

*Joint Economic Research Program (JERP)*

**Kazakhstan: Nationwide assessment of climate-change related risks  
and formulation of mitigation strategy**

**Policy and Institutional Directions for  
Bolstering Climate Resilience  
in the Agriculture, Forestry and Energy Sectors**

**Policy Note**

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## I. Background

The government of the Republic of Kazakhstan (GoK) has engaged the World Bank under a Reimbursable Advisory Services (RAS) agreement to better understand climate risks, in different oblasts of the country and different sectors of the economy, and develop effective policy responses. This effort includes two components:

- Mapping climate-related vulnerabilities in Kazakhstan (KZ) to identify “hotspots” to prioritize specific sectors or geographic areas particularly at risk; and
- Reviewing Kazakhstan’s sector and regional strategies/action plans in light of the most significant climate change risks in the coming decades to identify gaps and needs for building climate-resilience and prioritize climate-smart measures for effective and scaled-up response.

The task is planned to span several years but only resources to June 2015 are so far confirmed. As a result, it was agreed (as recorded in Terms of Reference signed with counterpart) to follow a phased approach. In the period till the end of June 2015, work would consist of piloting approaches with limited sectoral and geographic scope, to be followed by broadening and scaling-up in Fiscal Year 16 and beyond (for example further work on vulnerability indicators and more detailed analysis of specific climate risks by sector and locale) based on further discussion with counterpart.

This report comprises the FY15 deliverable under the second component, and is focused on a review of the agriculture and forestry sectors along with adaptation-related aspects of the energy sector. Those are the primary support areas for the Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB), a regional program on climate action. This ensures the present assessment informs CAMP4ASB activities in Kazakhstan. The primary client for the review is the Climate Change Department within the Ministry of Energy.

During an April 2015 mission, agreement was reached with the Client that the output would be a Policy Note outlining the most critical climate risks in coming decades, possible climate-smart measures for reducing these risks, and a review of how current GoK strategies and action plans address these issues. Regarding format, it was agreed that the Note would be succinct, focused at the management level, and would center around summary matrices of projected major impacts and possible mitigating approaches. The Government also expressed interested in learning from experience in other countries, including Bank clients. The findings and recommendations of this Policy Note are expected to be of particular importance to line Ministries that are required by the Government of Kazakhstan’s Green Economy Concept and Action Plan to incorporate resilience in their efforts, but lack the knowledge and tools on how to accomplish this task.

Following the presentation of this draft report at a workshop in mid-June 2015, and final edits thereafter, the effort (pending programmatic and budget considerations in FY16) could expand in several ways, for example: reviewing additional sectors, further tailoring of recommendations at the sub-national level, and/or carrying out a climate change/green growth public expenditure review. These options would reflect the parallel work in the vulnerability-mapping component

of this RAS, and the evolving Central Asia regional climate program supported by the World Bank<sup>1</sup>.

## II. Approach

Through discussion with the Client, other Kazakh specialists, review of mission preparatory materials, and conversations with World Bank task teams on mission in April, the set of most applicable GoK strategies, plans, and concepts were identified (see Table 1). These include broad coverage of climate adaptation and green growth, and more specific coverage of the three sectors. Each of the documents reviewed has significance as an expression of policy even if there are differences in influence on the budgetary process (as noted conceptually in **Figure 1**<sup>2</sup>).

**Table 1: Major GoK Policy Documents Reviewed**

| Policy Document                                                                                                                                                                                                                                                                                                                                                                          | Date                                                                                                                | Timeframe                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b><i>Strategy Kazakhstan 2050 (Strategy 2050)</i></b><br>Recognizes 10 global challenges (including water shortages and challenges to agriculture and traditional energy sources), and aims for KZ to join the ranks of the top 30 developed countries in the world by 2050.                                                                                                            | December 2012<br>(Address by the President of KZ)                                                                   | Providing a vision to 2050                                                                         |
| <b><i>Concept of the Republic of Kazakhstan transfer to the Green Economy (GE-C)</i></b><br>Sets quantitative and qualitative goals and targets for water, agriculture, energy efficiency, power, air pollution and waste recycling for 2020, 2030, and 2050. Includes background information, investment needs and benefits.                                                            | May 2013<br>(Decree of President of KZ no. 557)                                                                     | Overall sector goals for 2013 -2050                                                                |
| <b><i>Action Plan to Implement the Concept of the Republic of Kazakhstan transfer to the Green Economy 2013-2020 (GE-AP)</i></b><br>Lays out 119 specific activities within 12 overall topics (from institutional support through pilot projects) including, for each, deliverables, responsible parties, implementation period and projected annual budgets.                            | August 2013<br>(Resolution by Prime Minister of KZ)                                                                 | Activities largely set for 2013-2015 but in alignment with Concept goals to 2050                   |
| <b><i>Draft National Concept on Adaptation to Climate Change</i></b><br>Summarizes KZ climate trends and projections, general risks, and regional vulnerability; provides narrative recommendations for bolstering resilience policy directions including basic implementation mechanisms, financing, and monitoring results.                                                            | December 2010 Draft<br>(Prepared by UNDP with GoK engagement but not formally adopted)                              | Narrative recommendations; implied to boost resilience to mid-21 <sup>st</sup> Century and beyond. |
| <b><i>Program and Action Plan Energy Efficiency to 2020 (EE 2020)</i></b><br>Provides detailed sector context (including SWOT analysis for advancing energy conservation and efficiency); provides aspirational targets at sub-sector level); sets 137 specific activities, including for each: deliverables, responsible parties, implementation period and projected annual budgets. . | August 2012<br>(Program set by Prime Minister; details on Action Plan by Ministry of Industry and New Technologies) | Actions to 2020                                                                                    |

<sup>1</sup> In particular, the CAMP4ASB; see <http://www.worldbank.org/projects/P151363?lang=en>

<sup>2</sup> Figure courtesy of Vadim Ni, Chair, Ecoforum of NGOs in Kazakhstan, Almaty

| Policy Document                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Date                                                           | Timeframe                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b><i>Law on Energy Efficiency of Kazakhstan</i></b><br>Establishes basic responsibilities for GoK, implementing entities, other entities; general requirements (and exemptions) for EE investments and audits; compliance mechanisms; other operational matters.                                                                                                                                                                                                                            | January 2012 (amended in January 2015)                         | No end date per se; provisions in force until amended, expired or replaced.                                   |
| <b><i>State Water Management Program (strategic vision to 2050) (SWMP)</i></b><br>Summary of sector context and establishment of steps to meet target indicators for water set in the Green Economy Concept                                                                                                                                                                                                                                                                                  | Approved in April 2014 (decree of the President of KZ no. 786) | Mostly indicators to 2020 but assumed to be commensurate with directions to meeting targets to at least 2040. |
| <b><i>Agro-Industrial Complex Development of the Republic of Kazakhstan for 2010-2014 and Agribusiness 2020 (Agribusiness 2020)</i></b><br>Provides sector context, general plans and 80 specific actions for increasing the competitiveness of agricultural producers through financial assistance, improved market access, better government response, further subsidies and loans. Some links to better land management and crop diversification though few actions highlight resilience. | February 2013 (Resolution of the GoK #151)                     | Two stages; 2013-15; 2016-2020.                                                                               |
| <b><i>Program of Development of Forest Sector of Kazakhstan Economy (Forest Program)</i></b><br>Overview of sector, including SWOT analysis of physical and institutional needs to reduce risks from forest fires and pests, increase forest productivity and cover, etc..                                                                                                                                                                                                                   | Draft (early 2015)                                             | Generally to 2020; some to 2030/                                                                              |
| <b><i>Action Plan for the Development of Forest Sector of Kazakhstan Economy</i></b><br>List of 171 actions to implement the Forestry Program. Addresses forest conservation and expansion as well as improving productivity and biodiversity; including for each activity deliverables, responsible parties, implementation period and projected annual budgets.                                                                                                                            | Draft (early 2015)                                             | Activities to 2020                                                                                            |

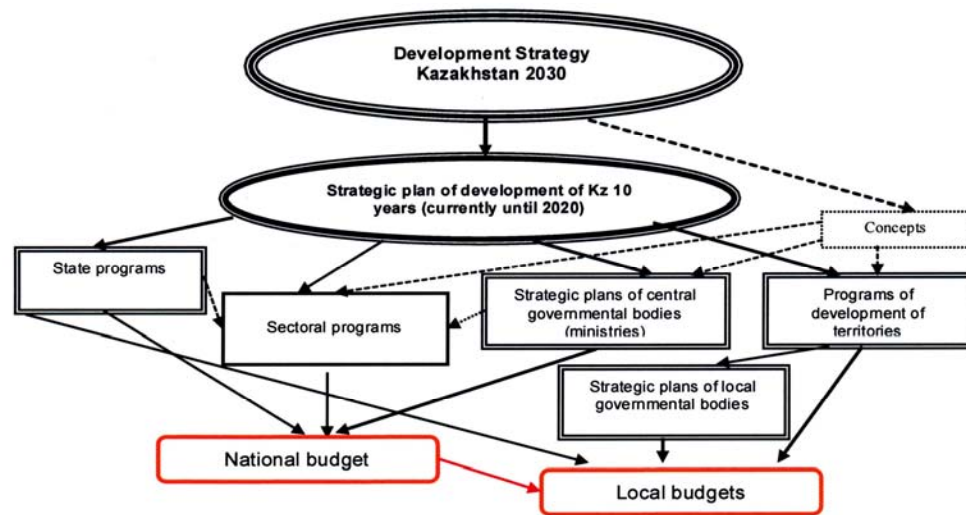
The first task after the April mission was to review the literature on projected climate impacts and mitigating approaches that have been or could be considered for Kazakhstan. The most recent Kazakhstan National Communications to the UNFCCC provides a full discussion on impacts, and is complemented by numerous other references cited at the end of this report (including an informational overview of projected climate risks, national strategies and development partner engagement prepared by the World Bank in 2013)<sup>3</sup>.

To array key impacts and mitigating measures, as well as the linkages to GoK strategies and policies, detailed matrices were assembled (shown as Tables 3 through 5). Each is structured to address five topics: (i) a summary from reviewed literature of the major projected impacts of climate change on the sector, (ii) a set of explanatory key factors on the sector or country context, (iii) up to 6 sets of response options cited in the literature that are good candidates for mitigating impacts and enhancing resilience, (iv) a review of how the projected impacts and

<sup>3</sup> See Ministry of Environment and Water Resources of the Republic of Kazakhstan (2013) and World Bank (2013a) in References.

response options are addressed in the GoK strategies, plans and concepts reviewed, and finally (v) initial recommendations to set the stage for further discussion and next steps.

**Figure 1: Organigram of Policy Documents and their Linkage to Budgetary Funding from the National and Local Budgets**



*Width of arrows and lines are indicating the importance of policy instruments for budgetary financing*

*→ Transfers from the national budget to local budgets for specified purposes*  
*- - - Indirect budgetary financing*

Senior Bank technical staff in each sector provided the first stage review of the matrices. Subsequent review will be carried out in and around the mid-June workshop with the Client as well as other Kazakh experts and development partners.

### III. Overall Findings

In keeping with the goal of this Policy Note, and especially its focus on management level engagement, a set of major working-level observations and findings are outlined below as a point of departure for workshop discussions. The relevance of GoK national/sector strategies to each item is displayed as relevant, with details provided in Tables 2,4, and 5. The first three observations are tied to the sectors, whereas the remaining observations are crosscutting.

#### **Sectoral Findings: Agriculture**

*There is clear consensus that the most significant risk to agriculture is the potential for continued or worsening reductions in yield of spring wheat as the temperature warms and precipitation patterns shift over the coming decades. Impacts to other crops as well as on*



*livestock will be appreciable. Kazakhstan's policies at the sector level do not reflect this understanding and could use bolstering to address the challenges.*

- While agriculture contributes around 5% of Kazakhstan's GDP, the sector provides jobs for one-third of the country's work force. The country is a global leader in wheat production, but also has among the highest variation in annual yields of any major wheat-growing region globally due to widely varying climate, especially drought. Production of other cereals, vegetable crops and livestock (meat and wool) are important for the domestic economy and rural livelihoods.
- Although rising temperatures in the coming decades could initially mean higher productivity, a projected shift in Spring/Summer precipitation suggest less available soil moisture during the critical growing season. Droughts are already a major problem in Kazakhstan affecting up to 66% of the country's land and could become more prevalent with climate change (World Bank, 2014). Spring wheat yields may drop from current levels to as low as 63% by 2030, and 52% by 2050, unless adaptive measures are taken. As noted in the references and Table 6, Kazakhstan along with a number of development partners, has looked in depth at wheat production given the crop's current and historical significance in the agricultural economy and rural employment.
- A number of recommendations are under consideration to improve productivity and farmer income over the coming 5-15 years, which will be helpful for bolstering longer-term resilience. Further scenario development, taking into account for example future climate projections by agro-ecological zone, can be a useful addition to shape policies for the longer term. An example of such an approach for Uzbekistan is shown in Figure 2. One uncertainty surrounds the possible role of carbon dioxide "fertilization" in helping boost productivity as the climate warms modestly, counter-balanced by concerns that warming in Kazakhstan could exceed any beneficial threshold (say to 3 degrees Celsius) sooner than other wheat growing regions, making Kazakhstan a future hotspot of heat stress for wheat production (World Bank, 2014).
- Cotton and rice production, while less dominant in the sector, does face productivity challenges now and will do so even more in the future. While expanded irrigation would be of benefit to mitigating shocks and shortages, overall water availability in many basins is projected to become even more problematic in the decades ahead. Regarding livestock production, restoration of already degraded (and degrading) pastureland cannot keep pace with the current situation and needs to be accelerated in the coming decades. Reliance on small farms in this sub-sector, however, is helpful as these farmers are historically more nimble in adapting to change by diversifying production and management methods.
- The KZ Green Economy Concept and Action Plan calls for more resilient agriculture, and recognizes the critical linkages between crop production and water use efficiency. Sets of targets to 2030 are introduced, for example: (i) downsizing wasteful furrow irrigation from 80% to 5% of applied land; (ii) reducing the area of cotton and rice production by 20-30% (and replacing with less water-intensive vegetables, oil seeds and other crops), and (iii) a three-fold reduction in transportation losses through irrigation system rehabilitation. These goals are very positive, and there are annual targets in the Action Plan for irrigation system rehabilitation in the near-term.

**Table 2: Summary of Projected Major Climate Impacts and Response Approaches: Agriculture**

| Major impacts                                           | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Selected response options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Major reduction in yields of spring wheat through 2050. | <ul style="list-style-type: none"> <li>Wheat is most important agricultural commodity for Kazakhstan (average \$1B US exports; grown on 85% of KZ area planted in cereals.)</li> <li>Productivity (tons/hectare) already below international norms under current conditions.</li> <li>Major droughts (8 over period 1985-2013) are already the most important shock to aggregate output.</li> <li>Rising temperatures combined with lower precipitation in Spring/Summer means less soil moisture during critical growing season.</li> <li>KZ research suggests yields may drop to as low as 63% by 2030 and 52% by 2050 unless adaptive measures are taken.</li> <li>Increase in extreme meteorological events (very heavy precipitation, strong wind and dust storms, etc.) damages crops.</li> <li>Water availability and costs constraints are generally expected to limit expansion of irrigation; wheat is likely to remain as a rain-fed crop through coming decades..</li> </ul> | <ul style="list-style-type: none"> <li>Consolidate wealth of expert recommendations for advancing climate-resilient approaches<sup>4</sup>.</li> <li>Continue overall sector improvements to bolster productivity and resilience (no-till farming; optimization of equipment and methods; optimization of subsidies; improvement in grain storage and transport; increase specialist knowledge, etc.)</li> <li>Broadening and strengthening use of conservation agriculture for cereal crops in northern KZ is critical for reducing risks and taking advantage of longer projected growing season.</li> <li>Expand agricultural research on both sub-national impact prediction and response (e.g. drought tolerant wheat varieties; wheat species and shifts to other cereals.)</li> <li>Bolster crop insurance systems (albeit more near-term concerns)<sup>5</sup></li> </ul> | <ul style="list-style-type: none"> <li>Green Economy Concept and Action Plan recognizes the importance of improving water efficiency in agriculture, with overall targets and a call for pilot projects to be launched in 2014.</li> <li>Agribusiness 2020 builds on the overall sector targets and includes a good discussion of the factors that have impeded crop and livestock production. Some narrative links to resilience (e.g. need for greater crop diversification, increased yields per hectare, and attention to land degradation.)</li> <li>Addressing climate-related risks is not shown as a clear priority, few of the 80 listed actions have any substantial link to resilience issues, and there is no strong call for assessing needs beyond 2020.</li> <li>Some Agribusiness 2020 targets and objectives could conflict with resilience (or need to be explained more clearly), for example increasing subsidies to expand use of fertilizers and pesticides, and increasing irrigation subsidies (without a tie to more efficient technologies).</li> </ul> | <ul style="list-style-type: none"> <li>Need to augment policy documents to reflect conditions beyond 2020, as most impacts on agriculture will be felt then.</li> <li>Need to assess whether proposed GoK subsidies to farmers discourage or encourage sustainable farming.</li> <li>Need to assess whether increased use of mineral fertilizers and pesticides may conflict with other environmental goals.</li> <li>Re-emphasize need for improved research on climate-related issues (e.g. crop diversification, plant breeding, drought resistant crops).</li> <li>Need for monitoring and reporting to assess progress on ambitious water saving goals.</li> <li>Consider recommendations from forthcoming Agricultural Risk Assessment report.</li> </ul> |

<sup>4</sup> See World Bank, 2015(a); cited in References)

<sup>5</sup> See the *Kazakhstan Agriculture Insurance Feasibility Study* for a thorough treatment on this topic (World Bank, 2012(b); cited in References)

| Major impacts                                                                                                             | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Selected response options                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                                                            | Recommendations                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>Suggestions to bolster agricultural research do not specifically target better understanding and mitigation of climate risks.</li> </ul>                                                                                                                                   |                                                                                                                                                                                                                        |
| <p>More varied shifts in productivity of other grains and crops</p>                                                       | <ul style="list-style-type: none"> <li>Cotton and rice production will also be negatively impacted by projected changes in climate; the latter exacerbated by water availability challenges.</li> <li>Irrigation more commonly used than for wheat but highly inefficient (including losses of 2/3 abstracted).</li> <li>Potato and tomato production less drought-prone as they are grown in more favorable agro-climatic zones in the south and southeast.</li> </ul>                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Increase water efficiency for irrigated crops – reduce transport losses and introduce water saving technologies.</li> <li>Limited, targeted expansion of irrigation systems (assuming cost effective and resources available).</li> <li>Expand agricultural research into drought tolerant oil seeds and pulses.</li> <li>Responses similar to wheat for overall sector improvement, including possible shift to crops with lower water use.</li> </ul> | <ul style="list-style-type: none"> <li>Comments above apply here</li> <li>State Water Resources Management Program provides comprehensive overview of problem and ambitious targets (years 2020 and 2040) for loss reduction, introduction of more efficient technologies, removal of subsidies, etc..</li> </ul> | <ul style="list-style-type: none"> <li>Similar comments as above.</li> </ul>                                                                                                                                           |
| <p>Deterioration of pastures with potential for reduction in sheep and beef cattle production in certain areas of KZ.</p> | <ul style="list-style-type: none"> <li>Livestock production most important in southern steppes and semi-arid regions. Generally less vulnerable to climate shocks than wheat or cereal production.</li> <li>An 80% drop in forage crop acreage since 1992 has increased risks associated with livestock production.</li> <li>Yields of forage crops are already below international norms under current conditions. Limited irrigation and highly inefficient.</li> <li>More favorable winter weather in the south will allow additional pasturing days, but extremes in winter could occur more frequently, and animal health will be of concern during hotter summers.</li> </ul> | <ul style="list-style-type: none"> <li>Continue overall sector improvement (e.g. reduced land degradation; pasture rotation) since overall total national impact is projected to be modest given balancing of stresses.</li> <li>Further research and elaboration of projected impacts given varying positive and negative factors; geographic variability of impact.</li> </ul>                                                                                                               | <ul style="list-style-type: none"> <li>Green Economy Concept mentions the need for improving utility and production of degraded lands.</li> <li>Agribusiness 2020 describes market-related risks but very little on climate</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>Similar comments as above.</li> <li>Clarify long-term targets for land restoration and pasture/fodder improvement -- both on hectare totals and geographic coverage.</li> </ul> |

| Major impacts                                                                      | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Selected response options                                                                | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                         | Recommendations                                                                                                                                     |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                    | <ul style="list-style-type: none"> <li>• Areas of degraded natural foraging land (hay fields and pasture) will be further negatively impacted by climate change.</li> <li>• Projected impacts on pasture plant yields vary; greatest in mountain area Zailiylisi Alatu (Assy).</li> <li>• Most livestock production in South and Southeastern KZ with smaller herds and reliance on pastoral farming systems. These farms have a greater ability to adapt and hence be resilient to impacts.</li> </ul> |                                                                                          |                                                                                                                                                                                                                                                                                |                                                                                                                                                     |
| <p>Increase in pests/locust population and proliferation of zoonotic diseases.</p> | <ul style="list-style-type: none"> <li>• Agriculture production is at an overall greater risk in the coming decades as temperatures warm and habitat for pests change.</li> </ul>                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Increased surveillance and response.</li> </ul> | <ul style="list-style-type: none"> <li>• Agribusiness 2020 stresses need for better monitoring of spread of dangerous organisms (phyto-sanitary safety) and need for control of diseases in animals. Assumed response to the former means higher use of pesticides.</li> </ul> | <ul style="list-style-type: none"> <li>• Bolster attention to proactive basic surveillance for spread of agricultural pests and disease.</li> </ul> |

**Table 3: Selected KZ Development Partner Activities Addressing Resilience**

| Sector/key impact                                          | Selected response option                                                                                                     | Development partner - current/proposed activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Agriculture</b>                                         |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Reduction in yields of spring wheat                        | Overall sector improvement; broadening of conservation agriculture; expanded agricultural research; bolstered crop insurance | <ul style="list-style-type: none"> <li>• WB Second Irrigation and Drainage Improvement Project (A)</li> <li>• WB National Agriculture Sector Risk Assessment (ongoing study)</li> <li>• WB CAMP4ASB (regional climate; P)</li> <li>• WB SE Europe and Central Asia Catastrophe Risk Insurance Facility (P)</li> <li>• UNDP Technical assistance on Steppe Conservation and Management; Climate Resiliency of KZ Wheat and CA Food Security; Green Growth and Astana Initiative (A)</li> <li>• GIZ Sustainable Pasture Management in Central Asia</li> </ul>                                                                                                                                                               |
| Shifting productivity of other grains and crops            | Management options as for wheat; also improve irrigation efficiency                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Reduction in cattle production in some areas               | Reduce land degradation; pasture rotation                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Forestry</b>                                            |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Increase in fires and pests; shifts in ecological zonation | Good forest management; IPM; better surveillance and response; more robust species mix                                       | <ul style="list-style-type: none"> <li>• WB Forest Protection and Reforestation Project (A)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Other forest management challenges                         | Attention to illegal logging; expanded reforestation for multiple benefits; improve forest connectivity                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Energy</b>                                              |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Need for reductions in energy intensity of KZ economy      | Encourage energy efficiency, especially in industry, housing and communal services                                           | <ul style="list-style-type: none"> <li>• WB Energy Efficiency Project (A)</li> <li>• EBRD CAEPCO Energy Efficiency Project (A)</li> <li>• EBRD Kyzylorda District Heating (P)</li> <li>• ADB Energy Efficiency Project; Karaganda District Heating Network Rehabilitation Project (A)</li> <li>• USAID support for building EE professional network (A)</li> <li>• UNDP technical assistance on EE Design and Construction; Municipal Heat and Hot Water; Energy Efficient Lighting.</li> <li>• EU Sustainable Energy Program for Central Asia: Renewable Energy Sources &amp; Energy Efficiency (RES &amp; EE ); IFCA grant in support of EBRD window of the Kazakhstan Sustainable Energy Financing Facility</li> </ul> |
| Hydrologic impacts on hydropower plants                    | Applied research to further assess risks                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Hydrologic impacts on thermal power plant cooling          | Modified designs and operating regimes                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Other physical risks                                       |                                                                                                                              | <ul style="list-style-type: none"> <li>• EBRD Shardara HPP Modernization (A)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

- The KZ Agribusiness 2020 Program and Action Plan focuses largely on nearer term needs for bolstering the economic performance of the sector. While implementing a set of effective interventions will in theory set the stage for adapting to climate conditions projected for the middle of the century, there is little if any treatment on these points in these critical policy documents. Activities that begin to address mid-to-longer term structural needs -- such as crop diversification and research on more drought tolerant wheat varieties and cereal diversification – are either missing or not clearly noted in Agribusiness 2020. The State Water Resources Management Program does call for more basin-wide planning which can help frame needed shifts in irrigation geographically and technically.
- The GoK has worked with numerous development partners in the agricultural sector, with recent sector reports expected to be helpful for shaping resilience plans. The pending World Bank report on Agricultural Sector Risk Assessment should add significant intellectual weight to the discussion<sup>6</sup>.
- Kazakhstan has shown an ability to implement improvements in agricultural production, which should set a positive tone for moving in the direction of climate smart agriculture. The country successfully doubled the application of no-till and minimum till on cropland from 5.2 million hectares coverage in 2007 (then representing 28% of cropland area) to 11.4 million hectares coverage in 2012 (then representing 60% of cropland area)<sup>7</sup>. The benefits of conservation agriculture (continuous minimum mechanical soil disturbance, permanent organic soil cover and diversification of crop species) in setting the stage for resilient agriculture in Kazakhstan are clear though targets in Agribusiness 2020 are missing. It would be helpful to see if there are Ministry of Agriculture program documents which are stronger in this regard.
- As will be noted later, however, the analytical basis for the various end targets for agriculture productivity, water use, and land degradation are not clearly presented in the documents reviewed. It needs to be determined to what degree climate impact projections (for example at least to 2050) have been taken into account. Furthermore, despite the details of near-term budget targets in relevant KZ Action Plans, it is also unclear to what extent long-term targets are linked to annual results oriented goals and if so, whether the goals can be and/or are tracked as performance measures.
- Since research on the *“impact of climate change on agriculture is the most studied area of impacts analysis”*<sup>8</sup>, experience gained across the globe can enlighten Kazakhstan’s plans. A few international examples are presented in a later section of this report, and recent news reports point to promising international collaboration, for example on efficient drip irrigation<sup>9</sup>.

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<sup>6</sup> World Bank 2015(a) currently going through internal quality review

<sup>7</sup> References on these points include FAO (2012), M. Karabayev et.al. (2014), and OECD (2013)

<sup>8</sup> See full citation for W. Nordhaus, 2013 in References

<sup>9</sup> See, for example, the June 10, 2015 edition of the Astana Times on separate efforts with Israel and the Philip Morris company ([www.astanatimes.kz](http://www.astanatimes.kz)).

Figure 2: Example Projection of Uzbekistan Irrigated Agricultural Yields in 2040-2050 by Agro-Ecological Zone

| Scenario      | Crop         | Desert and Steppe East | Desert and Steppe West | Highlands South | Piedmont East | Piedmont Southwest |
|---------------|--------------|------------------------|------------------------|-----------------|---------------|--------------------|
| Low impact    | Alfalfa      | -2                     | -13                    | -12             | 24            | -13                |
|               | Apples       | -13                    | -23                    | -19             | 0             | -20                |
|               | Cotton       | -11                    | -19                    | -15             | -3            | -16                |
|               | Potatoes     | -11                    | -22                    | -20             | 0             | -19                |
|               | Tomatoes     | -8                     | -21                    | -18             | -2            | -14                |
|               | Winter wheat | -1                     | -13                    | -14             | 19            | -17                |
|               | Spring wheat | -9                     | -18                    | -18             | 5             | -18                |
| Medium impact | Alfalfa      | -2                     | -16                    | -15             | 1             | -17                |
|               | Apples       | -12                    | -22                    | -25             | -18           | -25                |
|               | Cotton       | -10                    | -20                    | -15             | -17           | -21                |
|               | Potatoes     | -10                    | -21                    | -24             | -16           | -23                |
|               | Tomatoes     | -9                     | 23                     | -18             | -18           | -24                |
|               | Winter wheat | -2                     | 20                     | -18             | -7            | -21                |
|               | Spring wheat | -14                    | -22                    | -28             | -13           | -28                |
| High impact   | Alfalfa      | -33                    | -28                    | -27             | -39           | -28                |
|               | Apples       | -49                    | -39                    | -43             | -63           | -42                |
|               | Cotton       | -36                    | -31                    | -25             | -49           | -32                |
|               | Potatoes     | -41                    | -37                    | -38             | -57           | -37                |
|               | Tomatoes     | -45                    | -38                    | -29             | -56           | -40                |
|               | Winter wheat | -40                    | -32                    | -31             | -42           | -43                |
|               | Spring wheat | -55                    | -41                    | -50             | -57           | -49                |

Source: Sutton et. al; 2013

Notes:

- Results shown as % change over the decade from average current yields
- assumes no effect of carbon dioxide fertilization
- does include projected reductions in available water for irrigation
- increasing yield show in green
- decreasing yields shown in progressively darker shades of orange

**Sectoral Findings: Forestry**

*Kazakhstan has made improved forest management and reforestation a key priority given the sector's importance for water management and rural livelihoods; current strategies are headed in the right direction but goals may need to be more ambitious.*

- While forests cover less than 5% of the territory of the country, recent success in creating greenbelts and parks has shown many ancillary benefits. The most significant threat to the sector is the projected increase in forest fires in the coming decades, along with damage from expanding range of pests and shifts in ecological zonation. Kazakhstan's forests

comprise two roughly equal types in terms of coverage: woodland/steppe bushes (i.e. saxaul), and clusters of trees in areas of higher moisture. Goals for increasing forest cover<sup>10</sup> have been set by government but it is unclear whether the targets, if met, would keep pace with ongoing loss in forest cover and any degradation in management. Significant expansion and connectivity of forested lands can have considerable benefits – from watershed protection, to carbon sequestration, to reduced land degradation, to greater urban livability.

- The government has recognized the need for continued attention to the basics of good forest management such as fire prevention and response, enforcement against illegal and poorly executed clearing, and improvement of parkland. The Forestry Draft Program and Action Plan recognizes the need for sector improvement, and is comprehensive in attention to problems, goals and actions.
- As with the case of agriculture, while these efforts are targeted to the year 2020, adoption of good practices should be helpful in the coming decades, though the apparent lack of projections for changes in ecological zonation during this timeframe leaves uncertainty on this point. An example approach to zonation projection is shown for Belarus in **Figure 3**.
- Currently only the World Bank is working with Kazakhstan as a major development partner on overall forest sector improvement in the near to mid-term. Growing experience in Europe on climate adaptation is one source of knowledge to shape a longer-term vision in this regard.

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<sup>10</sup> The term “reforestation” or references to “increasing forest cover” in this document means the return of trees or woodlands/bushes regardless of whether this results from natural regeneration or from planting programs (following the convention of E. Stroud, 2013).



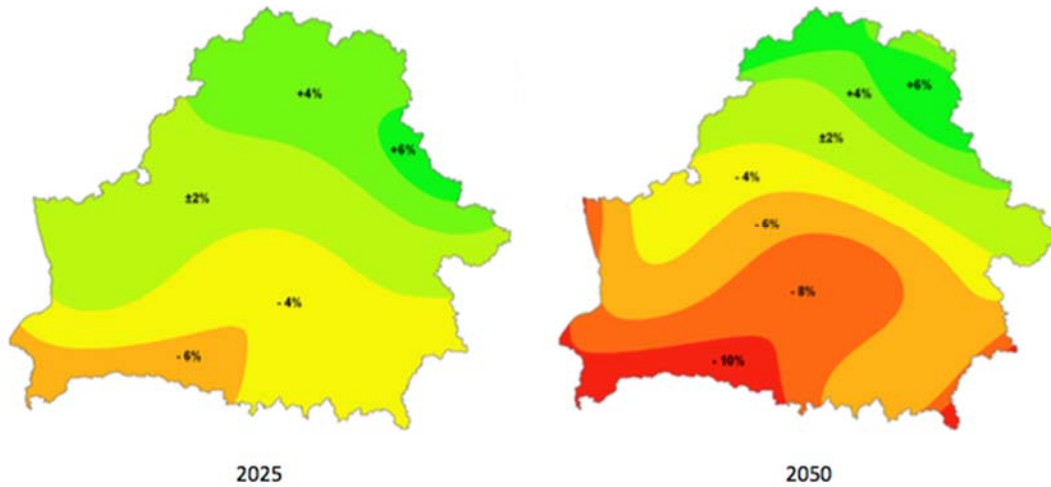
**Table 4: Summary of Projected Major Climate Impacts and Response Approaches: Forestry**

| Major impacts                                                                                                                                                                                                                                                                                                                                                                          | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Selected response options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increase in forest fires, damage from expanding range of pests, and shifts in ecological zonation due to higher temperatures and lower soil moisture.                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Unless checked, this could lead to an overall loss of forest cover with negative impacts on water resources, soil erosion and biodiversity.</li> <li>Tree growth concentrated in northern, eastern and southeastern regions; balance is woodland/bushes (saxaul); comprising half of the total forest cover.</li> <li>Reporting of impacts linked to available monitoring of hydro-meteorological conditions and disasters.</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>Continue and expand attention to good forest management, including fire prevention, monitoring, detection, and response.</li> <li>Improve silviculture systems (seeds, seedlings and plants)</li> <li>Expand attention to Integrated Pest Management</li> <li>Increased monitoring of presence of forest pests and disease.</li> <li>Research and demonstration on more robust species mix (e.g. besides saxaul monoculture).</li> </ul>                                                                                                                                              | <ul style="list-style-type: none"> <li>KZ Draft Program and Action Plan to 2020 recognizes the need for sector improvement and is comprehensive on problems, goals and actions.</li> <li>Calls for development of Forest Policy to 2050 (as more commensurate with mid-term climate risk).</li> </ul>                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Consider how expansion of forested areas on agricultural lands (including shelterbelts) can also prevent land degradation and enhance livestock production.</li> <li>Ensure that most critical elements of ambitious and thorough Action Plan are financed and mesh with planning for period beyond 2020.</li> </ul>                                                                                                                                                     |
| <p>Other forest management challenges, including:</p> <p>Illegal forest clearing and improper sanitary cutting needs attention to sustain and improve forest benefits.</p> <p>Spurring reforestation<sup>11</sup> will have numerous benefits for watershed management, carbon sequestration and prevention of land degradation.</p> <p>Urban forests and well-managed urban parks</p> | <ul style="list-style-type: none"> <li>Total forest cover of KZ (including saxaul bushes) fairly stable over last decade at around 4.6% of total land area. Area of long bore trees far lower (1.2%); and unfortunately mostly low density and discontinuous.</li> <li>Reforestation is on an upward trend since year 2000; reached annual rate of 27,700 hectares per year in 2012. Unfortunately at present does not keep pace with forest cutting and clearing .</li> <li>Very good progress on developing greenbelt around Astana (70,000 hectares).</li> </ul> | <ul style="list-style-type: none"> <li>Assess how climate trends and projections beyond 2020 would impact viability of reforestation goals (species; geographic coverage).</li> <li>Continue and expand attention to good forest management, including combatting illegal logging.</li> <li>Reinforce public awareness and adoption of community forest management for multiple benefits,</li> <li>Target greater connectivity of disparate forest segments.</li> <li>Seek opportunities for emphasizing benefits for carbon sequestration.</li> <li>Ensure that increased goals for forest production (fuels and</li> </ul> | <ul style="list-style-type: none"> <li>KZ Draft Program and Action Plan to 2020 recognizes the need for sector improvement and is comprehensive on problems, goals and actions.</li> <li>KZ forestry sector strategy to 2020 has modest goals for increase in total forest cover (+0.1% of current); more ambitious goals for increase in protected areas (to 9.2% of country), and measures for doubling percentage of staff with professional qualifications.</li> <li>Action Plan has noteworthy and positive attention to urban forestry issues, and</li> </ul> | <ul style="list-style-type: none"> <li>Ensure that most critical elements of the detailed Action Plan are financed and mesh with planning for period beyond 2020.</li> <li>Assess whether/where goals for increased use of forests for bioenergy and building materials may cause conflict with other benefits.</li> <li>Clarify basis for forest cover goals (hectares, budgets).</li> <li>Champion international efforts to recognize carbon sequestration benefits of differing types of forests.</li> </ul> |

<sup>11</sup> The term “reforestation” or “increasing forest cover” in this document means the return of trees or woodlands/bushes regardless of whether this results from natural regeneration or from planting programs (following the convention of E. Stroud, 2013).

| Major impacts                                                                                                                            | Selected key factors | Selected response options                                                      | Inclusion in GoK plans and strategies?                                                                                                                                                      | Recommendations |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <p>spur sustainable cities and public support.</p> <p>The unique challenge of restoring the dry Aral Sea Bed will remain (or worsen)</p> |                      | <p>building materials) do not present major conflicts with other benefits.</p> | <p>benefits from broader emphasis on ecotourism.</p> <ul style="list-style-type: none"> <li>• Reforestation (Zhasyl EL and Zhasyl Damu) received high-level attention in public.</li> </ul> |                 |

Figure 3: Projections of Changes in Belarus Pine Forest Coverage through 2050



| Forest Formation               | Percentage (%) Forest Type by Year |       |       |
|--------------------------------|------------------------------------|-------|-------|
|                                | 2005                               | 2025  | 2050  |
| Pine woods                     | 50,7                               | 52,5  | 54,4  |
| Spruce groves                  | 10,6                               | 11,9  | 12,4  |
| Oak forests                    | 3,7                                | 7,7   | 11,6  |
| Ash forests                    | 0,4                                | 1,3   | 2,1   |
| Maple groves, lime groves, elm | 0,1                                | 0,1   | 0,1   |
| Hornbeam groves                | 0,1                                | 0,1   | 0,0   |
| Birch groves                   | 21,4                               | 15,3  | 9,5   |
| Black alder groves             | 8,0                                | 8,3   | 8,6   |
| Grey alder groves              | 2,5                                | 1,4   | 0,4   |
| Asp groves                     | 2,1                                | 0,9   | 0,4   |
| Total                          | 100,0                              | 100,0 | 100,0 |

Note: figures and data relative to 1961-1990 base period; orange to red color shading indicates lower suitability for pine forest growth.

### Sectoral Findings: Energy

*Advancing energy efficiency for existing and new facilities has both mitigation and adaptation/resilience benefits and has been a central pillar of assistance for Kazakhstan's development partners, with a clear emphasis on institutional reform. Other potential impacts on hydropower and thermal generation facilities from changing climate are less obvious and should be clarified.*

- Kazakhstan is one of the 10 most energy-intensive countries in the world, and a wide array of development partners have offered comprehensive advice and supported pilot programs to accelerate energy efficiency in industry, housing and communal services. All major development partners, including the World Bank Group, Asia Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), and the United Nations

Development Program (UNDP) are currently or recently engaged with the country on this topic.

- The principal challenges of low energy prices, substantial energy subsidies and few incentives for EE finance are clear, and implementation of the Energy Efficiency Program-2020 (2013) and Law on Energy Efficiency introduced in 2012 and amended in January 2015 and Green Green Economy Action Plan adopted in 2013 should help. In March 2010, the President of Kazakhstan set the goal to reduce energy intensity of the national economy by 10 percent by 2015 and 25 percent by 2020 and 50% by 2050. To date, the Government is on track for achieving this short- and long-term objective; in 2012, the energy intensity already reduced by 13.5% compared to 2008. In addition, the GOK recently initiated a number of important measures to support further improvement in terms of EE. The list of nearly 140 actions under the EE Program activity plan (with budget lines for each) is very impressive in its specificity.
- While KZ relies on hydropower for only 10% of its electricity, the government has plans for considerable expansion beyond the 5 large HPPs now on line; also expanding small HPPs (threshold is up to 35 MW). Information to refine this risk include projections of hydrologic changes over the coming decades, with increases expected due to glacier melt in the next decade or two, followed by longer term reductions. Changes in use by other riparian countries in trans-boundary basins will also be an important factor.
- Less attention has been given to potential climate impacts on the few large coal fired power plants that rely on cooling water from rivers or reservoirs, as well as potential impacts from shifting Caspian Sea levels<sup>12</sup> on near-shore oil facilities. Worley Parsons (2012) provides the most complete assessment of current climate risks to power sector infrastructure though it is unclear whether the results from this study were finalized and incorporated in GoK policy documents. The Green Economy Action Plan calls for an Atlas of renewable energy, and the State Water Resources Management Program includes targets for water utilization by basin; helpful starts in any case for framing risk. No GoK policy document thus far examined, however, provides solid coverage of resilience alternatives.
- Both Worley Parsons (2012) and the Asia Development Bank provide general guidance on adaptation solutions that could be of particular value for strengthening sub-sector resilience<sup>13</sup>. Engineered solutions for hydropower include building or modifying storage reservoirs, adding upstream regulating reservoirs, adjusting spillway locations and dimensions, and installing more robust and efficient power turbines. Non-engineering (“no-regrets”) options includes new reservoir operating regimes, improved hydrologic forecasting and models, and watershed reforestation.

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<sup>12</sup> There is still scientific uncertainty as to whether Caspian levels will increase, decrease or remain the same; some researchers suggest an increase given higher runoff in the Volga Basin offsetting increased evaporation from the sea surface.

<sup>13</sup> Citation to ADB 2013 report is in the References section

**Table 5: Summary of Projected Major Climate Impacts and Response Approaches: Energy<sup>14</sup>**

| Major impacts                                                                                                                                             | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Selected response options                                                                                                                                                                                                                                                                                                                                   | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Recommendations                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Need for reductions in energy intensity of KZ economy through improving energy efficiency.</p> <p>Recognize adaptation and mitigation co-benefits.</p> | <ul style="list-style-type: none"> <li>• KZ is among the 10 most energy-intensive economies in the world. The country uses 2-3 times more energy per unit of GDP compared to the OECD average.</li> <li>• High power consumption in the industrial sector is primarily due to energy-intensive industries such as mining and metallurgical complex (nearly 70% of total electricity consumption in 2011), as contrasted with the EU average of 24%.</li> <li>• Housing and communal services comprise the second largest sector for energy use (12.5% in 2011).</li> </ul> | <ul style="list-style-type: none"> <li>• Higher energy prices (including removal of subsidies) and more favorable tax policies would encourage energy efficiency investments.</li> <li>• Incentives for industry, housing and other sectors to adopt more energy efficient technologies as the economy expands and new construction takes place.</li> </ul> | <ul style="list-style-type: none"> <li>• KZ Energy Efficiency Law passed in January 2012 provides a more effective legal, regulatory and institutional framework than previous law (1997). The law has been amended in January 2015 improving certain provisions and introducing ESCO.</li> <li>• The KZ Comprehensive Program for EE is a time-bound action plan targeting energy-intensive industry and municipal/residential sectors.</li> <li>• EE is central to several pilot projects under GE-AP including EXPO-2017</li> <li>• Considerable initiatives underway with key development partners to encourage EE investments and improve the enabling environment for sustainable energy finance.</li> </ul> | <ul style="list-style-type: none"> <li>• Consider ideas for EE finance (from dedicated and sustainable funds to credit lines) which are now under discussion with MDBs.</li> </ul>                                                                                      |
| <p>Changing hydrology over the coming decades will impact the hydrology of watersheds supporting hydropower plants.</p>                                   | <ul style="list-style-type: none"> <li>• While KZ relies on hydropower for only 10% of its electricity, the government has plans for considerable expansion beyond the 5 large HPPs now on line; also expanding small HPPs (threshold is up to 35 MW).</li> <li>• Projections of hydrologic changes cover the range from short term increases (due to glacier melt) to longer term reductions; also trans-boundary concerns</li> </ul>                                                                                                                                     | <ul style="list-style-type: none"> <li>• Advanced hydrologic modeling and risk assessment by basin for large and small projected HPPs (individual and cumulative).</li> <li>• Modify HPP design (modified reservoirs and spillways; more efficient turbines), location within basin, and operating regimes to account for changes in hydrology.</li> </ul>  | <ul style="list-style-type: none"> <li>• GE-AP does mention need for an Atlas of renewable energy potential; presumably could address risk.</li> <li>• State WRM Program includes targets for water utilization by basin (including gains in efficiency) and narrative management goals given future scenarios.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Need to clarify how climate risks to current and potential new HPP facilities will be addressed beyond general State WRM program. More than 20 new small HPPs may be planned for construction in the next 5+ years.</li> </ul> |

<sup>14</sup> Note this is a selective review of the energy sector focusing on energy efficiency and infrastructure resilience; components with clear mitigation and adaptation co-benefits. A full description of energy sector risks can be found in WorleyParsons (2012; see References); the report does not include facility-specific risk assessments, however.

| Major impacts                                                                                                                                                                  | Selected key factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Selected response options                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Inclusion in GoK plans and strategies?                                                                                                                                                                                                                                   | Recommendations                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                | with increased withdrawals by neighboring countries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Shifting from low quality coal to cleaner fuels will have considerable positive health benefits.</li> </ul>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |
| Changing hydrology over the coming decades may impact the availability of surface water for cooling thermal power plants.                                                      | <ul style="list-style-type: none"> <li>Theoretically, the general trend towards lower water availability and higher ambient temperatures could have negative consequences for TPPs that rely on cooling water for make-up water or once-through use.</li> <li>Three of the largest TPPs in the country are within the Irtysh river basin and are coal fired; one relies on direct river flow and the other 2 are supplied through reservoirs.</li> <li>Most TPPs in KZ, however, reportedly rely on dry cooling where this potential impact would be less of a concern.</li> </ul>                                                                | <ul style="list-style-type: none"> <li>Carry out research on basin-wide water availability and demands for the decades to 2050 and beyond, with scenarios assessing competition over water between agriculture, energy, and other users.</li> <li>Applied research to further assess risks on a facility-specific basis.</li> <li>For new and rehabilitated TPPs, shift to more efficient cooling technologies using recycled water; shift to air-cooling using more modern technologies.</li> </ul> | <ul style="list-style-type: none"> <li>While a better understanding of basin conditions should emanate from the State Water Management Program actions, the longer term sector risks are not specifically addressed in GE and Water strategies/plans examined</li> </ul> | <ul style="list-style-type: none"> <li>Need to assess if this is indeed a major risk given makeup of KZ energy infrastructure (current and planned).</li> </ul> |
| Rising temperatures, changing hydrology (including the level of the Caspian Sea) could pose other physical risks to electricity generation, transmission and other facilities. | <ul style="list-style-type: none"> <li>As an inland water body, the level of the Caspian Sea changes based on inflow of the major tributaries and evaporation. Some scientists project a rise in level due to increasing precipitation in the contributing Volga Basin, which may have consequences for off-loading of oil at terminals in KZ, or other impacts.</li> <li>Changes in the frequency and strength of storms in the Caspian Sea can also be detrimental.</li> <li>Impacts from other sector risks (e.g. on transmission systems from higher air temperatures, from landslides on pipelines, on coal mining) are possible.</li> </ul> | <ul style="list-style-type: none"> <li>Applied research to further assess risks; including projected changes in Caspian Sea level</li> </ul>                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Not specifically addressed in GE and Water strategies/plans examined</li> </ul>                                                                                                                                                   | <ul style="list-style-type: none"> <li>Need to assess if this is indeed a major risk given makeup of KZ energy infrastructure (current and planned).</li> </ul> |

## *Cross-cutting findings*

*Looking across the sectors, key risks and resilience approaches of relevance have been factored into national strategies, programs and action plans to varying degrees though the underlying basis for national resilience-related targets is unclear as is tracking and reporting implementation effectiveness.*

- The summary matrices of Tables 2,4, and 5 present major categories of climate impacts and response options, and most are linked to one or more relevant GoK strategies, programs, concepts and/or action plans.
- The Action Plans for energy efficiency and forestry have very detailed lists of individual activities (around 140 for the former and 170 for the latter) linked to very specific budget requirements. It would be helpful to further understand: (i) the analytical bases by which these aspirational targets link to these very detailed actions, (ii) whether these actions are funded as planned, and (iii) whether they are being tracked and reported for assessing progress at the sub-program level.
- Helpful steps have been taken to initiate and inspire change, including the establishment of greenbelts around Astana, and setting the theme of EXPO 2017 as future energy. Expansion and improved management of parks (both urban and rural) and establishment of vegetated or forested buffer strips along the expanding national highway network can also build public support.
- Following on the last two points, there may be some policy conflicts when comparing strategies, for example where goals for increases in irrigation water amounts and financial subsidies noted in Agribusiness 2020, might conflict with water availability goals in the State Water Resources Management Program (see Figure 4). Again, without an understanding of the underlying rationale, there was insufficient information to examine this issue in further depth. This also emphasizes the necessity to consider cross-cutting issues at the water, agriculture, and energy nexus, brought or amplified by climate change and the benefits of coordination across sectors and following landscape approaches, as discussed further below.
- Some development partners are concerned with government follow-through on the Green Economy Concept that underpins the overall shift to climate resilience. They wonder if this theme will be as short-lived as the recent themes of sustainable development and climate adaptation. Both of these rose in stature with concepts and action plans designed in part to highlight progress in the country related to the Rio +20 and COP processes, with a somewhat diminished stature thereafter. The Bank team notes that this situation is quite similar in other countries, and the Green Economy and resilience concepts can serve as an overarching frame encompassing the others.

**Figure 4: Example Hierarchy of GoK Policy Documents: Targeting Improvements in Irrigation**

**Kazakhstan 2050 Strategy:** sets the direction for the country to become one of the top 30 developed countries in the world. It recognizes 10 global challenges, laying out aspirational goals, for example:

**Food security:** *“This shortage in food presents a great opportunity for Kazakhstan. We have great opportunities in terms of that challenge. We are already among the top grain exporters in the world. We possess vast “green” territories that are capable of producing eco-friendly foodstuffs. To make this great leap forward in farm production we will need a new type of thinking in our state.”*

**Water shortage:** *“Global water resources are also under great pressure. By the middle of this century many countries will have to import water. Water remains a limited resource, so the fight for acquiring water is already becoming a critical geopolitical factor causing tensions and conflict in the world. Kazakhstan also faces an acute water supply issue. We lack high-quality drinking water. A number of regions face drinking water scarcity. There is a geopolitical aspect to this issue. We are already facing a serious issue of trans-boundary river use. Given the complexity of this problem, we should avoid politicizing it.”*

**Agribusiness 2020 program examples**

Sets target indicators for rehabilitating irrigation land between 2015 and 2019 (totaling 61,000 hectares)

Multiple budget line targets for each year thru 2020 (e.g., average of appx. 690 million tenge annually for subsidizing cost of water services to agricultural water users)

**Green Economy Concept examples:**

By 2040: provide all water needed for agriculture.  
By 2050: solve water resources problem forever

Increase wheat yields to 1.4 tons/ha by 2020 and to 2 tons/ha by 2030

Reduce irrigation water to 450 cubic meters/ton by 2020; to 330 cubic meters/ton by 2030

**Are targets and goals compatible?**

**Green Economy Concept Action Plan examples:**

Set intermediate objectives for 2015, 2020, and 2025 in order to achieve ultimate objective by 2030, which is to reduce water consumption in agriculture to 8 billion cubic meters (annually).

Assess the water saving potential and analyze feasibility to replace rice and cotton by less water-intensive crops.

Initiate five major types of pilot projects in agriculture and water management (e.g. limiting water use in Balkhash-Alakol basin)



*The Kazakhstan approach to coordinating and managing resilience actions across government, stakeholders and development partners appears to have some inherent weaknesses but could be strengthened by building on national and international examples.*

- A Green Economy Council was established through a Presidential order (number 823) in May 2014 to coordinate actions under the Green Economy Concept. Chaired by the Prime Minister, members include Ministers across the Executive Branch. The Ministry of Economy serves as the executing agency, and the Council has authorized working groups in at least eight areas to date, several of which (water resources management, agriculture development, and energy savings and efficiency) relate to the sectors addressed in this Policy Note. The Council has just begun its work, and is expected to meet at least twice yearly. The program of the working groups should be set over the coming year.
- The Council is currently focused on establishing targets for reducing the country's greenhouse gas emissions in advance of the 21<sup>st</sup> Conference of Parties meeting to the UNFCCC to be held in Paris in December 2015<sup>15</sup>. Setting roles and responsibilities for the Council and its working groups for the resilience/climate adaptation agenda (including establishing new working groups) is a possibility, though a Government decision in this regard does not appear to have been made to date.
- There are additional coordination experiences that can help operationalize a resilience agenda. A climate-focused Technical Working Group (TWG) of senior technical government officials, for example, has been formed to support the GoK engagement with the World Bank on the CAMP4ASB program. The TWG is chaired by the Director of the Climate Change Department from the Ministry of Energy, with representation from others in the environment, energy, agriculture, water and other key sectors. The TWG does not have any formal role in overseeing the cumulative progress of government towards achieving aggregated resilience goals, however.
- Kazakhstan has supported other cross-sector coordination discussions and entities dealing with sustainable development and climate adaptation. For example the Astana Green Economy Dialogue held in November 2011 and organized by the GoK with the International Institute for Environment and Development (IIED)<sup>16</sup> was very influential in spurring on the Green Economy Concept. A number of solid recommendations emerged to guide the establishment of a GE Working Group, including issues of moving the GE Concept to legislation and regulation, fostering inclusive multi-sector stakeholder engagement, building in transparency, and ensuring good monitoring and reporting. Further engaging the private sector through influential trade and industrial organizations could be especially fruitful<sup>17</sup>.

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<sup>15</sup> See interview with Energy Minister Vladimir Shkolnik in June 10, 2015 edition of the Astana Times ([www.astanatimes.kz](http://www.astanatimes.kz)).

<sup>16</sup> Report of the conference is available for download at: <http://pubs.iied.org/G03489.html>; further IIED suggestions for advancing GE is found at: <http://www.iied.org/kazakhstan-green-economy-future>

<sup>17</sup> For example the American Chamber of Commerce in Kazakhstan has a wide range in members; both national and international companies. It has supported conferences on energy efficiency and agricultural development and could, perhaps, be a vehicle for engaging companies in the resilience agenda.

- Finally, the “Green Bridge” initiative<sup>18</sup> has garnered support from the Asia Development Bank, UNDP, and European Union, but appears to be more of an informal partnership (for example around EXPO 2017) than a standing body.
- As Kazakhstan has seen with the Clean Technology Fund<sup>19</sup>, high-level engagement led to complementary leveraging of development partners such as the World Bank and EBRD, accompanied by supportive involvement of non-government stakeholders. While the investments are progressing, a 2014 independent review noted two concerns in Kazakhstan: a weak policy alignment of CTF goals with national climate policy, and a lack of clear understanding across ministries regarding responsibilities and activities. The new Green Economy Council can be helpful in achieving progress in this regard, especially when driven by highly visible global goals linked to the UNFCCC process.
- Growing international experience with both the CTF and the Pilot Program for Climate Resilience (PPCR; active in 19 countries but not Kazakhstan) strongly suggests that cross-sector coordination supported at the highest levels of government is the most effective mechanism for shaping an integrated national program for bolstering resilience<sup>20</sup>. Therefore, the Green Economy Council has the potential for accelerating a cross-sector approach to climate resilience if it expands its mandate to this topic and follows through on implementation through relevant working groups.
- Looking to other international examples (as discussed in Section IV of this note), some countries do utilize a technical working group under a line sector ministry for coordinating their resilience/adaptation agenda without a high-level council-type mechanism, or one led by finance or development ministries. Such approaches are generally less effective since they are detached from critical cross-sector budget formulation and execution functions.
- Kazakhstan’s progress in setting the correct political and strategic framework for addressing climate protection and adaptation issues has been recognized, while also noting the need for bolstering coordination. This latter point is described in the Climate Report 2014; Energy Security and Climate Change Worldwide released by the Konrad Adenauer Stiftung, as: *“However, there is no effective cross-sector institutional apparatus offering policy guidelines for tackling climate change in Kazakhstan that can take decisions on priorities, resource allocation and result monitoring, and ensure that adaptation and climate protection policies*

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<sup>18</sup> See: <http://www.adbi.org/files/2011.12.14.cpp.day2.sess2.16.country.presentation.kazakhstan.pdf> and <http://www.uncsd2012.org/index.php?page=view&type=13&nr=561&menu=46>; also UNESCAP (2010) in References.

<sup>19</sup> The CTF and PPCR are one of several programs under the Climate Investment Funds; the CTF focuses on mitigation but does include energy efficiency support. Respective citations at: <http://www-cif.climateinvestmentfunds.org/country/kazakhstan>; and for the June 2014 evaluation see: [https://climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF\\_SCF\\_TFC\\_12\\_3\\_Independent\\_Evaluation\\_of\\_the\\_CIF.pdf](https://climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_SCF_TFC_12_3_Independent_Evaluation_of_the_CIF.pdf)

<sup>20</sup> An independent evaluation of the CIFs (including the PPCR) can be found at: [http://www.cifevaluation.org/cif\\_interim\\_report.pdf](http://www.cifevaluation.org/cif_interim_report.pdf); full citation in References. Characteristics of effective investment plans based on the PPCR are included later in this Policy Note.

*and programmes are implemented.*<sup>21</sup> The Green Economy Council and its linked implementation structures can serve critical roles to fill such gaps.

- The benefits of more inclusive and substantive cross-sector engagement, with “empowered” champions at the highest levels of government cannot be under-estimated. The positive influence and drive of the late Nurlan Kapparov, former Minister of Environment and Chairman of Kazatomprom, to push the Green Economy concept was cited by many in Kazakhstan, and his tragic loss earlier this year left a considerable gap. Any new coordination and management mechanism that would be established for bolstering resilience can build on the many positive ideas that have been put in play these last few years both inside and outside the country.

**There are clear linkages between this initial review of policies and institutional directions and parallel efforts on vulnerability and risk mapping.**

- While this review looks at sector risks from a broad national context, parallel work on vulnerability mapping in Component 1 looks at how risks vary across the country, for example by geographic and socio-economic zonation influenced by sector relevance. Clearly there are synergies in linking the two, for example to focus technical and policy interventions in a given sector or sub-sector in a differentiated fashion based on more carefully targeting. Such an approach has already been used by Kazakhstan for awareness-raising in the latest National Communication to the UNFCCC. There, global models and expert judgment were used to project the variance in spring yield by region and further by district, and also to project the spatial distribution of days too cold for pasture; all to the year 2050. The database of climate indicators utilized in the National Communication actually formed the initial basis of the new parallel effort underway in Component 1.
- As noted in the above discussion of major findings on agriculture and forestry, there is merit to considering further detailed analysis. For example there are no projections in the Kazakhstan National Communication of shift in the nature of forests, as was done by Belarus (see **Figure 3**). Even if based on the same aggregated global data sets, such zonation helps to sharpen the dialogue. A more detailed analysis of projected changes to agriculture which links regional climate, water availability, agricultural yield and economic models is especially useful for engaging senior official and was the subject of a World Bank regional analytical program in several Europe and Central Asian countries including Uzbekistan (see **Figure 2**)<sup>22</sup>.

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<sup>21</sup> Analysis and quotation for Kazakhstan from B. Janusz-Pawletta and A. Helms; pages 123-125; in G. Wahlers, ed. (2014); full citation in references.

<sup>22</sup> See reports by Sutton et.al (2013) and Ahouissoussi (2014) in References

## IV. Selected Lessons from Other Countries

### *Agricultural innovation; from concept to discipline*

The GoK Green Economy Concept recognizes the critical role of global food security in the coming decade, the country's strengths as a major producer of agricultural products for domestic markets and exports, and the need for introducing more productive and sustainable systems. To achieve these goals, the country will need to innovate, following a *“process by which individuals or organizations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world<sup>23</sup>.”* While innovation has always played a role in agriculture to solve one issue or another, consensus is emerging that collaborative activities in a country can together be looked on as an agricultural innovation system (AIS).

The World Bank issued one of the most comprehensive reviews of the topic in 2012 in the form of a 658-page AIS Investment Sourcebook<sup>24</sup>. Thematic notes and case studies are provided in 7 areas: (i) coordination and collective action, (ii) agricultural education and training, (iii) investment in extension and advisory services, (iv) agricultural research, (v) incentives and resources for partnerships and business development, (vi) setting the enabling environment, and (vii) assessing, prioritizing, monitoring and evaluating AIS.

Examples of innovation from other countries that might inspire/instruct new systems in Kazakhstan are scattered throughout the Sourcebook, and include: (i) the China Technology Transfer project, which provides a learning platform for developing innovative models including public-private partnerships (PPPs), (ii) the EARTH University in Costa Rica, whose core purpose is to prepare leaders to promote sustainable development in the unique geography of the tropics, (as a possible model for Central Asia), (iii) a PPP between a European company and Argentina's national agricultural research institute to spur research on new wheat varieties in the country, and (iv) expanding efforts of the International Livestock Research Institute which, while based in Nairobi, Kenya, is expanding activities in China and Southeast Asia to address both sector productivity and resilience to climate change.

Kazakhstan is clearly interested in innovation and learning from other countries. The growing partnership between China and Kazakhstan on agricultural trade and research, and the strong interest of the international community in helping bring “new technologies, fresh capital and dynamic entrepreneurs” to agriculture are examples of such positive signs<sup>25</sup>. At the working, technical level, Kazakh water and environmental experts participated in a June 2015 study tour to the United States and Australia to learn about innovative irrigation systems and programs.

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<sup>23</sup> Quotation from next citation.

<sup>24</sup> See References for full citation; examples in the next paragraph can be found on starting (respectively) on pages 426, 160, 292, and 326 of the Sourcebook.

<sup>25</sup> See news articles in Astana Times ([www.astanatimes.com](http://www.astanatimes.com)); May 18, 2015 issue on several areas of collaboration with China; June 3, 2015 issue for quotation from EBRD and article on international community *“Helping Kazakhstan's Agriculture Blossom.”*

Other opportunities for learning from different World Bank clients can also be fruitful. Brazil's northeast has face severe droughts and, like Kazakhstan, is semi-arid. An inter-disciplinary World Bank team is working collaboratively with a wide range in Brazilian institutions and other development partners to advance a three-pillar approach to drought resilience: monitoring and early warning, vulnerability/resilience and impact assessment, and mitigation and response planning and management<sup>26</sup>. Lessons from that experience can help half a world away in Central Asia.

### ***Reforestation and adaptation policy; learning from the Eastern United States and Europe.***

Kazakhstan's goals for maintaining and increasing forest cover (at present around 4-5% of land area) are central to its Green Economy path for purposes as widely ranging as watershed protection, sustaining rural livelihoods, and making cities healthier. While the climate conditions of Kazakhstan are quite different from those in the Eastern United States, some inspiration and lessons-learned can be drawn from the approximate doubling of forest coverage in the Northeastern United States from the end of the 19<sup>th</sup> Century to the present time, with the most dramatic boost covering a 40-year period from 1890 to 1930. According to Ellen Stroud, currently an environmental historian at Bryn Mawr College in New York, "*A twentieth-century upsurge in acreage of forested land seems counter-intuitive at first, especially in a region of tremendous urbanization and population growth*<sup>27</sup>." Nevertheless, Dr. Stroud cites a number of initiatives and changes from shifting markets (e.g. better transportation allowed crops to be grown further from cities), to recognizing values of urban water supplies (e.g. payment for watershed protection for New York and Boston), to growing eco-tourism supporting smarter forest cutting and management (i.e. in the Adirondack, Catskill, Green and White Mountains). Perhaps Kazakhstan can aim for similar win-win solutions?

Taking on the more recent concept of forestry's role in adaptation to climate change, one study of the growing experience in Europe suggests that despite the European Union's overall proactive approach on climate change, the occurrence of extreme events (storms and droughts) in specific countries is a critical driving factor in the rather mixed integration of forestry into climate adaptation policy<sup>28</sup>. France is an example of a country which has a relatively central direction on forest policy, supported by a national adaptation policy. France experienced a severe drought and heat wave in 2003 that caused significant damage in forest stands, and the 2009 Klaus storm toppled some 37 million cubic meters of pine, followed by a massive beetle attack. These events helped spur both the integration of forestry as part of the National Adaptation Plan and Strategy, and an active program of research, capacity building and monitoring.

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<sup>26</sup> See: <http://documents.worldbank.org/curated/en/2015/04/24353604/living-semi-arid-proactive-drought-management-northeast-brazil-new-perspective> and World Bank 2015(c).

<sup>27</sup> See E. Stroud (2012) citation in References. Overall forest coverage in the New York State, for example is now 61% from a low of 25% at the end of the 19<sup>th</sup> Century.

<sup>28</sup> See citation for Keskitalo, E.C.H. and others. (2015) in References

While forest and adaptation policies in Sweden and Germany are more decentralized, they too are active and been influenced by local damage from extreme events (mostly floods and in Germany, also droughts).

Italy is one of the few EU countries without a national adaptation policy, and despite the impacts of forest fires (fewer in number yet greater in areal impact), there has been less of a connection between these events and adaptation to climate change. Nevertheless, there has been attention on the mitigation aspects of forests and programs for generating biomass energy, so sector professionalism and competency is present. Italian forest policy recognizes the ecosystem benefits of greater diversity in species composition and structure, and favors the shift away from production-driven goals to systemic management. While from a policy standpoint, adaptation might in general be a “*so far marginalized policy area*” in Italy, sound forestry policies may in fact mean the sector is more resilient than say a country with a weak forest sector policies but a nice sounding national adaptation strategy.

### ***Tackling energy subsidies; global and national perspectives***

As was noted earlier, advancing energy efficiency for existing and new facilities has both mitigation and adaptation/resilience benefits and has been a central pillar of assistance for Kazakhstan’s development partners, with a clear emphasis on institutional reform. Central to these and other energy sector reforms is pricing, with the goal of reducing energy price subsidies to encourage conservation and renewable energy investments. A new IMF Working Paper<sup>29</sup> finds, for example that global energy subsidies are dramatically higher than previously estimated; in large part since the externalities of environmental damage (including from climate change) were previously underrated.

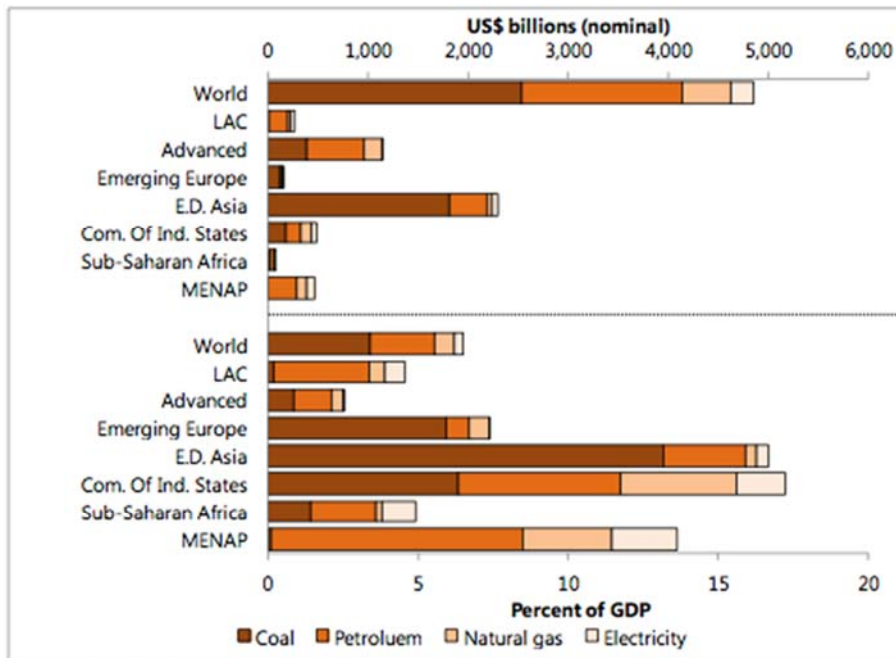
As noted in **Figure 5**, post-tax subsidies are especially large and pervasive in the CIS countries. Environmental gains in the region would be considerable. Looking across the CIS countries, removal of subsidies could mean a 20% reduction in carbon dioxide emissions and a more than 50% reduction in deaths from air pollution.

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<sup>29</sup> Coady, D. and others (2015); citation in References

**Figure 5: Energy Subsidies by Region and Product, 2013**

(US\$ billions on top axis; percent regional GDP on bottom axis)



Source: Authors' calculations, based on sources in Appendix Table 2.

Note: CIS = Commonwealth of Independent States; ED Asia = Emerging and Developing Asia, LAC = Latin America and the Caribbean; MENAP = Middle East, North Africa, Afghanistan, and Pakistan

The last country-specific review along these lines by the IMF (calculated for 2011) showed Kazakhstan with particularly high post-tax subsidies in terms of Government revenue, at almost 3.9% going to electricity subsidies and around 10.1% for the coal sector. These figures corresponded respectively to around 1% and 2.8% of GDP in 2011.

As the World Bank moves ahead with Kazakhstan on the new Energy Efficiency project, lessons will be drawn from sector work in other countries, for example the recently completed institutional review of energy efficiency in Turkey, and an earlier review of the potential for energy efficiency gains in Russia.

### ***Lessons from the Pilot Program for Climate Resilience (PPCR): transformative themes and coordination structures for building resilience***

The \$1.2 billion PPCR is the main funding window of the Climate Investment Funds that addresses national climate resilience. Established in 2008 and currently with 9 stand-alone country-based pilot programs, and an additional 10 countries benefitting under region efforts, there is considerable knowledge being gained on how to advance multi-sector planning and investments. The PPCR includes a planning phase that leads to the development of a Strategic Program for Climate Resilience (SPCR) –a document embracing all development partner

contributions, and thereafter the implementation phase for investments and complimentary capacity building efforts.

An independent evaluation of the CIFs (ICF, 2013) identified a number of transformative themes in two groupings (noted in Table 2), which could be used to guide Kazakhstan’s directions for resilience and the Green Economy. Apart from these over-arching themes, as agriculture and landscape management comprises the largest allocation of PPCR funding, there will be instructive experiences emerging that could be applicable to Kazakhstan. Other CIF funding windows cover forestry and energy efficiency investments.

**Table 6: Transformative Themes in PPCR-SPCRs**

| <b>Cluster 1 - Features of Highly Transformative Adaptation Strategies</b>                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Risk reduction systems</b> that are highly responsive to vulnerable peoples and social groups                                             |
| <b>Multi-stakeholder, multi-layered integrated governance structures</b> for ongoing and collaborative decision-making                       |
| <b>Integration of climate vulnerability and adaptation knowledge</b> into national development and poverty reduction policies and strategies |
| <b>Cross-sectoral, integrated adaptation planning systems</b> that include biodiversity and ecological considerations                        |
| <b>Significant increase in the scope and scale of action</b> on adaptation                                                                   |
| <b>Cluster 2 – Best practices in adaptation supporting transformation</b>                                                                    |
| <b>Climate resilience within institutions, communities and households</b> – assessed, renewed and strengthened                               |
| <b>Multi-level climate information system</b> – with targeted use in decision-making                                                         |
| <b>Community-based adaptation methods and approaches</b> – integrated into local planning, budgets                                           |
| <b>Adaptation tools, instruments, methods and strategies</b> – selected, tested and used                                                     |
| <b>Adaptation skills, knowledge</b> - strengthened                                                                                           |
| <b>Gender analysis</b> – integrated throughout adaptation planning, implementation and M&E                                                   |
| <b>Gender equality</b> – integrated into adaptation tools, instruments, methods and strategies                                               |
| <b>Participatory M&amp;E</b> – with local and national level participants involved and linked.                                               |

As the PPCR program has been in place for over 7 years, it also provides insights on the effectiveness of cross-sector coordination mechanisms for planning a resilience program. The World Bank has looked at “lessons-learned” from the PPCR to date<sup>30</sup>, for example, and on coordination found:

- Particularly effective modalities when leadership for developing multi-sector approaches rests with the Ministry of Finance or comparable institution given their influence at highest levels of Government, authority over major sector ministries, and experience dealing with MDB finance. Examples of this approach have been taken by Zambia and Cambodia.
- Leadership by Environment ministries with responsibility over natural resources or water infrastructure can be effective, for example in Bolivia where the Ministry of Environment

<sup>30</sup> Source: presentation on interim findings by the World Bank to the PPCR Sub-Committee; May 2015; based on report in final preparation.



and Water is the coordinating entity. Environment ministries without such responsibilities have generally been less effective.

- Countries who utilize climate change councils, climate adaptation project implementation units, and similar structures can accelerate the planning process if it is strongly supported by senior Government officials. Examples of this approach are in Niger and Yemen.

## V. Future Directions

Looking ahead to FY16, topics for further policy analysis could include a deeper review of cross-sector coordination, expanding the analysis to additional sectors, deepening attention to resilience planning at the sub-national level, and following-up on specific recommendations raised in this Policy Note. A Climate Public Expenditure and Investment Review (CPEIR) could complement these activities. Whether or not any of these (or others) will advance depends on the interest of the Client, further engagement with sector ministries, and available budget. Further discussion on these options follows:

### Cross-sector coordination

Coordination across-sectors could be influential in setting bringing consistency in strategic directions (e.g., consider climate change implications holistically, at the water-agriculture-energy nexus, maximize synergies between adaptation and mitigation actions, etc.), influencing informing budget and programmatic decisions, strengthening capacity in line ministries and agencies to facilitate implementation, and tracking progress. The Green Economy Council is accelerating attention to GHG emission reductions but could, as noted earlier, expand its focus on climate adaptation and resilience. As their work program shapes up in the coming months, one or more working groups could become active and others formed as needs arise. The Bank could share its experience with other countries and development partners regarding cross-sector coordination for climate action through: (i) providing lessons from specific PPCR or Green Growth programs, (ii) preparing TORs for working groups and/or topical information products, (iii) helping facilitate experience-sharing of Kazakh specialists with other country experts, and (iv) helping facilitate expert speakers to attend Council or working group meetings.

### Sub-national analysis

The work on vulnerability mapping is leading to a better understanding of climate risks by oblast and region. One study approach under the policy component could be to examine how especially vulnerable oblasts might better address resilience in one or more sectors through application of current or potential improved policies. One option could take the opposite approach, for example looking at an oblast that may actually benefit from changing climate in the relatively near-to-mid term to see how best to optimize this benefit. Admittedly this second scenario is less likely than the first. The choice of oblasts to assess could also take into consideration the locations of pilot projects selected under the CAPM4ASB program and/or other World Bank and development partner projects.

### Expansion to additional sectors

Interest has been raised to add sectors to this nation-wide assessment, for example transport and health. Work is already underway by the Bank on adaptation in the water sector so an

additional effort is not needed. Some believe cross-cutting topics such as disaster risk should be included. Much of this work could be informative for the country's resilience planning but any and all will be constrained by some over-arching factors, particularly the need for effective, high level coordination.

#### Considering a Climate Public Expenditure and Investment Review (CPEIR)

Some of the assessments described above could be combined within the framework of a CPEIR for Kazakhstan, whose recommendations on public support and the institutional and investment settings for climate policy can strengthen readiness for climate action and access to international climate finance. The most recent Bank-supported CPEIR was completed with Vietnam<sup>31</sup>, and included a unifying framework to map climate-change spending from the ministerial to sub-national level. It helped track the path of funding and map the chain of responsibilities while giving insights on effectiveness.

#### Implementing other recommendations from this Policy Note

A number of additional recommendations are included in this Note; for example carrying out more detailed impact assessments in agriculture and forestry. The team is happy to facilitate discussions on how to implement these recommendations.

## **VI. Acknowledgements**

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The author recognizes the challenge of summarizing the experience, policy observations, recommendations and many hundreds of pages of sector work on such critical sectors in so brief a note as this one. And while sector improvement under recent climate conditions should be extremely helpful for addressing tomorrow's challenges, there is a certain amount of art as well as science in projecting future climate conditions and consequent policy needs. Faults in understanding these many factors, and suggesting future directions from what we know today, should be ascribed to the author in this regard.

A final thanks goes to Yelena Yakovleva in the Bank's Astana office, who organized and supported our work on mission, and Sydnella Kpundeh who assisted on mission travel from Washington DC.

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<sup>31</sup> See World Bank 2015(b) in References

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(See Internet URLs for additional citations are shown as footnotes to text; also Table 1 for GoK policy documents)

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