ESTABLISHMENT OF AN ECO CLEAN ENERGY CENTER (CECECO)

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION (UNIDO)

ECONOMIC COOPERATION ORGANISATION (ECO)

Baseline and Needs Assessment Report

Final

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ABBREVIATIONS

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board (Pakistan)
ANREP	National Renewable Energy Policy
ANSA	Afghan National Standards Authority
AREC	Association of renewable energy of Kazakhstan
ARTF	Planning and Capacity Support Project of the Afghanistan Reconstruction Trust Fund
CDC	Coordination and Dispatching Center
CECECO	ECO Clean Energy Centre
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CLASP	Collaborative Labeling and Appliance Standards Programme
DABS	Da Afghanistan BrishnaSherkat
DFID	Department for International Development
DSM	Demand-side management
EBRD	European Bank for Reconstruction and Development
ECO	Economic Cooperation Organization
EE	Energy efficiency
EES	Energy Sector Strategy
EI	Energy intensity
EME	Energy, Minerals and Environment
EMRA	Energy Market Regulatory Authority (Turkey)
EPC	Energy performance contract
EPIAS	EnerjiPiyasalarıİşletme A.Ş.
EU	European Union
EXIST	Energy Exchange Istanbul
FEC	Fuel and Energy Complex
FiT	Feed-in tariff
GBAO	Gorno-BadhakshanAutonomous Region
GDI	Gender Development Index
GEF	Global Environment Facility
GHG	Greenhouse gas
GII	Gender Inequality Index
GN-SEC	Global Network of Regional Sustainable Energy Centres
HCI	Human Capital Index
HDI	Human Development Index
HVAC	Heating, ventilation, and air conditioning
IIEA	International Eco Academy
JICA	Japan International Cooperation Agency

LLDC	Landlocked developing country
MENR	Ministry of Energy and Natural Resources
MEW	Ministry of Energy and Water
MRRD	Ministry of Rural Development
MS	Member states
MTOE	Million tons of oil equivalent
MUD	Ministry of Urban Development
NDS	National Development Strategy
NEECA	National Energy Efficiency & Conservation Authority
NEPRA	National Electric Power Regulatory Authority
NGO	Non-government organization
PPP	Public-private partnership
PPPP	Pamir Private Power Project
R&D	Research and development
RE	Renewable energy
REC	Sub-regional economic communities
RISE	Regulatory Indicators for Sustainable Energy
S&L	Standards and labelling
SDG7	Sustainable Development Goal 7
SECO	State Secretariat for Economic Affairs
SEFF	Sustainable Energy Efficiency Financing Facility
SERI	Sharif Energy Research Institute
SME	Small and Medium-sized Enterprises
SPPRSD	State Program on Poverty Reduction and Sustainable Development
STEM	Science, technology, engineering, and mathematics
SWOT	Strengths, weaknesses, opportunities, threats
TEIAS	Turkish Electricity Transmission Company
TFEC	Total final energy consumption
TPES	Total primary energy use
TTF	Thematic Trust Fund
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organisation
WBL	Women, Business and the Law index
WEF	World Economic Forum
WHO	World Health Organization

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EXECUTIVE SUMMARY

Econoler was commissioned by the United Nations Industrial Development Organisation (UNIDO) to work in close collaboration with the Economic Cooperation Organisation (ECO) on the preparatory steps for establishment of the Clean Energy Centre for the Economic Cooperation Organisation (CECECO). The preparatory steps include a regional baseline assessment of ECO countries' energy sector and needs analysis of the CECECO. The baseline and needs assessment report has been accomplished by: conducting a situation analysis of the region, analysing the challenges and opportunities in the RE/EE sector, completing a stakeholder needs analysis, and completing a strengths, weaknesses, opportunities, threats (SWOT) analysis of the current regional support framework. Local consultants based in each of the countries in the ECO region completed national analyses that highlighted the results of interviews, desk research, and questionnaires filled out by key informants drawn from all sectors – public, private, international and non-governmental organisations. Information from the national analyses were then synthesized and analysed by our international team.

Situation analysis

The ECO region forms a contiguous bloc and a natural link between Asia and Europe, and member states have strong historical and cultural linkages as part of the Silk Route. The ECO region faces several important energy issues that limit economic development as well as health and wellness outcomes. Brief key energy statistics are shown in Table 1.

Table 1: Key Statistics of the ECO Region

Energy Themes	Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Energy Production and Subsidies										
Net Oil/Gas Exporters		●	●	●					●	●
Net Oil Importers	●				●	●	●	●		
Availability of significant subsidies for electricity and oil products			●	●		●			●	
Integration of renewable energy (RE) resources										
Country has an up-to-date RE Target		●	●	●		●	●	●	●	
Share of RE in TFEC is lower than global average (18%)		●	●	●				●	●	●
Existence of EE Policies										
EE target	●	●	●		●	●	●	●		
S&L for electric appliances			●	●	●	●		●		●

The largest population centre in the region is Pakistan with 207 million inhabitants, followed by Turkey (82 million) and Iran (81.8 million). Together these three countries represent 75% of the approximately 489 million total inhabitants in the ECO region, as of the end of 2019. The climate of the region varies widely as do energy consumption patterns, with seasonal peaks in some cases following cooling needs and in others the heating season. In general, countries in the region have succeeded in bringing stable electricity supplies to their urban areas. However, seven of the ECO region countries experience some degree of energy inaccessibility or instability in rural areas. In the period from 2000 to 2016, a general trend towards reduction of energy intensity is observed, with significant progress made by the most intense countries – Turkmenistan and Uzbekistan.

Despite the overall wealth of energy resources in the ECO region, which includes large oil and gas reserves and substantially developed hydroelectric generating potential, at least half of countries in the region experience electricity supply shortfalls on a regular basis. Seven ECO region countries have current targets for the development of renewable energy. Most countries in the ECO region include some type of goals or targets for energy efficiency, but these vary significantly in scope and objective.

Assessment of Gender and Energy

Policies, laws, traditions and gender roles are a hindrance to gender equality in the energy sectors in all of ECO countries. All countries have one or more laws preventing women from working in the same industries as men (either targeting specific industries or preventing women from occupying hazardous or “morally inappropriate” jobs). Most ECO countries are aware of the gender inequality that prevails towards energy and climate and have implemented policies to overcome this challenge. Much efforts however need to be deployed to deconstruct gender cultural and traditional roles and to improve women’s socioeconomic situations to enable their empowerment through a transition to a green economy. The gender roles and socioeconomic conditions affecting women’s relations with energy (as consumers and as economic participants in the energy value chain) in the ECO region may be broken down in four interconnected points: (1) the lack of decision-making power of women; (2) women’s lower economic status preventing them from accessing clean and reliable energy sources; (3) women’s energy consumption shaped by their domestic role; and (4) the gender segregation of the labour market that prevents them from accessing the green economy.

The report identifies two main needs to ensure women are included in the green economy. First, for women as energy consumers, there is a strong need to better understand intra-household needs and help introduce clean energy technologies that benefit all members of households and societies without leaving women behind. Second, for women to play an active role in the energy value chain, there is a need for decision-makers to ensure that women are not prevented from accessing the opportunities linked with future energy developments by legal frameworks, gender roles, or socioeconomic conditions in the ECO region.

Analysis of Challenges/Barriers and Drivers/Opportunities in the RE/EE Sector

Common legal and policy barriers highlighted by the exercises conducted in each country by a dedicated country team include: a lack of comprehensive legislation including sanctions/enforcement of energy efficiency (EE); a weak or missing regulatory framework and/or customs policy; and inconsistent sub-national implementation structures. Economic and financial barriers included: a lack of dedicated financing schemes; high levels of investor uncertainty; high costs of financing; and low electricity tariffs. Technical barriers included a range of technical human resource challenges, data and knowledge barriers, and the challenges posed by a lack of technical standards in the region. Knowledge and awareness challenges included: a lack of public awareness of RE and EE; a lack of promotion efforts by governments; and limited science-related publications available.

Legal and policy related enabling factors and drivers highlighted by country exercises included: stated government interest to make use of EE and RE; membership in important regional bodies; targets for RE, EE or energy intensity are in place; measures to strengthen the legislative framework have in many cases been started; and there exist a large number of intergovernmental organisations in the region available to support further changes. Economic and financial enabling factors include opportunities to specialize in specific RE technologies, international donor support for national strategies; growing consumer awareness; and specific cases of reduced duties. Technical enabling factors include: RE and EE potential has largely been mapped out; developments towards unification of the electricity system, and many low-hanging EE fruit.

Mapping Relevant Stakeholders and their Priority Needs related to RE/EE

Regional cooperation has the potential to support efforts to overcome many of the key barriers highlighted, and to take advantage of the most prominent enabling factors. A large variety of stakeholders can also support those efforts, and many expressed needs and priority interests that could be supported. Priority needs expressed by public sector organisations included capacity building, financial instruments to improve return on investment, improvements to energy security, policy development, and tariff design. Regional intergovernmental organizations emphasized the importance of supportive policies for energy efficiency and renewable energy, and environmental protection, as both high priority needs and opportunities of interest. The chief needs cited by stakeholders from the non-government organization (NGO) sector are for capacity building and financial support for energy efficiency and renewable energy. Feedback from private sector stakeholders shows few consistencies across countries, but a high degree of consistency within countries. Policy development is the only priority named by stakeholders in more than one country. Donor organizations emphasized policy development, institutional development within governments, and technology development as the priority needs and opportunities in the ECO region.

Ongoing Regional Initiatives

Table 2 highlights ongoing and recent clean energy initiatives in ECO countries, analysis of those initiatives highlights the following key issues: few multicounty EE/RE initiatives - EE/RE is not addressed in a cohesive regional approach; demand-side projects are the category of project mostly implemented in the region; initiatives focusing on gender equality and energy have been indexed, showing that gender equality is a concern for ECO countries and international development partners.

Table 2: RE/EE Projects and Programme Mapping in ECO Countries

Category of RE/EE Project	Multi-Country/Sub-Regional Initiatives	Number of Initiatives in ECO Countries										
		Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan	Total All Countries
Policy Development	3	1	2	3	6	3	3	3	0	2	3	**26**
Financial Initiatives	3	0	0	4	1	3	4	3	10	0	1	**26**
Centralised Power Supply	1	1	0	3	0	1	1	3	1	0	3	**13**
Decentralised Power Supply	2	2	1	1	0	2	2	2	1	0	0	**11**
Demand-side Management	2	0	3	8	2	3	4	6	7	6	4	**43**
Gender and Green Economy	0	1	0	9	2	3	1	2	2	0	0	**20**

1 to 2 projects
3 to 5 projects
More than 5

Strengths, Weaknesses, Opportunities and Threats

Institutional strengths focussed on government will to implement the required changes to regulation and legislation and collaboration and support from international organisations, with strong agreement among several countries. At the same time, weaknesses noted by most countries also highlighted the insufficiency of the same policy and regulatory frameworks. Technical strengths included project modernizing ageing infrastructure, favourable tariffs, and the renewable energy resource potential. Few countries mentioned knowledge strengths, but several countries mentioned knowledge-based weaknesses. Half of the countries in the region mentioned the lack of technical capacity and opportunities for training, potentially highlighting the quality of training that is available. Several countries highlighted economic and financial weaknesses. These focussed on a lack of economic incentives including the lack of dedicated funds and low electricity prices.

Institutional and political opportunities and threats show divergence among countries, with some country teams finding few if any opportunities to highlight. Specific threats to regional integration were highlighted including challenges moving between countries, energy security issues and the varied pace of the introduction of RE in the region. Several technical opportunities were noted by a diversity of countries. The strong potential for RE in the region specifically for electricity production was noted, with a strong regional potential for cross-border trade to improve stability of supply and encourage renewable integration throughout the region. A lack of recycling facilities in the region for e-waste was highlighted by the international team as a regional issue but not by any country teams.

Few countries noted knowledge opportunities. The most cited was the development of research and development (R&D) opportunities for RE followed by the existence of trained experts who are working abroad. Few countries mentioned environmental and social threats. Those that did focussed on ongoing climate change impacts – reduction of glaciers and changes to reservoir working capacities. Regionally, the strong reliance on a few transboundary water sources was noted to have the potential to heighten the challenge of ensuring water security for many countries in the region. Many of the central Asian countries noted the economic and financial opportunity posed by the development of the market and resulting increased cost competitiveness. This was the economic and financial opportunity with the most agreement. For several countries in the region the continuing existence of fuel subsidies were noted as an ongoing potential threat if not reduced in an orderly manner.

Conclusion

The results of the baseline and needs assessment clearly demonstrate the need for a regional centre to support cooperation in the field of clean energy. Despite significant differences among the member states, clearly defined needs and priority areas of intervention have been reported by key stakeholders and highlighted by this study. Priority needs identified in multiple sectors across the region include capacity-building, financial instruments, policy development support, institutional development and regional technology development. These five areas of intervention would be relevant to multiple sectors across all the countries in the region and could serve as the focus for the centre’s initial actions and initiatives.

INTRODUCTION

The United Nations Industrial Development Organisation (UNIDO), in partnership with sub-regional economic communities/organisations (RECs) and their members states (MS), has been developing for the past 10 years the Global Network of Regional Sustainable Energy Centers (GN-SEC), an innovative south-south and triangular multi-stakeholder partnership to accelerate the energy and climate transition in developing countries via the establishment of sub-regional sustainable energy promotion centres. The GN-SEC now counts six operating centres and three centres are in the preparatory phase.

The Economic Cooperation Organization (ECO)[1] is a regional intergovernmental organisation encompassing diverse member countries from Europe, the Caucasus, Central Asia, the Middle East, and South Asia, whose populations count more than 460 million inhabitants and whose geographies span over eight million square kilometres. Among the overall ECO objectives are the promotion of conditions for sustainable development in the region and intensification of mobilisation of natural resources, in particular energy resources. Over the past few years, ECO has been undergoing an energy cooperation paradigm shift toward energy efficiency (EE) and renewable energy (RE). ECO Vision 2025, recently endorsed by ECO Ministers, stipulates the enhancement of energy security and sustainability through wider energy access and trade as ECO's strategic objective. The establishment of the ECO Clean Energy Centre (CECECO), as part of the GN-SEC, is explicitly referred to as one of the region's clean energy goals.

The assignment involves the delivery of two main deliverables: (1) a baseline and needs assessment (BNA) report, and (2) a feasibility study report. The BNA report aims to provide a clearer understanding of ongoing activities related to clean energy in the ECO region and assess the regional needs that could be met through the establishment of a clean energy centre. The methodology involved partnerships with local experts covering each ECO country; they completed detailed national situation analyses with results gathered from a range of key stakeholders. The BNA report first provides a regional and national situation analysis, then analyses the barrier and opportunities in the RE/EE sector, maps the relevant existing initiatives and stakeholders' priority and needs related to EE/RE. Finally, a strength, weaknesses, opportunities and threat (SWOT) analysis of the transition to green energy is provided for the ECO region.

The BNA report will inform the feasibility study report (delivered in March 2020). The feasibility study report will structure the establishment of the CECECO including its institutional and technical design, scope of mandate, result framework, human resources needed, indicative budget and financial mobilisation strategy.

[1] The ECO region includes Afghanistan, Azerbaijan, Iran, Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan.

1 METHODOLOGY

The project started with a kick-off meeting involving Econoler, ECO and UNIDO on August 21st, 2019. Subsequently, meetings were held individually with team members in various countries to orient local teams and start the work. The main aspect of the methodology – the collaboration with local consultants and steps for performing the analyses – are presented in this section.

1.1 Collaboration with Local Consultants

A high-level methodology was used to develop and prepare the baselines and needs assessments as depicted in Figure 1.

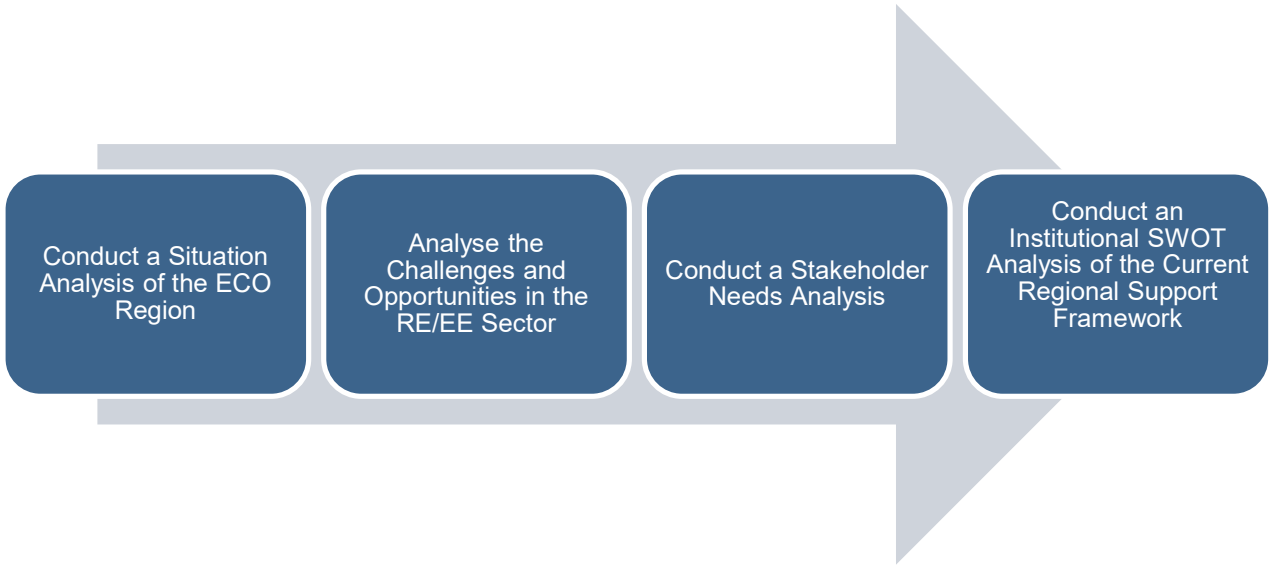

Figure 1: Baseline and Needs Assessment Methodology

The development of the baselines and needs assessments was strongly supported by local experts utilising their substantial professional contacts and expert knowledge of their respective countries. Econoler had local field presence in all targeted countries (see list of local consultants' names and designated countries in Appendix I). Experts covering Central Asian countries[2], Azerbaijan and Afghanistan were supervised by a regional coordinator. While each local expert had flexibility to complete the assignment in the manner that was most relevant to their particular circumstance, in general, the steps performed in each country are represented in Figure 2.

[2]Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

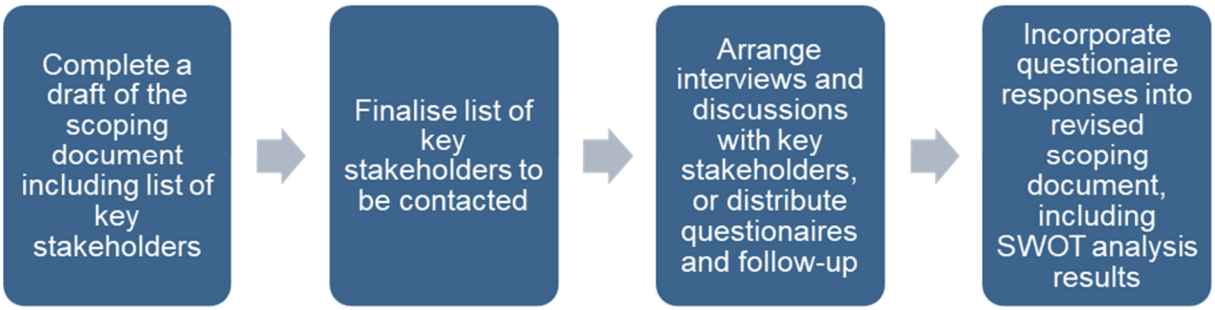

Figure 2: Steps Completed by Local Consultants in Each Country

1.2 Steps for Performing the National Analyses

The Scoping document was divided into four parts as follows:

1 **National Energy Profile:** Includes an extensive literature review to highlight current issues and recent events (including existing market surveys and analyses of the private sector), an overview of the energy supply and consumption patterns of the region and major variations, RE and EE potential contribution in tackling the various challenges associated with energy, water, food, the environment, and climate, gender status in the RE/EE sector.

2 **Barriers to the Penetration of EE/RE in Different Sectors:** Covers information gathering about the RE/EE issues faced in the private, public, and residential sectors, as well as an assessment of regional cooperation potential and how economies of scale can be achieved in the region. Includes the enabling factors and barriers faced by the private sector and industrial businesses in the RE market. This item will support the process of determining how regional cooperation can help overcome some of the barriers and achieve economies of scale.

3 **Stakeholder Analysis:** To carry out this analysis, an adaptation of the questionnaire provided by UNIDO was used to hold well-structured conversations with various important public and private RE and EE stakeholders. They mostly relied on personal contacts and official letters to secure interviews with well-placed representatives from public, private and non-governmental organisations. The information obtained helped develop an inventory listing and summarise the planned, ongoing, and completed RE/EE programmes and projects in the region, along with possible areas of cooperation among existing projects and programmes with potential opportunities to achieve synergies both within and outside the region.

A total of 139 questionnaires were sent in the 10 targeted countries and 69 questionnaires were filled through in-depth interviews. The local consultants completed their analysis with their own knowledge and through other means of communications. In the end, the assessment of stakeholder's priorities and needs towards EE/RE covers 125 stakeholder organisations throughout the targeted countries (Section 4.1). The completed scoping documents were analysed by Econoler's international team and the information therein fed into this baseline and needs assessment.





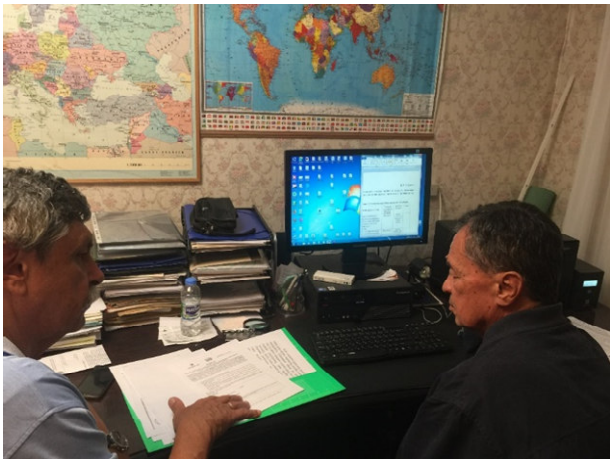

Figure 3: Local Experts Completing Questionnaires with key Informants

2 SITUATION ANALYSIS

The situation analysis covers the regional overview of the energy sector in the ECO region, a regional assessment of gender equality and social inclusion with regards to the energy sector and a country-by-country energy and climate situation analysis.

2.1 Regional Overview of the Energy Sector

The countries in the ECO region are socially, politically diverse and endowed with a wide range of natural resources. The region forms a contiguous bloc and a natural link between Asia and Europe, and member states have strong historical and cultural linkages as a result of the Silk Route. The ECO region encompasses seven[3] landlocked developing countries (LLDCs) that face specific trade and development challenges arising from a lack of territorial access to the sea and geographical remoteness from international markets.SDG7 targets LLDCs as countries where special effort needs to be deployed to expand infrastructure and upgrade technology for the supply of modern and sustainable energy services for all.[4] The ECO region faces several important energy issues that limit economic development as well as health and wellness outcomes. These are summarised in Table 3 and the bullet points below and discussed in more detail throughout this section.

Regional Energy Issues

- Energy access in rural areas is consistently unstable despite widespread improvements in energy accessibility since 2013.
- Many electricity grids are old and inefficient, with high losses. Note that, since 2010, Azerbaijan and Turkey both made significant progress improving the condition of their electrical infrastructure.
- Urbanisation and rising living standards are causing increased demand for electricity, gas, food, and water in many countries of the region. This issue is a direct outcome of countries expanding energy access and economic development.
- Lack of access to electricity in rural communities significantly increases the domestic workload typically performed by women. Electric cooking, dishwashing and clothes washing equipment would substantially reduce time spent on domestic work, thereby creating value and new opportunities for women.
- Water is a strategic risk across many countries in the region to agriculture, power generation, and human use. The region has experienced diminished water resources as a result of conflict or climate change.

[3]Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.
[4] Sustainable Development Goal 7, target 7.b.

Table 3: Matrix of Energy Themes by Country

Energy Themes	Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Energy Intensity (EI)										
EI higher than global average (5 MJ/USD)			●	●	●				●	●
EI equal to or lower than global average (5 MJ/USD)	●	●				●	●	●		
Energy Production and Subsidies										
Net oil/gas exporters		●	●	●					●	●
Net oil importers	●				●	●	●	●		
Availability of significant subsidies for electricity and oil products			●	●		●			●	
Integration of RE Resources										
Country has an up-to-date RE target		●	●	●		●	●	●	●	
Share of RE in total final energy consumption (TFEC) is higher than global average (18%)	●				●	●	●			
Share of RE in TFEC is lower than global average (18%)		●	●	●				●	●	●
Existence of EE Policies										
EE targets[5]	●	●	●		●	●	●	●		
Standards and labelling (S&L) for electric appliances			●	●	●	●		●		●
EE building code		●	●	●	●	●	●	●		
Main Energy Issues										
Urbanisation and economic development are increasing demand for electricity, gas, food, and water			●	●	●	●	●			●
Energy access in rural areas is unstable.	●			●	●	●	●		●	●
Electricity grids are old and inefficient, with high losses (more than 25%)	●			●	●	●	●			●
Electricity supply regularly falls short of demand	●		●[6]	●	●	●	●			●

[5]Include demand and supply-side efficiency opportunities, as well as sectoral approaches.
[6] According to Iran's Ministry of energy, the electricity supply only falls short during the summer period due to increase of HVAC demand. It is not something regular.

2.1.1 Population, Climate, and Economy

The largest population centre in the region is Pakistan with 207 million inhabitants, followed by Turkey (82 million) and Iran (81.8 million). These three countries combined represent 75 percent of the approximately 489 million inhabitants in the ECO region as of the end of 2019. The climate of the region varies widely because it stretches from the Persian Gulf to the Mediterranean Sea and extends into the high mountains of Central and South Asia. Incomes and levels of human development also vary widely across the region. Five member states are classified as upper-middle income according to World Bank method, while two are lower income and three are lower-middle income. Two countries are ranked low on the Human Development Index, while four are ranked medium and four are ranked high. These statistics are summarised in Table 4.

Table 4: Population, Climate, and Development by Country

Country	Population	Climate	Income Category	Human Development Index (HDI)[7]
Afghanistan	38 million	Continental climate. Highly variable due to mountainous topography	Low	Low: 0.498 (Rank 168)[8]
Azerbaijan	9.9 million	Continental influenced climate with warm summer and cold, dry winters	Upper middle	High: 0.757 (Rank 80)
Iran	81.8 million	Hot, dry climate characterised by long summers and short, cool winters	Upper middle	High: 0.798 (Rank 60)
Kazakhstan	18.5 million	Continental, extremely dry, with cold winters and hot summers	Upper middle	High: 0.800 (Rank 58)
Kyrgyz Republic	6.4 million	Continental with cold winters, warm summers, sometimes very hot at low altitudes, but cooler in the mountains	Lower middle	Medium 0.672 (Rank 122)
Pakistan	207 million	Temperate with high mountains in the north	Lower middle	Low 0.562 (Rank 150)
Tajikistan	9.1 million	Sharply continental climate. Varies, due to the country's mountainous topography.	Lower middle	Medium 0.650 (Rank 127)
Turkey	82 million	Quite temperate, with significant differences in climatic conditions from one region to the other	Upper middle	High 0.579 (Rank 64)
Turkmenistan	6 million	Continental and very dry	Upper middle	Medium 0.706 (Rank 108)
Uzbekistan	32 million	Continental with hot summers and cool winters	Lower middle	Medium 0.710 (Rank 105)

[7]UNDP (2018f), 'Human Development Indices and Indicators'. Retrieved from: http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf
[8] Rank is out of 189 countries. World HDI value in 2019 was 0.728.

Five countries in the ECO region – Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, and Uzbekistan – are experiencing population shifts from rural areas to urban centres accompanied by increasing demand for energy, food, and water. New energy demand is driven mainly by improved access to electricity in urban areas and wider adoption of cooling and refrigeration technologies.

2.1.2 Energy Access and Affordability

In general, countries in the region have succeeded in delivering stable electricity supply to urban areas. Most countries report widespread electricity access and minimal energy security issues, except for Pakistan and Afghanistan.[9] However, these statistics mask pockets of poor access, particularly in rural parts of Central Asia where seasonal energy shortages and unstable grid connections are common. For example, in parts of the Gorno-Badhakhshan province of Tajikistan, extreme mountainous geography means that certain rural communities do not have access to reliable electricity, such as the Bartang Valley and Murghab.[10]

Seven ECO region countries experience some degree of energy inaccessibility or instability in rural areas. There are several major causes of this issue. Some countries with the largest hydroelectric resources – Tajikistan and the Kyrgyz Republic – face high seasonal variability in river flows, which results in excess electricity supplies in the wetter spring and summer months, and regular supply shortfalls in the drier fall and winter. In Kazakhstan, the Kyrgyz Republic, and Pakistan, ageing transmission and distribution infrastructure leads to electricity losses as high as 40 percent, contributing to blackouts and grid instability for rural areas. Harsh weather is another challenge for establishing stable electricity supplies in remote mountain communities.

Another key issue is energy affordability. The Regulatory Indicators for Sustainable Energy scorecard (RISE) defines affordability in terms of household spending on electricity, estimating that those who spend more than five percent of their expenditures to purchase 30 kWh of electricity find their energy costs to be unaffordable. Particularly where electricity is the dominant heat source during winter months, energy costs can constitute significant portions of household budgets and cause hardships and health issues. Without widespread awareness of energy efficiency options, common coping techniques include poorly heated living spaces and heating only individual rooms.

[9] ESMAP Official Website (2019), “Tracking SDG 7”, retrieved from: https://trackingsdg7.esmap.org/. Latest data show 100% for all countries except for Pakistan (71%) and Afghanistan (98%).
[10] From questionnaire results and first-hand experience of local experts. For Tajikistan, this also appears in data for 2017, where the electrification rate dips from 100% in 2016 to 99% in 2017. See ESMAP (2019).

2.1.3 Energy Intensity

There is wide variation in energy intensity between countries in the ECO region that includes some of the most and least energy intensive countries in the world.[11] Figure 4 demonstrates the range of energy intensity across the ECO region. Energy intensity measures how a unit of energy benefits the economy.[12] When a country reduces wasted energy, it becomes more efficient and this lowers its energy intensity (EI).

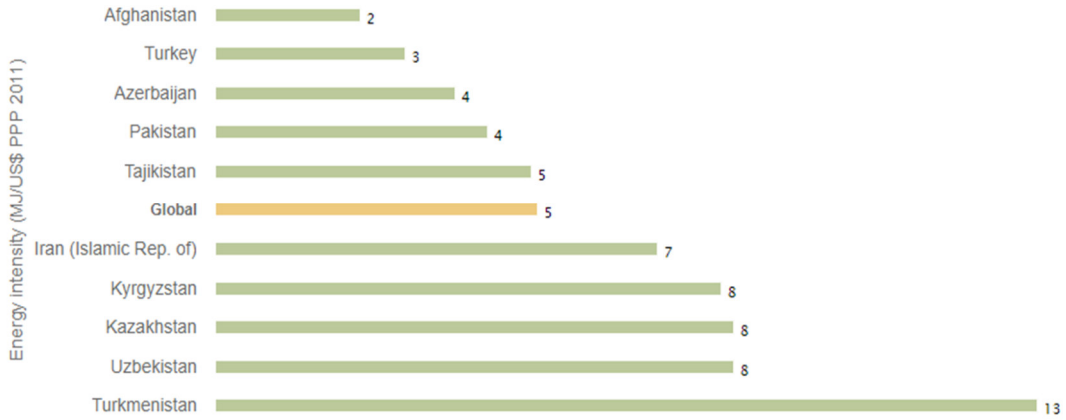

Figure 4: Energy Intensity by Country

The progress made by each country in the ECO region since 2000 in reducing energy intensity is illustrated in Figure 5. A general trend toward energy intensity reduction is observed, with significant progress made by the most intense countries – Turkmenistan and Uzbekistan. A slight upward trend is observed for Iran and Afghanistan, with Kyrgyzstan and Kazakhstan remaining relatively flat over the period in question. Only Kazakhstan indicates a slight upward trend from 2014 to 2016, while all other countries are either stagnant or decrease in energy intensity during this period.

[11] ESMAP (2019). Based on 2016 data, which are the most recent available for all countries in the region.
[12] EI is calculated by taking the ratio of total primary energy use (TPES) (all of the fuels and flows that a country uses to get energy) to GDP.

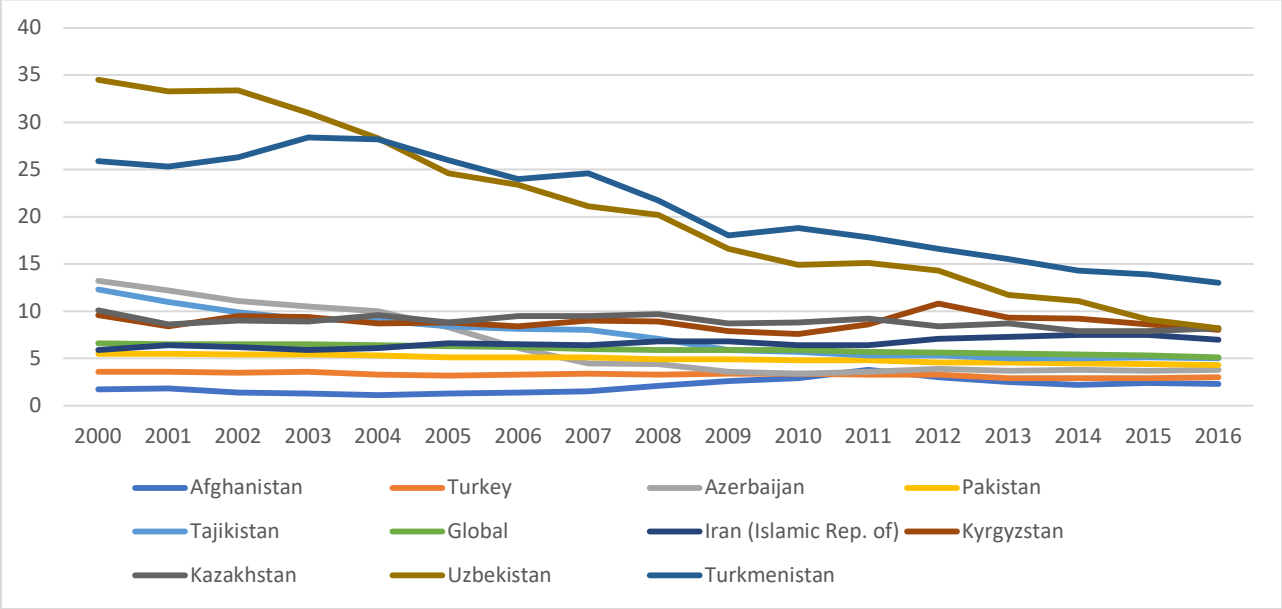

Figure 5: Energy Intensity of ECO Region Countries, 2000-2016

As shown earlier in Table 3, ageing and inefficient electricity generation, transmission, and distribution infrastructure is a common feature across the ECO region. Seven countries[13] experience grid losses greater than 25 percent. This creates further challenges to energy accessibility and stable energy supply, particularly where reduced flows at hydroelectric generating stations and increased heating loads during the winter season create shortfalls in electricity supply. Iran and Pakistan are less reliant on hydroelectric generation[14], but highly inefficient electricity infrastructure is a primary cause of blackouts and energy instability in these countries. Electricity demand is rising steeply in both countries – driven by cooling and refrigeration loads – further stressing electricity supply.

2.1.4 Energy Production and Subsidies

The region is rich in natural resources, especially in oil, gas, and minerals, however each country benefits from varying amounts of these resources. Azerbaijan, Iran, Kazakhstan, Turkmenistan, and Uzbekistan are oil and gas exporting countries. Energy products from these countries dominate exports from the region, with a gradual decrease in their importance over the past 15 years caused by decreasing oil prices and US-European Union sanctions against Iran. Pakistan, Turkey, Afghanistan, the Kyrgyz Republic, and Tajikistan are all net oil importers that benefitted from the drop in oil prices.[15]

[13]Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan.
[14] Share of hydroelectricity in Iran is 11% (Iran Ministry of Energy, 2020) and around 28% in Pakistan (International Hydropower Association, 2016).
[15] SADFAR, Muhammad (2017), "Economic Cooperation Organization: Fifteen Years of Cooperation and Development (2000-2015), ECO Economic Review". p. 83.

The availability of energy subsidies also varies greatly by country. Iran, Kazakhstan, Pakistan, and Turkmenistan provide significant subsidies for electricity and oil products. Meanwhile, electricity and fuel prices in Turkey generally reflect market prices, except for lifeline electricity tariffs.

Despite the overall wealth of energy resources in the ECO region, which includes large oil and gas reserves and substantially developed hydroelectric generating potential, at least half the countries experience electricity supply shortfalls on a regular basis. Electricity supply shortfalls are closely related to two other themes that are not noted above: inefficient electricity infrastructure, increasing energy demand and weather variation. The main causes of electricity shortfalls differ by country: Iran and Uzbekistan have very high energy intensity caused by a steep increase in energy demand[16], whereas Tajikistan and the Kyrgyz Republic are exposed to seasonal variability of hydroelectric production between the wetter spring-summer and the dry fall-winter. Meanwhile, Pakistan is developing electricity generation and transmission infrastructure with the goal of providing universal access to electricity but simultaneously faces a steep increase in electricity demand.

2.1.5 Renewable Energy Sources and Targets

The share of RE in the total final energy consumption of each country for the year 2016 – the latest for which data are available for all countries – is summarised in Figure 6. The Kyrgyz Republic and Tajikistan have a very high share of RE as part of their generation mix, mainly because of large hydroelectric generation facilities. At the other end of the spectrum, countries such as Azerbaijan, Iran, Kazakhstan, Turkmenistan, and Uzbekistan have very little RE as a share of their electricity. This is changing in Iran where large new RE projects offer significant electricity supply potential. Turkey has also achieved substantial progress in recent years and is on track to meet its 2023 RE development goals for solar, geothermal, and biomass energy.

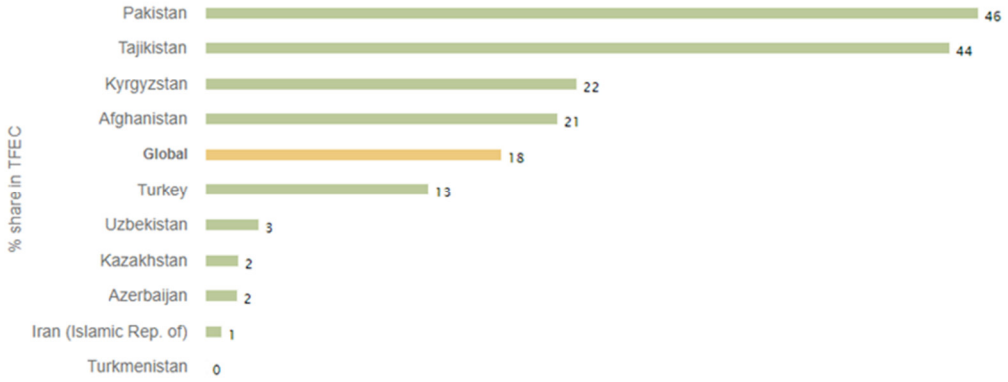

Figure 6: Share of Renewable Energy in Total Final Energy Consumption (%)

[16] CMS (2016) "Renewable Energy in Iran". Available online: http://www.satba.gov.ir/suna_content/media/image/2017/02/5196_orig.pdf?t=636219021775330000

Seven ECO region countries have current targets for the development of RE. Four countries – Azerbaijan, Kazakhstan, Turkey, and Tajikistan – specify targets for RE technologies (such as solar, wind, and small hydroelectricity). Iran, Pakistan, and Tajikistan have overall RE targets that are not specified by technology or sector.[17]

2.1.6 Energy Efficiency Policies and Targets

Most countries in the region have established policies that support the efficient use of energy through appliance labelling, building codes, and electric system efficiency. Labelling schemes for refrigerators, heating, ventilation, and air conditioning (HVAC), as well as lighting are prevalent across five countries – Iran, Kazakhstan, the Kyrgyz Republic, Turkey, and Uzbekistan – although labelling is required by law only in Iran. Pakistan supports labelling for HVAC on a voluntary basis. Seven countries support EE as part of their building codes for new commercial buildings. However, only Iran and Azerbaijan require developers to meet minimum code requirements by law. No consistent data were available regarding code enforcement. Afghanistan, Turkmenistan, and Uzbekistan do not include EE in their national commercial building codes. Four countries – Iran, Pakistan, Turkmenistan, and Uzbekistan – encourage or require electric utilities to implement EE as a part of their transmission and distribution mandates.

Most countries in the ECO region include some type of goals or targets for energy efficiency (EE), but these vary significantly in scope and objective. For example, Afghanistan has goals to transition to high-efficiency lighting technologies and ensure that new buildings are built in compliance with building energy codes; Azerbaijan has a target of improving the efficiency of its electricity generating facilities by 7.6 percent; the Kyrgyz Republic has an economy-wide target of reducing energy intensity by 30 percent. Other countries, such as Kazakhstan, have greenhouse gas (GHG) emission reduction targets but no clear EE targets (these were not included as EE targets in Table 3).

2.1.7 Overall Regional Progress on Energy

Based on the regulatory indicators for all ten countries in the ECO region and their progress over the past few years, some progress can be discerned. Regulatory Indicators for Sustainable Energy (RISE) is a World Bank project that gathers indicators from countries around the world to help compare national policy and regulatory frameworks for sustainable energy.[18] RISE scores reflect a snapshot of a country's policies and regulations in the energy sector, organised by three pillars: Energy Access, Energy Efficiency and Renewable Energy. The overall 2013 and 2017 RISE scores of ECO countries are shown in the figure below. The country name is highlighted in a colour reflecting the overall score, green scored above 67 points (out of 100), orange countries between 34 and 66, and red were below 33. Each country score is a sum of results based on each pillar – medium blue on the left of the bar represents a country's score on Energy Access, light blue shows Energy Efficiency, and dark blue the score for Renewable Energy. Most countries exhibit steady growth over the five-year period, with two exceptions. Pakistan and Uzbekistan both made significant advancements, each gaining more than 20 points according to

[17]ESMAP, Country profiles. Retrieved from: https://rise.esmap.org/countries
[18]ESMAP Official Website (2017), "Regulatory Indicators for Sustainable Energy". Retrieved from: https://rise.esmap.org/indicators.

the RISE methodology. No ECO region country experienced a decline in their RISE score over this period.

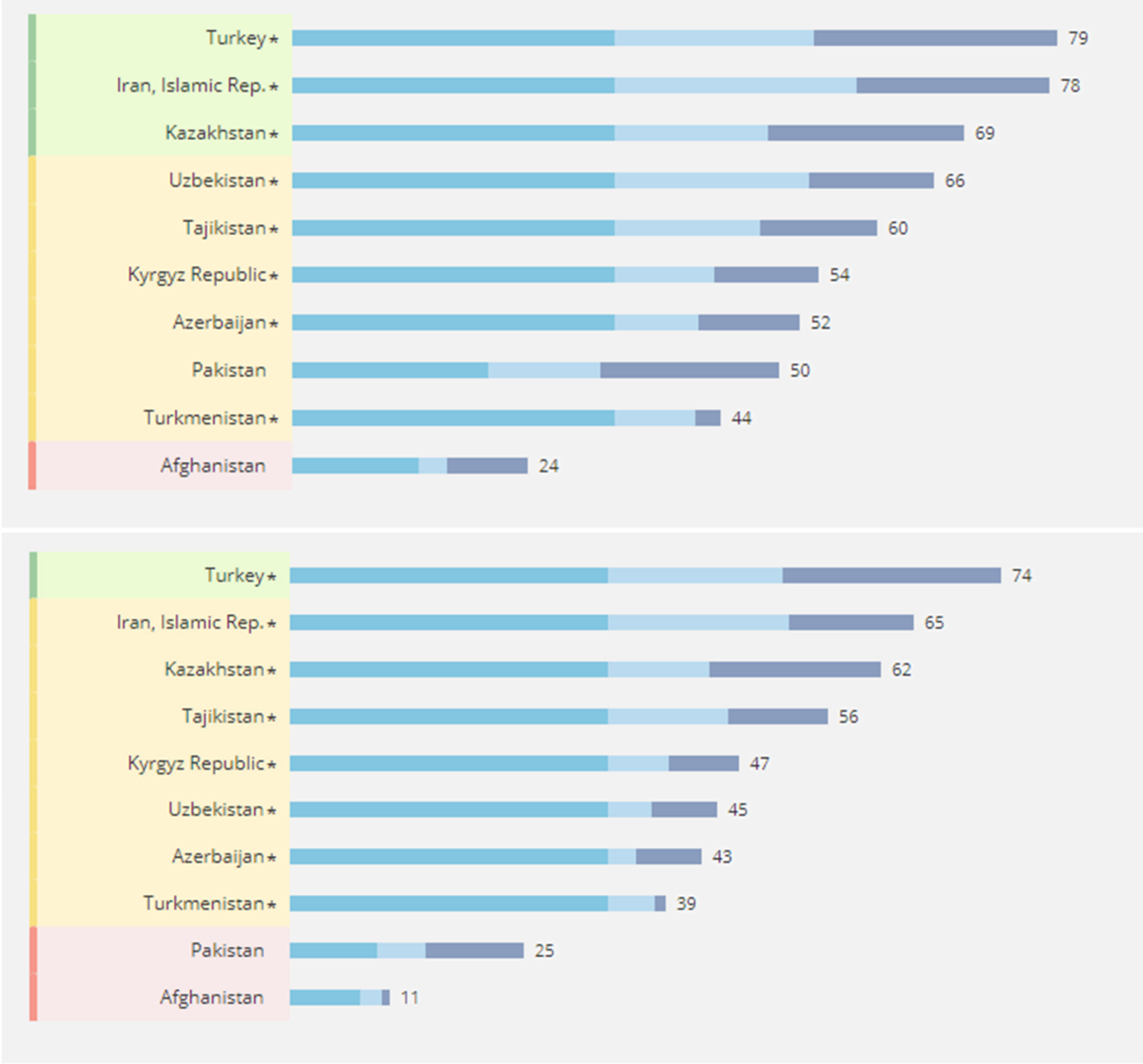

Figure 7: RISE Scores for 2013 (Above) and 2017 (Below)

Despite widespread improvements in energy accessibility and the development of EE and RE over the 2013-2017 period, the ECO region is currently facing several important energy issues that limit economic development, health, and wellness outcomes. Some of these issues will be aggravated by continued increases in energy access and economic development, while others will be ameliorated.

- Energy access in rural areas is consistently unstable despite widespread improvements in energy accessibility since 2013;
- Many electricity grids are old and inefficient, with high losses. Note that, since 2010, Azerbaijan and Turkey both made significant progress in improving the condition of their electrical infrastructure;
- Urbanisation and rising living standards are causing increased demand for electricity, gas, food, and water in many countries of the region. This issue is a direct outcome of countries expanding energy access and economic development;
- Lack of access to electricity in rural communities significantly increases the domestic workload typically performed by women. Electric cooking, dishwashing, and clothes washing equipment have the potential to substantially reduce time spent on domestic work, thereby creating value and new opportunities for women;
- Water security poses a strategic risk for agriculture, power generation, and human use across many countries in the region. Diminished water resources, as a result of conflict or climate change, will strain food and power production for many countries in the region.

2.2 Regional Gender Equality and Social Inclusion Assessment of the Energy Sector

EE/RE initiatives can play an important role in providing access to energy, creating new economic opportunities, strengthening livelihoods and improving health, safety and quality of life. EE/RE technologies are, however, not gender-neutral because of a wide range of factors such as cultural gender norms, women's and men's differentiated access to institutions, their relations in households and communities. Therefore, their opportunities to access and benefit from these technologies differ. Gender equality and social aspects must therefore be considered not only because of such potential for creating far-reaching benefits but also because it facilitates the adoption of new technologies. The gender and social assessment is a key element in ensuring that gender equality and social aspects are included as a transversal objective into the components of any EE/RE technical assistance. We suggest an approach that will involve addressing two analysis levels simultaneously, as described below.

- **Analysis Level 1: Gender Equality Situation at the Regional and National Level** to provide a general gender and social analysis of the 10 countries
- **Analysis Level 2: Energy Sector Level** to look at the differentiated needs of women and social dynamics within the energy sector as consumers and as actors of the energy value chain

Conducting a gender assessment is a lengthy and holistic exercise that requires primary data collection. The objective of this section is to provide indications on gender equality in the region but should not be considered a complete regional study on gender and energy.

2.2.1 Gender Equality Situation at the Regional and National Level

The regional and national level analysis of gender equality starts with an assessment of the main gender equality indicators in the ECO countries, then provides an evaluation of the policy and regulatory framework and finally presents existing national policies covering the topic of gender and energy or climate.

Main Gender and Social Indicators

The main indicators for gender equality and social development are provided in Table 5 below. They include:

- Country support for the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW);
- Three United Nations Development Programme (UNDP) indicators:[19] the Human Development Index (HDI); Gender Inequality Index (GII); and Gender Development Index (GDI);
- A new World Bank Group indicator, the Human Capital Index (HCI)[20], which uses factors on quality of education and health to assess the human capital that a child born today can expect to attain by age 18;
- Other data to assess women's access to decision-making positions, education, and their status in the household;
- Certain indicators were classified by world country groups to indicate a ranking.

The table depicts a region where countries have high disparities with regard to human development and gender equality. The GII factors attest that women's status in at least half of the region's countries is precarious and challenging with regard to reproductive health (maternal mortality ratio and adolescent birth rate), empowerment (females with at least a secondary education, female share of parliamentary seats) and the labour market (female labour force participation rate). Four countries have GDI values that classify them as "low equality" countries due to significant disparities in women's access to health and education as well command over economic resources compared to men. The low share of seats occupied by women in parliament and the labour force in a majority of countries indicates that women encounter several barriers to act as decision-makers and to enter and stay on the job market.

[19]UNDP (2018f).
[20]World Bank Group (2018e), 'The Human Capital Project'. Retrieved from: https://openknowledge.worldbank.org/bitstream/handle/10986/30498/33252.pdf?sequence=5&isAllowed=y

Table 5: Overview of Gender and Social Aspects and Indicators in the ECO Region

Gender Aspects and Indicators	Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Support for CEDAW	Ratified in 2003	Ratified in 1995	Neither ratified/ signed	Ratified in 1998	Ratified in 1997	Ratified in 1996	Ratified in 1993	Ratified in 1985	Ratified in 1997	Ratified in 1995
HDI[21]	Low: 0.498 (Rank 168)	High: 0.757 (Rank 80)	High: 0.798 (Rank 60)	High: 0.800 (Rank 58)	Medium: 0.672 (Rank 122)	Low: 0.562 (Rank 150)	Medium: 0.650 (Rank 127)	Medium: 0.579 (Rank 64)	Medium: 0.706 (Rank 108)	Medium: 0.710 (Rank 105)
GII[22]	0.575	0.321	0.492	0.203	0.381	0.547	0.377	0.305	N/A	0.303
GDI[23]	0.723	0.940	0.874	0.998	0.959	0.745	0.798	0.924	N/A	0.938
Share of seats in parliament occupied by women (%)[24]	23.6	16.8	5.9	27.1	19.2	20.2	20.0	17.4	24.8	16.4
HCI	0.39	0.60	0.59	0.75	0.58	0.39	0.53	0.63	N/A	N/A
Female labour force (% of female population ages +15)[25]	49	63	17	65	48	24	28	33	53	53

[21] The HDI world value in 2019 is 0.728. HDI is a statistic composite index of life expectancy, education, and per capita income indicators.
[22] The GII world value in 2019 is 0.441. The GII measures gender inequalities in three important aspects of human development: reproductive health, empowerment and labour market. It ranges from 0 (gender equality in all three dimensions) to 1 (gender inequality in all dimensions).
[23] The GDI measures gender inequalities in the achievement of three dimensions of human development: health, education and command over economic resources. It is the ratio of female-to-male Human Development Index (HDI) values.
[24] Inter-Parliamentary Union (IPU) Official Website 'Women in National Parliament', <http://archive.ipu.org/wmn-e/world.htm>, accessed January 2nd, 2020.
[25] World Bank Group data.

Gender Aspects and Indicators	Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Proportion of female heads of households[26] (%)	2	25	12	33	27	11	21	12	n/a	22
Mean years of schooling by gender[27]	Female: 1.9Male: 6.0	Female: 10.2 Male: 10.8	Female: 9.9 Male: 10.1	Female: 11.9 Male: 11.7	Female: 11.0 Male: 10.8	Female: 3.8 Male: 6.5	Female: 10.1 Male: 11.2	Female: 6.9 Male: 8.4	Female: N/A Male: N/A	Female: 11.3 Male: 11.8

1st World Country Group
2nd World Country Group
3rd World Country Group
4th World Country Group

[26]UNDESA (2017c), 'Household Size and Composition around the World - Data Booklet'. Retrieved from: https://www.un.org/en/development/desa/population/publications/pdf/ageing/household_size_and_composition_around_the_world_2017_data_booklet.pdf
[27]World Bank Group data.

Policy and Regulatory Framework

The Women, Business and the Law (WBL)[28] index measures how a country's regulatory framework affects women throughout their adult lives. It is a good indicator of the challenges women may face when entering the labour market, accessing financing, and becoming economically empowered. The country scores (out of 100) are presented in the table below. The ECO country global scores WBL Index indicates that all countries have discriminatory laws toward women for activities such as going places, starting a job, getting paid, getting married, having children, running a business, and managing assets.

Table 6: Discriminatory Legal Framework Toward Women

Countries	WBL Index	Laws Affecting Women's Participation in the Energy Value Chain				
		Women can travel outside the home in the same way as men	Women can travel outside the country in the same way as men	Existence of sexual harassment legislation in employment	Women can work in the energy sector the same way as men	Women can register a business in the same way as men
Afghanistan	38.13	No	Yes	Yes	Yes	Yes
Azerbaijan	78.75	Yes	Yes	Yes	No	Yes
Iran	31.25	No	No[29]	No[30]	Yes	Yes
Kazakhstan	75.63	Yes	Yes	No	No	Yes
Kyrgyzstan	76.88	Yes	Yes	Yes	No	Yes
Pakistan	46.25	Yes	No	Yes	Yes	No
Tajikistan	81.88	Yes	Yes	No	No	Yes
Turkey	79.38	Yes	Yes	Yes	Yes	Yes
Turkmenistan[31]	N/A	Yes	Yes	No	Yes	Yes
Uzbekistan	70.63	Yes	Yes	No	Yes	Yes

[28] World Bank Group (2018k), 'Women, Business and the Law'. Retrieved from: https://wbl.worldbank.org/
[29] The Passport Law Art. 18(3), passport application form and Civil Code Art. 1108 refrain women to apply for a passport and to travel outside the country in the same way as a man. The Iranian Ministry of Energy provides opportunities for female staff to travel for work. In 2018, women from the MOE conducted missions of about 750 person-day in foreign countries.
[30] Iran is in the process adopting a law banning violence against women and children but has yet to adopt a legislation on sexual harassment in employment.
[31] Econoler – Local Consultant (2019)

Looking more closely at existing laws that may prevent women from participating in the energy value chain (as employees or entrepreneurs), we notice that women do not have equality of movement outside their home in two countries, and they do not have equal access to travel outside the country in two countries (which is often required when working in the energy sector). Regarding the workplace, three countries have no legislation on sexual harassment and four countries have one or more laws preventing women from working in the energy sector in the same way as men. The Kazakh Government is determined to remove jobs from the list of jobs prohibited to women.[32] Regarding the opportunity for women to register a business, only one country treats men and women differently. These inequitable legal frameworks prevent women from participating in socio-economic dynamics, which in turn hinders the economic development of ECO countries. The policy and regulatory frameworks are, however, not the only factor for gender inequality. Traditional beliefs and gender roles are indeed a major hindrance to moving forward with women's rights and empowerment. ECO countries are aware of the gender inequality that prevails towards energy and climate and have implemented policies to overcome this challenge.

[32]2017-2019 Action Plan of the National Commission on Women's Affairs.

Table 7: Existing National Gender and Energy/Climate Policy Framework

Country	Policy Framework	Main Stakeholder in Charge of Gender Affairs
Afghanistan[33]	› Women affairs technical working group to be led by Ministry of Women Affairs is part of the stakeholders involved in implementing the National Renewable Energy Policy (ANREP). › The Energy Sector Strategy (EES) and Action Plan call for (1) gender mainstreaming in the policies of the energy sector, (2) special attention to gender issues in providing energy to rural areas.	Ministry of Women Affairs
Azerbaijan	› The State Program on Poverty Reduction and Sustainable Development, 2008-2015 (SPPRSD)[34] covers promotion and protection of gender equality as one of its strategic goals and gender issues are prioritised in the labour market and employment. The SPPRSD targets an increase in the representation of women in decision-making. The CEDAW has praised it for fully incorporating a gender perspective. › The Government has taken measures to challenge prevalent gender stereotypes related to the choice of jobs and to encourage girls and women to seek education and training in non-traditional fields.[35]	State Committee for Family, Women and Children
Iran	› Article 20 of the Constitution of Iran provides all men and women of the country with “equal protection of the law and all human, political, economic, social and cultural rights in conformity with Islamic criteria.” Article 21, the only article in the Constitution explicitly mentioning women’s rights, provides that “[t]he government must ensure the rights of women in all respects, according to the Islamic criteria.” Thus, Article 21 “strictly limits women’s rights according to the principles of Islam . . . [and ensures] that every dialogue about women’s rights must be understood in its religious context”.[36] › According to a memorandum of understanding between the Vice Presidency for Women and Family Affairs and the Ministry of Energy, promoting not only the role of women in managing and sustaining vital water and energy resources, but also women’s awareness and knowledge have all been considered.	Vice Presidency for Women and Family Affairs

[33]MURTAZA ERSHAD, Ahmad (2017), 'Institutional and Policy Assessment of Renewable Energy Sector in Afghanistan', *Journal of Renewable Energy,* 2017 (Article ID 5723152), 10 p.
[34]'State Program on Poverty Reduction and Sustainable Developmentin the Republic of Azerbaijan for 2008-2015', (September 15, 2008).
[35]Government of Azerbaijan (2019h), 'Report of the Implementation of the Beijing Declaration and Platform for Action '. Retrieved from: https://www.unwomen.org/en/csw/csw64-2020/preparations.
[36] Hammed Shahidian, *Women in Iran: Gender Politics in the Islamic Republic* 109 (Greenwood Press 2002)

Country	Policy Framework	Main Stakeholder in Charge of Gender Affairs
	› Under Article 101 of the Sixth Development Plan, all executive agencies are obliged to meet the objectives of Article 10, Article 20 and Article 21 of the Islamic Republic of Iran's Constitution, the 20-year vision document, general policies of the Sixth Development Plan and the general policies of the family plan in order to determine the primary indices of gender equity based on reinforcement of the institution of the family, women's status, legal and religious rights of women in all areas and special attention to the constructive roles of women. The purpose is to adopt the approach of gender equity based on Islamic principles in polices, programs and plans of agencies and to investigate decisions based on the indexes announced by the Women and Family Headquarters. › Under Article 101 and Article 102 of the Sixth Development Plan and Clause 4 of Article 8, all societal pivots are rooted in the manner of approaching the status of women and families. Article 101 concerns gender equity and Article 102 focusses on policy-making for women and families along with the policies announced by the Supreme Leader. Discourse analysis of gender equity within the Sixth Development Plan indicates that the dominant thinking in the Sixth Development Plan concentrates on gender equity, job opportunities, health, female literacy, reform of the legal system and participation in decision-making in which they include economic equity, health equity, educational equity, legal equity and political equity.	
Kazakhstan	› Strategy for Gender Equality in the Republic of Kazakhstan 2006-2016 identified seven priority areas, including gender equality in the economic sphere, gender education, the prevention of gender-based violence, and raising public awareness on gender equality. › The government has adopted the Family and Gender Policy for 2030 to guide its work on promoting gender equality in the years to come.	National Commission on Women's Affairs, Family and Demographic Policy
Kyrgyzstan[37]	› National Strategy on Achievement of Gender Equality to 2020. › Strategy of Social Services and Labour Development in the Kyrgyz Republic for 2019-2023.	Ministry of Social Development (now Social Protection)
Pakistan[38]	› Pakistan's Vision 2025 is aimed at ensuring uninterrupted access to affordable and clean energy to all sections of the population by 2025. › Government energy policies acknowledge women as energy consumers with potentially different needs. › Government has established a 10 percent quota for female employment in energy state-owned enterprises.	National Commission on the Status of Women

[37]EuroPlus Consulting & Management (2018h), 'Kyrgyzstan Final Report: Gender Study for Central Asia'. Retrieved from: https://eeas.europa.eu/sites/eeas/files/kyrgyzstan_final_report_09.01.2018_approved_workshop_final.pdf.
[38]ADB (2016b), 'Pakistan Country Gender Assessment'. Retrieved from: https://www.adb.org/sites/default/files/institutional-document/217811/pak-gender-assessment-vol2.pdf , Government of Pakistan (2019i), 'Report of the Implementation of the Beijing Declaration and Platform for Action'. Retrieved from: https://www.unwomen.org/en/csw/csw64-2020/preparations .

Country	Policy Framework	Main Stakeholder in Charge of Gender Affairs
	› The Ministry of Climate Change must adopt policy measures to mainstream gender into climate change efforts and reduce the vulnerability of women to climate change impacts, particularly in relation to their critical roles in rural areas in providing water, food, and energy. Also, the Ministry needs to report on SDG achievements. › The Alternative and Renewable Energy Policy recognises that energy needs differ between not only urban and rural populations, but also women and men; it further acknowledges that planning for investments must take account of these differences.	
Tajikistan	In 2016, Tajikistan developed and adopted the 2030 National Development Strategy (NDS 2030), which defines the main action lines for achieving SDGs in Tajikistan.	Committee on Women's Affairs
Turkey	Turkey's Climate Change Action Plan is intended to mainstream gender and be inclusive and gender-sensitive.	Ministry of Family and Social Affairs
Turkmenistan	The First National Action Plan of Turkmenistan 2015-2020 to ensure gender equality, approved by the Decree of the President of Turkmenistan in January 2015, is aimed at combatting gender-based violence and eliminating discrimination against women. Turkmenistan is a signatory to the Convention on the Elimination of All Forms of Discrimination against Women and has submitted its report in accordance with Article 18.	First Ombudsman - Authorized Representative for Human Rights in Turkmenistan
Uzbekistan[39]	› The government is in the process of developing the long-term National Development Strategy to Achieve Gender Equality. › As a temporary measure to increase the proportion of women at decision-making levels, a 30% quota has been introduced to elect women to political parties and movements. › Quotas are currently being introduced in other sectors, such as energy, and are intended to be met through measures on training and capacity development.	Ministry of Women's Affairs

2.2.2 Gender Assessment of the Energy Sector

Gender cultural and traditional roles and women's socioeconomic situation are major impediments for women's empowerment all around the world, including in the ECO region. Through a literature review and field data collection, the gender roles and socioeconomic conditions affecting women's relations with energy (as consumers and as economic participants in the energy value chain) were assessed and broken down into four interconnected points: (1) the lack of decision-making power of women; (2) women's lower economic status preventing them from accessing clean and reliable energy sources; (3) women's energy consumption shaped by their domestic role; and (4) the gender segregation of the labour market that prevents them from accessing the green economy.

[39] Government of Uzbekistan (2019), Report of the Implementation of the Beijing Declaration and Platform for Action.

1. Lack of Decision-Making Power for Women

ECO countries are largely patriarchal societies, thus leading to asymmetrical gender roles and implicit biases against women's leadership and decision-making capacities. This is already reflected in national data that reveal women occupy on average 20 percent of parliament seats in the region and represent from two to 33 percent of heads of households (see Table 5). Not only are women not represented in decisions related to politics and society, but men are also often responsible for making household purchasing decisions (and hence the decision regarding the sources and type of energy in the household).[40] One explanation for this dynamic is that women's contribution to the household budget is often lower than men's, or made through their free labour rather than money. This intra-household decision-making pattern is detrimental to women who are the primary energy users due to their domestic chores and are therefore more vulnerable to risks related to energy supply and use. It was reported that, in some ECO countries, women are involved in energy consultations at the local level. For example, Kazakh women in a number of rural districts have been found to actively attend community meetings related to district heating.[41] However, women are underrepresented at senior levels in local government and so are most often left out of decision-making related to energy and natural resources.

2. Women's Lower Economic Status Prevents them from Accessing Clean and Reliable Energy Sources

Throughout the region, households headed by women vary between two percent in Afghanistan and 33 percent for Kazakhstan. Within female-headed households, women who act as single parents with children under the age 15 are overrepresented and comprise on average 68 percent of such households. There are however significant variations in the region. Proportions range from 17 percent (Iran), 85 percent (Tajikistan), 90 percent (Pakistan), to 94 percent (Afghanistan).[42] The status of single parents being precarious, female-headed households are largely represented in low-income households. It was reported that poor households, often headed by women, are concerned about the cost of electricity and are unable to afford a meter-based consumption unless supported by subsidies.[43] The same dynamic applies to female entrepreneurs who usually own smaller businesses (micro or small enterprises) in the informal sector.[44] Energy shortages have negative impacts on all business but affects micro and small businesses even more since the latter cannot afford to invest in additional generation capacity or even to pay the electricity tariff.[45]

[40]Econoler - Local Consultant (2019b) Field Data Collection for Azerbaijan, Baku, Azerbaijan.ADB (2019f), 'Gender in Infrastructure: Lessons from Central and West Asia'. Retrieved from: https://www.adb.org/sites/default/files/publication/545006/gender-infrastructure-central-west-asia.pdf.
[41]ADB (2018g), 'Kazakhstan Country Gender Assessment '. Retrieved from: https://www.adb.org/sites/default/files/institutional-document/479136/kazakhstan-country-gender-assessment.pdf.
[42]UNDESA (2017c).
[43]ADB (2018g).
[44]ADB (2019g), 'Good Jobs for Inclusive Growth in Central Asia and the South Caucasus', Regional Report. Retrieved from: https://www.adb.org/sites/default/files/publication/489856/jobs-inclusive-growth-central-asia-caucasus.pdf .
[45]Econoler - Local Consultant (2019d) Field Data Collection for Tajikistan, Khorog, Tajikistan.

3. Women's Energy Consumption Shaped by their Domestic Role

Due to the social role ascribed to women in ECO countries, women perform the unpaid household work while men participate in productive and paid labour activities. Women are responsible for most of the daily household tasks and caring for children and other family members. Given power supply gaps and the shortage of electricity, women must dedicate more time to household work rather than spending time on income generation and in self-development educational programmes.[46] Since women are the main household energy users, they more often find themselves dealing with the electric company than men.[47]

Challenges linked with the use of solid fuels

The World Health Organization (WHO) estimates exposure to air pollution from cooking with solid fuels (wood, dung, charcoal, coal, or crop residues) is associated with over four million annual premature deaths worldwide, including half a million children under the age of five from pneumonia.[48] Solid fuels are commonly burned in inefficient simple stoves in poorly ventilated conditions, which results in indoor air pollution exposure. The table below presents a regional overview on the prevalence of solid fuel use (for cooking and heating) and its social impacts in terms of people affected and annual number of deaths.

Table 8: Social Impacts of Indoor Air Pollution (IAP) from Solid Fuel Use[49]

Country	% of population using solid fuels for cooking		Number of people affected by IAP (% of population)		Number of deaths per year attributable to IAP
	Urban	Rural	Number	% of Total Population	
Afghanistan	36.1	97.1	24,157,874	81%	41,164
Azerbaijan	< 5	22.7	1,022,726	11%	1,791
Iran	-	-	-	2%	-
Kazakhstan	-	-	-	51%	-
Kyrgyzstan	-	-		96%	-
Pakistan	30.8	90.6	111,079,269	62%	114,806
Tajikistan	< 5	34.5	2,963,326	37%	4,441
Turkey	-	-	-	11%	-
Turkmenistan	-	-	-	50%	-
Uzbekistan	< 5	25.9	3,275,454	11%	8,951

[46]ADB (2019f), Econoler - Local Consultant (2019c) Field Data Collection for Kazakhstan, Astana, Kazakhstan.
[47]ADB (2018g).
[48]WHO Official Website, 'Ambient (Outdoor) Air Pollution', <https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health>, accessed January 5th, 2020.
[49]Clean Cooking Alliance Official Website, 'Country-Level Data ', <https://www.cleancookingalliance.org/country-profiles/all.html>, accessed January 5th, 2020.(For Afghanistan, Azerbaijan, Pakistan, Tajikistan, and Uzbekistan).DESAI, Manish A., Sumi Mehta, Kirk R. Smith (2004), 'Indoor Smoke from Solid Fuels: Assessing the Environmental Burden of Disease at National and Local Levls', *WHO: Environmental Burden of Disease Series,* 4, 74 p. (for Iran, Kazakhstan, Kyrgyzstan, Turkey, and Turkmenistan).

Women and their youngest children are disproportionally exposed to IAP, even more so if they live in low-income and rural households. They are mostly exposed due to their household roles; women may cook up to three meals per day using such cooking methods, and women and children often spend more than five hours per day in smoky kitchens and poorly ventilated homes.[50] Epidemiological literature firmly associates exposure to IAP with acute lower respiratory infections (including pneumonia) in young children and chronic obstructive pulmonary disease and lung cancer in women (and to a lesser degree in men).[51] Incidences of deaths due to carbon monoxide poisoning in households that use solid fuel are reported periodically during winter in the local media.[52]

Furthermore, collecting solid fuel for cooking and heating is a major burden that falls on women and girls.[53] This is mostly prevalent in Central Asia, Pakistan, and Afghanistan where the use of solid fuels affects a large share of the population (see Table 8). Women in households reliant on biomass fuels are responsible for fuel collection, transport to their homes, fuel processing, and storage. These tasks have opportunity costs such as less time available for childcare, higher risks of health problems associated with biofuel collection and use, and higher risks of harassment from males during fuel collection. Girls may also be withdrawn from school to help with the fuel-collecting chore.[54]

Need to introduce energy sources and technologies that benefit all

Along with cultural changes in society, access to affordable, clean, and reliable energy is a solution to reduce women's domestic burdens. Women need to have access to technologies that help them in completing domestic chores. More importantly, they need access to clean cooking and heating technologies to reduce the time women and girls spend on collecting or preparing solid fuels and reduce health hazards on household members. Previous case studies in other developing and emerging countries have documented the benefits of decentralised clean energy technologies with regard to reducing household chore burdens, especially the collection of biomass fuel.[55] The decrease in domestic burden through access to reliable energy, as well as the potential for income generating activities for women, was also highlighted by some of our local consultants and in gender assessments of ECO countries.[56] Very few studies have documented patterns of household members' time-use, energy consumption, and impacts of energy sources on human health or the environment in the ECO region. It is essential for decision makers and the public to understand the patterns, determinants, and

[50]BARUAH, Bipasha (2017), 'Opportunities and Constraints for Women's Employment and Entrepreneurship in Renewable Energy', *GrOW Working Paper Series,* GWP-2017-10, 22 p.
[51]DESAI (2004).
[52] KERIMRAY, Aiymgul et al. (2017) "Household Energy Consumption and Energy Poverty in Kazakhstan", IAEE Energy Forum, First Quarter, pp. 31-34.
[53]ADB (2016c), 'Pakistan Country Gender Assessment ', Volume 1 of 2: Overall Gender Analysis. Retrieved from: https://www.adb.org/sites/default/files/institutional-document/218821/pak-gender-assessment-vol1.pdf , Consultant (2019d).ADB (2018i), 'Uzbekistan Country Gender Assessment'. Retrieved from: https://www.adb.org/sites/default/files/institutional-document/479841/uzbekistan-country-gender-assessment-update.pdf .
[54]ADB (2016c).
[55]KABIR, Ehsanul, Ki-Hyun KIM, and Jan SZULEJKO (2017), 'Social Impacts of Solar Home Systems in Rural Areas: A Case Study in Bangladesh', *Energies,* 10 (10).
[56]Econoler - Local Consultant (2019e) Field Data Collection for Turkmenistan Ashgabat, Turkmenistan, Consultant (2019b), ADB (2018j), 'Uzbekistan Country Gender Assessment - Update'.

implications of household energy consumption. Such studies would increase knowledge on intra-households needs and help introduce clean energy technologies that benefit all members of households and societies without leaving women behind.

4. Gender segregation of the labour market that prevents women from accessing the green economy

In its annual Global Gender Gap Report, the World Economic Forum (WEF) assesses gender equality in access to economic participation and opportunities. The sub-index serves to assess the prevalence of gender discrimination in the job market.[57] The results of ECO countries are presented in Table 9 below. The index also provides a useful ranking of countries in the region, highlighting where women face fewer obstacles and which country needs to improve economic opportunities for women. Three countries score higher than the global value (59%), namely Azerbaijan, Kazakhstan, and Kyrgyzstan. Although for these three countries, gender assessment reports that women are concentrated in traditional field (education, health and administrative), while men are concentrated in technical fields that include energy industries.[58] Women are also usually more poorly represented in private-sector formal employment, are employed in lower-paid occupations, and are likely to receive fewer social insurance benefits than men.[59]

Table 9: Gender Equality in Economic Participation and Opportunity in ECO Countries[60]

Countries	Economic Participation and Opportunity Sub-Index	World Ranking (out of 149)
Global Value	0.590	-
Afghanistan	-	-
Azerbaijan	0.716	47
Iran	0.376	143
Kazakhstan	0.741	32
Kyrgyzstan	0.662	78
Pakistan	0.318	146
Tajikistan	0.547	126
Turkey	0.466	131
Turkmenistan	-	-
Uzbekistan	-	-

[57]Based on indicators such as: female labour force participation over male value; wage equality between women and men for similar work; female estimated earned income over male value; female legislators, senior officials and managers over male value; female professionals and technical workers over male value.
[58]ADB, UN Women and Econoler local consultants in targeted countries.
[59]ADB (2019g).
[60]World Economic Forum (2018d), 'The Global Gender Gap Report'. Retrieved from: https://www.weforum.org/reports/the-global-gender-gap-report-2018, ADB (2018g).

- The country data represent the national labour market and do not represent the additional discrimination that women may face in male-dominated industries such as the energy sector. This bias causes an economic prejudice against women since technical jobs in the energy sector are good jobs because they pay well, are highly productive, and are thus secure.[61] Some regional statistics and examples may provide a better idea of these additional barriers to women employment in the energy sector:
- In Iran, women represent 14 percent of total employment in the water and energy sector and 30 percent in the RE public sector.[62]
- Iranian women occupy management positions (1,426 women) and sit on boards of directors of energy state companies (20 women). They are also involved in research and development in the field of water and energy (350 women having 3,395 achievements in this field).[63]
- Women's employment is only 11 percent in the energy and mining sectors of Azerbaijan compared to 48.2 percent of the national workforce;[64]
- In Pakistani electricity utilities, women represent less than one percent of staff. In other energy state-owned enterprises, females comprise 0.7 to 1.2 percent of employees despite the 10 percent government quota. Female employees in these enterprises report experiencing discrimination in a variety of forms that effectively limits their professional advancement;[65]
- In Kazakhstan, women represent 31 percent of total employment in the power and energy sector, 17 percent in the RE sector, and they face an average pay gap of 20 percent.[66] The lack of female employees in utilities was even reported as a constraint to receiving services in some areas where women are reluctant to open their doors to male technicians;[67]
- Globally, the oil and gas industry (prevalent in Iran, Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan) workforce is comprised of 22 percent of women, which is less than in the RE industry where women represent 32 percent of the workforce.[68] In both industries, women are overly represented in administrative jobs and less so in technical and field jobs;
- In Tajikistan, women are virtually unrepresented in areas such as economics, management, construction, transport, agriculture, energy, and engineering.[69]

[61]ADB (2019g).
[62] Data from Iran's Ministry of Energy, July 2020.
[63] *Ibid.*
[64]State Statistics Committee of the Republic of Azerbaijan (2018a).
[65]USAID (2016a), 'Engendering Utilities - Phase I'. Retrieved from: https://pdf.usaid.gov/pdf_docs/PBAAF230.pdf ,ADB (2016b).
[66]EBRD and Green Climate Fund (2019j), 'Terms of Reference - Programme for Supporting Renewable Energy and Promoting Gender Equality in Kazakhstan'.
[67]Econoler – local Consultant
[68]World Petroleum Council and The Boston Consulting Group (2017d), 'Untapped Reserves: Promoting Gender Balance in Oil and Gas'. Retrieved from: https://www.bcg.com/en-us/publications/2017/energy-environment-people-organization-untapped-reserves.aspx, IRENA (2009), 'Renewable Energy: A Gender Perspective'. Retrieved from: https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective .
[69]Econoler – Local Consultant (2019d).

These statistics show that gender stereotypes about women's employment are widespread throughout the ECO region, especially in male-dominated industries. These ideas also affect the enrolment rate of women in technical training and education programmes. While gender disparity in general enrolment is not a major issue, educational choices at the post-secondary level exhibit gendered patterns, with women overrepresented in humanities and social science programmes and ending up in lower-paying jobs in the public sector.[70] It was also reported that tertiary enrolment rates are generally low (for male and female) in Central Asia and South Caucasus countries, with few students choosing science, technology, engineering, and mathematics (STEM) subjects; this is a barrier to developing knowledge-based economies that generate high-paying jobs.[71]

The transition to a green economy should promote inclusive growth

It is anticipated that changes in ECO country energy sectors will generate an increase in job opportunities in the coming years. The Government of Kazakhstan, for example, estimates that more than 10,000 vacancies (an increase of 14%) will appear in Kazakhstan's electricity supply sector over the next five years across almost all levels and occupations.[72] While new investment in infrastructure provides new employment opportunities, experience indicates that the male labour force sees increases first, particularly in traditionally male-dominated occupations such as the energy sector.[73] The promotion of energy entrepreneurship among women and other vulnerable groups is also an alternative to unemployment. Decision makers therefore need to ensure that women are not prevented from accessing the opportunities linked with future energy developments by legal frameworks, gender roles, or socioeconomic conditions in the ECO region. Most countries of the region are indeed in a strong position to use the job creation potential of the green economy to strengthen labour markets and reduce industrial segregation by gender.[74]

2.3 Situation Analysis by Country

For each ECO country, the following topics were assessed through field data collection and literature review: (1) energy access and security, (2) energy, water, food and environment, (3) RE and EE solutions and co-benefits, (4) RE market survey and trends, (5) private sector and employment, (6) sustainable energy policy and incentive frameworks, (7) human resources and capacity development, (8) availability of investment and market data and (9) gender and energy.

[70]ADB (2019g).
[71]*Ibid.*
[72]EBRD and Green Climate Fund (2019j).
[73]ESMAP (2018c), 'Getting to Gender Equality in Energy Infrastructure: Lessons from Electricity Generation, Transmission, and Distribution Projects', Technical Report 012/18, World Bank. Retrieved from: http://documents.worldbank.org/curated/en/639571516604624407/pdf/122887-REVISED-GenderEquality-Report-WEB-2-2-18.pdf , ADB (2019g).
[74]UNDP (2016d), 'Progress at Risk: Inequalities and Human Development in Eastern Europe, Turkey and Central Asia', Regional Human Development Report. Retrieved from: https://www.eurasia.undp.org/content/dam/rbec/docs/undp-rbec-human-development-report-full-report-2016.pdf .

2.3.1 Afghanistan

Energy Access and Security

Afghanistan is one of the poorest and least developed countries in the world. About 36% of the population of Afghanistan lives below the poverty line (up to 80% in rural areas). Most residents in Kabul have electricity service, whereas 75 percent or more of rural residents do not have access to reliable electricity. Expanding access to reliable electricity, particularly in rural areas, is an important priority of the Afghan government. Afghanistan is not a significant energy producer; 86 percent of total electricity consumed in Afghanistan in 2018 was imported from neighbouring countries. The electricity grid is actually many different, disconnected grids. Transmission and distribution losses were extremely high a decade ago (54 percent in 2008), but recent investment has reduced these losses somewhat, to 24 percent in 2018.

Energy, Water, Food, and Environment

Agriculture is the dominant sector of the Afghan economy, and represents more than 90 percent of total water use. However available water supplies are not sufficient to meet the country's needs for agriculture and human use over the long-term. Water security is a source of tension between Afghanistan and neighbouring Uzbekistan and Turkmenistan.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

Afghanistan's hydroelectricity potential is estimated at 23,000 MW, of which eighty-seven percent is located in the northeast of the country. With 300 days of sunshine a year, the average solar potential is estimated at 6.5 kWh/m2/day. Afghanistan's wind resources are also significant and located at southwest of the country in the areas of maximum potential near the Iranian border. The operational capacity is estimated at approximately 66,700 MW.

Renewable Energy Market Survey and Trends

In general, the Afghan government encourages renewable energy development projects, such as by exempting such projects from tax requirements. Significant activity and investment have been directed toward development of large and small hydroelectric facilities and infrastructure. Many of these projects serve remote grids and local communities.

Private Sector and Employment

There are practically no private firms or companies in the energy sector of Afghanistan engaged in both the production and distribution of electricity. Some cross-border electricity sales from private-sector generators in Tajikistan and informal rural electricity sales using pico-hydro or diesel gensets do occur. The war makes it extremely difficult for private firms to be involved in energy sector development in most parts of the country.

Sustainable Energy Policy and Incentive Frameworks

Significant progress has been made in recent years through the implementation of policies intended to support the development of renewable energy resources, including master plans for the energy and agriculture sectors, a national renewable energy policy, national energy efficiency policy, and national building codes.

Human Resources and Capacity Development

Afghanistan has relatively few specialized professionals in the RE/EE industries within its borders – however many technically trained and experienced Afghan citizens live abroad in neighbouring countries. The country also has higher education institutions that train specialist engineers and have the potential to train high-qualified specialists, including Kabul University, the Faculty of Engineering and the Electrotechnical Institute of Energy and Water.

Availability of Investment and Market Data

Investor information and energy market data are not widely available.

Gender and Energy

Gender inequality is a major issue in Afghanistan, which ranks as a low equality country according to GDI. However recent developments have the potential to achieve positive change:

- The National Constitution guarantees equal rights for women, as well as the opportunity to enroll in public schools and universities;
- Da Afghanistan BreshnaSherkat (DABS), Afghanistan's national power utility, has committed to promoting gender equality;
- The Planning and Capacity Support Project of the Afghanistan Reconstruction Trust Fund (ARTF), managed by the World Bank, is helping DABS deliver on that commitment by organising awareness sessions for DABS staff on gender-related issues and provided specialized training to female employees.
- A $60 million grant from the World Bank Group's International Development Association, for the Herat Electrification Project that will support DABS' efforts to help achieve further progress, especially in the western Herat Province.[75]

[75]World Bank Group (2017a), 'Afghanistan's Energy Sector Leads the Way for Gender Equality'. Retrieved from: https://blogs.worldbank.org/endpovertyinsouthasia/afghanistan-s-energy-sector-leads-way-gender-equality

2.3.2 Azerbaijan

Energy Access and Security

Azerbaijan is rich with abundant oil and gas resources. It is one of the world's oldest oil producing countries. Electrification has been reached throughout the country (see Appendix I). Natural gas is the most used type of energy for cooking and heating. The situation will remain the same in the foreseeable future due to large national oil and gas reserves. Azerbaijan plans to become a major gas supplier to Europe and be the most significant source feeding into energy pipelines. As Azerbaijan increasingly becomes a Eurasian energy nexus, it will significantly contribute to energy security in the region.[76]

Energy, Water, Food, and Environment

Agriculture is a critical component of the non-oil economy. As a key source of jobs and a priority in the context of food security, Azerbaijan's agriculture sector will be increasingly at risk from higher temperatures, unpredictable rainfall and natural disasters. Azerbaijan is one of the most flood-prone areas in the world. Transboundary rivers are a major source of freshwater in the country, but studies show that water flow of major rivers is already decreasing because of reduced winter and spring precipitation. Projections suggest flows will continue to decrease contributing to reduced crop yields, loss of soil and arable land to flooding and a shift in production zones[77].

Renewable Energy and Energy Efficiency Solutions and Co-benefits

There is huge potential for RE in Azerbaijan, and there is a political will to use it throughout the economy. Such an expansion of RE generation would improve electricity security and supply, reduce the total costs of electricity generation, conserve natural resources, increase export opportunities for oil and gas, create new jobs, and contribute to environmental protection.

Renewable Energy Market Survey and Trends

The share of RE in gross electricity generation increased from 10 percent in 2011 to 16 percent in 2018. In that same timeframe, renewable sources other than hydroelectricity increased from 0.2 percent to two percent of total generation. Private-sector interest and investment in renewable energy technologies have also increased in recent years. The Ministry of Energy reached an agreement with the private company Total Eren in 2019 to develop RE generating facilities in Azerbaijan. Total Eren has committed to generating 420 MW of power from wind, solar, and bioenergy sources, which is in line with the Strategic Roadmap on the Development of Utilities developed by the government. The Ministry of Energy has invited foreign investors to develop RE facilities, for which the Ministry has allocated five plots of land for the construction of solar and wind plants (100-200 MW each). Developers have initiated partnerships with the Ministry to develop these facilities and support a system of RE auctions set to begin in 2020.

[76]RZAYEVA, Gulmira (2010), 'Azerbaijan: Eurasia's New Energy Nexus?', *Turkish Policy Quarterly,* 9 (2), 55-68.
[77]USAID (2017b), 'Climate Change Risk Profile: Azerbaijan'. Retrieved from: https://www.climatelinks.org/resources/climate-change-risk-profile-azerbaijan

Private Sector and Employment

The Azerbaijan government constructed and currently operates RE facilities via state-owned companies. Several private companies also own and operate smaller wind and solar generation facilities. These investments have created a base of qualified technical personnel for RE project development and operation. Approximately 10 local private companies provide services on RE technologies. They receive service orders from private companies and households. EE was defined as one of the priority measures in the Strategic Roadmaps issued in December 2016, which was intended to improve the market competitiveness and production efficiency of local industries.

Sustainable Energy Policy and Incentive Frameworks

The Strategic Roadmap for the Development of Utility Services (electric and thermal power, water, and natural gas) is the most significant recent policy for the development of RE and EE. It is focussed on increasing electricity generation from RE sources, upgrading the reliability and security of energy supply systems, and providing smart metering devices to increase accountability and control. The overall goals of the Roadmap include improving EE and developing the infrastructure to enable variable peak pricing to optimise on and off-peak electricity consumption.

Human Resources and Capacity Development

There are 230-250 qualified RE technology engineers in Azerbaijan. The RE field is relatively new in the country – most professionals have between eight and 10 years of experience. Local universities such as Azerbaijan Technical University and Azerbaijan University for Oil and Industry provide dedicated education on RE for Bachelor's and Master's degrees. Azerbaijan University for Oil and Industry expanded its department and teaching capacity for RE technologies in 2019. Many RE professionals are trained at the Gobustan Training Center of SAARES, which provides training in wind, solar, and biomass technologies. The following research institutes are also involved in RE technology development:

- Institute of Physics of National Academy of Sciences;
- Institute of Radiation Problems of National Academy of Sciences;
- Scientific-Research and Power Design Institute of Azerenerji JSC.

Availability of Investment and Market Data

While the renewable sector has not seen as much investment as the oil and gas sectors, the government is now looking to stimulate investment and accelerate deployment. Furthermore, the government is working on a new energy strategy that will set the stage for further policy shifts and increase the accessibility of investment and market data.

Gender and Energy

Gender patterns are explicit in the Azerbaijan energy sector. Men typically make decisions on energy sources and types even though women are the primary energy users in the home and are therefore more vulnerable to risks related to energy supply and use. Women often lack information on efficient energy use. Irregular power supply has a particularly negative impact on the elderly and women in rural or remote areas. In 2018, women's employment rate was only 11 percent in the energy and mining sectors, compared to an overall women employment rate of 48 percent in 2018. The State Program on Poverty Reduction and Sustainable Development, 2008-2015 (SPPRSD) has been praised by the Convention on Elimination of all Forms of Discrimination Against Women for fully incorporating a gender perspective. The promotion and protection of gender equality is one of nine strategic goals of the SPPRSD, and gender issues are prioritised.

2.3.3 Iran

Energy Access and Security

Iran is the world's third-largest oil exporter, accounting for almost four percent of global oil output and almost six percent of total world oil exports. It possesses the fourth-largest crude oil reserve and the second-largest liquefied natural gas reserve in the world. Iran is also one of the largest oil-consuming countries in the Middle East, second only to Saudi Arabia. Currently, more than 95 percent of Iran's gas production is used domestically (IEA 2018a). Oil and gas production has significantly decreased since 2017 with the imposition of U.S. led sanctions. Iran has experienced rapid increases in domestic energy demand in the last decades due to not only high population growth, increased urbanisation and changing consumer habits, but also subsidy-induced energy overuse. Iran has made progress with reducing its transmission losses in the past years, which were reduced from 17% in 2009 to 11.4% in 2017.[78] Some inefficiencies, however, remain in energy production, transport, and consumption. Nearly all rural and urban households have access to electricity; however, a shortfall in peak capacity leads to occasional blackouts.

Energy, Water, Food, and Environment

Iran is affected by the depletion of its water resources due to both a changing climate and increasing demand for water from the agricultural, industrial, and residential sectors. The risks of water shortages to energy security in general – and to the power sector in particular – have thus far been insufficiently examined. There is a need for deeper understanding of the role of water in Iran's current and future energy systems.

[78] Ministry of Energy (2017) Iran Energy Balance.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

The level of energy intensity in Iran is a consequence of several factors, notably energy subsidies (the most important), old equipment, and inefficient consumer behaviour (which is also a consequence of low energy prices). Iran has significant RE resources and massive potential for EE investments. Realising this potential would improve energy affordability, grid stability, and energy access while increasing the availability of domestic oil and gas for export. I accordance with national laws, RE and EE development are fully integrated in SATBA. Several activities have been implemented in the past to improve EE, including facility interest subsidies, initiatives to increase the efficiency of energy generation facilities and reducing losses of distribution and transmission systems, adoption of efficient technologies (such as LED lighting), etc.[79]

Renewable Energy Market Survey and Trends

In 2014, the Iranian government invested a total of USD 60 million in solar projects and put in place a feed-in tariff financial mechanism to accelerate growth in the RE sector. Iran's Sixth Development Plan (2016 to 2020), calls for the installation of 5,000 MW of RE during that period and an additional 2,500 MW by 2030. The current installed RE capacity is 824 MW, with an additional 821 MW currently under construction (SATBA). Installations are comprised of solar photovoltaic (44%), wind (34%), small hydroelectric (12%), and biomass (1%, SATBA).

Private Sector and Employment

Private-sector investments in RE projects exceed 143,000 billion rials (USD 3.73 B, SATBA). Growth in the RE sector is increasing employment. By December 2019, 20,070 people were employed in the RE sector, with a total of 54,869 person-year cumulative jobs according to SATBA. The Sixth Development Plan (by the end of 2021) is aimed at reaching the expected target of an additional 5,000 MWp in renewable energy, thereby creating 40,000 new jobs in the RE sector. Official statistics for EE are not available.

Sustainable Energy Policy and Incentive Frameworks

Iran could be considered as a leading country in developing a variety of EE and RE laws and regulations. The government created a feed-in tariff for RE generators. Iran also implemented the most comprehensive product energy performance labelling regime in the ECO region, along with building energy performance codes. Other important frameworks include the inclusion of RE/EE in the National Development Plans and the national energy and renewable energy strategic plans (2017 and 2015), as well as the establishment of renewable portfolio standards, support for RE electricity exports and the establishment of energy-saving certificates. Recently, the High Energy Council (HEC) of Iran released the Energy Efficiency and Environment Market (EEEM) to implement all projects that can save natural gas and electricity according to the tariff differences and also market mechanisms.

[79] Iran Ministry of Energy (2020).

Human Resources and Capacity Development

There are 22 EE consulting firms accredited by the Planning and Budget Organization of Iran, as well as an unknown number of ESCOs operating in the country. Moreover, there are 12 accredited RE consulting firms. Small firms are also active in the sustainable energy sector, although they have not achieved accreditation under the government scheme.

More than 10 institutions and research programmes for RE and EE exist in Iran, including:

- Niroo Research Institute, Department of Energy and Environment;
- Green Energy Centre of Iran (GECI);
- University of Amirkabeer, Renewable Energy Research Center;
- Sharif Energy Research Institute (SERI);
- Industrial Energy Efficiency in Iran financed by the Global Environment Facility (GEF) and implemented by UNIDO;
- Policy Reforms and Market Transformation of the Energy Efficient Buildings Sector of the I.R. Iran financed by GEF and implemented by UNDP.

Availability of Investment and Market Data

RE/EE market data are largely unavailable, but policy-makers are keen to attract investment to the sector. According to a SATBA report, a total of 124,600 billion rials was invested in renewable energy by non-governmental organizations by August 2019. No specific date have been announced for the energy efficiency market.

Gender and Energy

Gender is mentioned in the overall reports. Specific information about the energy sector is not available. Generally, the gender status varies: women's involvement is more visible in areas of policy-making and consulting services in the RE and EE sector than in the other areas of activity, including EPC or educational services.

2.3.4 Kazakhstan

Energy Access and Security

Kazakhstan is a major producer of oil, natural gas, and uranium. The economy relies heavily on fossil fuel exports, while the oil and gas sectors combined accounted for 21.3 percent of GDP in 2018. In 2017, 88 percent of electricity generation came from fossil fuel-fired plants, 11 percent from hydro power plants, and around one percent from wind and solar installations. Total installed electricity generating capacity was 21.6 GW in 2018. Domestic energy demand - particularly electricity – is rising steeply. The country's electricity demand is projected to increase by 2.5 percent annually between 2019 and 2030. Kazakhstan's generation and transmission infrastructure is generally old and inefficient. In winter,

electricity supply is sometimes unable to meet demand, leading to electricity shortages and adverse effects on regional economic development. Kazakhstan is the largest greenhouse gas (GHG) emitter in Central Asia. Power generation and heating account for 80 percent of the country's carbon emissions. While there is significant renewable energy potential, current national low-carbon policies fail to adequately address energy use issues. Energy security has become an important component of the national security system of the Republic of Kazakhstan, being an indispensable element of economic security which, according to legislation, is interpreted as "a state of protection of the national economy of the Republic of Kazakhstan against real and potential threats, which ensures its sustainable development and economic independence."

Energy, Water, Food, and Environment

Water security is a strategic issue for Kazakhstan. The country depends heavily on transboundary inflows, with 45 percent of stored water resources having origins outside the country. Agriculture, industry, and power generation are the largest water using sectors in the country. However, population growth and urbanisation combined with rapid economic growth are likely to result in increased demand for energy, food, and water. This is likely to stress the water system because per capita water availability is only 61 percent of the global average. Access to clean water is unevenly distributed, with less than half of rural residents having access to clean water supplies. Improved efficiency in the water system could offer an important solution – losses currently account for 45 percent of water use in Kazakhstan.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

Kazakhstan has excellent potential for RE, particularly from wind and small hydroelectric generating facilities. The country has the potential to generate 10 times as much power as it currently consumes, from wind energy alone. Increased RE deployment would increase the reliability of electricity supply and decrease GHG emissions and carbon intensity. The country's steppe geography makes it suitable for the development of wind energy. Nearly 50 percent of the country's territory has an average wind speed of four to six metres/second. There are 15 large hydropower stations in Kazakhstan, for a total capacity of 2.25 GW, which accounts for 11 percent of total generating capacity. In recent years, the country has seen the development of new small and medium-scale hydroelectric plants. These are attractive in terms of cost, construction time, reliability, and reduced environmental impacts.

Renewable Energy Market Survey and Trends

In 2013, Kazakhstan embarked on a transition to a green economy by setting up the Green Economy Concept with the targets of achieving 5 GW in wind energy and 500 MW in solar energy capacity. The policy includes a number of enabling conditions for the development of RE:

- RE tariffs (producers are paid rates 3 to 10 times higher than for conventional power) are fixed for every type of renewable generation (wind, solar, small hydropower, geothermal, and biofuel) for 15 years, and they are subject to annual indexation to inflation and the tenge exchange rate.

- Renewable power purchase agreements may be signed three years prior to renewable capacity commissioning.
- RE developers receive tax benefits and investment subsidies (30% of actual installation and equipment costs).
- Renewable generating facilities are not subject to paying the standard power transmission tariff.

Private Sector and Employment

Information on the Kazakhstan EE and RE workforce is not available. According to the government, approximately 1.7 percent of the total workforce is employed in the energy sector.

Sustainable Energy Policy and Incentive Frameworks

Kazakhstan has initiated several policies that have impacted the RE and EE fields since 2010, including the Electric Power Sector Law and the Strategy Kazakhstan 2050. The most significant policy development to date has been the Green Economy Concept, which established a feed-in tariff for many types of renewable generation and favourable conditions for RE developers.

Human Resources and Capacity Development

The Bolashak International Scholarship programme (https://www.bolashak.gov.kz) provides great opportunity for Kazakh youth to study abroad with full fee coverage. The programme allowed more than 12,000 young professionals to be trained in world-leading universities. Most scholarships is awarded in technical majors including electrical engineering and renewable energy. Nazarbayev University offers technical courses to prepare students for engineering or other careers in the energy sector.

Availability of Investment and Market Data

Kazakhstan has considerably improved its business climate over the past several years and that these actions resulted in a significant inflow of foreign direct investments. The transition to market arrangements, such as unbundling and auctions, is supporting growing investment and improved data availability. Investors' interest in the sector should be increased by creating an enabling environment that is stable, is transparent, and falls within a predictable legal and regulatory framework.[80]

Gender and Energy

Residential coal consumption per capita in Kazakhstan is one of the highest in the world. Coal is the primary heating source for close to one-third of all households and increases to 67 percent in rural areas. Incidences of death due to carbon monoxide poisoning in households are reported periodically during winter in the local media. Women are underrepresented at senior levels of local government and are consequently often excluded in decision-making. Since women are the main users of household energy,

[80] KETOVA, Olga "Report Contract No 2500145107" https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/Kazakhstan_EnergySectorReport.pdf

they most often deal with the electric company. A lack of female employees is a constraint to receiving services in certain areas where women are reluctant to open their doors to male technicians.

2.3.5 The Kyrgyz Republic

Energy Access and Security

The Kyrgyz Republic has huge hydropower potential of over 160 billion kWh per year; it has currently developed about 10 percent of that potential, which provides approximately 80 percent of the country's total electricity generation capacity. However, the Kyrgyz Republic also faces notable energy losses primarily because of old and inefficient transmission and distribution systems and inefficient end uses. Technical and economic total losses are approximately 35 percent, which have significant negative impacts on economic development and growth. The Kyrgyz Republic has significant reserves of energy resources and is able to fully meet its needs, both now and in the future. However, the potential capabilities of the Fuel and Energy Complex (FEC) are not sufficiently realised, and the efficiency of many energy companies has decreased significantly. As a result, the industry is experiencing enormous difficulties and is not able to fully cover consumer energy demand. The dependence of the country on energy is significant and has a negative impact on the efficiency of the economy.

Energy, Water, Food, and Environment

An important environmental challenge for the country relates to the use of the water resources of the Syr Darya Basin and the existence of a strong water-energy nexus. The proper use of the basin's water resources requires effective management of the trade-offs between the agriculture and power generation sectors as well as between upstream and downstream countries. Poor management of natural resources and their inefficient use have led to environmental degradation and tension between the riparian countries of the basin. The current trends in energy and water consumption, population growth, and climate change impacts indicate eventual increased stress on the overall system. Greater efficiency in the Kyrgyz Republic can play a major role in improving the management of the basin's water resources.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

The Kyrgyz Republic has large hydroelectric generation facilities that account for approximately 80 percent of overall generating capacity. The country has RE generation potential – small hydropower, wind, solar, biomass – to meet an additional 20 percent of total consumption. However, the current level of RE production beyond large hydroelectric plants represents less than .5 percent of total consumption. Many rural residents are not able to purchase fuel for domestic needs. Therefore, villagers often cannot pay the cost of consumed energy, leading to their villages being completely disconnected from the grid. Power networks and substations are overloaded, often by heating loads, which leads to accidents and rolling outages in villages and entire areas without official warnings. Distributed, small-scale RE facilities have the potential to improve energy access and security, as well as increase economic development in rural communities.

Renewable Energy Market Survey and Trends

Authorities have taken commendable steps to reform the electricity sector that contributes to an improved environment for renewable energy technologies to improve market share. Good governance and policy certainty will be key to generate the confidence that private investors need to commit long-term resources to the energy sector in the Kyrgyz Republic. Equally important is to address the electricity users' concerns and build social support for reforms. This includes improving the energy efficiency of residential and public buildings and upgrading the heating system to mitigate the supply shortage during the winter, enhancing customer service's quality, simplifying the procedures to get access to electricity, and strengthening the social safety net to protect the poor and the vulnerable[81].

Private Sector and Employment

The Kyrgyz Republic has specialised companies operating in the field of RE and EE technologies. They work in the real sector of the economy and carry out a range of activities related to energy supply, from the development of the concept of external energy supply to the construction and operation of energy facilities. They develop project documentation, install and commission new equipment, as well as operate and maintain energy systems. Their customers are offered equipment, devices, and materials from leading manufacturers in Europe, Commonwealth of Independent State countries, China, and Japan. The companies supply equipment according to any customer requirements. Energy audit services are also offered for various facilities, buildings, structures, and enterprises.

Sustainable Energy Policy and Incentive Frameworks

Kyrgyzstan has a legislative framework that contains the basic provisions for the use and management of the country's natural resources. In particular, the law On State Policy in the Use of Non-traditional Renewable Energy Sources was adopted to encourage the development and use of RE sources, improve energy infrastructure, diversify energy resources, improve the social status of the population, as well as ensure energy security, environmental protection, and sustainable economic development. In connection with this law, the government is developing complimentary tax codes and tariff structures, to encourage development and use of renewable energy. Other government ministries have also been more involved in RE since 2010, including the development of the energy savings programme by the Ministry of Industry, Fuel, and Resources, and a biofuels programme by the Ministry of the Economy.

[81] IMF (2019), "Kyrgyz Republic Selected Issues", Country report No. 19/209. Retrieved online: https://www.imf.org/~/media/Files/Publications/CR/2019/1KGZEA2019002.ashx

Human Resources and Capacity Development

There is little information available on the EE workforce in the Kyrgyz Republic. There are four universities in Kyrgyzstan that offer a specialisation in renewable energy resources: Kyrgyz State Technical University, Kyrgyz-Russian Slavic University, Kyrgyz-Uzbek University, and Kyrgyz State University of Construction, Transport and Architecture. Some of these institutions cooperate with international scientists on projects and research. In addition, the Republic has a specialised Institute of Energy and Economics that trains scientific and engineering personnel.

Availability of Investment and Market Data

Financing is available for RE and EE projects from the European Bank for Reconstruction and Development (EBRD), international lending institutions, and the government. It is not clear what level of investment and market data is available to potential investors.

Gender and Energy

The Kyrgyz Republic has progressive gender legislation and policies; however, the country lacks a clear implementation mechanism for gender equity laws, and the national strategy on gender equality faces funding shortfalls.

2.3.6 Pakistan

Energy Access and Security

Electricity access remains a challenge in Pakistan, with over 20 percent of the population not being connected to the grid. Many grid-connected rural areas continue to experience long hours of power outages and low-voltage conditions. Pakistan's energy sector has been dependent on domestic gas as the primary source of energy. The energy security situation in Pakistan has improved in recent years due to two main factors: (1) integration of imported liquefied natural gas into the national pipeline network; and (2) electricity production from indigenous coal.

Gas pricing has traditionally created a barrier for the entry of alternate fuels and other energy sources including hydropower. The electricity generation mix is primarily fossil fuels (69%) supplemented by hydroelectric generation (26%). Hydroelectricity production is subject to seasonal and annual variations.

Energy, Water, Food, and Environment

A few large hydropower projects are planned along the Indus River, including the Dasu and Diamer-Bhasha dams that will add about 8,000 MW of power generation over the next ten years. In addition, a number of small hydropower projects in the mountain regions will serve to operate distributed grids in rural communities, thus eliminating the need for major transmission line infrastructure. These hydroelectric projects are likely to have significant impacts on land use, arability, and agricultural production.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

The electricity grid needs significant upgrades to meet existing demand as well as accommodate new hydroelectric or transboundary supplies. New solar and wind energy projects have been temporarily put on hold until the transmission infrastructure is enhanced. The government approved a new RE policy in 2019 and new projects are expected to increase. Given the new small hydroelectric facilities serving local grids, distributed RE generation has the potential to reduce or eliminate transmission constraints, particularly when paired with targeted EE measures.

Renewable Energy Market Survey and Trends

Off-grid solar home solutions are now widespread, and it is estimated that about 1,000 MW in residential-scale installations are added each year in rural, off-grid areas. Financing for solar solutions is now common, ranging from state bank finance for large commercial solutions to consumer financing by banks for residential customers. The solar sector in Pakistan is attracting international attention. For example, the Saudi power producing company ACWA Power expressed willingness to invest approximately USD 4 billion in Pakistan's RE sector. Electric fans – a widespread end use that represents a significant share of energy use in Pakistan – became the first appliance to be certified with the Pakistan Energy Label. It is estimated that over 300,000 labelled fans were sold as of mid-2019. The Punjab province has initiated retrofit projects to replace inefficient fans and lights in public buildings with efficient units.

Private Sector and Employment

Pakistan relies mainly on the private sector to bring additional hydroelectric and RE generation online, and the government fast tracks RE project certification as an incentive.

Sustainable Energy Policy and Incentive Frameworks

Pakistan has implemented several sustainable energy policies since 2010, including product labelling and the policies below:

- Pakistan net metering policy for solar PV and wind projects;
- Framework for Power Cogeneration, 2013;
- Alternative and Renewable Energy Policy, 2011 (Medium-term policy);
- National Energy Efficiency and Conservation Act, 2016;
- Strategy and Work Plan (2016-2020) for Regional Cooperation in the Energy Sector of CAREC Countries.

Human Resources and Capacity Development

Residential solar installations have created more than 15,500 jobs for local people. The total is so high because most of this workforce is involved in small-scale residential and commercial deployment, which tends to be more labour-intensive than utility-scale installations. It seems that local human resource availability is a constraint in the region, but no specific information is available.

Availability of Investment and Market Data

Investment data targeting international investors are available but generally of poor quality.

Gender and Energy

In households reliant on energy supplied from the electricity grid, Pakistan's intermittent energy reduces women's efficiency in carrying out household tasks and the productivity of home-based workers, as well as that of women who telecommute and work in the services sector. In the case of households reliant on biofuels, women are primarily responsible for collecting fuel, which is a significant time burden and leads to negative health outcomes from poor indoor air quality.

The Alternative and Renewable Energy Policy neither recognises that energy needs differ among urban and rural populations and between women and men, nor that planning for investments must take account of these differences. The Ministry of Water and Power and National Electric Power Regulatory Authority (NEPRA) are among the largest employers in Pakistan, but female employees comprise far less than the government's 10 percent quota. Women account for 3.5 percent of total officers in these organisations. Women employed by distribution companies report several issues related to employment and advancement.

2.3.7 Tajikistan

Energy Access and Security

Tajikistan is a net energy importer of nearly half of the oil and gas consumed in the country. Electricity production is dominated by large hydroelectric facilities that supply 94 percent of the country's demand. Many of these facilities are more than 40 years old and require maintenance and additional investment to prevent deterioration and system losses. Despite recent achievements, Tajikistan suffers from energy shortfalls, particularly in winter and in rural regions. Approximately 70 percent of the population experiences frequent electricity outages. There is large variability in water flows between spring-summer (wet) and fall-winter (dry), leading to overproduction of hydroelectricity in the summer and shortfalls during the winter. The electricity transmission and distribution system is generally old and inefficient, thus exacerbating the challenge of seasonal variability and energy access in rural areas. Tajikistan's electricity grid does not connect to other Central Asian countries, which prevents it from selling electricity abroad during the wet season and importing needed electricity when hydroelectric production is constrained by low winter flows.

Energy, Water, Food, and Environment

Agricultural land irrigation is a major consumer of water and power in Tajikistan. Given the mountainous terrain throughout the country, the majority of irrigated areas rely on pumping to convey water, thereby creating a large, consistent load on the energy system. Moreover, the need for regular water supplies to serve agriculture can conflict with electricity generation priorities at hydroelectric facilities. Water security is a critical issue for Tajikistan, and it has led to conflicts with neighbouring Uzbekistan over water rights and withdrawals from major transboundary watersheds.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

As in the Kyrgyz Republic, the overwhelming portion of Tajikistan's RE generating potential is in hydroelectricity. The country already supplies 94-99 percent of its electricity demand through hydroelectricity, and significant untapped potential remains. Other RE sources – solar, wind, and biomass – have the potential to meet approximately 10 percent of electricity demand in Tajikistan, although only about one percent of that potential has been developed. Solar thermal technologies have demonstrated high potential to displace heating loads that currently stress the country's electric system. One local company produces residential-scale solar thermal technologies, the adoption of which has begun to spread in urban and rural communities.

Renewable Energy Market Survey and Trends

Overall, economic development and entrepreneurial activity is limited throughout much of the country because of irregular electricity supply and poor availability of investment capital. Loan rates are typically high (25-35%), which hampers private investment, particularly at the community or residential level. The government has established supportive policies and created financing opportunities to encourage the development of small hydroelectric facilities, and 47 MW of new small hydro facilities were developed in the 2010-11 period.

Private Sector and Employment

The Tajikistan private sector tends to operate under tight state control, particularly for larger enterprises. There are instances of private-sector involvement in the energy sector. For example, Pamir Energy developed a public-private partnership to turn around a decrepit, loss-generating utility and create a sustainable, profitable, viable, replicable energy system in the Gorno Badhakshan Province, the most remote, harsh and poverty-stricken region in Tajikistan. [82]The company counts approximately 600 engineering and technical personnel. The production of RE components existed for several years; solar thermal installations (water heaters) are manufactured on a large scale from imported parts in Dushanbe and in smaller centres in a more artisanal manner. However, these centres are generally not operating today. Few specialists design and install solar and wind installations, and there is a general lack of experience and opportunities for advanced training.

[82]EnergySector, PamirPrivatePowerProject (PPPP), Tajikistan.

Sustainable Energy Policy and Incentive Frameworks

Government policy for RE development is focused on hydroelectricity. At this stage, the national policy of Tajikistan is concentrated around the construction of the Rogun hydroelectric station. All other energy development projects are postponed until after the scheduled completion of the project in 2035.

Human Resources and Capacity Development

Since 2012, the Energy Institute of Tajikistan has offered an engineering and economics programme for the energy sector. Energy sector specialists are also being trained by the Energy Department of the Tajik Technical University. The Technical University has a RE department, while technical colleges and lyceums in Dushanbe, Vahdat, and Khujand train electrical engineers and electricians.

Currently, very few local professionals support the installation and design of solar, wind, and bioenergy facilities. Several organisations service the RE sector and provide some training, while small manufacturers (such as solar thermal assembly in Dushanbe) train workers internally and externally on assembly and installation.

Availability of Investment and Market Data

Tajikistan faces key issues that hinder the creation of a sustainable investment climate and long-term, sustainable economic growth. There are difficulties in ensuring compliance with contractual obligations, protection of property rights and other related rights, and inefficiency in the legal system. Other barriers to entry into the market include limited access to information, limited roads and transportation infrastructure, and complicated systems for customs and travel visas.

Gender and Energy

In rural areas, women spend considerable time collecting and preparing heating and cooking fuel. This role is especially significant for women who live in highlands where winter can last almost six months and electricity access is poor.

2.3.8 Turkey

Energy Access and Security

Turkey depends heavily on primary energy sources imported from other countries. Imports account for 99.13 percent of natural gas and 93.07 percent of oil consumed. Turkey has made serious efforts in recent years to diversify the countries from which it imports oil and natural gas, develop alternate importation routes, and increase storage capacity particularly for liquefied natural gas. The LNG input capacity, which was 34 million m^3/day in 2002, reached 117 million m^3/day in 2019. The natural gas input capacity, which was 190 million m^3/day in 2016, reached 318 million m^3/day in 2019. The TANAP and Turk Stream pipeline projects have been completed. Turkey's electricity generation, transmission, and distribution infrastructure is modern, with low losses and high stability in rural areas. The country has seen increasing demand for electricity since 2000, driven by economic growth, urbanisation, and higher adoption of cooling technologies. In addition to having significant hydro-electricity share in its

electricity production, Turkey made significant progress in solar, wind and geothermal resources in recent years.

Energy, Water, Food, and Environment

Beginning in the early 2000s, Turkey's electricity generation sector began transitioning from large, state-owned and managed hydroelectric facilities to smaller hydroelectric stations owned and operated by the private sector. The development of new hydroelectric generating facilities today requires greater oversight and sensitivity to environmental impacts.

In the period from 2000 to2016, the annual average energy savings were 2.6 mtoe (million tonnes of oil equivalent). By the end of 2016, the estimated cumulative savings were 42.5 mtoe. The transport sector generated the most savings (24.9 mtoe), due to renewal of the vehicle fleets as promoted by a governmental support scheme to phase out old and inefficient. Most of the savings in the manufacturing sector (9.8 mtoe) stemmed from equipment renewals. In buildings, renovations and refurbishments as well as the adoption of new efficient electrical generated savings of 7.7 mtoe.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

In some parts of Turkey, hydroelectric generating facilities have had positive impacts on irrigation and water availability. The GAP Project (South-eastern Anatolia Project) manages water supply needs in an integrated manner so that both irrigation and energy dimensions are considered. This created multiple benefits such as improved agricultural outputs, flood prevention, and electricity supply. Beginning in the second half of the 2000s, wind energy plants spread out all over the country. After 2010, Turkey witnessed rapid growth in the geothermal industry in certain regions. After 2015, solar energy soared. Solar installed power, which was just 40 MW in 2014 and 249 MW in 2015, boomed and reached 5,063 MW at the end of 2018.[83]

Renewable Energy Market Survey and Trends

Turkey seeks to become the world's tenth-largest economy by the 100th anniversary of the foundation of the Republic of Turkey in 2023. Energy is a critical aspect to achieving this goal, and the government is aiming to increase the share of total RE production to 30 percent of the energy mix by 2023.[84] Hydropower capacity increased by 1,018, solar by 1,642, geothermal by 219, and wind by 489 in 2018. Turkey is on course to meet its 2023 RE targets (set in 2014) for geothermal (1,000 MW), biomass (1,000 MW), and solar energy production (5,000 MW).

Private Sector and Employment

As of August 2019, the private sector operates 70.7 percent of total RE capacity in Turkey, whereas the public electricity company EÜAŞ operates 29.3 percent. More than 40 EE and RE consulting companies

[83] Turkey Ministry of Energy (2020).
84 SOGUKPINAR, Haci, Ismail, BOZKURT and Serkan CAG (2018), Turkey's Energy Strategy for 2023 Targets after 2,000 MW Giant Renewable Energy Contract, E3S Web of Conferences 64, 01001.

operate in Turkey. Also, strong markets for solar water heaters and a feed-in tariff (FiT) mechanism for renewable generating facilities have begun to improve employment prospects in the RE sector.

Sustainable Energy Policy and Incentive Frameworks

Various incentives for RE development – including FiT and tenders for mega projects – are in place and are continually being adjusted. FiT prices have successfully attracted new installations, placing Turkey on track to meet many of its 2023 RE development goals.

Turkey has implemented a range of strategies, actions plans, and development plans to increase the importance of RE and EE, including:

- 11th Development Plan (2019), period: 2019-2023;
- National Climate Change Action Plan (2012), period: 2011-2023;
- National Energy Efficiency Action Plan (2018), period 2017-2023;
- National Energy and Mining Policy;
- Ministry of Energy and Natural Resources Strategic Plan 2020.

Human Resources and Capacity Development

Turkey has a strong skilled trades sector whose workers might need additional skills to transition to the RE/EE sector. Approximately 50,000 people are currently employed in solar energy development and maintenance.[85] For energy efficiency, more than 5,000 energy managers have been trained by the Ministry of Energy and Natural Resources. Most are employed in the industrial sector. The Ministry of National Education also has programmes to develop skilled employees for the sustainable energy market; as of 2017, 34 secondary schools included RE programs.[86] However, training and capacity building for EE are lacking compared to RE. Current sustainable energy research programmes in Turkey include the UNIDO CleanTech Innovation Programme and the Scientific and Technological Research Council of Turkey.

[85]GÜNDER (International Solar Energy Society, Turkey Section), Solar Energy Roadmap for Turkey, Ankara, October 2018.
[86]B. G. Baykan, Yoth Employment in RE Sector, Grant Program of Ministry of Labor for Supporting Young Employment in Sectoral Investment Fields, prepared for the Project of Yeşil Düşünce Derneği (Green Thought Association), April 2017.

Availability of Investment and Market Data

High-quality information is available on investment levels in the RE energy sector in Turkey. Good RE data sources include:

- Turkish Electricity Transmission Corporation (TEİAŞ) installed power and energy generation statistics;
- Ministry of Energy and Natural Resources (MENR) energy balance statistics and the monthly installed capacity of plants;
- The electric utility company EnerjiPiyasalarıİşletme A.Ş. (EPİAŞ) electricity market statistics (day-ahead and intra-day prices, balancing power market, ancillary services, etc.);
- Energy Market Regulatory Authority (EMRA) Licences and information of all operating and under-construction power plants.

Gender and Energy

Knowledge on, attitudes about, and practices related to EE vary significantly by gender. Outreach to households, access to finance for the purchase of EE improvements and home appliances, and improved communication approaches can strengthen women's participation in the public sphere. MENR launched an EE education campaign in recent years, with a focus on non-working women.

2.3.9 Turkmenistan

Energy Access and Security

Turkmenistan has the fourth-largest proven natural gas reserves globally and significant crude oil resources. Energy accessibility is widespread; the electricity grid and natural gas distribution network serve almost all residents although some rural desert locations are served by off-grid diesel generation. Electrical service is robust and service interruptions are uncommon. Turkmenistan does not face the same energy security challenges as some of its neighbouring countries, but the economy is subject to fluctuations in gas markets because the economy depends on natural gas exports. The electricity generation mix is more than 99 percent natural gas, while small hydropower and off-grid diesel generation represent the remaining share. Although it cut off its connection to the Central Asia power grid in 2003, Turkmenistan continues to export electricity to Iran and Afghanistan. Projects are planned or underway to expand the country's energy export capabilities, including new transboundary transmission lines and power plant generation efficiency upgrades.

Energy, Water, Food, and Environment

Although rich in natural resources, Turkmenistan is affected by drought and desertification with almost 80 percent of its territory lacking a constant source of surface water flow. The situation is further aggravated by the increasing effects of climate change, which are threatening food and nutrition security. Since Turkmenistan is a downstream country, it depends on the flow of water from neighbouring countries. The Amu Darya River is the main source of surface water supply in Turkmenistan, and it is extremely important for agricultural irrigation. As a result, water use decisions in Uzbekistan have a significant impact on Turkmenistan's water security. Turkmenistan has experienced strong economic growth, expanding by 10.2 percent in 2013. The country's main exports are gas and crude oil petrochemicals, but its economy also benefits from a thriving cotton industry. Regardless, pockets of hardship persist everywhere although precise data are often difficult to obtain.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

Turkmenistan has significant solar energy potential owing to its 300 sunny days per year. Wind power potential is also high with a possible capacity of up to 500 GW in the long term. Combined, these sources would rival the country's fossil fuel potential in electricity generation. However, RE sources remain largely undeveloped due to affordable and abundant fossil fuel resources. Subsidies for electricity and natural gas keep tariffs low and challenge the economic viability of renewable technologies. The Kara Kum Desert is used for livestock husbandry and is served by wells with a constant need for electricity to power well pumps and groundwater desalination facilities. Solar pumping and desalination facilities have significant potential to displace the diesel generation that currently serves these uses.

Renewable Energy Market Survey and Trends

RE systems remain undeveloped due to the affordable and abundant resources of fossil fuels. Solar and wind power development is viable in remote, off-grid areas. Currently, photovoltaic panels or wind turbines used in individual private farms are only for demonstration or advertising purposes.

Private Sector and Employment

Currently, no private organisations produce or use RE except for specialised operations that supply equipment for radio relay stations and communications systems.

Sustainable Energy Policy and Incentive Frameworks

The Turkmen government aims to increase RE generation, but a legislative framework to promote and support such investments does not yet exist. The President of Turkmenistan recently approved a new energy conservation programme for the 2018-2024 period and a draft law on energy conservation has been developed, which is currently under consideration in key ministries and departments.

Human Resources and Capacity Development

Currently, few professional organisations exist or training programmes are offered for the RE industry in Turkmenistan. Two research efforts include:

- The renewable energy centre at the Mary Energy Institute under the Ministry of Energy of Turkmenistan. The first graduation ceremony of RE specialists was held in 2019;
- The Institute of the Academy of Sciences of Turkmenistan supports the development and dissemination of RE and new technologies to meet the needs of the population living in remote areas.

Availability of Investment and Market Data

The new energy conservation programme and law are anticipated to lead to greater availability of market data and investment information for RE developers.

Gender and Energy

The first National Action Plan of Turkmenistan to Ensure Gender Equality, approved by the Decree of the President of Turkmenistan in January 2015, is aimed at combatting gender-based violence and eliminating discrimination against women. Employment and entrepreneurship among women in Turkmenistan are high compared to the other ECO region countries. Today, 46.8 percent of women are employed in the non-state sector of the economy.

2.3.10 Uzbekistan

Energy Access and Security

Uzbekistan produces natural gas, coal, and oil for domestic use and for export. The country is also under pressure to expand its gas export market to raise revenue, requiring increased gas production and investments in export pipelines. Natural gas represents the largest share of the electricity generation mix (87 percent). Hydroelectricity accounts for approximately 10 percent of electricity generation. Ageing infrastructure and underinvestment in electricity and gas systems have led to electricity shortages, inefficiency, high losses and unreliability. Insufficient capacity and an overloaded transmission network result in regular outages, with the most severe occurring in autumn-winter. Uzbekistan has high potential for renewable energy, especially in remote, off-grid areas.

Energy, Water, Food, and Environment

Water issues have impacted the regional relations and interests of Uzbekistan, in connection with the construction of the Rogun hydropower plant in neighbouring Tajikistan, and its impacts on water supplies in the Amu Darya delta.

Renewable Energy and Energy Efficiency Solutions and Co-benefits

Uzbekistan has significant renewable energy potential, in particular for solar PV, and for wind power serving remote, off-grid agricultural uses. Subsidies for traditional energy sources, and low overall tariffs for electricity and natural gas pose a significant hurdle for large scale development of RE resources, however. There is significant EE potential in the industrial sector; the cost-effective savings potential is estimated to be 9-24 percent in small and medium enterprises, and 7-16 percent in large enterprises. Industries with the greatest energy efficiency potential include mining, chemicals, and construction materials.

Renewable Energy Market Survey and Trends

Uzbekistan plans to invest USD 889 million in hydropower plants between 2016 and 2020, according to a recent plan accepted by the ministerial cabinet. The plan includes restoration works on 15 older hydroelectric power plants as well as the construction of nine new ones in the country. In addition, Uzbekenergo plans to construct wind stations with a total capacity of more than 100 MW.

To address energy efficiency issues, the UNDP recently implemented a new programme aimed at improving building standards in the healthcare and education sectors, demonstrating building structures and developing local capacity for design, construction and maintenance.

Private Sector and Employment

The involvement of the private sector in energy production is limited due to continued monopoly of distribution, production and transmission by state-owned enterprises such as Uzbekneftegaz and Uzbekenergo JSC. This situation has the potential to change in the short-term, as the government is considering policy changes to increase competition in the energy sector.

Sustainable Energy Policy and Incentive Frameworks

There has been significant policy development in the past decade, including the following legislation:

- Resolution on Further Development of Renewable Energy and Energy Efficiency 2017-2025
- A Strategic Framework for the Central Asia Regional Economic Cooperation Program 2011–2020
- Strategy and Work Plan (2016–2020) for Regional Cooperation in the Energy Sector of CAREC Countries
- The Law on Rational Energy Utilization (introduced project-specific feed-in tariffs for renewable energy facilities).

Human Resources and Capacity Development

There are few skilled professionals in the RE/EE industries, but there is an experienced workforce in the construction and operation of hydroelectric power stations, whose skills could be adapted to the RE/EE industries. Uzbekistan also has several capacity development initiatives and research programmes to develop this industry, including:

- Samarkand Solar Power Project
- Uzbekistan Institute for Solar Power
- Renewable Energy Sources Group

Availability of Investment and Market Data

Uzbekistan is considered a moderately challenging environment to do business. The limited private sector experience in the energy sector and limited experience of the energy sector with RE and EE limits the availability of solid market data for investors.

Gender and Energy

Unsustainable power supply affects women's efficiency while performing traditional social roles and creates barriers for working women. Because women typically perform most household and family obligations, they are key consumers of electricity. Unsustainable supply of energy means that women cannot take advantage of labor-saving appliances like washing machines or electric cooking stoves. Unreliable energy supply also affects women who work at formal jobs. They must manage their job responsibilities when the power is available and also cope with the needs of their household and family. However, providing quality and sustainable electricity supply will not automatically reduce the time women spend on household work unless such interventions include awareness-raising activities on energy-efficient and labor-saving devices, as well as time use and redistribution of labor within the family. At the institutional level, women are underrepresented in the energy sector staff, accounting for only about 17% of all Uzbekenergo employees. Given that most of them do not work at higher grade jobs (e.g., management, engineering, and science), women have not reached the critical mass that would allow them to influence important policy decisions.[87]

[87]ADB (2018j).

3 ANALYSIS OF CHALLENGES/BARRIERS AND DRIVERS/OPPORTUNITIES IN THE RE/EE SECTOR

3.1 Enabling Factors and Barriers

Barriers and enabling factors were gathered in each country through an initial discovery process followed by consultants based in each country. Each consultant has significant experience with the challenges faced over the course of the past decades. An initial list of these factors was supplemented following the process of gathering surveys that involved speaking with key representatives of government, the private sector, and non-governmental organisations in each country. In most cases, barriers were grouped by type at the country level: legal and policy; economic and financial; technical; as well as knowledge and awareness. Market barriers were occasionally mentioned, but these often overlapped with economic and financial barriers. Enabling factors were grouped into legal and policy, economic and financial, and technical factors. Where they overlapped, the category that had the most significant impact was used based on the team's professional experience. It is important to note that a list of barriers and enabling factors was not provided to consultants or survey respondents – the type and nature of the barriers and enabling factors were created from scratch for each country without influence from our international team. In this manner, they represent the real impressions from local actors in the field. Over 136 individual barriers and 143 enabling factors were identified, many of which exist in multiple countries. The most common barriers and enabling factors are detailed below.

3.1.1 Legal and Policy Barriers

Regulation through law has the potential of addressing many of the barriers to RE and EE. Law is one of the social, regulatory, and economic instruments used to control and shape development. The wide range of barriers highlighted by experts and survey respondents reflects the diverse situations of the ten countries in the ECO region. Word clouds were used to highlight recurring terms across countries, as outlined in Figure 8 below.[88] Terms that are frequently repeated, which cited herein, demonstrate the importance to the region of an appropriate "framework", of "implementation", and of considering "sectors".[89] The lack of attention paid to many of these aspects is highlighted by the overwhelming size of the word "lack". Words that appear less frequently (and thus appear smaller in the word cloud) still highlight important facets of the countries being studied, including "war" (with particular reference to its importance in Afghanistan), the continuing importance of "monopolies", and the occasional consideration given to "municipalities".

In the sections below, the most common barriers mentioned by multiple countries are described and analysed. The underlined title of each section is the name of the barrier discussed

[88] All word clouds were created using Tagcrowd accessible at https://tagcrowd.com/.
[89] Word in quotations are drawn from the word cloud

Figure 8: Legal and Policy Barriers Word Cloud

Lack of comprehensive legislation including sanctions/enforcement of EE

Four out of 10 countries mentioned a lack of a set of comprehensive or integrated EE legislation as a particular barrier. Four other countries mentioned a lack of regulation or the limited nature of the regulation in place as strong barriers and included legislation related to renewable energy but did not focus their comments on energy efficiency. In countries with a more heavily developed framework in place specific mention was made of the importance of including sanctions and enforcement as a punishment to ensure that legislation has the intended impact. Shortcomings with legislation, be it a lack of comprehensiveness or complete lack of regulation, were highlighted by countries with both strong and weak RE/EE policies. This highlights the commonality of barriers, even amongst countries at very different stages in the development of clean energy.

Weak or non-existing regulatory framework and/or customs policy

Three countries highlighted a weak or non-existing regulatory framework and customs policy. Apart from those three countries, Afghanistan highlighted the lack of a regulatory agency as a major barrier. Since very little production of RE or EE equipment occurs in countries of the region, the lack of a customs policy that specifically treats RE and EE equipment with preferential rates can have a large and negative impact on the development of the industry. Reformed customs policies in several countries outside the ECO region have demonstrated the potential and rapid impact of removing this barrier on the development of the industry. While RE and EE equipment is manufactured in the region, in particular the production or assembly of solar water heaters in several countries, equipment, materials, or final products will, for the foreseeable future, continue to be imported into the region, highlighting the importance of this barrier.

Lack of comprehensive national incentive package for households, industry, and municipalities

Mentioned by two countries this barrier highlights the importance of comprehensive incentives that target broad swaths of end users. Incentives can play a strong role in advancing the market, while targeting specific groups of end users can support achieving broader policy goals and minimise hardships.

Inconsistent sub-national implementation policies, procedures, and structures

Highlighted by Pakistan and Tajikistan but likely to be present in additional countries, inconsistent sub-national implementation policies and procedures, as well as irregular structures, cause confusion and create unnecessary difficulties for the development of the clean energy sector. This barrier highlights how national legislation and regulatory policies are not sufficient to allow the sector to develop and that implementation can present new barriers that are very challenging to overcome.

Weak implementation of RE and EE legislation

Somewhat less specific than the previously mentioned barrier, weak implementation of existing legislation indicates that implementing appropriate legislation is not sufficient to develop the sector, which will require a more concrete activities and continued effort to implement well-conceived legislation strategically and efficiently. This barrier was mentioned by two country teams, including the team in Kyrgyzstan, which has made significant strides in recent years to move their RE/EE legislation forward and faces new implementation challenges.

Energy monopoly presents barriers to private-sector entrants

While most countries have started to move away from an energy monopoly structure and have introduced various levels of private-sector participation, two countries highlighted the negative impact that a partial or full energy monopoly has on unlocking private capital to invest in an energy transition. In Tajikistan, the electricity grid in the Gorno-Badhakshan Autonomous Region (GBAO) has been successfully privatized, but Barki Tojiki continues to be the monopolist energy supplier and generator in the remainder of the country. This is a case where multiple levels of barriers can exist within one country. In GBAO, where Pamir Energy signed a 25-year public-private partnership (PPP) with the Government of Tajikistan, private-sector investment has revitalised the grid, reduced distribution losses, rehabilitated existing run of the river hydro systems, and served to build new generation and distribution infrastructure that enables export to the neighbouring Badhakshan province of Afghanistan. This has also led to virtually eliminating supply shortages in GBAO. In other parts of the country, load shedding continues, particularly during the winter peak period, and the monopoly structure dissuades private-sector involvement.

3.1.2 Economic and Financial Barriers

In line with comprehensive studies on overcoming barriers to EE, this study revealed a correlation between the existence of a regulatory framework and how well it supports and enables EE investments. Generally, financial institutions continue to view EE as significantly riskier than other types of business projects, leading to a desire for various incentive or risk-mitigating modalities to support lending.[90] This is reflected in the importance that respondents placed on economic and financial barriers and fairly significant overlap in responses from different countries when reporting barriers.

The reoccurring words in the barriers elucidated by respondents in all ten countries are represented in the word cloud in Figure 8. Multiple respondents made clear the importance of dedicated “schemes”, while the “availability” of “financing” is highlighted multiple times. “Tariffs” are mentioned relatively frequently, along with “funds”, thus highlighting how the barriers reported include both the causes of the poor performance of RE and EE (tariff impacts) as well as some of the potential solutions (financing and dedicated funds) that could be proposed. Finally, some words, such as “corruption” or “culture”, are mentioned fewer times but still have oversized importance to the countries that mentioned them.

[90]UNECE (2017),“Overcoming Barriers to Investing in Energy Efficiency”. Retrieved form:https://www.unece.org/fileadmin/DAM/energy/se/pdfs/geee/pub/Overcoming_barriers-energy_efficiency-FINAL.pdf.

Lack of EE funds or dedicated finance schemes

A lack of a dedicated EE fund or other dedicated finances schemes was mentioned by nearly half of country respondents. In other countries in the region where EE funds or dedicated finance schemes have been put in place, for example Turkey's TurSEFF, significant reductions in emissions through EE improvements have been realized. Crucially, successful dedicated funds can be self-sustaining over the medium term as they reinvest following repayment. A case study on the Energy Efficiency and Renewable Sources Fund (EESRF), a success story of a financial mechanism that, using only USD 15 million in capital, was able to catalyze more than USD 63 million in EE investment in Bulgaria, is presented in Appendix II. Countries that highlighted the lack of this sort of an incentive include Pakistan and Kyrgyzstan, which have both started to make improvements in recent years to the EE lending environment. Survey respondents noted the challenges of trying to use non-dedicated credit facilities to finance EE investments (which they would do in the absence of dedicated funds) include a mismatch in terms, conditions, collateral requirements and interest rates compared to what is required for EE installations.

High levels of investor uncertainty/risk

Investor uncertainty and risk impact the whole economy, not just EE or RE investments. However, since EE and RE are both likely to be considered riskier by financial institutions and investors with less experience in the field, uncertainty and risk can be seen to impact RE/EE more acutely. Four countries highlighted this barrier, including Turkey where recent political instability has impacted lending rates in general and currency fluctuation risks. Both Tajikistan and Iran, where investor uncertainty can be seen as a more structural and long-term issue, also mentioned this barrier. This barrier overlaps, to some extent, with the risky business environment barrier, which was highlighted by an additional two countries including Afghanistan.

High costs and limited financing capacity

The high costs of borrowing is a barrier mentioned by three countries. This barrier is strongly correlated to the lack of dedicated financing barrier, as well as to the high levels of investor uncertainty/risk barrier that are present in many ECO countries. The limited financing capacity barrier is also strongly related to the inadequacy of national funds – a barrier mentioned by two of the same countries – as a way of re-emphasising the importance of finance issues. "Weak domestic finance possibilities" is another barrier related to financing challenges mentioned by two countries.

Figure 9: Word Cloud of Economic and Financial Barriers

Lack of financial incentive and support scheme

A lack of financial incentive and support scheme for EE and RE was mentioned by five countries. This is differentiated from the lack of an EE fund by the inclusion of RE in the barrier. While RE and EE are often treated together, they can require different supports, particularly when lending is concerned, for reasons that include the difficulty in collateralising EE investments. Improving the understanding of financial sector actors about RE/EE investment opportunities and risks involves costs that can be usefully covered by dedicated support schemes. Where these do not exist, it can be challenging to open up the financial sector to RE and EE investments.

Low electricity tariffs

Low electricity tariffs present a key and important barrier to the development of EE and RE. In the case of EE investments, low electricity tariffs prevent significant long-term savings due to efficiency investments, which negatively impacts the payback period of such investments. For RE investments, low tariffs present the same risk for behind-the-meter installations in that the avoided electricity consumption is insufficiently valuable to pay back the equipment purchase. In the case of larger systems feeding into the grid, low tariffs can suggest increased off-taker credit risk and deter the participation of the finance sector. Low electricity tariffs were specifically mentioned as a barrier by five countries and at least two other countries are significantly impacted by this situation.

Risky business environment

A risky business environment was highlighted by two countries, and the related barrier of investor risk by four. These barriers are highlighted through a number of related barriers including corruption limits foreign investment, standards for the use of RE are lacking, and limited domestic purchasing power, which were each highlighted by at least one country. A risky business environment increases financing costs, corruption increases transaction costs, and a lack of standards increases reputational risks for companies entering new markets.

3.1.3 Technical Barriers

Technical barriers to RE development and increased EE include inadequate technology and lack of infrastructure necessary to support the technologies. Given a lack of trained personnel to demonstrate, maintain, and operate RE and EE structures, especially in regions with low education levels, people are unwilling to import the technologies for fear of failure. A lack of physical facilities for transmission and distribution networks, connectivity to the grid, as well as equipment and services necessary for power companies is also a major infrastructure challenge. Additionally, inadequate equipment servicing and maintenance and low technology reliability can lower customer confidence in new RE and EE technologies.

The word cloud for the technical barriers presented in Figure 10highlights the frequency that the words “lack” and “limited” are mentioned, suggesting that limitations apply to technical factors related to RE/EE. The importance of the word “capacity” is also obvious, which suggests the need for improvement in capacity, while “implementation” is likewise very often mentioned, highlighting the importance of follow through from policy direction to on-the-ground impacts. The importance of energy performance contracts (“EPC”) is noted, particularly to countries that have the structures necessary to implement them, alongside the importance of the word “managers”. The prominence of both these terms, “EPC” and “managers”, puts a spotlight on how technical barriers have important organisational factors that must be addressed in addition to strictly technical issues. Strictly technical limitations do, however, play a significant role, highlighted by the prominence of, for example, the words “transmission”, “wind”, and “technology” in the word cloud.

Figure 10: Technical Barriers Word Cloud

Technical barriers reported by respondents in the ECO region generally overlap and coalesce under four categories: human resources; data and knowledge; standards; and technology.

Technical human resource barriers

Technical barriers focused on human resource capacity include limited professional expertise and number of technical consultants, a lack of technical capacity in the field, limited technical and financial skills in Small and Medium-sized Enterprises (SMEs), and a lack of qualified energy auditors and energy managers. Each of these was mentioned by at least three countries; six countries highlighted items within this group of barriers. A lack of appropriate technical resources in a country can stall even the most well-intentioned RE/EE development programme.

Technical data and knowledge barriers

Data and knowledge barriers include a lack of recent mapping of RE/EE potential, a lack of specialised test areas and laboratories on RE technologies, a lack of information about noise emissions and the impacts of bird migration, and the inadequacy of feasibility studies. Countries with more experience in the field of RE/EE also mentioned the limited number of good examples of RE/EE installations in the region and sharing good practices when they exist. Four countries highlighted barriers in this category.

Technical standard barriers

It was mentioned that standards for key equipment do not exist, and there is a lack of labelling, certification and recognition, as well as a lack of guidelines, handbooks, and certified energy audit companies. Six countries mentioned barriers in this category, some of which specifically highlighted the potential for regional cooperation to support their country in improving standards, while others mentioned expanding the reach of their existing standards, highlighting a ready opportunity for making exchanges. An example of regional cooperation in developing and implementing energy labelling a scheme for appliances within the West African Economic and Monetary Union (WAEMU) is provided in Appendix III.

Technology specific barriers

Technology specific barriers highlighted through country investigations included transmission losses and inefficient technologies, a lack of RE production capabilities, a lack of information about innovative and niche products, and geographic grid connection limitations. Some more general highlighted barriers included limited willingness to invest in EE technologies, to renovate buildings, along with grid stability issues. Seven countries mentioned barriers in this category.

3.1.4 Knowledge and Awareness Barriers

Not all countries mentioned specific knowledge and awareness barriers. Those that did identified fairly divergent barriers, although they had certain strong overlapping messages. Highlighted by the word cloud presented in Figure 11, aside from “EE”, “weak”, “consumer”, and “awareness” are the three most common words in this list of barriers, pointing to the observed importance consumers have in the process of improving EE. Highlighted by their size in the word cloud, “promotion” and “understanding” are also key, suggesting that depth of knowledge is important. A large number of words with a relatively small size highlights the divergence in this group of barriers; a significant number of barriers were highlighted by only one country. Several smaller terms indicate in-depth thought about the routes forward, such as the words “conferences”, “incentives”, “studies”, “information”, and “magazine".

Figure 11: Knowledge and Awareness Barriers Word Cloud

Lack of public awareness

Mentioned by four countries, a lack of public awareness can be considered a significant knowledge and awareness barrier. This is reinforced by lack of market demand, consumer neglect of EE when making purchases, and consumer confusion (too many options) mentioned as additional barriers by multiple countries.

Lack of promotion by government (information portal or other)

Highlighting the role of government as a trusted source of information, the lack of government promotion about RE and EE was highlighted by several countries. A lack of incentives for EE products was also specifically mentioned by multiple countries. Other barriers mentioned were specific data gaps, including electricity demand data, as well as energy consumption and management.

Lack of a popular science magazine

Mentioned by several countries, this specific barrier highlights an immediate need for a resource that helps to combine interest and practitioners with shared knowledge and build community. This barrier is again reinforced by several other barriers mentioned, including lack of regional and national conferences, lack of knowledge about methodologies to compare energy sources, and non-existing experience-sharing opportunities.

3.1.5 Legal and Policy Enabling Factors

Worldwide experience with successful RE and EE programmes demonstrates that the implementation of an enabling environment of legal, policy, and regulatory frameworks that attract large-scale capital investments is instrumental. The analysis of ECO region policies demonstrates, similarly to countries around the world, there are very different levels of progress across ECO countries. Ongoing studies continue to highlight how well-designed policies operate and need to be expanded to reach the 68 percent of global energy use not covered by codes or standards.[91]

Legal and policy enabling factors initially enjoy more agreement amongst countries in the ECO region than barriers. The word cloud presented in Figure 12 highlights some common reoccurring terms. The importance of “national”, “legislation”, and “policies” to respondents is clear, as is the importance of regional actions. As mentioned in the barriers, the importance of “implementing” is brought forward, while the size of the word “underway” suggests that actions are being taken. Several respondents also highlight key concepts that have oversized importance, including “tariff”, “rebate”, and “tax”, thus suggesting that awareness about the key areas where changes can be implemented with significant impacts are in some cases known in the region already.

[91] IEA (2017), “Energy Efficiency”, Retrieved from:https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/energy-resources/Energy_Efficiency_Marketing_Report_2017.pdf.

Figure 12: Legal and Policy Enabling Factors Word Cloud

Stated government interest to make use of EE and RE

This enabling factor was mentioned by all countries. It may seem to be a relatively minor point, but it is important to mention that, only a few years ago, stated government interest to make greater use of EE and RE was not a true enabling factor for some governments in the region. This indicates progress and that the region is united on a pathway to a sustainable energy future. As many of the barriers would suggest, a stated interest is not in and of itself sufficient to achieve any goals, but it is an important prerequisite.

Membership in important regional bodies (SPECA and CAREC)

Of particular importance to some of the smaller countries of Central Asia and the Caucasus, regional bodies and regional cooperation initiatives can bring strong benefits to countries wanting to move into this new field of activity. Since EE and RE are new topics to many countries and the time and energy cost of developing policies and programmes can be significant, regional initiatives have the opportunity to kick start and accelerate the transition. Seven of ten countries highlighted their membership in specific regional initiatives as an important enabling factor, emphasising the locally visible importance that regional initiatives play.

Targets for EE, RE and/or energy intensity reduction

EE and RE targets are a powerful means of quantifying desired changes to the economies of ECO countries. Energy intensity is one way that a target can be expressed; countries may also have specific GHG reduction targets, or specific targets related to installed RE generation for example. Specific higher-level RE/EE targets are proven to translate into more measurable and specific actions. Targets were mentioned as strong enabling factors by five countries, with Azerbaijan characterising them as strong targets. At least two additional countries are known to have them in place but did not mention them as an enabling factor.

Existence or movement toward a simple licensing procedure for RE

These final three opportunities have some strong commonalities in that they discuss more or less specific policies and the support available to advance them. Between two and four countries noted each of these opportunities, reflecting in some case the very different levels of progress that have already been achieved. Implementing a simple licensing procedure for RE was, in general, mentioned by countries that have already progressed toward increasing the amount of RE used in country and have observed challenges in obtaining the necessary licenses to install and use this new form of generation. The key concept in the opportunity is the simplicity of the procedure, as a complicated procedure for licensing is a common barrier for RE around the world.

Starting the process of strengthening the legislative framework for RE/EE

Compared to countries that highlighted the above simple licensing procedure opportunity, three countries that mentioned starting the process of strengthening a legislative framework are still at early stages in their journey to implementing EE and RE. Changes to legislation take time to implement and then improve, and this iterative process includes some of the first steps for a government to start improving the use of RE and EE (the first enabling factor mentioned).

Availability of relevant support and guidance from intergovernmental organisations to develop and support institutional changes

Learning from international experiences, even where they are not perfectly comparable, is an efficient way to accelerate the transition to greater use EE in country. Local respondents from three countries highlighted the importance of having intergovernmental organisations ready and able to assist in making necessary institutional changes. An additional country highlighted that international assistance to develop improved policies is currently ongoing.

3.1.6 Economic and Financial Enabling Factors

It is broadly recognised that improving EE contributes to more resilient and faster economic growth. A policy framework that supports market openness, competition, flexibility, and innovation can magnify spill over benefits and vastly accelerate technological progress. Some policies promoting EE, such as R&D expenditures, removal of institutional barriers, and information dissemination, fall under this category and can stimulate economic growth both directly by improving energy productivity and indirectly by strengthening spill over effects. Recent studies confirm this virtuous cycle at least in OECD countries where it has been found that EE improvement can contribute to higher economic output.[92]

Many EE projects with strong financial rates of return remain unimplemented in the world at large, but especially in developing countries and emerging markets. Traditional investment delivery mechanisms operated by local banks and other financing organisations often have played useful roles in the field of EE, but still only a fraction of the potential has been tapped. Renewed and strong efforts are required to develop financing programmes that combine effective technical project development with financial products appropriate for dispersed investments.[93]

The diverse ECO countries have a large range of enabling factors in place that reveal less coherence than policy and legal enabling factors. A large number of mentioned enabling factors highlight the importance of international assistance, which is also highlighted by the word cloud in Figure 13below. Costs were also frequently mentioned, in relation to grid connection costs, cost-recovery energy tariffs, as well as RE and EE investment costs.

[92]World Bank Group (2018),"Scaling Up Thermal Retrofit of Residential and Public Buildings in Eastern Europe", March, Retrieved from: http://documents.worldbank.org/curated/en/572001543352247459/pdf/124578-ACS.pdf.
[93]The World Bank (2008), "Financing Energy Efficiency: Lessons from Brazil, China, India and Beyond", Retrieved from: http://documents.worldbank.org/curated/en/838051468026936715/pdf/425290PUB0ISBN11OFFICIAL0USE0ONLY10.pdf.

Figure 13: Economic and Financial Enabling Factors Word Cloud

Opportunities to focus on specific RE to lower costs in specific countries

Many Central Asia countries mentioned a proposal for specific countries to specialise in the exploitation of RE sources that are abundant on their territory to drive costs down through economies of scale and learning. Particularly for smaller countries, this specialisation highlights an awareness of the need to find creative solutions to high costs imposed by the remote location of these landlocked countries and relatively small population base.

International donor support for key national strategies

The importance of international support for key national strategies was specifically mentioned as a strong enabling factor by three countries, one of those countries and a fourth – Turkey – focussed in on the importance of international dedicated funds that were available to support the RE/EE sector. Particularly where donor support is mentioned, it is highlighted that this requires more than funds and includes technical assistance. Countries also highlighted two other enabling factors: past, ongoing, or planned financial cooperation offered by international organisations; and the availability of dedicated lending products.

Growing consumer awareness and declining investment costs

Growing consumer awareness about the availability and benefits of RE and EE was highlighted as a strong enabling factor by two countries, including the relatively nascent market of Turkmenistan. More experienced markets, such as Turkey, meanwhile reported continued decline in RE investment costs. Together, this pair of enabling factors highlights how multiple forces are coming together to create strong environments for growth in clean energy throughout the ECO region. Other enabling factors mentioned that contribute further to this theme of an improved environment for growth in clean energy include decreasing purchasing power, incentivizing EE, and ongoing tariff adjustments to reflect cost recovery and reduce subsidies in specific countries.

Off-taker guarantee and reduced duties on equipment

Only one country highlighted the existence of an off-taker guarantee as an economic and financial enabling factor, even though it exists in several other countries. Several countries highlighted specific incentives for the purchase of RE and EE equipment, including reduced duties on equipment, tax benefits, or outright subsidies. Several countries also highlighted specific incentives for connecting RE generators to the grid, including waiving connection costs.

3.1.7 Technical Enabling Factors

Several technical enabling factors can support the development of RE resources and the implementation of EE projects in countries throughout the region. Global experience highlights how specific infrastructure, technical assistance, and specific interventions focussed on improving technical understanding can kick start the development of markets and spur market transformations. The word cloud of technical enabling factors highlighted by country teams, presented in Figure 14 below, offers insight into important specifics in the region. The three largest words are “EE”, ”energy” and ”potential”, emphasising the importance of this set of enabling factors to reaching the scale required. Other reoccurring words include “appliances”, “industrial”, and “management”, highlighting the level of detail that is already contained in these enabling factors and the important directions that next steps can take. For EE improvements, policies like minimum energy performance standards for appliances offer a straightforward means to achieve results, while the relative size of industrial energy consumption in many of the countries in the region results in the sector holding significant potential for EE improvements. The importance of the words “domestic” and “local” offer a contrast to the equally strong importance of the words “international” and “state”, highlighting how both domestic and international aspects have important roles in supporting technical enabling factors. The lack of energy performance contracts (EPCs) as critical approach to incentivizing EE was noted as part of the technical barriers, showing how organisational factors must be addressed in addition to strictly technical issues. EPCs should also be considered as an important enabling factor for overcoming technical barriers. Some countries, such as Turkey, have made progress in implementing the EPC approach, as presented in Appendix IV. This type of initiative should be shared at the regional level and be followed by other ECO countries.

Figure 14: Technical Enabling Factors Word Cloud

RE and EE potential has been mapped out (in part or in full) and graduate level training is available

This enabling factor was highlighted by most countries, and its absence was additionally strongly and repeatedly noted by Afghanistan where the mapped-out potential for RE and EE is old and often outdated. In many countries where RE and EE potential has been mapped out, not by accident, graduate training is also available. Institutions of higher learning will frequently improve the level of technical knowledge in the country, and departments and courses of study can both reflect important sectors in the economy and be a driver for change. Most countries that highlighted the availability of a mapped potential for RE and EE also highlighted a strong potential for RE, one exception being Kazakhstan. Kyrgyzstan and Uzbekistan, which highlighted that the RE and EE potential had been mapped out and had graduate level training available, also highlighted independent research being performed in the country.

Party to the UNECE convention on industrial accidents and the unification of the electricity system

Five countries highlighted their status as party to the United Nations Economic Commission for Europe (UNECE) convention on the effects of industrial accidents, and the same five countries highlighted the unification of the electricity system as a technical enabling factor. Four countries additionally highlighted regional interconnections and export power lines being developed, including Pakistan and Afghanistan with the CASA-1000 line. Two countries mentioned the development of hydro resources offering the potential for domestic and export consumption. Regional integration can play an important role in balancing daily and seasonal fluctuations in renewable energy generation and support greater levels of penetration. Two countries mentioned developing experience in solar and other RE technologies through demonstration or productive installations.

Low-hanging fruit, domestic manufacturing, a diaspora, and experience operating auctions

A longer list of enabling factors was only mentioned by individual countries. This highlights how many of the technical enabling factors are still national in nature despite a desire from several actors to strengthen regional cooperation. Pakistan specifically mentioned interest in harmonising standards and labelling schemes regionally, the existence of a domestic label covering at least one appliance, and plans to expand that scheme. Iran also showed interest in regional standards and labelling programs, highlighting its own positive experiences to share, as well as their Feed-in-Tariff (FiT) scheme. Turkey highlighted a large share of energy intensive industries and the availability of low-hanging fruit to generate energy savings. Azerbaijan mentioned the availability of domestic RE manufacturing, while in Pakistan this was specifically at the village level and is present in several other countries. Uzbekistan and Turkmenistan highlighted recent improvements to legislation, specifically to building codes, the implementation of an energy management system for state-owned companies, and government cooperation, all of which have led to successes. Tajikistan noted that the participation of civil society in managing the energy sector has been increasing in recent years, while Kazakhstan highlighted their experience in operating RE/EE auctions. Afghanistan noted a diaspora rich in technical skills awaiting an opportune moment to return as a strong potential enabling factor.

3.2 Potential Impact of Regional Cooperation

Regional cooperation has the potential of supporting efforts to overcome many of the key barriers highlighted and taking advantage of the most prominent enabling factors. Examples of potential regional cooperation are highlighted by broad category below.

3.2.1 Legal and Policy Regional Cooperation

Table 10: Regional Cooperation Potential to Overcome Legal and Policy Barriers

Barriers	How Regional Cooperation Can Help
› Lack of comprehensive legislation › Implementation of RE and EE legislation is weak › Inconsistent sub-national implementation and structures	› Sharing of best practices › Knowledge exchange about sanctions/enforcement techniques › Development of model legislation
Weak or missing regulatory framework and/or customs policy	› Regional technical cooperation › Development of harmonised customs policies and enforcement
Lack of comprehensive national incentive package for households, industry, and municipalities	› Exchange visits for municipalities › Sharing of best practices › Support to avoid cross border leakage
Energy monopoly presents barriers to private sector entrants	› Share success stories of private-sector finance mobilisation › Support regional private sector investments

Table 11: Regional Cooperation Potential to Support Legal and Policy Enabling Factors

Enabling Factors	How Regional Cooperation Can Help
Stated government interest to make use of EE and RE	› Foster enthusiasm and publicise for regional interest › Support transition from interest to action › Share best practices
Membership in important regional bodies (SPECA and CAREC)	› Coordinate regional initiatives trans-regionally › Support trans-regional information sharing
› Targets for EE, RE, and/or energy intensity reduction › Existence or movement toward a simple licensing procedure for RE › Starting the process of strengthening the legislative framework for RE/EE	› Regional sharing of best practices › Sharing of strategies to meet targets › Regional technical assistance to develop strategies and legislation › Regional legislation development support
Availability of relevant support and guidance by intergovernmental organisations to develop and support institutional changes	› Coordinate national and regional support to reduce overlap and duplication › Share regional successes and best practices across organisations › Provide regional perspectives on program design

3.2.2 Economic and Financial Regional Cooperation

Table 12: Regional Cooperation Potential to Overcome Economic and Financial Barriers

Barriers	How Regional Cooperation Can Help
Lack of EE fund or dedicated finance scheme	› Sharing of best practices, knowledge exchange about fund operation and setup requirements › Support to regional fund or regional technical assistance to national funds
› High levels of investor uncertainty/risk › Risky business environment	› Support for regional investments that balance regional risks › Publicise investment successes › Support de-risking initiatives
› High costs and limited financing capacity › Lack of financial incentives and support scheme › Low electricity tariffs	› Support regional discussions on the importance of cost recovery tariffs › Support regional sharing of profitable investment models in high-cost environments › Improve knowledge sharing about support schemes and their impacts

Table 13: Regional Cooperation Potential to Support Economic and Financial Enabling Factors

Enabling Factors	How Regional Cooperation Can Help
Opportunities to focus on specific RE to bring costs down in specific countries	› Support for cross-border trade agreements and energy exchange to support specialisation › Development and sharing of regional energy scenarios
International donor support for key national strategies	› Support development of regional donor projects to support national strategies › Support for regional sharing of successes › Regional point of contact for donors
› Growing consumer awareness and declining investment costs › Off-taker guarantee and reduced duties on equipment	› Support information exchange to enable countries to keep abreast of changing RE economics › Regional success story development and communication › Regional investor package

3.2.3 Technical, Knowledge, and Awareness factors in Regional Cooperation

Table 14: Regional Cooperation Potential to Overcome Knowledge Barriers

Barriers	How Regional Cooperation Can Help
Technical human resource barriers	› Regional technical resource sharing › Regional scholarships › Regional competencies and professional standards development
Technical data and knowledge barriers	› Technical support to develop RE/EE mappings › Regional technical assistance to build capacity on technical issues › Regional knowledge repositories and data sharing portals
› Technical standards barriers › Technology specific barriers	› Development of regional standards › Technical support to implement regional and global standards at the national level
› Lack of public awareness › Lack of a popular science magazine › Lack of promotion by government (information portal or other)	› Support in development of communication materials for regional audience and national versions › Sharing of successes and best practices › Support for regional knowledge platform

Table 15: Regional Cooperation Potential to Support Knowledge Enabling Factors

Enabling Factors	How Regional Cooperation Can Help
RE and EE potential has been mapped out (in part or in full) and graduate level training is available	› Support regional gathering of available data and development of regional investment prospectus › Support regional scholarships and exchanges between schools
Party to the UNECE convention on industrial accidents and the unification of the electricity system	› Support communication about important regional initiatives › Develop regional energy scenarios considering cross-border infrastructure and exchange
Low-hanging fruit, domestic manufacturing, a diaspora, and experience operating auctions	› Support sharing of best practices › Support for regional standards and labelling programmes › Support regional trade, harmonisation of codes › Support peace and good governance

4 MAPPING OF RELEVANT STAKEHOLDERS AND EXISTING INITIATIVES

This section first provides an analysis of the relevant stakeholders' priority and needs regarding RE/EE, undertaken by type of stakeholders (public and private sector, regional intergovernmental organisations, NGOs and international development partners) and by countries. The section then includes a regional mapping of existing and recent sustainable energy initiatives in ECO countries and analysis the themes covered and those missing.

4.1 Analysis of Stakeholder Priorities and Needs Regarding the RE/EE Sector

The analysis is informed by feedback from 132 stakeholder organisations across the 10 ECO region countries. As outlined in Table 16, this total includes 67 public sector organisations, 10 regional intergovernmental organisations, 27 NGOs, 16 private-sector companies and 12 international donor organisations. A complete list of stakeholders covered by this analysis is provided in Appendix V.

Table 16: Stakeholders Assessed by Sector and Country

Countries	Public	Regional	NGO	Private	International	Country Total
Afghanistan	6	0	0	0	0	**6**
Azerbaijan	6	0	0	0	3	**9**
Iran	4	0	3	0	0	**7**
Kazakhstan	8	0	3	1	5	**17**
Kyrgyzstan	13	2	4	7	1	**27**
Pakistan	4	0	2	2	3	**11**
Tajikistan	7	5	4	3	0	**19**
Turkey	9	0	7	0	0	**16**
Turkmenistan	5	2	2	1	0	**10**
Uzbekistan	5	1	2	2	0	**10**
Sector Total	**67**	**10**	**27**	**16**	**12**	**132**

4.1.1 RE/EE Priorities and Interests by Stakeholder Category

Public Sector

Public-sector organisations are well represented among those that provided feedback for this study. Priority needs cited by this sector included capacity building, financial instruments to improve return on investments, improvements to energy security, policy development, and tariff design. This was the only sector for which more than one stakeholder mentioned energy security (stakeholders from six countries) and financial instruments (stakeholders from five countries).

Opportunities of interest cited by public-sector stakeholders highlighted two topics that were not mentioned by the other stakeholder groups: attracting investors and regulating or operating energy markets (both named by stakeholders from four countries). Other opportunities of interest to the public sector included: improving access to electricity, policy development, and capacity building.

Regional Intergovernmental Sector

Stakeholders from regional intergovernmental organisations emphasised the importance of support policies for EE, RE, and environmental protection because both are high priority needs and opportunities of interest. This was the only sector to name environmental protection or preservation as a need or interest, which reflects the missions of some of these organisations to preserve transboundary water sources. Other priority needs identified included EE project implementation and the development of RE. Other opportunities of interest included developing not only trade and relationships between countries in the region, but also RE/EE markets, as well as job creation, technology development, and increased investment in RE.

Non-governmental Organisations

The chief needs cited by stakeholders from the NGO sector are for capacity building and financial support for RE/EE. Capacity building was cited as both a need (by stakeholders in four countries) and as an opportunity of interest. Financial support was cited by stakeholders from five different countries. NGO stakeholders also named policy development as a priority need. Development of RE facilities was the most-cited opportunity of interest by the NGO sector. Stakeholders from two countries specified opportunities or technologies, namely hydroelectricity (Tajikistan), biogas (Azerbaijan), and rural electrification using renewable sources (Tajikistan).

Private Sector

Feedback from private-sector stakeholders revealed few consistencies across countries, but a high degree of consistency within countries. Policy development is the only priority named by stakeholders in more than one country. Needs and opportunities cited by multiple stakeholders within a given country included financial support, technology support or exchange, tariff design, and RE project development.

International Donor Organisations

International donor organisations emphasised policy development, institutional development within governments, and technology development as priority needs and opportunities in the ECO region. The need for ensuring an inclusive growth (targeting vulnerable groups, including women) through energy transition is also highlighted by international donors.

4.1.2 RE/EE Priorities and Interests by Country

Afghanistan

Only public-sector stakeholder feedback was recorded for Afghanistan. The dominant need cited by stakeholders was for improved electric system reliability and accessibility. Stakeholder priorities focused on the development of EE solutions. No other needs or priorities were cited by more than one stakeholder.

Azerbaijan

Stakeholders from the public sector and international donor organisations provided feedback on Azerbaijan. Improved tariff designs, policies to support RE, and the development of RE facilities were the most cited needs. Priorities included tariff design and improving energy security.

Kazakhstan

Stakeholders from all five sectors in Kazakhstan provided feedback for this report. The development of RE projects and new support policies thereof were highlighted both as priority needs and opportunities of interest. Other consensus priorities included capacity building – particularly within the government – technology sharing, the development of new financial instruments to support RE, and strengthening relations between the state and private sector. Other opportunities of interest cited by two or more stakeholders included technology development and research and development (R&D), enhancing energy security, and expanding investment and entrepreneurship in sustainable energy.

Kyrgyzstan

Public-sector, NGO, regional intergovernmental, and private-sector stakeholders provided feedback on the Kyrgyz Republic. Multiple stakeholders emphasised the importance of increasing electric power production and transmission capacity as both a priority need and an opportunity of interest. Other highlighted needs included capacity building, RE project development, technology R&D, and financial support for RE projects. Opportunities of interest included policy development to encourage RE, training and workforce development, as well as RE business and market development.

Iran

NGOs and the public sector in Iran provided direct feedback, including organisations that interact with and represent the private sector. Multiple stakeholders emphasized knowledge transfer and sharing best practices as important priority needs, and suggested twinning between different governmental and private parties as an effective way to foster such exchanges. Financing and revolving funds were also mentioned. NGOs, including those working directly with the private sector, highlighted support for providing internationally accredited training and workshops, delegations between member countries' private and public sectors, and establishing an online platform to support development of regional markets.

Pakistan

Eleven stakeholders from the public, private, regional intergovernmental, and NGO sectors provided feedback on Pakistan. These stakeholders cited capacity building, policy development, and financial support as priority needs for the sustainable energy sector. They also highlighted the development of new financial mechanisms – specifically microfinance – policy development and implementation, and industrial EE as the most important opportunities of interest.

Tajikistan

Nineteen stakeholders from the public, private, regional intergovernmental, and NGO sectors provided feedback on Tajikistan. These stakeholders highlighted the need for new policies and tariffs to encourage the development of RE/EE, as well as the need for financing mechanisms to improve the investment potential of RE projects. Capacity building and energy security were also cited as priority needs. Environmental preservation and improving access to electricity – particularly in rural areas – were two key opportunities of interest cited by stakeholders, along with electricity production and attracting foreign investment to the power sector.

Turkey

A total of 16 stakeholders from the public and NGO sectors provided feedback on Turkey. The consensus among these stakeholders highlighted capacity building, technology R&D support, policy development, and financial support as priority needs and opportunities of interest. Attracting investors in sustainable energy and encouraging entrepreneurship was also cited as opportunities.

Turkmenistan

Ten stakeholders from the public, regional intergovernmental, NGO, and private sectors provided feedback on Turkmenistan. These stakeholders cited energy security, environmental protection, and financial support-cost reductions as priority needs to advance sustainable energy. In terms of opportunities of interest, these stakeholders highlighted capacity building and the development of new RE projects to serve remote communities.

Uzbekistan

Ten stakeholders from the public, regional intergovernmental, NGO, and private sectors provided feedback on Uzbekistan. For priority needs, these stakeholders highlighted improving energy security and reducing the cost of developing RE projects. They also cited improving the reliability of electricity supply and developing new RE projects – particularly solar and wind facilities – as opportunities of interest.

4.2 Regional Mapping of Existing RE/EE Initiatives

A mapping of existing RE/EE projects and programmes was conducted by the local consultants and through desk-based analysis. Projects implemented by Econoler with international funding were also indexed. A detailed presentation of all projects and programmes including donors, titles, status, and countries is presented in Appendix VI. A summary presenting the number of initiatives by category in each county is presented in Table 17. The summary also presents how many multi-country initiatives are unfolding in the ECO region.

Table 17: RE/EE Projects and Programme Mapping in ECO Countries

Category of RE/EE Project	Multi-Country/ Sub-Regional Initiatives	Number of Initiatives in ECO Countries										
		Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan	Total All Countries
Policy Development	3	1	2	3	6	3	3	3	0	2	3	**26**
Financial Initiatives	3	0	0	4	1	3	4	3	10	0	1	**26**
Centralised Power Supply	1	1	0	3	0	1	1	3	1	0	3	**13**
Decentralised Power Supply	2	2	1	1	0	2	2	2	1	0	0	**11**
Demand-side Management	2	0	3	8	2	3	4	6	7	6	4	**43**
Gender and Green Economy	0	1	0	9	2	3	1	2	2	0	0	**20**

1 to 2 projects 3 to 5 projects More than 5

The assessment of ongoing RE/EE initiatives in the region led to the following observations:

- Few multi-country RE/EE initiatives are occurring in the ECO region. Projects are mainly implemented in a country-by-country basis, indicating that RE/EE is not addressed under a cohesive regional approach. The multi-country initiatives indexed were all involving countries from the Central Asian sub-region (and sometimes include additional countries such as Afghanistan and/or Azerbaijan), showing that beyond this region, there is very little collaboration among the ECO countries.
- The main international donor agencies in the region are the ADB, World Bank Group, UN Agencies (UNDP, UNIDO, UNECE), EBRD and the Japan International Cooperation Agency (JICA). Projects financed by KfW, ILO, the Canadian Government, DFID, USAID, AFD, SIDA and SECO were also indexed.
- The category of project mostly implemented in the region over the past years is demand-side management (DSM) projects. This is a good tendency that should be sustained since EE and DSM measures are the most cost-effective way to enhance energy resilience and reduce GHG emissions.
- Several initiatives have been indexed in policy development and financial initiatives, which is a positive development that targets challenges identified by multiple stakeholders in the region.
- There have been few decentralised RE initiatives in the region despite the documented energy difficulties of rural populations in many ECO countries. Rural populations have to deal with a complete lack of or unreliable energy supply and should be better targeted by energy initiatives.
- 10 initiatives focusing on gender equality and energy have been indexed. Four initiatives falling into other categories that include a major gender component were also counted. This shows that gender equality is a concern for ECO countries and international development partners. Gender initiatives will need to be implemented in all ECO countries and at the regional level to ensure that women are included in the transition to a green economy.

5 INSTITUTIONAL STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS

As a final step, Econoler country experts performed a strengths, weaknesses, opportunities, and threats (SWOT) analysis of the current regional framework on EE/RE based on their knowledge and the information collected through the questionnaires and interviews with stakeholders. The analysis was performed for each country and results were compiled into a regional SWOT analysis. The factors raised in each part of the analysis were further broken down into four categories (institutional, technical, knowledge,[94] and economic) by the international team after responses were received, and the number of countries mentioning a given factor was noted (see Table 18 and Table 19).

5.1 Strengths and Weaknesses

Institutional strengths refer to the governments' will to implement the changes to regulation and legislation, as well as collaboration and support from international organisations. There was strong agreement amongst several countries about these institutional strengths. Simultaneously, weaknesses noted by most countries highlighted the insufficiency of a given policy and regulatory frameworks, missing policies, inconsistent support from different levels of government, and bureaucratic challenges (including a lack of professionalism). This highlights the iterative nature of policy development and the challenges that instituting changes in local contexts can pose over time. Seen together, the strengths and weaknesses reveal that while some institutional progress has been made, and this progress is rightly seen as a strength, a greater number of changes are still required, and these will take time and effort. To support further regional institutional progress, it is important to note several transboundary organisations that are active in the region and that have extensive experience with multi-country projects and overcoming regional institutional challenges.

[94]For the threats segment, knowledge was replaced by environmental and social to adapt to the results.

Table 18: Regional Strengths and Weaknesses

Strengths	Weaknesses
Institutional	
› Collaboration with world recognised organisations for RE development and implementation (6 countries) › Availability of (draft or implemented) legal, regulatory, and policy frameworks (6 countries) › Strong government will to support RE/EE (4 countries) › Support and guidance from intergovernmental organisations (3 countries) › Transboundary organisations active in the region with extensive experience (regional)	› Lack of or insufficient policy and regulatory RE/EE framework (8 countries) › Bureaucratic challenges to implementing changes (5 countries) › Lack of independent regulatory body and a clear and stable regulatory system (3 countries) › Lack of consistent government support at all levels (central, provincial, etc.) (3 countries) › Absence of cooperation between stakeholders (1 country) › Off-grid RE policies are non-existent (1 country) › No regional standards (quality, energy consumption, etc.) (regional)
Technical	
› Ongoing modernisation of the industrial sector, power supply, housing and transport sectors (1 country) › Sizeable RE resources (2 countries) › Existence of or experience with feed-in-tariffs (3 countries) › General movement toward less energy intensity in the region (regional)	› Poor energy infrastructure and inefficient power supply system (1 country) › Absence of a modern repair and maintenance system for energy equipment (1 country) › Challenging import logistics for equipment (sub-regional) › Poor knowledge on clean technologies supporting women's domestic work (regional)
Knowledge	
› Consumer awareness of the need to use RE sources and increase EE in production is growing (sub-regional + 1 country) › Growing awareness of the benefits of RE/EE at national government levels (regional) › Availability of training centres in the region (regional) › Highly qualified diaspora ready to return (sub-regional)	› Lack of technical RE/EE capacity and opportunities for training (5 countries) › Lack of non-technical capacity (managerial, etc.) (2 countries) › Lack of networking opportunities and information/awareness support (2 countries) › Lack of public awareness (2 countries) › Unintegrated nature of R&D policies (1 country)
Economic/Financial	
› Ongoing decrease in the price of RE technologies globally (regional) › Guaranteed purchase of RE (2 countries) › Monopoly ownership of the energy sector (1 country) › R&D investments from private sector (1 country)	› Lack of economic incentives (lack of EE funds) and information support (labelling, minimum RE/EE standards) and networking opportunities (4 countries) › Low electricity prices from conventional power plants (5 countries) › Lack of RE/EE financial support and financing mechanisms (3 countries) › High cost of financing instruments (sub-regional + 1 country) › Lack of relevant insurance (credit insurance, EE insurance) (sub-regional + 1 country)

Fewer countries mentioned technical strengths or weaknesses. Those that did focussed on ongoing project modernisation of ageing infrastructure, favourable tariffs, and the RE resource potential as strengths. The weaknesses of the infrastructure and power supply system and absence of modern repair facilities were noted. Again, the strengths and weaknesses overlap, highlighting the scale of changes that will be required and how, in the midst of those changes, infrastructure in the process of being repaired can be seen as both a strength and weakness, for example. Overall, throughout the region, a general movement toward less energy intensity is an ongoing strength.

Very few country teams felt that there were knowledge strengths; one country did mention public awareness and another mentioned experience with standards and labels. The international team included specific items such as the availability of graduate level courses in many countries, increasing awareness amongst officials about the importance of RE and EE and, for certain countries, the availability of a highly qualified diaspora potentially willing to return. Several more countries mentioned knowledge-based weaknesses. Half the countries in the region mentioned a lack of technical capacity and opportunities for training, potentially highlighting the quality of training that is available. Other countries mentioned non-technical skills, including managerial skills in the energy industry, as important and lacking. Two countries noted a lack of public awareness as a weakness, with one of them and a third country highlighting a lack of awareness support and networking opportunities. This highlights how weaknesses can seem to pile on to make it difficult to make changes without dedicated support. Turkey, which tends to have different needs than many countries in the region, highlighted the importance of alignment of R&D policy with RE and EE targets and goals.

Turkey highlighted R&D spending by the private sector as an economic and financial strength. Placing a spotlight on the diversity of the region and how economic circumstances can be perceived differently by different actors, other countries highlighted the monopoly ownership of the energy sector as an economic and financial strength. Not one country mentioned continued decreases in costs for RE equipment globally, although this is expected to continue approaching parity with other generating sources. Many more countries highlighted economic and financial weaknesses. These were focussed on a lack of economic incentives including the lack of dedicated funds and low electricity prices. Information and networking were mentioned to contribute to economic weaknesses, but the most repeated issues related to financing costs and the lack of insurance and other financial support mechanisms that could contribute to reducing financing and end-use costs of RE and EE equipment.

5.2 Opportunities and Threats

Institutional and political opportunities and threats reveal divergences among countries, with some country teams finding few if no opportunities to highlight. The opportunity presented by regional cooperation in general, including specific areas of institutional cooperation such as regional standards, were mentioned by some countries. A pair of countries mentioned that these actions can also help countries reach their international commitments and enhance a country's regional reputation. That pair, along with two others including Afghanistan, mentioned regional and domestic instability as a notable threat to such progress. Domestic challenges also feature prominently in posing a threat to regional progress, with several countries mentioning conflicting political alignments and issues with market liberalisation. This threat is susceptible to regional activities to strengthen liberalisation processes, including through knowledge and experience sharing. Specific threats to regional integration were also highlighted, including challenges travelling between countries, energy security issues, and the varied pace of RE introduction in the region. ECO country membership in multiple regional bodies was noted by the international team as a benefit to the entire region but was not mentioned by any country team.

Several technical opportunities were noted by a diversity of countries. The strong RE potential in the region was noted, specifically for electricity production, with strong regional potential for cross-border trade to improve stability of supply and encourage renewable resource integration throughout the region. The ability of RE to provide for the energy needs of nomadic populations was specifically highlighted by several Central Asia countries. Azerbaijan and Uzbekistan found value in international energy management standards and proposed expanding these to the region, while Pakistan focussed on the availability of EE test laboratories in the region that it can take advantage of to resolve pressing issues. Tajikistan, with its ongoing seasonal electricity production issues and upcoming large hydro projects, noted the potential that hydro offers the region, as well as new high-voltage transmission infrastructure connecting Central to South Asia, which offers export opportunities. Threats mentioned include RE project implementation risks, particularly in comparison to conventional hydrocarbon energy sources that are available in Azerbaijan, which mentioned this risk. Technical risks to particular RE installations, such as silt in hydro reservoirs, were highlighted by Tajikistan, along with the lack of an industrial base to transform raw materials into productive end-use generating equipment. A lack of e-waste recycling facilities in the region was highlighted by the international team as a regional threat.

Table 19: Regional Opportunities and Threats

Opportunities	Threats
Institutional/Political	
› Develop regional cooperation on RE/EE (2 countries) › Contribution to sustainable energy and global climate change commitments taken by governments and increased compliance with environmental requirements. (2 countries) › Enhanced countries' international reputation (1 country) › Develop harmonized RE/EE legislation at the regional level (ex. EE standards & labelling) (1 country) › Steps taken by government toward facilitating the licensing of unlicensed power plants (1 country) › ECO member countries hold membership in multiple other regional bodies (regional)	› Regional and domestic instability (4 countries) › Failure of government efforts to liberalise energy market and conflicting political alignments (3 countries) › Vulnerable energy security (1 country) › Barriers to travel between countries (1 country) › Poor integration of neighbouring states in introducing RE technologies (1 country) › Legal framework preventing women from working in certain industries (regional)
Technical	
› Harnessing the high RE potential (wind, solar, biogas, hydro) for electricity production (3 countries) › Expand ISO 50001 certification in the region (2 countries) › Mobility of RE installations for the well-being of nomadic populations (4 countries) › Common regional utilisation of test laboratories for EE technologies (1 country) › Deployment of new high voltage power lines to export electricity to South Asia (1 country) › Huge potential of the hydropower sector (1 country) › Better grid interconnections offer large potential to improve seasonality and intermittency of renewables (regional)	› Lack of recycling facilities in the region (e-waste, batteries, etc.) (regional) › Lack of an industrial base for the production of solar-grade silicon for solar energy needs (1 country) › High risks in the implementation of RE programmes (1 country) › Silt deposits in reservoirs that hinder hydro power supply (1 country)
Knowledge	**Environmental/Social**
› Development of R&D in RE (3 countries) › National RE/EE experts trained or working abroad (2 countries) › Integration into international RE/EE networks (1 country) › Educational programs to disseminate knowledge about renewable energy (1 country) › Remote residential solar knowledge and expertise is available in the region, to be shared and exported (regional)	› Reduction of glacier areas (1 country) › Resumption of construction of nuclear power plants (1 country) › Reliance on few transboundary water sources may increase the challenges to many countries potentially at risk of water security (regional)

Opportunities	Threats
Economic/Financial	
› Development of market and business, increased cost competitiveness (4 countries) › National monetary policies aimed at decreasing budget deficits and decreasing public expenditures (1 country) › Declining investment costs in RE sources as technology develops (regional + 1 country) › Improved RE market availability (regional + 1 country) › Development of solar energy under the framework of large regional projects (1 country)	› Instability in global oil and gas market (2 country) › Low levels of socio-economic development and slow progress (sub-regional + 1 country) › Relatively low energy cost of traditional sources and ongoing energy subsidies (sub-regional + 1 country)

Few countries noted knowledge opportunities. The most cited was the development of R&D opportunities for RE, followed by the existence of a diaspora of trained experts who work abroad. RE and EE networks were also cited as a potential opportunity to reap benefits from newly available technologies. Although several countries noted the existence of institutions of higher learning offering RE or EE graduate programmes, the opportunity was only highlighted by Iran and the international team as a regional knowledge opportunity. Few countries mentioned environmental and social threats. Those that did focussed on ongoing climate change impacts – melting glaciers and changes to reservoir working capacities – and the competition posed by nuclear power generation. Regionally, strong reliance on a few transboundary water sources was noted to have the potential of increasing the challenge of ensuring water security for many countries in the region.

Many of Central Asia countries noted the economic and financial opportunities posed by the development of the RE/EE market and resulting increased cost competitiveness. This was the economic and financial opportunity with the most agreement. Turkey highlighted the opportunity of decreasing budget deficits and decreasing public expenditures, as well as the declining investment costs of RE technologies. Afghanistan highlighted the increased availability of RE technologies in the market, and Tajikistan noted the development of solar under the framework of regional projects. Amongst threats, instability in the oil and gas markets was highlighted by Kazakhstan and Azerbaijan, two countries with significant reserves. The slow pace of development was mentioned by the Kyrgyz Republic as an economic threat, while Uzbekistan – which mentioned competition from nuclear generation restarting – highlighted the relatively low cost of energy from alternative sources. Iran mentioned challenges to liberalisation and ongoing sanctions as current threats. For Iran and several other countries, the continuing existence of fuel subsidies was noted as an ongoing potential threat, particularly if not reduced in an orderly manner.

CONCLUSION

The baseline and needs assessments have attempted to provide clearer understanding of ongoing activities related to clean energy in the ECO region and provide an assessment of the needs of the region that could be met through the establishment of a clean energy centre. The methodology involved partnerships with local experts from each country in the region; they completed detailed scoping documents that analysed the situation in their country and with their immediate neighbours with the support of interview and questionnaire results gathered from a range of key stakeholders. These country analyses were supported by regional desk research to establish an overview and per-country analysis as part of a situation analysis.

Barriers and opportunities related to EE and RE in the region were first brainstormed by country experts and then updated following in depth conversations guided by questionnaires with key respondents from each country. These attempted to include a mix of public-sector, private-sector, non-governmental, and regional actors to achieve a representative view of each country. Key respondents were asked to contribute and enhance a mapping of stakeholders in each country and an analysis of planned and ongoing RE/EE programmes for each country.

Finally, a regional SWOT analysis tied together these themes to summarise the key needs of individual countries as well as for the region. In a diverse location like the ECO region, a large variety of needs and opportunities present themselves with at times little overlap between the issues expressed by countries. Nonetheless, some themes emerged, which support the rationale for establishing an ECO clean energy centre (CECECO); these include:

- The vast majority of governments has expressed goals to increase the amount of RE and improve EE, and some of these are publicly stated commitments;
- Most countries have begun the process of changing key pieces of legislation and modifying regulatory frameworks to improve the overall environment for RE and EE activities;
- Regional bodies and international organisations are prominent in the region and are available to support institutional changes in most cases;
- Policies, laws, traditions and gender roles are a hindrance to gender equality in the energy sectors in all of ECO countries. CECECO would play a valuable role in guiding decision-makers on policies and measures to adopt for women to be included in the green economy as energy consumers and as active actors of the energy value chain;
- The economics of RE and EE investments are improving through a combination of reduced costs for RE/EE equipment and growing costs for traditional energy sources;
- Experience in the region through a great variety of programmes to improve the use of EE and RE exist, including examples of good regulatory policy and regulations for FiTs, S&L and other key instruments. Experience and knowledge sharing within the region offer strong potential to expand on those successes;

- Human resources are perceived as a challenge in many countries, including a shortage of training institutes. Regional exchanges can play a strong role in improving this situation;
- Public awareness about the importance of energy economics is growing and, with it, a demand for more and better information. Regional publications and promotion activities have the potential to offer effective and economical means of outreach across borders;
- Instability and the perception of a risky business environment continue to challenge efforts to attract foreign investment. Regional communication initiatives and de-risking instruments present opportunities to reduce those challenges to a certain extent.

The approach for CECECO to address these themes, along with a centre's institutional design, scope of mandate and result framework and financial strategy will be further developed in the Feasibility Study Report that will be delivered to UNIDO and ECO in March 2020.

APPENDIX I
LIST OF LOCAL CONSULTANTS

Consultant	Coverage
Artur Khudonazarov	Regional Coordinator
Mamadsho Ilolov Sabur Rasulov	Local – Tajikistan
Darush Ahmad Ahmadi Sabur Rasulov	Local – Afghanistan
Matanat Pashayeva	Local – Azerbaijan
Behzad Aghababazadeh	Local - Iran
Damira Mussina	Local – Kazakhstan
Isaev Ruslan	Local - Kyrgyzstan
Ali Habib	Local – Pakistan
Kubilay Kavak Melis Bitlis Şimal Çınar	Local – Turkey
Muratov Khakim	Local - Uzbekistan
Serdar Mamedniyazov	Local – Turkmenistan

APPENDIX II
BEST PRACTICES: ENERGY EFFICIENCY AND RENEWABLE SOURCES FUND

BACKGROUND:
The Government of Bulgaria established the Bulgarian Energy Efficiency Fund (EERSF) as a public-private partnership, operated by a specialized fund manager, with seed capital from the:

- Global Environment Facility (GEF), administered by the International Bank for Reconstruction and Development (IBRD) – USD 10 million grant;
- Government of Bulgaria – EUR 1.5 million;
- Government of Austria – EUR 1.5 million;
- Private donors – USD 170,000.

The main objective of the fund was to facilitate energy efficiency investments and promote the development of an energy efficiency market in Bulgaria. The key principles and objectives for the creation of EERSF were:

- Independent management;
- Sustainability of operations;
- Transparency in the administration of financial resources;
- Equal opportunities for all applicants;
- Energy consumption reduction;
- GHG emissions reductions.

After an international bidding process, a consortium was awarded the mandate to act as fund manager, created and led by Econoler International in collaboration with Bulgaria's Elana Holding and EnEffect.

ASSIGNMENT:
Econoler provided consulting support to develop all internal processes, procedures, and document templates, as well as defined the personnel's lines of accountability and responsibilities, etc. It also established and implemented a specialized IT system to manage, monitor and report on client accounts, as well as key financial and technical indicators of the fund while following the reporting requirements of the IBRD. As of today, Econoler is still involved in managing the fund, which is now financially self-sufficient.

Within six months of launch, the fund was adequately staffed and fully operational and introduced its first products on the market (direct lending and partial credit guarantees). Within a year, the first series of projects was successfully financed and the fund established a strong project pipeline.

In 2006, the Bulgarian Energy Efficiency Agency awarded EERSF the title of Number 1 Specialized Financial Institution for Energy Efficiency Financing.

In 2007, the fund became the energy efficiency financier of choice in the public sector (municipalities, public healthcare, education, etc.). In that same year, it won the World Bank recognition as a Highly Satisfactory (or Best Practice) Operation, Whose Design and Implementation Should Be Disseminated Internationally. After having a highly successful start with strong market penetration of direct lending products, EERSF also launched its EE partial credit guarantee product.

In 2008, EERSF was recognized for a second time as a Best Practice Operation by the World Bank. In that same year, the fund launched its EE 5% first-loss portfolio guarantee that targets receivables of Bulgarian Energy Service Companies (ESCOs) on a portfolio basis.

Because of the high professional standards imposed and followed by the fund management team, BEEF's loan and guarantee portfolio remained extremely healthy throughout the years, recording very low NPL rates and no loan write-offs. The core fund management team members have spent over 10 years with BEEF and are well recognized and renowned EE experts at the national and international levels.

Since launching, the fund has provided EE loans to a total of 197 projects, with a total project investment value of over USD 49.3 million (BGN 83.4 million). Additionally, it has provided partial credit guarantees or portfolio guarantees to 32 projects, for total project investments of USD 14.3 million (BGN 24.2 million).

Using only USD 15 million of capital, the fund has catalyzed more than USD 63 million in EE investment in Bulgaria. As of the end of Q1 2018, the investments financed or guaranteed by EERSF contributed to annual savings of 121,621 MWh/year and 88,792 kt/year of CO_2eq.

APPENDIX III
BEST PRACTICES: DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL ENERGY LABELLING SCHEME FOR APPLIANCES WITHIN WAEMU

CLIENT:
Renewable Energy and Energy Efficiency Partnership (REEEP), International Organisation of la Francophonie (IOF) and West African Economic and Monetary Union (WAEMU)

BACKGROUND:
In 2009, heads of WAEMU member countries decided to implement the Regional Initiative for Sustainable Energy (IRED), which aims primarily to promote sustainable energy to address energy shortages in the sub-region. As part of the assignment and with funding from the REEEP, the IOF – through its subsidiary body: the Institut de la Francophonie pour le développement durable (IFDD) – and the WAEMU, Econoler was asked to assist member countries in the development and adoption of a regional energy labelling scheme for lamps and appliances used in residential, public and commercial buildings. This assignment was carried out in two phases, running from 2011 to 2017.

ASSIGNMENT:
As part of the first phase (2011 to 2013), Econoler was asked to introduce this project's foundations by: (i) studying the lessons learned in the existing international labelling schemes; (ii) conducting market studies on appliances in Benin and Burkina Faso; (iii) assessing national frameworks so as to promote energy labelling; (iv) designing a voluntary energy labelling scheme adapted to national standards; (v) reinforcing institutional capacities; and (vi) identifying potential technical laboratories within the WAEMU area. Basing its work on the success of the first phase, Econoler initiated the second phase (2015 to 2017), primarily targeting technical assistance for the adoption of the energy labelling standard for appliances by the Union member countries on a regional scale.

To achieve its goals, Econoler performed the following tasks during the Phase II:

- Assist WAEMU member countries for the validation of the directive, the regional standard and the national energy labelling for appliances texts;
- Assist the WAEMU for the creation of a dynamic national specialists and decision-takers network that would be able to transfer the regional directive's provisions into the national legislation;
- Conduct market studies on appliances in the six other WAEMU member countries in addition to the Phase I, and quantify the social, economic and environmental impacts of an energy labelling scheme for appliances;
- Conduct national studies on the implementation of monitoring, verification and application (MVA) programs and on the implementation of complementary national policies and mechanisms as a supply and demand incentive;
- Develop a training program for trade inspectors, custom officers as well as appliances importers and distributors;
- Assist the WAEMU for the selection of three test laboratories, required test equipment and for the development of a public awareness campaign.

Once the regional energy scheme has been adopted, it will enable a sustainable reduction of energy consumption and greenhouse gas (GHG) emissions within the WAEMU member countries in order to address the energy supply issues they are facing.

IMPLEMENTATION: 2013-2017

PROJECT COST: EUR 1,676,887

CONTRACT VALUE: EUR 763,697

APPENDIX IV
BEST PRACTICES: PREPARATION OF GUIDELINES FOR EPC CONTRACTING FOR ESCOS IN TURKEY

CLIENT:
Ministry of Energy and Natural Resources/World Bank

BACKGROUND:
Energy efficiency (EE) is critical for Turkey to achieve its economic growth objectives in a sustainable manner. The Government of Turkey has therefore made EE a key component of its energy strategy and National Climate Change Strategy and Action Plan. Typically, recurrent EE barriers often prevent industrial, public and other end-users from investing in EE, such as a lack of knowledge and know-how, high transaction costs associated with relatively small EE investments, lack of access to affordable and appropriate financing, and limited capacity among stakeholders to prepare and implement EE projects. Energy service companies (ESCOs) have proven to be an effective way of facilitating EE investments and the Government has identified them as a vector to achieve its EE objectives.

ASSIGNMENT:
The General Directorate of Foreign Relations from the Ministry of Energy and Natural Resources (MENR) has asked Econoler to recommend actions and tools to help enhance the energy services market in Turkey by studying the market, identifying major barriers and recommending measures to address these issues. To achieve this, Econoler was required to:

- conduct an assessment of the national ESCO market;
- assess EE's market potential in Turkey's public sector;
- develop case studies on current energy performance contracts (EPC) experience in Turkey;
- identify necessary key changes in Turkey's legislative framework and develop adapted recommendations for implementation;
- develop guidelines for EPC contracting;
- develop adapted tools to support the development of the EPC market, including: (1) various types of contracts, (2) a saving measurement and verification (M&V) protocol, (3) M&V protocol methodology, (4) an ESCO certification process, (5) an ESCO pilot project grant scheme, and (6) an adapted arbitration scheme to deal with disputes.

These tasks were performed in close collaboration with representatives from the MENR and other relevant public institutions involved in the development of EPC in Turkey. The outcomes enabled the Government of Turkey to identify and promote adapted ESCO models suited to the Turkish context and provide the market with the necessary information and tools to ensure an increase in the use of the EPC model in the country.

IMPLEMENTATION: 2015-2017

CONTRACT VALUE: USD 252,000

APPENDIX V
LIST OF STAKEHOLDERS CONTACTED

The tables list all the 125 stakeholders from public and private sectors, regional intergovernmental organisations, civil society and international development partners whose priority and needs towards EE/RE were assessed in the stakeholders' assessment.

PUBLIC SECTOR

Public Sector	
Country	**Stakeholder**
Afghanistan	Da Afghanistan Brishna Sherkat (DABS)
	Ministry of Energy and Water (MEW)
	Ministry of Rural Development (MRRD)
	Afghan National Standards Authority (ANSA)
	Ministry of Urban Development (MUD)
	Ministry of Economic
Azerbaijan	Ministry of Energy
	The Tariff (price) Council
	AERA
	Azalternativenerji LLC
	Azerenerji JSC
	Azerishiq JSC
Iran	Ministry of Energy, including SATBA, Tavanir and its subsidiaries
	Ministry of Petroleum, including NIGC, NPC, NIORDC and NIOC/IFCO
	Department of Environment
	Iranian Fuel Conservation Company (IFCO)
	SATBA
	Center for Progress and Development of Iran
	Energy Department of Plan and Budget Org. (PBO)
Kazakhstan	Ministry of Energy of the Republic of Kazakhstan
	Committee on Regulation of Natural Monopolies and Protection of Competition under the Ministry of National Economy
	JSC KEGOC Financial Settlement Center of Renewable Energy LLP
	Samruk-Energo
	Kazatomprom JSC
	Invest in Kazakhstan
	JSC DAMU Entrepreneurship Development Fund
	Development Bank of Kazakhstan
Kyrgyzstan	State Committee for Industry, Energy and Subsoil Use
	State Agency for Regulation of the Fuel and Energy Complex

Public Sector	
	OJSC National Energy Holding
	OJSC Power Plants
	OJSC National Electric Network of Kyrgyzstan
	Research Institute of Energy and Economics
	Kyrgyz State Technical University, Department of RES
	Renewable Energy Associations
	American University of Central Asia
	Slavic University, Department of Alternative and Renewable Energy Sources
	Osh State University
	Chakan hydroelectric power station
	Associations of small hydropower plants
Pakistan	Ministry of Finance
	Alternative Energy Development Board (AEDB)
	PEECA
	NEECA
Tajikistan	Ministry of energy and water resources
	Ministry of Economic Development and Trade
	Barqi Tajik
	Ministry of Agriculture
	State Investment Agency
	State committee on investment
	Ministry of Industry and new technologies
Turkey	Ministry of Energy and Natural Resources
	Energy Market Regulatory Authority (EMRA)
	Energy Exchange Istanbul (EXIST)
	Presidency Budget and Strategy Office
	Investment Office of the Presidency of Turkey
	TÜBİTAK (The Scientific and Technical Research Council of Turkey)
	UNIDO Turkey
	Academic Departments
	Research Institutions
Turkmenistan	Ministry of Energy
	Ministry of Agriculture and Environmental Protection
	State Committee for Water Resources
	Ministry of Finance and Economics
	Ministry of Industry and Communications
Uzbekistan	Ministry of Economy and Industry
	Ministry of Finance
	Ministry of Agriculture
	Ministry of Energy
	Ministry of Water Resources

REGIONAL INTERGOVERNMENTAL ORGANISATIONS

Regional Intergovernmental Organisations and Development Partners	
Country	**Stakeholder**
Iran	RCUWM (The Regional Center on Urban Water Management) ICQHS (Intl. Center on Qantas and Historic Hydraulic Structures)
Kyrgyzstan	CAREC Central Asian Economic Cooperation
	Euro-Asian Economic Cooperation
Tajikistan	Regional committees
	International Fund for Saving the Aral Sea
	Interstate Coordination Water Commission
	Regional Center for Renewable Energy under the Interstate Commission on Sustainable Development
Turkmenistan	IFSAS
	ICSD/IWCC
Uzbekistan	Coordination and Dispatching Center (CDC) "Energy

CIVIL SOCIETY

NGO	
Country	**Stakeholder**
Iran	Iran Wind Energy Association
	Renewable Energy and Energy Efficiency Organisation of Iran
	Energy Efficiency Association
Kazakhstan	Kazenergy
	Association of renewable energy of Kazakhstan (AREK)
	Solar Energy Association of Kazakhstan
Kyrgyzstan	PF Fluid
	Unison
	CREED
	BIOM
Pakistan	Rural Support Network
	CLASP
Tajikistan	RE Association
	Tajik Energy Association
	Coordinating Council of business associations and public organizations
	National Association of Dehkan Farms
Turkey	GÜNDER (International Solar Energy Society – Turkey)
	GENSED (Solar Power Industrialists and Industry Association)
	TÜREB
	JESDER (Geothermal Power Plants Investors Association)
	TÜRKOTED (Turkish Cogeneration and Clean Energy Association)
	ENVER (Energy Efficiency Association)
	EYODER (Energy Efficiency and Management Association)
Turkmenistan	TebiqiKuvvat Ltd.
	TCS
Uzbekistan	Alternative Energy Association
	Center for Energy Efficiency and Renewable Energy

PRIVATE SECTOR

Private-sector Organisations	
Country	**Stakeholder**
Iran	Iran Chamber of Commerce
	Water and energy: Local and international EPC companies, local manufacturers, local consulting and energy service companies
Kazakhstan	Oil companies, e.g. Eni, Shell, Irena, Total
Kyrgyzstan	Kinetics
	Dordoi Energy
	220.kg
	NurSun Energy
	NewTech
	Smart Energy Solutions
	Alternative Energy
Pakistan	Renewable Energy Association of Pakistan
	Solar Quality Foundation
Tajikistan	Pamir Energy Co
	Corporate hydroelectric power station “Sangtuda HPP-1”
	Corporate hydroelectric power station “Sangtuda HPP-2”
Turkmenistan	Union of Entrepreneurs of Turkmenistan
Uzbekistan	MirSolar
	AllSolarидругие

INTERNATIONAL DEVELOPMENT PARTNERS

International DonorAgencies	
Country	**Stakeholder**
Azerbaijan	UNIDO
	ADB
	EBRD
Kazakhstan	EBRD
	The Asian Infrastructure Investment Bank
	ADB
	Development Bank of Kazakhstan
	UNIDO
Kyrgyzstan	ADB
Pakistan	IFC
	World Bank
	UNDP
Tajikistan	UNDP Thematic Trust Fund (TTF) on Energy and the Environment

APPENDIX VI
LIST OF ENERGY AND CLIMATE INITIATIVES IN THE ECO REGION

The table presents all existing and recent energy and climate initiatives indexed in ECO countries. It categorizes the initiatives along five main themes: (1) policy development, (2) financial initiatives, (3) centralized power supply (on-grid), (4) decentralised power supply (off-grid) and (5) gender and energy/green economy.

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Policy Development			
Asian Development Bank (ADB), Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan	Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan	Identify power sector deficiencies at regional level and resolve these by focusing on promotion of inter and intra-regional electricity trade	Completed
International Eco Academy (IEEA), Basics of Azerbaijan Energy Development for Period Through 2010	Azerbaijan	Adaptation of international practice and normative documents to local terms and conditions. Utilisation of international practices and techniques	Completed
European Union (EU), Support for the Energy Market and Sustainable Energy in the CIS (SEMISE)	Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Promotion of sustainable energy policies and assistance to partner countries for implementation	Completed
IFCO, SATBA and ISIRI, Establishment of energy label standards	Iran	Establishment of energy label standards for more than 25 different buildings' equipment or components.	Ongoing
SATBA, Renewable Energy Feed-in-tariff Mechanism	Iran	Under this programme, the Iranian government purchases renewable energy under a 20-year power purchase agreement with a FiT mechanism.	Ongoing

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Department of Environment, Clean Air Act	Iran	The Clean Air Law, adopted in July of 2017, continues implementing methods of reducing air pollution in Iran. For example, the law introduces heavier punishments and fines for any industries or individuals that do not adhere to the pollution limits. They also plan to divide the city of Tehran into three zones and charge people for crossing into the zones (like a toll system) as a way of deterring people from using personal cars, which will help decrease the particles present.	Completed (2017)
The Kazakhstan Government, Energy Efficiency 2020	Kazakhstan	The objective of this programme is to reduce energy consumption. For this purpose, 78 different activities were planned for total cost of more than 1.1 trillion tenge	Ongoing 2013-2020
The Kazakhstan Government, Concept on Transition Towards Green Economy until 2050	Kazakhstan	Increase efficiency in resource utilisation, propose measures for the modernisation of existing infrastructure, protection of the environment to enhance the energy security.	Ongoing 2013-2050
The Kazakhstan Government, Plan of Action for the Development of Alternative and Renewable Energy for 2013-2020	Kazakhstan	The plan lays the foundation for the long-term development of RE in Kazakhstan and initially addresses the period up to 2020	Ongoing 2013-2020
The World Bank, the European Union, State Secretariat for Economic Affairs (SECO) and the Department for International Development (DFID), Central Asia Water and Energy Sector Development Program	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan	Development of a roadmap to improve regional water energy modelling and analysis	Ongoing
National Energy Efficiency & Conservation Authority (NEECA) and Japan International Cooperation Agency (JICA), MEPS and Labelling Policy/Guidelines for Implementation of ES&L Scheme in Pakistan	Pakistan	Establish and provide guidelines to manufacturers and importers (local agents, distributors, retailers, etc.) of household appliances/products in Pakistan for voluntary participating in the ES&L scheme	Ongoing
NEECA and Collaborative Labeling and Appliance Standards Programme (CLASP), Energy Efficiency Standards for Induction Motors	Pakistan	Set the standards for electric induction motors, aimed at efficiency improvement, financial savings, as well as reduction in energy consumption and greenhouse gas emissions.	Ongoing
World Bank, Development of an EE Policy	Pakistan	Proposals from consultants are being invited	Planned

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Financial Initiatives			
PBO, High Energy Council (HEC)/UNDP/German Federal Ministry for the Environment, Nature, Conservation, and Nuclear Safety, Market Mechanism for developing the EE projects	Iran	Under this by-law, High Energy Council (HEC) of Iran released the Energy Efficiency and Environment Market (EEEM) to implement the all of projects can save the natural gas and also electricity according to the tariff differences and also market mechanisms. Currently two pilot projects are in progress under this new mechanism one focusing on building sectors supported by UNDP and the other one focusing on industrial sector supported by German Federal Ministry for the Environment, Nature, Conservation, and Nuclear Safety.	Ongoing
Law for Public-Private Partnerships (PPP) transitions for sustainable developments in energy sector	Iran	Including tender for RE/EE and DSM projects according to the annual budget	Ongoing until 2025
TAVANIR and Gas Company collaboration in Energy and Environment Market based Mechanism	Iran	Objective of this project is to reduce energy consumption and this market can play an important role in energy saving/emission reduction and trade across the country and the MENA region.	Ongoing
SABTA, Incentives to support local manufacturers of solar panels and facilitate the sale of their products	Iran	Make sure that local manufacturers can receive quality certificates from the competent international authorities, the supply of goods from domestic manufacturing products will also be provided for foreign investors.	Ongoing (since 2020)
UNDP (Istanbul Regional Hub for Europe and the CIS) and OPEC Fund for International Development (OFID), Energy Access SMEs Development Project	Tajikistan and Kyrgyzstan	The project goal is to offer a comprehensive strategy to scale up private-sector engagement in energy access by improving the risk-return profile of private investments in energy access products and services, specifically for SMEs	Ongoing 2018-2020
European Bank for Reconstruction and Development (EBRD), Sustainable Energy Efficiency Financing Facility (SEFF)	Kyrgyzstan (KyrSEFF) Turkey (MidSEFF)	EBRD and SEFF are designed to help local financial intermediaries support small-scale sustainable energy projects in the region by combining credit lines with technical assistance. KYRSEFF project provides training in new energy-saving resource management technologies for women.	Ongoing

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
EBRD and Climate Investment Funds, Pilot Program for Climate Resilience (PPCR)	Tajikistan	Launched a new financing mechanism to counter the effects of the climate change – CLIMADAPT. This new facility combines commercial and concessional funding to scale up financing through local banks and MFIs	Ongoing
The United Nations Economic Commission for Europe (UNECE), Green Bridge Partnership Programme	Kazakhstan and Kyrgyzstan	A mechanism to unlock the benefits of collaborative action in a green economy. The main goal of the program is to facilitate the transition to a green economy model through the implementation of investment projects based on multilateral cooperation and public-private partnerships	Ongoing
Unknown Implementing Agency Microfinance Schemes for RE Solutions	Pakistan	Dedicated financing for solar, micro-hydro schemes	Ongoing
World Bank, Develop Financing Schemes for EE	Pakistan	Proposals from consultants are being invited	Planned
Econoler and KfWBankengruppe, Consulting Services for a Solar Home Systems Finance Program Through the Pakistan Microfinance Investment Company (PMIC)	Pakistan	Developed a solar home system microfinancing program targeted at poor off-grid households and micro and small enterprises	Completed 2018
ZaraiTaraqiyati Bank (Agriculture Development Bank of Pakistan) Financing Rural Development	Pakistan	The Bank had launched agriculture related products/schemes for women to avail loans in order to participate in promotion and development of agricultural sector. Schemes included, among others: women's employment, solar energy pumps, biogas unit, etc.	Completed (2012-2016)
EU, program to create a special mechanism for investment in energy and the environment in Central Asia (CAIF)	Tajikistan	Dissemination of European experience for investments in the field of EE and RE	Ongoing
United Nations Industrial Development Organization (UNIDO), Global Cleantech Innovation Programme	Turkey	Catalysing Innovation and Entrepreneurship in Cleantech Start-Ups and SMEs of Emerging Economies to Project	Completed 2017-2018

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
UNDP, Ministry of Forestry and Water Affairs, Forest and Village Relations Department, Solar PV Installers/Manufacturers and GÜNDER, Sustainable Energy Financing Mechanism for Solar Photovoltaic Systems in Forest Villages in Turkey	Turkey	Assist Turkey with the promotion and financing of on-grid solar PV in forest villages in Turkey, with special focus on a cooperative model	Ongoing 2016
Technology Development Foundation of Turkey (TTGV), Green Technology Projects (YETEP) Support Program	Turkey	Repayable financial support to industrial enterprises for the implementation of projects in the areas of climate-friendly technologies, clean production technologies, EE, RE, and other energy technologies	Ongoing
Econoler and The World Bank, Market Assessment and Energy Efficiency Financial Calculator Preparation	Turkey	Develop an Excel-based EE calculator to help loan officers effectively identify EE project applications that comply with predefined IBRD eligibility criteria	Completed 2012-2013
Econoler, the World Bank and IBRD, Clean Technology Fund (CTF) Impact Assessment	Turkey	Analyse the impacts of the Clean Technology Fund (CTF) provided to projects/programmes for RE/EE market development in Turkey	Completed 2012-2013
Econoler and UNDP, Financial Mechanism Study	Turkey	Improve the financial mechanisms for EE in Turkey through benchmarking with programmes and instruments that have been implemented in other parts of the world	Completed 2012-2013
Econoler and UNPD, Improving Energy Efficiency Financing Mechanisms for the Industrial Sector	Turkey	Develop new individual EE financial mechanisms that are adapted to the needs of the Turkish market and can be implemented by the Turkish agencies YEGM, KOSGEB and TTGV	Completed 2013-2016
Econoler and AgenceFrançaise de Développement (AFD), Feasibility Study and Assessment of Energy Saving Insurance Program Structure	Turkey	Assessment, design, and justification of an energy saving insurance programme targeted at facilitating the implementation of energy efficiency projects	Completed 2018
Econoler and the World Bank, Design of a Financing Programme for Scaling-up Rooftop Solar PV	Turkey	Analysing the current financial, policy and technical precursors for the scale-up for rooftop PV in Turkey and providing recommendations for the design of an appropriate financial mechanism for every customer segment, as well as an appropriate technical assistance package to support MENR financial interventions	Completed 2019

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Ministry of Energy, Build new plants that produce energy from renewable resources with private funding as part of a PPP	Uzbekistan	Provide electricity to the common network of the Ministry of Energy of the Republic of Uzbekistan through the construction of small and micro power plants operating on RE sources	Planned
Centralised Power Supply			
Asian Development Bank (ADB), Power Transmission and Distribution Project	Afghanistan	Construct and rehabilitate the transmission network and associated substations and low-voltage distribution networks in the capital Kabul and adjacent rural areas	Ongoing
SATBA/Tavanir, Implementation of the renewable & clean power purchase agreement scheme	Iran	By end of December 2019 under Iran's Renewable & Clean Power Purchase Agreement Scheme a total capacity of 1,427 MW of wind power plant, 2,685 MW of solar PV power plants, 31 MW of biomass power plants, 15 MW of small hydropower plants, and 68MW of waste heat recovery power plants has been implemented by a total of 362 companies. Recently, in June and July 2020, 50 MW wind farm as well as six additional solar power plants with a total capacity of 33 megawatt has been launched under this program.	Ongoing
SATBA/Tavanir, Development of smart metering infrastructure and establishment of a control system for load management	Iran	In this project, a meta system has been established to conduct smart metering and load management of the national electricity grid, where a pilot project has been implemented in 6 provinces.	Ongoing
SATBA/Power Distribution Companies, Power transmission loss reduction programme	Iran	This project was implemented in 14 provinces to reduce the transmission losses with following measures: 1- Reducing the feed radius by increasing the medium voltage lines (20 kV). 2- Increasing the cross-section of power distribution lines in proportion to load consumption and predict load growth. 3. Load balancing in distribution networks, cable modification of customer service, and loose connections.	Completed
USAID and Tetra Tech Inc., Regional Security, Efficiency and Trade (RESET)	Kyrgyzstan and Tajikistan	The project provides for the integration of energy systems of Tajikistan and Kyrgyzstan	Planned

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Econoler, Management Systems International (MSI) and USAID, Power Distribution Program (PDP) Evaluation	Pakistan	Conducted an interim evaluation of the PDP Electronic metering, automatic meter readers (AMR), the use of hand-held meter readers, cost of service studies, enterprise resource planning, GIS mapping, customer service systems (CIS), and DSM initiatives in schools and industrial motors	Closed 2014-2015
ADB, Regional Power Transmission Project	Tajikistan	Construction and operation of power lines within the country and in the Central Asia region	Planned
EBRD, Project to reduce energy loss in Sughd region	Tajikistan	Improving the technical efficiency of the electric network by installing meters	Ongoing
IPA 2015 Supply of Equipment for Renewable Energy and Energy Efficiency Support for the Municipalities	Turkey	The project aims that construct 5 MW solar power plant and 2.3 MW hydro power plant for selected municipalities.	Ongoing
ADB, Construction of a 402 MW wind station	Uzbekistan	Increase generating capacities of the Uzbek electric power system using RE (wind energy)	Planned 2019-2025
ADB, Talimarjan Power Project (TPP)	Uzbekistan	Installation of energy-efficient generating plant and advanced meters at Uzbekenergo. Uzbekenergo set up a community service center and implemented a comprehensive Gender Action Plan (GAP). This project made sure that 50% of staff working in the 45 district service centersare women.	Completed (2018)
Decentralised Power Supply			
Unknown implementing agency, Power supply of rural settlements using solar power stations in the highlands	Afghanistan and Tajikistan	Improve access to energy in areas where there is huge potential for solar energy production; contribute to the improvement of the population's quality of life	Proposed
ADB, EQO-NIXUS, Floating Solar Energy Development	Afghanistan, Azerbaijan, and Kyrgyzstan	Pilot test and building expertise on the emerging floating solar photovoltaic (FPV) technology to diversify the energy mix, increase energy security, and reduce greenhouse gas (GHG) emissions	Ongoing 2018-2020
IFCO, Solar Water Heater Incentive Programme	Iran	As a part of this programme, IFCO was in charge of running an incentive programme to install 7,840 residential and 1,104 public solar water heaters.	Completed 2003 – 2011

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Unknown implementing agency, Development of new technologies to increase the reliability and efficiency of energy supply to consumers, including remote areas	Kyrgyzstan	Increasing the reliability, efficiency, safety, and sustainable development of the energy sector through the introduction of the latest scientific developments and technologies, including the development of new technical solutions and proposals for the introduction of RE sources	Ongoing
The World Bank, Pakistan - Sindh Solar Energy Project	Pakistan	Increase solar power generation and access to electricity in Sindh Province	Ongoing
ADB, Clean Energy Investment Project	Pakistan	The project will support installing 1,000 micro-hydels in the very remote and off-grid communities, increased opportunities for women and girls to access energy services and benefits, and enhanced institutional capacity to foster sustainability while promoting public sector energy efficiency.	Ongoing
Ministry of Health and Social Welfare and JICA, Project for Introduction of Clean Energy by Solar Electricity Generation System	Tajikistan	Promoting the use of clean energy to achieve CO_2 reductions by installing photovoltaic systems in healthcare facilities	Ongoing
IPA 2015 Technical Assistance for Renewable Energy and Energy Efficiency Support for the Municipalities and Universities	Turkey	The overall objective of this Project is defined as “to promote energy efficiency and renewable energy in line with the EU’s resource efficiency” while the Project purpose is defined as “to enhance the capacity of the municipalities and universities in relation to renewable energy and energy efficiency”.	Ongoing
Demand-side Management			
Ministry of Energy and EU4Energy, Accelerating the Development of Energy Labelling and Eco-design Requirements for Energy Using Products	Azerbaijan	Provide support for the development of secondary legislation on EE in line with the provisions of the draft Energy Efficiency Law	Ongoing
Cleaner Production and Energy Efficiency Center (CPEE Center), Introduction of the solar collectors technology in several regions of Azerbaijan for water heating and heat supply in dwellings	Azerbaijan	Pilot project development, support in new innovative projects on REin the industrial sector, mainly in energy-intensive ones	
EU, SOFRECO, AF Consult and SodruZhestvo, Energy Conservation Initiative in the Building Sector in Eastern Europe and Central Asia (ESIB)	Azerbaijan, Kazakhstan, Kyrgyzstan,	Assisting beneficiary countries in improving energy control in the construction industry	Completed

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
	Tajikistan, Turkmenistan, Uzbekistan		
UNECE, Strengthening Cooperation in the Use of Advanced Technologies in EE and RE	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Dissemination of European experience in the field of EE and RE	Started in 2013
IFCO, Double-pane Windows Incentive Programme	Iran	In this programme, the majority of the Ministry of Petroleum buildings were retrofitted with double-pane windows, which resulted in significant capacity-building in this sector.	Completed 2010-2015
IFCO/NIORDS, Promotion of dual-fuel passenger cars	Iran	Under this programme, different activities including supporting the Iranian car-manufacturing industry to develop CNG stations, has been implemented and currently this programme is in progress, with retrofitting CNG kits in the existing single fuel passenger cars.	Ongoing
SATBA, Energy efficiency programme in the Iranian cement sector	Iran	Within the scope of this project, different activities were done by SATBA to promote energy efficiency in the Iranian cement sector, including conducting energy audits, benchmarking, defining the EE roadmap for the cement sector, implementing pilot projects, etc.	Completed
IFCO/NIGC, Improvement of energy efficiency in 60,000 boiler rooms	Iran	This project is a part of Article 12, which is a performance-based contracting model to improve the energy efficiency of 60,000 boiler rooms.	Ongoing
IFCO/NIGC, Replacement of one million traditional natural gas/oil heaters with high-efficiency hermetic smart natural-gas heaters	Iran	This programme incentivizes the replacement of 1,000,000 traditional heaters with high-efficiency hermetic smart heaters.	Ongoing
SATBA, Promotion of Compact Fluorescent Lights	Iran	Within the scope of this programme, SATBA distributed free or low-cost CFLs to the subscribers, resulting in great effects in phasing out the incandescent bulbs. The same programme can be implemented for LEDs.	Completed

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Ministry of Energy, Reducing family consumption patterns	Iran	Promote the reform of the family consumption pattern in four areas of water, energy, waste and food waste through holding a series of educational-promotional meetings	Completed
GIZ, High Energy Council, Iranian Energy Efficiency Market	Iran	The project aims at developing an efficient implementation mechanism and to lower transaction costs for potential investors. In addition, the project aims at testing this approach in practice by developing the huge energy efficiency potential in the country in two main areas: the gas sector with special focus on the South Pars Special Economic Energy Zone (PSEEZ) in Assaluyeh and the sustainable energy supply in selected rural pilot areas. In case of necessity, adjustments of the implementation mechanism will be suggested accordingly to ensure proper functioning. The implementation mechanism shall become the corner stone of the integrated market for energy efficiency in Iran. Such a functioning mechanism could foster the implementation of Iran's INDC and even raise the ambitions of policy makers.	Planned
Econoler and UNDP, Assistance in Design Preparation and Technical Supervision of Public Building Constructions	Kyrgyzstan	Assistance and technical supervision for the construction of two highly energy-efficient public buildings. Providing assistance to UNDP staff and a team of national experts in preparing the design of two new highly energy-efficient school buildings	Completed 2010-2011
World Bank, Assist provincial government strategy in EE	Pakistan	Proposals from consultants are being invited	Planned
Punjab Government, Development of a strategy for lighting retrofits in public buildings	Pakistan	Pakistan Developing appropriate project designs for implementation	Ongoing
Econoler, HaglerBailly Pakistan (Pvt.) Ltd. and ADB, National Energy Efficiency Program Design	Pakistan	Design a suitable sector development programme proposal that supports government efforts to: (1) establish an enabling policy and business environment for energy efficiency; (2) provide immediate financing for priority projects	Completed 2008-2009
Econoler and IRG International Resources Group,	Pakistan	Improve power availability, affordability, conservation, and efficiency to sustain Pakistan's economic growth	Completed 2009-2010

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Empower Pakistan: Energy Efficiency and Capacity			
Unknown implementing agency, Development of animal husbandry based on the use of RE and EE in the high regions of the Pamirs	Tajikistan	Solar power for irrigation. The land is very good and with successful irrigation can produce four crops (clover, etc.). There are huge solar resources (up to 1 kW per 1 m^2.). It is enough to install a water-lifting pump on a solar drive and tens of hectares will receive life-giving water. After two years, you can build a livestock farm for hundreds of animals	Proposed
UN Economic Commission for Europe, Strengthening Cooperation in the Use of Advanced Technologies in EE and RE	Tajikistan	Dissemination of European experience in the field of EE and RE	N/A
Unknown implementing agency, Analysis of the development and dissemination of advanced technologies in the field of EE and RE within the framework of the Global Energy Efficiency 21 program, with special attention to SPECA countries	Tajikistan	US and Western European Advanced Technology Experience	N/A
Econoler and ADB, Recommendations and Options for Energy Efficiency Programs	Tajikistan	Identification of options for energy improvements in Tajikistan and recommendations for EE programmes in residential and commercial subsectors	Completed 2009-2010
UNDP, Global Environment Facility (GEF), Encouraging Energy Efficient Motors in SMEs Project	Turkey	Increase the use of efficient motors in SMEs	Ongoing
UNDP, UNIDO and GEF, Improving Energy Efficiency in Industry in Turkey	Turkey	Improve EE in industry by creating effective energy management through EE actions, using energy efficient technologies, and encouraging industrial enterprises to reduce energy consumption.	Completed 2011-2017
General Directorate of Electrical Power Survey and Development Administration (EIE), the Ministry of Energy and Natural Resources (MENR), UNDP.	Turkey	Shifting toward more energy efficient household appliances, improving the capacity of Turkish public authorities to better enforce applicable regulations	Completed 2009-2016

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Market Transformation of Energy Efficient Appliances in Turkey			
UNDP, EIE, and GEF, Promoting Energy Efficiency in Buildings	Turkey	Reduce energy consumption and associated GHG emissions in public buildings in Turkey	Ongoing as of 2014
EIE, Turkish Electricity Transmission Co. (TEIAS) and Japan International Cooperation Agency (JICA). Study on Optimal Power Generation for Peak Demand in Turkey	Turkey	This study served to formulate an optimal power development plan designed to meet peak demand growth (from 2010 to 2030) and reviewed the development plan of pumped storage power projects.	Completed 2011
TSKB Sustainability Consultancy (ESCARUS) and the Swedish International Development Coordination Agency (SIDA), STWI Project Energy and Resource Efficiency in Textiles	Turkey	Textile factories working for Swedish textile brands were assessed for energy and resource efficiency, and alternative projects were developed to improve the energy performance potential of the units	Completed 2015-2016
Econoler and KfWEntwicklungs Bank, Appraisal of Turkey's EE program for public buildings under the Directorate General for Renewable Energy	Turkey	Turkey Examine the various questions raised regarding the DGRE's EE strategy for the public building sector	Closed 2014
UNDP, Sustainable Cities in Turkmenistan: Integrated Development of the Green Cities of Ashgabat and Awaza	Turkmenistan	This project seeks to accelerate structural transformations through sustainable urban development in Ashgabat.	Ongoing 2018-2024
UNDP and GEF, Efficient use of energy and renewable energy for sustainable water management	Turkmenistan	Provide sufficient and environmentally sustainable water supply to maintain and improve social conditions and livelihood of the Turkmenistan population	Ongoing as of 2017
UNDP, Improving EE in the housing sector of Turkmenistan	Turkmenistan	Strengthening incentives and potential for the construction of highly energy efficient buildings; development of the potential of the Turkmengas State Corporation	Completed 2012-2017
Unknown implementing agency, Promoting the implementation of a sustainable development strategy - the rational use of natural and energy resources in Turkmenistan	Turkmenistan	Provide the necessary tools for introducing the concept of SEA and EIA to acquaint Turkmen specialists with best practices in the field of energy management, the practice of using RE, and organise special training with the assistance of relevant EU institutions	Completed 2014-2017

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
World Bank, Implementation of an energy management system according to ISO 50001 in industrial enterprises of the Republic of Uzbekistan	Uzbekistan	Improving EE in enterprises in various industries	Completed 2016-2017
Unknown International Development Agency, Improving the energy efficiency of industrial enterprises	Uzbekistan	Reducing energy consumption in technological production of industrial enterprises	Ongoing
Gender and Energy/Green Economy			
Ministry of Energy and Abangah, Training on the role of rural women in water and electricity consumption management	Iran	In collaboration with NGO Abangah, promote the involvement of women in water and energy management via training and awareness raising.	Completed
Khorasan Regional Electricity Company in cooperation with Imam Khomeini Relief Committee, Barakat-e-Aftab project	Iran	Install solar panels in low-income villages focusing on women-headed households and promote clean energy for income generation for women and girls.	Completed
Ministry of Labor and Technical and Vocational Training Organization, Memorandum of Understanding for female green employment	Iran	Signing a Memorandum of Understanding with the Ministry of Labor and the Technical and Vocational Training Organization regarding the green employments and women's entrepreneurship in environmental issues – which may play a role in social and cultural promotion of women and their employment especially in supporting women headed households as green entrepreneurs.	Ongoing
Government of Iran, various initiatives for awareness raising to increase women's engagement in energy and environment protection	Iran	The government of Iran has been active in various initiatives to promote women's engagement in the green economy and in sustainable development, examples include: encouraging MA and PhD students and centers of higher education to carry out research on the role of women in environment, Participation in the Korea International Women's Invention Exposition, KIWIE 2018. Holding conferences, meetings, exhibitions, festivals, etc. and conducting research on women and sustainable development and energy/water management.	Ongoing
Government of Iran, Supporting women's entrepreneurs with clean drinking water	Iran	Supporting women entrepreneurs and trying to increase their motivation and creativity by prioritizing the supply of drinking water to their workshops and business units	Completed

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
Ministry of Energy and Iranian Energy Productivity Organization (Saba). Special training seminar on women and energy management	Iran	Holding a special training seminar for women entitled "The role of women in expanding the culture of optimal energy consumption and electricity consumption management" as a province in some villages	Completed
Government of Iran, Training to involve women in climate change mitigation and adaptation	Iran	Hold educational workshops on women role in overcoming climate change, and environmental adaptation for 155 provincial managers, public managers, the female members of Metropolis councils and NGOs representatives	Completed (2018)
Ministry of Agriculture, Implement Entrepreneurship promotion and Sustainable Business Development	Iran	Annual program that promotes the knowledge and skills of rural women to participate in sustainable business development (such as sustainable agriculture). holding workshops for 990 rural women, agricultural facilitators, women from NGOs and agricultural entrepreneurs	Ongoing
National Development Fund, Sustainable loans for job creation in villages	Iran	National Development Fund in the twelfth Administration (2017 until present) has allocated resources for job creation in villages in the form of sustainable loans and urban amenities are anticipated of which nearly 40% have been attracted by women.	Ongoing (Since 2017)
EBRD, Green Economy Transition (GET) Policy Dialogue Framework: Design and Launch an Evaluation and Learning Activity	Tajikistan	The main objective of the Assignment is to contribute to evidence building on integrating gender considerations into climate-resilient policy and investment planning processes.	Ongoing until 2020
EBRD and GCF, Program for Supporting Renewable Energy and Promoting Gender Equality	Kazakhstan	The objective of the Assignment is to work closely with the Republic of Kazakhstan, as well as the RE companies, to promote women's economic opportunities in the RE sector in Kazakhstan.	Planned (2020-2021)
ADB and Agency for Technical Cooperation and Development (ACTED), Solar Panel Technician Training for Women in Pakistan	Pakistan	Pilot project to promote sustainable solutions for women's empowerment, through trainings in solar energy. 54 women in Multan, Punjab, were trained as solar technicians.	Completed (2017)
ADB, Strengthening Technical and Vocational Education and Training	Tajikistan	Project aimed at strengthening technical and vocation education training (TVET), with a focus on improving the overall system, promoting inclusivity, and removing barriers to young women. More than 2,000 women and girls benefitted from this project.	Completed (2016)

RE/EE Project (implementing agency, title)	Targeted Countries	Short Description	Status and Dates
World Bank Group, Planning and Capacity Support Project of the Afghanistan Reconstruction Trust Fund (ARTF)	Afghanistan	The project is helping Da Afghanistan BreshnaSherkat (DABS), the national power utility to promote gender equality among its staff through awareness raising and training of female staff.	Ongoing until 2020
Organization for Security and Co-operation in Europe (OSCE) Programme Office in Astana, Program on Green Growth Entrepreneurship	Kazakhstan	Program provides continued support to Kazakhstan's strategic legal, economic and institutional reforms aimed at fostering economic development while promoting women entrepreneurship with green technologies.	Ongoing
UNDP, Sustainable Energy Solutions for Rural Communities under the UNDP "JashylAyil" Initiative	Kyrgyzstan	project that aimed to increase energy efficiency with a focus on gender-specific needs.	Completed (2015-2018)
UNDP, Programme for Development of "Green" Economy in the Kyrgyz Republic for 2019- 2023	Kyrgyzstan	gender experts developed a set of gender mainstreaming recommendations in sectors sur as energy, agriculture, tourism, waste management and chemical risk mitigation. The programme is currently under review by the Government.	Planned (2020-2023)
International Foundation "RozaOtunbaeva's Initiative", with support from the Democracy Commission of the US Embassy in the Kyrgyz Republic, Women in STEM	Kyrgyzstan	A range of events was organized in Bishkek and across the country, including training courses in STEM disciplines (including fields of mechanical engineering, renewable energy sources, hydropower) for high school girls, computer literacy schools for women, and others.	Ongoing
Canadian Government, Foundation of the Turkish Women in Renewables	Turkey	WiRE (Women in Renewables) Canada. They helped Turkish women found the TWR (Turkish Women in Renewables) to advance the role of women working in Energy sector in Turkey	Founded in 2018, ongoing
ILO, More and Better Jobs for Women: Women's Empowerment through Decent Work in Turkey	Turkey	Project being implemented by ILO Office in Turkey and Turkish Employment Agency (İŞKUR), approximately 1,700 women and men were reached out and delivered awareness training on gender equality in many sectors including energy.	Completed (2016-2017)

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