kazakhstan needs to consider the country's endowments, constraints, and knowledge economy strategy to decide which might be the most suitable model for its next stage technopark investment. An informed choice on the model will then determine the specific and appropriate criteria for location and designs. In this light, while the objective of this task was to analyze suitability for and recommend potential location of planned technopark investment, this study will only provide factors of consideration of each location for different potential technopark models. Specific recommendations on location will need to be based on a more finalized technopark strategy and objective.

In the context of Kazakhstan, one common objective pointed out by various stakeholders is the upgrading of industrial and economic activities to be more knowledge-intensive areas. The Committee on Science and Technology in Kazakhstan, for example, expressed that “the country needs to make the transition from producing and exporting more primarily unprocessed raw materials to producing and exporting more knowledge-intensive, value-added goods and services...” (2007). While this calls for some restructuring of the industrial sector, the approach on how to achieve this is heatedly debated. Radosevic and Myrzakhmet (2006), in a detailed and specific study for the effect of technoparks in Kazakhstan, outline three possibilities: industrial firms applying domestic R&D from other players, the industrial firms building in-house R&D capacity, and technology imports. Each has its advantages and disadvantages. A United Nations Development Program (UNDP) report states that “in Kazakhstan the main instigators of innovative activity are large industrial enterprises” (2006, p.60). Its survey of 8000 enterprises that use innovation found that only 2.3% were qualified as innovatively active (p.60). These hint that existing capacities in domestic new technology-based firms (NTBFs) might be insufficient to drive original innovation and large-scale commercialization of technology. If this was true, the R&D-centered technology model, which typically succeeds by encouraging small, dynamic entrepreneurs to drive national innovation, might not be the most suitable strategy for Kazakhstan in this stage. Radosevic and Myrzakhmet (2006) also point out that this approach theoretically require substantial amount of material and political investment. This channel of growth also places a relatively larger demand on factors of endowment, such as amount of ICT graduate, research sophistication of the R&D community, etc.

The other two approaches then might seem like more viable strategies at this stage. As applied technologies in Kazakhstan, especially in manufacturing processes, still significantly lag behind those in developed markets, there can be relatively easy gains in simply trying to adapt and learn from existing international technologies. Large industrial firms can then either develop their in-house R&D capacity to focus on innovation needed to adapt technologies to unique domestic environments or create the demand for small companies to do so. In a way, this is already taking place. The UNDP report finds that currently in Kazakhstan, innovation overwhelmingly takes shape in firm purchase of overseas machines and licensing foreign technology (p.50). There are also tremendous constraints in end-to-end research and development capacity within the country. These initial steps in incremental innovation can reap large immediate and broad-based benefits in economic productivity, as well as serve as initial catalysts to build up domestic research capacity that can lead to future original research. To achieve this goal, international success stories also show that the 'interactive innovation model', where firms learn from each other and achieve external economies of scale, instead of learning solely from R&D institutes, achieved more impact on downstream manufacturing sectors (Chen and Choi, 2004; Radosevic and Myrzakhmet, 2006). For these reasons, this study analyzes related factors such as maturity and size of industrial clusters, instead of focusing solely on capacity of research institutions.

Related, either approach still faces the critical issue of the lack of industry demand. Many studies have voiced this as the critical concern for knowledge economy development in Kazakhstan. Radosevic and Myrzakhmet (2006) state that while Kazakhstan has large industries, they do not yet generate visible demand for technological innovation. This could happen either because the industry lack other complementary factors that will reap return from advanced technologies, such as management skills, or there is simply a disconnect between the specific needs of the industry and the research. The experience of Russia and Ukraine have demonstrated the importance of industry demand in the success or failure of technoparks. This suggests the importance of analyzing not only what endowment the nation or each location has, but also on what the orientation and development needs of firms. For this reason this study conducts a firm orientation surveys to better understand Kazakhstan's firms' innovative development plans and objectives of locating on technoparks.

While due to low response rates, the responses from the firm surveys are insufficient to draw definite conclusions, they act as a start in future efforts to understand firm orientation and industry demand. The macro level analyses in Section 2 also serve as hypotheses that subsequent studies can test. In this way, this study can be seen as a theoretical framework to gain a more substantial and detailed phase of the joint effort.

## 6. Regional Macro Endowment Analysis

There is a need to analyze technopark investment in Kazakhstan in several dimensions, keeping in mind the context of each region. This section will analyze macro-level data to draw some preliminary hypotheses which can be tested rigorously in more detailed subsequent studies. An important part of the analysis will be the emphasis on demand-side factors from the perspective of potential tenant firms. Cities and regions will be evaluated on their attractiveness for companies to setup operations. Distinctions will also be made among models of technopark development and firm objectives. The analysis will refrain from recommending specific regions, sectors or strategies, but will identify possible advantageous and disadvantageous conditions in each region for different models of technopark development.

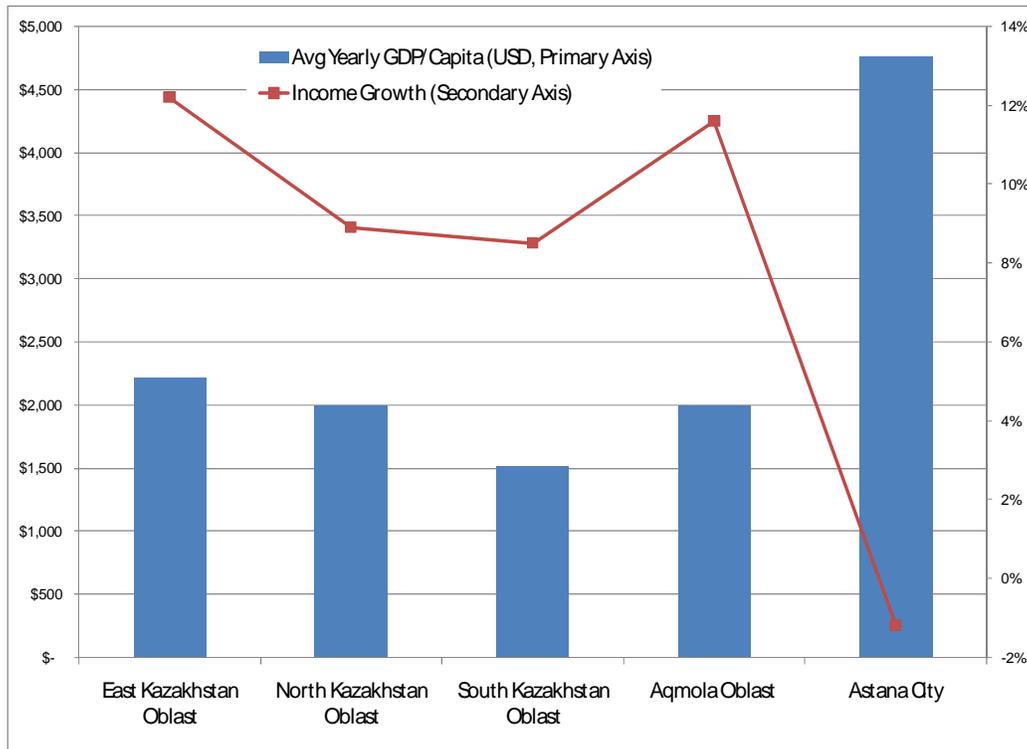
An analysis of the capital cities of the four high-priority candidate oblasts, namely Astana in Aqmola, Ust-Kamenogorsk in East Kazakhstan, Petropavl in North Kazakhstan, and Ust-Kamenogorsk in East Kazakhstan, is presented here, using data from the Kazakhstan Statistics Agency, Kazakhstan Ministry of Education, National Center on Scientific and Technical Information, and United Nations Development Program (UNDP).<sup>13</sup>

As a first dimension in this analysis, the level and dynamism of general economic activity is considered. GDP per capita serves as a proxy for a variety of conceptual dimensions including local market's purchasing power, dynamism and maturity of the supplier and competitive sector, and state of infrastructure.

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<sup>13</sup> Since city-level data is not available for three of the cities, oblast-level data is used as a proxy but these should be interpreted and compared carefully. Astana is administratively separate from the Aqmola oblast and is accounted for independently in statistics. Yet, since Astana is geographically located in Aqmola, the attractiveness of Astana could be analyzed by combining its data with that of Aqmola in appropriate oblast-level metrics. In the other three oblasts, the capital cities all possess significantly higher average level of economic development than do the rest of their region. Moreover, the proportion of total economic activities owned by the capital cities might vary widely across oblasts. Subsequent studies should try to examine city-level data.

Figure 1: Average and growth of GDP per capita (2007)



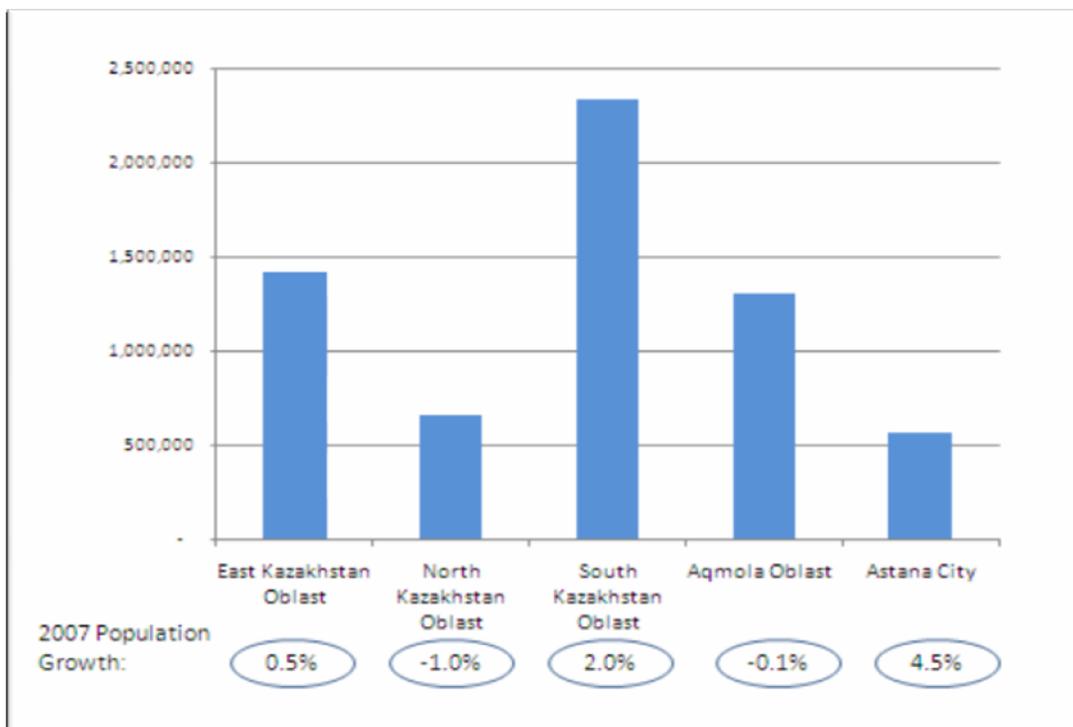
Source: Kazakhstan Statistics Agency, 2008. "Estimation of population money income in the Republic of Kazakhstan in November of 2007". 1 Tenge:0.00829 USD.

As shown in Figure 1, Astana's average GDP per capita is more than twice the highest oblast-level average. City-level comparison is not available but it is believed that Astana does possess significantly higher average income than other provincial capitals. It is worthy to note that the average income of South Kazakhstan is about 25% lower than the other three oblasts. All four oblasts also witnessed near double-digit per capita growth, reflecting the general momentum of Kazakhstan's economy. While still strong, South Kazakhstan also has the lowest regional level growth rate, suggesting a general lagging of economic growth among the regions.

Another dimension important to corporate investment decisions is population size. Population matters due to its impact on both market size and available hiring pool. In general, corporations, unless for the purpose of extractive operations (such as oil or mining), are unwilling to put down significant investments in a region with a substantially small surrounding population. This matters even more for the many corporations who setup operations in technoparks partly to support a market-access strategy.

If population is considered as a variable, South Kazakhstan has almost twice the population of the next highest oblast - East Kazakhstan - and is the most densely populated (Figure 2). North Kazakhstan has by far the smallest oblast-level population, accounting for almost as many people as the city of Astana alone does while also registering a considerable decline in population in the previous year. As city-level data was not available for this analysis, oblast level population is used to serve as an 'upper-limit' indicator for 'local' market. In terms of the population variable, Petropavl and North Kazakhstan could be unattractive locations for corporations to setup manufacturing or production operations in technoparks given the access to smaller resource pools. This matters less significantly for purely research-focused parks.

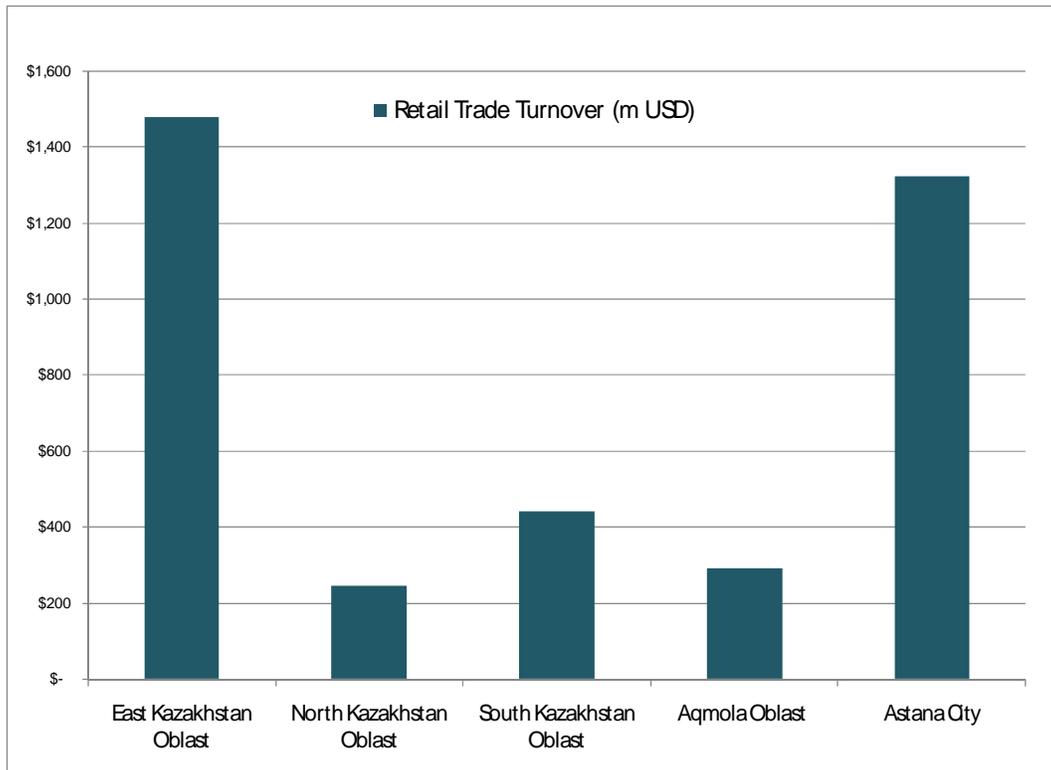
Figure 2: Population and growth (2007)



Source: Kazakhstan Statistics Agency, 2008.

Lastly, retail turnovers can be a unique and important indicator for consumer products and services firms that intend to use technopark operations as part of their market access strategy. Many companies, especially foreign entrants or infant brands, see technoparks as a strategic step to gain brand credibility or understand local industry and competitive dynamics. The size of the local market, the competitive landscape and the potential growth of their product line serve as major considerations for these firms. These variables are of particular relevance to industries such as pharmaceuticals, textile, food, electronics, furnitures, tourism and transportation, and financial services, among others.

Figure 3: Retail turnover (2007)



Source: Kazakhstan Statistics Agency, 2008. "Main indicators of trade in January-December of 2007, Retail trade, Total volume of retail trade turnover", 1  
Tenge:0.00829 USD

A substantial portion of the black or grey or informal market might not be captured in the data in Figure 3. This analysis therefore proceeds under the bold assumption that the proportion of unregistered businesses is similar across regions, and cautions that the results can be interpreted as proxy at best. The cautions withstanding, a polar picture regarding the retail market emerges. East Kazakhstan and the city of Astana alone provide more than 3-6 times more the retail market volume as each of the other three oblasts. North Kazakhstan, as predicted from its smaller population, has a formal retail market of only about \$244 million USD. The Aqmola oblast by itself is small but combined with Astana, they make up the largest market in the sample. From a market size perspective therefore, Astana and Petropavl can be attractive for consumer product companies who are interested in utilizing technoparks as part of their market access strategy.

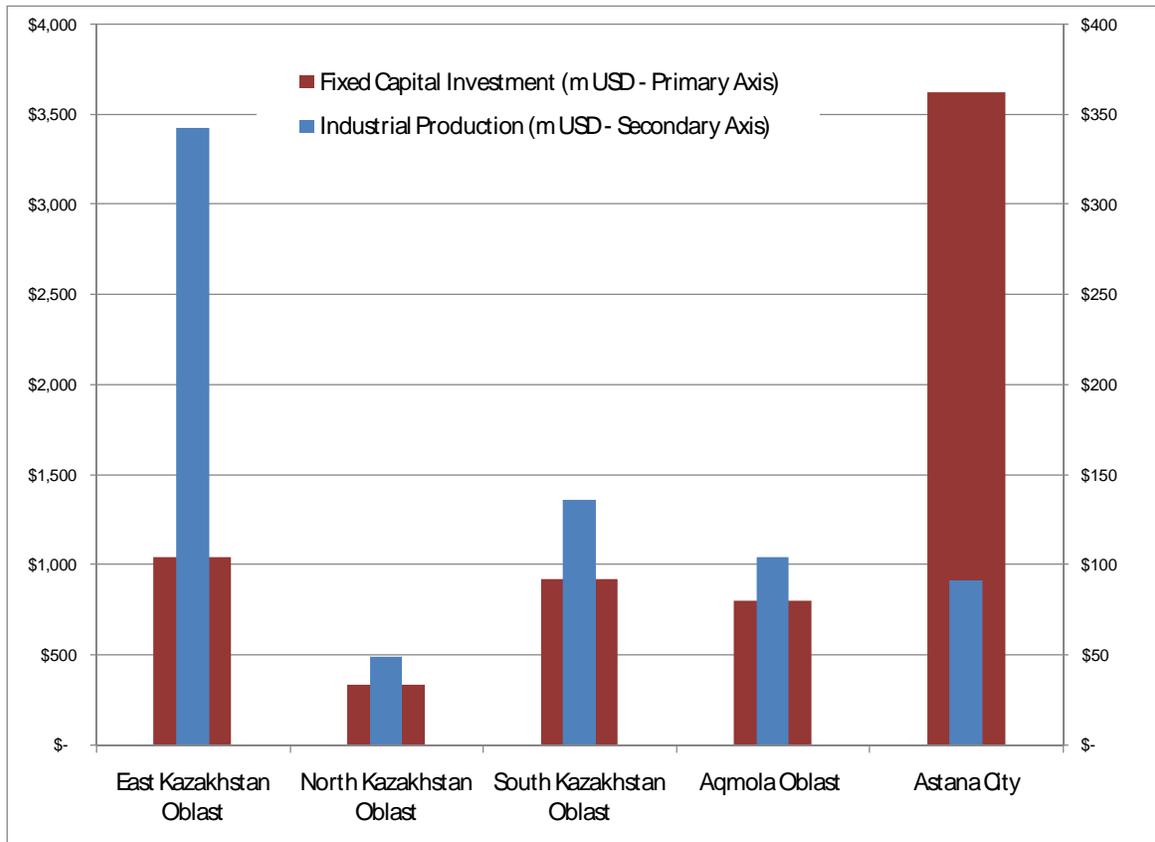
## Industry

The second high-level demand side consideration involves size and maturity of the industrial sector. Since a substantial portion of Kazakhstan's economy involves either extractive or manufacturing industries, a distinct competitive advantage of Kazakhstan's technoparks would be to provide value to industrial firms through the "science parks" and "industrial restructuring-oriented parks" models mentioned in the previous section. Some studies also suggested the importance of a 'critical industry size' above which strong externality can result (Chorda 1996). In this regard, the size of the existing industrial sector indicates the development and existence of current industrial cluster.<sup>14</sup> The maturity of the cluster is important as it directly indicates firms' absorptive capacity for inter-firm tacit learning and 'learning by doing'. Since intra-sector learning and the maturity of value chain and suppliers are important considerations in these models, a city with a small existing industry might be unattractive to firms who want to improve manufacturing processes or conduct product innovation.

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<sup>14</sup> Cluster here is defined loosely to mean a geographical concentration of industry and companies.

Figure 4: Industrial Output and Fixed Capital Investment (2007)



Source: Kazakhstan Statistics Agency, 2008. "Utilisation of fixed capital investment" and "Industrial production in 2007, Volume of output (goods, services) at current prices of enterprises", 1 Tenge:0.00829 USD

As seen in Figure 4, East Kazakhstan has by far the largest industrial sectors. In 2007, according to official statistics, it produced around \$350 million USD worth of industrial products, or around 2.5 times the next largest industrial producer, South Kazakhstan, which produced \$136 million USD worth of products. North Kazakhstan, in addition to its smaller retail sector, also has a relatively small industrial sector, producing around \$50 million USD worth of products.

Fixed capital investment includes investment in factories and machinery, but also roads and real estate construction. It can therefore be a rough proxy for industrial demand and growth. Official statistics show that fixed capital investment outstripped industrial product in all regions, and Astana saw by far the largest fixed capital investment in 2007. Qualitative reviews suggest that most of this comes from government-sponsored real estate and construction development in the capital city. East Kazakhstan also shows healthy fixed asset investment, while North Kazakhstan again seems to have the least investment. More detail and granular analysis needs to be conducted to disaggregate this indicator to capture the

accurate numbers in industrially productive assets. But from the indicators discussed, the broad trend suggests that East Kazakhstan and Astana might be relatively more attractive and feasible candidates for establishment of technoparks following the “science parks” and “industrial restructuring-oriented parks” models.

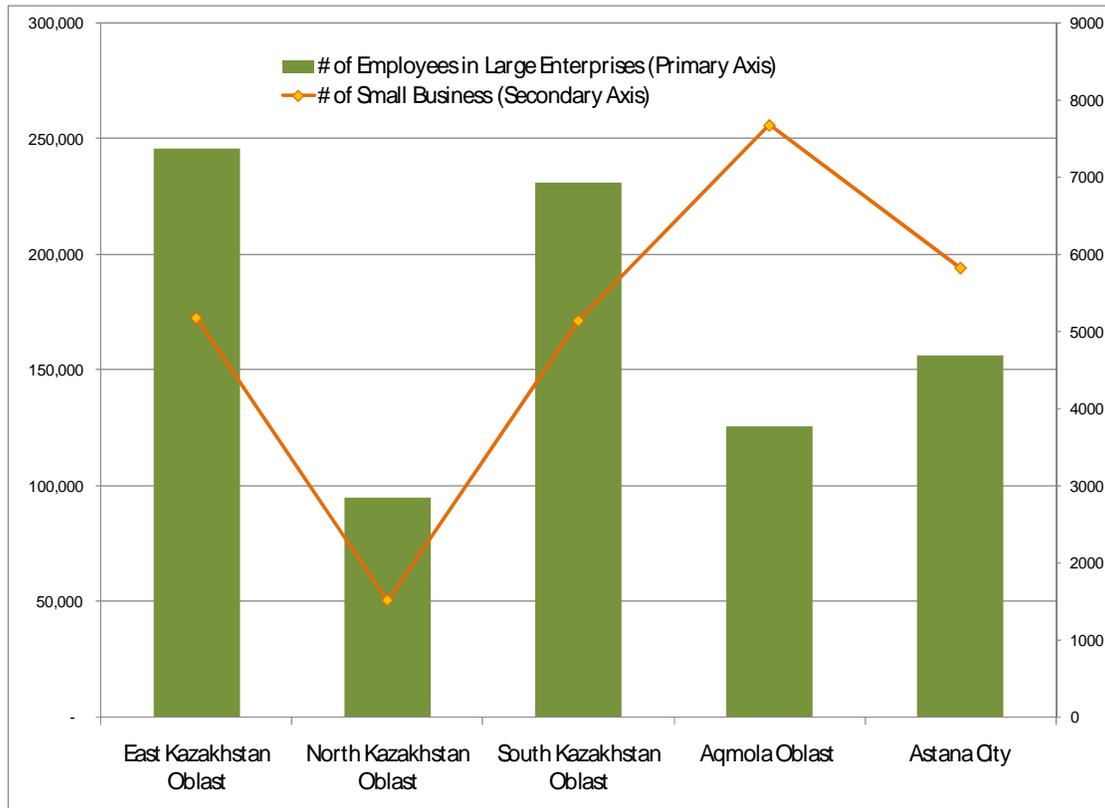
## Segment

Partly related to the industrial indicators are the average size of the enterprises and fragmentation of the industry. “R&D Centered Parks” such as the Silicon Valley typically attract a more substantial number of smaller size and more flexible entrepreneurs who are focused on first-generation, innovation-driven research and development. These R&D-focused small and medium-size entrepreneurs, often new technology-based firms (NTFBs), form close link with research institutions and concentrate on patent licensing. It can be argued from studies of cross-country cases<sup>15</sup> that firms in this model benefit more from strategic flexibility and decentralized and minimally regulated competition than connection to a large manufacturing operation. On the other hand, as mentioned, ‘industrial restructuring-oriented parks’ such as Hsinchu Industrial Park emphasize production over research functions (Kang 2004) and create value on downstream R&D and manufacturing activities. They rely more heavily on the existence of larger firms, including those with established manufacturing capacities and processes.

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<sup>15</sup> This can be seen from the fact that most studies on advanced country, innovation-based technoparks start from analysis of small NTBFs, whereas studies of industrial restructuring-based technoparks mention transnational corporations much more frequently, for example.

Figure 5: Number of small businesses and number of employees in large enterprises (2007)



Source: Kazakhstan Statistics Agency, 2008. “Number of small business enterprise, of which active” and “Number of employees at large and medium-sized enterprises in November of 2007, Actual number of employees (for calculation of average earnings), thsd. Persons”, 1 Tenge:0.00829 USD

Building on this hypothesis, the size of the small and medium enterprise (SME) sector vis-à-vis large enterprise sector can provide one dimension to judge the suitability of a city’s economic structure to each type of park. Official statistics of active, registered companies show that Aqmola and Astana have the highest small business-to-large enterprise employee ratio (Figure 5). East and South Kazakhstan are relatively more dominated by large enterprises, perhaps partly attributed to large state-owned and multinational corporations in extractive industry. North Kazakhstan, consistent with previous indicators, has the lowest number of both small businesses and large enterprise employees.

## Transportation and Access

In addition to providing a concentrated area of related economic activities, companies also look for locations that will allow them easy transportation for both employees and products.

Summarized below are the each city’s accessibility metrics. It should be noted that this is merely macro-level information and should be supplemented by more detailed field studies.

Overall, the lack of transportation options both limit the mobility of tenant companies’ staff and raise the go-to-market costs of any goods produced inside the park. The latter becomes less relevant if the park is concentrated only in patent or process innovation that requires little actual or test production and raw materials. As a general rule, however, if a city with poor accessibility is selected for the target investment, unless a substantial number of candidate tenants can be identified in the immediate proximity of the city, the government is encouraged to consider build-out of infrastructure.

Table 2: Transportation ‘assets’ of the four cities

	On Railway?	Airport	Road	Water	Distance from Almaty	Close international Border
Astana	Yes	International	Main	River	975 km	None
Shymkent (South)	Yes	International	Secondary	River	610 km	Kyrgyzstan, Uzbekistan
Petropavl (North)	Yes	None <sup>1</sup>	Secondary	River	1410 km	Russia
Ust-Kamenogorsk (East)	No	International	Secondary	River	864 km	Russia, China

<sup>1</sup> Believed to be closed to regular traffic since 2006

Astana and Shymkent both have international airports, railway and roads, suggesting access to those cities will be significantly easier (Table 2). Petropavl’s airport is believed to have shut down in 2006, significantly limiting ease of business travel. Ust-Kamenogorsk is not directly located on the railway, creating potential obstacles to transport of large volume products or raw materials. But this might be mitigated as East Kazakhstan has a strong industrial production base and alternate transport routes might have been established, perhaps to the nearest railway point.

Neighborhood country proximity across a border should also be considered as it will significantly affect the origin and type of transnational tenants and the type of innovation issues in research.

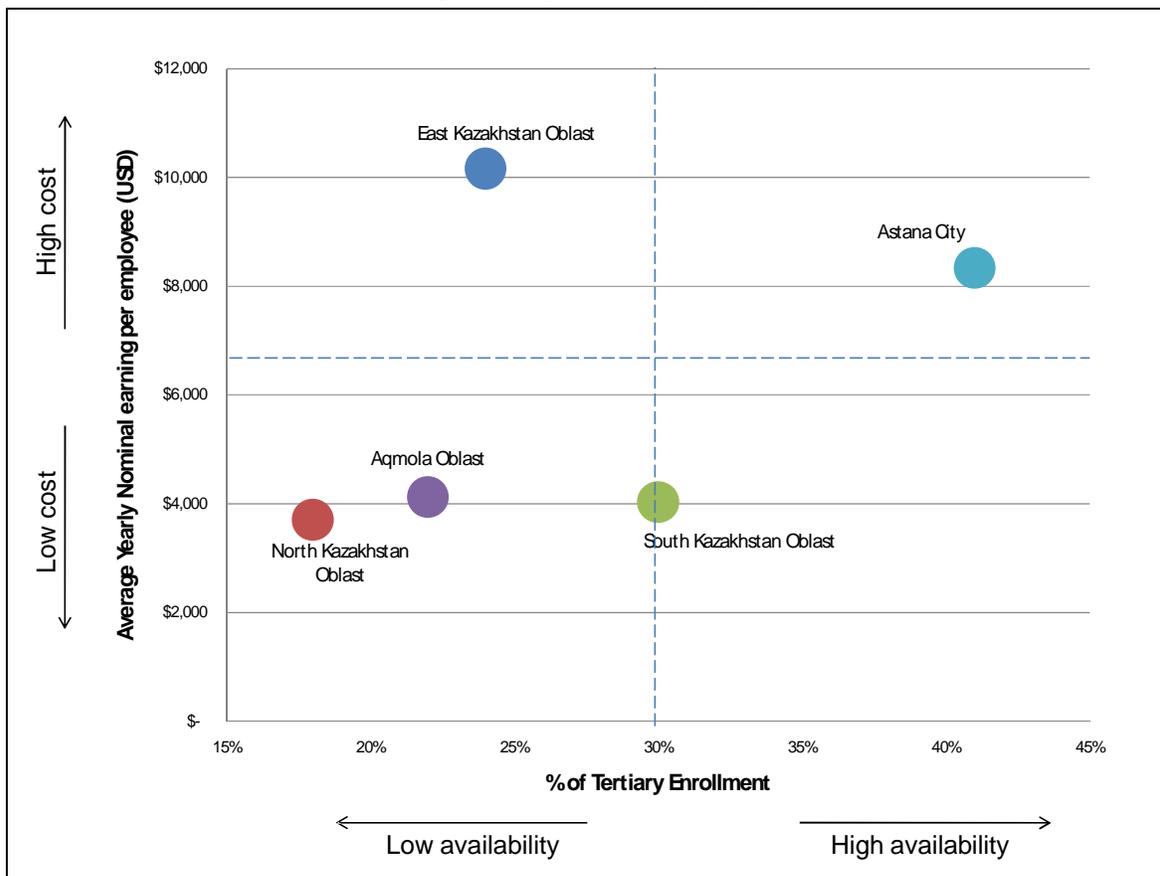
## Supply of Talent Pool

Availability and quality of a highly educated talent pool is an important consideration in corporate technopark investment.. A minimum level of education such as at least a tertiary education, preferably in science and technology, is typically required for research and development operations. A consistent local source of human talent such as a university is important. Labor costs are also a factor for businesses that set up larger scale operations such as outsourcing centers.

Statistics from UNDP and the Kazakhstan Ministry of Education show that there is a relatively high disparity in tertiary enrolment among regions, ranging from 18% in North Kazakhstan to 41% in Astana. Similarly, in Astana in the East Kazakhstan Oblast the average salary is more than twice as high as the average salary in the other three regions (Figure 6). Judging from its small educated workforce, relatively high salary and buoyant industrial output, it is possible that East Kazakhstan is running into a labor scarcity issue. Existence of talent scarcity and rising wages make technoparks unattractive for companies that would like to relocate a significant operational part of their company. Astana, as expected, has a high portion of population enrolled in tertiary education as well as a relatively expensive workforce. South Kazakhstan, if its relative technical labor cost is adequately estimated by its relative overall employment salary, might offer an attractive option of providing sufficient but low-cost talents to the park.

It is important to note that companies' consideration for local talent pool depends not only on the technopark's model, but also on the sector and value chain of the on-park operation. Migration of core operation for a Business Process Outsourcing (BPO) company (e.g. call center) would require a large amount of skilled employees, while migration of core operations of a consumer product manufacturer would only look for cheap, unskilled labor. Migration of core R&D activities on the other hand, would require relatively few, high quality candidates for almost all sectors and be less sensitive to salary level.

Figure 6. Tertiary enrolment percentage and average regional salary for 5 districts



Source: Kazakhstan Ministry of Education, UNDP, 2008.

As a cautionary note, these are again imperfect proxy measures that rest on strong assumptions. Percentage of tertiary enrollment does not take into account effects of migration and quality of tertiary institutions. The way the data is presented here only is only aimed at comparative measures, and masks uniform problems such as the universal lack of human resources.<sup>16</sup> The general average salary for all sectors obviously hides relative differences in engineering and technology sector compared to the general economy. In next stage analyses, average net salary costs for specific positions such as research or software engineer should be obtained from firm surveys.

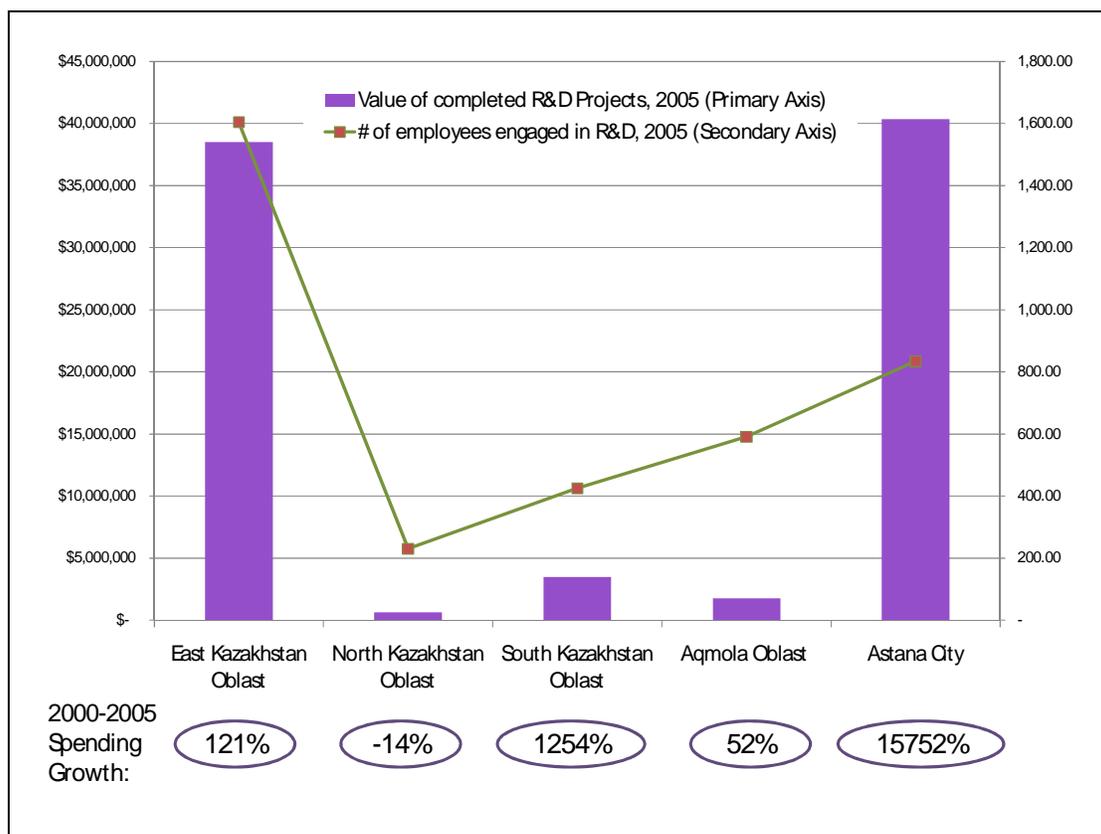
<sup>16</sup> According to the World Bank, for example, the average age of scientists is more than 56 years old.

## Current R&D Sector

For technopark models that emphasize core R&D activities, the size of the existing R&D sector can serve as a proxy for the general research infrastructure, including size and quality of the professional talent pool, quality of complementary research institutions, effectiveness of formal and informal cross-learning networks, and other benefits of clustering. This study did not include an in-depth analysis of the educational and research institutions, macro R&D sector indicators act like rough proxies for the institutions' maturity and contribution to industries.

According to the Kazakhstan National Center on Scientific and Technical Information, Astana and East Kazakhstan spent by far the most amounts on completed R&D projects in 2005 (Figure 7). Astana's R&D spending alone, at approximately \$40 million USD, is more than 60 times that of the least spending North Kazakhstan. Equally noteworthy are their growth rates. While East Kazakhstan spending has impressively doubled from 2000 to 2005, the R&D spending in Astana grew by more than 150 times, from approximately a quarter of a million dollars. This explosive rate could either signal potential dynamism of the sector, or on the contrary downside risk of unsustainable growth. The latter could be the case if the recent growth is funded only by superficial or temporary government spending without proper institutionalization. In-depth analysis of the actual activities funded and updated statistics on total spending will both help inform this question. R&D spending in South Kazakhstan, while small in absolute size, grew more than twelve times. In contrast, the R&D sector in North Kazakhstan and Aqmola are significantly smaller in size as well as growth rates.

Figure 7: Volume of completed R&D projects and number of employees in R&D activities (2005)



Source: National Center on Scientific and Technical Information, 2006. "Value of completed R&D Projects, 2005", 1 Tenge:0.00829 USD

In addition to spending, the size of employment in R&D is a more direct measure of the human resource network available to be tapped in, both directly as supply and for externality benefits. It is worth noting that while Astana spends slightly more than East Kazakhstan, it employs only slightly more than half the professionals that East Kazakhstan employs. While the exact reason needs to be more deeply examined, the aforementioned hypothesis that spending in Astana has been spurred by government spending with lagging institutionalization can be one possibility. Another reason could be that value-added per employee in the activities conducted in Astana is higher than that in East Kazakhstan. The fact that Aqmola employs significantly more people in R&D than its spending predicts is interesting for similar reasons.

It is worth noting here that the government contributes greatly toward the funding of R&D activities in Kazakhstan. The bulk of this funding, as much as 63%, goes toward applied research, 36% goes toward fundamental science and only 1.5% is spent on design and engineering. In high-income economies such as in the EU, South Korea and USA, 15-20%

of government funding goes toward applied research, 25-30% goes toward fundamental science, and 50-60% for design and engineering (UNDP, 2006, p.43-44).

The substantially higher R&D spending in Astana and East Kazakhstan makes a strong argument for technopark investments to be made in either location, if the success of the park is the main goal (as opposed to broad-based employment creation, for example). A city that has this order of magnitude more R&D activity is likely to be much more successful in drawing in tenants. Yet, further due diligence is still required. The distribution of existing clusters, spending activities and employment, and whether they can be located in Ust-Kamenogorsk deserves further study, for example.

## 7. Firm Orientation Survey

Recent empirical studies increasingly emphasize the importance of firm orientation and interest as critical success factors of technoparks (see Kihlgren, 2003 and Shelton and Margenbhalter, 2006 for examples). While previous park efforts focused on supplying incentives to attract tenants, researchers now believe that the demand of the firms plays a key role in the survival and outcome of parks. Several studies on Kazakhstan specifically assert that the lack of industrial interest and demand for innovation as the critical issue in the country's knowledge economy initiatives (UNDP, 2006; Radosevic and Myrzakhmet, 2006). This section discusses the methodology and preliminary results from a firm orientation survey effort that is aimed to start the efforts toward understanding this important aspect in Kazakhstan's technopark planning process.

The literature also broadly agrees that different firm objectives and orientations call for different models and therefore, different location selection criteria. Chen et al (2004) assert that companies' R&D orientation and motivation to enter a science park can and should influence the type of science parks that are built. They conclude from an empirical survey-based study in Taiwan that firms choose science parks based on market demands, corporation's strategy structure, and competition and associated supporting companies. Specifically, companies interested in original and manufacturing process R&D and "improved R&D" prefer "mass-produce" science parks, in which innovation focus is in applied and in downstream operations; and companies interested in resource-acquisition are interested in "R&D science parks", which focuses on primary and seed research during the early stage of the concept-to-market lifecycle. The analysis below partly aims to shed light on this difference, as it significantly affects the requirements of the ideal investment location.

### Methodology and Data Limitation

Table 3 summarizes basic information from the surveys and shows the limitation of the data in its current breadth. Due to low response rates, there are only five responses per city, representing a sample size issue. No firm responses were obtained from Astana and therefore any of the trends discussed below should not reflect positively or negatively on Astana. Uralsk from West Kazakhstan is added to the sample for comparison. Selected companies were recommended by each city/region's Chambers of Commerce and existing technoparks or incubators as "the most important" in their cities or parks. Yet due to limited responses from the Chambers and parks, significant sample bias issue exists. Biased recommendations from Chambers/parks are also a possible concern. All but two of the

respondents are current tenants in technoparks or incubators, though most of the ones outside of Shymkent claim themselves to be only ‘renting office space’ in the parks. Respondents from Shymkent are all tenants of the Business incubator SodBi Shymkent, and therefore are all R&D-focused companies. All Petropavl respondents are manufacturers. It cannot be determined whether these trends reflect the general economic structure of the cities. Some of the preliminary conclusions drawn below are therefore better interpreted as trends corresponding to company types rather location. Most operations are small enterprises.

Table 3: Survey respondent list and classification

City	Main KZ Operations	Currently located on a park?	Current number of employees	Planned # of employees to be or currently on parks
Ust-Kamenogorsk	Sales, Source	Yes	30	10
Ust-Kamenogorsk	R&D	Yes	13	13
Ust-Kamenogorsk	Manu	Yes	15	5
Ust-Kamenogorsk	R&D	Yes	7	ND
Ust-Kamenogorsk	Source	Yes	10	ND
Shymkent	R&D	Yes	2	1
Shymkent	R&D, Sales	Yes	300	120
Shymkent	R&D	Yes	10	10
Shymkent	R&D	Yes	3	3
Shymkent	Sales	Yes	3	8
Petropavlovsk	Manu	No	50	ND
Petropavlovsk	Manu	No	1500	ND
Petropavlovsk	Manu Diversified	Yes	10	6
Petropavlovsk	Manu	Yes	4	2
Petropavlovsk	Manu	Yes	5	20
Uralsk	R&D	Yes	30	10
Uralsk	R&D	Yes	4	11
Uralsk	Manu	Yes	10	15
Uralsk	Service	Yes	3	12
Uralsk	Service	Yes	ND	7

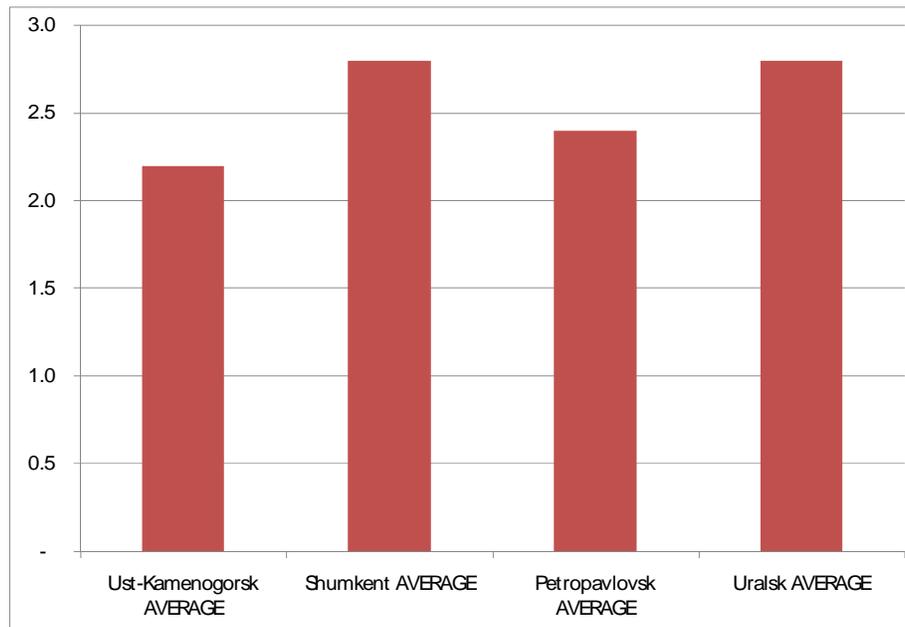
Keys: companies were asked to divide the budget of their current Kazakhstan operations into 1) Sales, 2) Sourcing (eg. materials), 3) Manufacturing, production, or services, and 4) Research & Development. Each company is then classified by the majority of their budget allocation. A sample of the survey is included in Appendix D.

While this data collection effort has notable limitations due to time and access constraints, the authors believe that this kind of firm orientation surveys is important in Kazakhstan’s technopark planning. The Government is encouraged to conduct the next stage discovery process by extending a similar and larger scale survey effort.

## Results and Preliminary Trends

Companies were asked to rate the “overall environment for innovation in your city as compared to other Kazakhstani cities”, with regard to factors including quality and orientation of research institutions, innovative entrepreneurship, infrastructure, and industry clusters. The scale ranged from 1 being among the least conducive to innovation to 5 being excellent. The average scores are close to each other, ranging from 2.2 for Ust-Kamenogorsk to 2.8 for Shymkent. The small difference is not meaningful given the small sample size, however.

Figure 8: Rating of overall innovation environment

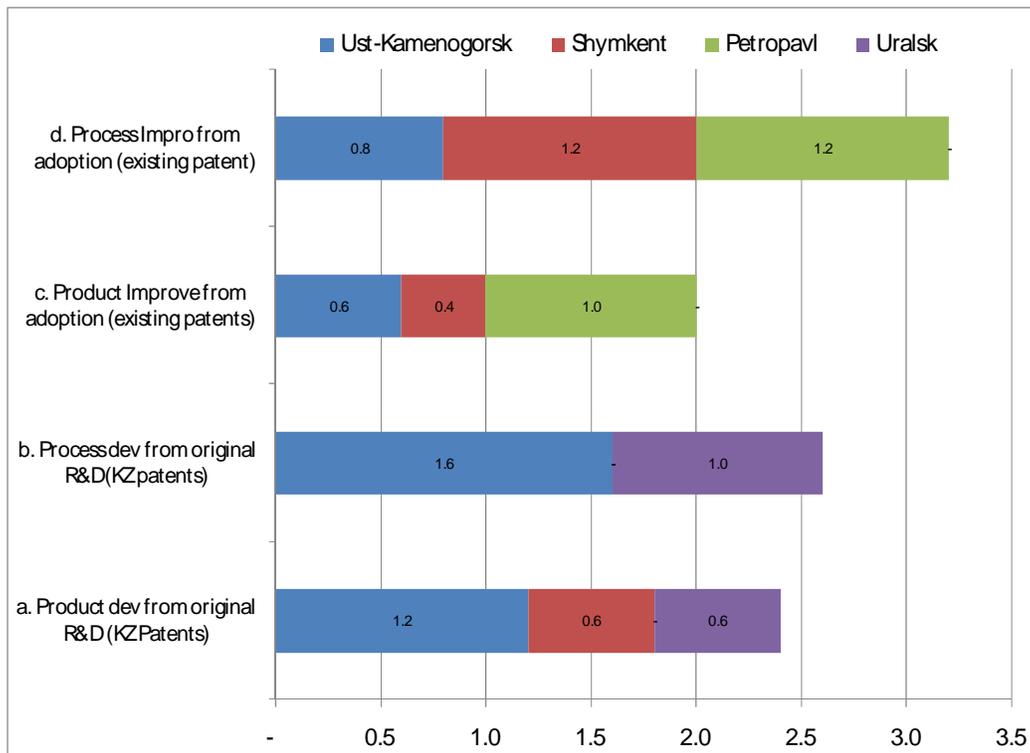


Next, companies are asked to rank their top three strategic goals of locating operations in a technopark, whether in their current or planned park involvement (Figure 9). Choices range from various product and process innovation and development, obtaining low-cost advantages, obtaining access to local markets and relationships, to forming an operational base for expansion. Higher score correspond to a more important objective.

The survey draws distinctions between original domestic R&D and domestic adaption of existing technologies. The former denotes end-to-end research lifecycle and native technology discovery and commercialization. This typically requires more sophisticated and persistent research capacity and tighter partnership with institutions and universities. The latter denotes more emphasis on incremental innovation, international cross-learning and downstream effect into product operations. From the limited data, R&D-focused companies

tend to prefer adopting existing technologies to achieve process improvement but use original domestic innovations for product development (i.e. Kazakhstani patents). On the other hand, firms from our sample that concentrate on manufacturing tend to generally be more interested in using incremental innovation and adopting existing technologies to domestic environments to drive both product and process development. While our data show some city-level trends, the current sample is not statistically representative to draw geographical conclusions. Decisions about which technopark model to pursue, however, should be based on a more clear understanding of the types and orientation of the majority of firms in a city. Aforementioned macro analyses suggest that Ust-Kamenogorsk might be dominated by large industrial companies, which according to the trend identified here might value more incremental research and adaption.

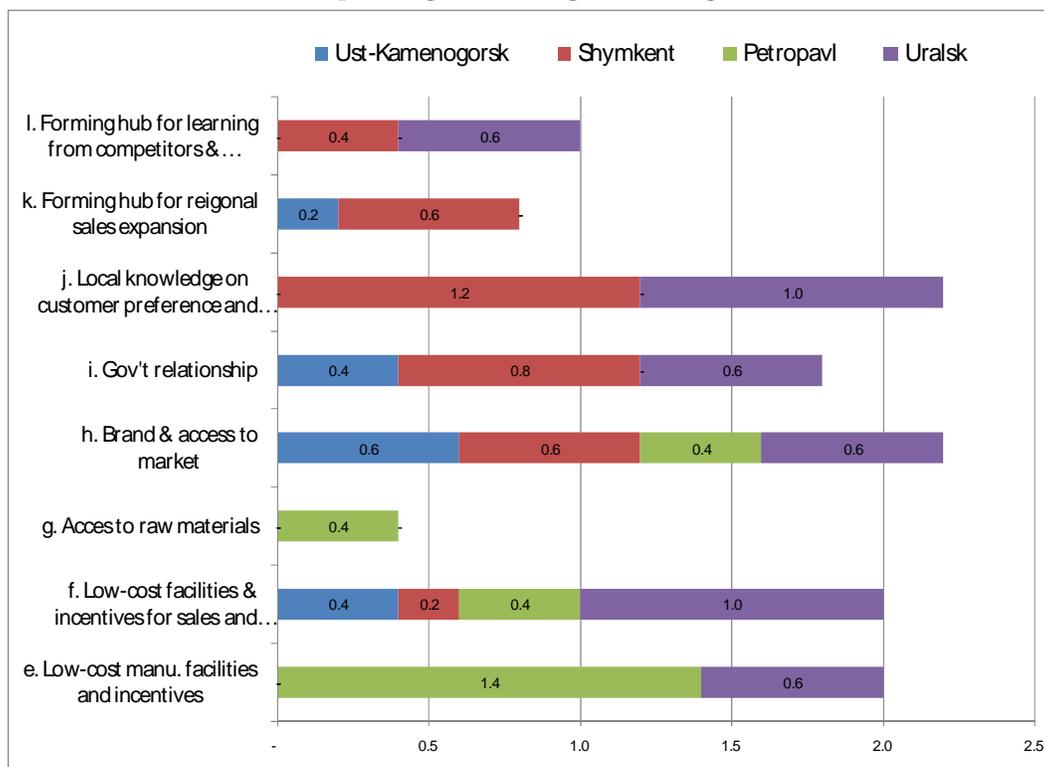
Figure 9: Importance of strategic goals of locating operations in a technopark, types of innovation



Other objectives of locating in a technoparks are relatively less important than the above four options of obtaining innovation (Figure 10). The most important two of these actually fit with the “market access” model of locating in a technoparks (gaining local knowledge on customer preferences and business environment, and building credibility in and product access to domestic/regional markets). This suggests more attention to the size and type of

regional markets and purchasing power, which were partly analyzed above. Next, manufacturing firms overwhelmingly cite access to low-cost manufacturing facilities and incentives as a top objective. This might also suggest interest in industrial parks that focus on production. Many firms cite improvement of relationship with the government as a top objective, hinting that government might have considerable leverage to encourage firms to relocate. Lastly, few firms cite access to raw materials as an objective, likely because technoparks offer little advantage to raw material access. This fits with a strategy of using parks as an alternative tool for economic diversification.

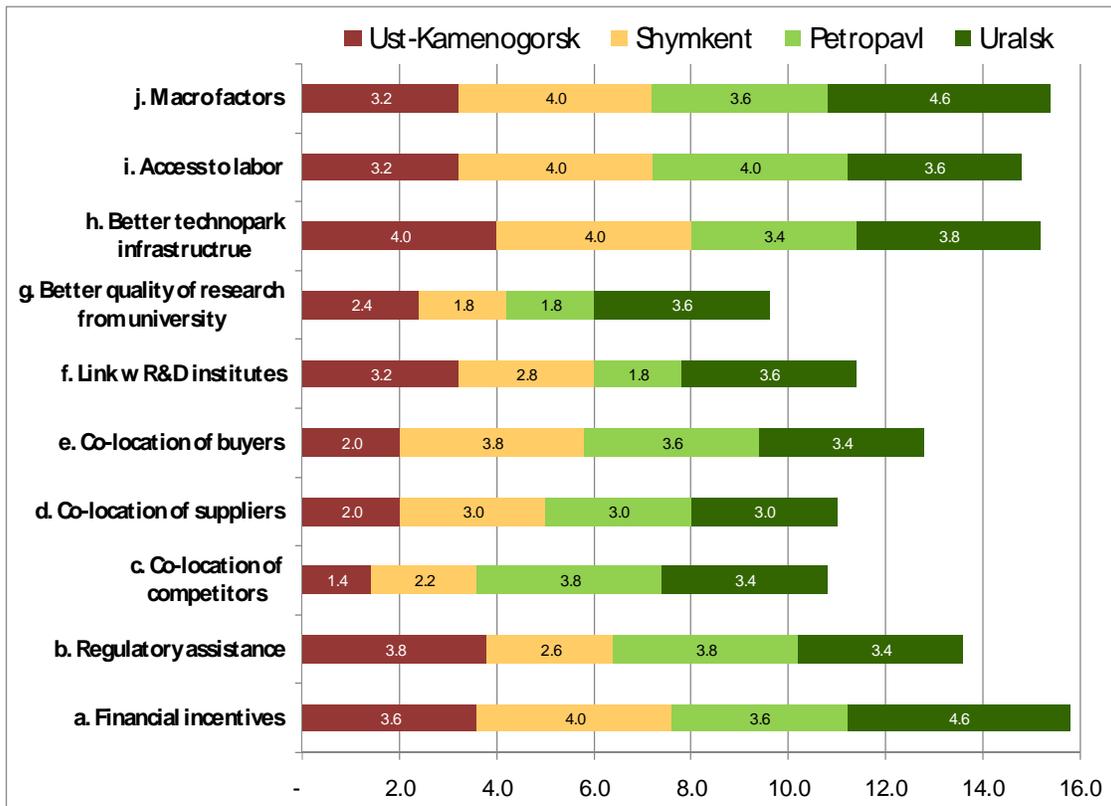
Figure 10: Importance of strategic goals of locating operations in a technopark, cost, operating and strategic advantages



Lastly, we asked firms how effective a series of factors would be in encouraging them to relocate to or expand their presence in technoparks (Figure 11). Financial incentives (eg. tax breaks, subsidized office space), macroeconomic and political factors, technopark infrastructure, and access to labor rank the highest and as considerably more important than other factors. While the first three can be addressed by the technopark's designs (macroeconomic and political factors by preferential regulatory treatments), the last consideration calls attention to the availability and cost of local talent pool as a location selection criteria, as discussed above. Interestingly, co-location of competitors and suppliers,

as well as better quality and linkage with research institutions and universities, rank low among companies' concerns. These preliminary observations fit with international empirical findings that co-location and linkage with research institution often matter less than technopark designers' projection.

Figure 11: Effectiveness of factors in attracting tenants onto technoparks



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## Appendix A: Best practice workshop Alatau IT City technopark May 15-16 2008

### Proposed Workshop Schedule

Structure	Timing	Day:1	Day: 2
1 <sup>st</sup> session	0930-1100	technoparks: Impressions and challenges	New firm formation
Coffee break			
2 <sup>nd</sup> session	1130-1300	Discussion on impressions and challenges	Value added services
Lunch break			
3 <sup>rd</sup> session	1400-1530	Introducing best practice cases	Regional technology networks
Tea break			
4 <sup>th</sup> session	1600-1730	Land and estate management	Way forward

### Commentary

Each session will begin by presenting material – predominantly through Power-point presentations – and aim to stimulate a discussion. The balance may vary but in the main the introductory material will be covered in about half an hour leaving plenty of time for participants to contribute and discussions to flow.

### *Day 1: Impressions and best practice models*

#### Session 1: technoparks, impressions and challenges

Here the observations made on each of the technoparks visited and comments on their strengths and weaknesses will be presented. Their role and purpose will be highlighted and their similarity and variance in relation to international models will be stressed. Also the different expectations now being placed on technoparks from a national policy perspective will be covered.

### Session 2: Discussion on impressions and challenges

A follow on discussion will focus on aspects of each technopark that have been highlighted and the overall national policy perspective. Mainstream thinking on the principles behind the functionality of technoparks will be introduced and the aspects that have proved to be helpful and led to success elsewhere but will not at this stage present best practice cases. The objective will be to get the participants to begin to formulate their responses and action points for their own technoparks and to identify how their particular initiatives fit with the others or differ from them.

### Session 3: Introducing best practice cases

A range of examples of technopark developments – both specific technoparks and national strategies – will be introduced and the key characteristics highlighted in relation to the four topics of session 4 to 7. In each aspect at least 2 technoparks will be described and contrasted to bring out the choices that faced the promoters and how they were resolved.

### Session 4: Land and estate management

Here the emphasis is on creating the real estate in a way to sustain the operations of the technopark and satisfy the needs of the companies settling on the technopark. The variety of models will again stress the choices relating to funding, development strategy, estate management and revenue generation.

### *Day 2: Key aspects of services and way forward*

### Session 5: New firm formation

This is the core value added aspect of the technopark model and the mechanisms needed and used in the case studies will be described in a way to emphasise the choices that will need to be made on both strategy and delivery. A fuller treatment will also be made of the new firm formation challenge and the many pitfalls that need to be overcome.

### Session 6: Value added services

The differentiation of the successful higher level technoparks is largely in the way they offer value added services over and above the core estate management and initial business support services. Again strategies will be contrasted to highlight the choices and alternatives for provision through in house capabilities and external partnerships.

### Session 7: Regional technology networks

The broader issues about technoparks contributing to and benefiting from a regional level technology commercialisation network will be demonstrated and specific cases and

approaches will be highlighted. The objective being to place the technopark as a hub of a network with a strong transactional value to both firms resident in the technopark and technology based firms across the region.

#### Session 8: Way forward

The last session will seek to draw together the discussions of the two days and chart a way forward to improve the performance of and effectiveness of the technoparks. The outline of an operations manual will be introduced as well as covering the training needs of the participants and strategies to meet them.

The Power Point presentations prepared for the workshop are attached in Appendix B.

## Appendix B: Power Point slides prepared for the workshop

## Appendix C: Example of an 18-Month Technopark Strengthening and Capacity-Building Program for Kazakhstan

### Objective

The objective of the program is to provide technical assistance and capacity building to

- 1) a selected technopark and its surrounding innovation “ecosystem”, including researchers, firms and potential sources of finance in the region
- 2) the national agency responsible for the development of technoparks - the Center for Engineering and Technology Transfer (CETT)
- 3) officials of the Ministry of Industry and Trade responsible for technopark policy

### Intended Impact

Raising the level of the effectiveness of technoparks in fostering entrepreneurship and innovation in SMEs by:

- a) transferring management best practices to the selected technopark, as measured by:
  - the implementation of a twinning/mentoring arrangement between the technopark and a foreign technopark
  - the establishment of additional technopark tenants at an increased rate
  - an increase in the self-sustainability of the technopark
- b) increasing the capacity of the CETT to support its technoparks, as measured by:
  - the establishment of a monitoring and evaluation system for technoparks
  - the establishment of an incentives-based funding structure for technoparks
  - the use of best practice procedures for assessing the feasibility of technoparks
  - the number of partnerships formed with other national and international organizations
- c) increasing the technical capacity of the Ministry of Industry and Trade to design effective technopark policies, as measured by:
  - use of best practice procedures for assessing the feasibility of technoparks
  - the establishment of an incentives-based funding structure for technoparks

- the development of a strategy for the role of technoparks in Kazakhstan over the next ten years, and their integration in the national innovation system.

The proposed program will sustain and continue strengthening the achievements of the technology, innovation and competitiveness activities implemented by the Government of Kazakhstan.

### Components

- a) Carry out an in-depth assessment of the needs and constraints faced by
  - 1. a selected technopark;
  - 2. the national agency responsible for technopark development and management, CETT;
  - 3. officials at the Ministry of Industry and Trade responsible for technopark policy, particularly in the Department for Industrial and Innovation Policy.
  
- b) Propose and implement a technical assistance and capacity-building program to increase the effectiveness of the selected technopark. Outputs will include:
  - 1. A customized strategic plan, based on evidence of available sources of technology, human capital, entrepreneurial demand, financing, potential markets, infrastructure for entrepreneurship and innovation.
  - 2. Operational models for the different aspects of the technopark, including management, performance metrics, entry and exit criteria, program delivery, services, infrastructure improvements and business networking.
  - 3. A financial model for the technopark based on rental and service revenues, local and national government support and public-private partnerships.
  - 4. Creating a twinning arrangement between the selected technopark and a foreign technopark to share experiences in technopark management. Mentors from the foreign technopark will periodically visit the selected Kazakhstani technopark and Kazakhstan technopark managers and CETT officials will conduct study tours in the foreign technopark. The foreign technopark will be based in a country with a tradition of successful technoparks and have a profile similar to the selected technopark, in term of its structure, size, funding sources and specialization.

5. Capacity-building for technopark staff through advisory services, workshops and training sessions on technopark management and administration, business support services, marketing, fundraising, networking, creating partnerships and technology commercialization. Some training sessions will be open to staff of all Kazakhstani technoparks while others will be tailored to the selected technopark.
  6. Holding workshops for researchers and students in institutes and universities affiliated with the selected technopark to help them understand technology commercialization opportunities and business planning.
  7. Sending in international technology commercialization experts to “scout” the knowledge base of the research institutes and universities related to the technopark, identifying knowledge with high commercialization potential and establishing partnerships with the researchers to commercialize the technology through the technopark.
- c) Propose and implement a technical assistance and capacity building program to increase the effectiveness of the national technopark agency, the Center for Engineering and Technology Transfer (CETT) Outputs will include
1. A strategic plan for CETT.
  2. An operational model for evaluating the feasibility of planned technopark developments
  3. A monitoring and evaluation system for the selected technopark
  4. A model for the financing of Kazakhstan’s technoparks, based on clear performance metrics.
  5. Capacity-building for CETT staff through workshops and “train the trainers” sessions on technopark management, business support services, marketing, fundraising, networking, creating partnerships and technology commercialization.
  6. Holding workshops and network-building activities with businesses to increase their understanding of the technology commercialization potential of Kazakhstani research institutes and universities. The businesses will be selected through chambers of commerce and business associations, and by targeted “scouting” of interested businesses.
  7. Holding workshops and network-building activities with high net-worth individuals to form a regional business angel network with potential to invest

in the selected technopark's companies. Representatives from high-profile and well-established business angel networks from various countries will lead the workshops.

8. The establishment of a national network of technoparks and incubators.
- d) Propose and implement a technical assistance and capacity-building program to increase the effectiveness of Ministry of Industry and Trade officials involved in technopark policy. Outputs will include
1. Workshops, training sessions and advisory services on innovation policy
  2. Workshops and training sessions on international experience in technoparks
  3. The development of a strategic plan for the role of technoparks in Kazakhstan in the next 10 years, and their interaction with the national innovation system

## Financial Plan Example for an 18-Month Technopark Strengthening and Capacity-Building Program

<b>Component 1: Assessment of detailed technopark needs and constraints</b>	<b>Amount</b>
Consultant fees	\$ 10,000
Consultant travel	\$ 8,000
<b>Subtotal</b>	<b>\$ 18,000</b>
<b>Component 2: Technical Assistance to Technoparks</b>	
International technopark consultant fees	\$ 35,000
International technopark consultant travel	\$ 15,000
International technology commercialization expert fees	\$ 20,000
International technology commercialization expert travel	\$ 15,000
Local consulting and training fees	\$ 20,000
Workshops	\$ 10,000
Travel and hosting of twinned foreign technopark management	\$ 45,000
Twinning study tours for technopark management & CETT	\$ 80,000
<b>Subtotal</b>	<b>\$ 240,000</b>
<b>Component 3: Capacity Building and strategic plans for CETT</b>	
Consultant fees	20,000
Consultant travel	15,000
<b>Subtotal</b>	<b>\$ 35,000</b>
<b>Component 4: Increasing the effectiveness of the Ministry of Industry and Trade</b>	
Consultant fees	\$ 25,000
Consultant travel	\$ 15,000
<b>Subtotal</b>	<b>\$ 40,000</b>
<b>Administration Costs</b>	
Program Coordinator Fees (Program Coordinator is located in Kazaskhtan)	\$ 80,000
Program Coordinator Domestic Travel	\$ 45,000
Program Coordinator Telecommunication Costs	\$ 3,000
Printing	\$ 2,000
Interpretation & translation	\$ 20,000
<b>Subtotal</b>	<b>\$ 150,000</b>
<b>Total Costs</b>	<b>\$ 483,000</b>

## Appendix D: Firm Orientation Survey Template

The original survey is included in its entirety below. This is translated into Russian for companies and the responses translated back to English:

World Bank, in collaboration with the Kazakhstan Ministry of Industry  
and Trade

Kazakhstan Facilitation of Innovation Entrepreneurship through  
Technoparks JERP

Company Technopark Preference and Planning Survey for [insert city name]

1. Will you like to keep this survey confidential?<sup>17</sup>    Yes \_\_\_                      No \_\_\_
  
2. Please describe the nature of your current operations in Kazakhstan:

Operation Type	Approximate % of budget
a. Sales	_____
b. Sourcing (eg. materials)	_____
c. Manufacturing / Production	_____
d. Research / Development	_____
  
3. How would you rate the overall environment for innovation in your city as compared to other Kazakhstan cities, including such factors as quality of universities and research institutes, concentration of innovative entrepreneurs, supply of infrastructure and facilities, orientation of the industry toward innovation, etc.  
5. Excellent            4. Strong            3. Average            2. Below average            1. Among the least conducive
  
4. How interested in your company in locating some operations on a technopark in Kazakhstan? \_\_\_\_\_
  - a. Actively looking to select location and locate
  - b. Conducted past effort on selection / locating
  - c. Open to locating
  - d. Unlikely to locate unless given significant incentives
  - e. Unlikely to locate under any foreseeable circumstances

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<sup>17</sup> World Bank guarantees the confidentiality of your company's identity and answers belong the small team that will process and aggregate the survey results, if you so choose.

5. If and when your company locates operations onto the park, approximately how many employees do you envision will be in the operations within 2-years from your tenancy start-date?
- \_\_\_\_\_

6. If you are to locate on a technopark, what will be your top three most important strategic goals of your operations on the park? (please rank 1-3 for 3 of the selections a-i below)

1. \_\_\_\_ 2. \_\_\_\_ 3. \_\_\_\_

- a. Development of new product from original domestic R&D (ie. KZ patents)
  - b. Development of new manufacturing or process from original domestic R&D (ie. KZ patents)
  - c. Improvement of product from domestic adaption of existing technologies (eg. R&D for using existing patents)
  - d. Improvement of manufacturing or process from domestic adoption of existing technologies (eg R&D on using and applying existing techniques)
  - e. Obtaining low-cost facilities, human resources and regulatory incentives for manufacturing and production operations (including factories and machinery manufacturing)
  - f. Obtaining low-cost facilities, human resources and regulatory incentives for sales and marketing and distribution operations
  - g. Advantaged acquisition or procurement of low-cost or high efficiency raw materials
  - h. Enhancement of your brand, access and market relationship with the domestic market
  - i. Starting or solidifying a strong relationship with the domestic government / local bureaucracy
  - j. Gaining intimate local knowledge about local customer preference and business environment
  - k. Forming an operational base / trade hub for domestic or regional market sales expansion
  - l. Forming an operational base for learning and collaboration with competitive companies or suppliers
7. Please rate the following factors in how effective they will be in encouraging you to locate some operations onto Kazakhstan technoparks:

(Rate each on a scale of 1-5: 1. Will have no effect on decision; 2. Will add a small incentive to locate; 3. Will add a considerable incentive to locate; 4. Will likely lead you to locate on the park; 5. Will almost certainly lead you to locate on the park)

- a. Increased financial incentives (eg. tax break, subsidized office space, etc) \_\_\_\_\_
- b. Regulatory assistance (eg. regulatory and licensing one-stop shop) \_\_\_\_\_
- c. Co-location of other companies in your industry  
\_\_\_\_\_
- d. Co-location of your supplier companies  
\_\_\_\_\_
- e. Co-location of your buyer companies  
\_\_\_\_\_
- f. Closer linkage with Kazakhstan research institutions and universities  
\_\_\_\_\_
- g. Better quality of research capacity from research institutions and universities  
\_\_\_\_\_
- h. Better technopark infrastructure  
\_\_\_\_\_
- i. Special access to high-quality and cheap technical labor  
\_\_\_\_\_
- j. Improvement in non-park specific, macro factors (eg. Economic development of the country, industry-level development, improved governance environment)  
\_\_\_\_\_
- k. Others, please specify: \_\_\_\_\_

8. Please describe any details of your plan or preference for the park, or add any comments:

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