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*Kazakhstan*

**LESSONS LEARNT FROM THE UNDP-GEF PROJECT  
“KAZAKHSTAN — WIND POWER MARKET  
DEVELOPMENT INITIATIVE”**

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**Lessons learnt from the UNDP-GEF project  
“Kazakhstan — Wind Power Market Development Initiative”.**  
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## ***Executive Summary***

The Kazakhstan — Wind Power Market Development Initiative project (the Project) began in December 2004 and finished in June 2011. It has been financed by the Global Environment Facility and implemented by the United Nations Development Programme and the Government of Kazakhstan.

A resource assessment carried out by the Project has estimated the potential wind resource in Kazakhstan to be in the region of 929 billion kWh per annum or 354 GW of installed capacity. This is over 18 times the capacity of electricity generating plant currently installed in Kazakhstan.

The Project has achieved substantial progress on realising its objective to reduce Kazakhstan's greenhouse gas emissions by facilitating the sustainable development of the wind energy market in the country.

The Project has led to a National Wind Energy Programme being prepared and supporting legislation being enacted. A Kazakhstan Wind Atlas has been developed and is freely available to potential investors online. Technical, commercial and environmental studies have been undertaken into various issues relating to the wind industry and proposed wind farm sites including the suitability of the electricity grid, innovative financing mechanisms and the legal and regulatory environment. The studies have shown that there are no insurmountable obstacles to wind energy development in Kazakhstan. In particular, the grid study has shown that the impacts of meeting the 2030 target of 2,000 MW of wind energy will not require any special measures to deal with them. All information has been freely and widely disseminated.

The Project also made very significant progress towards establishing the first tranche of wind farms in Kazakhstan. Investment proposals were prepared for a number of sites and installed capacity based on technical, environmental and commercial investigations. A good number of international developers have been involved in development work, gaining knowledge and insight of the market. In carrying out development work on the pilot project, attention was focussed on the barriers to development.

As a direct consequence of its work, The Project has effectively removed or mitigated a significant number of barriers to the development of a wind energy industry in Kazakhstan. However, some barriers do remain to developing commercially viable wind farms. Importantly, however, there is now Government acceptance that a fixed feed-in-tariff for a fixed time-frame should be offered to developers rather than individual projects being offered support based upon lengthy feasibility studies. This has been a major achievement of the Project.

The potential benefits to Kazakhstan of a successful wind energy sector have been identified and promoted by the Project. These include:

- Assuming that the 2030 target of the draft National Wind Power Development Program is reached (i.e. 2000 MW installed) then the Kazakhstan economy could benefit by up to \$18 billion dollars (2.6 trillion KZT).
- If the 2030 target is reached then an emissions reduction of up to 4.2 million tCO<sub>2</sub> per annum in 2030 or approximately 84 million tCO<sub>2</sub> over a 20 year lifespan is possible. Based on a current international price of carbon of approximately US \$21, then these anticipated carbon savings could be worth over US \$88 million per annum in 2030 or US \$1.7 billion over the lifetime of the projects.

This report was prepared in order to summarise the achievements of the Project and to make recommendations concerning the future development of the wind energy industry in Kazakhstan as it enters a new and exciting phase. The major recommendations include:

### **For the Government of Kazakhstan**

- That the National Wind Energy Programme be formally approved and promoted by Government as a clear statement of intent and as guidance to all state agencies and potential developers
- A fixed feed-in-tariff for a fixed period of time should be made available to wind farm developers rather than continuing the status-quo of negotiating a feed-in-tariff following a feasibility study as per the current RES Law

### **For Wind Farm Developers**

- Developers should access the wind energy knowledge base developed by the Project to inform their development decisions
- As the wind energy market develops in Kazakhstan, developers and other interested parties should consider establishing a national wind energy association to pursue their mutual interests in an organised way

### **For Project Donors**

- Project donors and implementation teams engaged in the promotion of renewable energy development should focus on ensuring that a supportive legal and regulatory regime is in place as an essential, and often the primary element, of renewable element policy
- That future projects in this theme are promoted as a means of, not just supporting renewable energy, but also having significant positive benefits for a country's national economy. A good wind energy investment climate is dependent upon a good general investment climate. Improving either aspect also improves the other.

As the Project is coming to a close, the outcomes have been handed over to the Kazakhstan Electricity Association to ensure that the wind energy market continues to develop and mature.

The Project has tackled barriers that are present in many other transition economies and is therefore a very important source of knowledge and experience for tackling these issues elsewhere.

The Project has been a success in that it has made the prospect of a successfully functioning wind energy development sector in Kazakhstan a real and immediate one. Prior to the Project, this looked unlikely, today it is a question of when, not if, the first wind farms will be developed in Kazakhstan.

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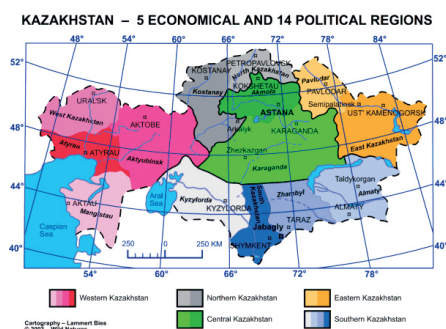
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## **List of Abbreviations**

CDM	Clean Development Mechanism
CIS	Commonwealth of Independent States
COP	Conference of Parties (of UNFCCC)
c/kWh	Cent (US or Euro) per kWh of electricity
\$	United States Dollar
€	Euro – official currency of the Euro zone
FE	Final Evaluation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GW	Gigawatt – a unit of power. Equal to 1,000,000,000 Watts
GWh	Gigawatt hour – a unit of energy. Equal to 1,000,000,000 Watt hours
JI	Joint Implementation
KEA	Kazakhstan Electricity Association
KEGOC	Kazakhstan Electricity Grid Operating Company
km <sup>2</sup>	Square kilometre
KOREM	Kazakhstan Operator of Energy and Capacity Market
kV	Kilovolt – a unit of potential difference. Equal to 1,000 Volts
kWh	Kilowatt hour – a unit of energy. Equal to 1,000 Watt hours
KZT	Kazakhstan Tenge
m/s	Metre per second – measure of wind speed
MEMR	Ministry of Energy and Mineral Resources
MINT	Ministry of Industry and New Technologies
MTE	Mid-Term Evaluation
Mt/year	Megaton per year 1Mt = 1,000,000 tons
MW	Megawatt – a unit of power. Equal to 1,000,000 Watts
MWh	Megawatt hour – a unit of energy. Equal to 1,000,000 Watt hours
NEAP	Kazakhstan National Environment Action Plan
OPEC	Organisation of the Petroleum Exporting Countries
PIU	Project Implementation Unit
PPA	Power Purchase Agreement
REC	Regional Energy Company
RoK	Republic of Kazakhstan
tCO <sub>2</sub> /MWh	Tonnes of Carbon Dioxide emitted per MWh of electricity produced
TOR	Term(s) of Reference
TWh	Terawatt hour – a unit of energy. Equal to 1,000,000,000 Watt hours
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VTT	VTT Technical Research Centre of Finland
WWEA	World Wind Energy Association

# 1 Introduction

## 1.1 Kazakhstan – A Land of Opportunity



The Republic of Kazakhstan is the ninth largest country and the largest landlocked state in the world. The country consists of approximately 2.7 million km<sup>2</sup>. Kazakhstan borders Russia and China to the west, east and north as well as Turkmenistan, Uzbekistan and Kyrgyzstan to the south. The Caspian Sea forms part of the western border. With approximately 16.1 million people, the country is one of the least densely populated in the world (5.5 persons/km<sup>2</sup>) and has an approximately even division between urban and rural population.

The Constitution of Kazakhstan establishes the nation as a democratic, secular, legal and social state, which strengthens this ethnically, culturally and religiously diverse country. A portion of Kazakhstan extends west of the Ural Mountains into what may be geographically termed Eastern Europe. The country identifies itself as a bridge between Europe and Asia and promotes a positive sense of “Eurasianism”.

Kazakhstan has a long history of producing raw materials, fuels and agricultural commodities. The collapse of the Soviet Union disrupted previously stable trade links with Russia and other Soviet republics but close cooperation within the Commonwealth of Independent States (CIS) has reinvigorated these links while, at the same time, Kazakhstan has been active in developing new trading partnerships. Kazakhstan has an important role within the Central Asian group of countries and has promoted the dynamic “Asian Snow Leopard” ideal as a model for its vibrant, developing economy. The Gross Domestic Product (GDP) of Kazakhstan increased by approximately 10% year-on-year from the late nineties to 2008 when, in response to the worldwide economic down-turn, GDP growth slowed to low single digit figures. The previously high GDP growth has been attributed primarily to favourable commodity prices during that period but sound macroeconomic management and a stable political environment are also acknowledged factors.

President Nursultan Nazarbayev has set a goal for Kazakhstan to become one of the world’s 50 most developed and competitive countries by 2015. The country currently ranks 82nd in Human Development Index used by UNDP.

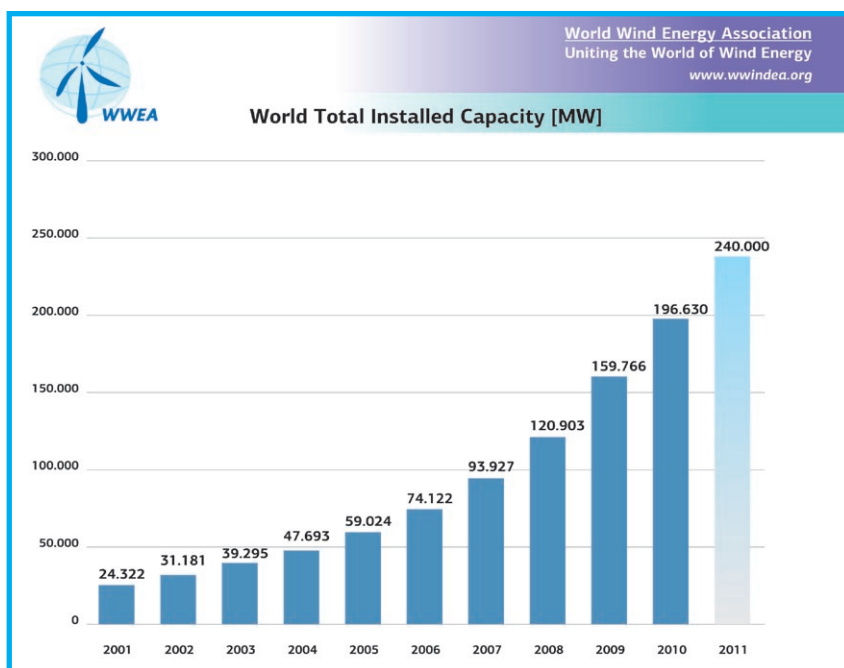
## 1.2 Wind Energy – The Global Picture

Generation of electricity from wind energy on a commercial scale began to become prevalent in Denmark, Germany and the United States of America (USA) in the 1980’s and 90’s. This followed a renewal of interest in the technology following the oil price spikes of the 1970’s. Wind energy is now the fastest growing source of electricity generation in the world. As can be seen from Figure 1 below, the globally installed wind energy capacity increased by 1000% in

the last decade from approximately 24 GW at the end of 2001. The global wind energy industry is now worth approximately US\$ 70 billion.

Installed capacity is expected to increase to 240 GW by the end of 2011 and the World Wind Energy Association (WWEA) is predicting that this could again be increased ten-fold (to 2,000 GW of capacity) by 2020. Currently, the annual increase in installed wind energy capacity is approximately 38 GW per year — equivalent to about 19,000 individual turbines (assuming an average turbine capacity of 2 MW).

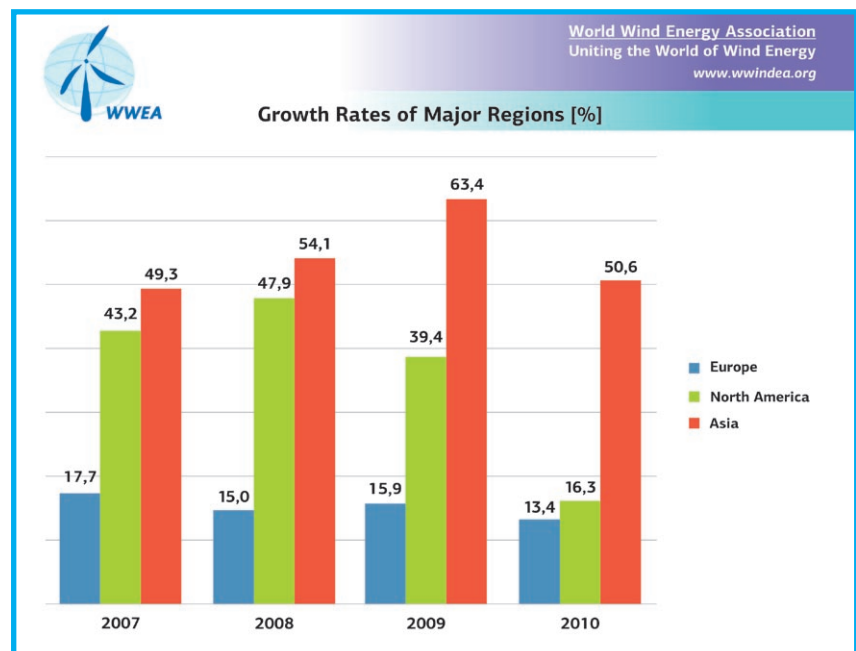
Current electricity production globally from wind energy is approximately 430 TWh. For comparison, this is equivalent to the total electricity usage of Italy or about 2.5% of global electricity demand.



**Figure 1**  
**Growth of Wind Energy Globally (Source WWEA)**

Wind energy development has, historically, been especially strong in OECD countries such as Denmark, Germany, Spain, the USA and the United Kingdom but growth rates and targets are rapidly accelerating in countries such as China and India. In 2009 over 40% of the newly installed capacity was installed in Asia. Figure 2 shows the acceleration in new capacity in Asia.





**Figure 2**  
**Asian Dominance of New Wind Capacity (Source WWEA)**

Thanks to the pioneering work of the UNDP-GEF wind programme we know that Kazakhstan is blessed with excellent wind resources. In order to make use of this very privileged situation, Kazakhstan should take two steps, one short term, the other step for the long term prospects:

In order to kick-start private investment in the wind sector in the country, the feed-in tariff should be clearly defined and grid access should be guaranteed in the very near future, in order to provide long-term security for investors. With such framework, it can be made sure that private investment is done not only in wind farms but also in manufacturing capacities. The leading wind energy countries around the world, e.g. Denmark, Spain, Germany, India or China, have demonstrated that the wind industry emerges where it finds a strong home market. And the industries of these countries are ready to cooperate with the public and private sector in Kazakhstan. Secondly, Kazakhstan should develop a long-term vision on how to make use of its vast wind potential. From its huge wind resources, Kazakhstan can cover not only its own energy needs. The country could one day even become an exporter of clean and inexhaustible wind energy, directly and indirectly. Based on its practically infinite wind resources, the country could become a Eurasian hub e.g. for energy intensive industries and for environmental friendly production of energy intensive products, made with wind.

**Stefan Gsanger**  
**Secretary General of WWEA**

*While working for the wind project I started feeling great respect to energy experts and those who deal with renewable energy. It is very difficult to promote renewables in the country full of fossil energy resources. And this is the most interesting thing about the project. Our project team has managed to find people who think the same and are keen on wind power. During project life time I met and worked with government officials, who are engaged in renewables; scientists and energy experts; potential investors who are interested in investing in wind parks construction. I am satisfied with the results achieved by the project. Willingness and eagerness of key actors of renewable energy development process makes me believe that in the nearest future wind parks become common thing in Kazakhstan. Every schoolboy will be aware of renewable energy and the share of “green” energy will reach world rates.*

**Ainur Sospanova**  
**National Project Manager**

### **1.3 About the UNDP/GEF Wind Power Market Development Initiative**

#### **1.3.1 Origins and Structure**

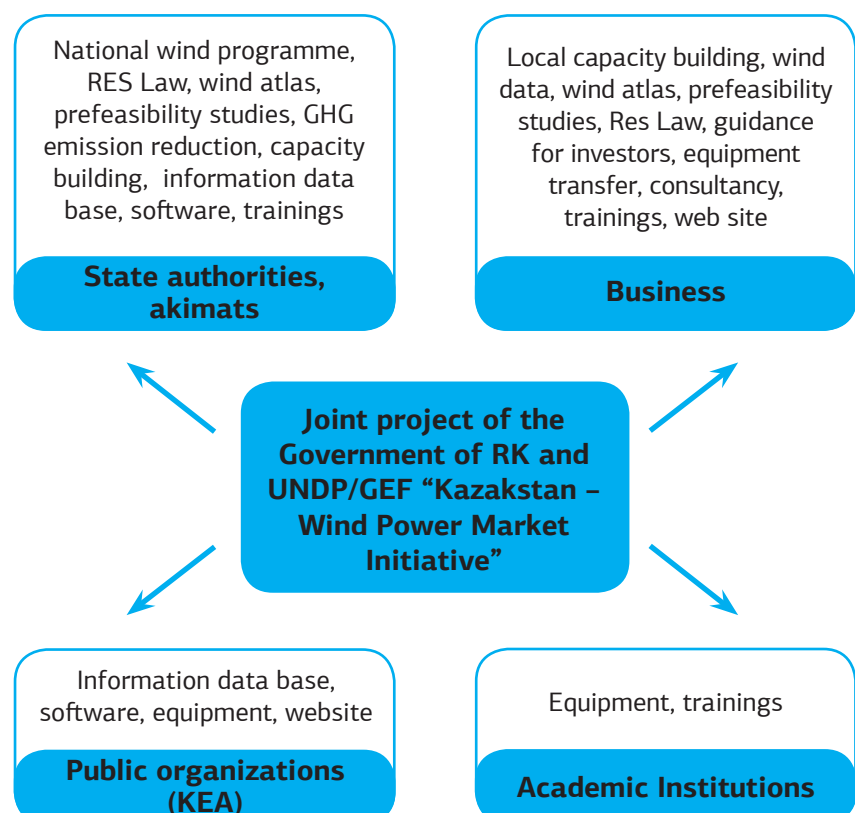
The Kazakhstan – Wind Power Market Development Initiative” project (the Project) began in December 2004 and finished in June 2011. The Project has been financed by the Global Environment Facility (GEF) with the Implementing Agency being the United Nations Development Programme (UNDP) and the Ministry of Energy and Mineral Resources (MEMR) — now the Ministry of Industry and New Technology (MINT) — of the Government of the Republic of Kazakhstan (RoK) as the Executing Agency.

The project brief approved in 2004 was developed in 2002 and built upon the UNDP/GEF project preparatory phase Removing Barriers to Wind Power Production in Kazakhstan which was carried out between 1997 and 1999 as an initiative of the MEMR. The Project was also informed by a 1997-98 project funded by the Government of the Netherlands, Wind Energy in Kazakhstan which determined that Kazakhstan was “one of the most appropriate countries in the world to develop wind energy” from a wind resource point of view. The Project has been carried out in cooperation with other private and public sector organisation with an interest in the development of wind energy in Kazakhstan (as illustrated in Figure 3) including:

- Ministry of Environment Protection
- Ministry of Industry and Trade of the Republic of Kazakhstan (MIT)
- Almaty Oblast Akimat
- Kazakhstan Electricity Grid Operating Company (KEGOC)
- Almaty Institute of Energy and Communications
- Kazakh Scientific Research and Development Works Institute of Fuel Energy Systems
- KazSelenergoproject Institute
- TATEK

A Project Implementation Unit (PIU) was established immediately and consisted of a Project Manager (Gennady Doroshin (2004—2008) , Ainur Sospanova (2009—2011)), Project Advisor (Gennady Doroshin — 2009—2011), a Technical Specialist (Michael Rakov (2005—2011)) and a Project Assistant (Diana Bimakhimova (2004—2006), Mugilshin Tutkushova (2010—2011)).

A Chief Technical Advisor (Peter Dickson) was appointed from 2005 to 2007. Other international consultants have also been engaged to work alongside the Project team and national consultants to provide specific services. This has greatly benefited the Project by providing an international outlook and knowledge of best practice.



**Figure 3 Project and its Partners**

### 1.3.2 Objectives of the Project

The overall objective of the Project may be summarised as:

“to reduce Kazakhstan’s greenhouse gas emissions by facilitating the sustainable development of the wind energy market in Kazakhstan”

It was recognised that the development of the wind energy market in Kazakhstan was dependent upon the removal of certain barriers identified in the project preparatory phase. These barriers were broken down into three broad groups i.e.

- Awareness, information and capacity barriers
- Financial barriers and low electricity prices
- Institutional barriers



**RT with Govt. on the RES legislation discussion, photo by G.Doroshin**

*The deal of my life is wind power. It is difficult to say why? Perhaps the reason is novelty, difficulties, meetings with new people who are passion about it, or just kind of adventures. Everything started in those hard post-Soviet times called perestroika with disruptions in electricity supply. I was employed by one of the companies which designed construction of windmill with the capacity of 500 kW in the Djungar Gates area. Later I was lucky to work for UNDP-GEF project team which was involved in large scale wind power project. Targets of project team seemed quite complicated. It was supposed to develop basics of wind power market for the whole country, notably the legal framework. I would very much notice the team’s capacity in qualified project management.*

**Michael Rakov**  
**Technical Specialist of the Project**

At the time that the Project started, the expected end-of-project situation entailed an increase in electricity tariffs to be reflective the true cost of production and capital replacement as well as the removal or mitigation of the effects of the identified barriers to wind energy development.

In order to address these barriers, a project was designed that had the potential to deliver the necessary results. Table 1 outlines the basic components of the Project.

- Adoption of a cross-sectoral national wind energy program to achieve the goals set forward in the energy sector development program until 2030 and in the National Environment Action Plan (NEAP).
- Building the local capacity to develop commercially feasible investment proposals and to structure financing for the projects
- Facilitating the construction of the first pilot project(s)
- Using the results and lessons learnt for further development of the wind energy market in Kazakhstan

**Table 1 The Project Components**

In February 2011, as the Project was nearing completion, the UNDP signed a memorandum of cooperation with the Kazakhstan Electricity Association (KEA) to transfer all project outcomes to the Association so that it may lead the ongoing development of renewable energy in Kazakhstan following the closure of the Project.

#### 1.4 *Sharing Knowledge*

The purpose of this report is to present the main results of the Project and the lessons learnt during it. It is hoped that the report may be an aid to further development of the renewable energy sector in Kazakhstan and a means of disseminating the valuable work of the Project amongst national, regional and global stakeholders.

This report is presented in six sections:

- This first section provides an introduction to the Project, the Republic of Kazakhstan and a brief note on the scale of opportunities in the global wind energy industry
- Section 2 contains a background briefing on the energy sector in Kazakhstan, particularly as it relates to wind energy as well as some of the national and internal drivers of development
- Section 3 is devoted to wind energy in Kazakhstan i.e. the nature of the wind resource which could be utilised, the potential benefits of wind energy development to the country as well as the legal and policy framework.
- Section 4 examines the barriers to wind energy development in Kazakhstan and how the Project has succeeded in removing or mitigating the impacts of these barriers
- Section 5 looks at the lessons learnt during the undertaking of this project. The lessons are considered under the headlines of policy and programme, removing barriers and also how the project has dealt with facilitating the development of the first wind farm projects in Kazakhstan
- Finally, Section 6 presents conclusions and recommendations aimed at charting the future of wind energy development in Kazakhstan based upon the significant work carried out under the Project.

## 2 Kazakhstan’s Energy Sector

### 2.1 Energy Sector of Kazakhstan

#### 2.1.1 Abundant Resources

In December 1991 the Republic of Kazakhstan was declared. The changing political and economic situation of the previous decades, as well as the relative abundance of energy resources in the country, has impacted upon the development of the energy sector in Kazakhstan. The electricity sector had been developed as a centralised system heavily dependent upon fossil fuels, especially coal, for generation.

Kazakhstan has very large coal, oil, gas and uranium resources that are all being actively exploited. The country is the third largest producer of crude oil in Central Asia, behind Russia and China and has the third largest reserves outside of the OPEC member countries. Reserves are circa 30 billion barrels of oil with production at around 1.5 million barrels per day, around 75% of which is exported by pipeline to neighbouring countries.

Coal resources in Kazakhstan are in the region of 40 billion tonnes. The country produces some 90 million tonnes per annum. Approximately 35% of this is exported to markets such as Russia and Ukraine while much of the remainder is used to feed the country’s coal burning electricity generation plants.

Kazakhstan is the number one producer of uranium in the world. In 2009 13,820 tonnes of the material was produced representing 27.6% of global production.

One result of the abundance of energy resources has been the lack of a driver, in developing wind energy on the basis of a scarcity of indigenous energy resources. It should be noted that this has been the case in other countries (such as USA and China), where a robust wind energy sector has been established. Nevertheless, other drivers needed to be (and were) identified such as the need to reduce greenhouse gas emissions, to strengthen local power supply and to act as an economic stimulus.

#### 2.1.2 Electrical Power Infrastructure

Kazakhstan’s total installed power generation capacity is approximately 19 GW. However, actual firm capacity during peak winter load is in the region of about 12 GW due to aging equipment and poor maintenance. Eighty five percent of the plants are coal fired with the remaining being natural gas and hydroelectric power (VTT, 2011).

Three large hydroelectric generating plants are in operation which produce approximately 10% of the countries electricity needs. Over 600 small hydro plants were closed in the 1980’s and 1990’s mean-



**Installation of the meteor mast,  
photo by M.Rakov**

ing there is an untapped, decentralised renewable energy resource in this sector. The legislation developed as a direct consequence of the Project applies to hydroelectric plants and all other renewable energy sources and may be used by those wishing to redevelop these plants.

The electricity grid network is state-owned and operated by the Kazakhstan Electricity Grid Operating Company (KEGOC). There are also 21 regional energy companies (RECs) that distribute electricity on a regional monopoly basis. Dispatch of generation is scheduled by KEGOC and tariffs are determined by the Agency for the Regulation of Natural Monopolies.

There is a general north-south split in generation and demand with approximately 80% of the electricity being produced in the north near coal reserves and 70% being used in the same industrialised region. In general the northern electricity grid links with Russia and Central Asia and the southern network links with Kyrgyzstan and Uzbekistan. The west of Kazakhstan is also isolated from the national electricity system and has interconnections with Russia.

The transmission system operates at 500 kV and 220 kV. A new 1,100 km 500 kV electricity transmission system has connected the two Kazakhstani geographic systems since 2009. The transmission and distribution systems in general are Soviet era (as are the majority of the generating plants) and are a source of high losses (up to 12%) and low reliability.

The peak electrical load in 2009/10 was 12,400 MW. This was somewhat lower than the prevailing average over the last number of years (circa 15,500 MW) due to global economic factors. The load is estimated to double from current levels by 2030. This growth, combined with natural retirement of existing plant will necessitate a very significant investment in new generating capacity. It is estimated that 2,757 MW of new and replacement capacity will be required by 2015 and over 8,000 MW by 2030.

The pressing need for new generating capacity provides an opportunity where wind energy can be promoted as an important part of the response. A portion of the public funds that will be required to redevelop existing facilities or to build new plant could be utilised to stimulate the wind energy sector, leveraging private sector finance to bring about the construction of environmentally friendly new generating capacity.

### **2.1.3 The Power Market**

Research conducted by the Technical Research Centre of Finland VTT (2011) under the direction of the Project describes the operation of the power market by the Kazakhstan Operator of Energy and

Capacity Markets (KOREM). It is a day ahead power market which accounts for only 5% of traded power in the country. The remaining 95% of power is traded by means of negotiated bilateral contracts. The largest producers exclusively use bilateral contracts for the sale of their power. A nascent balancing market is being trialled and it is thought likely that a capacity market will be introduced in the medium term in order to help incentivise the necessary new generation capacity.

The power market is likely to provide a medium term avenue for the sale of power from wind farms, however, given the lack of operational experience in Kazakhstan with wind farm developments and the inherent variability of their output, the most appropriate route to market for wind farms is certainly via the mandatory purchasing of output by RECs as envisaged by the Government under the Law on Renewable Energy Sources (RES Law).

#### 2.1.4 Electricity Prices – The Investment Signal

Wholesale electricity prices in Kazakhstan vary considerably from region to region but are in the range of 2 - 4 US c/kWh. Tariffs have exhibited a strong upward trend in the last decade and are overseen by the Agency for the Regulation of Natural Monopolies. Table 2 illustrates the increasing electricity prices in the last ten years.

	2002	2004	2006	2008	2010	% increase 2001-2010	% change - annual
Electric Power (KZT/kWh)	3.88	4.08	4.75	6.78	8.32	220%	25%
Exchange Rates (KZT to 1 USD)	152	136	126	120	147	102%	11%

Source: State Statistical Committee of the Republic of Kazakhstan,  
UNDP calculations;

**Table 2 Electricity Prices in Kazakhstan from 2002 – 2010**

Despite significant increases, the electricity price does not reflect the long-term costs for replacing of generation nor does it reflect the (external) costs associated with the negative environmental costs of the coal industry. It simply, uses a “cost plus” mechanism to cover operating costs and a profit margin. Generating plants built under the former Soviet regime are considered “paid for” however the result of this is to give an artificially low electricity price which lacks the necessary incentive to encourage new, independent generating plants including wind farms.

The reasons for this under pricing may be laudable (ensuring the affordability of electricity for individual consumers, industry and tackling energy poverty) however, in the long-run they are uneconomic and distort the electricity industry, discouraging energy efficiency measures and new market entrants as well as preventing new tech-



nologies such as wind energy (with a cost of c. 15 US c/kWh or above) which must include capital costs in the price that they seek from customers.

A Government Decree (No. 392) in March of 2009 concerning power tariff levels envisages a wholesale rate of between 3.1 US c/kWh and 6.4 US c/kWh in 2015 (up to 10.2 c/kWh for final end-users) in order to help stimulate investment in new generation capacity. These prices are to be achieved by agreement between project promoters and Government – outside of the KOREM market. It is clear that these increases will not be sufficient to support the construction of wind farms in Kazakhstan and further support will still be needed.

## 2.2 Policy and Legal Framework

The national policy driver for wind energy development in Kazakhstan is the Sustainable Development Concept for 2007 – 2024, which was prepared taking into account the outcomes of the World Summit on Sustainable Development held at Johannesburg in 2002. The Concept is an important tool in the delivery of the agreed Strategy of the Development of Kazakhstan by the year 2030.

The Concept has the following to say on the use of renewable energy:

Efficient and sustainable use of renewable resources and alternative energy sources.

In the Republic of Kazakhstan measures on efficient and sustainable use of renewable resources and alternative energy should be taken by:

- Introduction of innovative technologies in use of land, water, forestry, fishery, biological resources and renewable sources of energy;
- Stimulation of efficient use of hydropower resources, solar and wind resources and other renewable resources and alternative energy sources;
- Establishment of the Centres for distribution of international experience in the area of energy and resource efficiency and use of renewable sources of power.

The Activity Plans for the Realisation of the Concept promote the development of appropriate legislation for the development of renewable energy.

Wind energy development is also considered to be a “promising sector”, mentioned as deserving of support under the Strategy of Industrial and Innovation Development of Kazakhstan for 2003—2015.

The Government Programme for Acceleration of Industrial and Innovation Development of Kazakhstan (2010—2014) has set a target of 125 MW (approx 400 million kWh) of wind energy capacity by 2015.

### 2.3 Drivers of Wind Energy in Kazakhstan

Based on the particulars of the Kazakhstan economy as well as global energy and environmental factors, there are a number of compelling drivers that make the case for developing wind energy in Kazakhstan very attractive.

#### **Drivers of Wind Energy in Kazakhstan**

- The aging power generation infrastructure in Kazakhstan and the need to replace this in order to maintain acceptable levels of power quality and reliability presents an opportunity for wind energy. Significant public funds will be required to replace this again plant. This means that wind energy proponents can make a case for Government support based on an obvious and immediate need (i.e. that generation capacity must be replaced)
- The recognition by Government of the need to move Kazakhstan to a more environmentally responsible society and economy presents an opportunity for wind energy to be developed as part of that new reality and to present itself as one of the regional leaders in renewable energy in Central Asia
- Transmission and distribution losses are currently high in Kazakhstan (c. 15%), due predominantly to aging infrastructure. The utilisation of wind energy (and other de-centralised forms of generation) can reduce losses (by reducing the demand for long distance power transmission). This increased efficiency in the deliver of power to end users will have cost and environmental benefits for consumers and society.
- Kazakhstan currently has one of the highest, per capita, carbon footprints in the world. In 2007, the International Energy Agency ranked Kazakhstan 16th in per capita carbon dioxide emissions. There are many reasons for this, including the relatively low population densities, but notable amongst them is the heavy reliance (approx 85%) on coal for electricity production. Coal is a very carbon intensive fuel. A drive to moderate coal’s contribution to electricity production provides a driver for wind energy development. The very low (near zero) carbon intensity of wind farms presents an attractive opportunity for Government and investors as developing climate change financing mechanisms help to make such projects commercially feasible.

**Table 3 Drivers of Wind Energy in Kazakhstan**

## 3 Wind Energy in Kazakhstan

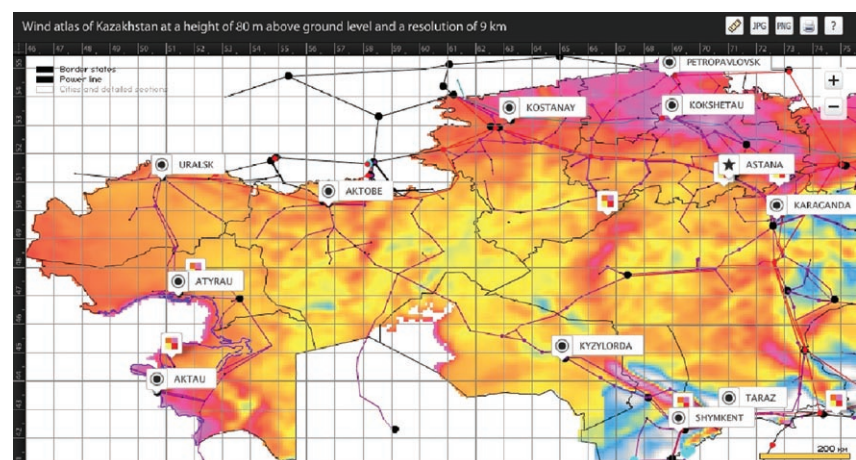
### 3.1 Kazakhstan's Untapped Resource

Kazakhstan is the world's ninth largest country with over 2.7 million km<sup>2</sup> of varied landscapes meaning that it is approximately the same size as the whole of Western Europe. This gives an indication of the potential wind resource that could, in theory, be available for exploitation. The country extends from the Caspian Sea in the west to the Altay Mountains in the east. North to south Kazakhstan spans territory from the plains of Western Siberia the deserts of Central Asia.

Kazakhstan is not wind resource limited i.e. it will not be the availability of suitable wind regimes that will limit the amount of wind turbines deployed. Neither is it limited by available land. On the contrary, large swaths of the country have a very significant wind resource including:

- southeastern parts of the country near the border with China including the Djungar Gates region, the region around Astana and Jambul
- western parts of the country around the Ural mountains and the central region near the Alytau mountains

A study by Parsons Brinckerhoff, commissioned by the Project during the preparation of the Kazakhstan Wind Atlas, showed that over 50,000 km<sup>2</sup> of territory across nine of the country's 14 oblasts had a good wind resource (7–8 m/s) and that parts of the Almaty province contained areas of very good (8–9 m/s) and exceptional wind speeds (>9 m/s).



**Figure 4 The Kazakhstan Wind Atlas**

The study estimates the potential wind resource in Kazakhstan to be in the region of 929 billion kWh per annum i.e. a wind energy capacity of 354 GW (compared to a total installed capacity on the national grid of 19 GW).

Commercial wind farms will normally require on site data monitoring and robust wind resource assessment (using long term data and statistical techniques) for development. This work has been completed for 15 prospective wind farm sites in Kazakhstan with a combined potential installed capacity in excess of 500 MW.

The development and publication (at <http://www.atlas.windenergy.kz>) of the Kazakhstan Wind Atlas was a very significant step in developing an active wind energy industry in Kazakhstan. It has allowed potential developers to access good quality resource information remotely. It has also allowed other stakeholders within Kazakhstan to easily view the location and magnitude of wind energy resources at a national level for the first time.

### 3.2 Unlocking the Resource – Policy and Legal Framework

The fundamental consideration of rational investors when assessing an opportunity is the nature of the risk-return balance. Crucial to controlling commercial risk is a stable, transparent and enforced policy, legal and regulatory framework which outlines the rights and responsibilities of actors, defines Government support and describes enforcement measures and penalties for non-compliance. Investors must be confident that laws and regulations upon which they base their decisions will be enforced this means that, to inspire investor confidence, the legal and regulatory framework must be attractive and the country must nurture a reputation of stability and legal enforcement.

Significant progress has been achieved over the lifetime of the Project in developing a legal and regulatory framework that can foster wind energy development. A fundamental document is the National Wind Power Development Program for Kazakhstan to 2015 with a perspective until 2030.

*As a result of joint efforts between the ministry of industry and new technologies of Kazakhstan and UNDP project team Kazakhstan has favorable basic conditions for wind power development. UNDP constantly supports the ministry in the sphere of renewable energy providing trainings for national experts and local technical staff via seminars, conferences and study tours in the field of wind power development. And I strongly believe that in the nearest future we will be witnessing first wind farms in the country.*

**Kairat Rakhimov**  
Head of RES unit of MINT RK

### **The National Wind Power Development Program**

A National Wind Power Development Program for Kazakhstan to 2015 with a perspective until 2030 was prepared by the MEMR and the UNDP-GEF Initiative in 2008. It should be noted that the MINT took over responsibility for Kazakhstan's energy policy (excluding oil and gas policy issues) from the former MEMR during the course of this Project.

The objective of the Program is to achieve a target of 750 million kWh of electricity generation from wind energy in Kazakhstan by 2015 and 5 billion kWh by 2030. This production figure equates to approximately 250 MW and 2000 MW respectively.

The Program aims to achieve these targets by fulfilling the following goals:

- Development and implementation of legal and technical documentation for wind power sector development
- Designing and implementation of activities to install wind power capacities by 2015 with perspective until 2030
- Support of small scale wind power generation
- Development of scientific, technical and industrial base of wind power sector
- International cooperation under Program of wind power development

The Program briefly outlines the three-stage approach to achieving these goals and what may be the expected outcomes of successful implementation of the Program. The Program is an ambitious first attempt to outline a clear national development programme for wind energy.

A full description and analysis of the legal and regulatory framework may be found in the UNDP-GEF report Effective legal and regulatory framework for the support of wind energy in Kazakhstan (Lettice, 2011). Presented in the following sections are the 3 Laws (2 pre-existing and one developed with the support of the Project) and 4 Rules that define the legal basis for wind farm development in Kazakhstan.

<b>Laws</b>
RES Law
Law on Investments (pre-existing)
Law on Power Industry (pre-existing)
<b>Rules</b>
Rules for the Purchase of Electricity
Rules for Connection to the Grid
Rules for Monitoring RES
Rules for Considering Feasibility Studies

**Table 4 Main Legal and Regulatory Instruments**

### 3.2.1 The RES Law

The Law About the Support of Usage of Renewable Energy Sources (The RES Law) was adopted in 2009 following preparatory work by the MEMR and the UNDP-GEF. Its creation is a very significant achievement as it provides a legal foundation for developers to base commercial decisions and it further enhances the reputation of Kazakhstan as a country intent on welcoming wind energy and other renewable energy developments.

The RES Law sets out the purpose, scope and main directions of state regulation of renewable energy development. It also sets out the responsibilities of the Authorised Body for Renewable Energy as well as the responsibilities of local executive bodies.

The support for renewable energy projects in selling electricity (and/or heat) is addressed in Article 9 of the RES Law. The Law establishes a novel form of feed-in-tariff, although without a guaranteed price as commonly used with such schemes elsewhere, with the following characteristics pertinent to wind energy:

*The RES Committee was set up within Kazakhstan Electricity Association to develop renewable energy sources and will continue alternative energy initiatives launched by UNDP. ‘This meets the interests of consumers and the economy. Kazakhstan has a huge wind potential, which should be used to diversify electric power generation and reduce greenhouse gas emissions as part of Kyoto Protocol commitments of the Republic of Kazakhstan. Key objectives of the Association are to participate in the development of the regulatory framework and to support RES projects of different scale in Kazakhstan’*

**Almasadam Satkaliyev**  
**Chairman of the Board of Kazakhstan**  
**Electricity Association**

(From the speech to the ceremony of signing of Memorandum on cooperation between UNDP and KEA, 9 February, 2011)

#### **Characteristics of the Kazakhstan Financial Support for wind according to the RES Law**

- Regional electricity distribution companies must purchase the full volume of renewable electricity produced by qualified generators to cover up to 50% of the electricity loss in the respective distribution network.
- If the renewable electricity exceeds the volume of 50% of



**The Khan Shatyr  
Entertainment Center in Astana,  
photo by S.Orymbayeva**

losses in the distribution company, then the remainder will be purchased by the system operator (KEGOC) to cover losses in the national electricity network.

- Power Purchase Agreements (PPAs) are made at prices “no less than the renewable energy unit’s construction cost recovery terms appointed in the feasibility study of the renewable unit construction project”
- Article 9.5 states that the price of power is to be established by the generator (the “qualified energy production organisation”) independently but not more than the level stated in the feasibility study of the project of renewable energy unit construction.
- Generators have the right to enter into direct agreements with consumers

Article 10 of the RES Law addresses the issue of grid connection of renewable energy projects. This is an important element in wind energy development as, unless clearly defined and enforced, grid connection can be a source of significant delay and cost for wind energy projects and therefore is a commercial risk.

Since the adoption of the RES Law in 2009, debate has taken place regarding the suitability of the support scheme developed within it. The scheme does not offer a fixed price (feed-in-tariff) for a fixed period but instead proposes that a price be agreed between generator and energy purchaser (REC or KEGOC) on the basis of a full (lengthy and costly) feasibility study. This means that developers must invest significant resources in carrying out the feasibility study before a clear commercial case can be made for the project. This is a source of risk and a deterrent to developers.

The Government has recognised this problem and is currently developing amendments to the RES Law to include a fixed feed-in-tariff price and duration. These amendments, if they are adequate and perceived as stable, have the potential to kick-start the wind energy market in Kazakhstan by removing the most significant source of project risk.

### **3.2.2 The Law on Investments**

Private property rights are constitutionally protected in Kazakhstan however there remains some uncertainty amongst foreign investors regarding the nature of and risks to these rights. The Law on Investments was approved in 2003 and defines how these commercial ventures are handled in Kazakhstan.

Article 4 of the Law robustly guarantees the legal protection of investors in Kazakhstan however Article 4.3 Subsection 2 is quite wide

ranging in the scope of reasons why the government may legally fail to guarantee the stability of contracts between investors and state bodies i.e. national and ecological security, healthcare and morality. However unlikely it is that this clause would be enacted, it is a source of potential risk for investors.

### **3.2.3 Law on the Power Industry**

The Law on the Power Industry was enacted in July 2004 to regulate issues arising from electrical and thermal energy generation, transmission and utilisation.

Article 2 sets out some of the goals and aims of the regulation including:

- creating a competitive environment in the energy market
- manage and grow competition in the market
- use and development of renewable sources of energy
- mobilising investments for development and re-equipment of the power industry

All of the stated aims are entirely conducive to the promotion of wind energy. A competitive energy market would allow wind energy, adequately supported in the short to medium term by Government to penetrate the existing generation sector introducing new generating companies and more liquidity of supply. The successful entry by wind energy developers into the Kazakhstan market can serve as a model and advertisement for developers interested in developing other independent power projects in the country.

It must be pointed out though that none of these aims are likely to be met while the wholesale price of electricity in Kazakhstan remains artificially low. Pricing electricity on a “cost plus” basis, failing to take into account the huge replacement costs for Soviet era infrastructure is uneconomic and a direct barrier to achieving the above aims.

### **3.2.4 Rules Governing Wind Energy**

In addition to the RES Law, the Government, with the support of the Project has developed and adopted the following Rules in support of renewable energy:

- Rules of purchase of electricity from qualified power generating organisations
- Rules of definition of the nearest point of connection to the grid or thermal networks for renewable energy
- Rules for monitoring of the use of renewable energy
- Rules for feasibility study assessment and approval





**Mosque Nur-Astana,  
photo by A.Dissyukov**

The Rules are important as they provide detail not covered explicitly in the RES Law concerning wind energy development.

### **Rules for the Purchase of Electricity**

The Minister of Energy and Mineral Resources, adopted the Rules of purchase of electricity from qualified power generating organisations in September 2009. They were developed to remove any doubt concerning the mechanism of selling electricity from renewable energy generators. The rules set out the procedures to be followed by generators of renewable energy to sell electricity to RECs. A number of recommendations have been made concerning possible improvements to these rules, in particular in the area of Power Purchase Agreements (PPA) and these are being developed for approval by parliament. It is important that PPAs are transparent, stable and dependable. They should be for a fixed price (with scope to accommodate for inflation) and duration.

### **Rules for Connection to the Grid**

The “Rules of definition of the nearest point of connection to the grid or thermal networks and connections of the objects on use of renewable energy” were enacted in October 2009 to clearly outline the mechanism to be followed by generators to obtain a grid connection according to the RES Law.

The rules are a very positive addition to the legal framework supporting renewable energy as they provide for a clear and speedy application and decision process. This is important as it removes delays and uncertainty for a development project.

The rules reiterate the RES Law stating that costs for reconstruction of the existing grid will be paid for by the grid proprietor. There remains some lack of working knowledge, however, regarding the split of costs for grid connection as laid out in the RES Law. It is important that this uncertainty be managed to ensure it is not regarded as a risk by developers. Nevertheless, the Rules for Connection to the Grid are an important, positive step in encouraging wind energy developers.

### **Rules for Monitoring Renewable Energy**

The Rules for monitoring the use of renewable energy were adopted by the Government in accordance with the RES Law in October 2009. The rules are a necessary step in ensuring that the growing penetration of renewable energy is accurately measured in Kazakhstan for national and international reporting requirements and for comparison to established targets. The Rules are, as they should be, simple and workable.

## Rules for Considering Feasibility Studies

The Rules concerning the consideration and approval of renewable energy feasibility studies and civil engineering designs were adopted by the Government in December 2009. The Rules apply distinct procedures for projects based on their capacity.

These rules were important because they provided guidance to developers on the nature and level of detail required of them in their feasibility studies which were submitted to Government for approval. In light of ongoing revisions to the RES Law, the need for these rules must be kept under review.

It is crucial that all of these rules are now tested by actual proposed projects to determine the efficacy of their implementation.

### 3.3 Reaping the Benefits of Wind

Wind energy is well recognised internationally as having real and substantial benefits to local, regional and national economies as well as to the global environment. Some benefits may be location specific or more generally associated with the technology or commercial activities. Defining the potential benefits of wind energy to Kazakhstan is important for the ongoing promotion of the industry amongst stakeholders.

#### 3.3.1 Economic Benefits

##### Investment in wind development

The global wind energy industry is now worth in the region of US \$70 billion per annum. On average, the cost of developing 1 MW of wind energy is approximately \$1.5—\$2.5 million. Over the course of a 20-year lifespan, 1 MW of wind energy may produce circa 50 GWh of electrical energy. Assuming a PPA was agreed for, say, \$0.15 per kWh then, assuming operational conditions typical to Kazakhstan, revenues from the sale of power over the course of the lifespan of the project could be up to \$7 million.

Each megawatt of operational wind energy in Kazakhstan may, therefore, be responsible for over \$9 million of direct economic activity as a result of development, construction and the sale of power. The economic activity will be shared amongst the following sectors:

- power sales
- balance of plant construction
- civil engineering works (site roads, foundations, etc)
- turbine delivery (or possibly turbine production)



Project team at the project site,  
photo by G.Doroshin

- engineering consultancy
- professional services (legal, planning, etc)
- local and national taxes

Assuming that the 2030 target of the draft National Wind Power Development Program is reached (i.e. 2000 MW installed) then the Kazakhstan economy could benefit by up to \$18 billion dollars (2.6 trillion Tenge). This is comparable to the total value of all investments stimulated by the Investment Fund of Kazakhstan since 2003.

### Employment creation

It is reported by the World Wind Energy Association (March 2010) that 550,000 people were employed in the wind energy industry around the world by the end of 2009. If projected global growth rates are achieved then in excess of 2 million people could be employed in the industry by 2020.

It has been reported in a number of studies that, for countries not engaged in the manufacture of turbines, then a figure of 1.33 jobs per MW installed is a reasonable estimate of the potential of wind energy to increase employment. Assuming that, for the short to medium term at least, Kazakhstan sources all wind turbines from beyond its borders then by 2020 there could be 1,500 people employed in the industry based on current targets.

The employment is typically in the following sectors:

- construction
- development (legal, financing, engineering)
- planning
- operation and maintenance
- support services

It is likely that such employment will have a stimulating effect and lead to further indirect employment as a consequence of this economic activity.

### Regional export opportunities

The wind energy industry is a global industry. Countries benefit by importing technology, services and skills from other countries further along the wind energy development path. Central Asia and the CIS are currently regions that have very low penetrations of wind energy considering the ample wind resource present in many countries. In general, the barriers that have prevented wind energy development in Kazakhstan are broadly similar to those in neighbouring countries. This means that there is a significant potential both for rolling out similar solutions in these countries and for Kazakhstan to export



**Monument Bayterek,**  
*photo by Sh.Jetpissova*

services and goods uniquely tailored to the needs of its neighbours seeking to develop wind energy.

A series of training events were provided through the Project for over 200 local professionals in the following areas:

- wind energy technology
- wind resource measurement and assessment
- wind farm layout
- energy yield assessment
- business plan development for wind energy projects
- specific wind farm development software tools (WindPro, Mapinfo, Wind Atlas applications, cash flow and financing calculation tools)

In October 2009, for example, a training seminar on carbon finance was delivered by Mr. Vladislav Arnaudov of Mitsubishi UFJ Security Bank. The seminar was presented to 23 participants from government bodies (MINT and the Ministry of Environment), state companies (Samruk-Kazyna, Samruk-Energo) private consultancies, businesses and potential investors.

Seven people were trained and certified competent in the use of the WindPro development software. These specialists can now utilise this training in Kazakhstan and in neighbouring countries for wind energy development.

Typical services that may easily be exported could include wind energy meteorological, resource assessment, wind farm layout design, wind farm power engineering, operation and maintenance, construction expertise and turbine delivery logistics.

## **Tax revenues**

The economic activity created by a developing wind energy industry can be a source of corporate, employment and indirect tax revenues for the RoK. Wind farms are usually developed on a project finance basis (i.e. using a special project investment vehicle where the recourse for lenders is limited to the revenues generated by the project). These newly formed companies will be additions to the national tax-base.

Pre-feasibility studies carried out for potential wind farm sites in Kazakhstan have estimated that each 1 MW of wind energy can be expected to generate US \$50,000 per annum in tax revenue. This means that, if 2030 targets are reached (2,000 MW), tax revenue from the wind energy sector could be as much as US \$100 million.

### 3.3.2 Social Benefits

#### Rural development opportunities

There is an approximately equal split of the rural and urban populations in Kazakhstan. In the decades since independence from the Soviet Union, a dramatic shift in land ownership has occurred with a very large number of smallholders managing land previously controlled by the State. Wages in the agricultural sector of the economy have consistently been below those in either the industrial or services sectors. In fact, the majority of human development indicators show a clear gap between urban and rural dwellers. For example, the Ministry of Environment estimates that there are approximately 230 populated rural areas with no access to the electricity grid. For this reason, initiatives that can attract investment and development in rural areas of Kazakhstan are important as they can improve infrastructure, boost the local economy, reduce unemployment and increase the opportunities available to people living in isolated communities.

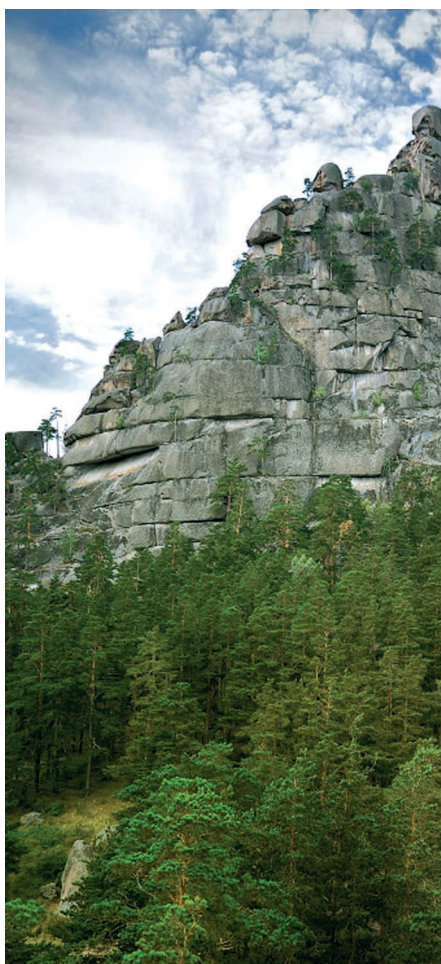
Wind farm projects can yield all of the above results at a local level apart from their contribution to regional and national energy infrastructure and environmental sustainability.

#### Energy security

Kazakhstan is fortunate in having world-class raw energy resources such as coal, oil and uranium. In this sense, it is a country with a high level of energy security. Despite these enormous resources, difficulties in delivering energy services, especially electricity and heat with maximum efficiency and reliability remained up until quite recently.

The Kazakhstan electricity system is, like that of all developed countries, a centralised one with large generators producing electricity for a mix of large and small consumers. This can mean that, in the absence of appropriate development and management of the grid, it can be vulnerable to supply interruptions leading to short-term partial brownouts or even blackouts.

It is recognised that very significant work has been carried out in the past 10 years in RoK with the assistance of various international development banks to improve the infrastructure and management of the Kazakhstan electricity sector. Adding distributed wind energy to the system has the potential to further strengthen it by inserting localised, small to medium scale generation at appropriate nodes on the grid.



**National Park Burabay,  
photo by Sh. Jetpissova**

## Local development and ownership

There is a wide range of ownership models for wind farms. They may be:

- Developer owned through non-recourse project finance
- Developer owned by on-balance sheet investment
- Investor owned (project finance or on-balance sheet), may be purchased operational
- Owned by state agency
- Owned by co-operatives of local residents
- Any consortium of a combination of the above, either new to the market or currently active public or private companies

The co-operative model of ownership, usually by local landowners and other residents wishing to make a (generally) small investment in the project, has been well developed, particularly in Denmark and Germany but also in the United Kingdom and the Netherlands. Even if a wind farm is not run on a co-operative basis, there may be an element of community involvement in the share capital of the wind farm company.

### Case Study: Westmill Wind Farm Cooperative, United Kingdom

Westmill Cooperative was established in 2004 with the aim of developing a community owned and operated wind farm in Oxfordshire in the south east of the United Kingdom. Following a successful £ 4.6 million funding drive whereby over 2,300 individual purchased a share of the wind farm and a bank loan was arranged, the wind farm was developed.

The Westmill wind farm consists of five Siemens 1.3 MW turbines and have operated since early 2008. It sells electricity to a large electricity supplier and any profits are distributed amongst its shareholders.

The wind farm produces enough electricity to supply approximately 2,500 typical UK homes and is expected to remain operational for another 20 years.

The Westmill Cooperative, along with several other in the UK (and many more elsewhere in Europe) is a good example of how an interested group of citizens can mobilise to develop wind farms in their communities.

## Environmental awareness & stewardship

Wind farms are very visible signs of the commitment of nations to

reducing environmental pollution including greenhouse gas emissions and to developing a sustainable energy future for the country.

The presence of a wind farm in a community or region can be a strong motivational and educational tool for the promotion of a greater sense of responsibility amongst inhabitants over the protection of natural resources and a clean environment. It is common practice in many countries for school children, students and community groups to be invited to tour wind farms to admire the turbines themselves and to see the farm in operation. This has been shown to promote public acceptance of wind farms and an understanding of their role in creating a cleaner environment.

Wind farms may also become the focus of eco-tourism. They can draw visitors to a region simply to view them in operation. A number of facilities (e.g. the Ecotricity turbine at Swaffham, United Kingdom) have been developed to allow visitors to ascend to the nacelle area to visit specially designed viewing platforms similar to the Bayterek monument in Astana.

### **3.3.3 Environmental Benefits**

#### **Greenhouse gas emission reductions**

As an electricity system currently heavily reliant on coal powered generation plants, the carbon intensity of electricity in Kazakhstan is currently quite high, in the region of 0.85 tCO<sub>2</sub>/MWh (<http://carma.org/>). In simple terms, the production of electricity from wind farms will reduce the requirement for electricity from other sources, including coal plant.

Assuming that the 2030 target of the draft National Wind Power Development Program is reached (i.e. 2000 MW installed) then this could mean an emissions reduction of up to 4.2 million tCO<sub>2</sub> per annum in 2030 or approximately 84 million tCO<sub>2</sub> over a 20 year lifespan. This would have the same emissions reduction impact as removing over 600,000 cars from Kazakhstan's roads. This would make a small but significant step to achieving reductions mandated by the Kyoto Protocol or its successors. Based on a current international price of carbon of approximately US \$21, then these anticipated carbon savings could be worth over US \$88 million per annum in 2030 or US \$1.7 billion over the lifetime of the projects.

#### **Other environmental impacts**

Like any other type of infrastructure development, wind farms have both positive and negative impacts on the receiving environment. Compared to the impact of fossil fuel energy sources, however, the negative environmental impact of wind energy is relatively minor.

This stems mainly from the absence of fuel inputs, relatively limited development footprint and lack of direct emissions.

Kazakhstan will not be especially susceptible to any of the negative environmental impacts of wind turbines. Although, there is local concern about the impact of wind turbines on birds, particularly migratory birds, for sites located close to migration routes (such as the Djungar Gate project). Well recognised and easily implemented mitigation options may need to be employed, as conditions dictate, to tackle the effects of such impacts as bird hazard, noise, shadow flicker and visual intrusion. These are all relatively minor compared to impacts such as air pollution, ground water and surface water contamination, fly-ash production and land degradation associated with fossil-fuel utilisation in Kazakhstan.

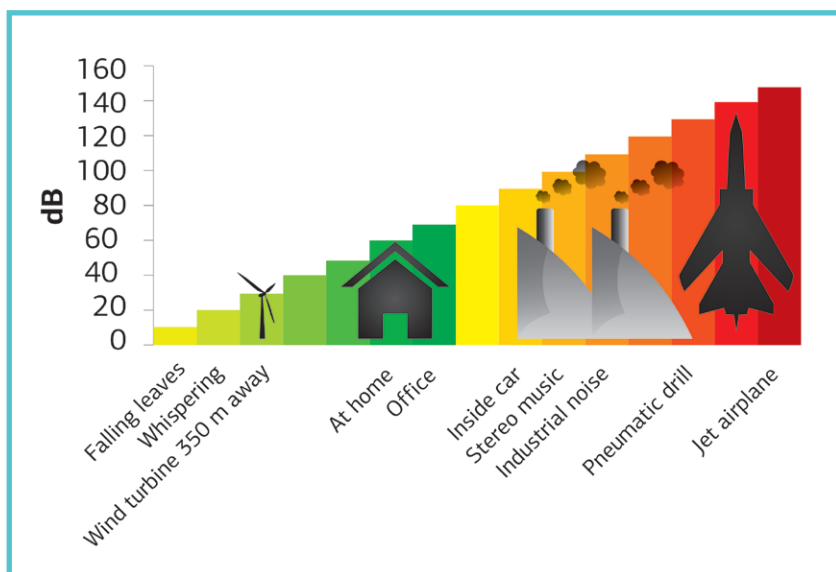
### Human and animal impacts

As with environmental impacts, wind energy can, potentially, have impacts on people and animals. Again, these should be considered in light of the impacts of alternative energy sources such as fossil fuels, nuclear fission or other renewable energy sources.

No proven negative impacts on human health have been identified although some sources claim that noise and “nuisance” impacts can have a detrimental impact on individuals. The evidence for this so-called “wind turbine syndrome” is, however, scant.

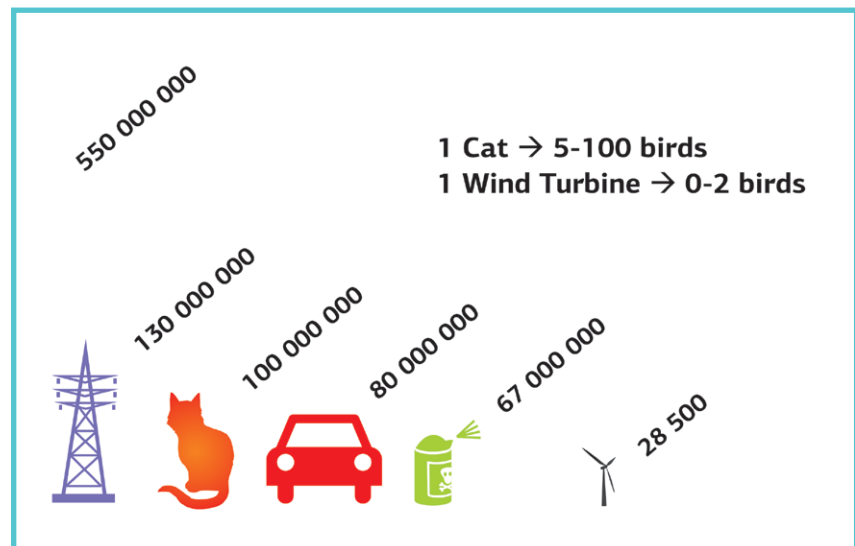
Both domesticated and wild animals show little attention to wind turbines. There is typically no permanent (beyond the construction phase) impact on agricultural activity within and around the wind farm due to the small development footprint.

There have been impacts on certain bird and bat populations with collision mortality high in certain cases.



**Wind power sound**





*Bird mortality in birds in US*

#### Potential Benefits of Wind Energy to Kazakhstan

- Economic stimulus of circa \$18 billion by 2030
- An extra 1,500 good quality jobs created directly by the industry
- Potential to export services to neighbouring countries
- Broadening of the tax base and \$100 million per annum additional tax revenue
- Catalyst for and source of rural development
- Improving energy security with distributed generation
- Opportunity for local involvement in wind farm developments
- Promoting environmental awareness and ecotourism
- Reducing greenhouse gas emissions by 4.2 million tCO<sub>2</sub> per year by 2030
- Reducing other negative environmental impacts of energy use
- Mitigating human and animal health impact of energy use

*Table 5 Summary of Potential Benefits of Wind Energy to Kazakhstan*

## 4 Removing Barriers to Wind Development in Kazakhstan

### 4.1 What Were The Barriers?

This Project has been about removing, or mitigating the effects of, barriers to development. In this case, the development of properly functioning wind energy market in Kazakhstan. When the Project began in 2004 a range of existing barriers were identified to be addressed. They are each listed and examined in Sections 4.2 to 4.4 in light of the achievements of the Project in addressing them.

The barriers identified fell into three broad categories:

- Awareness, information and capacity barriers
- Financial barriers and low electricity prices
- Institutional barriers

The first category included barriers that are typical of any new market being developed. It included a general lack of awareness of the opportunities associated with wind energy, a lack of technical experience in aspects of the development, construction and operation of wind farms as well as the absence of any wind farms in the country and few examples in the region.

The financial barriers, including the low price of electricity in the country, centred on the lack of an existing support scheme or clear facility for power sales, difficulties in attracting foreign investment and the, at that time insurmountable, commercial risks faced by indigenous companies wishing to participate in the wind energy market.

I am proud to say that the Project has effectively removed or mitigated a significant number of barriers – financial, technical, and institutional - to the development of a wind energy industry in Kazakhstan. . However, some barriers remain to developing commercially viable wind farms. The Project ends but the outcomes have been handed over to the MINT and Kazakhstan Electricity Association to ensure that these barriers will be tackled and the wind energy market continues to develop and mature. I want to stress again that the Project has been successes in that it has made the prospect of a successfully functioning wind energy development sector in Kazakhstan a real and immediate one. Prior to the Project, this looked unlikely, today it is a question of when, not if, the first wind farms will be developed in Kazakhstan.

**Stephen Tull**

**UNDP Resident Representative/UN  
Resident Coordinator in Kazakhstan.**

(From the speech to “Regional conference on  
renewable energy development in the CAR and CIS”  
May 12—13, 2011)

Finally, the institutional barriers related to the absence of a clear national policy for wind energy development, a lack of specific legislation and regulation relating to the wind energy market along with the absence of a central office or department to foster the development of wind energy.

## 4.2 Awareness, Information and Capacity Barriers

<b>Barrier</b>	A lack of awareness and experience of the local utilities on the performance of wind power generation and its interference with the grid
<b>Before</b>	<p>Power utilities and grid operators (such as KEGOC) are, by their nature, conservative organisations. They are tasked by their shareholders, customers and, in the case of KEGOC, by act of government to ensure a reliable, secure and uninterrupted supply of good quality electricity.</p> <p>Utilities and the grid operator were, like their equivalents in other countries, initially cautious about the impact of wind power on the electricity system. This was due to the lack of information and direct experience of accommodating wind power on the system.</p>
<b>After</b>	Utilities and KEGOC have been active stakeholders throughout the project. VTT were appointed to carry out an assessment of the power system's capability for accommodating wind energy development in Kazakhstan. By commissioning this study in January 2011 the Project convincingly demonstrated that the impacts of meeting the 2030 target of 2,000 MW of wind energy were not likely to require any special measures to deal with them. The report did suggest that, to accommodate further wind power penetration (above 2,000 MW) a new Grid Code be developed to address wind farms and that day-ahead forecasting be developed to facilitate planning and dispatch. These are, however, medium to long-term issues.

<b>Barrier</b>	A lack of information and experience to determine accurately the specific construction and operational costs of wind power generation in Kazakhstan
<b>Before</b>	In order to make informed investment decisions, it must be possible to construct a good quality financial model of the proposed investment. For a wind energy development this includes, amongst other factors, expected generation, power purchase price, turbine costs, construction and balance of plant costs, delivery costs, operation and maintenance costs, cost of finance and decommissioning costs.

<b>Before</b>	Clearly, at the outset of this Project, there was very little, if any, information and experience available to accurately determine these factors for the Kazakhstan market. Lack of this type of information was an enormous risk and a barrier to advancing developments. This risk made financing projects on commercial terms prohibitively expensive.
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<b>After</b>	<p>Much work has been done to better understand the specific construction and operational costs. The required PPA price necessary to support wind energy development is c. 15 US c/kWh. Although, in advance of projects being constructed, there will remain a lack of hard data upon which to model future projects. It is likely that a number of developments will be required before absolutely reliable figures are arrived at (given that every project will be location specific).</p> <p>A fundamental factor in establishing a commercial model is wind resource. An online Kazakhstan Wind Atlas has been prepared by Parsons Brinckerhoff and is available to investors and, furthermore, meteorological monitoring has taken place at a total of 15 sites across the country and prefeasibility studies carried out for 8 sites.</p>



**Regional Conference on RE development in the CAR and CIS, photo by A. Sospanova**

<b>Barrier</b>	An absence of “success stories” of wind power generation in Kazakhstan
<b>Before</b>	<p>With no experience of wind farm development in Kazakhstan at the beginning of the Project, there were no “success stories”, case studies, best practice guides or exemplar projects to imitate. Knowledge of successful developments in similar transition economies was also scarce.</p> <p>Successfully constructed and operating projects can be the key to unlocking a wind energy industry by boosting confidence and displaying tangible results. However, if fundamental barriers to commercial development have not been adequately addressed and the “success stories” are heavily dependent upon one-off grant funding and exceptions to the rules, then this boost will be short lived.</p>
<b>After</b>	<p>Wind energy is now a real option for Kazakhstan. A report on the commercial viability of RES in Kazakhstan was prepared in 2007. Credible local as well as international developers have been, and continue to be, engaged in feasibility analysis. These include: Samruk-Energo, Green Energy, Spain Consulting, Jetisu Ltd, Kazpiy Ltd, Energy Ecology Engineering Ltd and Ordabacy Ltd.</p> <p>A practical guide for investors on the required steps, procedures, technical and legal requirements for developing wind farms in Kazakhstan has been prepared.</p>

<b>Barrier</b>	A lack of reliable wind resource assessments and wind maps for the perspective sites and regions
<b>Before</b>	<p>Some work of limited scope had already been carried out to identify the nature of the wind resource in Kazakhstan and the suitability of the technology for the country. A 1997-98 project funded by the Government of the Netherlands, Wind Energy in Kazakhstan which determined that Kazakhstan was “one of the most appropriate countries in the world to develop wind energy” from a wind resource point of view. This work did not provide the type of detail required by developers to “screen” multiple potential wind farm locations or to carry out anything more than very basic prefeasibility assessments of wind resource and energy yield.</p> <p>In 1997-2000 a wind monitoring programme was carried out for two potential sites in the south of Kazakhstan as part of the UNDP/GEF project preparatory phase “Removing Barriers to Wind Power Production in Kazakhstan”.</p>
<b>After</b>	<p>The Kazakhstan Wind Atlas has been prepared by Parsons Brinckerhoff and is freely available to all interested parties at <a href="http://www.atlas.windenergy.kz/">http://www.atlas.windenergy.kz/</a></p> <p>It is an excellent resource for potential developers to use in order to screen potential wind farm sites.</p>

<b>After</b>	<p>The Atlas gives long-term average wind speeds at 80 metres above ground level for the entire country. The information is at a resolution of 9 km for much of the country but is at 100 m resolution for nine areas of particular interest. The Atlas is an excellent marketing tool for the Kazakhstan wind energy market.</p> <p>For the development of the Atlas, raw wind data was recorded at 10 locations. A further five sites were monitored at a later stage. All of this data is available to potential developers to inform their analysis.</p>
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<b>Barrier</b>	A lack of local capacity to prepare “bankable” feasibility studies and business plans, and to finalise all the other documentation needed to present projects for financing
<b>Before</b>	<p>No wind farm development had ever been attempted in Kazakhstan prior to this Project. Therefore there was a lack of experience amongst technical and business professionals of carrying out and reporting upon wind farm feasibility studies.</p> <p>To secure finance for any project, the lender or investor must be happy with the risk-return profile of the project. For a larger expected return an investor may be willing to accept a higher level of risk.</p> <p>At the beginning of the project, as discussed previously, little hard information was available regarding project costs and expected revenue streams for wind farm projects. This meant that any thorough feasibility study would have returned a negative conclusion due to the absence of a commercial case for development.</p>
<b>After</b>	<p>Kazakhstani professionals and consultants have been employed on this Project throughout. Academic institutions such as the Kazakh-German University, Eurasian National University and Nazarbayev University have been engaged. Government and civil society have been active participants. A variety of training events were held which directly informed over 200 Kazakhstani professionals in the areas of wind turbine technology, wind potential assessment, energy yield assessment, usage of the simulation programme Wind Pro and in the preparation of bankable proposals. In addition, the results of the Project have continuously been disseminated through reports, conferences, seminars and publications.</p> <p>Prefeasibility studies for wind energy projects at 10 monitored sites have been carried out by UNDP-GEF experts and ongoing feasibility studies are being carried out by a number of private sector developers.</p>

<b>After</b>	The capacity certainly exists now within Kazakhstan to prepare feasibility studies, with the assistance of international experts where appropriate (for instance, in the case of wind resource assessment). Feasibility studies should at all times focus on commercial feasibility in addition to technical feasibility. The Project has made significant progress in making many of the factors surrounding commercial feasibility far more transparent (e.g. wind resource, grid connection, support scheme).
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### 4.3 Financial Barriers and Low Electricity Prices

<b>Barrier</b>	Prevailing low electricity prices
<b>Before</b>	<p>At the time the Project began, the average end-user electricity price was approximately 2.3 US c/kWh with a maximum level of 3.5 US c/kWh in certain parts of the country. These low prices were due to an abundance of inexpensive domestic coal and the continued operation of older, Soviet-era, power plants for which no capital cost or future replacement costs had been accounted for.</p> <p>The result of this was to give an artificially low electricity price signal which lacked the necessary incentive to encourage new, independent generating plants including wind farms.</p>
<b>After</b>	<p>Tackling the issue of uneconomically low electricity prices in Kazakhstan was not explicitly an objective of the Project. This is a larger, more fundamental issue relating to the management of the entire electricity sector. However, the Project has sought to encourage debate on the merit of tackling the problem of low prices. The low electricity prices were identified as a major barrier to wind energy development and remain a cause for concern as the artificially low prices make wind energy projects appear wholly uneconomic by comparison, depress any likely PPA prices and discourage investors and developers who require a sufficiently high, long-term and stable price signal in order to make their commercial decisions.</p> <p>To address the problem of low wholesale electricity prices, the RES Law was developed by Government with the support of UNDP-GEF to provide a feed-in-tariff for wind farm operators. This is a common method of market support used successfully in other countries. Unfortunately, the initial form of the feed-in-tariff mechanism was unsatisfactory. This was because the price was not set out in law but rather it was due to be determined following a lengthy and costly feasibility study carried out by the aspiring developer. Following a review and comment by stakeholders, including UNDP, the RES Law is currently being revised to provide a fixed feed-in-tariff that, if set at an appropriate level (15 US c/kWh at a minimum), should provide the support necessary to develop wind farms despite the prevailing low prices for electricity.</p>

<b>Barrier</b>	A lack of information about potential international partners and other sources of financing to facilitate the wind power development in Kazakhstan
<b>Before</b>	<p>Credible international partners are an important element of a successful wind energy development market. They often bring experience gained in other (sometimes similar) jurisdictions and markets. They are sources of development and project finance and can encourage other national or international investors to enter the market due to their recognised expertise and reputation for good due diligence.</p> <p>At the beginning of the project there was little contact with potential international partners or the finance sources they could potentially unlock. This meant the new wind energy development community in Kazakhstan was isolated and unlikely to prosper.</p>
<b>After</b>	<p>The Project has succeeded in engaging the attention of a number of international developers, some of whom are currently actively engaged in feasibility and development work such as Samruk-Energo, Green Energy, Spain Consulting, Jetisu Ltd, Kazpiy Ltd, Energy Ecology Engineering Ltd and Ordabacy Ltd. There is a continuing need to increase the visibility of Kazakhstan amongst international developers as an attractive location for development. To this end, the production of the Wind Atlas, development of the National Wind Energy Programme (in draft form), and the use of the www.windenergy.kz are important building blocks.</p> <p>Kazakhstani developers are now aware of the important skills, experience and finance that international developers can bring to projects. The role of this Project has been to help ensure that contacts with international developers are made and that, when approaches are made, the development environment is attractive enough to encourage activity.</p> <p>In addition, a report on Innovative Financing for Renewable Energy Projects in Kazakhstan was produced as a guide to developers seeking to access finance.</p>



**Training with MINT and KEGOC,  
photo by A. Sospanova**

<b>Barrier</b>	A lack of long term agreements on energy purchase and uncertainties with the long term power purchasing tariffs
<b>Before</b>	<p>Prior to this Project there was significant uncertainty over the nature, level, stability and “bankability” of any means of power purchase that might be negotiated for power produced by wind farms. Any PPA, if it could have been agreed would certainly have been negotiated on a “one-off” basis. This lack of certainty was an unacceptable risk and therefore a barrier to the development of a functioning wind energy development sector.</p>



<b>After</b>	<p>Significant progress has been made in removing this particular barrier. In particular the RES Law and the Rules for the Purchase of Electricity, developed with the assistance of the Project, are fundamental building blocks which can be built upon. The legislation places an onus on REC's and KEGOC to purchase electricity from renewable sources at a price to be agreed at following a thorough feasibility study.</p> <p>There were important issues identified with the RES Law, concerning how the prices are agreed and the terms of the PPA which must still be resolved. There is now Government acceptance that a fixed feed-in-tariff for a fixed time-frame should be offered to developers rather than individual projects being offered PPAs based upon lengthy (and very expensive) feasibility studies. This is perhaps the single most important change that could be made to foster a successful development environment in Kazakhstan. Nevertheless, the basic structure of the RES Law can certainly be used as a vehicle for any changes required. These changes are currently being prepared to be put before parliament for approval.</p>
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<b>Barrier</b>	A high perceived investment risk in Kazakhstan, leading to very high interest rates and short expected pay-back periods of local financing, making the available commercial credits in Kazakhstan practically unusable for any long term energy sector investment
<b>Before</b>	Despite tremendous progress since independence, there is no doubt that Kazakhstan was, at the beginning of this project (and beyond), regarded as a relatively high risk economy in which to invest. Coupled with the novel (to this market) nature of wind energy developments, this made the prospect of investment in a wind farm project in Kazakhstan appear to be prohibitively risky.
<b>After</b>	<p>In 2011, the World Bank "Doing Business" report ranked Kazakhstan 59th out of 183 countries for ease of doing business. This is a very respectable result, higher, for example, than Italy, Turkey, Poland and the Czech Republic. However, the report has consistently ranked Kazakhstan very low in two areas that are key to wind energy development. Kazakhstan is ranked 181st (third last) in the "Trading Across Borders" subcategory and 147th in the "Dealing with Construction Permits" subcategory, despite performing relatively well in other subcategories (including Registering Property 28th, Enforcing Contracts 36th and Protecting Investors 44th). Such low rankings in areas crucial to wind energy project development will, undoubtedly, have a major influence on national and especially international investors.</p> <p>The Project has made great strides in developing policy, legislation and capacity supportive of a successful wind energy industry. This will reduce risk for investors and improve credit terms.</p>

<b>After</b>	However, the wind energy industry is not an isolated part of the economy. Therefore, the problem of formal and informal barriers to trade affecting the wider economy also affects the wind sector. All necessary steps must be taken to ensure a continued improvement of the ease of doing business in Kazakhstan.
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<b>Barrier</b>	High project preparation costs without the assurance for obtaining partners and financing for the actual implementation of them
<b>Before</b>	Without a history of wind farm development, every new project can be an expensive and risky endeavour. At the beginning of this Project, there was no formal channel, body or set of guidelines available to prospective developers and, of course, there was no guarantee that a realisable project could be achieved following difficult and expensive development activity.
<b>After</b>	<p>The work of the project has reduced in scope and cost the amount of “ground-up” development work that must be engaged in by developers. In particular, the collection of wind data, development of the Wind Atlas, making of relevant legislation and dissemination of information that the Project has promoted makes the task of carrying out pre-feasibility or feasibility work less onerous and more likely to meet with success.</p> <p>Even so, there remain hurdles to overcome, especially regarding the commercial case for developments. The current situation whereby the PPA price is agreed following a lengthy feasibility study has been unsuccessful. As discussed, a clearly price signal is needed before investors will be confident of committing scarce development funds to wind farm projects in Kazakhstan.</p>

#### 4.4 Institutional Barriers

<b>Barrier</b>	Absence of a cross-sectoral strategy and policy framework to promote wind energy activities in Kazakhstan, and to support the start up of the development of this sector
<b>Before</b>	Prior to the Project, there was, effectively, no coordinated strategy or policy framework for the development of wind energy. The Government Energy Program of 1999 had a goal to achieve 520 MW of wind energy capacity by 2030 but no specific policy documents, laws or rules were in existence to properly promote and govern the industry. This absence of policy and legal frameworks meant that there was no clear encouragement for developers to begin wind projects.

<b>After</b>	<p>A National Wind Energy Program for Kazakhstan to 2015 with a perspective until 2030 was prepared by the MEMR and the Project in 2008.</p> <p>The objective of the Program is to achieve a target of 750 million kWh of electricity generation from wind energy in Kazakhstan by 2015 and 5 billion kWh by 2030. This equates to approximately 250 MW and 2000 MW respectively.</p> <p>The Program is, however, still in draft form and has not been finally approved and promoted. As a draft document it gives an indication of future commitments in the area, it would be a far stronger signal to investors of the commitment of the Government if the Program was formally approved. Nevertheless, there is a commitment under the Programme for Acceleration of Industrial and Innovation Development 2010-2014 to achieve 125 MW of wind energy capacity by 2015.</p> <p>One of the primary means of developing the industry committed to in the Program is the development of the necessary legislation. This has happened in the meantime and is an ongoing process. A review of the legal and regulatory framework was carried out in 2010 with recommendations brought to Government for final revisions of legislation.</p>
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<b>Barrier</b>	Absence of a strong national focal point to support and promote wind energy development
<b>Before</b>	There was no dedicated national focal point with the remit to support and promote wind energy development in Kazakhstan. The first “port-of-call” for anyone interested in developing the technology would have been to the MEMR.
<b>After</b>	<p>During the course of the Project the UNDP-GEF project team became a valuable source of information, expertise and support for interested stakeholders and developers. The MEMR and later the MINT committed resources to advancing the industry. A Renewable Energy Office has been established within the MINT to oversee the development of the industry. The UNDP-GEF project team has worked closely with this office to highlight barriers that require Government intervention and appropriate mechanisms of doing this.</p> <p>As the Project comes to a close, the UNDP has signed a memorandum of cooperation with the Kazakhstan Electricity Association (KEA) to transfer all project outcomes, information and results to the Association so that it may lead the ongoing development and promotion of renewable energy in Kazakhstan following the closure of the Project.</p>

<b>Barrier</b>	Barriers connected to monopoly status of electricity distribution companies on retail market
<b>Before</b>	The limited choice available for PPAs and grid connections presented a lack of options for developers and meant there was little incentive for distribution companies to assist developers.
<b>After</b>	The existence of monopolies such as these can reduce options for the sale of power from independent power plants including wind power. There has been significant liberalisation of the electricity market in Kazakhstan and the RES Law, in theory, provides a clear avenue for the sale of power i.e. the mandatory acceptance by REC's of renewable energy generated in their region. In practice, as discussed previously, the power price and commercial terms and conditions of the PPAs is an issue being addressed.

#### 4.5 The Djungar Gates Pilot Project

An objective of the Project was to facilitate the construction of the first pilot wind farm project(s) in Kazakhstan. This was originally expected to be a circa 5 MW wind farm in the Djungar Gate region.

Due to difficulties in negotiating an adequate PPA for the output of this pilot project, against the backdrop of a radically altered power sector (privatisation of RECs) and the prevailing legislation (lack of support scheme) at the time, private sector involvement was not enough to bring a pilot project to fruition. The pilot project, therefore, suffered due mainly to the most pressing and complex barrier addressed by the project i.e. the absence of a clear, government-backed support scheme for renewable energy.

This has meant that, in spite of successes in making the wind energy development environment more appealing to investors and developers, there is still no operational wind farm in Kazakhstan. The Project funds destined for supporting the development of the pilot project have been redirected to support more fundamental work with potentially greater impact, in particular the development of legislation.

##### Brief summary of a pilot Wind Farm (WF) project

The pilot 5 MW project was an important component within the framework of the UNDP/GEF Project.

This project was expected to provide with the knowledge on the implementation of wind parks in Kazakhstan in order to reduce investment risks in future projects in Kazakhstan.

It was planned that the pilot wind farm (WF) of 5 MW would be implemented via attraction of private investments through an open tender. To make the project more attractive investors were offered following privileges:



**KazMunayGas building,  
photo by S.Orymbayeva**

1. A framework agreement between Government and investor on granting investment preferences in accordance with the law of the Republic of Kazakhstan “On Investment”: a grant on land, discount income tax, exemption from tax on land, tax on property and customs duty on equipment
2. A long-term agreement on purchasing electricity from a pilot WF at a price securing economic stability of the project, but no more than 3.5 c / kW\*h;
3. Technical assistance in the connection of the WF to the grid and its simultaneous operation with the grid.
4. An agreement between UNDP/GEF and investor on financial support to the first pilot project in the amount of 200 (two hundred) dollars for each kW of installed capacity, but no more than 1 mln USD.

MEMR at support of the UNDP/GEF Project organized an open contest on the investment and construction of a pilot WF in 2005. As it turned out, the limitation of the cost for energy purchase from a pilot WF at a level of no more than 3.5 c / kW\*h in competitive conditions resulted in a negative output of the contest, no interested investors appeared. After the consultations with MEMR the limitation of the cost for energy purchase from a pilot WF in competitive condition was removed and the second contest was organized. According to results of the contest, the minimum cost of a pilot 5 MW WF offered by investors was 6.214 mln euro, and electricity price of —3.73 euro/kWh including the UNDP/GEF grant in the amount of 1 mln USD. Thus, the cost of a pilot WF according to the investment proposal reached 7.5 mln USD compared to the proposed cost of 5.5 mln USD according to the UNDP/GEF Project, and the cost of electric energy from a pilot WF — 4.5 c / kW\*h;

The electricity price in the area of Dzhungar Gates was 3.7 c/kW\*h in 2006 that didn't allow selling the energy from a pilot WF considering liberalization of power energy market in 2004. In such conditions, an agreement between MEMR and investor on the investment and construction of a pilot WF was signed in 2006. According to it the obligations on energy purchase were substituted by the obligations on the part of MEMR on implementation of organizational activities securing further conclusion of a long-term agreement with the buyer of energy from a pilot WF. In the conditions of such uncertainty and lack of guarantees for selling energy, the project on a pilot WF hasn't been implemented by the investor.

At the same time, the experience on implementation of the pilot WF has allowed having a number of important lessons:

- the need for legislative support of renewable energy in the conditions of market economy, incentives on the use of renewable energy

sources and rules on purchase and sale of electricity from renewable energy sources to secure economic attractiveness of WF projects should be specified in the legislation,

- while organizing open tender on the investment of WF construction it is inadvisable to limit the marginal cost of electricity generated by WF, since this may lead to negative outcomes of the tender. While selecting investor, it is reasonable to pay more attention to the qualification and experience of investors when their proposals are being considered. Lack of the experience in the implementation of WF projects on the part of the investor also may lead to negative outcomes.

- in the conditions of weak legislative framework on the support of RES, the success in the implementation of pilot project will depend on government support including financial assistance to secure economic attractiveness and reduce the risks for investors in the project implementation,

It should be emphasized that role of a pilot WF is important in terms of reduction of investment risks in future WF projects. So, lack of experience in the construction and operation of pilot WF didn't allow tackling such important issues as: transportation of large-size wind turbines to a construction site, experience in the installation of wind turbines and connecting of a WF to the grid, experience in development of long-term power purchasing agreement, experience in WF operation and experience in balancing and dispatching. These issues remain to be urgent for wind energy development in Kazakhstan.

## 5 Lessons Learned

### 5.1 What was Learned



The embankment of the Esil river,  
photo by S.Orymbayeva

Lessons learned during the course of this Project may be considered in terms of the type of barriers that the Project sought to address. The barriers identified at the outset of the Project were, in general, those that did, in fact, require addressing. However, a number of barriers proved to be more complex and intractable than anticipated e.g. the lack of a power purchase support scheme. This means that further assistance is required to remove them. The momentum developed by the Project, especially concerning the adjustment of the RES Law, must be maintained.

A holistic approach to removing barriers is required, with one goal i.e. the reduction of commercial risk to a level that stimulates investment in the market. These barriers are not unique to Kazakhstan. They have been experienced and tackled, to a greater or lesser extent in many of the successful wind energy markets. The bottom-line is a need for investor and developer confidence that they will get an adequate return on their investment.

### 5.2 Awareness, Information and Capacity Barriers

- There is an appetite amongst national and international developers for wind energy projects with the right risk profile and awareness that Kazakhstan is an exciting, emerging wind energy market.
- There is a perception internationally, despite enormous change in recent years, of informal barriers to trade in Kazakhstan. This perception has meant that some international wind energy developers have not yet considered the market.
- There is no substitute for actual project development experience to determine the most important barriers to development.
- The logistics surrounding the delivery of turbines to sites in Kazakhstan has been identified as an unexpected barrier. International turbine suppliers should be consulted with in an effort to determine possible shipping, road and rail options as well as delivery costs.

### 5.3 Financial Barriers

- Wind energy in Kazakhstan must be supported by a sufficiently high (at least 15 US c/kWh) long-term feed-in-tariff in order to support its development in a market with such low wholesale electricity prices.
- Developers will not be able to attract funding, on a commercial basis, for wind energy projects in Kazakhstan that are not backed by a Government supported and enforced feed-in-tariff, of sufficient value, that is seen to be permanent and bankable.
- The approach taken to removing barriers or mitigating their negative impacts should be one that aims to facilitate a real commercial basis for developments i.e. stable, repeatable legislation,

properly implemented and enforced is far superior to once-off acts of support by Government.

- Wind farms will be developed in Kazakhstan as soon as a risk-reward balance acceptable to a credible investor/developer has been arrived at. At all times, the need for investors to justify their decisions by means of a commercial model must be borne in mind. Anything that prevents a commercial basis for projects is a barrier that needs to be tackled.

#### **5.4 Institutional Barriers**

- Long-term policy and legal certainty is essential to attracting wind energy developers and investors.
- The delay in formally approving the National Wind Energy Programme is reducing confidence in the sector within Kazakhstan and amongst international investors.
- Realistic targets are essential for the Programme to gain traction. Given the time required for project development, the 2015 target of 250 MW may need to be revised.
- The timeframe for developing projects from beginning to financial close (when all contracts are in place and construction can commence) can be lengthy even in mature wind energy markets due to application processes, wind resource assessment and environmental impact assessment. No project has yet completed this process in Kazakhstan. This fact, the lifespan of projects and the significant finance involved reinforces the need for long term certainty in policy, legal and regulatory aspects.
- Investors and developers are very risk averse and are not keen to spend significant sums before a clear commercial case can be made. This has meant that the current method of agreeing a feed-in-tariff following a substantial feasibility study has not been a success.
- Kazakhstan is fortunate to have a very good wind resource, a cohort of technically proficient professionals and experience of large infrastructure projects. However, without an appropriate legal and regulatory regime that provides commercial certainty, the wind sector will falter. The characteristics of such a regime should include:
  - o Fixed feed-in-tariff for a minimum of 15 years duration at not less than 15 US c/kWh available via PPA to wind developers
  - o Firm targets in National Wind Energy Programme enforced by political support
  - o Legal enforcement of rights of developers to connect to grid via their local REC
  - o No unnecessary or unexpected delays at any stage of the permitting process



## 5.5 Experience of First Wind Farm Project Development

One of the objectives of the Project was to facilitate the construction of the first pilot wind farm project(s) in Kazakhstan. This was originally expected to be a circa 5 MW wind farm in the Djungar Gate region. This objective has not been achieved as a result of structural changes in the Kazakhstan electricity sector which led to a reluctance on the part of certain RECs, in a new commercial reality, to shun the risk and extra expenditure associated with wind energy. In the absence of a clear, government guaranteed support scheme, this led to the pilot project being rendered not commercially viable due to an unclear revenue stream.

Some lessons learnt from this aspect of the project are:

- There is an argument that the original scope of the Project would appear to have been overly ambitious. In retrospect, either a project breakpoint should have been inserted at some stage allowing for the construction of the pilot project as a separate (optional) phase or the pilot project left as an entirely separate project. Project team believes that, in fact, the work undertaken (and still being done) to develop a first, pilot project was worthwhile because it focused attention on the very barriers and roadblocks that needed to be removed.
- The Project funds made available by the non-completion of the pilot project were redirected to good effect in supporting work on fundamental aspects of policy, legislation and capacity building.
- A significant amount of commercial interest and project know-how has been developed as a result of the work undertaken to establish a pilot project. This has not been lost despite the wind farm not being completed.
- In conclusion, it was correct to fund the development phase of the pilot wind farm, but funding should not have been committed, at the beginning of the project, to project construction.

## 6 Future of Wind Energy in Kazakhstan

### 6.1 Conclusions

I discovered the wind project in 1998 when started working for UNDP projects on energy and climate change in Kazakhstan. Later it became my basic field of work for many years. By that time I have already had 20 years of work experience in energy sector. What has changed in promotion of wind power project in Kazakhstan after more than 10 years of UNDP intervention in Kazakhstan? Let me analyze some of the key conditions for wind power development in the country before and after project implementation.

Prior to the UNDP/GEF Project:

1) There were no reliable wind data to motivate construction of wind farm as well as assessment of wind potential in Kazakhstan and integration of wind energy into the power system. Therefore the absence of these data appeared to be a barrier for development and adoption of wind energy programs and stopped investors to start construction of wind farms in Kazakhstan.

2) In the very beginning of the Project Kazakhstan did not have formally identified the need for use of wind power in the system of energy supply. In 1999 Kazakhstan adopted the Program of power development until 2030 which provided for the possible construction of 520 MW capacity wind farm starting from 2005. However, these intentions and plans were declarative by nature and didn't aim to achieve national goals in energy sector or to reduce green house gases emissions. These plans remained unfulfilled. The position of Kazakhstan in Kyoto Protocol at that time has been uncertain as Kazakhstan has not ratified it.

3) At the time the legal framework to support the use of renewable energy sources in the country was represented by the Law on “Energy saving”, 1997 and “On Electric power industry”, 2004. The necessity and priority for development of renewable energy was declared under these laws however, there was no specific regulatory mechanisms to support renewable energy.

These conditions have been changed by the completion of the Project:

1) Wind data base on 15 perspective sites was recorded. The Kazakhstan Wind Atlas has been prepared. These data show the presence of significant wind resources suitable for energy production at wind farms. Data are freely available for investors and developers of wind farms to inform their analyses. The wind potential and the possibility for its use as well as

the analyses of wind power integration in the energy system of Kazakhstan have been assessed. All the outcomes of these studies show that there is a possibility for the large-scale commercial use of wind energy in Kazakhstan.

2) Kazakhstan ratified Kyoto Protocol in 2009. The country joined Appendix 1 and declared of its commitment to reduce GHG emissions by 15 % by 2020 and by 25% by 2050. A National Wind Energy Program for Kazakhstan to 2015 with a perspective until 2030 was prepared by the Project in 2008. The objective of the Program is to achieve a target of 250 MW wind energy capacity by 2015 and 2000 MW by 2030. There is a commitment under the Programme for Acceleration of Industrial and Innovation Development 2010-2014 to achieve 125 MW of wind energy capacity by 2015.

3) In 2009 Kazakhstan adopted the Law “On support of using renewable energy sources”. This law provides specific mechanisms to support the use of renewable energy in Kazakhstan. Thus, there is a significant progress in establishing necessary conditions for wind power market development in Kazakhstan. And great contribution to that progress has been made by the joint project between the Government of Kazakhstan and UNDP/GEF. As a result currently there are several projects of about 300 MW of wind capacity.

In summary I would note that Kazakhstan has all the opportunities and the need for large-scale wind power development, and this process is already underway. However, the success of this initiative still much depends on removal of remaining barriers in legal framework as well as adoption of long-term targets for wind power.

**Gennady Doroshin**  
**Technical Advisor of the Project**

The following major achievements in developing the wind energy market in Kazakhstan have been made in the course of the Project

- A National Wind Energy Programme with targets for 2015 and 2030 has been drafted
- The RES Law and supporting Rules have been prepared and enacted
- A wind measurement program has been carried out and an excellent Kazakhstan Wind Atlas has been developed and made freely available online
- Prefeasibility studies have been carried out at 10 sites
- The project website [www.windenergy.kz](http://www.windenergy.kz) has been established and continues to be updated with information
- An analysis of the power system in Kazakhstan has been carried out by international consultants in 2011 to remove any doubt about the capacity of Kazakhstan’s system to accommodate 2000

MW wind power by 2030

- An analysis of the legal and regulatory environment for wind energy was carried out in 2010 by an international consultant and its recommendations presented to Government
- Technical support has been provided to several interested developers and investors to develop up to 7 wind farm projects. A number of these are continuing
- Many of the original barriers to wind energy development have been addressed, a number do remain to be resolved however
- The Project has been a success in that it has made the prospect of a successfully functioning wind energy development sector in Kazakhstan a real one. Prior to the Project, this looked unlikely, today it is a question of when, not if, the first wind farms will be developed in Kazakhstan

As a result of the Project, the following conclusions may be made concerning the future development of the wind energy market in Kazakhstan:

- There is, undoubtedly, an attractive wind energy resource in the country
- Given the nature of the economy and standard of education and training, there exists the technical capacity to develop, operate and maintain wind farms in Kazakhstan. The involvement of external experts in the first several projects would be advantageous to ensure best practice and efficiency
- A certain and sufficient level of financial support (ideally by means of a fixed feed-in-tariff) is essential to make projects commercially viable and capable of attracting support from investors.
- Government is a prime mover in the development of the market; it should continue to actively support the development of the market by means of establishing appropriate targets, supporting legislation.

## 6.2 Recommendations

Recommendations for the future development of wind energy in Kazakhstan must focus on removing the remaining barriers faced by commercial developers. The question must be asked – what is missing that would help unlock the potential of the sector? As a result of the work undertaken during the course of the Project and considering the current status of the wind energy industry in Kazakhstan and elsewhere, the following recommendations, for Government, developers and project donors, are made:

### For the Government of Kazakhstan

- That the National Wind Energy Programme be formally approved and promoted by Government as a clear statement of intent and as guidance to all state agencies and potential developers

- A fixed feed-in-tariff for a fixed period of time should be made available to wind farm developers rather than continuing the status-quo of negotiating a feed-in-tariff following a feasibility study as per the current RES Law
- The Government should consider how, in addition to the feed-in-tariff, it can accelerate the development of the wind farm projects. This may be done by empowering state or semi-state organisations or companies to invest in early projects or facilitating inexpensive lending arrangements for wind energy project
- That Government should continue to pursue means by which electricity prices can become reflective of the true economic cost of production, including replacement costs of generators and transmission and distribution infrastructure
- That Government continue to progress actions that would see the ease of doing business in Kazakhstan (especially in the areas of trading across borders and dealing with construction permits) improved. Remembering that many investment decisions rely on sentiment and confidence as much as hard data
- That a new Grid Code be developed, as recommended by the VTT report, to address wind farms and that day-ahead forecasting be developed to facilitate planning and dispatch.

One lesson learnt is that the construction of wind parks takes a long time, especially when project having to go through a long process of tariff negotiation, obtaining permits and processes for selection of equipment and service suppliers. One should be careful therefore in linking a capacity building programme's indicator of success too much with the realization of one particular pilot project, which may be too ambitious a goal. Similarly, political decision-making is a long process. A project period of 3-5 years may simply not be enough time to cover the cycle of raising awareness, policy formulation, enacting laws and defining regulations. In the case of the Kazakhstan wind this has become clear. To really have a policy formulation impact, a series of smaller interventions over a longer period might be considered or the formulation of projects in phases in future UNDP-GEF projects.

**Jan van den Akker**  
International consultant

**Natalya Druz**  
National Consultant

(From the report on final assessment of the project)

### For Wind Farm Developers

- Developers should access the wind energy knowledge base developed by the Project to inform their development decisions

- As the wind energy market develops in Kazakhstan, developers and other interested parties should consider establishing a national wind energy association to pursue their mutual interests in an organised way
- With the proposed revision of the RES Law to include a fixed feed-in-tariff, developers should revisit commercial models and assess project viability in light of this new support
- Developers should continue to investigate likely costs based on their knowledge of related infrastructure development in Kazakhstan and relevant international price trends e.g. turbine prices
- Developers should examine turbine delivery logistics and costs at an early stage of the development process

### **For Project Donors**

- Project donors and implementation teams engaged in the promotion of renewable energy development should focus on ensuring that a supportive legal and regulatory regime is in place as an essential, and often the primary element, of renewable element policy
- That future projects in this theme are promoted as a means of, not just supporting renewable energy, but also having significant positive benefits for a country’s national economy. A good wind energy investment climate is dependent upon a good general investment climate. Improving either aspect also improves the other.

This Project was a first one in a series of UNDP-GEF supported initiatives aimed at promoting renewable energy in CIS countries. As this report has shown, development of wind and other forms of renewable energy is a complex undertaking which requires strong political will and targeted efforts from the Governments and their partners.

Renewable energy is still regarded as a very novel idea and barriers to its wider use, which this Project identified and attempted to remove in Kazakhstan, are very much alike across all transition economies. The Project and this report, therefore, offer a wealth of useful lessons and knowledge to all those interested in this exciting field.

I hope that the story of the Kazakhstan - Wind Power Market Development Initiative will encourage other countries, in particular the neighboring Central Asian states, to look at the removing barriers to renewable energy in order to harness abundant potential for green energy generation that this region possesses.

**Marina Olshanskaya**  
**UNDP-GEF Regional Technical Advisor on**  
**Climate Change, Europe and CIS**

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## **Appendix B — Kazakhstan Wind Energy Knowledge Base**

Over the course of the Project, a very significant body of data, information, analysis and know-how has been collected and developed by the Project Team. Prior to the Project, this information did not exist or was unavailable in a usable format.

One of the achievements of the Project has been to make this information available to all stakeholders, including interested developers. This knowledge base constitutes a very significant public good arising from the Project i.e. the knowledge is freely available to all, required or desired by developers but would, most likely, not have been produced in the absence of a development initiative such as the Project.

Below is a list of information and documentation that make up the Kazakhstan Wind Energy Knowledge Base.

### Website

- [www.windenergy.kz](http://www.windenergy.kz)

### Wind Resource Data and Tools

- Kazakhstan Wind Atlas <http://www.atlas.windenergy.kz/>
- 12 months plus of wind data and location mapping for the following sites ([http://www.windenergy.kz/rus/pages/tech\\_info.html](http://www.windenergy.kz/rus/pages/tech_info.html)):
  - o Arkalyk
  - o Astana
  - o Atyrau
  - o Ermentau
  - o Karkaralinsk
  - o Kordai
  - o Shevchenko
  - o Zhuzhumdyk
  - o Chilik Corridor
  - o Jungar Gate
  - o Agadyr
  - o Borovskoe
  - o Karateren
  - o Badamsha
  - o Kuryk

### Reports

- Power system assessment for wind energy development in Kazakhstan
- Innovative Financing for RE Projects in Kazakhstan
- Effective legal and regulatory framework for the support of wind energy in Kazakhstan
- Prospective of Wind Power Development in Kazakhstan
- Wind Monitoring Programme for Kazakhstan
- Information Guide for Investors and Developers

### Site Specific Information

- Jungar Gate Estimate of Wind Speed and Energy Prediction
- Pre-feasibility reports for the following development sites:
  - o Astana
  - o Arkalyk
  - o Ermentau
  - o Fort Shevchenko

- o Karabatan
- o Karkaralinsk
- o Kordai
- o Zhuzumdyk

Relevant Legislation developed over the course of the Project

- National Wind Power Development Programme
- RES Law
- Rules for the Purchase of Electricity
- Rules for Connection to the Grid
- Rules for Monitoring RES
- Rules for Considering Feasibility Studies

## ***Appendix C — The Fundamental Elements of Successful Wind Energy Policy***

### **The Fundamental Elements of Successful Wind Energy Policy**

Wind energy policy should

- be consistent, credible, predictable and not unduly complex
- give clear price and risk signals
- have strong political support with legal penalties for non-compliance
- reduce the number of permits, licences or approvals necessary to a minimum
- eliminate all unnecessary delays and reduce waiting times to a minimum
- ensure access to the electricity network to generators at a reasonable, predictable cost and without undue delay
- provide revenue support to projects by means of a clear, long-term, sufficient support scheme based on electricity output (e.g. a fixed feed-in-tariff)
- give unambiguous guidance on land-use and planning issues relating to wind energy
- guarantee private property rights and promote investor confidence
- foster social acceptance of wind energy