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Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: Report on Nationally Appropriate Mitigation Actions

TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component
(Financed by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility)

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For the State Agency on Alternative and Renewable Energy Sources of the Republic of Azerbaijan, the Ministry of Energy of the Republic of Kazakhstan, and the Ministry of Finance of the Republic of Uzbekistan

Asian Development Bank

ABBREVIATIONS

ADB	Asian Development Bank
AGGC	Astana Green Growth Centre
AIS	Automated information system
AZN	Azerbaijan New Manat
BOT	Build-operate-transfer
BUR	Biennial Update Report
CDM	Clean development mechanism
CH_4	Methane
CNG	Compressed natural gas
CNGFS	Compressed natural gas fueling station
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CSIP	Cross-sectoral intervention plan
DBFO	Design-build-finance-operate
DCC	Department of Climate Change (Ministry of Energy, Kazakhstan)
EESS	Energy Efficiency Support System
EPC	Energy performance contract
ESCO	Energy service company
ETS	Emissions trading system
FAO	Food and Agriculture Organization
GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographic information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
GWP	Global warming potential
HPP	Hydropower plant
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JSC	Joint Stock Company
KEEP	Kazakhstan Energy Efficiency Project
kg	Kilograms
km	Kilometers
km^2	Square kilometers
KWh	Kilowatt hour
LNG	Liquefied natural gas
MAWR	Ministry of Agriculture and Water Resources (Uzbekistan)
MENR	Ministry of Environment and Natural Resources (Azerbaijan)
MID	Ministry of Investment and Development
MOE	Ministry of Energy (Kazakhstan)
MRV	Monitoring, reporting, and verification
$MtCO_2e$	Million tons of carbon dioxide equivalent
MW	Megawatts
MWh	Megawatt hour
N_2O	Nitrous oxide
NAMA	Nationally Appropriate Mitigation Action

NGO	Nongovernmental organization
NGV	Natural gas vehicle
O&M	Operations and maintenance
OECC	Overseas Environmental Cooperation Center
OECD	Organisation for Economic Co-operation and Development
PD	Power density
PSA	Production-sharing agreement
PV	Photovoltaic
R&D	Research and development
RES	Renewable Energy Supply
RETA	Regional Technical Assistance
SAARES	State Agency on Alternative and Renewable Energy Sources (Azerbaijan)
SER	State Energy Registry (Kazakhstan)
SHP	Small hydropower plant
SOCAR	State Oil Company of the Azerbaijan Republic
SPPRSD	State Program of Poverty Reduction Sustainable Development (Azerbaijan)
TA	Technical assistance
tCO_2	Tons of carbon dioxide
tCO_2e	Tons of carbon dioxide equivalent
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
US	United States
US EPA	United States Environmental Protection Agency
WARM	WAste Reduction Model

NOTE

(i) In this report, "$" refers to US dollars

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I. INTRODUCTION

1. This report describes four Nationally Appropriate Mitigation Action (NAMA) concept notes developed for Azerbaijan, Kazakhstan, and Uzbekistan and the process for their selection and formulation. The report is part of a series of deliverables produced under the mitigation component of the Asian Development Bank (ADB) Regional Technical Assistance (RETA) 8119 Economics of Climate Change Mitigation in Central and West Asia (the TA). The objective of the TA is to support the three countries' readiness to leverage public and private finance to address prioritized mitigation investment needs. The TA assesses mitigation opportunities in the energy and transport sectors of Azerbaijan, Kazakhstan, and Uzbekistan. Two other reports produced under the TA accompany this report. The first analyzes the costs and benefits of greenhouse gas (GHG) emission reductions in the energy and transport sectors. The second identifies investment opportunities for the three countries (Box 1).[1] Training in NAMA prioritization and in the design of monitoring, reporting, and verification (MRV) procedures complemented the development of these reports.

2. The four NAMA concepts were developed in consultation with government counterparts in each country. They are formulated as stand-alone write-ups for each government to use for its own needs. For example, a country may submit the concepts to the United Nations Framework Convention on Climate Change (UNFCCC) NAMA Registry,[2] a public online platform that facilitates matchmaking between planned NAMAs and funding sources. A country can also use the concepts as a foundation for development of a proposal for financial, technical, or capacity building support with assistance from an international partner. Alternatively, Azerbaijan, Kazakhstan, and Uzbekistan may decide to implement the NAMAs unilaterally without international support.

Box 1. Asian Development Bank Regional Technical Assistance 8119: Economics of Climate Change in Central and West Asia

Regional Technical Assistance 8119 (the TA) was approved by the Asian Development Bank Board in July 2012 and is co-financed by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility and the Climate Change Fund. The mitigation component of the TA started in May 2013 and will be completed in September 2015. Two main project outputs are expected under the TA:

Output 1: The cost of climate change mitigation in energy and transport is estimated in Azerbaijan, Kazakhstan, and Uzbekistan.
Output 2: Climate change mitigation investment opportunities are identified in Azerbaijan, Kazakhstan, and Uzbekistan.

The TA will result in the publication of regional reports on the economics of climate change, Nationally Appropriate Mitigation Actions (NAMAs), and climate change investment concept notes. The development of these reports has been complemented by a two-year capacity development program that has trained decision-makers in economic analysis of mitigation measures and systems for greenhouse gas (GHG) emission monitoring, verification, and reporting. A consultant team of Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, implements the TA.

[1] Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: Final Summary Report and Investment Concept Notes.* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

[2] The NAMA Registry. 2015. Accessed at: http://unfccc.int/cooperation_support/nama/items/7476.php

3. This report presents four NAMA concepts:

(i) Promoting Agro-Energy Development Based on Renewable Energy in Azerbaijan;
(ii) Fostering use of Natural Gas in the Transport Sector in Kazakhstan;
(iii) Developing a National Energy Efficiency Support System in Kazakhstan; and
(iv) Accelerating Deployment of Small-Scale Hydropower in Uzbekistan.

4. The selection of the four NAMAs grew out of consultations conducting during workshops and individual meetings with stakeholders in each country. Beyond their contributions to avoiding GHG emissions, the NAMAs were selected based on their alignment with national development priorities and the commitment and willingness of individual stakeholder agencies to engage in the NAMA process and provide the information needed for NAMA development. Finally, as illustrated in Table 1 the mitigation options selected for NAMAs were found to have no or very little cost per tCO_2e abated and are therefore attractive from a perspective of social benefits.[3] The NAMA to foster use of natural gas for transport in Kazakhstan (-82.6 $/tCO_2e$) and the NAMA to accelerate small-scale hydropower in Uzbekistan (-20.7 $/tCO_2e$) both result in cost savings to society. The NAMA to promote agro-energy development based on renewable energy in Azerbaijan is low cost (10 $/tCO_2e$) and results in important energy security and rural development benefits. Similarly, the NAMA to develop an energy efficiency support system for Kazakhstan targets a range of negative or low cost measures (-2 to 19.5 $/tCO_2e$) that can result in considerable fuel savings to the country.

Table 1: Proposed NAMA Concepts for Azerbaijan, Kazakhstan, and Uzbekistan

	Azerbaijan	Kazakhstan		Uzbekistan
NAMA	**Promoting Agro-Energy Development Based on Renewable Energy**	**Fostering Use of Natural Gas in the Transport Sector**	**Developing a National Energy Efficiency Support System**	**Accelerating Deployment of Small-Scale Hydropower**
Description	Support construction of renewable energy at agricultural complexes in Azerbaijan, revises the normative and regulatory framework for renewable energy, and pilots the concept at the Samukh agro-energy complex.	Expands the CNG refueling infrastructure, converts vehicles to natural gas, and increases the technical capacity to support CNG in transport.	Creates an online system for tracking energy efficiency improvements, pilots its use, and expands it to include energy efficiency in the transport sector.	Addresses institutional and investment barriers to the acceleration of small-scale hydropower and finances the rehabilitation of existing plants and construction of new small hydropower plants.
Potential GHG Emission Reductions (tCO_2e)	116,825 – 584,125 annually by 2020	135,315 – 1,766,574 annually by 2025	1,607 annual direct reductions Indirect reductions to be determined	918,715 annually by 2030
Time Period	2014–2020	2014-2025	2015-2025	2015-2030
Cost of implementation	277.9	74.1	3.5	728.7

[3] Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

NAMA	Azerbaijan	Kazakhstan		Uzbekistan
	Promoting Agro-Energy Development Based on Renewable Energy	**Fostering Use of Natural Gas in the Transport Sector**	**Developing a National Energy Efficiency Support System**	**Accelerating Deployment of Small-Scale Hydropower**
(Million $)				
Average Cost of GHG Abatement [a] (2010 $/$tCO_2e$)	10	-82.6	(-2) to 19.5 Depends on the type of efficiency improvement	-20.7

Sources: [a] Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

5. This report discusses the status of NAMA design in the three countries (Section III) and then describes the four proposed NAMA concepts (Sections IV through VII) including how the proposed NAMAs support national development priorities while addressing barriers to GHG abatement. Appendix 1 describes the methods used to evaluate and design the NAMA concepts selected for Azerbaijan, Kazakhstan, and Uzbekistan and summarizes the results of the stakeholder training and consultations.

6. The development of the NAMA concepts was complemented by a two-year capacity development program focused on strengthening the capacity of stakeholders to evaluate mitigation options for NAMA development, access financing, and measuring and reporting on progress once they have been implemented. Appendix 2 includes agendas for the two regional workshops conducted under the TA to provide training on NAMAs and climate change finance. Appendix 3 provides the full list of NAMA ideas proposed by workshop participants and stakeholders in Azerbaijan, Kazakhstan, and Uzbekistan based on which the four NAMA concepts presented in this report were selected. Appendix 5 presents the four NAMA concepts in the format used for submitting NAMAs to the UNFCCC NAMA Registry.

II. OBJECTIVES, PURPOSE, AND APPROACH FOR NAMA DEVELOPMENT

A. Objectives and Purpose

7. RETA 8119 seeks to contribute robust information on options and costs to reduce GHG emissions and identify priority investments for low-carbon development in Azerbaijan, Kazakhstan, and Uzbekistan. As outlined in the Design and Monitoring Framework for RETA 8119, the TA's impact will be the implementation of climate change actions in the target countries, accompanied by an improved understanding of the cost of climate change mitigation.[4] Two main project outputs are expected under RETA 8119's mitigation component:

(i) **Output 1:** The cost of climate change mitigation in energy and transport is estimated in Azerbaijan, Kazakhstan, and Uzbekistan.
(ii) **Output 2:** Climate change mitigation investment opportunities are identified in Azerbaijan, Kazakhstan, and Uzbekistan.

8. The completion of these outputs will support the three countries' readiness to leverage public and private finance to address prioritized mitigation investment needs.

9. Output 2 encompasses the formulation of NAMAs for each country, reflecting priority climate change mitigation policies and measures in energy and transport. It calls for working with national stakeholders to build capacity and formulate the NAMAs while delivering training on methods to measure and monitor results once the NAMAs are implemented. Work under Output 2 therefore involved a mix of stakeholder consultations, training, and technical assistance to support the selection and design of the NAMA concepts.

B. Background on NAMAs

10. The term Nationally Appropriate Mitigation Action emerged as part of the negotiations under the UNFCCC for a long-term climate change agreement. The term refers to an action that reduces GHG emissions in a developing country below business-as-usual levels. NAMAs must be the product of a national government initiative and may take the form of policies directed at transformational change within an economic sector or actions across sectors for a broader national focus.[5] They are voluntary and do not represent a legal obligation under the UNFCCC.

11. The first mention of NAMAs appeared in the 2007 Bali Action Plan as "nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner."[6] The 2010 Cancun Decision later clarified the term, specifying that NAMAs must

(i) take place within a context of sustainable development;
(ii) be supported and enabled by technology transfer, financing, and capacity building;
(iii) contribute to reducing emissions relative to business-as-usual in 2020; and

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[4] ADB. 2012. *Economics of Climate Change in Central and West Asia*. Manila. (TA8119-REG. $2,000,000) http://www.adb.org/projects/44068-012/main

[5] UNFCCC. *FOCUS: Mitigation – NAMAs, Nationally Appropriate Mitigation Actions.* http://unfccc.int/focus/mitigation/items/7172.php

[6] UNFCCC. 2007. *Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007.* Addendum. Part Two: Action taken by the Conference of the Parties at its thirteenth session. FCCC/CP/2007/6/Add.1*. March 14 2008. Bonn. http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf

(iv) result in GHG emission reductions that are measured, reported, and verified.[7]

12. The international community did not further specify what form NAMAs should take. Since 2010, international NAMA support programs, such as the NAMA Facility funded by the governments of Denmark, Germany, and the United Kingdom and the Spanish NAMA Facility, have provided more details on expectations for NAMA design.[8]

13. NAMAs are designed to change emission trends in developing countries and to offer potential to leverage large-scale GHG emission reductions through sustainable development. Financing is a central issue in NAMA design and implementation. The NAMAs that have successfully obtained international support leverage domestic resources to attract international funds, typically by redirecting existing financing within a country.[9]

C. Approach for NAMA Development

14. As stated in the 2010 Cancun Decision, NAMAs must support sustainable development and fit within a country's national development priorities. Within this context, they can take different forms: sector plans; specific policies, regulations, and programs; or individual projects. The NAMA concepts developed under RETA 8119 include various components of these forms while generally meeting the four basic criteria for NAMAs as clarified by the 2010 Cancun decision and outlined above. Appendix 1 describes the methods used to evaluate and design the NAMA concepts selected for Azerbaijan, Kazakhstan, and Uzbekistan.

15. The NAMA concepts described in this report are ready for submission to the UNFCCC NAMA Registry,[10] which serves as a venue for countries to attract financing and be recognized for their mitigation efforts. Appendix 5 includes the completed forms that a country must submit to the UNFCCC Secretariat for the NAMAs to be recorded in the Registry. The national NAMA Approver listed on the NAMA Registry's website makes the submission to the UNFCCC. The NAMA Approvers for Azerbaijan, Kazakhstan, and Uzbekistan are also the countries' UNFCCC Focal Points (Table 2). Both Azerbaijan and Kazakhstan have already submitted NAMAs developed under other programs to the registry.

Table 2: NAMA Approvers Responsible for Submitting NAMAs to the United Nations Framework Convention on Climate Change NAMA Registry

Country	NAMA Approver	Organization
Azerbaijan	Issa Aliyev	Ministry of Ecology and Natural Resources
Kazakhstan	Gulmira Sergazina	Ministry of Energy
Uzbekistan	Aleksander Merkushkin	Uzhydromet

Source: UNFCCC. *The NAMA Registry: Registered NAMA Approvers.* Accessed 26 August 2015 at: *http://unfccc.int/cooperation_support/nama/items/7476.php*

[7] UNFCCC. 2010. *The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its fifteenth session.* Decision 1/CMP.6. Bonn. Accessed at: http://unfccc.int/resource/docs/2010/cmp6/eng/12a01.pdf

[8] MitigationMomentum. 2015. *Status Report on Nationally Appropriate Mitigation Actions (NAMAs): Mid-year Update*. 2015.

[9] UNDP, United Nations Environment Programme (UNEP), UNFCCC. 2013. *Guidance for NAMA Design: Building on Country Experiences.*

[10] UNFCCC. *The NAMA Registry*. 2015. Accessed at: http://unfccc.int/cooperation_support/nama/items/7476.php

16. ADB does not have a funding mechanism specifically targeting NAMAs. As a result, the NAMA concepts proposed in this report are not formulated into complete bankable NAMA proposals but instead are general concept notes that can be modified by potential funders based on their specific guidelines. Alternatively, Azerbaijan, Kazakhstan, and Uzbekistan may implement the NAMAs unilaterally without international support.

17. Individual components of the proposed NAMA concepts are still in development. The NAMA proponents have plans underway for further feasibility studies to clarify specific implementation strategies and funding needs. For example, the Azerbaijan State Agency on Alternative and Renewable Energy Sources (SAARES) is conducting feasibility studies to assess the technologies to be used and determine the funding needed to develop renewable energy capacity for a NAMA to promote renewable energy development in the agricultural sector. SAARES is also working to improve the legal and normative framework to increase incentives to invest in renewable energy. Kazakhstan plans to conduct site-specific feasibility studies for its NAMA to promote natural gas for transport. The Government of Uzbekistan is outlining its strategy for promoting hydropower and other renewable energy sources; as a result, parts of the framework for the proposed NAMA to accelerate deployment of small-scale hydropower may change.

18. Given the ongoing work by each country to clarify and create incentives for the targeted mitigation actions, the proposed NAMA concepts will likely need to be updated as more information becomes available. Indeed, NAMA concepts often require an update as they move from conceptualization to implementation, particularly with respect to financial matters (footnote 9). Recognizing the expected need to update information, the consultant team worked with national counterparts to design the NAMA concepts around currently available information, develop a format that lends itself to easy updating, and document all assumptions and quantitative analyses so that future NAMA proponents can easily build on the initial NAMA concepts outlined in this report.

19. A central criterion of NAMAs is that the proposed mitigation action must be measurable, reportable, and verifiable. However, to date the UNFCCC process has not yielded guidance on how MRV guidelines for GHG emissions and other NAMA elements should be implemented. The consultant team worked with stakeholders to develop the MRV components of the proposed NAMAs, addressing a mix of GHG and general reporting elements, including financing, implementation status, and progress toward general development goals. Tracking such information will help the countries inform civil society and the international community about progress on their mitigation activities. The Biennial Update Reports (BURs) to the UNFCCC are an example of such reporting—the BURs update the international community on national circumstances, GHG emission inventories, and mitigation activities.

20. In addition to MRV, this report addresses an important, emerging requirement for NAMAs: transformational change.[11] The new support mechanisms that provide financial and capacity building assistance to developing countries for the preparation and implementation of NAMAs and other mitigation actions place a high value on this concept, as evident in the application criteria put forth by organizations such as the NAMA Facility, the Spanish NAMA Facility, and the Green Climate Fund.

[11] Overseas Environmental Cooperation Center (OECC). 2015. *NAMA Guidebook*. 2nd Edition. Japan. pp. 29-30; UNDP, UNEP, UNFCCC. 2013. *Guidance for NAMA Design: Building on Country Experiences*.

21. As described in Box 2, transformational change is linked to innovation and the ability of the mitigation activity to be scaled up or replicated, become sustainable in the long run, and allow for learning. NAMA supporters also focus on the ability of a NAMA to leverage domestic financial resources. The general expectation is that NAMAs will be based on a program for an entire sector or industry rather than on an individual project, because such broader activities are more likely to lead to a measurable and sustained change in GHG emission trends.[12]

22. The consultant team worked with NAMA proponents to incorporate the objective of transformational change into the NAMAs selected for this report. In some cases, stakeholders will need to further clarify how their proposed NAMAs will meet the transformational change criterion, especially if countries seek international support to implement their NAMAs. For example, the NAMA concept to provide an energy efficiency information support system in Kazakhstan addresses major informational barriers to energy efficiency penetration in Kazakhstan but otherwise does not link directly to specific policy, regulatory, or other financial measures that can help accelerate energy efficiency measures. The creation of such a link will strengthen the NAMA by ensuring a more comprehensive and sustainable framework to promote energy efficiency. However, to forge such a link, the lead NAMA proponent will have to partner with other agencies that are responsible for regulatory or policy issues governing energy efficiency, pushing the NAMA beyond the timeline for completing the TA.

Box 2: Transformational Change in the Context of NAMAs, as Defined by the NAMA Facility

In order to obtain financial or technical support for implementation of a NAMA, a proponent must demonstrate that the proposed concept

- contributes to enabling either a significant evolution in scope (e.g., scaling-up or replication) or a faster shift from one state to another;
- has a catalytic effect and includes (a) mechanisms to ensure the sustainability of the impacts, local ownership, and political will; (b) the involvement of the private sector; and (c) the use of innovative technologies and approaches; and
- allows for systematic learning processes.

Source: The NAMA Facility. 2014. *Potential for Transformational Change*. Accessed at: http://www.nama-facility.org

[12] OECC. 2015. *NAMA Guidebook*. 2nd Edition. Japan. pp. 29-30.

III. NAMA IMPLEMENTATION AND INSTITUTIONS IN AZERBAIJAN, KAZAKHSTAN, AND UZBEKISTAN

23. During the implementation of RETA 8119, the consultant team conducted several consultative meetings with stakeholders in Azerbaijan, Kazakhstan, and Uzbekistan to understand progress and priorities for NAMA implementation. The team also organized national and regional workshops to discuss the implementation of and barriers to NAMA development. (Appendix 4 contains a list of these workshops). This section provides a synthesis of the findings and recommendations from the meetings and workshops.

A. Regional Overview

24. Work on NAMAs is still in the early stages in Azerbaijan, Kazakhstan, and Uzbekistan, and the formal institutional framework supporting NAMA development and implementation has yet to be established. In view of the collapse of the clean development mechanism (CDM) market, many stakeholders—national governments, the private sector, and national financial institutions—have adopted a wait-and-see attitude toward NAMAs.[13] Limited financial support mechanisms for NAMA implementation further underscores stakeholders' hesitation (footnote 8).

25. Government stakeholders have outlined the following major barriers to increased engagement in NAMA development in Central Asia:[14]

(i) an absence of dedicated international funds for NAMA implementation and lack of agreement on NAMA design requirements;
(ii) a lack of formal national institutions for NAMAs that would clarify and create incentives for interagency collaboration and engagement in NAMA development;
(iii) a lack of dedicated personnel in government institutions with responsibility for and training in NAMA development, implementation, and evaluation;
(iv) government stakeholders' limited understanding of the benefits of NAMAs and the procedures for designing NAMAs and MRV processes; and
(v) a lack of engagement by the countries' private sectors in formulating NAMAs and supporting the design of the underlying financing mechanisms.

26. The governments in each country are broadly supportive of NAMA development. Stakeholders in each country have already proposed several NAMA concepts, with support from international development partners. Azerbaijan has also started initial planning for an institutional framework for NAMAs.

B. NAMA Institutions in Azerbaijan

27. The government of Azerbaijan supports NAMA initiatives in the context of the UNFCCC negotiating process. This support is reiterated in the draft text of the Action Plan on

[13] Abt Associates. 2014. *Workshop Summary: Interim Regional Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors; RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC.

[14] Abt Associates. 2014. *Workshop Summary: Regional Inception Workshop – Developing Climate Change Mitigation Policies and Nationally Appropriate Mitigation Actions (NAMAs).* Baku. January 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates. 2014. *Workshop Summary: Interim Regional Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors.* Astana. June 2014.

Improvement of the Environmental Situation in Azerbaijan, which will be finalized in 2015. The Ministry of Ecology and Natural Resources (MENR) leads and coordinates Azerbaijan's NAMA process and represents the country during UNFCCC negotiations. As the UNFCCC National Focal Point for Azerbaijan, the MENR also approves and submits NAMA ideas to the UNFCCC NAMA Registry. Azerbaijan included an update on NAMAs in the country's first BUR, submitted to the UNFCCC in March 2015.[15]

28. Azerbaijan is interested in reaching a new global agreement that takes into account climate change adaptation, technology transfer, finance, and capacity building issues, along with support for climate change mitigation (footnote 15). To that end, Azerbaijan has launched an internal government process and stakeholder consultations, led by MENR, to prepare an Intended Nationally Determined Contribution (INDC). In May 2014, the Cabinet of Ministers assigned all relevant ministries to prepare INDC proposals; the ministries submitted their proposals to the MENR in late 2014. The government intends to finalize the INDC by August 2015 and submit it to the UNFCCC Secretariat soon thereafter.[16] The current version of the INDC includes proposed contributions to mitigation and adaptation but does not discuss the role of NAMAs and how they can support the contributions.

29. During the inception workshops for the TA, stakeholders in Azerbaijan identified several barriers to NAMA development, including the following:[17]

(i) There is no coordinating body within the government to facilitate collaboration on NAMAs across agencies. The MENR is the contact point for NAMAs developed by other agencies and approves submissions to the UNFCCC NAMA Registry, but it does not have a mandate to develop or spearhead efforts to prepare NAMAs for submission on behalf of other agencies. The MENR therefore depends on champions in other parts of the government to conceive of potential NAMAs and encourage collaboration to address potential interagency barriers to implementation;
(ii) Relevant national stakeholders' current knowledge and capacity to develop NAMAs is low, particularly among government representatives. In the past, participants in related international capacity building activities largely represented nongovernmental organizations (NGOs); and
(iii) Azerbaijan's private sector has been reluctant to engage in NAMAs, mainly because of negative experiences with CDM projects. Without private sector participation in financing, however, the government would have to act as the key investor. This could potentially limit the share of investment covered by national contributions.

30. Two projects funded by the German Society for International Cooperation (GIZ) aimed to strengthen the capacity for NAMAs and other mitigation activities in Azerbaijan. The first project—Capacity Development for Climate Policy in the Western Balkans, Central and Eastern Europe and Central Asia—focused on national capacity building activities.[18] The second project,

[15] Government of Azerbaijan. 2014. *The First Biennial Updated Report of the Republic of Azerbaijan to the UN Framework Convention on Climate Change.* Baku. 2014. Accessed at: http://unfccc.int/resource/docs/natc/aze_bur1_eng.pdf

[16] Abt Associates. 2015. *Workshop Summary: National Final Workshop for Azerbaijan*. Baku. July 2015; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates.

[17] Abt Associates. 2014. *Workshop Summary: National Inception Workshop for Azerbaijan*. Baku. January 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates; Abt Associates. 2014. *Workshop Summary: Regional Inception Workshop – Developing Climate Change Mitigation Policies and Nationally Appropriate Mitigation Actions (NAMAs)*. Baku. January 2014.

[18] The countries targeted for this technical assistance activity include Azerbaijan, Belarus, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Montenegro, the Russian Federation, Serbia, Turkmenistan, Ukraine, and Uzbekistan.

implemented by the Regional Environmental Center for the Caucasus in 2013, led to one national workshop and two regional South Caucasus NAMA workshops. Neither project resulted in the institutionalization of NAMA development, largely because of funding constraints and limited stakeholder reach. Nonetheless, government stakeholders remain interested in building the capacity to institutionalize the NAMA process in Azerbaijan.[19]

31. Because many emerging technologies applied in NAMAs must be imported, stakeholders in Azerbaijan also request support for technology transfer. Such support includes training in the use of new technologies to ensure proper installation, maintenance, and sustained use. In addition, government stakeholders have expressed a strong interest in capacity building in the following areas:[20]

(i) improving general awareness of NAMA initiatives and their expected benefits;
(ii) improving understanding of NAMA design and MRV procedures;
(iii) identifying state, private, and international financial support mechanisms; and
(iv) incorporating modern, environmentally friendly technologies into NAMA design and implementation.

C. NAMA Status in Azerbaijan

32. To date, stakeholders in Azerbaijan have developed two NAMA proposals: (i) Nationally Appropriate Mitigation Actions for Low-Carbon End-Use Sectors in Azerbaijan and (ii) Concept Note: NAMA in the Foam, Refrigeration, and Air-Conditioning Sectors in Azerbaijan. Several other NAMA ideas are in the earliest preparation stages.

1. NAMA for Low-Carbon End-Use Sectors in Azerbaijan

33. The objective of the NAMA for Low-Carbon End-Use Sectors is to support the State Oil Company of the Azerbaijan Republic (SOCAR) in developing and implementing selected programmatic NAMAs in low-carbon end-use sectors.[21] The United Nations Development Programme (UNDP) will support the development and five-year implementation of the NAMA, which focuses on where and how pilot investments may be directed into low-energy and low-carbon technologies that are so far absent on a large scale. The NAMA will address the potential to improve the energy performance of buildings (new and existing residential, service, and public buildings) and transportation (passenger cars, trucks, buses, and special-purpose vehicles). The NAMA also focuses on the oil and gas sector, which is one of the main sources of GHG emissions in Azerbaijan. The NAMA identifies mitigation activities that reduce emissions by capturing gases that are vented from on-shore oil and gas fields and then using these

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The objectives are to (i) provide regional support for climate policy dialogue processes and advisory services in Eastern European and Central Asian countries, strengthening technical know-how, instruments, and institutional arrangements related to climate change mitigation and adaptation; and (ii) support flexible and timely interventions in response to the requests of the partner countries. In Azerbaijan this includes providing capacity building workshops on NAMA development.

[19] Abt Associates. 2014. *Workshop Summary: Interim Regional Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors.* Astana. June 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates.

[20] Abt Associates. 2014. *Workshop Summary: National Inception Workshop for Azerbaijan.* Baku. January 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates; Abt Associates. 2014. *Workshop Summary: Interim Regional Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors*. Astana. June 2014.

[21] UNDP. 2013. *Nationally Appropriate Mitigation Actions for low-carbon end-use sectors in Azerbaijan: Background.* Azerbaijan. Accessed at: http://www.az.undp.org/content/azerbaijan/en/home/operations/projects/sustain_development/NAMA.html

captured gases as fuel for nearby residential areas that otherwise use firewood from nearby forests (Table 3). The Government of Azerbaijan submitted the NAMA to the UNFCCC Registry in 2014.[22]

Table 3: Overview of the NAMA for Low-Carbon End-Use Sectors in Azerbaijan

Project Component	Annual GHG Emissions (tCO_2e)	GHG Emissions during Five-Year Project Life (tCO_2e)	GHG Emissions during Lifetime of Technology (tCO_2e)	Lifetime of Technology (Years)
NAMA 1—Green Buildings Program				
Direct emission reductions	420	2,100	10,500	25 years
Indirect emission reductions (top-down)	86,124	430,618	1,291,855	
NAMA 2—Sustainable Transport				
Direct emission reductions	162	808	1,616	10 years
Indirect emission reductions (top-down)	1,611	8,055	9,666	
NAMA 3—Gas Capturing				
Direct emission reductions	21,962	109,809	549,044	25 years
Indirect emission reductions (top-down)	329,426	1,647,132	4,941,395	
Total direct GHG emission reductions	**22,543**	**112,717**	**561,160**	
Total indirect GHG emission reductions	**417,161**	**2,085,805**	**6,242,916**	

Source: UNDP. 2013. *Nationally Appropriate Mitigation Actions for low-carbon end-use sectors in Azerbaijan: Background.* Azerbaijan. Accessed at: http://www.az.undp.org/content/azerbaijan/en/home/operations/projects/sustain_development/NAMA.html

2. NAMA for the Foam, Refrigeration, and Air-Conditioning Sectors

34. GIZ has prepared a concept note for a NAMA in the Foam, Refrigeration, and Air-Conditioning Sectors.[23] The NAMA's overall objective is to reduce GHG emissions by introducing environmentally friendly and energy-efficient technologies in Azerbaijan's refrigeration, air-conditioning, and foam sectors. Activities specified in the NAMA include converting domestic refrigeration, air-conditioning, and foam production to more efficient technologies. Currently, the share of domestically produced refrigerators and commercial refrigeration equipment is estimated at 45% to 55% of the market. Local industry has expressed interest in introducing new, more efficient technologies. Because Azerbaijan does not produce split-residential air-conditioners, which are more efficient than the ones currently produced domestically, the NAMA advocates the introduction of policy measures to promote imports of more efficient air-conditioners and residential and commercial refrigerators. These appliances not only operate at higher energy efficiency but do so without ozone-depleting substances or high global-warming potential (GWP) refrigerants and blowing agents.

[22] The NAMA Registry. 2014. *NS-95 – Nationally Appropriate Mitigation Actions for low-carbon end-use sectors in Azerbaijan*. Accessed at: http://www4.unfccc.int/sites/nama/_layouts/un/fccc/nama/NamaSeekingSupportForPreparation.aspx?ID=57&viewOnly=1

[23] Aliyev, I. 2014. *Climate Change Policy and New Global Agreement*. Presentation at ClimaEast: Support to Climate Change Mitigation and Adaptation in Russia and ENP East Countries – Intended Nationally Determined Contributions workshop. August 2014. Azerbaijan. Accessed at: http://1067656943.n159491.test.prositehosting.co.uk/wp-content-sec/uploads/2014/08/Climate-Change-Policy-and-New-Global-Agreement.pdf

35. By implementing the NAMA, Azerbaijan's refrigeration, air-conditioning, and foam industry will avoid direct emissions from refrigerants and blowing agents and indirect emissions that stem from energy consumption by old, inefficient equipment (Table 4).

Table 4: Expected Greenhouse Gas Emission Reductions from the NAMA for the Foam, Refrigeration, and Air-Conditioning Sectors ($MtCO_2e$)

Item	Total Annual GHG Emission Reductions by 2020	Total Annual GHG Emission Reductions by 2030
Split-residential air-conditioners	2.100	3.200
Domestic refrigeration	0.800	1.570
Condensing units (centralized commercial refrigeration)	0.032	0.057
Foam for commercial refrigeration appliances	7.400	48.900
Foam for domestic refrigerators	1.500	28.400

Source: Aliyev, I. 2014. *Climate Change Policy and New Global Agreement*. Presentation at Clima East: Support to Climate Change Mitigation and Adaptation in Russia and ENP East Countries – Intended Nationally Determined Contributions workshop. August 2014. Azerbaijan. http://1067656943.n159491.test.prositehosting.co.uk/wp-content-sec/uploads/2014/08/Climate-Change-Policy-and-New-Global-Agreement.pdf

36. The MRV system specified in the NAMA is designed to measure the market share of more efficient technologies. The market MRV design captures domestic sales, type of refrigerant, performance, cooling capacity, and initial cost of equipment. The equipment MRV design tracks the type of refrigerant, performance, cooling capacity, initial cost, first fill/refill of systems (service sector), and energy consumption (annual basis).

D. NAMA Institutions in Kazakhstan

37. In Kazakhstan, the lead agency for NAMAs is the Ministry of Energy (MOE),[24] which is also responsible for national energy and electricity policy, low-carbon development, renewable energy, transition to a green economy, solid waste, and natural resources management. Two MOE departments—the Department of Climate Change (DCC) and the Department for Renewable Energy Supply (RES) Development—have been involved in NAMA proposals. The DCC is listed as the NAMA Approver for the UNFCCC NAMA Registry. So far, the DCC's role has focused on

(i) consideration of NAMA proposals prepared by other entities according to national sustainable development priorities and existing climate change policies;
(ii) submission of approved NAMAs to the UNFCCC Registry; and
(iii) support for and approval of measures to implement national and local climate change action plans.

38. To date, the government has focused on implementing key domestic climate change mitigation programs such as the emissions trading system (ETS) and the green growth concept;

[24] According to the President's Decree "On the reform of public administration of the Republic of Kazakhstan" (No. 875, August 6, 2014), the Government of Kazakhstan reorganized its ministerial structure into 12 new ministries and 30 committees. Major changes initiated by the decree included splitting the functions of the Ministry of Environment Protection and Water Resources between two ministries: the Ministry of Agriculture, which oversees the administration and management of fisheries, water, forests, and wildlife; and the MOE.

it has paid less attention to NAMAs. Nonetheless, stakeholders in the MOE and other agencies are interested in better understanding the concept, including how to prepare effective NAMA proposals, in case NAMAs can help attract financing for priority climate change programs. In a series of capacity development workshops organized under RETA 8119, participants requested practical, hands-on support to formulate NAMAs and help to prepare proposals to attract climate finance.[25]

39. A few international development partners have supported NAMAs in Kazakhstan through the following activities:

(i) UNDP has a project titled "Capacity-building for sustainable development through the integration of climate change issues into the strategic planning of the Republic of Kazakhstan" (2009–2012). One of the major project outcomes was the development of the Low-Carbon Development Plan of Kazakhstan until 2050. This plan aimed to reduce GHG emissions without compromising economic and social development. To demonstrate practical steps for mitigating climate change, UNDP worked with stakeholders to develop two NAMA concepts ("Astana—A Low-Carbon City" and "Support for the Solar Industry"), which were approved by the city of Astana and the MOE; and

(ii) Kazakhstan is participating in a regional project implemented by the GIZ titled "Capacity Development for Climate Policy in the Western Balkans, Central and Eastern Europe and Central Asia." The project began in 2013 and continues through 2017. It targets Azerbaijan, Belarus, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Montenegro, the Russian Federation, Serbia, Turkmenistan, Ukraine, and Uzbekistan. In Kazakhstan, the project assists with implementation of the ETS and delivers regional capacity building workshops on NAMA design.

E. NAMA Status in Kazakhstan

40. UNDP developed two NAMAs, which the MOE submitted to the UNFCCC in 2014. At the time of writing this report, only the Low-Carbon City NAMA had been uploaded to the NAMA Registry website.[26]

1. Astana—A Low-Carbon City NAMA (or Urban NAMA Astana)

41. The Low-Carbon City NAMA will introduce cross-sectoral interventions that result in sustainable growth and healthy urban living conditions. This NAMA includes the following:

(i) creation (in the mayor's office) of the Astana Green Growth Centre (AGGC), will serve as the implementing agency for the Low-Carbon City NAMA;
(ii) completion of a city-wide GHG inventory and MRV framework;

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[25] Abt Associates. 2014. *Workshop Summary: National Inception Workshop for Kazakhstan*. Astana. January 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component.* Washington, DC: Abt Associates; Abt Associates. 2014. *Workshop Summary: Regional Inception Workshop – Developing Climate Change Mitigation Policies and Nationally Appropriate Mitigation Actions (NAMAs)*. Baku. January 2014; Abt Associates. 2014. *Workshop Summary: Interim Regional Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors*. Astana. June 2014.

[26] The NAMA Registry. 2014. *NS-124 – Nationally Appropriate Mitigation Actions for Low-carbon Urban Development in Kazakhstan.* Accessed at: http://www4.unfccc.int/sites/nama/_layouts/un/fccc/nama/NamaSeekingSupportForPreparation.aspx?ID=66&viewOnly=1

(iii) definition of a 2020 GHG target and a cross-sectoral intervention plan (CSIP) to meet this target;
(iv) strengthening of the institutions that enable investment in infrastructure;
(v) a dedicated fund to support mitigation actions; and
(vi) a pilot program to modernize urban infrastructure in Astana's Prigorodnoye District.

42. The goals are to exceed the countrywide GHG target of 15% below 1990 emission levels by 2020 and to provide an example for city-wide interventions throughout Kazakhstan.

43. UNDP and the City of Astana will prepare the NAMA over a two-year period, after which the AGGC will lead implementation through 2020. Initial financing for the AGGC will come from the City of Astana's own budget. The full cost of implementation is estimated at $1 million the first year and then $600,000 annually through 2020. The City of Astana is seeking additional donor financing from UNDP, the European Union, and others.

2. Support for the Solar Industry NAMA

44. The national implementing entity for the solar industry NAMA will be the Central RES Operations and Management Centre, a government agency with a mixed governing structure that will be established as part of the NAMA. The solar industry NAMA calls for (i) creation of a new and dedicated institution; (ii) provision of geographic data on solar energy potential; (iii) improvement of the feed-in-tariff; (iv) provision of financial incentives for solar power, and (v) construction of 200 megawatts (MW) of solar power capacity by 2020 (1% of 2012 capacity). Specific activities to be implemented and financed include the following:

(i) creation of the Central RES Operations and Management Centre ($1 million);
(ii) development of a geographic information system (GIS)-based solar atlas ($200,000); and
(iii) an international loan facility (cost unknown).

45. The government will fund the creation and operation of the Central RES Operations and Management Centre. The government will also update the renewable energy supply law, which will call for an institutional oversight structure. It will also fund the cost of meeting 50% of the 2020 solar target. International funds are expected to cover the cost of the remaining solar capacity and the additional feed-in-tariff cost, the cost of developing a solar atlas, and the cost of creating a loan facility dedicated to supporting investment in renewable energy.

F. NAMA Institutions in Uzbekistan

46. The Government of Uzbekistan is receptive to the NAMA concept but has not yet clarified institutional arrangements for evaluating and implementing NAMAs.[27] The government has delegated functions related to the UNFCCC and the Kyoto Protocol to Uzhydromet, which is also listed as the NAMA Approver with the UNFCCC NAMA Registry. Uzhydromet prepares the national GHG emissions inventory and national communications for submission to the UNFCCC.

[27] Abt Associates. 2014. *Workshop Summary: National Inception Workshop for Uzbekistan*. Tashkent. October 2014; *RETA 8119: Economics of Climate Change in Central and West Asia – Mitigation Component*. Washington, DC: Abt Associates.

47. International development partners have supported the design of NAMAs in the following ways:

(i) Through a joint UNDP/Ministry of Economy project titled "Supporting Uzbekistan in Transition to a Low-Emission Development Path," UNDP is investigating the potential for NAMAs in buildings and evaluating potential institutional arrangements for NAMAs. As part of its work, UNDP published two Russian-language publications related to NAMAs:
    (a) A Road Map—The Transition from the CDM (2014)
    (b) Guidelines on Nationally Appropriate Mitigation Actions (NAMAs) (2014)

    Both documents propose a legislative arrangement for NAMAs, which the government is now considering.

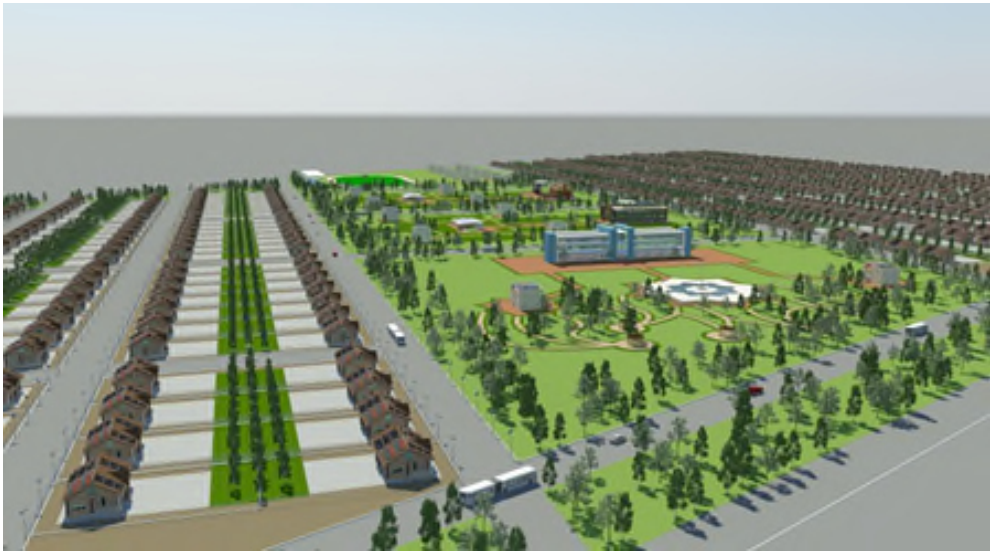
(ii) Along with Azerbaijan and Kazakhstan, Uzbekistan is participating in a regional project implemented by the GIZ titled "Capacity Development for Climate Policy in the Western Balkans, Central and Eastern Europe and Central Asia." The project delivers regional capacity building workshops on NAMA development. These workshops have included representatives from Uzbekistan.

48. Uzhydromet, in collaboration with the State Nature Protection Committee, has established a working group to prepare an INDC ahead of the UNFCCC Conference of Parties 21 in Paris. The working group is receptive to incorporating NAMAs into the INDC if they are finalized before the INDC is submitted to the UNFCCC.

G. NAMA Status in Uzbekistan

49. With assistance from international development partners, national stakeholders have proposed two NAMAs. A third is under development. The first NAMA, developed with support from the German government, focuses on energy-efficient rehabilitation of multistory residential buildings. Uzkommunkhizmat would be the implementing partner. The second NAMA is being developed under the UNDP/Ministry of Economy project "Supporting Uzbekistan in Transition to a Low-Emission Development Path." It targets energy efficiency in rural buildings. Finally, ADB is working with the Ministry of Economy and Uzbekenergo to develop a NAMA based on the country's solar roadmap. At the time of writing this report, none of these NAMA concepts had been submitted to the NAMA Registry.

IV. PROMOTING AGRO-ENERGY DEVELOPMENT BASED ON RENEWABLE ENERGY: NAMA CONCEPT FOR AZERBAIJAN



A. Summary of the NAMA Concept

1. Country

50. Azerbaijan

2. Implementing Entity

51. The Azerbaijan State Agency on Alternative and Renewable Energy Sources (SAARES) will lead the NAMA's design and implementation. SAARES is a government agency established in 2010 to implement state policy on renewable energy, develop the infrastructure for renewable energy, oversee the adoption of renewable energy in all sectors of the economy, and track and report on renewable energy activities.

3. Contact Information

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4. Brief Description

53. To support the Government of Azerbaijan's goal to increase the use of renewable energy, the proposed NAMA is designed to address barriers to renewable energy by reforming the legal and regulatory norms governing renewable energy. Reforms extend to revising the tariff

structure, proposing tax exemptions for relevant equipment and spare parts, and establishing a preferential loan program.

54. The NAMA will also support the construction and implementation of the Samukh Agro-Energy Residential Complex, a modern, multifaceted agriculture and food processing center that will be powered by renewable energy. It will be integrated in one campus with public and residential facilities. It comes as close as possible to offering a carbon-neutral, waste-free operating cycle. The Samukh Complex will serve as a pilot test case for renewable energy deployment in an agricultural setting. It will include several lines of production—grain and vegetable plantations; greenhouses; fruit orchards; cattle breeding facilities; milk farms; fisheries; and juice, fruit, and livestock feed packaging factories. Electricity and heat will be generated by a variety of renewable sources, including solar photovoltaic (PV), solar thermal, and geothermal energy as well as locally produced agricultural or other types of waste generated from the Samukh Complex's operations or collected from the nearby region. Construction of parts of the Samukh Agro-Energy Complex began in 2014, including installation of PV panels with 2.8 MW of generating capacity. Feasibility studies are ongoing to determine the technology and financing requirements of the additional renewable energy capacity.

55. There are a small but growing number of agricultural enterprises in Azerbaijan. The Samukh Complex will be the first to be powered by renewable energy. Because it is part of the NAMA, SAARES will use the lessons learned and technical skills gained from the Samukh complex to replicate the agro-energy complex at five other locations in Azerbaijan.

56. The NAMA's renewable energy capacity will replace the consumption of electricity from the grid, which is powered mostly by fossil fuels. It will also provide heat, 100% of which is currently generated by fossil fuels in Azerbaijan. The fuel switch will reduce three GHGs: carbon dioxide, methane, and nitrous oxide.

5. Time Period

57. The NAMA will take place over a seven-year period. It will be split into two phases:

(i) Phase 1: 2014–2016
(ii) Phase 2: 2017–2020

58. Work on the Samukh Agro-Energy Residential Complex started in 2014 with the initiation of design and feasibility studies for various parts of the complex. Construction of the first solar power plant has already begun. Feasibility studies for other renewable energy facilities are ongoing. During Phase 2, SAARES will begin planning for replication of the Samukh complex at five other sites in Azerbaijan.

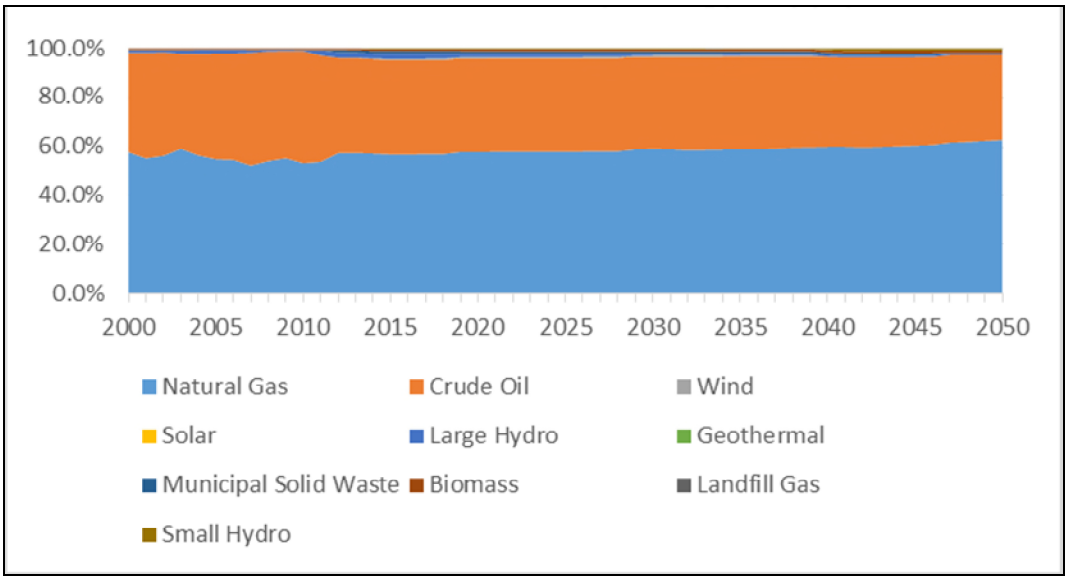
B. Background on Azerbaijan

59. The Republic of Azerbaijan was established in 1918 but was incorporated into the Soviet Union in 1920. The country regained its independence in 1991. With a total land area of 86.6 thousand square kilometers (km^2), Azerbaijan is bordered by Russia, Georgia, Armenia, Turkey, and Iran. Mountains dominate the northern, southern, and western regions, covering roughly 43% of the country. Flatlands run throughout the center of the country, accounting for the other 57% of Azerbaijan's land area. The country's population in 2014 was 9.46 million, with more than half residing in urban areas. During the 2015–2050 period, the population is expected to grow to 14.24 million—an increase of 51% (footnote 3).

60. With rich hydrocarbon reserves and favorable natural conditions, Azerbaijan has achieved rapid economic development since gaining independence from the Soviet Union. In 1995, Azerbaijan started to implement policies to transition from a planned economy to a free market economy. Since then, liberalization of the economy and stimulation of the oil sector has led to a sustained period of economic growth and development, which is expected to continue (footnote 3).

61. Azerbaijan's economy is driven mainly by oil and gas production, which accounts for over half of national revenue.[28] Other major economic sectors include chemicals and petrochemicals, metallurgy, mechanical engineering, textiles, and the food industry. Agriculture also plays an important role in the economy. The country relies primarily on natural gas and oil to meet its energy and transport needs and will continue to do so in the future (Figure 1). As a result, even though the economy's GHG intensity is declining with the shift from oil to natural gas for electricity generation, Azerbaijan's absolute GHG emissions will likely increase through 2050 to satisfy the demands of a growing economy and population (Figure 2).

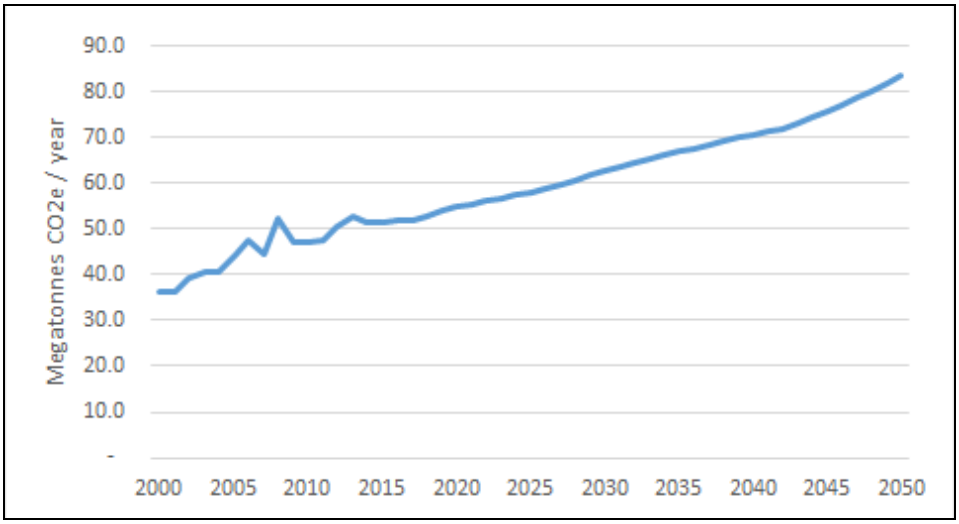
Figure 1: Share of Fuels in Primary Energy Supply of Azerbaijan, 2000–2050



Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

[28] *Report of the Ministry of Ecology and Natural Resources for 2008–2012, 1st Volume.* 2013.

Figure 2: Total Annual Greenhouse Gas Emissions in Azerbaijan, 2000–2050



Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

62. Recognizing the need to decouple future economic growth and energy use from GHG emissions, Azerbaijan is looking at measures to reduce emissions. The country's overarching development plan, titled "Azerbaijan-2020: Vision to the Future," states that "... during the period covered by the concept, it is planned to bring the amount of energy used for the production of one unit of GDP and the amount of carbon dioxide in line with the appropriate indicator of member countries of the Organization for Economic Cooperation and Development [OECD], and this is important in terms of implementing the development goals of the millennium." Climate change-related issues are now reflected in and addressed by several state programs and action plans, including the State Programme on Utilization of Renewable and Alternative Sources of Energy (2008–2015), which set an alternative and renewable energy target of 20% by 2020.[29] At the same time, the government is developing an Action Plan on the Improvement of the Environmental Situation in Azerbaijan for 2014–2020 and a State Programme on Energy Efficiency for 2015–2020. The government is likely to adopt both the program and the plan in late 2015. The draft texts of the documents reflect strategies for climate change mitigation, alternative and renewable energy development, and NAMAs.

63. Azerbaijan has implemented several mitigation actions related to energy and transport. The country is (i) enhancing renewable energy sources, (ii) switching away from the use of black oil to natural gas in thermal power stations, (iii) applying smart cards (advanced payment billing systems) for electricity and gas metering, (iv) applying Euro-4 standards for transportation, (v) establishing a solar panel production plant, (vi) developing a waste incineration plant, and (vii) introducing capture and use of methane and associated gases from oil and gas production. In

[29] State Programme on Utilization of Renewable and Alternative Sources of Energy (2008–2015), State Programme for the Development of the Fuel Energy Complex (2005–2015), State Programme on Poverty Reduction and Sustainable Development (2008–2015), State Programme on Socio-economic Development of Regions (2014–2018), Action Plan on the Improvement of the Environmental Situation in Azerbaijan (2006–2010); and Action Plan on the Improvement of the Environmental Situation in Azerbaijan (2006–2010).

addition, Azerbaijan sees significant potential for further GHG mitigation by reducing the country's heavy reliance on fossil fuels. Many mitigation measures are cost-effective, including increasing the use of alternative and renewable energy sources (footnote 3). Some energy sources—small hydropower, wind, and solar facilities—fall in the lower cost range.

64. The government of Azerbaijan is looking to increase the use of renewable energy to diversify the economy and promote energy independence. With this in mind, SAARES proposed to develop a NAMA to pilot several renewable energy technologies in an agricultural complex that would promote rural employment and economic development. SAARES plans to use the lessons learned to replicate these technologies in other agricultural settings. By combining the piloting of renewable technologies with normative and legal reforms for tariffs, import duties, and credit for renewables, Azerbaijan hopes to facilitate increased investment in renewables for agriculture and other sectors.

C. Main Goals of the NAMA

65. The proposed NAMA concept supports several development priorities for Azerbaijan, including:

(i) Ensuring energy independence and an adequate energy supply by increasing the supply of alternative and renewable energy. In 2011, the President issued a new order that set a target for alternative and renewable energy and directed SAARES to develop a strategy for meeting the target.[30] The target specifies that 20% of electricity consumption by 2020 must come from electricity generated from renewable sources. In addition, by 2020 renewable energy sources must account for 9.7% of total energy consumption and 2,000 MW of renewable energy capacity must be installed. SAARES, which is the implementing agency for the renewable energy NAMA, is charged with achieving the government's goals for increasing alternative and renewable energy sources and diversifying the economy. In December 2014, SAARES released its strategic plan for 2015–2018. The plan calls for (a) increasing renewable energy capacity, (b) modifying existing norms and regulations to provide incentives for the private sector to develop renewable energy sources, (c) developing and making available preferential loans, (d) increasing technical capacity, (e) improving institutional arrangements that support the tracking and evaluation of renewable energy, and (f) conducting education and outreach activities. According to the strategic plan, SAARES will construct 187 MW of wind, 369 MW of solar, 63 MW of bioenergy, and 116 MW of hydropower capacity between 2015 and 2018, totaling 735 MW of new alternative and renewable energy.

(ii) Reducing GHG emissions. Even though Azerbaijan has not set forth a binding GHG target, several strategy documents address climate change. As pointed out on the previous page, the "Azerbaijan 2020: Vision to the Future" calls for the country to bring its energy usage and carbon dioxide levels in line with OECD indicators. The plan also identifies the "promotion of ecologically clean agricultural production" as a priority. The State Program of Poverty Reduction Sustainable Development (SPPRSD) for the Republic of Azerbaijan (2008–2015) proposes to (a) double GDP in the non-oil sector between 2008 and 2015, and (b) decrease fuel combustion (conditional fuel spent per kilowatt hour, or KWh) in electricity production by 20% by the end of 2015 in order to reduce GHG emissions in the energy sector.

[30] Order of the President of Republic of Azerbaijan on preparation of National Strategy on the use of alternative and renewable energy sources for 2010–2020. Accessed at: http://www.abemda.az/uploads/ABEMDA%20prezintation.pdf

(iii) Increasing investment in non-oil sectors, increasing regional development, shifting to an innovation economy, promoting intensive production in agriculture, and developing the economy in clusters.[31] The renewable energy NAMA calls for the adoption of high-tech and other cutting-edge technologies, investments in infrastructure and human capital, and the promotion of comprehensive and balanced regional development. These priorities extend to the agricultural and food processing sectors. Agriculture accounts for less than 5% of GDP but more than 21% of employment.[32] Development of the agricultural sector will help ensure food security; improve the quality of life for rural populations; and resolve serious demographic, social, and environmental problems, especially in remote regions. As a result, the government has introduced several measures to support and incentivize agricultural production, including tax incentives; increased access to credit; and subsidies for crops, fuel, fertilizers, and machinery.

66. When SAARES commissioned and initiated construction of the Samukh Agro-Energy Residential Complex, it set out to increase the use of renewable energy, test innovative development in an agriculture-centered region, improve the reliability of the electricity supply, and meet the Samukh district's growing demand for electricity and heat. The complex will operate several agricultural and food processing production lines, all of which will be fully powered by renewable energy sources: solar, geothermal, and biofuel. The agricultural products proposed for the complex are already grown in the region. Over the last 10 years, these high-value crops and livestock have contributed to the growth of agricultural production in Azerbaijan.

67. The Samukh complex's long-term goal is to provide a proof-of-concept for other hybrid facilities that will help Azerbaijan move toward more modern, highly efficient, low-emission, and waste-free rural development. Using the lessons learned from Samukh, SAARES plans to replicate the complex at five other sites in Azerbaijan: Nakhchivan, Gadabav, Neftchala, Balaka, and Oghuz. These sites were identified for potential expansion because of unmet energy demand, expected population growth, and favorable renewable energy resource mapping.

68. To help improve conditions for replicability and ensure sustainability upon completion of the Samukh complex, SAARES will introduce supporting measures for advancing renewable energy, including (i) a program to provide preferential loans for alternative and renewable energy sources; (ii) customs duty exemptions for equipment, spare parts, and other devices for renewable and alternative energy production; and (iii) proposed electricity tariffs designed for alternative and renewable energy sources.[33]

69. The construction of renewable energy capacity at Samukh and other agro-energy complexes in Azerbaijan will avert GHG emissions by displacing electricity or heat that would otherwise be generated predominantly by fossil fuel. As illustrated in Figure 3, fossil fuels currently account for more than 75% of installed electricity generation capacity in Azerbaijan; unless more renewables are constructed, the share will likely grow. Similarly, fossil fuel powers 100% of installed heat capacity in Azerbaijan. In 2014, the agricultural and residential sectors consumed 0% and 68% of total heat generation and 6.1% and 45.1% of total electricity

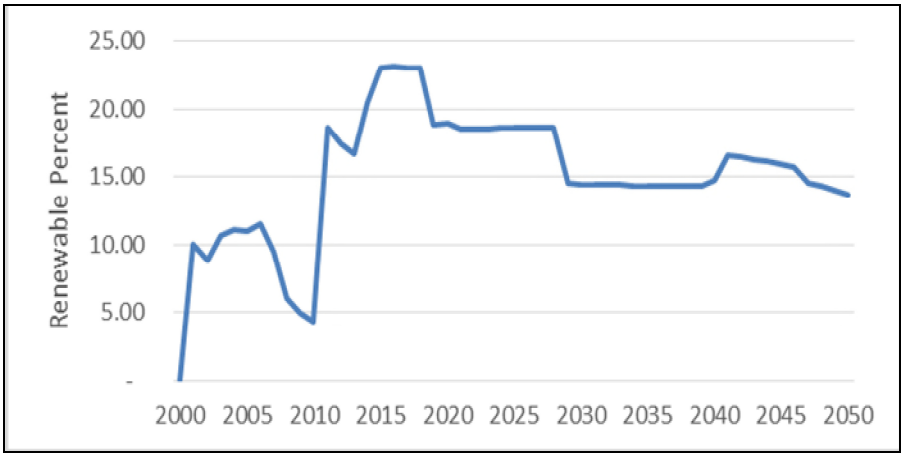
[31] State Program of Ensuring Reliable Population in the Republic of Azerbaijan in Food Provision (2008–2015); SPPRSD in the Republic of Azerbaijan for 2008–2015; State Program of Socio-economic Development of Regions (2014–2018); The Concept of Economic and Social Development and Forecast Indicators for 2014 and the Following 3 Years of the Republic of Azerbaijan (2015–2017).

[32] Food and Agriculture Organization (FAO) of the UN. FAOSTAT. Accessed at: http://faostat.fao.org/site/550/default.aspx#ancor

[33] State Agency for Alternative and Renewable Energy Sources of the Republic of Azerbaijan. 2014. *Strategic Plan (2015–2018).* http://area.gov.az/strateji-plan-2015-2018/

generation, respectively. These figures indicate that there is significant potential to reduce GHG emissions by using renewable energy sources in these sectors (footnote 3).

Figure 3: Percentage of Electricity Generation from Existing and Planned Renewable Energy Sources in Azerbaijan, 2000–2050



Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

D. Barriers Addressed by the NAMA

70. Construction of the Samukh Agro-Energy Residential Complex will help address several barriers to the adoption of renewable energy. Key barriers include the following:

71. Financial and economic barriers. The high cost of the equipment needed for reliance on renewable energy sources, limited access to credit for the purchase and installation of such equipment, and unfavorable terms of financing even when credit is available all pose barriers to the adoption of renewable energy sources. Moreover, the tariff structure is insufficient to support solar, biogas, and geothermal sources. The special tariff of 0.025 and 0.045 Azerbaijan New Manat (AZN) for small hydropower and wind sources is insufficient to recover costs for those technologies.[34]

72. Policy barriers. The absence of incentives for green investment, rather than a lack of or poorly formulated policies per se, poses a barrier to adoption. While the government recognizes and affirms the urgent need to expand generation of renewable energy, it has yet to advance policies to mandate the adoption of renewable energy. Therefore, renewable energy sponsors cannot count on any targeted incentives—soft loans, tax breaks, or custom duty waivers—except in the three technological parks established by presidential decree.

73. Other barriers. Other barriers relate to the scarcity of national experience with modern, highly efficient, and renewable energy-based technologies, especially in the agricultural and

[34] UNFCCC. 2011. *Project Design Document*. Project 4822: Yeni Yashma Wind Farm. Azerbaijan. Bonn. http://cdm.unfccc.int/UserManagement/FileStorage/192AOK6HMSEWBVQX7PCNRFG4DZ0UJ3

food processing sectors. Furthermore, traditional approaches to rural development often do not recognize the potential for alternative and climate-friendly growth strategies.

74. The renewable energy NAMA intends to tackle these barriers by (i) leveraging targeted national and multilateral funding to catalyze investment in renewable energy technologies; (ii) creating a renewable energy cluster that encourages experimentation with optimal use of local energy resources and creates domestic expertise with new technologies; (iii) establishing a proving ground and training facilities for state-of-the-art agricultural technologies; and (iv) raising awareness of a new low-emission comprehensive approach to rural development among the public and decision-makers from the local to national levels. Restructuring tariffs for renewables, providing preferential loans, and creating a tax exemption for imported equipment will help address the financial, economic, and policy barriers described above by improving the tariff structure, increasing access to credit, and reducing the cost of equipment.

E. Co-benefits

75. In addition to averting GHG emissions, the co-benefits of the Samukh Agro-Energy Residential Complex are numerous. In many rural areas, the lack of dependable, uninterruptable, and affordable sources of electricity and heat poses a major barrier to the implementation of modern agricultural techniques and state-of-the-art food processing technologies. In 2013, 14% of private enterprises in the Ganja-Gazakh economic region (where the Samukh complex is located) experienced daily power outages.[35] The lack of a stable energy supply not only hampers intensive development of agriculture and related industries but also translates into a prevalence of manual labor in household husbandry, small-scale family enterprises, and medium-scale village farms. In addition to reducing productivity, the lack of a stable energy supply leads to higher production costs, restricts the range of economically feasible products and services, and undercuts the attractiveness of work in the agricultural sector, particularly among the younger generations. Ultimately, it threatens the long-term sustainability of rural life.

76. The main outcomes of the Samukh complex are expected to include

(i) increased agricultural production in the region, providing food and other agricultural products to the residents of Samukh and the city of Ganja;
(ii) sustainable generation of renewable energy and experience gained in building and managing a diverse renewable energy system;
(iii) increased public awareness of the comprehensive approach to agricultural planning and development, which is based on the latest agro-technologies, provides high-quality organic products, and incorporates an environment-friendly, waste-free or waste-to-energy philosophy; and
(iv) creation of new jobs in a region where job creation is slowing. According to the State Statistical Committee, 1,067 new permanent jobs were created in 2005 versus 308 permanent jobs in 2013, indicating a slower rate of job creation compared to other parts of the country.[36]

[35] The State Statistical Committee of the Republic of Azerbaijan. 2013. *Results of 2012 Sample Statistical Survey on Consumption and Production of Types of Energy by Private Entrepreneurs (Natural) Entities.* Breaks in Electricity Supply for Private Enterprises, %. Table 23. Baku. Accessed at: http://www.stat.gov.az/source/balance_fuel/en/FS_en.pdf

[36] The State Statistical Committee of the Republic of Azerbaijan. 2015. *Samukh.* Environment and Other Indicators, the Regions. Baku. Accessed at: http://www.stat.gov.az/source/regions/az/004_7.xls

77. Secondary outcomes are expected to include

(i) additional sources of income for the local population, with resulting improvements in their quality of life;
(ii) indirect stimulation of agricultural development in the region, through creation of demand for processing of local food products (i.e., milk, fruit, poultry);
(iii) access to less expensive energy or other supporting products and services (livestock feed, technical and repair facilities, veterinary care, etc.);
(iv) alleviation of some of the regional social, cultural, and environmental problems caused by lack of socioeconomic opportunity;
(v) decreased urban flight of the younger generation and improved demographic stability in the region;
(vi) potential improvement in gender equality with the move away from manual labor in agriculture, which disproportionally falls to women;
(vii) resettlement and re-employment of internally displaced persons from the Nagorno-Karabakh conflict area;
(viii) resolution of environmental problems related to agricultural waste and suboptimal use of water resources for irrigation;
(ix) increased food security through new domestic agricultural production that meets the demands of a growing population; and
(x) improved energy security through the development of domestic renewable energy resources to meet growing energy demand.

F. Activities to be Carried Out

78. The Samukh district is located on the plains along the banks of the Kura River in northwest Azerbaijan. It is part of the Ganja-Gazakh economic region and is located between the border with Georgia in the north and Ganja in the south; Ganja is Azerbaijan's second-largest city. The Bozdagh and Jeyranchol winter pastures are located at the district's northern edge. The district is also close to two large reservoirs: Mingachevir and Yenikand. The district's total area is 1,455 km^2. In 2014, Samukh's population totaled 56,300. The area of Samukh that is planned for the agro-energy complex is connected to the national grid. The government gave SAARES the land for the Samukh complex, which is currently unused. SAARES plans to lease the land to agricultural enterprises for cultivation of various crops and livestock and for food processing purposes.

79. Over the past decade, agricultural production has expanded in Azerbaijan overall, as well as in the Samukh district. Land cultivation for agriculture in Samukh grew by 123% (from 9,627 to 21,508 hectares) between 2000 and 2013, compared with 61% growth in Azerbaijan as a whole.[37] Agricultural output of both crops and livestock is also growing, as illustrated in Table 5. Poultry farming is becoming increasingly profitable, with production of meat, eggs, and down. Other valuable products in Azerbaijan include meat (cattle and sheep), milk, tomatoes, potatoes, wheat, and apples.[38] The agricultural activities undertaken by Samukh will lead to similar outputs.

[37] The State Statistical Committee of the Republic of Azerbaijan. 2015. *2. The data on Regions, Plant Growing. Area Sown for Agricultural Products*. Table 2.1. Total Area under Agricultural Crops, ha. Baku. Accessed at: http://www.stat.gov.az/source/agriculture/en/2.1en.xls

[38] FAO Regional Office for Europe and Central Asia. 2012. *Assessment of the Agriculture and Rural Development Sectors in Eastern Partnership Countries: the Republic of Azerbaijan.* Budapest. Accessed at: http://www.fao.org/docrep/field/009/aq671e/aq671e.pdf

Table 5: Agricultural Production in the Samukh Region of Azerbaijan, 2005–2013

Item	2005	2009	2010	2011	2012	2013
Major crop production (all categories), tons						
Cereals and dried pulses,	21,493	40,804	23,218	32,029	30,831	31,317
including wheat	16,473	27,237	14,277	18,982	18,032	17,609
Cotton	23	71	60	58	77	72
Beets	-	-	-	-	1,024	6,185
Sunflowers	542	1,707	2,108	3,141	2,943	3,462
Potatoes	1,839	2,563	2,430	2,377	2,429	8,202
Vegetables	6,321	10,955	9,899	10,062	10,004	10,195
Melons	3,323	5,585	6,256	6,289	4,695	5,514
Fruit and berries	12,282	14,081	14,129	13,760	14,874	14,385
Grapes	701	1,395	6,235	5,702	5,793	7,110
Animal population (all categories), number						
Large cattle	17,459	19,702	20,245	20,515	20,726	21,094
cows and buffalo	8,530	9,582	9,804	9,901	10,013	10,164
Sheep and goats	152,800	161,959	163,577	164,544	165,918	167,266
Poultry	122,468	153,577	106,507	111,026	117,972	214,592
Livestock production, tons						
Meat (slaughtered weight)	1,703	1,726	1,784	1,790	1,794	2,159
Milk	11,094	13,106	13,616	13,685	13,714	14,041
Eggs, thousand units	2,903	12,175	5,652	5,398	5,438	5,608
Wool (greasy weight)	274	306	316	323	326	330

Source: The State Statistical Committee of the Republic of Azerbaijan. 2015. *Samukh.* Environment and Other Indicators, the Regions. Baku. http://www.stat.gov.az/source/regions/az/004_7.xls

80. Implementation of the renewable energy NAMA will take place in two phases. The first phase, which will establish the Samukh complex, is now underway (with some preliminary work already completed) and will continue through 2016. Phase 1 also includes work on the normative and legal framework designed to improve financial and economic incentives for renewable energy. Phase 2 will expand the Samukh complex and begin to use the lessons learned to plan for replication at other sites in Azerbaijan.

1. Phase 1 (2014–2016)

81. Activities planned for Phase 1 of the Samukh complex include the feasibility assessment, design, and construction of the first set of facilities.

(i) Develop 14.1 MW of installed electricity and heat capacity from renewable energy sources, including:
   (a) A solar PV power plant with installed capacity of 6 MW. PV panels with 2.8 MW of generating capacity have already been installed and are about to be commissioned.
   (b) A biogas plant with 0.75 MW electric and 0.75 MW heat-generating capacity that will use cattle manure from the cattle-breeding and milk farms, together with

vegetative waste from plantations, greenhouses, and processing facilities. A feasibility study is in process.
(c) A geothermal plant with 0.6 MW heat-generating capacity, used primarily to heat residential buildings, greenhouses, and farms. A feasibility study is in process.
(d) A solar thermal plant with installed capacity of 6 MW.

(ii) Complete a feasibility study to optimize the design of agricultural and food processing facilities to be constructed starting in 2015.

(iii) Use the energy supplied by the renewable energy cluster for several agricultural ventures that will be developed simultaneously on 6,500 hectares, including the following:
(a) Crop fields of 3,000 to 3,500 hectares for production of wheat and barley to be used as fodder at cattle and dairy farms and as raw material for the livestock/fowl feed factory. The rest—mostly grain—will be set aside for agro-production.
(b) Greenhouses for vegetables and spices on 5 hectares.
(c) A nursery farm (seed plot, 2 hectares).
(d) Vegetable plantings (500 hectares).
(e) Fruit plantings on 1,000 hectares, including:
i. A pomegranate orchard (700 hectares)
ii. A black plum plantation (300 hectares)
(f) Dairy and cattle-breeding farms (2,500 and 2,000 heads of livestock, respectively).
(g) A fishery with an artificial pond to produce 1 million fish annually.

(iv) Process the harvested agricultural products on site. Developers will fund the construction of:
(a) A dairy processing plant with capacity for 1,800 tons of milk products a year.
(b) A fruit processing, drying, and packaging line with an annual capacity of 1,000 tons.
(c) A juice factory with an annual capacity of 1,000 tons.
(d) A livestock feed producing facility with an annual capacity of 20,000 tons of mixed feed.

(v) Provide housing for workers of the Samukh Agro-Energy Residential Complex, constructing 350 to 500 houses that take advantage of modern, energy-efficient design. The State Committee for Internally Displaced Persons will provide financing. The target population for the homes will be local workers and refugees, who generally are very experienced at working in the agricultural sector.

(vi) By 2015, prepare proposals to the government on preferential loans for the development of alternative and renewable energy sources.

(vii) By 2015, complete proposals to the government on customs duty exemptions for equipment, spare parts, and other devices for renewable and alternative energy production.

(viii) Draw on international experience to study and propose tariffs for alternative and renewable energy sources by 2016, in addition to those already proposed for wind and small hydropower.[39]

(ix) Complete feasibility studies for establishing similar agro-renewable energy complexes at the five sites mentioned in Section IV.C.

2. Phase 2 (2017–2020)

82. In Phase 2, the activities at Samukh will expand and draw on lessons learned from Phase 1, particularly as related to the new renewable facilities. Phase 2 foresees the development of an additional 21.25 MW electric-generating capacity and 41.65 MW heat-generating capacity from renewable energy sources, including

(i) solar units with 14 MW electric-generating capacity and 32 MW heat-generating capacity;
(ii) a biogas plant with 7.25 MW electric-generating capacity and 7.25 MW heat-generating capacity; and
(iii) a geothermal installation with 2.4 MW heat-generating capacity.

83. By the end of the development term in 2020, the Samukh complex will have a capacity of 28 MW electricity and 49 MW heat. The plans for Phase 2 call for connecting the newly installed renewable energy capacity to Samukh city and expanding the complex's agriculture operations. In particular, the greenhouse area will increase to a total of 30 hectares. The cattle farms will expand to up to three complexes for 10,000 head of livestock. Housing for Samukh's workers will grow to 1,000 units.

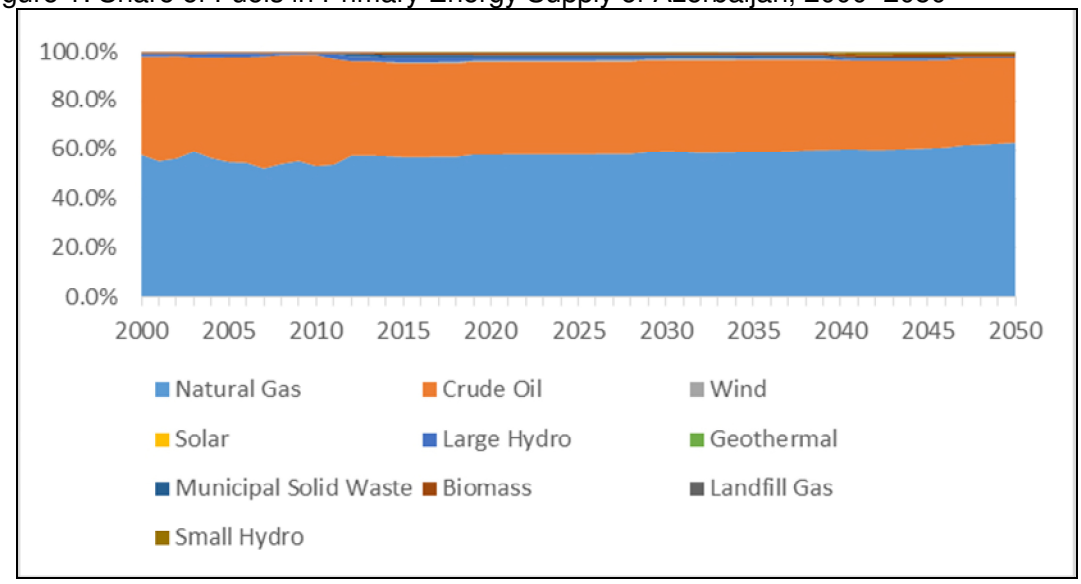
84. Finally, during Phase 2, SAARES will review the lessons learned from the early years of the Samukh complex and develop a plan for replicating the complex in the five other selected sites.

G. Transformational Potential of the NAMA

85. As illustrated in Figure 1 and Figure 3 above, Azerbaijan's energy sector is highly dependent on fossil fuels and is expected to continue to rely heavily on such fuel sources in the future. Meanwhile, as demonstrated in Table 6 below, Azerbaijan shows significant potential to increase the use of renewable energy sources for both heat and electricity. As shown in Figure 4 on the next page, existing and planned non-hydropower renewable energy represents no more than 25% of the country's electricity generation.

[39] The tariff for wind electricity has already been set at 0.045 AZN or $0.055 per kW (decision of Tariff Council 06.10.2007 No.3). Imported wind energy equipment and its parts are free from customs fees on the basis of decisions of the Cabinet of Ministers from 31.01.2005 No.11 and 15.10.2005 No.187.

Figure 1: Share of Fuels in Primary Energy Supply of Azerbaijan, 2000–2050



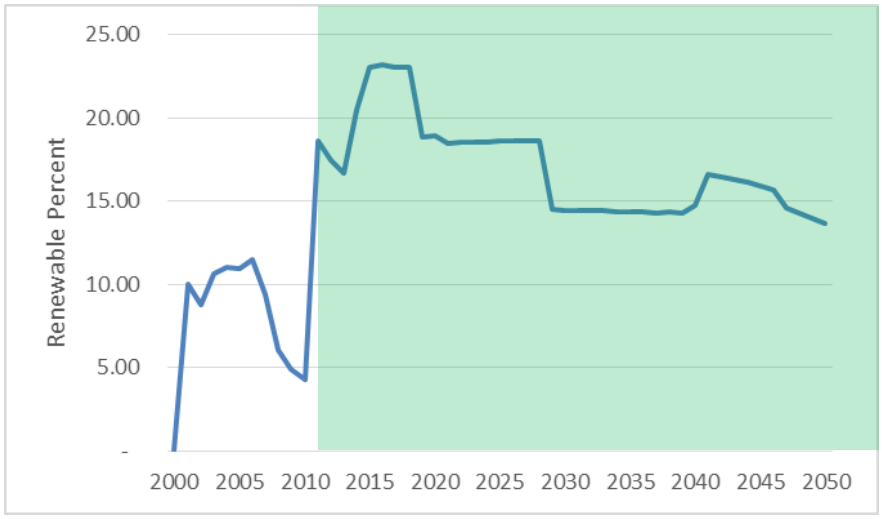
Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

Table 6: Estimated Potential for Renewable and Alternative Energy in Azerbaijan

Type of Potential	Power, Megawatts
Solar energy	>5,000
Wind energy	>4,500
Bioenergy	>1,500
Geothermal and geothermic	>800
Small hydropower stations	>350

Source: Alternative and Renewable Energy Agency of Azerbaijan

Figure 4: Percentage of Electricity Generation from Non-Hydropower Renewables in Azerbaijan, 2005–2035



Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

86. The Samukh NAMA is intended to demonstrate the feasibility of a mixed renewable energy and agriculture residential complex in Azerbaijan. The complex will tap Azerbaijan's renewable energy potential and expand the use of renewable energy for agricultural production in rural areas, particularly in remote areas with unreliable access to the grid.

87. As described in Section IV.C, SAARES expects to replicate the design and technologies piloted in the Samukh complex in five other sites in Azerbaijan. Development of these sites would satisfy the goals for regional economic growth set forth by the State Agency on Regional Economic Development. Such development would also help Azerbaijan attain its target of having 20% of its energy supply provided by renewable sources by 2020, as asserted in the National Strategy on the Use of Alternative and Renewable Energy Sources, 2020.

88. By working with the government to revise the normative and legal framework, SAARES's goal is for the Samukh complex to bring about long-term systemic ("transformational") impact by lowering and removing barriers to renewable energy development in the agricultural sector and by developing technical experience with a variety of renewable energy options. In addition, by providing much-needed housing for over 500 agricultural workers and displaced persons, the Samukh complex is expected to increase agricultural productivity and improve employment in this remote region.

89. The NAMA's most important transformational role may lie in providing "proof of concept" for modern, efficient, waste-free, and renewable energy-based agricultural development. If the Samukh complex succeeds and is effectively replicated in other regions, it could eventually become a new paradigm for rural development in Azerbaijan and other countries in Central Asia.

H. Greenhouse Gas Emission Reductions

90. The NAMA's renewable energy capacity will replace the consumption of electricity from the grid, which is powered mostly by fossil fuels. It will also provide heat, which in Azerbaijan is generated 100% by fossil fuel. The fuel switch will result in reductions of three GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

91. Feasibility studies are still underway to confirm the design of the biofuel and geothermal facilities to be built at Samukh during Phase 1; construction of the solar power plant has begun. Planning for Phase 2 is also still underway. Similarly, SAARES has just initiated feasibility studies at the five other sites planned for replication. The GHG impact of the renewable energy NAMA will therefore depend on the success of the Samukh complex and on the technical feasibility of installing renewable energy capacity at the other sites. It will also depend on the specific changes to be made to the normative and regulatory framework governing renewable energy in general.

92. Given the uncertainty about the reductions that can be achieved by replicating Samukh, this NAMA concept does not include their implementation in its estimate of potential direct GHG emission reductions. Instead, the estimated emission reductions are based on the implementation of Phases 1 and 2 of the Samukh complex. However, if the results of the feasibility studies for the other sites are favorable, SAARES may extend the time period for the NAMA and incorporate the additional expected GHG emission reductions at a later stage. The concept also does not include the potential GHG emission reductions that can be achieved by changing the regulatory and normative framework governing renewable energy, since the details of the proposed changes have not yet been agreed upon.

1. Baseline

93. Without the NAMA, the agricultural output projected for the Samukh complex and the other five planned agricultural complexes would likely be produced by traditional farms located elsewhere in Azerbaijan. Because these traditional farms depend on electricity from the national grid and use fossil fuels for heat generation, the assumption for the baseline (without the NAMA) is that the existing fuel mix would produce the required electricity and heat.

Table 7 shows the expected share of different fuels in the electricity mix for agriculture and residential buildings through 2020 using confirmed capacity expansion plans for Azerbaijan (footnote 3). As illustrated in
Table 7, fossil fuels continue to dominate the fuel mix for electricity. The baseline fuel for heat generation for agriculture is natural gas.

95. Using the economic model developed for the energy and transport sectors of Azerbaijan under RETA 8119, the consultant team estimated the annual baseline GHG emissions for electricity and heat generation during the period 2015–2020. The equation for estimating baseline emissions is as follows:

Equation (1)

$$GHG_y = \sum_{F,f,p}\left(O_{F,y} \times \frac{1}{E_{F,y}} \times S_{F,f,y} \times (C_{F,f,p,y} + U_{f,p,y})\right) + \sum_{f,p}\left(H_{f,y} \times (C_{f,p,y} + U_{f,p,y})\right)$$

Where:

y	=	Year
F	=	Electricity-generating facility
f	=	Fuel
p	=	GHG
GHG	=	GHG emissions (tCO_2e)
O	=	Electricity generation (MWh)
E	=	Generating efficiency (%)
S	=	Fuel share (%)
C	=	Combustion emission factor (tCO_2e / MWh)
U	=	Net emission factor of upstream fuel production (tCO_2e / MWh)
H	=	Fuel consumption for heating (MWh)

Table 7: Baseline Share of Fuels in Electricity Generation in Azerbaijan, 2015–2020 (%)

Fuels	2015	2016	2017	2018	2019	2020
Natural gas	71.723	71.663	71.846	71.806	74.967	74.917
Diesel	0.008	0.008	0.008	0.008	0.008	0.008
Residual fuel oil	4.967	4.872	4.822	4.829	5.830	5.792
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Wind	3.255	3.295	3.340	3.361	3.373	3.402
Solar	0.550	0.567	0.600	0.629	0.656	0.686
Large hydropower	16.067	16.144	15.904	15.887	11.693	11.710
Municipal solid waste	0.983	0.988	0.994	0.993	0.990	0.991
Landfill gas	0.039	0.045	0.051	0.056	0.062	0.068
Small hydropower	2.406	2.418	2.433	2.430	2.421	2.425
Total (%)	**100**	**100**	**100**	**100**	**100**	**100**

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

96. The baseline emission results are shown in Table 8 and the national model for Azerbaijan is made publically available on ADB website. The approach and emission factors for estimating GHG emissions from electricity and heat generation in Azerbaijan are documented in the forthcoming TA consultant's report *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors* (footnote 3) and the national model for Azerbaijan is made publically available on ADB's website.

Table 8: Annual Greenhouse Gas Emissions and Reductions from Electricity and Heat Generation in Azerbaijan with and without the NAMA, 2015–2020

	Phase 1		Phase 2			
Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Baseline without the NAMA						
GHG emissions from electricity and heat generation in Azerbaijan (tCO_2e)	13,933,833	13,847,079	13,799,211	13,820,095	13,885,779	13,862,349
Average emission factor for the grid (tCO_2e/MWh)	0.429	0.428	0.429	0.429	0.429	0.429
With the NAMA						
GHG emission reductions from introducing the NAMA (tCO_2e)	–9,053	–18,560	–42,645	–66,789	–92,232	–116,825
% Change from baseline	–0.06	–0.13	–0.31	–0.48	–0.66	–0.84

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

2. The NAMA

97. Table 8 above describes the annual expected GHG emission reductions from the renewable energy capacity to be installed at the Samukh Agro-Energy Residential Complex. These reductions were calculated using the approach outlined in Equation (1) and assumes the load factors shown in Table 9 for the solar, biogas, and geothermal capacity to be installed at Samukh. Table 8 indicates that by 2020, the pilot project at Samukh will result in direct annual emission reductions of 116,825 tCO_2e, which equals a 0.84% change in GHG emissions compared to the baseline for national electricity and heat generation.

Table 9: Assumed Load Factors of Renewable Energy Generation at the Samukh Agro-Energy Residential Complex

Heating		Electricity	
Biogas Load factor (availability)	0.795	Biogas Load factor (availability)	0.62
Geothermal Load factor (availability)	0.500	Geothermal Load factor (availability)	0.75
Solar Load factor (availability)	0.086	Solar Distributed PV load factor* Utility scale PV load factor	 0.17 in 2010, rising to 0.20 in 2040 0.19 in 2010, rising to 0.21 in 2040

Note: * The 2.8 MW solar already constructed is deemed "distributed," while the remaining solar MW is deemed "utility scale."
Source: Abt Associates analysis and Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

98. If the Samukh Agro-Energy Residential Complex succeeds and is replicated at other sites in Azerbaijan, and assuming that the complexes are similar in size to Samukh, the potential *additional* emission reductions are roughly estimated by multiplying year 2020 GHG emission reductions by 5. That is, additional GHG emission reductions would eventually be 116,825 tCO_2e/year * 5 = 584,125 tCO_2e/year, which equals 4.21% of 2020 baseline GHG emissions from electricity and heat generation in Azerbaijan. However, this number is highly uncertain, as it depends on the actual renewable energy capacity to be installed at each site.

I. Costs and Financing

99. As the implementing agency, SAARES is charged with securing and tracking financing for the NAMA. Specifically, SAARES must (i) attract sufficient capital to meet the demand for funding, (ii) ensure effective and transparent expenditure of public and private funds, and (iii) leverage upfront financing to catalyze the private sector's sustainable long-term investment.

100. The total estimated cost of the NAMA is $277.9 million. Table 10 shows the likely sources of financial support for Phases 1 and Phase 2. The cost estimate includes feasibility studies for Samukh and five other sites, construction and technical assistance for implementation of Samukh, and work on the normative and regulatory framework for renewables.

Table 10: Proposed Budget and Requested Financing

	Million $ (exchange rate as of May 15, 2015)		
Activity	**Phase 1**	**Phase 2**	**Total**
Total implementation cost	**55.2**	**222.7**	**277.9**
Renewable energy capacity at Samukh	44.0	167.7	211.7
Feasibility studies, technical assistance, etc.	11.2	55.0	66.2
Total amount covered by state budget	**12.9**	**44.5**	**57.4**
NAMA implementation	11.0	44.5	55.5
Feasibility studies	1.9	TBD	1.9
Total amount from private sector	**11.0**	**44.5**	**55.5**
Total amount of support requested	**31.3**	**133.7**	**165.0**
Renewable energy capacity	TBD	TBD	TBD
Technology transfer support	TBD	TBD	TBD
Technical assistance: financial management system	TBD	TBD	TBD
Technical assistance: business management	TBD	TBD	TBD
Technical assistance: evaluation of lessons learned for replication	TBD	TBD	TBD
Technical assistance: revision to legal and regulatory norms	TBD	TBD	TBD

Source: State Agency for Alternative and Renewable Energy Sources.

101. Azerbaijan state budget. The state budget includes 2 million AZN ($1.9 million as of May 15, 2015) to support the Samukh feasibility study, which is expected to be completed by September 2015. The Government of Azerbaijan will finance part of the renewable energy facilities. The State Committee on Displaced Persons will cover the cost of houses for workers and displaced families at the complex.

102. Private sector financing. Private sector entities currently engaged in agriculture and food processing elsewhere in Azerbaijan will likely finance the agricultural facilities. The government's active support for expanding agricultural production and the resulting return on investment make investment in the agriculture sector attractive to the private sector. As a result, the private sector has increased investment in agricultural enterprises such as the ones targeted by SAARES. Between 2005 and 2011, the percent share of private agricultural entities in all areas of agricultural production grew from 3.7% and 5.2%, with the remainder of production coming from small private household and peasant farms. During the same period, overall agricultural production grew by 4.65% (footnote 39).

103. SAARES plans to establish a commission to facilitate private sector involvement in the agricultural sector. Detailed plans for the role of the private sector are expected to be finalized in late 2015.

104. International support. SAARES is interested in technical assistance and/or financing to

i) facilitate the construction of the renewable energy capacity not covered by the state budget (Phases 1 and 2);
ii) support technology transfer to enable high-tech agricultural production (Phases 1 and 2);
iii) design a financial management and reporting system to track funds provided by several institutions for several project implementers (Phase 1);
iv) establish and manage a complex organization consisting of several interconnected lines of business, and conduct market research and analysis (Phase 1);
v) revise legal and regulatory norms for renewable energy (Phase 1); and
vi) evaluate lessons learned from the agro-complex and help design measures for replication elsewhere in Azerbaijan (Phase 2).

105. Once it has signed loan agreements with private institutions and signed funding guarantees with interested international partners, the Ministry of Finance will issue a sovereign guarantee that will green-light Samukh and other agro-energy complexes and guarantee repayment to financiers as required. Once financing for Phase I of the NAMA is fully secured, SAARES will submit the activities described in the NAMA to the prime minister. In turn, the prime minister will authorize SAARES as the executive agency and mandate implementation and tracking of the NAMA.

106. Financial tracking mechanisms are already in place for the existing state budget funds that are earmarked to SAARES for the Samukh feasibility study and for construction of the first solar PV plant. SAARES is seeking assistance from interested international organizations to help devise and adapt a financial management and reporting system capable of simultaneously tracking several financing streams and recipients. The financial management and reporting system is a Phase 1 activity that is needed for Phase 2 implementation.

J. Proposed Monitoring, Reporting, and Verification System

1. Institutions for Monitoring, Reporting, and Verification in Azerbaijan

107. Several existing institutions and mechanisms can be used for the design and implementation of various aspects of an MRV plan for the NAMA, as described below.

108. Renewable energy reporting. SAARES is mandated to track and report annually to the State Statistics Committee and the Ministry of Economy and Industry on electricity and heat generated by renewable energy.

109. Air pollutant reporting. National law requires every entity with stationary sources of traditional air pollutant emissions to submit an annual statistical report on air pollution to the regional office of the State Statistics Committee. Before the January 25 annual submission of a report, the regional MENR must first approve the report's emission data. MENR's Environment Protection Department is responsible for analyzing and verifying the data provided by the reporting entities. Lack of technical capacity, resources, and technology for accurately monitoring emissions has resulted in high levels of uncertainty. Thus, calculations of entity-level emissions as performed by the entities themselves lack methodological rigor, measurement precision, and oversight. Renewable energy facilities with no air pollutant emissions would not be required to submit an emissions report, but a biogas facility may need to submit a report, depending on the associated air pollutants. Some agricultural processing facilities in the

Samukh complex may also produce pollutants and wastewater that would need to be reported to MENR.

110. Greenhouse gas emissions reporting. As the UNFCCC Focal Point, MENR compiles national data on GHG emissions, including national energy balances and GHG-generating activities. MENR periodically reports the data to the UNFCCC through its national communications on climate change and BUR. To date, MENR has developed three national GHG inventories. Most recently, Azerbaijan submitted its 2010 GHG inventory as part of its first BUR.[40] These inventories do not capture the contributions of individual renewable facilities to GHG emission reductions. However, future inventories would provide an emissions profile of the electricity grid and could be used to verify that the claim of averted emissions is reasonable.

111. Socioeconomic reporting. The government mandates regular reporting of socioeconomic indicators. Regional governments submit data to relevant agencies and ministries, including the State Statistical Committee, the Ministry of Finance, and the Ministry of Economy and Industry. The receiving agencies and ministries manage, analyze, and report on this information at both the regional and national levels. The collected data include information on employment, construction, and economic activity by individual establishments such as farms and other agricultural facilities.

112. Financial reporting. SAARES reports regularly to the Ministry of Economy and Industry on funds allocated and spent.

2. General Monitoring, Reporting, and Verification Metrics

113. Table 11 contains a proposed MRV system for the renewable energy NAMA, involving the institutions outlined above. Given that the details of many Phase 1 and Phase 2 activities are still undergoing evaluation, SAARES may need to modify the activities pending final design of the NAMA and finalization of the socioeconomic benefits that stakeholders agree to track.

114. For now, the MRV system proposed for the NAMA calls for self-monitoring by SAARES and regular (annual) audits by MENR during Phase 1. As mentioned above, SAARES is required to report to the State Statistics Committee on alternative energy sources' electricity and heat generation, disaggregated by facility. Thus, the renewable energy produced at the Samukh complex and the other planned renewable energy-agricultural complexes would fall within current reporting mandates, suggesting that reporting and verification associated with Samukh and the other complexes' GHG emission reductions should be fairly straightforward.

115. SAARES has agreed to submit an annual report to MENR on the GHG emission reductions from the NAMA. MENR has not yet set specific guidelines for the contents of such a report and has not yet indicated if it should include other metrics (in addition to averted GHG emissions). At a minimum, the reporting should include the GHG emission metrics listed in Table 11, as well as a selection of other metrics outlined in the table.

[40] Government of Azerbaijan. 2014. *The First Biennial Updated Report of the Republic of Azerbaijan to the UN Framework Convention on Climate Change.* Baku. Accessed at: http://unfccc.int/resource/docs/natc/aze_bur1_eng.pdf

Table 11: Proposed Metrics for Monitoring, Reporting, and Verification

Monitoring, Reporting, and Verification		
Quantitative metrics	Greenhouse gas emissions	• Amount of electricity (KWh) and heat generated by each renewable energy facility (including the amount of methane captured and combusted at the biogas facility) and supplied to the grid or used for own use • Emission factors used to calculate emissions from averted baseline heat and electricity generation • Amount and type of on-site fossil fuels consumed to support renewable energy generation and the emission factors used to calculate emissions • Emissions from non-condensable gases from geothermal plant • GHG emissions averted by renewable energy (by type and facility)
	Socioeconomic benefits	• Number of residential units built • Agricultural output (by type) per agricultural entity within the complex • Construction of residential units • Commissioning of new renewable energy capacity (MW and type) • Construction of agricultural production and processing facilities • Pollutants reported to MENR and State Statistical Committee • Number of additional jobs created by the complex • Number of families provided with housing • Additional environmental co-benefits
	Financial tracking	• Annual funds spent by entity (SAARES, State Committee on Displaced Persons, etc.); source (state budget, private sector, international support); and activity (renewable energy, technical assistance, buildings, agricultural production facility, etc.)
Qualitative metrics		• Status of implementation activities: - Implementation of a Phase 2 MRV system - Completion of feasibility studies for additional renewable energy capacity - Establishment of financial management and tracking system - Completion of feasibility studies for replication of Samukh

3. Greenhouse Gas Measurement and Monitoring Parameters

116. The GHG emission reduction estimates and monitoring parameters differ depending on whether the renewable energy is supplying electricity to the grid or is being used on-site, and on whether the renewable energy is producing heat for on-site use. The proposed estimation and monitoring parameters below draw on guidance from several CDM methodologies for small-scale renewable energy.[41]

[41] UNFCCC. 2014. *Clean Development Mechanism AMS-I.D. Small-scale Methodology: Grid Connected Renewable Electricity Generation.* Version 18.0; UNFCCC. 2014. *Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources.* CDM ACM0002. Version 16.0; UNFCCC. 2015. *Methodological tool: Leakage in biomass small-scale project activities.* CDM Tool 22. Version 4.0; and UNFCCC. 2014. *Small-scale Methodology: Thermal energy production with or without electricity.* CDM. AMS-I.C. Version 20.0.

117. Baseline GHG emissions from electricity supplied to the grid are calculated as shown below:

Equation (2)

$BEy = EG_{PJ,y} \times EF_{grid,y}$

Where:

BEy	=	Baseline emissions in year *y* (tCO_2)
$EG_{PJ,\text{facility},y}$	=	Quantity of net electricity generation that is supplied to the grid as a result of the implementation of the NAMA in year *y* (MWh)
$EF_{grid,y}$	=	CO_2 emission factor for grid-connected power generation in year *y* (tCO_2/MWh)

118. GHG emission reductions from renewable electricity supplied to the grid as a result of the NAMA are calculated as shown in Equation (3):

Equation (3)

$ER_y = BE_y - PE_{FF,y} - PE_{GP,y} - LE_y$

Where:

ERy	=	Emission reductions in year *y* (tCO_2)
BEy	=	Baseline emissions in year *y* (tCO_2)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2)
$PE_{GP,y}$	=	Project emissions from operation of geothermal power plants related to release of non-condensable gases in year *y* (tCO_2)
LEy	=	Leakage emissions in year *y* (tCO_2)

119. For most renewable energy activities, $PE_{FF,y}$ and $PE_{GP,y}$ equal 0. However, in the case of a geothermal power plant, emissions may result from non-condensable gases and the consumption of fossil fuel-based electricity; such emissions need to be captured. If SAARES identifies a need to use fossil fuel at the geothermal plant, this will be captured using the guidance in Equation 3.

120. In terms of the release of non-condensable gases, SAARES must account for fugitive emissions of CO_2 and CH_4 from produced steam.[42] In geothermal plants, non-condensable

[42] Non-condensable gases in geothermal reservoirs consist mainly of CO_2 and hydrogen sulfide. They also contain a small quantity of hydrocarbons, including predominantly CH_4.

gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/ bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are re-injected into the geothermal reservoir. Using a conservative approach, the guidance in Equation 3 assumes that all non-condensable gases entering the power plant are discharged to the atmosphere via the cooling tower and that nothing is reinjected in the reservoir.[43]

$PE_{GP,y}$ is calculated as shown below:

Equation (4)

$$PE_{GP,y} = (W_{steam,CO_2,y} + W_{steam,CH_4,y} \times GWP_{CH_4}) \times M_{steam,y}$$

Where:

$PE_{GP,y}$	=	Project emissions from operation of geothermal power plants related to the release of non-condensable gases in year *y* (tCO_2e/yr)
$W_{steam,CO_2,y}$	=	Average mass fraction of CO_2 in the produced steam in year *y* (tCO_2/t steam)
$W_{steam,CH_4,y}$	=	Average mass fraction of CH_4 in the produced steam in year *y* (tCH_4/t steam)
GWP_{CH_4}	=	Global warming potential of CH_4 ($tCO_2e/t\ CH_4$)
$M_{steam,y}$	=	Quantity of steam produced in year *y* (t steam/yr)

121. Some biomass activities may lead to leakage, LE_y, resulting from (i) the shifting of pre-project activities and a subsequent decrease in carbon stocks outside the activity boundary; (ii) emissions from cultivation of the biomass; or (iii) use of the biomass elsewhere in the absence of the NAMA.

122. For this NAMA, agricultural residues and wastes will provide the proposed biomass. As a result, items (i) and (ii) will not produce leakage.[44] Regarding item (iii), however, it is possible that agricultural residues could have been used elsewhere as fertilizers or for energy generation. To address such potential leakage, SAARES must demonstrate (for example, by drawing on published literature, official reports, or surveys) that the region's quantity of available biomass (e.g., within a 50-kilometer radius) is at least 25% greater than the quantity of biomass used at the agro-energy complex. If SAARES determines that the available biomass is greater than 25% of the biomass used at the complex, then biomass as a source of leakage may be ignored. If it is less than 25%, the emissions from the potential leakage must be estimated and deducted from the emissions associated with the NAMA.

[43] UNFCCC. 2014. *Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources.* CDM ACM0002. Version 16.0 https://cdm.unfccc.int/filestorage/0/X/6/0X6IERWMG92J7V3B8OTKFSL1QZH5PA/EB81_repan09_ACM0002_ver16.0_clean.pdf?t=c2p8bm92NzNzfDAK8MbFqDlQFDaJsL6WHHQv

[44] UNFCCC. 2015. *Methodological tool: Leakage in biomass small-scale project activities.* CDM Tool 22. Version 4.0. Accessed at: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-22-v1.pdf

123. For thermal energy produced with fossil fuels, the baseline emissions are calculated as shown below:[45]

Equation (5)

$$BE_{thermal,CO_2,y} = \left(\frac{EG_{thermal,y}}{\eta BL,thermal}\right) \times EF_{FF,CO2}$$

Where:

$BE_{thermal,CO_2,y}$	=	Baseline emissions from thermal energy displaced by project activity during year *y* (tCO_2)
$EG_{thermal,y}$	=	Net quantity of thermal energy supplied by the project activity during year *y* (terajoule (TJ))
EF_{FF,CO_2}	=	CO_2 emission factor of the fossil fuel that would have been used in the baseline plant as obtained from reliable local or national data, if available; alternatively, Intergovernmental Panel on Climate Change (IPCC) default emission factors (tCO_2/TJ)
$\eta BL,thermal$	=	Efficiency of the plant using fossil fuel that would have been used in the absence of the NAMA

124. GHG emissions from the production of heat as a result of the NAMA are calculated as shown below:

Equation (6*)*

$$PE_y = PE_{FF,y} + PE_{EC,y} + PE_{GEO,y} + LE_y$$

Where:

PE_y	=	Emissions from project activity during year y (tCO_2)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption during year y (tCO_2)
$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO_2)
$PE_{GEO,y}$	=	Project emissions from the operation of geothermal power plants related to the release of non-condensable gases in year y (tCO_2)
LE_y	=	Leakage emissions in year y (tCO_2)

[45] UNFCCC. 2014. *Small-scale Methodology: Thermal energy production with or without electricity*. CDM. AMS-I.C. Version 20.0. Accessed at: https://cdm.unfccc.int/methodologies/DB/JSEM51TG3UVKADPA25IPUHXJ85HE8A

125. Regarding the consumption of fossil fuel, $PE_{FF,y}$, and electricity, $PE_{EC,y,}$ SAARES is investigating whether the other renewable capacity generated at the agro-energy complex can supply the required fuel and electricity or whether fossil fuels are needed. If SAARES identifies a need to use fossil fuels, the MRV protocol will reflect the applicable GHG accounting and monitoring guidance.

126. The process for calculating emissions for $PE_{GEO,y}$ and LE_y is described in Equation 3 and Equation 4 above.

127. Table 12 summarizes the required monitoring parameters for the calculation of averted GHG emissions from generating heat and supplying electricity to the grid.

Table 12: Monitoring Parameters for Generation of Electricity from Renewable Energy Supplied to the Grid and for Generation of Heat

Parameter	Description	Unit	Measuring Methods and Procedures	Monitoring Frequency
$EF_{grid,y}$	CO_2 EF of the grid electricity in year *y*	tCO_2e/MWh	Using the economic model developed under RETA 8119 for energy and transport in Azerbaijan, the average CO_2 EF is calculated and shown in Table 8.	
$EGPJ_{,\text{facility},y}$	Quantity of net electricity generation supplied by the plant/unit to the grid in year *y*	MWh	This parameter should be monitored with bidirectional electricity meter(s) OR calculated as the difference between (i) the quantity of electricity supplied by the plant/unit to the grid and (ii) the quantity of electricity the plant/unit received from the grid. If it is calculated, then the following parameters should be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid (ii) The quantity of electricity delivered to the project plant/unit from the grid	Continuous monitoring, hourly measurement, and at least monthly recording
GWP_{CH4}	Global warming potential of methane	$tCO_2e/t\ CH_4$	Value to be applied: 21 $tCO_2e/t\ CH_4$	
$W_{steam,CO_2,y}$	Average mass fraction of carbon dioxide in the produced steam in year *y*	T CO_2/t steam	Non-condensable gas sampling should be carried out in production wells and/or at the steam field-power plant interface by using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single-phase steam only). The CO_2 and CH_4 sampling and analysis procedure requires the collection of non-condensable gas samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. hydrogen sulfide and CO_2 dissolve in the solvent while the residual compounds remain	At least every three months; more frequently if needed

Parameter	Description	Unit	Measuring Methods and Procedures	Monitoring Frequency
			in their gaseous phase. The gas portion is then analyzed by using gas chromatography to determine the content of the residuals, including CH_4. All alkanes concentrations are reported in terms of methane.	
$Wsteam,CH_4,y$	Average mass fraction of methane in the produced steam in year *y*	tCH_4/t steam	Same procedures outlined for $Wsteam,CO_2,y$	Same procedures outlined for $Wsteam,CO_2,y$
$Msteam,y$	Quantity of steam produced in year y	t steam/yr	The steam quantity discharged from the geothermal wells should be measured with a venture flow meter or other equipment with at least the same accuracy. Measurement of temperature and pressure upstream of the venture meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and based on international standards. The measurement results should be summarized transparently in regular production reports.	Daily

K. Replicability

128. The government's strong interest in replicating the Samukh Agro-Energy Residential Complex led to the design of the renewable energy NAMA. In addition to the five prospective areas already noted, Azerbaijan can point to several other agricultural regions that have growth potential but that also have industries and agricultural production limited by a non-dependable, conventional energy supply because of remotes location, constrained access to and losses from the local transmission and distribution grid, high energy costs, or other reasons.

129. While conditions in several other regions are similar enough to conditions in Samukh to make them replication sites, some differences from region to region will undoubtedly prove critical to successful implementation. The experimental nature of Samukh as a pilot project offers an ideal opportunity to document and analyze the process of comprehensive agricultural development based on modern technology and alternative energy sources. Such analysis must include careful documentation and scrutiny of local conditions so that plans for replication at other sites can take into account appropriate local factors.

130. The renewable energy NAMA includes a targeted activity under Phase 2 that calls for an evaluation of lessons learned during Phase 1 to guide replication of the complex in other parts of Azerbaijan. The evaluation will consider measures to make Samukh replication attractive enough to draw private sector participation. For example, in addition to the normative changes already envisioned for the renewable energy NAMA, the government could encourage private sector investment in Samukh replication by introducing a temporary tax holiday that would grant companies tax abatements for seven years following initial start-up. Other regions of Azerbaijan currently rely on tax holidays to promote the development of industrial parks.

L. Implementation

131. The stakeholders involved in the NAMA implementation include

(i) SAARES
(ii) The Cabinet of Ministers
(iii) The Ministry of Finance
(iv) The Ministry of Economy and Industry
(v) The Ministry of Environment and Natural Resources
(vi) The Ministry of Agriculture
(vii) AzerEnerji
(viii) The Committee on Displaced Persons
(ix) The Executive Power of Samukh Region
(x) The Executive Power of Samukh City
(xi) The private sector
(xii) The State Statistical Committee of the Republic of Azerbaijan

132. As lead implementing agency of the NAMA, SAARES will work closely with the Ministry of Economy and Industry, the Ministry of Finance, the MENR, the Ministry of Agriculture, AzerEnerji, the State Committee on Displaced People, the Executive Power of Samukh, and other related organizations to implement the Samukh complex and report on and monitor its success.

133. SAARES will develop all project plans and proposals and submit them to the Ministry of Economy and Industry for eventual transmission to the Cabinet of Ministers, which will coordinate any necessary approvals with related ministries. Usually, when the Cabinet of Ministers approves a plan for the next year, the Ministry of Finance includes the requested amount in next year's State Investment Plans. SAARES will report to the Ministry of Finance on funds expended.

134. The MENR will work with the Ministry of Agriculture to change the land status of the Samukh property; some of the land is undergoing development as forest. The MENR will also serve as the repository and auditor of the annual MRV report and will report on the NAMA to the UNFCCC. Finally, the MENR will ensure that the agro-energy complexes comply with national and local environmental regulations. The national utility, AzerEnerji, is responsible for integrating electricity generated by the renewable energy sites into the grid and for providing technical expertise to connect households in the region to the new capacity. The Executive Power of Samukh City and the administrations of the other regional sites to be selected will cooperate on issues related to development of the agricultural complexes and their impact on the local population and environment. They will also collect and report data on local population and employment to the State Statistical Committee.

M. Implementation Risks and Risk Mitigation Strategies

135. As with any investment project there are many things that could go wrong. For a greenfield project such as Samukh and other agro-energy complexes, the major risks are (i) construction and start-up risks, (ii) performance risks of the alternative energy sources, and (iii) performance risks of the agricultural enterprises.

136. Construction and start-up risks. There is significant risk in the process of building, assembling, setting up, and launching new facilities—mainly cost overruns and construction,

permitting, or commissioning delays. The usual way to mitigate such risks is to employ a careful process for selecting contractors for the construction and installation work and to sign contracts with proper terms and clauses. When selecting a construction company through competitive bidding, the highest weights among the various criteria should be assigned to a bidder's track record of completing previous work on time and on budget and to the bidder's proven ability to successfully deal with emergencies. The resulting contract should include a detailed schedule of milestones for construction and installation, articles specifying penalties for non-performance, and liquidated damages clauses that would automatically come into effect if the milestones are missed (preferably by altering scheduled payments to the company).

137. Performance risks of the renewable energy source. There is a risk that renewable energy installations may not be able to produce electricity or heat according to the original project specifications. This could be caused by natural factors (such as weather), glitches in the construction and installation process, or operation and maintenance issues after the installations are put into service.

138. Performance risks of agricultural enterprises. These risks include failure to generate the expected volume of agricultural products or production with lower quality or higher costs. Since these risks are related to in-house operations, they cannot be mitigated by competitive bidding or punitive contractual clauses. The best way to counter these risks is to have a good system of quality control and monitoring for technological processes, along with continuous education and training for personnel.

139. The multifaceted nature of the Samukh complex offers some unique mitigation strategies for both the renewable energy and the agriculture enterprise risks. Firstly, the performance of the renewable energy and agricultural components are tied together to an unusual degree: energy will be used in agricultural production while the waste from the production (straw and vegetative trunks, and livestock manure) will serve as a biomass energy source. This direct connection between the two allows agricultural production to be adjusted to the changes in performance of different renewable energy sources and energy production (at least from biomass) to be adjusted to the performance of the agricultural enterprises. Secondly, the co-existence of different energy sources at the same site will provide further flexibility. For example, if PV installations will generate only electricity and geothermal sources will be used mostly for heat, a biogas power plant may allow adjustments in the ratio between generated electricity and heat according to the current needs of agricultural production and the current supply of biomass resources. This flexibility will considerably reduce the combined performance risk of the Samukh complex (compared to the separate performance risk levels described above). Finally, the development of the project in several phases, together with the project's "proof of concept" nature (which will require transparent documentation and real-time analysis of problems or solutions) will create extra opportunities for mid-course corrections and fine-tuning of complex operations.

140. Other potential risks (such as accidents and incidents) are manageable with coverage under an appropriate insurance policy. Other relatively minor and uncommon risks include market risks due to sudden changes in prices for final products, competition risks associated with the unforeseen loss of clients to other suppliers offering similar products and services in the region, and compliance risks associated with failure to meet existing on new regulations. Foreign funders may also encounter currency conversion risks that could be addressed with standard mitigation approaches (forwards, swaps, put options, etc.).

V. FOSTERING USE OF NATURAL GAS IN THE TRANSPORT SECTOR: NAMA CONCEPT FOR KAZAKHSTAN

A. Summary of the NAMA Concept

1. Country

141. Kazakhstan

2. Implementing Entity

142. Joint Stock Company (JSC) KazTransGas will lead the design and implementation of this NAMA. JSC KazTransGas is a fully state-owned natural gas production and supply operator in Kazakhstan.

3. Contact Information

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4. Brief Description

144. The goal of this NAMA is to reduce GHG emissions and decrease air pollution by switching from gasoline and diesel to natural gas as a fuel for the transport sector. The fuel switch will result in reductions of carbon dioxide and nitrous oxide.

145. The NAMA will support the government's goal of increasing the use of Kazakhstan's cheap and clean natural gas for transport. It will do this by first developing the infrastructure to supply compressed natural gas (CNG) throughout the country and later also developing the infrastructure for liquefied natural gas (LNG). The national gas operator JSC KazTransGas will implement the NAMA by (i) constructing a network of 35 to 100 CNG fueling stations (CNGFSs); (ii) creating other infrastructure to enable a natural gas market in Kazakhstan (e.g., workshops for converting existing vehicles to CNG, testing and certification centers, training facilities); and (iii) extending natural gas to non-traditional transport areas. In addition to investment in specific sites and projects, the NAMA will enable development and implementation of a comprehensive

program for natural gas fuel promotion, including a package of government support measures; formulation of technical and regulatory norms, protocols, or documents; and development of the necessary institutional and human capacity to support a switch to natural gas.

5. Time Period

146. The NAMA will be implemented during a 12-year time period from 2014 to 2025.

B. Background on Kazakhstan

147. The Republic of Kazakhstan became a sovereign state on December 16, 1991, following the collapse of the Soviet Union. The country has a total land area of 2,724.9 thousand km², and is bordered by Russia, China, Kyrgyzstan, Uzbekistan, and Turkmenistan. In 2014, Kazakhstan's population was 17.16 million. It is expected to grow to 24.33 million by 2050.

148. Kazakhstan is rich in hydrocarbon reserves (oil, coal, and natural gas) and other minerals (copper, chrome, gold, and aluminum). The extraction, consumption, and exportation of these hydrocarbons and minerals contribute significantly to economic production and growth. Following market reforms in the 1990s, the economy started growing quickly in the 2000s; this growth is expected to continue to 2050. Kazakhstan's primary energy sources (including for transport) are coal, oil, and natural gas. As a result, even though GHG emissions intensity is declining in Kazakhstan, total GHG emissions are expected to increase through 2050 to meet economic and population growth.

149. Recognizing the growing risks of climate change, the government has adopted a voluntary quantitative commitment to reduce GHG emissions by 15% by 2020 and 25% by 2050 (relative to a 1992 baseline). In 2012, Kazakhstan further revised this goal and declared its readiness to reduce emissions by 5% to 7% from the 2013 to 2020 period; the country is now evaluating and implementing mitigation options to meet this goal. In particular, for 2015 the national goal is to reduce GHG emissions by 1.5% over the 2013 level.

150. The government's goal of mitigating the environmental impact of its rapid growth is codified in many official strategy documents,[46] most importantly in the 2013 Concept of Transition of the Republic of Kazakhstan to a Green Economy.[47] Among the key areas addressed in this concept is the creation of a "clean" transport system. In addition, the concept provides key development plans for water resources, energy, and agriculture through 2020, 2030, and 2050, including

(i) reducing the energy intensity of GDP by 10% by 2015, 25% by 2020, 30% by 2040, and 50% by 2050 (compared to the 2008 baseline;)
(ii) increasing the share of alternative energy[48] in electricity generation to: wind and solar not less than 3% by 2020, 30% by 2030 and 50% by 2050;
(iii) increasing the share of gas power plants in electricity generation to: 20% by 2020, 25% by 2030 and 30% by 2050;

[46] The address of the Head of State N. Nazarbayev to the people of Kazakhstan, November 11, 2014. Available at: http://strategy2050.kz/en/ and http://strategy2050.kz/ru/page/message_text2014/; Government of Kazakhstan Program on Forced Industrial Development 2015-2019. Available at: http://strategy2050.kz/ru/page/gosprog3/ and http://strategy2050.kz/static/files/pr/rus.doc; The President Decree on Action Plan on implementation of the message of January 17, 2014. Available at: http://www.zakon.kz/4598452-glava-gosudarstva-utverdil-plan.html

[47] The official text of Green Economy strategy and Decree of the President No. 577 of May 30, 2013. Available at: www.kazpravda.kz/_pdf/jun13/010613decree.pdf

[48] Defined as solar, wind, hydropower, and nuclear.

(iv) bringing natural gas infrastructure to regions such as Akmola and Karaganda Oblasts by 2020, and to North and East Kazakhstan by 2030;
(v) reducing GHG emissions from the power sector to 2012 levels by 2020, and reducing them by 15% by 2030 and 40% by 2050; and
(vi) reducing air pollution and increasing recycling of waste.

151. Several key programs inform planning for the transport sector, including planning for the goal of increasing the use of natural gas for transport. These programs are described further in the following existing and draft strategies:

(i) National Program of Development and Integration of Transport Infrastructure of the Republic of Kazakhstan until 2020 (2014);
(ii) Plan of Action for Switching Transport Vehicles to Environmentally Friendly Types of Fuel and Creation of Relevant Infrastructure (under consideration by the government);
(iii) General Scheme of Gasification of the Republic of Kazakhstan to 2030 (2014); and
(iv) National Program on Energy Saving—2020 (2013).

152. Particularly relevant to this NAMA, the General Scheme of Gasificiation specifies that by 2020 the use of natural gas by public transport and public vehicles must be at least 30% in Astana and Almaty and at least 10% in other cities. By 2030 the share of natural gas must be at least 50% in Almaty and Astana and 30% in other regional cities. Other priorities put forth in these documents include

(i) creating incentives for mechanisms to accelerate vehicle stock turnover through the purchase of fuel-efficient vehicles with the goal of reducing fuel consumption by 30%;
(ii) using energy-efficient buses;
(iii) engaging in fleet renewal and modernizing railway locomotives;
(iv) designing measures to develop energy-efficient transport infrastructure for inclusion in national development programs;
(v) introducing Euro standards for road transport (Euro 4-2014; Euro 5-2015; and Euro 6-2020); and
(vi) adopting international standards for vehicle efficiency.

C. Main Goals of the NAMA

153. Kazakhstan has plentiful reserves of oil, natural gas, coal, ores, and minerals; ample areas suitable for agriculture; and an educated population. However, the country's huge territory and low population density (one of the lowest in the world) present developmental challenges and ensure that the transport sector will always be an important and, for the foreseeable future, growing part of the national economy.[49] The government's goal for Kazakhstan is to transform itself from a landlocked to a "land-linked" country, capitalizing on its location and becoming a major bridge between Europe and Asia in a present day reincarnation of the Great Silk Road.
The number of vehicles on the road has more than tripled since 2000 and is expected to continue to grow. As a result, GHG emissions and local air pollutants will also increase significantly unless major measures are implemented to improve efficiency and switch to low-carbon fuels. In line with national strategic objectives to increase the use of natural gas and

[49] Decree of the President No. 725 of January 13, 2014. "On GOK Program of Development and Integration of Transport System in the Republic of Kazakhstan up to 2020." Available at: http://www.akorda.kz/upload/%D0%96%20%E2%84%96%20725%20%D1%80.pdf; The program itself available at: www.mid.gov.kz/images/stories/contents/gp_150520141656.pdf

slow the growth in GHG emissions, the NAMA proposes to foster a modern, efficient, low-carbon transport system based on the use of CNG as a major transport fuel.

154. The transport sector is based primarily on traditional fuels—gasoline and diesel. Natural gas's share of total fuel consumption is less than 1%. One of the reasons for the low penetration of natural gas is insufficient infrastructure for this fuel. Meanwhile, the potential for increasing the use of natural gas is large; it is a priority for the government, given the country's vast supply of cheap, domestic natural gas and its reliance on imports for 34% of gasoline and 9% of diesel fuel. As illustrated in Table 13, CNG is cheaper than gasoline and diesel. In addition, the price of natural gas and CNG has remained much more stable than the price of oil-based fuels and is expected to remain low over the next decades. The low cost of CNG is expected to make this fuel attractive in many vehicle applications, if the engine technologies and infrastructure to support refueling were available. This is particularly true for operators of large fleets such as municipal buses, trucks, and taxis.

Table 13: Prices for Transport Fuels in Kazakhstan, 2000-2050 (2010 $ / GJ)

Fuel	Historical			Forecast							
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
CNG	0.6	1.2	1.2	1.8	2.1	2.4	2.8	3.3	3.8	4.4	5.1
Diesel	8.3	5.3	9.9	15.1	17.5	20.3	23.6	27.3	31.7	36.7	42.6
Gasoline	10.1	6.5	9.9	14.0	16.3	18.9	21.9	25.4	29.4	34.1	39.5
LPG	3.9	6.0	6.2	9.1	10.6	12.2	14.2	16.4	19.1	22.1	25.6
Natural Gas	0.4	0.8	0.8	1.2	1.4	1.6	1.8	2.1	2.5	2.9	3.3
Crude Oil	2.1	3.6	7.1	9.3	10.8	12.5	14.5	16.8	19.5	22.6	26.2

CNG = compressed natural gas, LPG = liquefied petroleum gas
Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

155. To address the infrastructure problem and ensure development of a clean transport sector in accordance with national priorities, the NAMA will support the natural gas company, JSC KazTransGas, in constructing a network of up to 100 CNG refueling stations and creating other elements of the infrastructure for a natural gas refueling market in Kazakhstan. These include institutional support elements such as workshops to provide technical training on how to convert existing vehicles to CNG, creation of testing and certification centers, and introduction of training facilities for technicians who can convert and maintain the vehicles.

156. Implementation of the NAMA will encourage the market for production and consumption of natural gas as an engine fuel, with the goal of increasing the share of natural gas vehicles to 15% of all vehicles on the road (up to 50% in large cities). This would include natural gas-powered municipal, agricultural, construction, and other specialized vehicles. In most cases, using natural gas in vehicles results in lower GHG emissions, particularly when natural gas replaces gasoline as the fuel source. This means that implementation of the NAMA will help avoid GHG emissions from transport by encouraging a switch from diesel and gasoline to natural gas.

157. The implementation of the NAMA will be supported by other ongoing efforts to develop the country's natural gas supply infrastructure. For example, in early 2015, the government decided

to commence construction of two more LNG plants, opening the path to much wider use of natural gas in regions where it is currently unavailable and in fields that are not considered traditional domains of gas-fueled transportation. Specifically, there are ongoing discussions about future use of LNG as fuel for railway locomotives, ships, and long-distance heavy tractor-trailers running on the "Western Europe–Western China" highway system. There is also consideration of trucking LNG to cities without natural gas infrastructure, where it would then be converted to CNG for road transport.

D. Barriers Addressed by the NAMA

158. Natural gas has a number of economic benefits in Kazakhstan, such as providing a more reliable, long-term domestic supply of fuel with a much lower, less volatile price. In addition to its pollution-control benefits (as it emits lower levels of GHGs and air pollutants than traditional transport fuels), natural gas is safe and well-suited for vehicles driven under the local climate extremes found in Kazakhstan. Moreover, the government has explicitly stated its support for wider use of natural gas.

159. Despite these advantages, however, there are still many barriers preventing widespread adoption of natural gas, including those summarized below.

160. Economic barriers. Trying to develop the CNG infrastructure, Kazakhstan faces the hurdle of needing to reach a minimum penetration threshold. To interest end-users in CNG, there needs to be a CNG support system (conversion facilities, fueling stations, service providers). However, for this support system to become a viable investment opportunity, there must be a sufficiently large number of CNG end-users. The government is trying to resolve this problem by adopting an action plan for switching vehicles to environmentally friendly fuels and similar programs,[50] but other budget priorities and the high cost of installing CNG refueling stations makes it difficult to stage the massive and swift roll-out campaign needed to overcome the barriers to initial acceptance.

161. Administrative barriers. Existing rules and restrictions on budget procurement for every project component (siting and zoning, equipment acquisition, tenders for service contracts) create administrative barriers. These barriers delay project implementation beyond any reasonable timeframe. On the other hand, if CNG project developers attempt to avoid relying on the budget, they will face barriers to private financing. They will discover that few lenders and investors are ready to get involved in introducing and promoting a new engine fuel in Kazakhstan, since it will be perceived as having risks too difficult to foresee and manage.

162. Regulatory barriers. Regulations also play a role in impeding the advance of CNG in Kazakhstan. Firstly, there are no national standards or rules for construction and operations and maintenance (O&M) of CNG fueling stations or multi-fuel refueling stations. To build and operate CNGFSs, JSC KazTransGas had to prepare a request to develop and approve these normative regulations at its own cost. This effort is expected to be completed in mid-2015.

163. At the same time, technical committee PC 252 of the International Organization for Standardization (ISO) is currently working on standards for CNG and LNG fueling stations. Initial discussions have already taken place and publication is expected to happen sometime in

[50] Government of Kazakhstan Decree No. 969 of September 4, 2014. "Amendments on adoption of Action Plan to implement Green Economy Concept 2013-2020," related to the Action Plan for switching vehicles to environmentally-friendly fuels, creation of associated infrastructures and introduction of electro mobiles. Accessed at: http://tengrinews.kz/zakon/docs?ngr=P1400000969

2015. JSC KazTransGas has submitted a short-time technical assistance request to an international energy co-operation program— INterstate Oil and GAs Transportation to Europe (INOGATE). The assistance would support JSC KazTransGas in obtaining, translating and modifying these ISO documents for use in Kazakhstan. The Kazakh firm has not yet received a positive response.

164. In addition, existing construction codes contain some very restrictive provisions related to approval of possible sites for CNGFSs. These provisions need to be reconsidered, since they are based on an assessment of obsolete technologies and do not reflect actual safety issues and the current environmental impact of modern CNG refueling equipment. A further challenge is that there is no set of norms and standards for installing conversion kits on existing vehicles or operating CNG conversion shops; JSC KazTransGas is working on development of such norms. The requested changes include updates in the terminology, rules, and regulations for operating natural gas vehicles (NGVs) and for transporting CNG and LNG.

165. In short, a continuous and systemic update is needed of the regulatory environment for the NGV infrastructure. This will require comprehensive cooperation with a number of stakeholders from the national to local levels.

166. Informational barriers. There is no widespread informational support for developing the NGV sector. Decision-makers—even those familiar with and supportive of natural gas as an environmentally friendly fuel—are not fully informed about the current state of existing technologies and opportunities. Even the proponents of NGV interviewed by this project team were not always aware of each other's efforts or of the different technological approaches being pursued by different companies.

167. Psychological barriers. These barriers are not as prominent as might be expected given negative public impressions stemming from unsuccessful attempts to introduce CNG vehicles 30 year ago. The equipment of that period led to safety, dependability, and environmental problems. Private car owners in Kazakhstan today are quite open to modern natural gas-powered vehicles. Existing conversion shops report a backlog of orders.

168. Institutional barriers. Kazakhstan currently has limited human capacity to support a switch to NGVs. There is an insufficient supply of skilled labor, and the few specialist who are available need more education and experience. Currently there are no training programs for CNGFS operators and there are very rudimentary educational resources for specialists to learn to convert existing vehicles to NGVs. The only oversight or testing is done by authorities in the areas of safety and emergency responses. While necessary, this oversight and testing cannot substitute for professional teaching of proper O&M for complicated modern equipment.

E. Co-benefits

169. In addition to significantly reducing GHG emissions in the transport sector and promoting sustainable development, the NAMA is expected to create the following co-benefits:

(i) reduced local air pollution;
(ii) health co-benefits from reduced local air pollution;
(iii) increased energy security;
(iv) income and job generation;
(v) increased disposable income due to reduced fuel costs;
(vi) increased private enterprise in fields related to fuel switching and vehicle conversions;

(vii) accelerated turnover of outdated vehicle stock (e.g., through imports of original equipment manufacturer CNG vehicles); and
(viii) development of domestic CNG vehicle production capacity (eventually) with potential for exports.

F. Activities to be Carried Out

170. The NAMA consists of four phases. Each phase has increasing scope and impact, and each stage includes (i) a specific ("hard") component that entails implementation of particular tangible projects such as construction of natural gas-related facilities or production, purchase, and installation of particular equipment; and (ii) a systemic ("soft") component that involves less tangible but no less crucial elements such as development and approval of necessary legislative and regulatory norms, research and development (R&D), education and training, marketing, and public awareness campaigns. The four phases are described below.

1. Phase 1 (2014–2015): Pilot Market Infiltration

171. This phase includes the capture of anchor clients, such as major state or municipal consumers that can change the market and perception of the technology.

172. Project components:

(i) Construct and install three CNGFS in the cities of Aktobe, Shymkent, and Kyzylorda and finalize the design of two more CNGFSs for the cities of Taraz and Zaysan, if supported by additional funding through the NAMA.
(ii) Purchase or obtain long-term lease-to-own contracts for land plots in regional centers, big cities, and along main transport routes. The land plots must be suitable for constructing CNGFSs and for mounting related equipment or infrastructure according to CNGFS site blueprints.
(iii) Convert the corporate fleet of JSC KazTransGas and its subsidiaries to CNG. This may require co-financing and technical assistance from foreign sources.
(iv) Construct, install, and commission a certification center for CNG tanks and other equipment.
(v) Construct a training complex to prepare personnel for employment at CNGFSs and other gas fueling facilities, including LNG installations that can help natural gas reach new parts of the country, where it can then be converted to CNG for road transport.

173. Systemic components:

(i) Develop a comprehensive national program for promoting use of CNG in vehicles, including (a) completion of market research on natural gas potential by locality and on potential network routes for cargo and passenger flows; (b) harmonization with the government program for bringing natural gas to new regions; (c) support for the approval of criteria for siting CNGFSs in cities and along the main highways connecting Western Europe with Western China; and (d) preparation of feasibility studies for constructing 30 to 100 CNGFSs in different parts of Kazakhstan. Evaluate indicators for monitoring and reporting on the GHG impacts of the infrastructure and capacity building activities included in the NAMA. This may include studies to determine emission factors for different categories of traditional and replacement natural vehicles or engines. This analysis will be used to inform the design of an MRV

framework for the remaining NAMA phases, where activities extend beyond initial pilot sites to general market penetration.

(ii) Develop a general approach and specific scheme for financing a national program to promote CNG adoption (designed under Phase 1, system component (i)), including staggered funding by stages and subprograms, regions, type of expenditure, and types of financing (equity, debt, project finance, leasing, co-financing by private and public entities, etc.).

(iii) Design and obtain approval for the technical and regulatory documents needed to support growth of the NGV sector, including rules and protocols for construction, installation, and operation of infrastructure for using natural gas in vehicles. This could be done with cooperation from donors.

(iv) Elaborate and obtain authorization for a standard design for a CNGFS that would be optimized for the diverse geologic, climatic, and technical conditions in Kazakhstan. This could be realized as a modular design and may require donor technical assistance of up to $500,000.

(v) Conduct analysis and suggest an optimal package of government measures to promote implementation of NGVs, including institutional, regulatory/normative, and financial incentives. This may require technical assistance from donors.

(vi) Develop an education and training program for a natural gas infrastructure workforce (engineers, designers, refueling station technicians) by introducing special courses in colleges and vocational schools, hiring foreign experts, and sending domestic specialists abroad for training (with governmental or donor educational grants). Staff and launch the educational center for the NGV industry, in conjunction with Phase I, project component (v).

(vii) Join international NGV organizations and associations, gather existing know-how, and share experience gained through initial market penetration.

2. Phase 2 (2016–2018): Extension of Compressed Natural Gas to Medium and Small Commercial Players

174. Project components:

(i) Complete construction and installation of nine CNGFSs in regional centers. Begin wide-scale construction of CNGFSs in major cities and along trucking routes, including along the Eastern Europe–Western China highway.

(ii) Establish NGV certification and service facilities in nine regional centers.

(iii) Continue the corporate fleet conversion program within JSC KazTransGas. Launch a similar program for fleets operated by companies under the Samruk-Kazyna sovereign wealth fund.

175. Systemic components:

(i) Implement the incentive package designed under Phase 1, systemic component (v). Analyze initial feedback and, if necessary, make mid-course corrections to the incentive package.

(ii) Develop a unified system of automatic reporting and control for the network of CNGFSs in Kazakhstan.

(iii) Design a program for development of the LNG sector in Kazakhstan, including suggested resolution of existing technical, logistical, and other market barriers. Harmonize this program with existing plans for natural gas expansion and creation of CNG infrastructure.

(iv) Conduct technical design and prefeasibility study for an LNG plant.
(v) Initiate a program for domestic design and manufacture of NGVs, potentially supported by donor technical assistance or technology transfer.

3. Phase 3 (2019–2020): Fuel Switching in Agricultural, Construction, and Other Specialty Vehicles

176. This phase focuses on expanding the NGV market to new sectors and includes the activities described below.

177. Project components:

(i) Continue to develop the network of NGV refueling stations under the previously approved master plan.
(ii) Continue implementation of the corporate fleet fuel-switching program for companies under Samruk-Kazyna.
(iii) Start construction of LNG liquefaction and regasification plants.
(iv) Launch a fuel conversion program for agriculture and specialty vehicles in conjunction with Phase 3 systemic component (ii).

178. Systemic components:

(i) Expand and adjust the national program for promoting NGVs with the specific goal of using LNG in regions with no natural gas infrastructure, including by transporting and converting LNG into CNG.
(ii) Develop a program to convert agricultural, construction, and other specialty vehicles to natural gas.[51] The program should consider railway locomotives and sea and river ships, and should cover both CNG and LNG technologies.
(iii) Complete the program for domestic design and manufacture of NGVs.

4. Phase 4 (2021–2025): Comprehensive Market Penetration

179. This phase focuses on more deeply penetrating the market, including by increasing the use of CNG in private vehicles.

180. Project components:

(i) Complete construction and installation of a CNGFS network in Kazakhstan, including stations in smaller cities. Optimize their operations based on experience and feedback gained to this point.
(ii) Complete the corporate fleet conversion program for companies under Samruk-Kazyna.
(iii) Construct CNGFSs in regions with no natural gas infrastructure, utilizing LNG transport and regasification facilities. Expand LNG infrastructure according to current market analysis.
(iv) Launch the previously designed program for converting agricultural and specialty vehicles to natural gas, possibly including rail and water transport.
(v) Start domestic production of NGVs.

[51] There are about 200,000 agricultural vehicles in Kazakhstan.

181. Systemic components:

(i) Analyze and make corrections to the NGV programs being implemented based on acquired experience and feedback.
(ii) Continue international cooperation in the field of NGVs.

G. Transformational Potential of the NAMA

182. Once implemented, the NAMA will in the long term remove economic barriers to NGVs, such as the minimum penetration threshold. A concerted rollout campaign to convert gasoline and diesel vehicles to CNG will achieve this by developing the supporting infrastructure, introducing necessary financial incentives, resolving regulatory issues, and developing the capacity of technical staff. The NAMA is also intended to help lower financial barriers by demonstrating successful performance by the NGV industry, which would then attract private investors for construction of additional infrastructure. By generating empirical data through implementation of “hard” projects, the NAMA will help identify and quantify risks; this data can then be used to design targeted risk mitigation strategies.

183. Regulatory barriers will be removed during the first phase of the NAMA (by 2016), as missing or inconsistent regulatory elements are studied, developed, and approved. With these barriers removed, there will be significant potential to expand the use of natural gas for transport. The NAMA’s goal is to facilitate the use of natural gas technology in 15% of the country’s vehicles. Because costs for natural gas are lower than costs for traditional fuels, this number could grow even higher once the technology and infrastructure have become more widespread and the barriers to increased private sector investment have been removed.

184. Finally, recent government plans to build two new LNG facilities will help expand the use of natural gas into more regions, into non-traditional transport applications (railway locomotives, ships), or even beyond the transport sector.

H. Greenhouse Gas Emission Reductions

185. The NAMA concept will increase the use of natural gas in the transport sector and reduce the use of diesel and gasoline, both of which have a higher carbon content than natural gas. This fuel switch will result in reductions of two GHGs: carbon dioxide and nitrous oxide.

186. JSC KazTransGas is conducting feasibility studies to determine specific locations and target markets for a large portion of the proposed natural gas infrastructure. The estimated GHG emission reductions included in this NAMA concept therefore focus on those activities that JSC KazTransGas has already conceptualized or that are directly under its control and for which emission reductions can be determined. The estimate only covers fuel switching in vehicles for road transport, as the use of natural gas for shipping and rail transport is still under consideration by the government and therefore cannot be quantified.

187. The GHG emission reduction estimate also considers a second scenario where an increasing number of cars, buses, and trucks are converted to CNG during the life of the NAMA resulting in a conversion of 8% all vehicles on the road in 2025.

1. Baseline

188. Without the NAMA, Kazakhstan will continue to use mostly diesel and gasoline for transport, and investment in new natural gas refueling infrastructure will remain low. Meanwhile, the need for transport will continue to grow along with Kazakhstan's improving economy. Therefore, the assumption is that in the baseline (without the NAMA) the share of natural gas in transport will continue to stay below 1% of total energy demand (footnote 3).

189. Using the economic model developed for the energy and transport sectors of Kazakhstan under RETA 8119, the consultant team estimated the annual baseline GHG emissions for vehicle transport in Kazakhstan. Table 13 lists the expected number of vehicles in Kazakhstan during the 2014-2025 life time of the NAMA. Equation (1) demonstrates how GHG emissions from these vehicles are calculated:

Equation (1)

$$GHG_y = \sum_{F,f,p} \left(O_{F,y} \times \frac{1}{E_{F,y}} \times S_{F,f,y} \times (C_{F,f,p,y}) \right)$$

Where:

y	=	Year
c	=	Vehicle class
v	=	Vintage (year of sale)
f	=	Fuel
p	=	GHG
GHG	=	GHG emissions (tCO_2e)
N	=	Number of vehicles
E	=	Fuel consumption per vehicle (MJ)
C	=	Combustion emission factor (tCO_2e / MJ)

190. The baseline emission results are shown in Table 15. The approach and emission factors for estimating GHG emissions are documented in the TA consultant's report titled *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors* (footnote 3) and the national model for Kazakhstan is made publically available on ADB's website.

Table 14: Baseline Number and Type of Vehicles for Road Transport, 2014–2025

Vehicle Class	Year											
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
M1	3,576	3,727	3,871	4,006	4,136	4,260	4,374	4,478	4,572	4,654	4,725	4,784
M2 and M3	87	90	92	95	94	95	96	97	97	98	96	98
Motorcycles	72	74	74	75	75	76	76	76	76	75	75	73
N	422	432	441	448	451	451	450	448	448	450	454	458
Total	**4,157**	**4,323**	**4,477**	**4,623**	**4,756**	**4,882**	**4,997**	**5,099**	**5,193**	**5,279**	**5,350**	**5,414**

Notes: M1 = passenger vehicles of no more than 9 seats and not exceeding 2.3 tons; M2 = passenger vehicles of more than 9 seats and not exceeding 5 tons; M3 = passenger vehicles of more than 9 seats and exceeding 5 tons; N = vehicles for carrying goods.
Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

Table 15: Baseline Greenhouse Gas Emissions from Road Transport, 2014–2025

Scenario	Year												Total
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	
Baseline GHG emissions ($MtCO_2e$)	23.9	23.8	24.1	24.2	23.7	23.6	23.4	22.7	22.9	22.8	22.4	22.5	280.0

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

2. The NAMA

191. The GHG emission reductions that can be achieved by this NAMA depend on the amount of refueling infrastructure to be constructed and the number and type of vehicles to be converted to natural gas. Since JSC KazTransGas is still conducting feasibility studies and market analyses to clarify these amounts, the estimate of potential GHG abatement presented in this report is based on two different scenarios:

(i) Scenario 1: All vehicle fleets under JSC KazTransGas and its partners are converted to CNG by 2025; and
(ii) Scenario 2: Optimistic scenario where 8% of cars, buses and trucks are converted to natural gas by 2025.

192. The following subsections describe the approach used to calculate emission reductions from each of these scenarios.

a. Scenario 1: Greenhouse Gas Emission Reductions from Switching Vehicles owned by JSC KazTransGas and Partners to CNG

193. Based on already planned refueling infrastructure and vehicle conversions to be managed by JSC KazTransGas and its partners, the company estimates that 7,500 vehicles will be

converted to CNG by 2025 according to the schedule outlined in Table 16. The estimation of the potential GHG emission reductions is based on the assumption that the vehicles to be converted will be in addition to those CNG vehicle sales that are already taking place in the baseline.

194. Table 17 on the next page summarizes the potential GHG emission reductions that can be achieved by switching JSC KazTransGas and its partners' gasoline and diesel vehicles to CNG. Annual GHG emission reductions are expected to grow from 7,653 tCO_2e per year in 2016 (Phase 1) to 135,315 tCO_2e per year in 2025 (Phase 4). Cumulative GHG emission reductions by 2025 are 802,254 tCO_2e.

195. These figures are conservative, since they take into account only the fuel switching activities of JSC KazTransGas and its partners, such as the conversion of JSC KazTransGas' corporate fleet and municipal buses.

Table 16: Number of Vehicles Converted to Compressed Natural Gas in Scenario 1

	Year										
Vehicle Class	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
M1 (cars)	130	150	190	290	290	290	290	290	290	290	--
M2 and M3 (buses)	20	130	350	500	500	500	500	500	500	500	--
N (trucks)	50	70	110	110	110	110	110	110	110	110	--
Total	**200**	**350**	**650**	**900**	**900**	**900**	**900**	**900**	**900**	**900**	**--**

Notes: M1 = passenger vehicles of no more than 9 seats and not exceeding 2.3 tons; M2 = passenger vehicles of more than 9 seats and not exceeding 5 tons; M3 = passenger vehicles of more than 9 seats and exceeding 5 tons; N = vehicles for carrying goods.
Source: JSC KazTransGas.

Table 17: Estimated Greenhouse Gas Emission Reductions in Scenario 1

	Year												Total
Scenario	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	
Baseline GHG emissions ($MtCO_2e$)	23.9	23.8	24.1	24.2	23.7	23.6	23.4	22.7	22.9	22.8	22.4	22.5	280.0
GHG emission reductions ($MtCO_2e$)	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.06	0.08	0.06	0.09	0.11	0.12	0.14	0.14	0.80	0.14	0.14
Percent change from baseline	0.00	0.00	0.04	0.08	0.17	0.25	0.34	0.40	0.48	0.53	0.63	0.62	

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

b. Scenario 2: Greenhouse Gas Emission Reductions from Converting 8% of Cars, Buses, and Trucks to Natural Gas by 2025

196. Given that JSC KazTransGas is still conducting feasibility studies of where to place the new natural gas infrastructure, there are large uncertainties surrounding the timing of the conversions and the specific types of vehicles that will be converted as part of the NAMA. As a placeholder, the consultant team developed an optimistic emission reduction scenario based on the assumption that 8% of the cars, buses, and trucks in Kazakhstan (i.e., 430,000 vehicles) would be converted to CNG by 2015. This includes the following assumptions:

197. 430,000 vehicles are switched to CNG by 2025 using the schedule outlined in Table 18:

(i) 5% of cars (i.e., M1 vehicles) are converted (325,000)
(ii) 30% of buses (i.e., M2 and M3 vehicles) are converted (45,000)
(iii) 10% of trucks (i.e., N vehicles) are converted (60,000)

These 430,000 are interpreted as a total target for CNG vehicles in Kazakhstan and therefore include CNG vehicle sales that would also occur in the baseline.

198. The conversion of more buses and trucks than cars reflects the assumption that it will be easier and more cost-effective to switch heavy-duty vehicles to CNG in the early years, since they typically are managed as part of a fleet. The refueling infrastructure will still be limited and can therefore best support fleets that consistently use the same refueling station(s).

Table 18: Number of Vehicles Converted to Compressed Natural Gas in Scenario 2

	Year (1,000 units)											
Title	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Diesel vehicles converted to CNG	0.6	10	23	41	53	69	80	87	99	104	105	105
Buses (M2 /M3)	0.5	5	11	18	23	31	35	38	45	46	46	45
Trucks (N)	0.1	4	12	23	30	38	45	49	54	58	59	60
Gasoline cars converted to CNG (M1)	0.4	15	105	220	230	240	250	265	280	285	300	325

Notes: M1 = passenger vehicles of no more than 9 seats and not exceeding 2.3 tons; M2 = passenger vehicles of more than 9 seats and not exceeding 5 tons; M3 = passenger vehicles of more than 9 seats and exceeding 5 tons; N = vehicles for carrying goods; CNG = compressed natural gas
Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

199. Similar to the approach used for the baseline, the consultant team calculated the resulting GHG emission reductions using the national energy and transport model developed under RETA 8119 (footnote 3) and the process outlined in Equation (1). Using this approach, the total cumulative GHG emissions reductions by 2025 are 14 million tCO_2e (Table 19). The annual emission reductions grow over time as more and more refueling infrastructure is put in place.

Table 19: Estimated Greenhouse Gas Emission Reductions in Scenario 2

	Year												Total
Scenario	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	
Baseline GHG emissions ($MtCO_2e$)	23.9	23.8	24.1	24.2	23.7	23.6	23.4	22.7	22.9	22.8	22.4	22.5	280.0
GHG emission reductions ($MtCO_2e$)	0.0	0.2	0.6	1.1	1.2	1.5	1.6	1.6	1.8	1.8	1.8	1.8	14.0
Percent change from baseline (%)	0.1	0.8	2.4	4.5	5.3	6.2	6.7	7.1	7.9	8.0	8.0	7.8	5.3

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

200. These reductions will result from the conversion of buses, trucks, and cars only. Agriculture and specialty vehicles, as well as any off-road transport or non-transport natural gas applications, are not included in this estimate due to the uncertainty in the number of applications to be converted.

c. Indirect Effects

201. A large portion of this NAMA involves creating the supporting infrastructure and regulatory framework for natural gas vehicles. Although these activities will not directly lead to GHG emission reductions, they will result in a general improvement in market penetration by natural gas for transport and other uses, which can be tracked by analyzing the overall share of natural gas in energy and transport.

202. In addition, by building LNG production plants in Kazakhstan (and constructing the associated network of LNG refueling stations in five regions that do not currently have natural gas infrastructure), the NAMA will facilitate general fuel switching away from coal and diesel and enable CNGFSs to be introduced for road transport. Because LNG will be delivered for regasification on the spot, residential buildings, industry, and small and medium-sized businesses in remote areas will be able to replace coal and diesel with natural gas. This includes using natural gas in boiler houses for heat generation. However, potential emission reductions cannot be calculated until the specific distribution of various end uses is determined.

I. Cost and Financing

203. Table 20 outlines expected funding sources, including the amount of support JSC KazTransGas expects to receive from international sources.

Table 20: Requested Funding for NAMA Implementation ($)

				Including		
Phase	**Years**	**Description**	**Total cost**	**State Budget**	**Own Capital**	**International Support**
1	2014–2015	Pilot market infiltration	10,325,000	180,000	6,890,000	3,255,000
2	2016–2018	Extending CNG to medium and small commercial players	30,500,000	250,000	7,930,000	22,320,000
3	2019–2020	Fuel switching in agriculture, construction and other specialty vehicles	16,700,000	620,000	4,280,000	11,800,000
4	2021–2025	Comprehensive market penetration	16,600,000	630,000	4,000,000	11,970,000
Total			**74,125,000**	**1,680,000**	**23,100,000**	**49,345,000**

J. Proposed Monitoring, Reporting, and Verification System

204. There is no precedent for a fully developed MRV plan for a NAMA in Kazakhstan, nor is there any official system for tracking fuel consumption by vehicle types. The MRV system proposed in this report, therefore, is designed to rely on (i) JSC KazTransGas's ability to monitor natural gas industry developments, including natural gas refueling and corporate fleet conversions; and (ii) existing government indicators for tracking fuel consumption at the national level as well as by sector, city, and region.

205. Implementing fuel switching and transitioning Kazakhstan to a low-carbon transport system will take many years. For this reason, during Phase 1, the MRV system will only capture emission reductions associated with the pilot sites described for that phase. The MRV framework will also capture the supporting activities included in the NAMA and the funds used.

206. As CNG refueling stations expand and LNG becomes more widely available during Phases 2 through 4, the MRV system will be scaled up to capture general market effects. The market study proposed under Phase 1, systemic component (i) will clarify the expected natural gas end uses and identify the specific infrastructure proposed. This information can then be used to develop indicators for estimating and tracking GHG impacts.

207. As the executing agency for this NAMA, KazTransGas Onimderi LLP is ultimately responsible for project execution and reporting and for coordinating the activities of implementation partners. Staff from KazTransGas Onimderi LLP will work directly with JSC KazTransGas on general management and oversight, financial review, and approval of project investments. KazTransGas Onimderi LLP will prepare monitoring reports for JSC KazTransGas, which will pass them on to relevant stakeholders. This includes the Ministry of Finance and the Ministry of Economy, which will review the use of funds from the state budget and from international donors. The report will also be sent to Ministry of Energy for potential reporting to the UNFCCC. Starting during Phase 2, the monitoring reports will go to the Ministry of Innovation Development (through the Institute of Power Development and Energy Saving) for potential reporting on efficiency improvements in transport. As the executing agency, JSC

KazTransGas will track the NAMA's financing, in accordance with established regulations and processes and with oversight from the Ministry of Finance and the Ministry of Economy.

208. Table 21 outlines MRV activities by NAMA phase.

Table 21: Schedule of Suggested Monitoring, Reporting, and Verification Actions

Phase	Timeline	MRV Activities
Phase 1: Pilot market infiltration	2014–2015	• Conduct MRV of GHG impacts at pilot sites, including corporate fleet of JSC KazTransGas. • Develop MRV methodology for capturing project and market impacts during Phases 2 through 4.
Phase 2: Extension of CNG to medium and small commercial players	2016–2018	• Begin operationalizing the MRV system across the three CNG fueling stations in the cities of Aktobe, Shymkent, and Kyzylorda and two more CNGFSs in the cities of Taraz and Zaysan (when operable). • Conduct MRV of corporate fleet conversions. • Evaluate and support scaling up the MRV system to include additional regions and end uses.
Phase 3: Fuel switching in agricultural, construction, and other specialty vehicles	2019–2020	• Regularly measure, report on, and verify GHG impacts, sustainable development co-benefits, and financial support. • Based on reports, reassess and adjust MRV system.
Phase 4: Comprehensive market penetration	2021–2025	• Regularly measure, report on, and verify GHG impacts, sustainable development co-benefits, and financial support

209. The indicators shown in Table 22 will be used at both the local and national levels to track mitigation impact, sustainable development co-benefits, and financial support.

Table 22: Proposed Metrics for Monitoring, Reporting, and Verification

Quantitative metrics	GHG emissions	Indicators for annual tracking of natural gas adoption during Phase 1: • Number and type of vehicles converted to natural gas • Natural gas consumption (by type) and vehicle kilometers driven on natural gas per year by vehicle type • Number of refueling stations constructed and volume of fuel sold per year • Number of passengers, kilometers, tons transported, passengers per kilometer, and tons per kilometer per year for vehicles converted to natural gas Potential indictors for Phases 2 through 4: • Share of natural gas-powered vehicles by vehicle and fuel type and by market segment/end-use (private, municipal, agriculture, etc.) • Average annual kilometers driven using natural gas by vehicle type, market segment, and geography (region, city) • Age of fleet by market segment, fuel type, and vehicle category • Fuel efficiency by vehicle category and fuel type • Number of passengers, kilometers, tons transported, passengers per kilometer, tons per kilometer per year for vehicles converted to natural gas
	Sustainable development	• Number of CNG and LNG facilities and their capacity • People trained • Number of jobs created in natural gas-related fields • Accelerated turnover of outdated vehicle stock • Air pollutant reductions due to switch to natural gas
	Financial tracking	• Annual funds spent by source (state budget, private sector, international support) and activity (fleet conversion, technical assistance, training or workshops, infrastructure, market studies)
Qualitative metrics		Metrics for tracking individual activity items outlined for Phase 1 through Phase 4 could include: • Funding requested • Funding obtained • Initiated and/or construction started • In progress • On hold • Completed

K. Implementation

210. Stakeholders involved in the implementation of the NAMA include the following:

(i) **JSC KazTransGas,** as the national operator responsible for development of the natural gas supply network in Kazakhstan, will be responsible for general management, approval of investment projects, financial review, and consultations.
(ii) **KazTransGas Onimderi LLP** will lead the elaboration of investment projects, project execution, reporting, and coordination of partner activities within the project. It will also be responsible for design and implementation of the MRV system.
(iii) **JSC KazMunayGas,** a state-owned oil and gas holding, will be responsible for approving the investment program and for helping resolve financial matters with the sovereign wealth fund Samruk-Kazyna.
(iv) The **Ministry of Energy** will provide technical consultations and assistance to resolve issues at the government level, including relevant updates of norms and regulations.
(v) The **Ministry of Investment and Development** will provide technical consultations and assistance on issues related to vehicle conversion.

(vi) The **Research and Development Institute of Transport and Communications LLP** will assist with technical consultations.
(vii) **Ernst & Young** will be asked to update the feasibility study “Project of Construction of 95 NGV-refueling Compressor Stations in the Republic of Kazakhstan.”
(viii) The **Ministry of National Economy** will consult on financing and enter into agreements on credit lines.
(ix) The **Ministry of Finance** will consult on financing and enter into agreements on credit lines.

VI. DEVELOPING A NATIONAL ENERGY EFFICIENCY SUPPORT SYSTEM: NAMA CONCEPT FOR KAZAKHSTAN

A. Summary of the NAMA Concept

1. Country

211. Kazakhstan

2. Implementing Entity

212. The NAMA will be implemented by JSC Institute of Power Development and Energy Saving[52] (formerly JSC Kazakhenergoexpertiza), which is a subordinate institution of the Ministry of Investment and Development (MID).

3. Contact Information

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4. Brief Description

214. The NAMA supports the Government of Kazakhstan's efforts to encourage and create incentives for the adoption of energy efficiency measures across all sectors of the economy by improving the infrastructure for tracking, reporting, and evaluating progress on energy efficiency. JSC Institute of Power Development and Energy Saving will accomplish this by upgrading and enhancing the existing State Energy Registry (SER) of Kazakhstan and expanding it into an Energy Efficiency Support System (EESS). The EESS will be a user-friendly, web-based knowledge management platform. It will improve compliance by entities subject to reporting to SER under Kazakhstan's Energy Efficiency Law and will provide state decision-makers, the private sector, and other end-users with technical and financial information and tools to facilitate implementation of specific energy efficiency projects. Additionally, it will enable the Government of Kazakhstan to better measure and report on energy activities in both the public and private sectors, facilitating the country's shift toward a low-carbon development path that has the potential to be replicated throughout Central Asia.

215. The resulting improvement in energy efficiency will avoid the combustion of fossil fuel for electricity and heat generation. This will result in reductions of three GHGs: carbon dioxide, methane, and nitrous oxide.

[52] See the web site at http://www.kazee.kz/en/en/

5. Time Period

216. The NAMA will be implemented from 2015 through 2025, and will consist of four phases.

B. Background on Kazakhstan

217. The Republic of Kazakhstan became a sovereign state on December 16, 1991, following the collapse of the Soviet Union. The country has a total land area of 2,724.9 thousand km², and is bordered by Russia, China, Kyrgyzstan, Uzbekistan, and Turkmenistan. In 2014, Kazakhstan's population was 17.16 million. It is expected to grow to 24.33 million by 2050.

218. Kazakhstan is rich in hydrocarbon reserves (oil, coal, and natural gas) and other minerals (copper, chrome, gold, and aluminum). The extraction, consumption, and exportation of these hydrocarbons and minerals contribute significantly to economic production and growth. Following market reforms in the 1990s, the economy started growing quickly in the 2000s; this growth is expected to continue to 2050. Kazakhstan's primary energy sources (including for transport) are coal, oil, and natural gas. As a result, even though GHG emissions intensity is declining in Kazakhstan, total GHG emissions are expected to increase through 2050 to meet economic and population growth.

219. Recognizing the growing risks of climate change, the government has adopted a voluntary quantitative commitment to reduce GHG emissions by 15% by 2020 and 25% by 2050 (relative to a 1992 baseline). In 2012, Kazakhstan further revised this goal and declared its readiness to reduce emissions by 5% to 7% from the 2013 to 2020 period; the country is now evaluating and implementing mitigation options to meet this goal. In particular, for 2015 the national goal is to reduce GHG emissions by 1.5% over the 2013 level.

220. The government's goal of mitigating the environmental impact of its rapid growth is codified in many official strategy documents,[53] most importantly in the 2013 Concept of Transition of the Republic of Kazakhstan to a Green Economy, [54] which among other items sets a goal of reducing the energy intensity of GDP by 10% by 2015, 25% by 2020, 30% by 2040, and 50% by 2050 (compared to the 2008 baseline).

221. In addition, several laws and programs have been introduced to specifically promote energy efficiency, including the following:

(i) The Law on Energy Saving and Energy Efficiency Improvement (2012, with amendments in 2015);
(ii) The Law on Changes and Amendments to Legislative Acts of the Republic of Kazakhstan on Issues of Energy Saving and Energy Efficiency (2012, 2015);
(iii) National Complex Plan on Energy Saving (2011);
(iv) Program for Energy Saving 2020 (2013);
(v) Strategic Plan for the Republic of Kazakhstan's Development up to 2020 (2010);
(vi) Overall national plan on the implementation of the President's Message "Strategy Kazakhstan—2050" (2012);

[53] The address of the Head of State N. Nazarbayev to the people of Kazakhstan. November 11, 2014. Available at: http://strategy2050.kz/en/ and http://strategy2050.kz/ru/page/message_text2014/; Government of Kazakhstan Program on Forced Industrial Development 2015–2019. Available at: http://strategy2050.kz/ru/page/gosprog3/ and http://strategy2050.kz/static/files/pr/rus.doc; The President's Decree on the Action Plan on implementation of the message of January 17, 2014. Available at: http://www.zakon.kz/4598452-glava-gosudarstva-utverdil-plan.html.

[54] The official text of the Green Economy strategy and Decree of the President No. 577 of May 30, 2013. Available at: www.kazpravda.kz/_pdf/jun13/010613decree.pdf

(vii) Governmental Program of Forced Industrial and Innovative Development of the Republic of Kazakhstan for 2015–2019 (2014);
(viii) Program of Government Infrastructure Development "Nurly-Zhol" for 2015–2019 (2015); and
(ix) An additional 16 regional and three sectors plans and strategic plans of individual ministries to implement the above laws and programs.

222. These laws and programs aim to decrease the energy intensity of GDP by no less than 10% by 2015, 25% by 2020, and 50% by 2050, including through increased energy efficiency.

C. Main Goals of the NAMA

223. Over the last 15 years the Republic of Kazakhstan has pursued an ambitious program of rapid inclusive economic growth while making conscientious efforts to mitigate the environmental impact on the population and the global community. This includes making efforts to radically improve the energy efficiency of the economy. Despite these efforts the energy intensity of Kazakhstan's GDP, while declining, still remains among the highest in the world.[55] A number of barriers remain to improving energy efficiency, but these barriers can be overcome with proper efforts by the national government and targeted assistance from international partners.

224. This NAMA proposes to address some of these problems by improving the infrastructure for tracking, reporting on, and evaluating efforts to improve energy efficiency. This will be done by creating a modern, comprehensive national EESS based on the recently mandated SER. Under the current energy efficiency law,[56] all enterprises and organizations with annual consumption of fuel or other energy resources over 1,500 tons of coal equivalent (about 1,050 tons of oil equivalent—including government and quasi-public sector entities—are subject to reporting to the SER. Since 2013, at least once every five years, SER subjects must undergo an energy audit, then formulate and implement a plan of action to improve energy efficiency as identified during the audit. Since 2014, all large industrial enterprises have started implementing energy management systems according to ISO 50001. However, additional measures are required to achieve further improvements. Currently, there are more than 78 energy-auditing companies. Twenty-eight of these have proper accreditation, indicating that the market for energy efficiency services has grown.

225. The audit results and the action plans and reports on their implementation are submitted to, analyzed, and controlled by the SER. The SER is currently being operated by JSC Institute of Power Development and Energy Saving,[57] which helps MID monitor implementation of the main policy indicator on energy savings. This indicator is based on the goal of decreasing the energy intensity of GDP by 25% by 2020 and 50% by 2050 (compared to 2008 levels).

[55] World Energy Council. 2013. *Energy Efficiency Indicators*. Enerdata. Accessed at: http://www.wec-indicators.enerdata.eu/primary-energy-intensity.html

[56] "The law on energy saving and improvement of energy efficiency" of the Republic of Kazakhstan (# 541-IV), signed by the President of Kazakhstan on January 13, 2012. Available at: http://shygys.kz/acts/energosberejenie.php (in Russian), articles 9,10;20; The law "Amendments and changes into some legislative acts in the Republic of Kazakhstan on the issues of energy saving and improvement of energy efficiency," # 542-IV, January 13, 2012. Available at: http://pravo.zakon.kz/4469885-vneseny-izmenenija-i-dopolnenija-v.html. The last update of this law was completed and signed by the President of RK on 14 January, 2015. Available at: http://www.akorda.kz/ru/page/page_218917_glavoi-gosudarstva-podpisan-zakon-respubliki-kazakhstan-

[57] Information required from SER subjects, including the rules for preparing and submitting reports, the legislative basis, and the method for calculating energy consumption, can be accessed at: http://kazee.kz/en/gosudarstvennyy-energeticheskiy-reestr/subekty-gosudarstvennogo-energeticheskogo-reestra-/

Kazakhstan is on track to meet this goal—by 2014, energy intensity had fallen by 13.5% compared to 2008.

226. By the end of 2013, the SER covered 11,067 legal entities. In 2015 more than 3,000 of them reported to the MID on implementation of plans for improving energy savings. By 2020, the number of entities required to report to SER is expected to reach 12,000. There are standards for energy consumption by government agencies, coupled with strict monitoring of their implementation. As of July 2015, more than 3,500 legal entities are required to conduct energy audits, resulting in the development and implementation of numerous five-year plans for energy efficiency improvement.

227. This entire process is handled manually by the SER, with reports presented in hard copy (on paper). As a result, reporting involves many discrepancies, errors, or omissions that require a comparatively large expenditure of qualified labor to be checked and resolved. The near-term goal is to upgrade the SER to an automated on-line database to improve data reporting, collection, and analysis (during Phase 1). The user interface will contain preliminary data analysis and real-time validation at the point of entry, using criteria for proper format, completeness, and consistency. The software will include all the necessary tools for in-depth analysis and for multi-functional and multi-criteria data tracking and mining, including trend identification. It will allow online interactions with the covered entities after a report has been submitted.

228. This system will significantly reduce the cost of compliance for both subjects of the SER and for its custodian. It will also generally increase the efficacy of enforcing the energy efficiency law. Eventually, it should evolve into a nationwide advanced MRV framework for energy efficiency improvements. Execution of this stage of the NAMA has already received support within the framework of an agreement between the Institute of Power Development and Energy Saving and the European Bank for Reconstruction and Development (EBRD) for implementation of the World Bank Kazakhstan Energy Efficiency Project (KEEP).

229. After the automated registry database is introduced and tested under its current legal scope, it will be expanded to cover information on additional sectors and technologies, such as transport, that are not currently under its mandate (during Phase 2). While these enterprises are not legally required to report to the SER, the registry will provide them with the same basic reference information as it provides to its mandated subjects. Such information includes approaches and methods for conducting energy efficiency audits, normative documents and standards, and lists of certified auditors. This will enable the new entities to voluntarily undertake energy efficiency improvements, and will prepare them for the likely future extension of the SER into new sectors and areas.

230. During Phase 3, the SER will become a comprehensive web-based knowledge management platform that will provide state and community decision-makers and other end-users with general information on energy efficiency (e.g., typical energy efficiency measures, their technical and economic parameters, and sectoral and technical benchmarks and best practices). This platform—the EESS—will include tools to help proponents of energy efficient projects assess and refine their ideas, contact potential investors, and learn about the experiences of others who tried to develop similar projects. Such tools may include interactive case studies, selection guides, calculators, and templates, particularly for technical and financial analysis. The EESS will also become a platform for conducting a public awareness campaign targeting end-users, which will be designed to improve energy efficiency by changing day-to-day behavior and decision-making in millions of ordinary households.

231. At this stage, EESS developers will likely need to coordinate with the government on creation of the national Energy Efficiency Fund, which has been under discussion for quite some time and now seems to be heading for approval. The custodian of the EESS (the Institute of Power Development and Energy Saving) is unlikely to manage this fund, which will probably be operated by JSC National Management Holding "Baiterek." The EESS, however, is a natural source of full-range informational support to the fund, from updates on implementation status and energy savings by particular projects to the best practices, technologies, or even up-to-the-minute market and pricing information for optimal project design and management. This may become the most consequential of all of the EESS's functions.

232. Government support for the creation of the Energy Efficiency Fund is currently very high. As a result, a decision was recently made for KEEP to focus on conducting comprehensive analysis and optimal development of the functions and structure for the fund. Initially the technical assistance portion KEEP, which was approved in the spring of 2013 and mainly targeted public housing, centered on general capacity building, energy efficiency market assessments, energy audits, awareness or outreach campaigns, and workshops. It barely mentioned potential "design of a sustainable energy financing mechanism."[58] By now, however, the work to create and structure the Energy Efficiency Fund has taken central stage. (This may be partially because the fund is seen as a possible guarantee mechanism for introducing energy service companies, or ESCOs.) As a future vehicle for accepting contributions from various donors, funds, and international financial institutions and assuring their optimal coordination, the Energy Efficiency Fund may become the main player in promotion of energy efficiency in Kazakhstan. This would make proper informational and technical support provided from the EESS invaluable.

233. Eventually (during Phase 4), the EESS knowledge platform should become "quasi-commercialized," not functioning in a for-profit mode, but instead employing all tools of a market approach to its own operations. It should include a marketplace for energy efficiency-related goods and services (e.g., advertisements from energy efficiency practitioners or a mechanism for posting requests for proposals and receiving bids from energy auditors, ESCOs, or any other applicants) or any other commercial instruments deemed appropriate. This could not only ensure the sustainability of the EESS without permanent budget support, but also widen the system's reach and increase its effectiveness in promoting energy efficiency.

234. During Phase 1, the success of the NAMA will be judged by the decrease in labor time required to compile and reconcile reports, as well as by improved data coverage of the enterprises subject to SER reporting. Later, when the system opens for unrestricted web access (during Phase 3), one or two pilot projects will be implemented to test the platform's effectiveness at supporting project implementation.

D. Barriers Addressed by the NAMA

235. Despite persistent efforts by the Government of Kazakhstan to promote energy efficiency, improvements in this field are coming as quickly as desired, for several reasons:

[58] World Bank. 2013. *Kazakhstan - Energy Efficiency Project*. Washington DC; World Bank Group. Pages 6–7. Accessed at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/12/30/000456286_20131230153427/Rendered/PDF/698380PAD0P13000Box382105B00PUBLIC0.pdf

(i) Kazakhstan has strong investment potential and many provisions that make it an attractive destination for foreign investors. The country usually ranks high on various "ease of doing business" indices. However, an exceedingly small share of the growing foreign investment goes into energy efficiency projects due to very strong competition from other investment opportunities, particularly those in the traditional energy sector activities (coal, oil, and gas) and in other extraction industries (ores) that are perceived as offering much better return on investment and lower risks. These sectors alone draw almost two-thirds of total investment.
(ii) In spite of many legal documents, the government has not yet developed a consistent national strategy for improving energy efficiency and reducing GHG emissions, particularly in the energy sector. In essence, the government supports all viable options and technologies but aggressive competition between proponents of different approaches and sources sometimes leads to official pronouncements that change the focus from one clean energy strategy to another within several months.
(iii) Some legal, procedural, and institutional barriers still remain. It is not yet easy to resolve the issue of land assignment and use, connection to the grid, or the negotiation of tariffs and power purchase agreements.
(iv) Non-formal informational and psychological barriers remain important. Too many people, from high-level decision-makers to ordinary citizens, do not think about maximizing energy efficiency. Even when they try to, they do not have information on the most cost-effective and best technically available options.

236. These barriers are disparate and entrenched; no specific action could remove all of them. However, anything that makes implementing an energy efficiency project easier helps. In addition to allowing the government to enforce the law on energy efficiency, the creation of the EESS will make green projects more visible and easily accessible and thus potentially help them attract more "green" (non-commercial) financing, which would offset the first barrier. By providing data and the results of statistical analyses, and by identifying trends, the EESS may spur national discussions on energy efficiency priorities and mitigate the second barrier. By identifying problems and solutions based on the experiences of implemented projects that use the system, the EESS can help lower the third barrier. And finally, elimination of the fourth barrier is the main purpose of the proposed NAMA.

E. Co-Benefits

237. The following co-benefits are expected from the NAMA:

(i) Energy savings and energy security. Energy efficiency improvements will lead to reduced demand for energy, which in turn will reduce Kazakhstan's dependence on energy imports and decrease the strain from extraction of domestic hydrocarbon reserves.
(ii) Health/air quality. Public health improvements will result from improved air quality when the energy and transport sectors become more efficient, use best-available technologies, and decrease the demand for extraction of Kazakhstan's hydrocarbon resources.
(iii) Productivity and competitiveness. Promotion of energy efficient technologies through the SER knowledge platform and marketplace will improve companies' bottom lines and global competitiveness.
(iv) Policy setting. The SER streamlines the process of data gathering, management, and analysis. It also significantly improves access to statistical information on energy savings, energy efficiency, and energy consumption, which is important for evaluating and setting national policy.

(v) Job creation. Investment in the energy sector and promotion of energy efficient technologies creates technical jobs with good compensation. The training programs implemented under Phase 3 will provide technical training to currently unskilled workers. JSC Institute of Power Development and Energy Saving estimates that up to 20,000 jobs will be created by implementing the NAMA and stimulating energy efficiency improvements.

F. Activities to be Carried Out

238. The list of actions to be taken within the NAMA is long and, depending on the phase, changes from very specific and well thought-out steps to fairly general ideas that will require further analysis during the later phases of NAMA implementation.

1. Phase 1 (2015–2016)

239. This phase involves the development of a computerized on-line automated information system (AIS) for the SER that will replace the existing paper system and provide reporting and analytical capabilities for authorized users. This is the most urgent and specific part of the NAMA. It is also the least expensive. Preliminary cost estimates are about $100,000.

240. The management and specialists of JSC Institute of Power Development and Energy Saving have given this step a lot of thought and have already expounded a draft terms of reference (TOR) for a software developer. The TOR includes not only functional and technical requirements but also some screenshot mock-ups.

241. Enterprises that are subject to SER reporting have to submit the following data every year by March 1:

(i) Name, address, and main categories of economic activity
(ii) Volume of extraction, production, consumption, transmission, and loss of all kinds of primary energy sources, electricity, heat, and water—in natural and monetary values for the previous year
(iii) A plan of action for energy efficiency improvements, developed as a result of an energy audit at the enterprise, and any additions or changes to the plan
(iv) Results of implementation of the action plan during the previous year
(v) Actual consumption of energy for a unit of production and the usage of energy resources for heating a square meter of buildings and structures
(vi) A copy of the conclusions of the conducted energy audit
(vii) Data on the degree of enterprise coverage by energy meters

242. These fields and data inputs will comprise the core of the on-line automated information system. User authentication modules and tools for validation, analysis, data-mining, and reporting will make the new system more functional than the current hard copy-based system.

2. Phase 2 (2015–2017)

243. During this phase, the SER will be expanded into the transport sector. This work will be implemented in close cooperation with JSC Kazakh Academy of Transportation and Communication Named After M. Tynyshpayev (KazATK, Almaty). Phase 2 activities include

(i) Collect, analyze, and develop audit methods for the transport sector based on other countries' experiences and the best available technologies and practices (2015–2016).

(ii) Develop and seek approval for indicators, regulations, and standards for fuel consumption, energy efficiency, and environmental parameters for transport (2015–2017).
(iii) Develop guidelines (methods) for conducting energy and environmental audits for road transport, transport companies, public transport, and private vehicles (2016–2017).
(iv) Incorporate the resulting information and protocols into the energy registry (2017).
(v) Begin training energy auditors to conduct future audits at transport enterprises (2017).
(vi) Test new energy audit methods on transport entities, with the following phases: development, training, testing, and implementation (2017).
(vii) Conduct research and analysis on the effects of the growth of passenger transport CO_2 emissions (2017).

244. The specific timetable and budget for this phase is to be developed in 2015 and will take into account the on-line automated information system architecture and maintenance experience acquired by that time. Technical assistance and capacity building will be needed to implement these activities.

245. The Academy of Transport preliminarily estimates the total cost of this phase to be $502,800. Of this amount, 76% is expected to come from international sources. This will cover technical assistance to develop methodologies for energy audits for transport, make suggestions and test additional SER interfaces (if necessary), and research statistical information to improve the SER.

3. Phase 3 (2016–2020)

246. This phase involves transforming the on-line automated information system for the SER into a national EESS by adding to it an open-access web-based knowledge platform. This public information and decision-support system will contain the following:

(i) general background information on energy efficiency and green growth, including the latest research and practices in different sectors, how-to guides, and links to relevant national and international websites such as the NAMA registry;
(ii) searchable, aggregated national data with energy and emission indicators, including the annual energy intensity of GDP, the publicly available parts of analysis, and reports on the implementation of SER plans for energy efficiency improvements;
(iii) a library of energy efficiency improvement methods and standards, legislative acts, norms for energy consumption by government agencies, types of energy performance contracts (EPCs), manuals and templates for EPCs, and case studies of projects implemented based on EPCs;
(iv) collected energy data for baseline calculations;
(v) benchmarking data, searchable by sectors and technology;
(vi) information on and a list of best available technologies and practices;
(vii) a directory of suppliers of energy-saving materials and equipment;
(viii) a directory of energy efficiency service providers, including registered ESCOs;
(ix) a library of MRV methodologies and standards;
(x) a list of verification bodies;
(xi) energy savings calculators, guides, and selection assistance modules for project sponsors and the general public;
(xii) a multi-criteria, searchable directory of financing sources, together with directions and templates for specific application procedures;

(xiii) information on (a) energy efficiency pilot projects, if any; and (b) ongoing energy efficiency projects in Kazakhstan supported (funded) by international agencies, along with links to associated websites;
(xiv) information on related national and international webinars and other capacity building workshops;
(xv) announcements about the annual competition for the most energy efficient entity, with specific indicators for selection of the winners;
(xvi) an energy efficiency awareness module (a public awareness and education program and energy efficiency labeling for consumer goods); and
(xvii) links to the main government websites (such as http://www.strategy2050.kz/) and websites related to NAMAs, CO_2 emission reductions, approved methodologies, and MRV.

247. Work to gather the necessary information will start shortly after Phase 1 is finished. The scope and structure of the public information system will be continuously adjusted as it is rolled out. This approach will permit testing of original ideas, tools, and presentation modes, as well as incorporation of feedback from the system's early adopters.

248. Development of the EESS architecture will also have to take into account the future functions, structure, and information needs of the national Energy Efficiency Fund, since it will be created and approved by the government after consultations with the World Bank KEEP team and other potential donors.

249. The exact budget for this phase is impossible to calculate no. The current rough estimate is $1,750,000. After the conclusion of Phase 1 and the initial collection of data to populate the EESS, a more exact estimate should possible by conducting a feasibility study and preparing a detailed implementation plan for Phases 3 and 4 of the NAMA.

4. Phase 4 (2018–2025)

250. The phase will expand the EESS to include a commercial marketplace for energy efficiency-related goods and services. The goal is for this system to become financially viable and self-supporting in the long term, so that it will survive and be sustainable without being dependent on foreign donors or the state budget.

251. At this time, future revenue streams are difficult to determine with precision. They could include obtaining paid advertisements from energy efficiency practitioners, providing customized searches or data-mining of the EESS on a commercial basis (including publicly available subsets of SER data), or offering a fee-based venue to conduct energy efficiency tenders (i.e., providing a mechanism for posting requests for proposals and receiving bids from energy auditors, ESCOs, or other consultants).

5. Pilot Project or Projects

252. During the latter stages of the NAMA (Phase 3 or later), JSC Institute of Power Development and Energy Saving will implement one or more pilot projects to assess the scope and quality of the support provided to energy efficiency project developers through EESS. One possible pilot would involve a feasibility study and cost-benefit analysis of links between private sector energy providers and public-private financing to modernize the existing transmission and distribution system. Both JSC Samruk-Energo and regional energy transmission companies are interested in this. Another possible pilot is the refurbishment of schools, hospitals, or residential

housing in a selected area (e.g., the Sovetski District in Karaganda, which is implementing the ADB-financed project on rehabilitation of district heating). Other sponsors of energy efficiency projects who choose to utilize the system will be encouraged to offer their own projects as potential pilots.

G. Transformational Potential of the NAMA

253. This NAMA has the potential to catalyze transformational change in Kazakhstan and Central Asia toward more widespread adoption of energy efficiency measures. To ensure its impact is sustainable, the NAMA includes mechanisms such as capacity building, knowledge transfer, local ownership, involvement of the private sector, use of innovative technologies, and creative approaches to promoting energy efficiency.

H. Greenhouse Gas Emission Reductions

254. The direct mitigation effects of this NAMA concept are 1,606 tCO_2e annually. This estimate is based on the direct emission reductions that can be achieved by switching to online reporting and avoiding the use of paper and hand delivery of SER reports.

255. The expected indirect energy efficiency improvements resulting from better information on energy efficiency measures are not quantified due to the difficulties in distinguishing between the energy efficiency benefits resulting from the NAMA and those resulting from other government measures and regulations.

1. Direct Greenhouse Gas Emission Reductions

256. Direct GHG emission reductions will result from the SER's improved operation. As explained above, the reports and energy efficiency plans are currently submitted on paper, typically hand delivered to regional SER branches. Switching to online reporting will avoid carbon dioxide, methane, and nitrous oxide emissions related to

(i) production and disposal of office paper;
(ii) energy consumption for printing reports; and
(iii) travel by SER subjects and mail carriers to and from SER branches to submit the reports.

257. Production and disposal of office paper. The online automation of SER will avoid GHG emissions resulting from landfilling of office paper used for reporting. To estimate direct GHG emission reductions resulting from paper, the consultant team used the WAste Reduction Model (WARM)[59] developed by the United States Environmental Protection Agency (US EPA). WARM is the most detailed publicly available model on lifecycle GHG emissions from paper. The UNFCCC recommends that non-Annex I parties use WARM to prepare national communications.[60]

[59] US EPA. 2015. *Waste Reduction Model (WARM).* Washington DC. Accessed at: http://www.epa.gov/epawaste/conserve/tools/warm/Warm_Form.html; US EPA. 2015. *Paper Products. WARM Version 13*. Washington DC. Accessed at: http://epa.gov/epawaste/conserve/tools/warm/pdfs/Paper_Products.pdf

[60] UNFCCC. *CGE Training Materials for the Preparation of National Communications from non-Annex I Parties*. Bonn. Accessed at: http://unfccc.int/national_reports/non-annex_i_natcom/training_material/methodological_documents/items/349.php

258. The input assumptions used for determining the GHG emissions factor for office paper are described in Table 23. All other inputs are WARM defaults.

Table 23: WARM Inputs for Estimating GHG Emissions from Office Paper

WARM Input Variable	Input	Assumptions
Tons recycled (%)	2	Office paper is exclusively imported, mainly from Russia (54%) and the United Kingdom (24%).[61] The postconsumer content used in production of office paper is generally low. In the United States, it is estimated at 4% (WARM model assumptions) and in Russia, it is close to 0%. The average ratio of recycled paper in the paper imported by Kazakhstan is assumed to be 2%.
Tons landfilled (%)	98	Programs to recycle office paper are just starting in Kazakhstan.[62] As a result, most used office paper ends up in landfills.
Landfill gas recovery (%)	0	Landfill gas recovery is insignificant in Kazakhstan.

Source: Abt Associates analysis.

259. Incorporation of the assumptions from Table 23 into the WARM model results in a GHG emission factor for avoided use of office paper of 11 tCO_2e per ton of non-used office paper.[63]

260. The input assumptions used for estimating GHG emissions from SER subjects are described in Table 24. These inputs can be used to calculate the GHG emissions from avoided paper use by multiplying the WARM emission factor for office paper (11 tCO_2e per tonnes of paper) with the weight of the paper used for SER reporting (0.902 tonnes). This results in 10 tCO_2e of avoided GHG emissions from switching to online reporting.

Table 24: Inputs for Determining Emissions from SER Reporting

Input Variable	Input	Assumptions
Number of SER subjects	11,000	
Number of SER reports	22,500	Of the entities subject to SER reporting, over 70% resubmit reports because information is missing or incorrect. At least half of these resubmit more than once. The total number of reports submitted to SER is therefore estimated at 11,000 + 0.7*11,000 + 0.5*0.7*11,000 = 22,550.
Length of SER reports	8 pages	
Paper used for SER reporting	180,400 pages 361 reams	The total amount of paper used for SER reporting is 8*22,550 = 180,400 pages, or 361 reams
Weight of a ream of paper	2.5 kilograms (kg)	
Weight of SER reports	0.902 tonnes	The weight of paper used for SER reporting is 361 x 2.5 = 902 kg, or 0.902 tonnes

Source: Abt Associates analysis

[61] ITC. *TRADE MAP, 2010 - 2014.* Accessed at: http://www.trademap.org/tradestat/Country_SelProductCountry_TS.aspx?nvpm=1|398|||4802|||4|1|1|1|2|1|2|1|1

[62] Kagazy. 2014. *Kazakhstan Waste Recycling begins an environmental campaign called "Save Trees by Collecting Waste Paper".* Almaty. Kazakhstan. Accessed at: http://www.kazakhstankagazy.com/en/news/news/857-kazakhstan-waste-recycling-begins-an-environmental-campaign-called-%E2%80%9Csave-trees-by-collecting-waste-paper%E2%80%9D.html

[63] See relevant WARM model input page http://www.epa.gov/epawaste/conserve/tools/warm/Warm_Form.html

261. Energy consumption for printing reports. Printing consumes energy which results in GHG emissions. Implementation of the NAMA will reduce energy-related GHG emissions by 0.462 tCO_2e.

262. The GHG emissions from printing of SER paper is calculated by using the input variables in Table 25 which includes the average power consumption of a laser printer (3.3 Wh) and the grid emission factor for Kazakhstan (0.92 tCO_2e/MWh). Multiplying these inputs with the number of pages (180,400) used for SER reporting yields 462 $kgCO_2e$ (i.e., 0.462 tCO_2e).

Table 25: Inputs for Determining Energy Consumption and GHG Emissions from Printing SER Reports

Input Variable	Input	Assumptions
Average power consumption of a laser printer (per page of printed text)	3.3 Wh	
Electricity grid emission factor for Kazakhstan	0.92 tCO_2e/MWh	Econometrica (2011)
Pages used for SER reporting	180,400	JSC Institute of Power Development and Energy Saving

Source: Econometrica, 2011. Technical Paper: Electricity-specific emission factors for grid electricity. August 2011. http://ecometrica.com/white-papers/electricity-specific-emission-factors-for-grid-electricity

263. Travel by SER subjects and mail carriers. The emissions associated with travel to hand deliver the SER reports are estimated based on the number of trips taken, the average length of these trips, the amount of gasoline consumed, and the emission factor for gasoline. The specific inputs for calculating emissions from travel are detailed in Table 26.

264. To estimate GHG emission reductions from reduced travel, the study team used the Kostanay Region—one of Kazakhstan's 14 regions—as a typical example. With an area of 196,000 km^2 and a population of 886,000, Kostanay is close to the average size for a region in the country.[64] Assuming the amount of fuel burned is 41,637.75 liters, the resulting GHG emissions are 97.765 tCO_2e for all SER subjects in Kostonay. Divided by 674, the emissions per subject are 0.14505 tCO_2e.

265. Extrapolating this number to all SER subjects nationally (0.14505 tCO_2e * 11,000), the total emission reductions from avoided travel is 1,596 tCO_2e.

Table 26: Inputs for Determining Emissions from Travel to Deliver SER Reports

Input Variable	Input	Assumptions
Number of SER subjects in Kazakhstan	11,000	JSC Institute of Power Development and Energy Saving
Number of SER subjects in Kostonay	674	JSC Institute of Power Development and Energy Saving
Number of SER subjects who hand deliver reports	404	60% of SER subjects hand deliver their report: 674*0.6 = 404

[64] AboutKazakhstan.com. Data on Kostanay Oblast from the census of 2009. Accessed at: http://aboutkazakhstan.com/kostanay-oblast

Input Variable	Input	Assumptions
Total number of SER reports delivered	828.2	Of the entities subject to SER reporting, over 70% resubmit reports because information is missing or incorrect. At least half of these resubmit more than once. The total number of reports submitted to SER is therefore estimated at 404 + 0.7*404 + 0.5*0.7*404 = 828.2
Average trip length	201.1 km	Kostanay Region consists of 16 districts and 4 cities; the distance from the region's center (where an SER branch is situated) to each location ranges from 48 km to 503 km, with an average of 201.1 km.
Total km driven	333,102 km	Number of reports delivered multiplied by trip length times 2 to reflect return trip: 828.2*201.1*2
Average gasoline consumption of cars	12.5 liters/100 km	JSC Institute of Power Development and Energy Saving
Amount of fuel consumed	41,637.75 liters	333,102 km / 100*12.5
Emission factor for gasoline	0.002348 tCO_2e/liter	8.887 $kgCO_2e$/gal = 8.887/3.785 $kgCO_2e$/liter = 0.002348 tCO_2e/liter US EPA. Clean Energy http://www.epa.gov/cleanenergy/energy-resources/refs.html

Source: Abt Associates analysis

266. Total direct GHG emission reductions. Adding up the avoided emissions from paper disposal (10 tCO_2e), printing (0.462 tCO_2e) and travel (1,596 tCO_2e), the direct mitigation effects of the NAMA comes to 1,606.5 tCO_2e annually.

2. Indirect Greenhouse Gas Emission Reductions

267. The indirect emission reductions of this NAMA are potentially much greater than the direct reductions presented above. They are also more difficult to estimate and are therefore not quantified for this NAMA concept. JSC Institute of Power Development and Energy Saving would need to conduct further studies and surveys to determine the potential energy savings that can be attributed to the increased access to energy efficiency data versus those that will result from other energy efficiency measures implemented by the government.

Indirect energy savings and emission reductions will result from sources summarized below.

(i) In Phase 2, JSC Institute of Power Development and Energy Saving and the Academy of Transport plan to expand the scope of the NAMA to develop an auditing method and provide international best available technologies for the transport sector. JSC Institute of Power Development and Energy Saving estimates that a 5% reduction in energy consumption can be achieved by this expansion if it is combined with a revision of the Energy Efficiency Law to cover audits in the transport sector.
(ii) During Phases 3 and 4, the SER will be transformed into a web-based national EESS that includes an online marketplace for energy-efficiency related goods and services and a public information and decision support system. JSC Institute of Power Development and Energy Saving estimates that this will result in an increase in energy efficiency ranging from 1% at the start of the EESS to 6% at the time of its full deployment in 2020.

I. Costs and Financing

268. JSC Institute of Power Development and Energy Saving estimates that implementation of the national energy efficiency support system NAMA will cost $3.553 million, of which $2.93 would come from international support.

Table 27: Cost of Implementing the NAMA to Develop a National Energy Efficiency Support System

Phase	State Budget ($)	International Support		Total ($)
		Cost ($)	Notes	
1	0	100,000	Design and deployment of SER automation	100,000
2	122,800	380,000	Technical assistance, capacity building	502,800
3	250,000	1,500,000	Technical assistance for web-based knowledge platform	1,750,000
4	450,000	750,000	Capacity building	1,200,000
Total	**822,800**	**2,730,000**		**3,552,800**

269. National public funds will be the initial source of financial support for the NAMA, at least during Phase 1. This is assumed because the government has stated its support for similar measures. Specifically, items 20 and 21 in Section 1 of the Action Plan to Implement the Concept of Transition of the Republic of Kazakhstan to Green Economy contain explicit authorization "to establish and ensure maintenance of the hardware and software analytical system for coordinating the transition to the green economy," as well as to develop "a plan to provide information" on related issues. The EESS suggested in this NAMA is part of this wider mandate.

270. The Government of Kazakhstan requests financial support in the amount of $100,000 for the Phase 1 design, development, and deployment of the EESS. An additional $2,730,000 in financial support is requested for Phases 2 through 4. This includes targeted technical assistance for the on-line automated information system custodian and energy auditors; the sharing of best available technologies, benchmarking, and public awareness materials for the SER knowledge platform; and assistance with technical design and development of the energy registry and marketplace.

J. Proposed Monitoring, Reporting, and Verification System

271. JSC Institute of Power Development and Energy Saving is tasked with establishing the information management system that seeks to foster transparency between the Government of Kazakhstan, the business community, and civil society. The SER also seeks to facilitate compliance with the Energy Efficiency Law, which mandates businesses that meet specific criteria to undergo energy audits and implement energy efficiency actions to reduce energy consumption over time. While the existing SER system serves as a means to electronically measure, report, and verify implementation of the Energy Efficiency Law, after modifications proposed by this NAMA it can also be used as the basis for the NAMA MRV system.

272. This NAMA supports Kazakhstan's GHG mitigation actions by establishing an effective energy and data management system to improve enforcement of energy efficiency laws and regulations and optimize decision-making in this field. While the NAMA will have some direct and quantifiable GHG emission reductions (due to automation of the SER), its main effect—

increased EESS contributions to energy efficiency in the country—will be indirect and difficult to measure precisely. This effect can, however, be estimated with increasing accuracy as NAMA implementation takes place and the architecture of the EESS is more fully defined. For instance, it can be assessed by evaluating the implementation time, success rate, and final scope of a statistically significant set of projects whose sponsors actively used the EESS (which can be tracked by web server logs or logs of actions undertaken on the EESS marketplace) and comparing the results to a comparable set of projects developed without using the EESS.

273. Table 28 shows illustrative metrics for reporting on the impacts and outcomes of the NAMA.

Table 28: Proposed Metrics for Monitoring, Reporting, and Verification

Quantitative metrics	GHG emissions	• Avoided emissions from electronic submission of energy audits (number of submissions submitted electronically times emission factors for paper, transport, etc.)
	Sustainable development	• Time spent addressing errors and faulty reporting in the SER • Number of energy auditors trained • Time spent compiling and reconciling audit reports • Number of new training materials developed for the EESS • Number of new sectors and entities added to the registry (both voluntary and mandatory) • Number of subjects of the SER in transport covered by energy audits • Number of public end-users accessing “green pages;” number of their interactions • Trading volume on the future energy efficiency marketplace; number and frequency of transactions • Number of stakeholders with improved capacity due to workshops, conferences, etc. • Number of television shows and videos issued on energy saving and energy efficiency improvements • Number of jobs created
	Financial tracking	• Annual funds spent by source (state budget, private sector, international support) and activity (SER, training, guidance for new sectors, pilot projects, etc.)
Qualitative metrics		Tracking according to individual items outlined in the final action plan for NAMA implementation, using metrics such as: • Not yet started • Funding requested • Funding obtained • Initiated and/or construction started • In progress • On hold • Completed

K. Implementation

274. The stakeholders involved in the NAMA implementation include the following:

(i) **JSC Institute of Power Development and Energy Saving** will serve as the lead implementing agency for this NAMA.
(ii) The **Kazakh Academy of Transportation and Communication Named after M. Tynyshpayeva**[65] will lead implementation of Phase 2 activities.
(iii) The **Ministry of Investment and Development**[66] coordinates energy saving and energy efficiency policy and directs the overall work of JSC Institute of Power Development and Energy Saving. MID will stay informed on the implementation of all phases.
(iv) The **Ministry of Energy, Department of Climate Change** coordinates activities related to NAMAs in Kazakhstan and will be the repository of MRV reports during all phases.
(v) The **Department of Transport** will coordinate transport issues, for roads in particular.
(vi) **JSC Samruk-Energo**[67], regional energy transmission companies, and other companies that are SER subjects and will report to the SER.
(vii) The **Ministry of National Economy** determines economic policy and will set the budget for implementation.
(viii) The **Ministry of Finance** will provide a guarantee on behalf of the government.
(ix) National **nongovernmental organizations** such as the Kazakh Association of Energy Auditors, the National Chamber of Entrepreneurs, and other civil society stakeholders will be determined during implementation.

275. In early 2015, the Government of Kazakhstan secured some support from the World Bank for the implementation of parts of this NAMA. The support is provided within the framework of the existing KEEP project. Specifically, the World Bank agreed to provide technical assistance to JSC Institute of Power Development and Energy Saving to automate the SER and develop some public-oriented pages on its website that may be incorporated into the EESS knowledge platform in the future. The current World Bank project document (dated May 3, 2015) states that "three activities were agreed for implementation in the first year of project implementation. These include (a) a comprehensive energy efficiency market assessment of Kazakhstan; (b) computerization of the State Energy Registry; and (c) public outreach campaign, including the improvement of EEDI's web-site."[68] Additionally, as discussed above, the KEEP project team is working on development of the concept of the national Energy Efficiency Fund, which may be supported by the EESS in the future. As a result, the World Bank may become a stakeholder for NAMA implementation.

[65] See the website of the Academy at http://www.kazatk.kz/
[66] See the Ministry website at http://mid.gov.kz/
[67] JSC Samruk-Energy. Accessed at: http://samruk-energy.kz/index.php?lang=en
[68] World Bank. 2015. *Kazakhstan - Kazakhstan Energy Efficiency Project: P130013 - Implementation Status Results Report: Sequence 03*. Washington DC: World Bank Group. Page 5. 0000A8056. 2015. Accessed at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/ECA/2015/03/09/090224b082bea66a/1_0/Rendered/PDF/Kazakhstan000K0Report000Sequence003.pdf

L. Implementation Risks and Risk Mitigation Strategies

Table 29: Implementation Risk and Mitigation Strategies

Type of Implementation Risk	Description	Mitigation Strategy
Technical risks	• The need for a partial or complete restructuring of t Kazakhenergoexpertiza • The need to change various aspects of the online automated information system • A temporary increase in staff work load during implementation of the system • The need to develop a skilled implementation team and select an influential leader	• Build capacity, attract consulting (international)
Behavior risk	• Resistance from employees	• Build capacity, train personnel
Other risks (financial, operational, organizational, etc.)	• Complex and long process involving a large number of staff • Documents issued with considerable delay • Need for each issued document to be reconciled with and approved by many officials, leading to additional delays • Long searches resulting from each external request for a document • Missed (or late) reviews of previously issued documents • Manually performed controls of expirations for issued documents also leads to considerable time and resource costs • Improperly organized and time-consuming process creates significant, for example, in the form of inspection and audits by regulators and state agencies	• Improve planning • Improve management • Provide MRV on regular basis • Monitor other indicators and outcomes • Improve legislation and regulation • Improve coordination and interaction between stakeholders • Develop marketing strategy and strategy to attract investors

VII. ACCELERATING DEPLOYMENT OF SMALL-SCALE HYDROPOWER: NAMA CONCEPT FOR UZBEKISTAN

A. Summary of the NAMA Concept

1. Country

276. Uzbekistan

2. Implementing Entity

277. The NAMA will be implemented by the Ministry of Agriculture and Water Resources and Uzbekenergo.

3. Contact Information

278. To be determined.

4. Brief Description

279. The goal of this NAMA is to accelerate and expand the development of small hydropower in Uzbekistan by supplementing governmental plans for implementation with analysis and comprehensive identification of steps to accelerate that implementation. This includes clarifying the institutional arrangements governing small hydropower; modifying the tariff structure to incentivize investment; improving technical skills for evaluating, planning, and constructing small hydropower plants (SHPs); and introducing measures to accelerate the utilization of public and private capital to finance planned hydropower capacity.

280. For this NAMA, small hydropower is defined as hydropower plants with installed capacity of less than 30 MW. The acceleration of the rehabilitation and construction of these plants in Uzbekistan will avoid the use of fossil fuel-based electricity generation, thereby decreasing emissions of three GHGs: carbon dioxide, methane, and nitrous oxide.

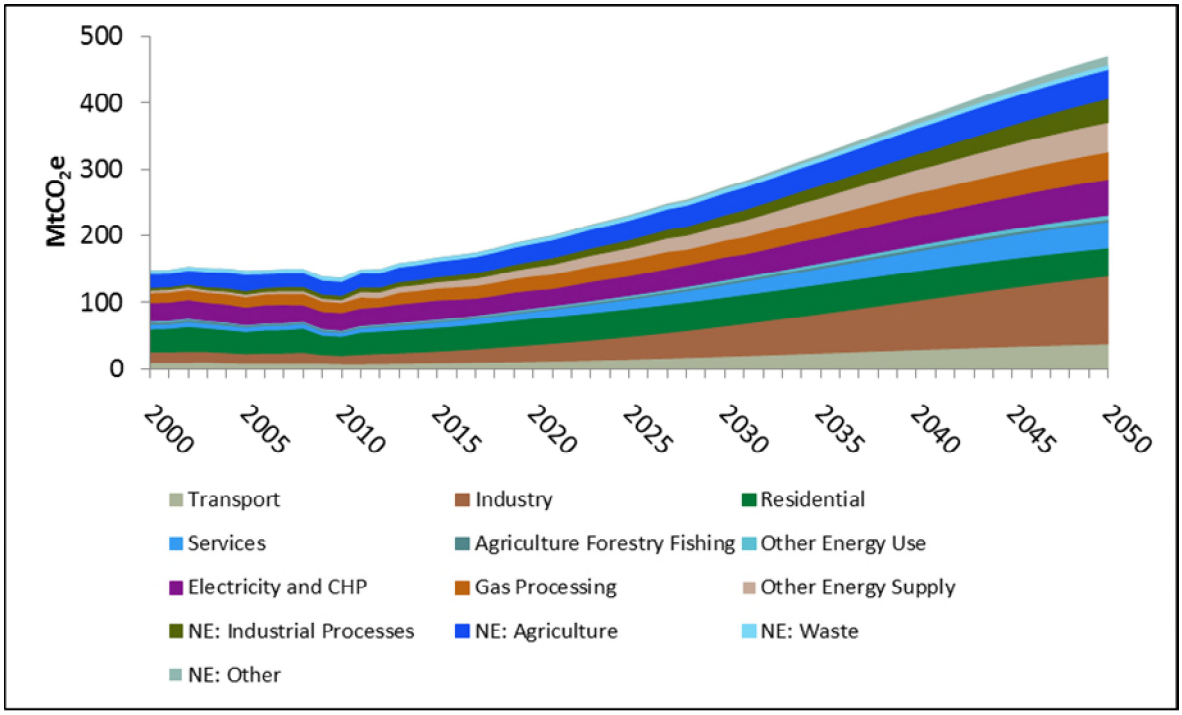
5. Time Period

281. The NAMA will be implemented from 2015 to 2030 within the framework of the government's Program of Small Hydropower Development, which will be approved by the end of 2015.

B. Background on Uzbekistan

282. Uzbekistan obtained independence after the dissolution of the Soviet Union. Since then, the country has been trying to find the optimal path to a market-based economy that provides for the needs of its population while taking into account major social and environmental constraints, including climate change. Energy and the power sector have provided the backbone of the economic development experienced since the initial economic contraction of the early 1990s. As a result, GHG emissions have increased and are expected to continue to do so over the next couple of decades (Figure 5).

Figure 5: Greenhouse Gas Emissions by Source in Uzbekistan, 2000–2050



Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

283. Uzbekistan has plentiful energy resources, with natural gas representing over 80% of the total energy mix. However, given both environmental considerations and the potential value of natural gas or oil as export resources, the country has been making efforts to increase the role of renewable energy, including utilization of SHPs. Other development priorities for the energy and transport sectors include

(i) rehabilitating existing power plants;
(ii) promoting energy savings and energy efficiency;
(iii) electrifying railroads; and
(iv) increasing the use of natural gas in transport and power generation.

284. The government prioritizes rehabilitation of existing plants and expansion of renewable energy, since they contribute to energy security and energy independence while also reducing emissions.

C. Main Goals of the NAMA

285. As part of a larger strategy to increase the use of renewable energy, the Government of Uzbekistan has started looking into ways to promote investment in hydropower, including small HPPs. The goal of the NAMA is to support the government in its efforts to accelerate the construction and rehabilitation of more SHPs through increased investment, capacity building, clarification of institutional roles, and improvement of legal and regulatory norms.

286. Until the 1950s, within the framework of the Soviet state there were numerous small- and micro-level hydropower plants (HPPs), sometimes called "village HPPs," that provided power to remote regions and settlements. However, with the development of the Uzbek Power Network and, eventually, the United Power System of Central Asia, these SHPs became less critical, received less attention, and were therefore not very well maintained. As a result, most existing plants fell into disrepair, the potential for small hydropower in Uzbekistan was underutilized, and the capacity for manufacturing new plants and equipment was lost. Hydropower in general represents less than 12% of total electricity generation, with the share of SHPs at just 1.5% of all hydropower, or about 0.15% of total power production.

287. The technical potential for hydropower generation in Uzbekistan is substantial, despite the country's dry climate and landlocked position. The potential is estimated at 27.4 billion kWh per year—only a quarter of which is used. About a third of the unused potential is tied to agricultural infrastructure (irrigation channels and water storage facilities) where small HPPs would be a fitting solution. The rest of the potential is located near natural rivers and streams. The small hydropower potential includes viable HPP sites at up to 1,100 small rivers, 42 reservoirs, and 98 main irrigation channels.[69]

288. There are two entities that involved in hydropower generation:

(i) The State JSC Uzbekenergo, which is fully owned and directly controlled by the Government of Uzbekistan; and
(ii) Uzsuvenergo, which is a fully state-owned, specialized enterprise that falls under the jurisdiction and operational control of the Ministry of Agriculture and Water Resources (MAWR).

289. Uzbekenergo is in charge of all the hydropower plants on natural water streams and reservoirs, while Uzsuvenergo is tasked with the construction and operation of HPPs at irrigation channels and other agricultural infrastructure. Uzbekenergo operates 28 HPPs with total installed capacity of 1,396 MW and electricity production of 5.3 billion kWh per year, while Uzsuvenergo runs eight HPPs with a capacity of 441 MW and annual production of 1.3 billion kWh.[70] These 36 HPPs include both big and small power plants. However, the majority of the small hydropower potential falls within the Uzsuvenergo responsibility related to irrigation.

290. The Government of Uzbekistan has made persistent attempts to encourage the development of small HPP capacity; most of the attempts were made by adopting targeted programs that prescribed construction or rehabilitation of an explicit list of power plants. The first such program was adopted in 1995 by the Cabinet of Ministers Resolution #476 "On development of small hydropower generation in Republic of Uzbekistan."[71] The program covered the period from 1995 to 2005. It directed the MAWR, together with the Ministry of Finance and the State Statistics Committee, to source and allocate funds for the construction of 14 SHPs with a total capacity of 422.8 MW, five of which were designated as priority. One more hydropower plant was to be developed by Uzbekenergo. The program also envisaged conducting a study of small hydropower potential and an analysis of additional 127 HPPs with a

[69] United Nations Educational, Scientific and Cultural Organization (UNESCO). 2010. *Use of Renewable Energy Sources in Central Asia.* Review. Accessed at: http://www.un.org.kg/index2.php?option=com_resource&task=show_file&id=14722
[70] Draft of Program of Development of Hydropower in Uzbekistan until 2030 (Uzsuvenergo)
[71] See the official text (in Russian) at: http://webcache.googleusercontent.com/search?q=cache:oVfFFnpDfh8J:zakonuz.ru/Wc1fbc493c1bee.htm+&cd=1&hl=en&ct=clnk&gl=us

capacity of 757.1 MW, as well as considering options for restoring domestic capability to manufacture equipment for small hydropower.

291. The program was repeatedly modified in several respects and extended until 2030. It was only partially implemented, with significant delays against the original schedule. By the end of 2013, only five HPPs with a cumulative capacity of 147.5 MW out of 15 planned were commissioned.[72] The success of the program has been limited despite the strong interest in and support for small-scale hydropower expressed by many international donors and despite specific technical assistance projects targeting the government's high-priority SHPs.

292. On May 5, 2015, the President of Uzbekistan, I. Karimov, signed resolution #2343 "On the Program of Measures to Lower Energy Intensity and Implement Energy Efficient Technologies and Systems in the Economy and Social Sphere from 2015 to 2019." In the very first paragraph, the resolution points out the importance of renewable energy. In the second paragraph, it approves a wide-ranging Road Map of 33 activities that must be undertaken in order to achieve the stated goals. Item #20 of the Road Map requests the Ministry of Economy, the Ministry of Finance, the MAWR, Uzbekenergo, and the design institute Hydropowerproject to develop the State Program for Development of Hydropower for 2016-2020. The program must be approved by the end of the third quarter of 2015. Existing drafts of the program, written earlier by Uzbekenergo, foresee construction of 76 new HPPs with a total generating capacity of 2,512 MW and rehabilitation of 33 existing HPPs that would increase their capacity to 1,973 MW.

293. In Spring 2015, a new Program for Development of Small Hydropower during 2015–2030 was developed by the MAWR and is going through the appraisal process within the government. This new program provides for the construction of 19 SHPs with a total capacity of 210 MW and requires investment of $727.2 million. With passing of the Resolution 2343 and approval of the road map, this program will become a part of the wider program of hydropower development for 2016–2020.[73] It is likely to be adjusted in scope and timing, given other developments related to hydropower. Most likely, the program will be combined with development plans for the SHPs under the jurisdiction of Uzbekenergo. Alternatively, it may be absorbed into a general program covering all HPPs.

294. In spite of these developments, there are a number of gaps that impede successful development of small hydropower. The goal of this NAMA is to accelerate and expand the development of small hydropower in Uzbekistan by identifying and analyzing these obstacles and proposing measures to help remove these obstacles, unlock the full potential for small hydropower expansion, and utilize both public and private capital for increased investment.

D. Barriers Addressed by the NAMA

295. As mentioned above, several remaining gaps have slowed past government efforts to expand SHP capacity. Conducting a detailed analysis of these barriers and creating a road map to remove them would be among the NAMA's first activities. The study will define the scope, sequence, and substance of the next steps, as well as the entities and experts whose cooperation will be crucial. Some of the gaps to be examined are described briefly below.

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[72] *Noviy vek.* Uzbekistan independent weekly. November 21, 2013. "Energy of money and water." Accessed at: http://noviyvek.uz/sotsium/energiya-deneg-i-vodyi.html

[5] See Review.uz, online version of the monthly *Economic Review*. "Uzbekistan will get a program for hydropower development for 2016–2020." May 6, 2015. Accessed at: http://www.review.uz/index.php/novosti-main/item/2505-v-uzbekistane-poyavitsya-programma-razvitiya-gidroenergetiki-na-2016-2020-gody

296. Institutional barriers. Two agencies have been assigned to deal with hydropower generation: Uzbekenergo and Uzsuvenergo. The coordination of activities by Uzbekenergo and Uzsuvenergo, as well as the resolution of possible conflicts of interests, are being implemented by the relevant departments of the Cabinet of Ministers, the Ministry of Economy, the Ministry of Finance, and the Ministry of Foreign Economic Relations, Investments and Trade. While Uzsuvenergo is focusing mainly on small hydropower, because of its significant potential for irrigation systems, Uzbekenergo is managing the whole power sector, including thermal plants, transmission and distribution, combined heat and power, and large hydropower. SHPs are only a tiny share of Uzbekenergo's overall responsibilities. Additionally, as the owner and operator of the national transmission grid, Uzbekenergo is the sole wholesale purchaser of power, through its subsidiary Energosotish. It controls the process of dispatch and load factors for any source connected to the grid through the National Dispatch Center. This situation creates uncertainty for potential investors in small hydropower projects not managed by Uzbekenergo.

297. Legal barriers. The Law on Electric Power Generation of September 30, 2009 (Article 10) stipulates that the state should own 100% of generation capacity for hydropower, which prevents private investment through traditional project finance.[74] There are no such restrictions for thermal power plants or electric network facilities. Additionally, there are no requirements for state ownership of power plants that use other renewable energy sources. In the absence of straightforward project financing, other forms of investment could be utilized, such as build-operate-transfer (BOT) or design-build-finance-operate (DBFO) contracts, concessions, or production-sharing agreements (PSAs). However, there is no experience with applying these instruments to power generation in Uzbekistan, and there is no supporting legal infrastructure. For example, the current Law on Production Sharing Agreements of December 7, 2001 only covers mining. This barrier should be addressed so that private capital can be involved in developing small hydropower.

298. Economic barriers. Both wholesale and retail tariffs for electric power in Uzbekistan are regulated under a set procedure (for example, by the Resolution of the Cabinet of Ministers #239 of October 28, 2010, Section IV). Calculations supporting wholesale ("inter-sectoral") and retail ("end-user") tariffs are performed and proposed by Uzbekenergo and submitted to the Ministry of Finance for approval. Inter-sectoral tariffs are different for each generating and transmission company. The system is complicated and non-transparent, and contains cross-subsidies. Moreover, the existing tariffs for hydropower generation do not fully cover the costs of production, operation, and maintenance of SHPs, nor do they enable new investment to be recouped. These barriers create a need to provide incentives for small hydropower through means such as dedicated tariffs, targeted tax breaks, or special incentives for importing the necessary equipment.

299. Regulatory and operational barriers. Uzbekenergo's monopoly on state-owned distribution and dispatch of generated electricity creates risk for investors—the risk that their SHPs will not be dispatched or placed under load even if the tariffs are favorable. Guarantees could be provided to investors, for example, through power purchase agreements with mandatory take or pay clauses. Alternatively, specific procedures for dispatch could be introduced that would be transparent and verifiable and would serve as a basis for business planning.

[74] The Law of the Republic of Uzbekistan "On Power Generation" N 3PY-225 of September 30, 2009. Full text in Russian available at: http://kkaetk.uz/index.php?id=podssylka-9&lang=ru

300. Financial barriers. Given the scarcity of budget funds and competing demands for public finance, it is crucial for small hydropower projects to have access to credit and capital from domestic and foreign sources. Such access is limited, however. In addition to removing legal impediments (as described above), other steps to improve the investment climate and to ease access to capital are needed. They could include streamlining institutional steps and procedures for permits and providing specific guarantees to investors.

301. Educational barriers. Institutions involved in the development of small hydropower persistently note that they lack qualified, experienced staff—designers, project developers, managers, and operators. Most veteran specialists have left (due to natural attrition) and new specialists in the field are rare, as young staff choose more popular areas of the energy sector. The number of specialists needed is not huge, but the specialists will need to gain practice designing and operating modern facilities by working alongside the best experts.

302. Informational barriers. The new program for developing small hydropower needs to have a solid technical and informational component. A full-scale analysis of small hydropower potential was conducted in 1999 (within the first SHP program) by the design institute Vodoproject under the jurisdiction of the MAWR and other associated R&D institutions. This analysis, and the resulting suggestions for SHP construction, were discussed and approved by the Cabinet of Ministers. This analysis needs to be adjusted and updated, since many changes have occurred within last 15 years in both anthropogenic factors (economic or technical) and natural factors (climatic or hydrological). There is also a need for a new atlas of small hydropower potential.

E. Co-benefits

303. Implementation of the NAMA will produce the following co-benefits:

(i) reduced emissions of local air pollutants and associated negative health effects;
(ii) increased energy security;
(iii) enhanced quality, sustainability, and operational maneuverability of the power supply;
(iv) growth in agricultural production and food processing resulting from a more stable supply of energy;
(v) increased food security and supply of raw materials;
(vi) creation of new jobs and reductions in local unemployment;
(vii) improved technical capacity for local developers and operators of SHPs;
(viii) maximum use of local resources and labor and minimal reliance on imports (one of the official goals of the government);[75] and
(ix) increased income and quality of life for the local population.

F. Activities to be Carried Out

304. The activities proposed for this NAMA are described below.

[75] For small hydro, the share of imported components (mainly equipment and controls) usually does not exceed 30% of total capital costs.

1. Analysis of Institutional Issues and Elaboration of Proposals to Optimize Institutional Arrangements Related to Small Hydropower

305. Resolution #2343 (paragraph 7) establishes the Republican Commission on Energy Efficiency and Renewable Energy Development under the Cabinet of Ministers of Uzbekistan. This new entity is responsible for coordinating and directing renewable energy policies and programs at the national level. In paragraph 8, the resolution directs the Ministry of Economy to create a department with the same name to serve as an executing agent for the commission. These are potentially positive steps for promoting small hydropower.

306. However, it is unclear if small hydropower will be under the jurisdiction of these new bodies. The question of whether or not SHPs will be legally designated as renewable energy sources has not yet been clarified. While most experts agree that hydropower plants with a capacity under 30 MW should be considered renewable, there is no formal decision or legal document confirming this. At the same time, unlike other renewable energy sources, small hydropower is governed by two agencies, private ownership of generating assets is prohibited, and there are external restrictions related to the irrigation regime.

307. One option for addressing this issue is to create a specialized entity—an Interagency Coordinating Council on Small Hydropower under the Republican Commission. Its responsibilities would be determined and enumerated in more detail by participants and founding parties, but the main goal would be to have a permanent advisory body on small hydropower development that could also handle potential conflict resolution.

308. Stakeholders. Uzbekenergo; Uzsuvenergo; the MAWR; the Ministry of Economy; the Ministry of Finance; the State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition; the Ministry of Justice; the Academy of Science; specialized R&D institutions; and others to be determined.

309. Duration. One year to initiate, complete, and obtain necessary approvals to establish the Coordinating Council on Small Hydropower under the Republican Commission.

310. Cost. $50,000, including the costs of legal and financial expertise, salaries for support staff, and miscellaneous expenses.

2. Comprehensive Study of Legal Issues and Proposals Related to Ownership of Hydropower Generating Assets and Other Factors Influencing Private Investment

311. Several issues could be considered as part of this study:

(i) a legislative change that would permanently bring HPPs in line with other generating facilities by allowing partial private ownership of the assets;
(ii) introduction of less-traditional financing schemes (BOT or DBFO);
(iii) concession agreements for building and operating SHPs that would provide investors with the necessary measures of control without outright ownership of the assets;
(iv) joint ventures with a PSA that is not directly tied to a partner's share in the ownership of capital assets; and
(v) ordinary loans with sovereign or other high-quality guarantees.

312. Finally, if small hydropower plants are qualified as renewable energy (exempting them from the public ownership requirement for HPPs), it may still be useful to conduct a thorough legal analysis to check whether the option of such requalification is legally viable and would hold up in courts without any changes to the legislation.

313. Within the NAMA, a comprehensive estimation of these approaches and their comparative practicability and cost-efficiency will be made. After this comparison, the best measures will be identified, fully elaborated, and suggested for implementation.

314. Stakeholders. Uzbekenergo; Uzsuvenergo; the MAWR, the Ministry of Economy; the Ministry of Finance; the State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition; the State Tax Committee; the State Customs Committee; the State Nature Protection Committee; the Ministry of Justice; the Cabinet of Ministries; and Parliament.

315. Duration. One year to conduct the analysis, develop drafts, and obtain necessary approvals to make relevant changes to legislative documents such as laws, resolutions, and internal orders.

316. Cost. At least $100,000, including the costs of legal and financial experts, salaries for support staff, translation services, and miscellaneous expenses, and at least $70,000 for an international consultancy if needed.

3. Removal of Economic Barriers by Analyzing and Proposing Special Tariffs for Small Hydropower, Reduced Import Taxes on Equipment, and/or Introduction of Specific Steps to Promote Domestic Production (if Viable)

317. Even if the legal means for private capital to invest in small hydropower are created, the current tariffs for potential SHPs do not ensure a sufficient return on investment, especially when compared to other market options. A special tariff for small hydropower would accelerate investment. This solution may prove difficult, however, due to budgetary constraints. Therefore, the economic and political viability of a special feed-in tariff for small hydropower should be analyzed, at least for a fixed introductory period after commissioning an SHP (e.g., seven years) or for an approved payback period for a particular project. Other economic incentives could also be considered, such as a temporary exemption from profit or other taxes, a reduction in import taxes, or incentives for domestic production of equipment.

318. Stakeholders. Uzbekenergo; Uzsuvenergo; the MAWR, the Ministry of Economy; the Ministry of Finance; the State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition; the State Customs Committee; the Ministry of Justice; the Cabinet of Ministries; and Parliament.

319. Duration. One year and a half to draft and obtain necessary approvals to make applicable changes to legislative documents such as laws, resolutions, and internal orders.

320. Cost. $50,000, including the costs of legal and financial expertise, salaries for support staff, translation services, and miscellaneous expenses.

4. Clarification of the Practice of Dispatch and Development of Proposals to Provide Potential Investors with Assurance that their Electricity will be Purchased as Long as it is Economically Viable

321. Private investors need assurances that their SHPs will be dispatched and placed under load and that generated electricity will be purchased at the agreed-upon tariff. This proposed study will seek to address the following questions:

(i) Is the current system of dispatch conducive to development of small hydropower? What are the established principles and real practices of dispatch? Is there a need to change these to promote implementation of renewable energy sources in general and small hydropower in particular? If yes, then how?
(ii) Is it possible or advisable to create a general legal obligation to uptake energy from small hydropower, similar to the Public Utilities Regulatory Policies Act in the US, which obligates network operators to purchase all energy from independent power producers as long as the requested price is equal to or below the current marginal cost of the network? Or is it better for SHP developers to sign specific long-term power purchase agreements with "take or pay" clauses?
(iii) If a special feed-in-tariff for small hydropower is introduced, what effect would that have on the dispatch procedure and load factors of SHPs?
(iv) What normative and regulatory changes are necessary to ensure that the optimal answers to the questions above are put into practice?

322. Stakeholders. Uzbekenergo (with its thermal and hydropower stations and other generating enterprises); Uzsuvenergo (with its hydropower stations); the MAWR, the Ministry of Economy; the Ministry of Finance; the State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition; the State Tax Committee; the Ministry of Justice; the Cabinet of Ministries; and Parliament.

323. Duration. One and half year to draft and obtain necessary approvals to make applicable changes to legislative documents such as laws, resolutions, and internal orders.

324. Cost. No less than $50,000, including the costs of legal and financial expertise, salaries for support staff (not direct management), translation services, and miscellaneous expenses.

5. Development of Measures to Attract Foreign and Domestic Private Investment

325. Access to credit and capital from public sources is important to accelerate development of small hydropower, but increased participation by private capital, especially foreign capital, is critical. Along with funds, private capital brings a fresh look at market opportunities and expertise optimizing financial and technical engineering for projects. All available means—informational support, specific guarantees, or streamlined processes—should be analyzed and deployed to attract private investment to small hydropower.

326. Stakeholders. Commercial banks; the Central Bank of Uzbekistan; Uzbekenergo; Uzsuvenergo; the MAWR, the Ministry of Economy; the Ministry of Finance; the Ministry for Foreign Economic Relations, Investments and Trade; the State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition; the State Tax Committee; the Ministry of Justice; and the Cabinet of Ministries.

327. Duration. Two years to draft and obtain necessary approvals to make applicable changes to legislative documents such as laws, resolutions, and internal orders.

328. Cost. $30,000, including the costs of legal and financial expertise, translation services, and miscellaneous expenses.

6. Education, Training, and Capacity Building for Small Hydropower

329. To address the lack of qualified staff, the NAMA proposes to bring together interested parties (Uzbekenergo, Uzsuvenergo, R&D institutes, universities, and others) to

(i) develop specialized training curricula (e.g., for SHP design and operation);
(ii) arrange targeted workshops and conferences;
(iii) organize and conduct student and research exchanges;
(iv) organize hands-on training and practice abroad for specialist, especially engineers, designers, and project development specialists; and
(v) conduct training and capacity building within existing structures (e.g., Uzbekenergo, Uzsuvenergo).

330. Stakeholders. Uzbekenergo; Uzsuvenergo; the MAWR; the Ministry of Higher and Secondary Special Education; and the Cabinet of Ministries.

331. Duration. One year to draft and obtain necessary approvals for new educational curricula and training programs.

332. Cost. $200,000, including the costs of legal and financial expertise, salaries for support staff, study tours, and miscellaneous expenses.

7. Development of an Updated Atlas of Small Hydropower Potential in Uzbekistan

333. As part of the development of this atlas, particular attention should be paid to identifying opportunities for mini- and micro-HPPs and reassessing their potential in the face of technical and climatic changes.

334. Stakeholders. Uzbekenergo; Uzsuvenergo; the MAWR; and specialized R&D institutions.

335. Duration. One year and a half.

336. Cost. $500,000 to $1,000,000.

8. Investment in SHPs Approved within the Program of Hydropower Development by the End of 2015

337. This activity involves investing in the rehabilitation of existing SHPs or construction of new facilities, based on the priorities set forth in the Program for Hydropower Development (to be approved this year).

338. Stakeholders. The Ministry of Finance; the Ministry of Economy; Uzbekenergo; Uzsuvenergo; the MAWR; multilateral development banks; international donors; and private investors.

339. Duration. 15 years (the life of the NAMA).

340. Cost. $27.2 million.

G. Transformational Potential of the NAMA

341. If the small hydropower investment activities are implemented as envisioned in MAWR's proposed Program for Development of Small Hydropower during 2015–2030,[76] the NAMA will result in the construction and commissioning of at least 19 new SHPs. The NAMA will also support bottom-up development of small hydropower through increased participation by private capital, provision of state-of-the-art international technical expertise, and local initiatives. By addressing the major regulatory, financial, and other gaps listed above, investment in SHPs will be accelerated and the considerable potential for small hydropower generation will be fully realized.

H. Greenhouse Gas Emission Reductions

342. If all 19 SHPs are commissioned and the three existing HPPs are rehabilitated, as outlined in the Program for Development of Small Hydropower during 2015–2030, the displaced electricity generation will result in estimated GHG emission reductions of 918,715 tCO_2e per year by 2030 and cumulative GHG emission reductions of 7,396,414 tCO_2e during the 2015-2030 lifetime of the NAMA. The method used for calculating these reductions is described in Sections VII.H.1 and VII.H.2 below.

343. These figures are a rough estimate since they are based on implementation of a development program that is currently under consideration, which makes it likely to change before it is approved. The final estimate of potential GHG emission reductions will be available once the government approves the consolidated program for hydropower development. The approval is estimated for late 2015.

1. The Baseline

344. Without the NAMA, it is expected that the key barriers to increasing investment in small hydropower will remain unresolved and will continue to prevent investment in new and rehabilitated capacity. Therefore, the assumption is that in the baseline without the NAMA the existing fuel mix will continue to produce the required electricity. Table 30 shows the expected share of different fuels in the electricity mix through 2030 using confirmed capacity expansion plans for Uzbekistan. As shown in Table 30, fossil fuels are expected to continue to dominate the mix in the baseline scenario where no GHG abatement actions are implemented.

345. Using the economic model developed for the energy and transport sectors of Uzbekistan under RETA 8119, the consultant team estimated the annual baseline GHG emissions for electricity generation during the period 2015–2030. The equation for estimating emissions is as follows:

[5] See Review.uz, online version of the monthly *Economic Review*. "Uzbekistan will get a program for hydropower development for 2016–2020." May 6, 2015. Accessed at: http://www.review.uz/index.php/novosti-main/item/2505-v-uzbekistane-poyavitsya-programma-razvitiya-gidroenergetiki-na-2016-2020-gody

Equation (1)

$$GHG_y = \sum_{F,f,p} \left(O_{F,y} \times \frac{1}{E_{F,y}} \times S_{F,f,y} \times (C_{F,f,p,y} + U_{f,p,y}) \right)$$

Where:

y	=	Year
F	=	Electricity-generating facility
f	=	Fuel
p	=	GHG
GHG	=	GHG emissions (tCO_2e)
O	=	Electricity generation (MWh)
E	=	Generating efficiency (%)
S	=	Fuel share (%)
C	=	Combustion emission factor (tCO_2e / MWh)
U	=	Net emission factor of upstream fuel production (tCO_2e / MWh)

Table 30: Baseline Share of Fuels in Electricity Generation in Uzbekistan, 2015–2030 (%)

Fuels	2015	2020	2025	2030
Natural gas	68.641	78.566	77.219	75.635
Residual fuel oil	0.792	0.563	0.385	0.335
Uzbek brown coal	11.871	5.433	7.172	8.803
Wind	0.004	0.003	0.003	0.003
Solar	0.007	0.423	0.586	0.597
Hydropower	18.685	15.012	14.635	14.626
Total (%)	**100**	**100**	**100**	**100**

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,*Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

346. The baseline GHG emission results are shown in Table 31 and the approach and emission factors for estimating GHG emissions are documented in *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors* (footnote 3) and the national model for Uzbekistan is made publically available on ADB's website.

Table 31: Baseline Greenhouse Gas Emissions from Electricity Generation in Uzbekistan, 2015–2030

Year	Year				
	2015	2020	2025	2030	Cumulative Total (2015-2030)
GHG emissions from electricity generation in Uzbekistan (tCO_2e)	33,224,917	31,110,579	34,051,761	40,865,485	540,061,088

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

2. The NAMA

347. Table 32 describes the annual expected GHG emission reductions from the small hydropower capacity to be installed and rehabilitated as well as the cumulative GHG reductions that can be achieved by 2030. The reductions were calculated using the economic model for energy and transport developed under RETA 8119. As indicated in Table 32, if fully implemented by 2030, the NAMA will result in a 2.2% annual reduction in GHG emissions compared to the baseline for electricity generation.

Table 32: Annual Greenhouse Gas Emission Reductions from Electricity Generation in Uzbekistan with the NAMA, 2015–2030

Year	Year				
	2015	2020	2025	2030	Cumulative Total (2015-2030)
GHG emissions from electricity generation in Uzbekistan (tCO_2e)	33,224,917	31,110,579	34,051,761	40,865,485	540,061,088
GHG emission reductions from introducing the NAMA (tCO_2e)	0	-359,990	-602,842	-918,715	-7,396,414
% Change from baseline	0.0	-1.2	-1.8	-2.2	-1.4

Source: Abt Associates, Stockholm Environment Institute, and Nazar Business and Technology, LLC, 2015. *Economics of Climate Change in Azerbaijan, Kazakhstan, and Uzbekistan: The Economics of Reducing Greenhouse Gas Emissions in the Energy and Transport Sectors,* Technical Assistance Consultant's Report, TA8119-REG Economics of Climate Change in Central and West Asia – Mitigation Component, August 2015.

I. Costs and Financing

348. The cost estimate provided in Table 33 is preliminary, as it is based on MAWR's draft Program for Development of Small Hydropower which is described further in Section C.

Table 33: Cost of Implementing the NAMA to Accelerate Small Hydropower

	Cost ($ million)		
Activity	**State Budget**	**International Support**	**Total**
Construction of 19 new SHPs	499.38	80.92	580.3 (including 326 for equipment)
Rehabilitation of three existing SHPs	146.80		146.80
Research, analysis, training, and education		1.55	1.55
Total	**646.18**	**82.47**	**728.65**

Source: Uzsuvenergo

349. In its current form, the MAWR program envisions construction of 19 new SHPs with a total installed capacity of 210 MW and a cost of $580.3 million (including $326 million for equipment) and rehabilitation of three existing HPPs at the cost of $146.80 million. This adds up to a total cost of $728.65 million.

350. Included in this total is foreign investment sought by the MAWR in the amount of $80.92 million to finance construction of the first three new SHPs on the list. The “soft” measures in this NAMA (activities 1 through 7) have a combined cost of $1.55 million. Funds to cover this cost are requested from international sources in the form of technical assistance and capacity building.

J. Proposed Monitoring, Reporting, and Verification System

351. The monitoring, reporting, and verification system proposed for this NAMA concept is based on self-monitoring and self-reporting by the entities engaged in construction and operation of SHPs (Uzbekenergo and Uzsuvenergo). Most of the parameters to be monitored and reported on are already a part of the obligatory reporting within these organizations’ official chains of command.

1. General Monitoring, Reporting, and Verification Metrics

352. Precise protocols and schedules for measuring and reporting on particular indicators will be developed when the national Program of Small Hydropower Development is fully elaborated. They will partially depend on the specifics of the individual SHPs, including technology, connection to the grid, and local customers. Table 34 lists suggested metrics for building the MRV system.

Table 34: Proposed Metrics for Monitoring, Reporting, and Verification

Quantitative metrics	GHG emissions	• Amount of electricity (KWh) generated by each SHP, including the amount supplied to the grid, provided to local consumers, or used for internal needs • The grid emission factors used to calculate emissions from avoided baseline electricity generation • Amount and type of on-site fossil fuel consumed to support operations and maintenance of hydropower plants; related emission factors • GHG emissions related to rehabilitation and repair of SHP infrastructure, particularly to on-site construction works
	Socio-economic benefits	• Commissioning of new small hydropower capacity (MW) • Number of jobs created within the Program of Small Hydropower Development • Changes in the agricultural output of local enterprises supplied by power from SHPs • Capacity building and training: number of new courses, workshops, and conferences or working exchange programs; number of participants who graduated or received certificates of completion.
	Financial tracking	• Annual funds spent by entity (Uzbekenergo, Uzsuvenergo, Coordinating Council, R&D or educational institutions, etc.), source (state budget, private sector, international support), and activity (construction, equipment, rehabilitation, network facilities improvement, technical assistance, education or training, etc.)
Qualitative metrics		Status of implementation: • Creation of the Interagency Coordinating Council on Small Hydropower • Development of the Program of Small Hydropower Development • Creation of the legal mechanism for private investment in SHPs • Completion of feasibility studies for SHPs from the list to be approved • Development of the updated atlas of small hydropower potential of Uzbekistan

1. Proposed Greenhouse Gas Measurement and Monitoring Parameters

353. This section discusses the proposed monitoring metrics for tracking and estimating GHG emission reductions from the renewable energy provided by small-scale hydropower facilities. The monitoring parameters differ depending on whether the renewable energy provided by the SHP is supplying electricity to the grid or is used on-site. This guidance draws on methods used in several CDM methodologies for small-scale renewable energy.[77]

a. Baseline for Greenfield Power Plant

354. Baseline GHG emissions from a greenfield hydropower plant are calculated as follows:

[77] UNFCCC. 2014. *Clean Development Mechanism AMS-I.D. Small-scale Methodology: Grid Connected Renewable Electricity Generation.* Version 18.0; UNFCCC. 2014. *Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources.* CDM ACM0002. Version 16.0; UNFCCC. 2015. *Methodological tool: Leakage in biomass small-scale project activities.* CDM Tool 22. Version 4.0; and UNFCCC. 2014. *Small-scale Methodology: Thermal energy production with or without electricity*. CDM. AMS-I.C. Version 20.0.

Equation (2)

$BEy = EGPJ,y \times EFgrid,y$

Where:

BEy	=	Baseline emissions in year y (tCO_2)
$EGPJ$,facility,y	=	Quantity of net electricity generation supplied to the grid as a result of implementation of the NAMA in year y (MWh)
$EFgrid,y$	=	CO_2 emission factor for grid connected power generation in year y (tCO_2/MWh)

b. Baseline for Capacity Addition and/or Rehabilitation

Baseline emissions = BE_y

355. In the case of hydropower plants or units, the addition of new power plants/units may significantly affect the electricity generated by the existing plants/units. For example, a new hydropower turbine installed at an existing dam may affect power generation by the existing turbines. Therefore, the approach for capacity additions that supply electricity to the grid is similar to that of retrofit, rehabilitation, or replacement projects that supply electricity to the grid. *EGfacility,y* corresponds to net electricity generation supplied to a grid by the existing plants/units and the added plants/units together constituting "project plants/units".

356. The baseline energy generation ($EG_{PJ,Y}$) corresponding to the net increase in electricity production associated with the NAMA is calculated as follows:

Equation (3)

$$(EG_{PJ,Y}) = \begin{cases} \max(\text{EGPJ,facility,y} - (\text{EG}historical + \sigma historical), 0), \text{ until } DATE_{BaselineRetrofit} \\ 0, \text{ after } DATE_{BaselineRetrofit} \end{cases}$$

Where:

$EG_{historical}$	=	Annual average historical net electricity generation by the existing hydropower plant operated at the project site prior to the implementation of the NAMA and determined by the procedure prescribed below (MWh).
$\Sigma_{historical}$	=	Standard deviation of the annual average historical net electricity supplied to the grid by the existing renewable energy plant operated at the project site prior to the implementation of the project activity (MWh).
$DATE_{BaselineRetrofit}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date). This parameter does not apply to rehabilitation projects.

Determination of $EG_{historical}$:

357. This is the average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week, or other time period) to the time when the facility was constructed, retrofitted, or modified in a manner that significantly affected output (i.e., by 5% or more).

358. To determine $EG_{historical}$, NAMA participants may choose between two historical periods. This allows some flexibility. Use of a longer time period may result in a lower standard deviation, while use of the shorter period may allow a better reflection of the (technical) circumstances observed during more recent years.

359. The NAMA proponents can choose between the following two time spans of historical data to determine $EG_{historical}$:

(i) The three last calendar years (or five years in the case of hydropower power plants) prior to the implementation of the NAMA activity.
(ii) The time period from the calendar year following $DATE_{hist}$ up to the last calendar year prior to the implementation of the NAMA, as long as this time span includes at least five calendar years. $DATE_{hist}$ is the latest point in time between:

    (a) the commissioning of the plant/unit;
    (b) if applicable, the last capacity addition to the plant/unit; or
    (c) if applicable: the last retrofit or rehabilitation of the plant/unit.

360. In cases of rehabilitation where the power plant/unit did not operate for the last five calendar years before the rehabilitation starts, $EG_{historical}$ is equal to zero.

Calculation of $DATE_{BaselineRetrofit}$:

361. In order to estimate the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the NAMA activity ($DATE_{BaselineRetrofit}$), NAMA proponents may take into account the typical average technical lifetime of the type of equipment. The point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity should be chosen in a conservative manner—that is, if a range is identified the earliest date should be chosen.

c. NAMA Emissions

362. For most renewable energy activities, NAMA activities $PE_y = 0$. However in the case of hydropower, there may be emissions from water reservoirs that must be accounted for. These emissions are determined by the power density of the reservoirs and the default emission factors for water reservoirs.

363. The power density (PD) of the NAMA reservoir(s) is calculated as follows:

Equation (4)

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{APJ - ABL}$$

Where:

PD	=	Power density of the project activity (W/m^2).
Cap_{PJ}	=	Installed capacity of the hydropower power plant after the implementation of the NAMA activity (W).
Cap_{BL}	=	Installed capacity of the hydropower power plant before the implementation of the NAMA activity (W). For new hydropower power plants, this value is zero.
APJ	=	Area of the single or multiple reservoirs measured in the surface of the water after the implementation of the project activity, when the reservoir is full (m^2).
ABL	=	Area of the single or multiple reservoirs measured in the surface of the water before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

364. For hydropower activities that result in new single or multiple reservoirs and hydropower power activities that result in the increase of single or multiple existing reservoirs, CH_4 and CO_2 emissions from the reservoirs shall be estimated as follows:

365. For integrated hydropower activities the power density of the entire NAMA activity is calculated as follows:

Equation (5)

$$PD = \frac{\Sigma C_{ap\ PJ,j}}{i \Sigma A_{PJ,j}}$$

Where:

j	=	Individual power plants included in integrated hydropower generation
i	=	Individual reservoirs included in integrated hydropower generation

366. If the power density of the NAMA activity using equation (3) or in case of integrated hydropower activity using equation (4) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

Equation (6)

$$PE_y = \frac{EF_{Res} \times TEG_y}{1000}$$

Where:

PE_y	=	NAMA emissions from water reservoirs (tCO$_2$e/yr)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydropower power plants (kg CO$_2$e/MWh)
TEG_y	=	Total electricity produced by the NAMA activity, including the electricity supplied to the grid and the electricity supplied to internal loads in year y (MWh)

367. If the power density of the project activity is greater than 10 W/m^2:

Equation (7)

$$PE_y = 0$$

d. NAMA Emission Reductions

368. Emission reductions ER_y are calculated as follows:

Equation (8)

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year *y* (tCO$_2$)
BE_y	=	Baseline emissions in year *y* (tCO$_2$)
PE_y	=	NAMA emissions in year *y* (tCO$_2$)

369. Based on the equations described above, Table 35 summarizes the required monitoring parameters for calculation of avoided GHG emissions from generating electricity from hydropower plants.

Table 35: Monitoring Parameters for Generation of Electricity from Hydropower Plants

Parameter	Description	Unit	Measuring Methods and Procedures	Monitoring Frequency
$EGPJ,\text{facility},y$	Quantity of net electricity generation supplied by the plant/unit to the grid in year *y*.	MWh	This parameter should be monitored using bi-directional electricity meter(s) OR calculated as the difference between (a) the quantity of electricity supplied by the plant/unit to the grid; and (b) the quantity of electricity the plant/unit received from the grid. If it is calculated, the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid; and (b) The quantity of electricity delivered to the project plant/unit from the grid.	Continuous monitoring, hourly measurement, and at least monthly recording
$EFgrid,y$	CO_2 EF of the grid electricity in year *y*.	tCO_2e/ MWh	This parameter is based on the approved combined margin CO_2 emission factor for Uzbekistan's electricity system, applicable to all project activities other than wind and solar for the first crediting period of a CDM project.[78] Value to be applied: 0.532 tCO_2e/MWh	N/A
$\sigma historical$	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing hydropower plant that was operated at the site prior to the implementation of the NAMA. Calculated from data used to establish *EGhistorical*.	MWh	Parameter to be calculated as the standard deviation of the annual generation data used to calculate *EGhistorical* for retrofit or replacement NAMA activities.	
$EGhistorical$	Annual average historical net electricity generation by the existing hydropower plant that was operated at the project site prior to the implementation of the NAMA.	MWh/ year	Electricity meters.	
$DATEBaseline\ Retrofit$	Point in time when the existing equipment would need to be replaced in the absence of the NAMA.	Date	As per methodology described above.	
$DATEhist$	Point in time from which the time span of the historical date for retrofit, rehabilitation, or replacement NAMA activities may start.	Date	*DATEhist* is the latest point in time between: (a) the commercial commissioning of the plant/unit; (b) if applicable: the last capacity addition to the plant/unit; or	

[78] Clean Development Mechanism. 2013. *Standardized Baseline: Grid Emission Factor for the Republic of Uzbekistan.* ASB0003. Version 01.0. Bonn. https://cdm.unfccc.int/methodologies/standard_base/Standardized_Baseline_PSB005_ver01.0.pdf

Parameter	Description	Unit	Measuring Methods and Procedures	Monitoring Frequency
			(c) if applicable: the last retrofit or rehabilitation of the plant/unit.	
$EFes$	Default emission factor for emissions from reservoirs.	$kgCO_2e$/ MWh	Based on a decision of the CDM Executive Board 23. Value to be applied: 90 kgCO2e/MWh	
Cap_{BL}	Installed capacity of the hydropower plant before implementation of the NAMA activity. For new hydropower power plants, this value is zero.	W	Determine the installed capacity based on manufacturer's specifications or recognized standards.	
ABL	Area of the single or multiple reservoirs measured in the surface of the water, before implementation of the NAMA activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.	m^2	Measured at the site from topographical surveys, maps, satellite pictures, etc.	

K. Implementation

370. The stakeholders involved in NAMA implementation include the following:

(i) The Republican Commission on Energy Efficiency and Renewable Energy of the Cabinet of Ministers
(ii) The Ministry of Economy
(iii) The Ministry of Finance
(iv) Uzbekenergo
(v) The Ministry of Agriculture and Water Resources
(vi) Uzsuvenergo
(vii) The State Committee of Uzbekistan on Privatization, Demonopolization and Development of Competition
(viii) The Ministry of Justice
(ix) The State Tax Committee
(x) The Academy of Science of Uzbekistan
(xi) "Hydroproject", the Institute for Power Industry and Automation of the Academy of Science, and other specialized research & development institutions
(xii) Tashkent Technical University and other educational institutions

APPENDIX 1. PROCESS FOR SELECTING AND FORMULATING THE NAMAS FOR AZERBAIJAN, KAZAKHSTAN, AND UZBEKISTAN

372. During the implementation of RETA 8119, the consultant team worked with stakeholders in Azerbaijan, Kazakhstan, and Uzbekistan to identify and analyze potential mitigation options for development into NAMAs and to provide training and capacity development on NAMA formulation and MRV.

373. In the early stages of the TA, the consultant team—with support from national counterparts and ADB—met with several agencies across the energy and transport sectors in the three countries to solicit NAMA ideas. As described below, the team also organized workshops to train stakeholders in NAMA development and to solicit feedback on NAMA selection. However, the experts attending the workshops were not necessarily those authorized to select among the NAMAs. As a result, the final selection of NAMAs grew out of a political decision-making process rather than from a clearly defined, multi-criteria analysis involving the full range of relevant stakeholders.

374. Two regional workshops were organized under the TA to build capacity for NAMAs. The Regional Inception Workshop, conducted in Baku, Azerbaijan, in February 2014 helped workshop participants identify and consider national climate change mitigation policies that could be formulated into NAMAs. The Regional Interim and NAMA Investment Workshop held in Astana, Kazakhstan, in June 2014 focused on ranking and financing such measures and designing effective monitoring, reporting, and verification systems for NAMA implementation. Appendix 2 presents the agendas for the two training workshops.

375. The June 2014 workshop included a separate session devoted to NAMA prioritization and development based on the "NAMA Tool: Developing a NAMA in 10 Steps."[79] The tool, conceived by GIZ and introduced at the workshop by a representative of GIZ, brings order to the often iterative process of communications between and among stakeholders involved in the design of a NAMA. After enumerating a country's developmental priorities and legal and other international obligations, the users of the tool assessed conditions for mitigation activities, including (i) gaps in policies and institutional frameworks, (ii) needed and available resources, and (iii) potential actions that support mitigation priorities. Based on the assessment, participants then prioritized proposed mitigation options by undertaking a multi-criteria analysis that combined objective measurements and expert estimates for various values.

376. Workshop participants separated into three breakout groups by country and applied ranking processes from the NAMA tool to a list of potential NAMAs they had compiled. While the session proved useful as a training device, it also demonstrated some limits. For example, the workshop participants were not in a position to make the final decision regarding potential policies, regulations, or incentive structures needed for introducing a NAMA; therefore, their preferred NAMAs were not always grounded in political realities. Participants represented several agencies and NGOs and may not have had access to the latest planning information from the respective agencies responsible for implementing the selected NAMAs. As a result, the top ranked candidates during the NAMA tool exercise—illustrated in Table 36–were not the same stakeholders eventually selected for the TA.

[79] NAMA Tool: Steps for Moving a NAMA from Idea Towards Implementation, International Partnership on Mitigation and MRV. Available at: http://mitigationpartnership.net/nama-tool-steps-moving-nama-idea-towards-implementation

Table 36: Top-Ranked NAMA Concepts Selected at the Regional Interim and NAMA Investment Workshop, June 2014

Country	Top-Ranked NAMA Concepts
Azerbaijan	Legislative NAMA based on improving the legislative and normative framework to promote green growth and regular energy audits
Kazakhstan	Modernization of the public transport fleet through improved monitoring and audits, training, and tax incentives
Uzbekistan	Energy-efficient reconstruction of residential buildings through improvements in legislative norms, requirements for energy audits, and provision of incentives to technology providers

377. In addition to the NAMA ideas introduced at the workshop, the consultant team solicited proposals throughout the course of the TA at any opportunity, from formal meetings to workshop coffee breaks. Some unsolicited ideas even surfaced, such as the proposal for expanding the use of natural gas in the transport sector set forth by a representative of TransKazGas Onimderi in Kazakhstan. The representative sought out the consultant team during the Regional Interim Workshop after he learned about the purpose of the TA. By the end of the workshop, the consultant team counted 23 ideas for NAMA activities in Kazakhstan, nine in Azerbaijan, and three in Uzbekistan. Later, after a similar brainstorming exercise at the Uzbekistan Inception Workshop in October 2014, the team added six ideas for NAMAs in Uzbekistan. Appendix 3 presents the full list of proposed NAMAs.

378. The consultant team, the national counterparts, and ADB then began discarding NAMA ideas that would not be sustainable because of limited data, lack of an obvious “champion” for implementation, or absence of associated ideas for investment concepts for future ADB consideration. Other ideas either proved infeasible for technical, legal, or—most often—economic reasons, or the team determined that it would be difficult to formulate the NAMAs within the timeline for the TA. Some ideas proved to be related closely enough to be combined into one NAMA. Considerations involved in the final NAMA selection include whether:

(i) the NAMAs support national development priorities, address general sustainability goals, and have clear a champion supporting their formulation;
(ii) the NAMAs address specific barriers to mitigation that can be resolved through a NAMA;
(iii) the NAMAs result in cost-effective and measurable GHG emission reductions;
(iv) the NAMAs relate to the energy and transport sectors according to the scope of the TA;
(v) the NAMAs offer potential opportunities for developing investment concepts for individual components of selected NAMAs, as expected under Output 2 of the TA;
(vi) the NAMA design is based on sufficient data and generates clearly defined stakeholder participation, enabling formulation within the TA’s time frame; and
(vii) the NAMAs are supported by the national counterparts for the TA.

379. One of the most important factors in selecting NAMA concepts turned out to be local counterparts’ interest and commitment, as manifested by the specificity of concepts, willingness to elaborate on country-specific needs and wishes, readiness to provide high-quality substantiating information, ability to adjust original designs in the face of specific NAMA requirements, and general responsiveness to the requests from the consultant team.

380. In the end, the consultant team was left with one NAMA for Azerbaijan and two NAMAs for Kazakhstan; in Uzbekistan, the government expressed interest in two NAMAs, of which only

one (related to small-scale hydropower) was possible within the TA's timeframe. The NAMA concepts follow:

(i) Promoting agro-residential development based on renewable energy in Azerbaijan
(ii) Fostering the use of natural gas in the transport sector in Kazakhstan
(iii) Developing a national energy efficiency support system in Kazakhstan
(iv) Accelerating deployment of small-scale hydropower in Uzbekistan

381. The four NAMA ideas underwent informal review processes and were deemed valuable from the point of view of national stakeholders in reducing GHG emissions at a transformational level. Moreover, all four NAMAs clearly support the priority development goals of Azerbaijan, Kazakhstan, and Uzbekistan.

382. Once the consultant team had selected the final NAMA candidates, in collaboration with national counterparts and ADB, the team began working with stakeholders to design the NAMAs. Table 37 lists the national counterparts for the TA and the selected NAMA lead agencies. The national counterparts were instrumental in supporting outreach to other agencies involved in the NAMA design and graciously provided staff time for technical input, workshop planning, and training.

Table 37: RETA 8119 National Counterparts and NAMA Lead Agencies in Azerbaijan, Kazakhstan, and Uzbekistan

Country	RETA 8119 Counterpart	NAMA Lead Agency
Azerbaijan	State Agency for Alternative and Renewable Energy Sources	State Agency for Alternative and Renewable Energy Sources
Kazakhstan	Ministry of Energy	JSC Institute of Power Development and Energy Saving (energy-efficiency NAMA) JSC KazTransGas (natural gas for transport NAMA)
Uzbekistan	Ministry of Economy of the Republic of Uzbekistan and Centre of Hydrometeorological Service (Uzhydromet) in the Cabinet of Ministers, Republic of Uzbekistan	Ministry of Agriculture and Water Resources Uzbekenergo

383. In Azerbaijan, the national counterpart, SAARES, is also the lead agency for the selected NAMA. From the outset of the TA, SAARES was highly interested in engaging in NAMA development. The organization saw a clear fit between its mandate of accelerating investment in alternative and renewable energy and the opportunity to capitalize on NAMAs to access international finance and technical support for low-emissions strategies.

384. In Kazakhstan and Uzbekistan, the agencies that will implement the NAMAs are not the same line agencies that serve as the TA's counterparts, thus requiring coordination among several parties. In Uzbekistan, the Ministry of Economy is coordinating development of the NAMA with Uzbekenergo and the MAWR, both of which are responsible for hydropower. In Kazakhstan, the consultant team is working directly with the proponents of the two NAMAs (JSC KazTransGas and JSC Institute of Power Development and Energy Saving), with the concurrence of the Department of Climate Change in the MOE.

385. To develop the NAMA ideas into NAMA concepts, the consultant team designed a NAMA template in collaboration with ADB to meet the basic requirements for reporting to the UNFCCC

NAMA Registry and to allow for incorporation of additional detail on likely barriers to implementation, estimated GHG emissions, MRV, transformational impact, and implementation arrangements. The consultant team distributed the templates to the NAMA proponents, who then provided the information needed to complete the form. This began an iterative process of drafting text, exchanging information, and reviewing draft language, all of which resulted in the NAMA concepts presented in this report.

APPENDIX 2. WORKSHOP AGENDAS

Regional Inception Workshop: Developing Climate Change Mitigation Policies and Nationally Appropriate Mitigation Actions

Agenda

Tuesday January 28, 2014: Baku, Azerbaijan
Hotel Park Inn by Radisson

Schedule	Session	Speaker
8.30–9.00	Registration	
9.00–9.15	Welcoming the participants	- Asian Development Bank - ABEMDA
9.15–9.35	ADB strategy on climate change mitigation and finance	Cinzia Losenno, Senior Climate Change Specialist, ADB
9:35–9:45	Overview of RETA 8119: Economics of Climate Change (mitigation component)	Jette Findsen, Regional Team Leader
9.45–10:05	Report from Inception Workshops in Azerbaijan and Kazakhstan	- Dr. Muslum Gurbanov, National Team Leader, AZE - Dr. Alexander Golub, Economist
10:05–10.25	NAMAs and their role in national and international climate change mitigation	Dr. Alexander Golub, Economist
10.25–10.35	Questions and answers	
10.35–10:50	Coffee break	
10:50–11:10	Short- and long-term climate change plans in Azerbaijan	- Mr. Nazir Ramazanov, Advisor to the Chairman, State Agency for Alternative and Renewable Energy Sources - Gulmalı Seleymanov, Director, Climate Change Center, Ministry of Ecology and Natural Resources, AZE
11:10–11.30	Short and long-term climate change plans in Kazakhstan	Bekbergen Kerey, Deputy Director, Department of Green Technology and Attraction of Investment, Ministry of Environment and Water Resources, KAZ
11:30–11:45	Questions and answers	
11.45–12:45	Regional activities to support climate change mitigation finance and Nationally Appropriate Mitigation Actions	Chingiz Mammadov, Senior Programme Advisor, UNDP
12.45–1:00	Questions and answers	
1:00–2:00	Lunch	
2:00–3:00	Emerging criteria and examples of NAMAs in the energy and transport sectors	Lindsay Kohlhoff, NAMA Expert
3:00–3:30	Developing the institutional framework to support NAMAs in Azerbaijan, Kazakhstan, and Uzbekistan—including measuring and monitoring requirements	Jette Findsen, Regional Team Leader
3:30-3:45	Questions and answers	
3:45-4.00	Coffee Break	
4:00–4:40	Panel Discussion: Using NAMAs to mobilize financing for climate change mitigation in the energy and transport sectors in Azerbaijan and Kazakhstan – Attracting public versus private funding – Interaction between NAMAs and national development strategies/priorities – NAMAs for improving investment environment – NAMAs as a way to address specific investment risks – NAMAs as a public awareness/participation tool	- Gregory Lvovsky, Investment Specialist for Mitigation - JSC “Zhasyl Damu”, KAZ - Gulmalı Seleymanov, Director, Climate Change Center, Ministry of Ecology and Natural Resources, AZE - Rauf Rzayev, Deputy Head of Department on Investments and Project Management, SAARES
4.40-4.50	Workshop summary and next steps	Jette Findsen, Regional Team Leader
4.50–5.00	Closing remarks	
	Announcements	

Regional Interim Workshop: NAMA Readiness and Investment Training for Mitigation Activities in the Energy and Transport Sectors

Agenda

Park Inn by Radisson
June 17–18, Astana, Kazakhstan

Day 1

Schedule	Session	Speaker
9.00–9.30	Registration	
9.30–9.45	Welcome and opening remarks	Manshuk Nurseitova, Economics Officer, ADB Gulmira Sergazina, Department of Climate Change, Ministry of Energy, KAZ
9.45–10.05	Presentation of participants and workshop goals - Overview of RETA 8119: Economics of climate change (mitigation component) - Background, objectives, and main outputs - Design of NAMAs and development investment concept notes to support components of the NAMAs	Jette Findsen, Regional Team Leader, Abt Associates
10.05–10.20	The concept of NAMAs and its practical implementation - Brief history and overview of current state - Global experience implementing NAMAs	Lindsay Kohlhoff, NAMA Expert, Abt Associates
10.20–10.30	Question and answers	
10.30–10.35	Group photo	
10.35–10.50	Coffee break	
10.50–11.15	NAMAs in Azerbaijan - Status of NAMAs - Priority sectors, policies, and technologies	Anar Mehtiyev, AZE Energy and Transport Specialist
11.15–11.40	NAMAs and climate finance in Kazakhstan - Status of NAMAs and climate finance in light of a future binding commitment under the UNFCCC - Priority sectors, policies, and technologies for climate finance	Lyubov Inyutina, KAZ Investment Specialist
11.40–12.05	NAMAs in Uzbekistan - Status of NAMAs - Priority sectors, policies, and technologies	Majid Khodjaev, UZB Team Leader
12.05–12.30	Questions and answers	
12.30–1.30	Lunch	
1.30–2.00	Financing NAMAs - Structuring finance for NAMA activities - As a program/policy - As a set of specific projects or subprojects (best practices from other countries on how to structure finance) - Risks and risk management for NAMAs (finance, technical, legal, safeguards, processing, etc.)	Gregory Lvovsky, International Mitigation Investment Specialist, Abt Associates
2.00–3.00	Perspectives on financing NAMAs and mitigation activities in the energy and transport sectors - World Bank - Bank Respublika, Azerbaijan - ADB	Rakhymzhan Assangaziyev, World Bank Ilgar Ojagov, Bank Respublika Jette Findsen, Abt Associates

3.00–3.15	Questions and answers	
3.15–3.30	Coffee break	
3.30–4.15	Experience in developing and Financing a NAMA - Overview of the UK/Germany NAMA Facility - Quality criteria - Examples from selected countries - Lessons learned	Verena Bruer, GIZ
4.15–4.30	Questions and answers	
4.30–5.00	Regional experience in supporting NAMAs from the donor perspective - Examples from selected countries in the region - Examples in Kazakhstan	Stanislav Kim, UNDP Kazakhstan
5.00–5.15	Questions and answers	
5.15–5.30	Summing up day 1 and overview of day 2 - Homework on NAMAs	Jette Findsen, Abt Associates

Day 2

Schedule	Session	Speaker
9.00–9.30	Registration	
9.30–9.45	Overview of day 1 and objectives for day 2	Gregory Lvovsky, Abt Associates
9.45–10.45	Monitoring, reporting, and verification (MRV) as integral part of NAMA development and implementation - General principles - Needed infrastructure - Specific approaches for energy and transport for measuring effective implementation - Potential metrics for performance indicators, using best practices from other countries	Jette Findsen, Abt Associates
10.45–11.00	Questions and answers	
11.00–11.30	Coffee break	
11.30–11.50	Introducing the “10-Step NAMA Tool”	Verena Bruer, GIZ
11.50–12.00	Click-session: Participants get familiarized with the tool	
12.00–12.30	Questions and answers	
12.30–1.30	Lunch	
1.30-1.45	Introduction to afternoon exercises	Verena Bruer, GIZ
1.45–3.15	Applying the NAMA Tool: Steps 1 through 3, including prioritization - Group work using real country data	Verena Bruer, GIZ RETA Consultants
3.15–3.45	Reporting back	
3.45–4.00	Coffee break	
4.00–5.15	Applying the NAMA Tool: Steps 4 through 10 - Group work using real country data	Verena Bruer, GIZ RETA Consultants
5.15–5.45	Summing up and next steps - Next steps in the NAMA development process - Summary of the regional workshop and next steps/upcoming Activities and milestones	Jette Findsen, Abt Associates
5.45–6.00	Closing remarks	AZE, KAZ, UZB Representatives

APPENDIX 3: NAMA IDEAS PROPOSED FOR AZERBAIJAN, KAZAKHSTAN, AND UZBEKISTAN

NAMA Ideas Identified in Discussions and Workshops with National Stakeholders

#	NAMA Idea	Sector	Author and/or Sponsor
Azerbaijan			
1	Development of energy-efficiency standards and norms for renewable energy	Energy	SAARES
2	Creating a smart grid in Gobustan renewable energy polygon (testing ground)	Energy	SAARES
3	Renewable energy development in Samukh agro complex	Energy	SAARES
4	Using solar panels for lighting roads in Siyazan region and Garadagh and Pirallahi areas of Baku	Energy/ Transport	SAARES
5	Optimizing solid waste transportation in Baku	Transport	Temiz Sheher, Ministry of Transportation
6	Reducing losses and related GHG emissions in transmission and distribution networks	Energy	Azenerji
7	Building medium and small hydropower plants (off the grid)	Energy	Azenerji
8	Development of legal environment for promotion of energy efficiency and renewable energy	Energy	Ministry of Energy, Ecoenergy Academy
9	Building mini- and micro-hydropower plants (off the grid)	Energy	SAARES
Kazakhstan			
10	Automation of State Energy Registry	Energy	JSC Institute of Power Development and Energy Saving (former KazEnergoExpertisa)
11	Expanding energy audits in transport sector	Energy/ Transport	Kazakhstan Academy of Transportation named after Tynyshpayev
12	Creation of system of information support for energy audits by industry/technology	Energy	Representative of USAID and Study Team
13	Promoting combined development of wind/solar renewable energy in rural areas	Energy	Workshop suggestion
14	Development of detailed and comprehensive atlas of renewable energy potential in the country	Energy	Ministry of Energy
15	Separation of consumer waste for waste- to-energy processing	Energy	Center for Sustainable Development (an environmental NGO)
16	Biogas utilization at wastewater treatment facilities	Energy	Center for Sustainable Development (an environmental NGO)
17	Biogas utilization at major animal farms	Energy	Representative of World Bank
18	RFTs (Center of Financial Settlements) risk improvement	Energy	Samruk Invest
19	Energy infrastructure rehabilitation	Energy	IFC and Samruk Energo
20	Create a system of information support for investors in renewables (atlas, rules, tariffs, last changes in legislative and normative climate)	Energy	Workshop participants
21	Biomass-based power plant using timber biomass waste	Energy	V. Starostin
22	Rehabilitation of district heating in the country	Energy	Ministry of Regional Development
23	Landfill methane utilization	Energy	Center for Sustainable Development (an environmental NGO)

#	NAMA Idea	Sector	Author and/or Sponsor
24	Correction of distortions in GHG quota allocation procedures in the ETS	Energy	Samruk Energo
25	Switch to benchmarking from grandfathering quotas for GHG emissions in ETS	Several	Zhasyl Damu
26	Accelerate motor vehicle stock turnover through incentives for lower-income citizens, emissions auditing, and restrictions on import of older cars, in order to meet Euro-5 standards	Transport	Several workshop participants
27	Conversion of personal vehicles to natural gas (dual-fuel vehicles)	Transport	Workshop suggestion, KazTransGas
28	Construction of network of CNG filling stations	Transport	KazTransGas
29	Optimization of transport management	Transport	Transportation Ministry
30	Use of solar panels on municipal buses	Transport	Kazakhstan Academy of Transportation named after Tynyshpayev
31	Production of electric automobiles in Kazakhstan for internal use and export	Transport	Kazakhstan Academy of Transportation named after Tynyshpayev
32	Astana mobility comprehensive transportation development	Transport	Directorat of Expo 2017
Uzbekistan			
33	Increase use of solar energy, building on recommendations from the new Solar Roadmap for Uzbekistan	Energy	UZB inception workshop
34	Expand electrification of railroads	Transport	UZB inception workshop
35	Enable wide introduction of micro-hydropower power plants on irrigation systems	Energy	UZB inception workshop
36	Incentivize solar preheating in district heating systems	Energy	UzbekEnergo
37	Improving the environment for energy efficiency measures	Energy	UZB inception workshop
38	Promote market for energy-efficient materials and equipment	Energy	UZB inception workshop
39	Energy-efficient reconstruction of residential buildings	Energy	Regional interim and NAMA workshop
40	Tax and other financial incentives for adoption of more efficient technologies	Energy	Regional interim and NAMA workshop
41	Subsidies for new technologies	Energy	Regional interim and NAMA workshop

APPENDIX 4: WORKSHOPS AND TRAININGS HELD IN AZERBAIJAN, KAZAKHSTAN, AND UZBEKISTAN DURING RETA 8119

Capacity-Development Activities to Support Economic Analysis of Mitigation, NAMA Design, and GHG Emissions Accounting, Monitoring, and Reporting

Workshop/Training	Location	Date	Training Content	Number of Participants (including women)
Five-day regional training on use of Long-Range Energy Alternatives Planning (LEAP) tool for economic analysis of mitigation	Astana, KAZ	November 2013	Basic theories and practical techniques for conducting cost-benefit analysis of mitigation and for constructing marginal abatement cost (MAC) curve Estimating, tracking, and reporting GHG emissions from mitigation measures	22 (11)
One-day national inception workshop for Kazakhstan	Astana, KAZ	January 2014	Economic analysis and design of mitigation measures, including development of business-as-usual scenario	28 (9)
One-day national inception workshop	Baku, AZE	January 2014	Economic analysis and design of mitigation measures, including development of business-as-usual scenario	36 (9)
One-day regional inception workshop	Baku, AZE	January 2014	Provide information on NAMAs, including criteria for identifying and developing successful NAMAs	31 (5)
Two-day regional interim regional workshop on NAMA readiness and investment for mitigation	Astana, KAZ	June 2014	Evaluation, design, and finance of NAMAs and mitigation measures Monitoring, reporting, and verification of mitigation options	36 (15)
One-day national inception workshop in Uzbekistan	Tashkent, UZB	October 2014	Introduction of TA 8119 and training in NAMAs and climate finance Monitoring, reporting, and verification of mitigation measures	21 (6)
Five-day national interim workshop and LEAP training in Azerbaijan	Baku, AZE	November 2014	Theories and practical techniques for conducting cost-benefit analysis of mitigation using the national model for Azerbaijan Estimating, tracking, and reporting GHG emissions from mitigation measures	19 (8)
Four-day national interim workshop and LEAP training in Kazakhstan	Astana, KAZ	December 2014	Theories and practical techniques for conducting cost-benefit analysis of mitigation using the national model for Kazakhstan Estimating, tracking, and reporting GHG emissions from mitigation measures	14 (7)
Five-day national interim workshop and LEAP training in Uzbekistan	Tashkent, UZB	March 2015	Theories and practical techniques for conducting cost-benefit analysis of mitigation using the national model for Uzbekistan Estimating, tracking, and reporting GHG emissions from mitigation measures	18 (9)
One-day national final workshop in Uzbekistan	Tashkent, UZB	July 2015	Presentation of final results of TA 8119 Monitoring, reporting, and verification	28 (8)

Workshop/Training	Location	Date	Training Content	Number of Participants (including women)
One-day national final workshop in Kazakhstan	Astana, KAZ	July 2015	Present final results of TA 8119 Monitoring, reporting, and verification	37 (14)
One-day national final workshop in Azerbaijan	Baku, AZE	July 2015	Present final results of TA 8119 Monitoring, reporting, and verification	23 (3)
Two-day regional final workshop in Azerbaijan	Baku, AZE	July 2015	Design and financings of NAMAs and other mitigation options Monitoring, reporting, and verification of mitigation options	36 (8)
Total Number of Decision-Makers Trained				**254 (89)**

APPENDIX 5

NAMA Registry Submission Form

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AZE Renewable Energy

(iii) By 2015, preparation of proposals to the government on preferential loans for renewable energy;

(iv) Preparation of tariff proposals for alternative and renewable energy sources by 2016;

(v) Analyze specific processes in agricultural and food production that can benefit from renewable energy and prepare suggestions for realizing the identified benefits within the Samukh Complex and replicating these at other sites; and

(vi) Complete feasibility studies for establishing similar agro-renewable energy complexes at sites in Nakhchivan, Gadabav, Neftchala, Balakan, and Oghuz.

Phase 2 (2017-2020) will expand the Samukh Complex and begin to use the lessons learned for replication at other sites in Azerbaijan.

A.4 Sector

- ☒ Energy supply
- ☐ Residential and Commercial buildings
- ☒ Agriculture
- ☐ Waste management
- ☐ Transport and its Infrastructure
- ☐ Industry
- ☐ Forestry
- ☐ Other <Pls enter Other text here>

A.5 Technology

- ☒ Bioenergy
- ☐ Energy Efficiency
- ☐ Hydropower
- ☐ Wind energy
- ☐ Carbon Capture and Storage
- ☐ Land fill gas collection
- ☐ Cleaner Fuels
- ☒ Geothermal energy
- ☒ Solar energy
- ☐ Ocean energy
- ☐ Low till / No till
- ☐ Other <Pls enter Other text here>

A.6 Type of action

- ☐ National/ Sectoral goal
- ☐ Strategy
- ☒ National/Sectoral policy or program
- ☐ Project: Investment in machinery
- ☐ Project: Investment in infrastructure
- ☐ Project: Other
- ☒ Other: Includes a pilot project based on renewable energy at an agro-energy complex, which will then be replicated at 5 other sites in Azerbaijan.

A.7 Greenhouse gases covered by the action

- ☒ CO_2
- ☒ CH_4
- ☒ N_2O
- ☐ HFCs
- ☐ PFCs
- ☐ SF_6
- ☐ Other <Pls add in text here>

B National Implementing Entity

B.1.0 Name	Azerbaijan State Agency of Alternative and Renewable Energy Sources
B.1.1 Address	40 Uzeyir Hajibeyov Street, Government House, Gate IV, Baku, Azerbaijan Republic, AZ1000

B.1.2 Contact Person	Jamil Malikov
Alternative Contact Person	<Pls enter Alternative Contact Person here>
B.1.3 Phone	(+99412) 493 72 75
Alternative Phone	<Pls enter Alternative Phone Number here>
B.1.4 Email	info@area.gov.az
Alternative Email	<Pls enter Alternative Email Address here>

+ Add Additional entity

C. Expected timeframe for the implementation of the mitigation action	
C.1 Number of years for completion	7 years
C.2 Expected start year of implementation	2014

D.1 Used Currency	USD
Conversion to USD	<to be filled automatically>

E Cost	
E.1.1 Estimated full cost of implementation	277,900,000
Conversion to USD	<to be filled automatically>
E.1.2 Comments on full cost of implementation	

Table 1 shows the likely sources of financial support for Phases 1 and Phase 2 of the NAMA. The cost estimate includes feasibility studies for the Samukh Complex and five other sites, construction and technical assistance for implementation of Samukh, and work on the normative and regulatory framework for renewables.

Proposed Budget and Requested Financing

	Million $ (exchange rate as of May 15, 2015)		
Activity	**Phase 1**	**Phase 2**	**Total**
Total implementation cost	**55.2**	**222.7**	**277.9**
Renewable energy capacity at Samukh	44.0	167.7	211.7
Feasibility studies, technical assistance, etc.	11.2	55.0	66.2
Total amount covered by state budget	**12.9**	**44.5**	**57.4**
NAMA implementation	11.0	44.5	55.5
Feasibility studies	1.9	TBD	1.9
Total amount from private sector	**11.0**	**44.5**	**55.5**
Total amount of support requested	**31.3**	**133.7**	**165.0**
Renewable energy capacity	TBD	TBD	TBD
Technology transfer support	TBD	TBD	TBD

Technical assistance: financial management system	TBD	TBD	TBD
Technical assistance: business management	TBD	TBD	TBD
Technical assistance: evaluation of lessons learned for replication	TBD	TBD	TBD
Technical assistance: revision to legal and regulatory norms	TBD	TBD	TBD

E.2.1 Estimated incremental cost of implementation 0.00
Conversion to USD <to be filled automatically>

E.2.2 Comments on estimated incremental cost of implementation
<Pls enter Comments here>

F Support required for the implementation of the mitigation action

F.1.1 Amount of financial support 165,000,000
Conversion to USD <to be filled automatically>

F.1.2 Type of required financial support

- ☐ Grant
- ☐ Loan (sovereign)
- ☐ Loan (Private)
- ☐ Concessional loan
- ☐ Guarantee
- ☐ Equity
- ☐ Carbon finance
- ☐ Other <Pls enter Other text here>

F.1.3 Comments on Financial Support <Pls enter Comments on Financial Support here>

F.2.1 Amount of Technological Support 0.00
Conversion to USD <to be filled automatically>

F.2.2 Comments on Technological Support <Pls enter Comments here>

F.3.1 Amount of capacity building support 0.00 $ (Dollars)
Conversion to USD <to be filled automatically>

F.3.2Type of required capacity building support

- ☐ Individual level
- ☒ Institutional level
- ☐ Systemic level
- ☐ Other <Pls enter Other text here>

F.3.3 Comments on Capacity Building Support <Pls enter Comments here>

F.4 Financial support for implementation required ☒
F.5 Technological support for implementation required ☒
F.6 Capacity building support for implementation required ☒

G Estimated emission reductions

G.1 Amount 0.116 – 0.584

G.2 Unit MtC02e/yr

G.3 Additional information (e.g. if available, information on the methodological approach followed):

The potential GHG emission reductions are estimated in the Long-range Energy Alternatives Planning tool and are based on the assumption that the following renewable energy capacity will be installed at the Samukh Complex:

Phase 1 will include development of 14.1 MW of installed electricity and heat capacity from renewable energy sources, including: A solar PV power plant with installed capacity of 6 MW (PV panels with 2.8 MW of generating capacity have already been installed); a biogas plant with 0.75 MW electric and 0.75 MW heat-generating capacity that will use cattle manure from the cattle-breeding and milk farms, together with vegetative waste from plantations, greenhouses, and processing facilities; a geothermal plant with 0.6 MW heat-generating capacity, used primarily to heat residential buildings, greenhouses, and farms. A feasibility study is in process; and a solar thermal plant with installed capacity of 6 MW.

Phase 2 foresees the development of an additional 21.25 MW electric-generating capacity and 41.65 MW heat-generating capacity from renewable energy sources, including: solar units with 14 MW electric-generating capacity and 32 MW heat-generating capacity; a biogas plant with 7.25 MW electric-generating capacity and 7.25 MW heat-generating capacity; and a geothermal installation with 2.4 MW heat-generating capacity

These facilities are expected to result in direct GHG emission reductions of 116,825 tCO_2e year by 2020. The potential additional emission reductions from replicating Samukh at 5 other sites are roughly estimated by multiplying year 2020 GHG emission reductions by 5. That is, additional GHG emission reductions would be 116,825 tCO_2e/year * 5 = 584,125 tCO_2e/year, which equals 4.21% of 2020 baseline GHG emissions from electricity and heat generation in Azerbaijan. However, this number is highly uncertain. SAARES has just initiated feasibility studies at the five other sites planned for replication. The GHG impact of the renewable energy NAMA will therefore depend on the success of the Samukh complex and on the technical feasibility of installing renewable energy capacity at the other sites.

The estimate does not yet include the potential GHG emission reductions that can be achieved by changing the regulatory and normative framework governing renewable energy, since the details of the proposed changes have not yet been agreed upon.

H.1 Other indicators of implementation <Pls enter Comments here>

I.1 Other relevant information including co-benefits for local sustainable development

Expected benefits of the NAMA include:

(i) increased agricultural production in the region, providing food and other agricultural products to the residents of Samukh and the city of Ganja;

(ii) creation of new jobs and addition of new sources of income in a region where job creation is slowing. According to the State Statistical Committee, 1,067 new permanent jobs were created in 2005 versus 308 permanent jobs in 2013, indicating a slower rate of job creation compared to other parts of the country.

(iii) indirect stimulation of agricultural development in the region, through creation of demand for processing of local food products (i.e., milk, fruit, poultry);

(iv) access to less expensive energy or other supporting products and services (livestock feed, technical and repair facilities, veterinary care, etc.);

(v) alleviation of some of the regional social, cultural, and environmental problems caused by lack of socioeconomic opportunity;

(vi) decreased urban flight of the younger generation and improved demographic stability in the region;

(vii) resettlement and re-employment of internally displaced persons from the Nagorno-Karabakh conflict area;

(viii) resolution of environmental problems related to agricultural waste and suboptimal use of water resources for irrigation;

(ix) increased food security through new domestic agricultural production that meets the demands of a growing population; and

(x) improved energy security through the development of domestic renewable energy resources to meet growing energy demand.

J Relevant National Policies strategies, plans and programmes and/or other mitigation action

J.1 Relevant National Policies In 2011, the President of the Republic of Azerbaijan set a target for alternative and renewable energy and directed SAARES to develop a strategy for meeting the target. The target specifies that 20% of electricity consumption by 2020 must come from electricity generated from renewable sources. In addition, by 2020 renewable energy sources must account for 9.7% of total energy consumption and 2,000 MW of renewable energy capacity must be installed. SAARES is charged with achieving the government's goals for increasing alternative and renewable energy sources and diversifying the economy. In December 2014, SAARES released its strategic plan for 2015–2018. The plan calls for (a) increasing renewable energy capacity, (b) modifying existing norms and regulations to provide incentives for the private sector to develop renewable energy sources, (c) developing and making available preferential loans, (d) increasing technical capacity, (e) improving institutional arrangements that support the tracking and evaluation of renewable energy, and (f) conducting education and outreach activities. According to the strategic plan, SAARES will construct 187 MW of wind, 369 MW of solar, 63 MW of bioenergy, and 116 MW of hydropower capacity between 2015 and 2018, totaling 735 MW of new alternative and renewable energy.

J.2 Links to other mitigation actions <Pls enter/select NAMA ID>

United Nations
Framework Convention on
Climate Change

K Attachments

K.1 Attachment description

K.2 File Browse

L Support received

L.1 From outside the Registry <Please enter text here>

L.2 From within the Registry

Source	Amount	Date

APPENDIX 5

NAMA Registry Submission Form

KAZ Energy Efficiency

United Nations
Framework Convention on
Climate Change

NAMA Seeking Support for Implementation

A Overview

A.1 Party Joint Stock Company (JSC) Institute of Power Development and Energy Savings, Ministry of Investment of Development (MID)

A.2 Title of Mitigation Action Developing a National Energy Efficiency Support System

A.3 Description of mitigation action

The NAMA supports the Government of Kazakhstan's efforts to encourage and create incentives for the adoption of energy efficiency measures across all sectors of the economy by improving the infrastructure for tracking, reporting, and evaluating progress on energy efficiency. JSC Institute of Power Development and Energy Saving will accomplish this by upgrading and enhancing the existing State Energy Registry (SER) of Kazakhstan and expanding it into an Energy Efficiency Support System (EESS). The EESS will be a user-friendly, web-based knowledge management platform. It will improve compliance by entities subject to reporting to SER under Kazakhstan's Energy Efficiency Law and will provide state decision-makers, the private sector, and other end-users with technical and financial information and tools to facilitate implementation of specific energy efficiency projects. Additionally, it will enable the Government of Kazakhstan to better measure and report on energy activities in both the public and private sectors, facilitating the country's shift toward a low-carbon development path that has the potential to be replicated throughout Central Asia.The resulting improvement in energy efficiency will avoid the combustion of fossil fuel for electricity and heat generation. This will result in reductions of three GHGs: carbon dioxide, methane, and nitrous oxide.

Phase 1 of the NAMA involves the development of a computerized on-line automated information system (AIS) for the SER that will replace the existing paper system and provide reporting and analytical capabilities for authorized users. During Phase 2, the SER will be expanded to the transport sector. Phase 3 involves transforming the on-line automated information system for the SER into a national EESS by adding to it an open-access web-based knowledge platform. Phase 4 involves expanding the EESS to include a commercial marketplace for energy efficiency-related goods and services. The goal is for this system to become financially viable and self-supporting in the long term, so that it will survive and be sustainable without outside support. Phase 4 also includes implementation of one to two pilot projects in one of the oblasts to test the effectiveness of the support provided by EESS for project implementation.

A.4 Sector

- ☐ Energy supply
- ☒ Residential and Commercial buildings
- ☐ Agriculture
- ☐ Waste management
- ☐ Transport and its Infrastructure
- ☒ Industry
- ☐ Forestry
- ☐ Other <Pls enter Other text here>

A.5 Technology

- ☐ Bioenergy
- ☒ Energy Efficiency
- ☐ Hydropower
- ☐ Wind energy
- ☐ Cleaner Fuels
- ☐ Geothermal energy
- ☐ Solar energy
- ☐ Ocean energy

☐ Carbon Capture and Storage ☐ Low till / No till
☐ Land fill gas collection ☐ Other <Pls enter Other text here>

A.6 Type of action
☐ National/ Sectoral goal
☐ Strategy
☐ National/Sectoral policy or program
☐ Project: Investment in machinery
☒ Project: Investment in infrastructure
☐ Project: Other
☐ Other: <Pls enter Other text here>

A.7 Greenhouse gases covered by the action
☒ CO_2 ☒ CH_4
☒ N_2O ☐ HFCs
☐ PFCs ☐ SF_6
☐ Other <Pls add in text here>

B National Implementing Entity

B.1.0 Name JSC Institute of Power Development and Energy Saving, Ministry of Investment and Development
B.1.1 Address Astana, Kazakhstan

B.1.2 Contact Person Serik Turchekenov, Acting President
Alternative Contact Person <Pls enter Alternative Contact Person here>
B.1.3 Phone +7 7172 988609
Alternative Phone +7 7172 968613
B.1.4 Email 1050@kazee.kz
Alternative Email s.turchekenov@mail.ru
+ Add Additional entity

C. Expected timeframe for the implementation of the mitigation action
C.1 Number of years for completion 12
C.2 Expected start year of implementation 2015

D.1 Used Currency USD
Conversion to USD <to be filled automatically>

E Cost
E.1.1 Estimated full cost of implementation 3,552,800
Conversion to USD <to be filled automatically>

E.1.2 Comments on full cost of implementation
JSC Institute of Power Development and Energy Saving estimates that implementation of the national energy efficiency support system NAMA will cost $3.553 million, of which $2.93 would come from international support as outlined in Table 1.

United Nations
Framework Convention on
Climate Change

Table 1: Cost of Implementing the NAMA to Develop a National Energy Efficiency Support System

Phase	State Budget ($)	International Support		Total ($)
		Cost ($)	Notes	
1	0	100,000	Design and deployment of SER automation	100,000
2	122,800	380,000	Technical assistance, capacity building	502,800
3	250,000	1,500,000	Technical assistance for web-based knowledge platform	1,750,000
4	450,000	750,000	Capacity building	1,200,000
Total	**822,800**	**2,730,000**		**3,552,800**

National public funds will be the initial source of financial support for the NAMA, at least during Phase 1. The Government of Kazakhstan requests financial support in the amount of $100,000 for the Phase 1 design, development, and deployment of the EESS. An additional $2,730,000 in financial support is requested for Phases 2 through 4. This includes targeted technical assistance for the on-line automated information system custodian and energy auditors; the sharing of best available technologies, benchmarking, and public awareness materials for the SER knowledge platform; and assistance with technical design and development of the energy registry and marketplace.

E.2.1 Estimated incremental cost of implementation 0.00
Conversion to USD <to be filled automatically>

E.2.2 Comments on estimated incremental cost of implementation
<Pls enter Comments here>

F Support required for the implementation of the mitigation action

F.1.1 Amount of financial support 2,730,000
Conversion to USD <to be filled automatically>

F.1.2 Type of required financial support

- ☐ Grant
- ☐ Loan (sovereign)
- ☐ Loan (Private)
- ☐ Concessional loan
- ☐ Guarantee
- ☐ Equity
- ☐ Carbon finance
- ☐ Other <Pls enter Other text here>

F.1.3 Comments on Financial Support <Pls enter Comments on Financial Support here>

F.2.1 Amount of Technological Support 0.00
Conversion to USD <to be filled automatically>

F.2.2 Comments on Technological Support <Pls enter Comments here>

F.3.1 Amount of capacity building support 0.00 $ (Dollars)
Conversion to USD <to be filled automatically>

F.3.2Type of required capacity building support
- ☐ Individual level
- ☒ Institutional level
- ☐ Systemic level
- ☐ Other <Pls enter Other text here>

F.3.3 Comments on Capacity Building Support <Pls enter Comments here>

F.4 Financial support for implementation required ☒
F.5 Technological support for implementation required ☐
F.6 Capacity building support for implementation required ☒

G Estimated emission reductions

G.1 Amount 0.0016

G.2 Unit MtC02e/yr

G.3 Additional information (e.g. if available, information on the methodological approach followed)

The estimate of direct GHG emission reductions includes avoided emissions from paper disposal (10 tCO_2e), printing (0.462 tCO_2e) and travel to deliver hard copies of the SER reports (1,596 tCO_2e), which comes to 1,606.5 tCO_2e annually.

The indirect emission reductions of this NAMA are potentially much greater than the direct reductions. However they are not quantified for this NAMA concept. JSC Institute of Power Development and Energy Saving will conduct further studies and surveys to determine the potential energy savings that can be attributed to the increased access to energy efficiency data versus those that will result from other energy efficiency measures implemented by the government.

H.1 Other indicators of implementation <Pls enter Comments here>

I.1 Other relevant information including co-benefits for local sustainable development

The following co-benefits are expected from the NAMA:

(i) Energy savings and energy security. Energy efficiency improvements will lead to reduced demand for energy, which in turn will reduce Kazakhstan's dependence on energy imports and decrease the strain from extraction of domestic hydropowercarbon reserves.

(ii) Health/air quality. Public health improvements will result from improved air quality when the energy and transport sectors become more efficient, use best-available technologies, and decrease the demand for extraction of Kazakhstan's hydropowercarbon resources.

(iii) Productivity and competitiveness. Promotion of energy efficient technologies through the SER knowledge platform and marketplace will improve companies' bottom lines and global competitiveness.

(iv) Policy setting. The SER streamlines the process of data gathering, management, and analysis. It also significantly improves access to statistical information on energy savings, energy effi-

ciency, and energy consumption, which is important for evaluating and setting national policy.

(v) Job creation. Investment in the energy sector and promotion of energy efficient technologies creates technical jobs with good compensation. The training programs implemented under Phase 3 will provide technical training to currently unskilled workers.

J Relevant National Policies strategies, plans and programmes and/or other mitigation action

J.1 Relevant National Policies

The Government of Kazakhstan has adopted a voluntary quantitative commitment to reduce GHG emissions by 15% by 2020 and 25% by 2050 (relative to a 1992 baseline). In 2012, Kazakhstan further revised this goal and declared its readiness to reduce emissions by 5% to 7% from the 2013 to 2020 period. The government's goal of limiting growth in GHG emissions is codified in many official strategy documents, most importantly in the 2013 Concept of Transition of the Republic of Kazakhstan to a Green Economy which among other items sets a goal of reducing the energy intensity of GDP by 10% by 2015, 25% by 2020, 30% by 2040, and 50% by 2050 (compared to the 2008 baseline).

In addition, the government has introduced several laws and programs to specifically promote energy efficiency, including the following:

(i) The Law on Energy Saving and Energy Efficiency Improvement (2012, with amendments in 2015);

(ii) The Law on Changes and Amendments to Legislative Acts of the Republic of Kazakhstan on Issues of Energy Saving and Energy Efficiency (2012, 2015);

(iii) National Complex Plan on Energy Saving (2011);

(iv) Program for Energy Saving 2020 (2013);

(v) Strategic Plan for the Republic of Kazakhstan's Development up to 2020 (2010);

(vi) Overall national plan on the implementation of the President's Message "Strategy Kazakhstan—2050" (2012);

(vii) Governmental Program of Forced Industrial and Innovative Development of the Republic of Kazakhstan for 2015–2019 (2014);

(viii) Program of Government Infrastructure Development "Nurly-Zhol" for 2015–2019 (2015); and

(ix) An additional 16 regional and three sectors plans and strategic plans of individual ministries to implement the above laws and programs

J.2 Links to other mitigation actions <Pls enter/select NAMA ID>

K Attachments

K.1 Attachment description

K.2 File Browse

L Support received

L.1 From outside the Registry <Please enter text here>

L.2 From within the Registry

Source	Amount	Date

APPENDIX 5

NAMA Registry Submission Form

KAZ Natural Gas for Transport

United Nations
Framework Convention on
Climate Change

NAMA Seeking Support for Implementation

A Overview

A.1 Party Joint Stock Company (JSC) KazTransGas

A.2 Title of Mitigation Action Fostering Use of Natural Gas in the Transport Sector

A.3 Description of mitigation action

The goal of this NAMA is to reduce GHG emissions and decrease air pollution by switching from gasoline and diesel to natural gas as a fuel for the transport sector. The NAMA will support the government's goal of increasing the use of Kazakhstan's cheap and clean natural gas for transport. It will do this by first developing the infrastructure to supply compressed natural gas (CNG) throughout the country and later also developing the infrastructure for liquefied natural gas (LNG). The national gas operator JSC KazTransGas will implement the NAMA by (i) constructing a network of 35 to 100 CNG fueling stations (CNGFSs); (ii) creating other infrastructure to enable a natural gas market in Kazakhstan (e.g., workshops for converting existing vehicles to CNG, testing and certification centers, training facilities); and (iii) extending natural gas to non-traditional transport areas. In addition to investment in specific sites and projects, the NAMA will enable development and implementation of a comprehensive program for natural gas fuel promotion, including a package of government support measures; formulation of technical and regulatory norms, protocols, or documents; and development of the necessary institutional and human capacity to support a switch to natural gas. The NAMA envisages 34 distinct activities that can be grouped into four main phases:

(i) Phase 1 (2014–2015): Pilot market infiltration in selected cities;

(ii) Phase 2 (2016–2018): Extending use of natural gas in transport to medium and small commercial players;

(iii) Phase 3 (2019–2020): Fuel switching in agriculture, construction, and other specialty vehicles; and

(iv) Phase 4 (2021–2025): Comprehensive market penetration.

Work on the NAMA has already begun, mainly focusing on a wide range of regulatory barriers, including technical norms and standards that must be updated to reflect current CNG refueling equipment, conversion techniques, and vehicles.

A.4 Sector

- ☐ Energy supply
- ☐ Residential and Commercial buildings
- ☐ Agriculture
- ☐ Waste management
- ☒ Transport and its Infrastructure
- ☐ Industry
- ☐ Forestry
- ☐ Other <Pls enter Other text here>

A.5 Technology

- ☐ Bioenergy
- ☐ Energy Efficiency
- ☐ Hydropower
- ☐ Wind energy
- ☐ Carbon Capture and Storage
- ☐ Land fill gas collection
- ☒ Cleaner Fuels
- ☐ Geothermal energy
- ☐ Solar energy
- ☐ Ocean energy
- ☐ Low till / No till
- ☐ Other <Pls enter Other text here>

A.6 Type of action

- ☐ National/ Sectoral goal
- ☐ Strategy
- ☒ National/Sectoral policy or program
- ☐ Project: Investment in machinery
- ☒ Project: Investment in infrastructure
- ☐ Project: Other
- ☒ Other: Support for conversion of vehicles to compressed natural gas and development of testing and training centers

A.7 Greenhouse gases covered by the action

- ☒ CO_2
- ☐ CH_4
- ☒ N_2O
- ☐ HFCs
- ☐ PFCs
- ☐ SF_6
- ☐ Other <Pls add in text here>

B National Implementing Entity

B.1.0 Name JSC KazTransGas
B.1.1 Address <Pls enter Address here>

B.1.2 Contact Person Arman Kasenov
Alternative Contact Person <Pls enter Alternative Contact Person here>
B.1.3 Phone +77172-55-23-34, ext 48 00
Alternative Phone <Pls enter Alternative Phone Number here>
B.1.4 Email kasenov@cng.kz
Alternative Email <Pls enter Alternative Email Address here>
+ Add Additional entity

C. Expected timeframe for the implementation of the mitigation action
C.1 Number of years for completion 12
C.2 Expected start year of implementation 2014

D.1 Used Currency USD
Conversion to USD <to be filled automatically>

E Cost
E.1.1 Estimated full cost of implementation 74,125,000
Conversion to USD <to be filled automatically>

E.1.2 Comments on full cost of implementation
Table 1 outlines expected funding sources, including the amount of support JSC KazTransGas expects to receive from international sources.

Table 1: Requested Funding for NAMA Implementation (USD)

				Including		
Phase	**Years**	**Description**	**Total cost**	**State Budget**	**Own Capital**	**International Support**

1	2014–2015	Pilot market infiltration	10,325,000	180,000	6,890,000	3,255,000
2	2016–2018	Extending CNG to medium and small commercial players	30,500,000	250,000	7,930,000	22,320,000
3	2019–2020	Fuel switching in agriculture, construction and other specialty vehicles	16,700,000	620,000	4,280,000	11,800,000
4	2021–2025	Comprehensive market penetration	16,600,000	630,000	4,000,000	11,970,000
Total			**74,125,000**	**1,680,000**	**23,100,000**	**49,345,000**

E.2.1 Estimated incremental cost of implementation 0.00
Conversion to USD <to be filled automatically>

E.2.2 Comments on estimated incremental cost of implementation
<Pls enter Comments here>

F Support required for the implementation of the mitigation action

F.1.1 Amount of financial support 49,345,000
Conversion to USD <to be filled automatically>

F.1.2 Type of required financial support

- ☐ Grant
- ☐ Loan (sovereign)
- ☐ Loan (Private)
- ☐ Concessional loan
- ☐ Guarantee
- ☐ Equity
- ☐ Carbon finance
- ☐ Other <Pls enter Other text here>

F.1.3 Comments on Financial Support <Pls enter Comments on Financial Support here>

F.2.1 Amount of Technological Support 0.00
Conversion to USD <to be filled automatically>

F.2.2 Comments on Technological Support <Pls enter Comments here>

F.3.1 Amount of capacity building support 0.00 $ (Dollars)
Conversion to USD <to be filled automatically>

F.3.2Type of required capacity building support

- ☐ Individual level
- ☒ Institutional level
- ☐ Systemic level
- ☐ Other <Pls enter Other text here>

F.3.3 Comments on Capacity Building Support <Pls enter Comments here>

F.4 Financial support for implementation required ☒
F.5 Technological support for implementation required ☒
F.6 Capacity building support for implementation required ☒

G Estimated emission reductions

G.1 Amount 7.8

G.2 Unit MtC02e/yr

G.3 Additional information (e.g. if available, information on the methodological approach followed):

The potential GHG emission reductions are calculated in the Long-range Energy Alternatives (LEAP) system and include both upstream and tailpipe GHG emissions resulting from the baseline and converted vehicles. The GHG emission reductions that can be achieved by this NAMA depend on the amount of refueling infrastructure to be constructed and the number and type of vehicles to be converted to natural gas. Since JSC KazTransGas is still conducting feasibility studies and market analyses to clarify these amounts, the estimate of potential GHG abatement presented is based on two different scenarios:

Scenario 1: All vehicle fleets under the control of JSC KazTransGas and its partners are converted to CNG by 2025; and

Scenario 2: Optimistic scenario where 8% of cars, buses and trucks are converted to natural gas by 2025. The estimated cumulative emission reductions are 14 $MtCO_2e$ by 2025.

H.1 Other indicators of implementation <Pls enter Comments here>

I.1 Other relevant information including co-benefits for local sustainable development

the NAMA is expected to create the following co-benefits:

(i) reduced local air pollution;
(ii) health co-benefits from reduced local air pollution;
(iii) increased energy security;
(iv) income and job generation;
(v) increased disposable income due to reduced fuel costs;
(vi) increased private enterprise in fields related to fuel switching and vehicle conversions;
(vii) accelerated turnover of outdated vehicle stock (e.g., through imports of original equipment manufacturer CNG vehicles); and
(viii) development of domestic CNG vehicle production capacity (eventually) with potential for exports.

J Relevant National Policies strategies, plans and programmes and/or other mitigation action

J.1 Relevant National Policies

The government of Kazakhstan has adopted a voluntary quantitative commitment to reduce GHG emissions by 15% by 2020 and 25% by 2050 (relative to a 1992 baseline). In 2012, Kazakhstan further revised this goal and declared its readiness to reduce emissions by 5% to 7% from the 2013 to 2020 period. The goal of limiting growth in emissions is codified in several official strategy documents, most importantly in the 2013 Concept of Transition of the Republic of Kazakhstan to a Green Economy. Among the key areas addressed in this concept is the creation of a "clean" transport system and the plan to bring natural gas infrastructure to regions such as Akmola and Karaganda Oblasts by 2020, and to North and East Kazakhstan by 2030. Specific plans for increasing the use of natural gas in transport are also included in the following existing and draft government strategies:

(i) National Program of Development and Integration of Transport Infrastructure of the Republic of Kazakhstan until 2020 (2014):

(ii) Plan of Action for Switching Transport Vehicles to Environmentally Friendly Types of Fuel and Creation of Relevant Infrastructure (under consideration by the government)

(iii) General Scheme of Gasification of the Republic of Kazakhstan to 2030 (2014)

(iv) National Program on Energy Saving—2020 (2013)

For example, the General Scheme of Gasificiation specifies that by 2020 the use of natural gas by public transport and public vehicles must be at least 30% in Astana and Almaty and at least 10% in other cities. By 2030 the share of natural gas must be at least 50% in Almaty and Astana and 30% in other regional cities. Other priorities put forth in the above documents include:

(i) creating incentives for mechanisms to accelerate vehicle stock turnover through the purchase of fuel-efficient vehicles with the goal of reducing fuel consumption by 30%;

(ii) using energy-efficient buses;

(iii) engaging in fleet renewal and modernizing railway locomotives;

(iv) designing measures to develop energy-efficient transport infrastructure for inclusion in national development programs;

(v) introducing Euro standards for road transport (Euro 4-2014; Euro 5-2015; and Euro 6-2020); and

(vi) adopting international standards for vehicle efficiency.

J.2 Links to other mitigation actions NS-124 NAMAs for Low-Carbon Urban Development in Kazakhstan

K Attachments

K.1 Attachment description

K.2 File Browse

L Support received

L.1 From outside the Registry <Please enter text here>

L.2 From within the Registry

Source	Amount	Date

APPENDIX 5

NAMA Registry Submission Form

UZB Small Hydropower

United Nations
Framework Convention on
Climate Change

NAMA Seeking Support for Implementation

A Overview

A.1 Party To be determined

A.2 Title of Mitigation Action Accelerating Deployment of Small-Scale Hydropower

A.3 Description of mitigation action

i. The goal of this NAMA is to accelerate and expand the development of small hydropower in Uzbekistan by supplementing governmental plans for implementation with analysis and comprehensive identification of steps to accelerate that implementation. This includes clarifying the institutional arrangements governing small hydropower; modifying the tariff structure to incentivize investment; improving technical skills for evaluating, planning, and constructing small hydropower plants (SHPs); and introducing measures to accelerate the utilization of public and private capital to finance planned hydropower capacity. In addition, the NAMA includes a component to invest in the rehabilitation of three existing small hydropower plants or construction of 19 new facilities, based on the priorities set forth in the Ministry of Agriculture and Water Resources' proposed Program for Hydropower Development (to be approved in 2015). The specific activities proposed for the NAMA include:

(i) Analysis of institutional issues and elaboration of suggestions to optimize the institutional structures related to the development of small hydropower;

(ii) A comprehensive study of legal issues, primarily the problems of ownership of hydropower generating assets or other impediments to private investment, and development of solutions;

(iii) Clarification of the dispatch of hydropower and development of the means to provide potential investors with assurance that their electricity will be purchased as long as it is economically viable;

(iv) Analysis and development of a proposal introducing a special tariff for small hydropower production;

(v) Consideration of incentives for importing small hydropower equipment and specific steps to promote its domestic production, if viable;

(vi) Developing proposals for attracting foreign and domestic private investment to the sector;

(vii) Education, training and capacity building in the field of small hydropower, including curriculum development, student exchange and study abroad programs, and targeted workshops and conferences;

(viii) Development of an updated atlas of small hydropower potential in Uzbekistan; and

(ix) Investment in the construction and modernization of small hydropower plants.

For this NAMA, small hydropower is defined as hydropower plants with installed capacity of less than 30 MW. The acceleration of the rehabilitation and construction of these plants in Uzbekistan will avoid the use of fossil fuel-based electricity generation, thereby decreasing greenhouse gas emissions.

A.4 Sector

- ☒ Energy supply
- ☐ Residential and Commercial buildings
- ☐ Agriculture
- ☐ Waste management
- ☐ Transport and its Infrastructure
- ☐ Industry
- ☐ Forestry
- ☐ Other <Pls enter Other text here>

A.5 Technology

- ☐ Bioenergy
- ☐ Energy Efficiency
- ☒ Hydropower
- ☐ Wind energy
- ☐ Carbon Capture and Storage
- ☐ Land fill gas collection
- ☐ Cleaner Fuels
- ☐ Geothermal energy
- ☐ Solar energy
- ☐ Ocean energy
- ☐ Low till / No till
- ☐ Other <Pls enter Other text here>

A.6 Type of action

- ☐ National/ Sectoral goal
- ☐ Strategy
- ☒ National/Sectoral policy or program
- ☐ Project: Investment in machinery
- ☐ Project: Investment in infrastructure
- ☐ Project: Other
- ☐ Other: <Pls enter Other text here>

A.7 Greenhouse gases covered by the action

- ☒ CO_2
- ☒ CH_4
- ☒ N_2O
- ☐ HFCs
- ☐ PFCs
- ☐ SF_6
- ☐ Other <Pls add in text here>

B National Implementing Entity

B.1.0 Name Ministry of Agriculture and Water Resources
B.1.1 Address <Pls enter Address here>

B.1.2 Contact Person <Pls enter name of Contact Person here>
Alternative Contact Person <Pls enter Alternative Contact Person here>
B.1.3 Phone <Pls enter Phone Number here>
Alternative Phone <Pls enter Alternative Phone Number here>
B.1.4 Email <Pls enter Email Address here>
Alternative Email <Pls enter Alternative Email Address here>
+ Add Additional entity Uzbekenergo

C. Expected timeframe for the implementation of the mitigation action
C.1 Number of years for completion 16
C.2 Expected start year of implementation 2015

D.1 Used Currency USD
Conversion to USD <to be filled automatically>

E Cost
E.1.1 Estimated full cost of implementation 728,650,000

Conversion to USD <to be filled automatically>

E.1.2 Comments on full cost of implementation

The cost estimate provided with this NAMA is preliminary, as it is based on Ministry of Agriculture and Water Resources' draft Program for Development of Small Hydropower.

Table1 : Cost of Implementing the NAMA to Accelerate Small Hydropower

	Cost ($ million)		
Activity	**State Budg-et**	**International Support**	**Total**
Construction of 19 new SHPs	499.38	80.92	580.3 (including 326 for equipment)
Rehabilitation of three existing SHPs	146.80		146.80
Research, analysis, training, and education		1.55	1.55
Total	**646.18**	**82.47**	**728.65**

Note: SHP = Small hydropower plant

In its current form, the Ministry of Agriculture and Water Resources program envisions construction of 19 new small hydropower plants with a total installed capacity of 210 MW and a cost of $580.3 million (including $326 million for equipment) and rehabilitation of three existing HPPs at the cost of $146.80 million. This adds up to a total cost of $728.65 million.

Included in this total is foreign investment sought by the Ministry of Agriculture and Water Resources in the amount of $80.92 million to finance construction of the first three new SHPs on the list. The other measures in this NAMA (i.e., research, analysis, training, and education) have a combined cost of $1.55 million. Funds to cover this cost are requested from international sources in the form of technical assistance and capacity building

E.2.1 Estimated incremental cost of implementation 0.00

Conversion to USD <to be filled automatically>

E.2.2 Comments on estimated incremental cost of implementation

<Pls enter Comments here>

F Support required for the implementation of the mitigation action

F.1.1 Amount of financial support 82,470,000

Conversion to USD <to be filled automatically>

F.1.2 Type of required financial support

- ☐ Grant
- ☐ Loan (sovereign)
- ☐ Loan (Private)
- ☐ Concessional loan
- ☐ Carbon finance
- ☐ Other <Pls enter Other text here>

☐ Guarantee
☐ Equity

F.1.3 Comments on Financial Support <Pls enter Comments on Financial Support here>

F.2.1 Amount of Technological Support 0.00
Conversion to USD <to be filled automatically>

F.2.2 Comments on Technological Support <Pls enter Comments here>

F.3.1 Amount of capacity building support 0.00 $ (Dollars)
Conversion to USD <to be filled automatically>

F.3.2Type of required capacity building support
☐ Individual level
☒ Institutional level
☒ Systemic level
☐ Other <Pls enter Other text here>

F.3.3 Comments on Capacity Building Support <Pls enter Comments here>

F.4 Financial support for implementation required ☒
F.5 Technological support for implementation required ☐
F.6 Capacity building support for implementation required ☒

G Estimated emission reductions

G.1 Amount 40.87

G.2 Unit MtC02e/yr

G.3 Additional information (e.g. if available, information on the methodological approach followed):

The potential GHG emission reductions are calculated in the Long-range Energy Alternatives (LEAP) system and includes emissions from both fuel production and combustion. If all three existing small hydropower plants are rehabilitated and the proposed 19 new facilities are constructed, the NAMA will result in emission reductions of 40.87 $MtCO_2e$ per year by 2030 and cumulative total emission reductions of 540 $MtCO_2e$ by 2030.

H.1 Other indicators of implementation <Pls enter Comments here>

I.1 Other relevant information including co-benefits for local sustainable development

Implementation of the NAMA will produce the following co-benefits:

(i) reduced emissions of local air pollutants and associated negative health effects;

(ii) increased energy security;

(iii) enhanced quality, sustainability, and operational maneuverability of power supply;

(iv) growth in agricultural production and food processing resulting from a more stable supply of energy;

(v) increased food security and supply of raw materials;

(vi) creation of new jobs and reductions in local unemployment;

(vii) improved technical capacity for local developers and operators of small hydropower plants;

(viii) maximum use of local resources and labor and minimal reliance on imports; and

(ix) increased income and quality of life for the local population.

J Relevant National Policies strategies, plans and programmes and/or other mitigation action

J.1 Relevant National Policies

On May 5, 2015, the President of Uzbekistan, I. Karimov, signed resolution #2343 "On the Program of Measures to Lower Energy Intensity and Implement Energy Efficient Technologies and Systems in the Economy and Social Sphere from 2015 to 2019." The resolution stresses the importance of renewable energy and approves a wide-ranging Road Map of 33 activities that must be undertaken in order to achieve the stated goals. Item #20 of the Road Map requests the Ministry of Economy, the Ministry of Finance, the Ministry of Agriculture and Water Resources, Uzbekenergo, and the design institute Hydropowerproject to develop the State Program for Development of Hydropower for 2016-2020. The program must be approved by the end of of 2015. Existing drafts of the program, foresee construction of 76 new HPPs with a total generating capacity of 2,512 MW and rehabilitation of 33 existing HPPs that would increase their capacity to 1,973 MW.

In addition, in Spring 2015, a new Program for Development of Small Hydropower during 2015–2030 was developed by the Ministry of Agriculture and Water Resources and is going through the appraisal process within the government. This new program provides for the construction of 19 SHPs with a total capacity of 210 MW and requires investment of $727.2 million. With passing of the Resolution 2343 and approval of the road map, this program will become a part of the wider program of hydropower development for 2016–2020.

J.2 Links to other mitigation actions <Pls enter/select NAMA ID>

K Attachments

K.1 Attachment description

K.2 File Browse

L Support received

L.1 From outside the Registry <Please enter text here>

L.2 From within the Registry

Source	Amount	Date