CAREC 2030: SUPPORTING REGIONAL ACTIONS TO ADDRESS CLIMATE CHANGE

A SCOPING STUDY

APRIL 2023

CAREC
Central Asia Regional Economic Cooperation Program

ADB

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ASIAN DEVELOPMENT BANK

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ISBN 978-92-9270-105-5 (print); 978-92-9270-106-2 (electronic); 978-92-9270-107-9 (ebook)
Publication Stock No. SPR230126-2
DOI: http://dx.doi.org/10.22617/SPR230126-2

Notes:
1. In this publication, "$" refers to United States dollars, unless otherwise stated.
2. ADB recognizes "China" as the People's Republic of China, "Korea" as the Republic of Korea, "Kyrgyzstan" as the Kyrgyz Republic, and "Russia" as the Russian Federation.
3. ADB has placed its regular assistance to Afghanistan on hold effective 15 August 2021.
4. All photos are owned by ADB unless otherwise stated.

On the cover: Windmills in Sainshand, capital of Dornogovi Province in Mongolia (photo by Eric Sales/ADB); emissions from coal-fired power plants contribute to the air pollution in Ulaanbaatar, Mongolia (photo by Ariel Javellana/ADB); rural lands experiencing drought in Mongolia (photo by Eric Sales/ADB); solar panels installed in Islamia University Bahawalpur Solar Park producing 2.5 megawatt of clean energy and improving people's access to electricity in Punjab, Pakistan (photo by Rahim Mirza/ADB); and use of biogas slurry to plant Phyllostachys praecox in the People's Republic of China (photo by Deng Jia/ADB). Cover design by Judy Yñiguez.

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Azerbaijan. Construction and completion of flood mitigation work along the rivers of Sheki (photo by Daro Sulakauri/ADB).

Foreword

The CAREC 2030: Supporting Regional Actions to Address Climate Change—A Scoping Study presents a comprehensive overview of the potential impact of climate change on Central Asia Regional Economic Cooperation (CAREC) member countries. Its main objective is to assess and recommend how CAREC member countries can collaborate to address climate change issues through regional cooperation.

Commissioned by the CAREC Secretariat, this study examines 43 climate change issues and sub-issues through a literature review and in-depth consultations with experts and practitioners. The issues are core, crosscutting, and "on-the-horizon," highlighting the need for policymakers to consider them.

The study concludes that CAREC has a unique opportunity to support its member countries in implementing and reinforcing existing national strategies for climate change mitigation and adaptation, as well as in developing regional actions to respond to the regional climate change impacts and challenges.

Throughout the preparation process, the study report was discussed with CAREC member countries and development partners at the 21st Ministerial Conference in November 2022, and the member countries acknowledged it through a Joint Ministerial Statement issued after the conference.

This pioneering work will serve as the basis for preparing a regional climate change vision and strategy to further advance climate action through regional and subregional cooperation in one of the world's most populous region.

The Asian Development Bank (ADB) expresses gratitude to the member countries for their active engagement and commitment to advancing regional climate change cooperation. ADB stands with the member countries in their efforts to address climate change issues and remains committed to providing necessary support as the climate bank for the Asia and Pacific region.

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People's Republic of China. Municipal District Energy Infrastructure Development Project. Jiamisu Cityscape (photo by Deng Jia/ADB).

Acknowledgments

This study was undertaken on behalf of the Central Asia Regional Economic Cooperation (CAREC) Secretariat and the Asian Development Bank (ADB). The team would like to thank Yevgeniy Zhukov, director general, Central and West Asia Department (CWRD); M. Teresa Kho, director general, East Asia Department (EARD); Lyaziza Sabyrova, director of the Regional Cooperation and Operations Coordination Division; Yasmin Siddiqi, director of Environment, Natural Resources, and Agriculture Division, CWRD; and Thomas Panella, director of Environment, Natural Resources, and Agriculture Division, EARD, for their invaluable guidance and management support.

The CAREC Secretariat at ADB administered and managed the production of this scoping study. The Secretariat team supporting CAREC climate change work includes Saad Paracha, senior regional cooperation specialist and CAREC unit head; Mary Ann Magadia, associate economics officer; Reneli Gloria, CAREC regional cooperation coordinator; and Alzeus Alzate, secretariat logistics coordinator. The study benefited from technical inputs, comments, and review by ADB climate change focal persons including Nathan Rive, Malte Maass, and Kathleen Anne Coballes. Other ADB staff including Safdar Parvez, Xiaoqin (Emma) Fan, Hideaki Iwasaki, Joonho Hwang, Sujata Gupta, Giap Minh Bui, Heeyoung Hong, Giacomo Giuseppe, Mark Bezuijen, Lei Zhang, Alfredo Bano, Belinda Hewitt, Kazuhiro Yoshida, Maria Pia Ancora, Rie Hiraoka, Shingo Kimura, and Silvia Cardasci, also provided valuable technical inputs.

The team expresses its appreciation to the CAREC Secretariat's regional cooperation coordinators and national focal points' advisors based in the member countries for the assistance extended in collecting relevant information from their respective countries and organizing the regional consultation workshops.

The principal author of this study is Johannes Linn, with Gulshat Raissova and Turdakun Tashbolotov providing research support. The secretariat expresses gratitude to CAREC member country officials and experts, development partners, and climate experts in the CAREC region and beyond for their valuable inputs to the study. The team also recognizes and is thankful for the helpful comments from colleagues at the Asian Development Bank Institute and the CAREC Institute.

Georgia. Windmill along the highway emits little to no greenhouse gases or pollutants into the air (photo by Eric Sales/ADB).

Abbreviations

ADB	Asian Development Bank
ADBI	Asian Development Bank Institute
AFOLU	agriculture, forestry, and other land use
AI	artificial intelligence
ASEAN	Association of Southeast Asian Nations
BAU	business-as-usual
BRI	Belt and Road Initiative
BTI	Bertelsmann Transformation Index
C4CA	Communication for Climate Awareness
CA	Central Asia
CACIP	Central Asian Climate Information Platform
CAFEWS	Central Asian Flood Early Warning System
CAREC	Central Asia Regional Economic Cooperation
CASA-1000	Central Asia–South Asia Power Transmission Initiative
CCAMTAC	Caucasus, Central Asia, and Mongolia Regional Capacity Development Centre
CCS	carbon capture and storage
CEP	Core Environment Program
CESDRR	Centre for Emergency Situations and Disaster Risk Reduction
CI	CAREC Institute
CIF	Climate Investment Fund
CLIENT	Climate and Environment Program in Central Asia
CO_2	carbon dioxide
COP	(United Nations) Climate Change Conference of the Parties
COVID-19	coronavirus disease
CSIS	Center for Strategic and International Studies
CSO	civil society organization
DAI	Digital Adoption Index
DER	Development Effectiveness Review
DP	development partner
DRM	domestic resource mobilization
EbA	ecosystem-based adaptation
EBRD	European Bank for Reconstruction and Development

EC	European Commission
EEC	energy efficiency and conservation
EIB	European Investment Bank
EPI	Environment Performance Index
ESG	environmental, social, and governance
ETI	Energy Transition Index
ETS	emission trading system
EU	European Union
EV	electric vehicle
GCF	Green Climate Fund
GDP	gross domestic product
GEF	Global Environment Facility
GEI	Government Effectiveness Index
GEL	Georgia's currency, Lari
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	greenhouse gas
GIZ	German Development Agency
GMS	Greater Mekong Subregion
Hydromet	hydro-meteorological agency
ICT	information and communication technology
ICWC	Interstate Commission on Water Coordination
IFAS	International Fund for Saving the Aral Sea
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LULUCF	land use, land-use change, and forestry
MDB	multilateral development bank
MW	megawatt
ND-GAIN	Notre Dame Global Adaptation Initiative
NDC	nationally determined contribution
NGO	nongovernment organization
O&M	operation and maintenance
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PPP	public–private partnership
PRC	People's Republic of China
RE	renewable energy
REE	rare earth element
RESILAND CA+	Resilient Landscapes in Central Asia
RISE	Regulatory Indicators for Sustainable Energy

RM	rare metal
SAARC	South Asian Association for Regional Cooperation
SDG	Sustainable Development Goal
SIDA	Swedish International Development Cooperation Agency
SOFF	Systemic Observations Financing Facility
SPECA	United Nations Special Program for the Economies of Central Asia
SSC	South–South Cooperation
SSTC	South–South and Triangular Cooperation
SWOT	strengths, weaknesses, opportunities, and threats
TA	technical assistance
tkm	ton-kilometer
ToC	theory of change
UK	United Kingdom
UN-Habitat	United Nations Human Settlements Programme
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
WB	World Bank
WEF	World Economic Forum
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resources Institute

People's Republic of China. Using biogas slurry to plant *Phyllostachys praecox* (photo by Deng Jia/ADB).

Executive Summary

The countries in the Central Asia Regional Economic Cooperation (CAREC) region face severe impacts of climate change, now and more so in the future. The year 2022 has witnessed particularly dramatic and deadly examples of the impacts of climate change in the region, including the devastating floods in Pakistan, punishing droughts in Afghanistan and the People's Republic of China (PRC), days and even weeks of excessive heat, and cross-border conflict over scarce water resources in Central Asia. These climate-linked events are sharp reminders of the long-term prospects for even more serious impacts of climate change if urgent steps are not taken to control carbon emissions and to increase the resilience of the countries so they can withstand the worsening impacts of climate change over the coming decades. And while it may be understandable that these long-term challenges and threats are not currently the top concerns of the policymakers or the general public—considering the current global economic crises of inflation, financial stress, food insecurity, and geopolitical tensions—it will be critical for the welfare of the people in the CAREC region that climate change issues are addressed urgently and effectively.

It is, therefore, timely that CAREC is focusing attention on climate change as a crosscutting issue for its CAREC 2030 Strategy. To support an enhanced focus on climate change, the CAREC Secretariat commissioned this scoping study on regional climate change issues in the CAREC region. The study team explored a comprehensive range of climate change issues based on an in-depth review of the literature and intensive consultations with experts and practitioners; took stock of CAREC's and the CAREC Institute's strategy and knowledge work and of CAREC investment projects in support of climate action; and considered how CAREC and the CAREC Institute can best address the most important climate change challenges and opportunities moving forward.

Climate change raises many complex issues for policymakers, both in mitigation and adaptation, that are closely interrelated and hence require a systemic perspective. This report identifies and explores 43 climate change issues and sub-issues to be considered by policymakers in the CAREC region. This is by no means exhaustive; additional ones may need to be added for further consideration. The issues are complex for the following reasons: they involve highly technical aspects; typically, involving winners and losers; they have local, national, regional, and global implications; many combine mitigation and adaptation features; and many are strongly interrelated. As a result of these interrelationships, action requires awareness of the entire ecosystem affected by climate change and of the potential interactions between responses. This report uses a categorization of issues into "core" issues, "crosscutting" issues, and "on-the-horizon" issues (see table on the next page):

- the core issues have been bundled under eight major headings each deserving the attention of the appropriate national authorities;

- the crosscutting issues need to be addressed, considering specific actions in each core area;
- "on-the-horizon" issues need to be monitored and acted upon as and when the right time arrives, new such issues will arise over time, and existing ones integrated into particular core area action plans.

The scoping study's overarching conclusion is that CAREC has a unique and urgent opportunity to chart a course of proactive, systematic, and strategic engagement in supporting its member countries in reinforcing, modifying, and implementing existing national strategies on climate change mitigation and adaptation, and in developing a range of regional actions in response to the regional nature of many climate change impacts and solutions.

Main Climate Change Issues Addressed in the Scoping Study

	Core Issues		Crosscutting Issues		On-the-Horizon Issues	
	National	Regional	National	Regional	National	Regional
Mitigation Adaptation	Energy, water, agriculture, energy–water–agriculture nexus, transport, cities, disasters, health		Macroeconomic, private sector, information and communication technology, hydromet, institutional capacity, costs and benefits, just transition, gender, communication, or advocacy		On-the-horizon energy issues, artificial intelligence (AI), technology transfer and South–South Cooperation, migration, new concepts, research, or data	

Source: Authors.

Main Conclusions Regarding Climate Issues and Policies in the CAREC Region

Climate change presents a major challenge for CAREC and requires an urgent and effective response. The impacts of climate change will be severe nationally and regionally for the countries in the CAREC region. Particularly notable are higher than average increases in temperature, and greater variability and extremes in temperature and precipitation, resulting in greater water scarcity, more floods and droughts, the melting of glaciers, expanding desertification, declines in agricultural productivity, food insecurity, migration, worse health outcomes, and possibly, conflict. To help limit further increases in global and regional temperatures, CAREC countries will have to face an inevitable energy transition toward low-carbon intensity by investing in renewable energy. They will also have to invest in much greater resilience of their economies, through better use of water, climate-smart agriculture, transport and cities, more effective health systems and improved early warning systems for climate-linked disaster, and more. Even though many of the more severe impacts of climate change appear to be a long time away, many critical actions need to be taken urgently, rather than being deferred to an uncertain future date.

But climate change also offers the opportunity to develop a "new climate economy" that can sustain growth, employment, and prosperity even as climate change mitigation and adaptation require major transitions. Many of the policies needed for effective climate action also enhance the efficiency and productivity of the economy and, thus, support growth. Moreover, green

technology offers the prospects of green and clean jobs, climate-smart cities will have cleaner air and less congestion, and resilient agriculture can offer better opportunities to farmers and greater food security to the population. The transition to the new climate economy will have to be equitable (i.e., distribute gains and losses fairly and ensure that the most vulnerable are protected) and apply nature-based solutions (i.e., draw on natural rather than human-made resources in a way that helps solve climate change and environmental problems).

Climate change has significant regional impacts, and many climate issues need to be addressed— for maximum effect—on a regional basis. Climate change affects weather and climate conditions regionally and, therefore, requires regional weather and climate observations and prediction based on those, regional or regionally coordinated planning and action—i.e., an "all-countries" approach that covers all relevant countries. In the CAREC region, such action is especially required for energy, water, agriculture, transportation, and disaster early warning and response, where regional infrastructure has to be built and maintained and/or regional public "goods" (shared energy and water) or "bads" (disasters, pollution, and others) have to be addressed jointly. A regional approach to green technology transfer and knowledge sharing, research and data, and capacity building creates a special kind of regional public good through the creation and diffusion of relevant knowledge and best practice. Regional climate action requires a readiness by countries to cooperate, it demands a regional strategy that complements national climate change strategies, and it needs a regional institutional capacity to support the cooperation process. CAREC is such an institution.

National and regional climate action is complementary and mutually reinforcing. Many of the conclusions in the report refer to national climate change impacts and national responses at the country level. This does not mean that the national perspective has primacy over the regional perspective. Given the regional interconnectedness of CAREC countries in many of the climate issues identified in this paper (energy, water, transport, information and communication technology [ICT], and others) and considering that a regional approach to sharing technology, knowledge, experience, and scarce capacity is so important, that the national and regional perspectives must be treated as complementary. This complementarity is reflected in the messages and recommendations for CAREC presented in this report.

In addition to an "all-countries" approach, the systemic nature of climate change and the response to it requires an "all-of-government" and an "all-of-country" approach with the development and implementation of a national climate change strategy. "All-of-government" means that all government branches and agencies, including provincial and local governments, need to be made responsible for integrating climate considerations into their policies and programs, even where there is one ministry or agency in charge of climate change (as in Pakistan). "All-of-country" means that not only the central government, but all national stakeholders, including private businesses and bankers, farmers, teachers, health-care professionals, university and think tank experts, civil society and community organizations, women, men, and young people have to be engaged in learning about, tracking, and responding to climate change. Therefore, a national climate strategy typically needs to be developed, which incorporates the nationally determined contributions (NDCs), mostly relating to mitigation and, where contained in a separate document, the planned national adaptation actions (Adaptation Plan). The strategy needs to take into consideration the interests of all major stakeholders and should be prepared in a transparent and participatory manner.

National climate strategies need to set priorities for action among issues—it helps to structure the issues into broad buckets for high-level strategic decisions. Given the limited institutional and financial capacity, as well as often limited political bandwidth, priorities have to be set across issues, and over time, responsibilities are allocated to the appropriate national actors. The issues categorization used in this report ("core" issues, "crosscutting" issues, and "on-the-horizon" issues) can help set priorities at the national and regional levels. Moreover, national strategies need to incorporate the regional aspects of climate change and allow for solutions based on regional cooperation.

Strategies and commitments are not enough—they need to be implemented, transparently monitored, and adapted in light of the lessons learned. All countries in CAREC have prepared NDCs—some have climate change strategies, while others have adaptation plans. This is most welcome, but action plans need to be developed and implementation has to be assured. Monitoring is essential to verify that implementation is happening and achieves the intended results. Lessons learned from implementation need to reflect in adaptations of the strategy. In setting results objectives and monitoring progress, regional benchmarks are helpful; and in seeking to draw lessons and adapting national strategies, relevant regional experience and lessons are of great value.

Next to the government, the private sector is the most critical element in any national climate strategy. Private businesses take on most production and distribution tasks in national value chains and are critical players in developing, integrating, scaling, and financing innovative green solutions. Therefore, climate-smart policies, regulations, and business conditions need to underpin private sector responses in support of the climate change strategy. Private actors are linked across borders by trade, transport, investment, technology transfer, knowledge exchange, and regional business associations. The regional aspects of climate change and climate policies, therefore, also greatly matter to private businesses.

Financing is a critical ingredient of—and often a severe constraint at the country level on—climate change action and has to be actively planned and accounted for. Climate strategies will need credible financing plans, which include domestic public and private resources, as well as international public and private resources. Macroeconomic constraints, and especially the sustainability of external debt, have to be respected and addressed. Domestic public resource mobilization can play the dual role of raising revenues for green investments while also providing incentives for the transition to a carbon-neutral society (by eliminating carbon subsidies). Green private finance can play a role in raising national and international finance but requires the development of domestic capital markets and the capacity to prepare and negotiate bond issuance. Regional cooperation will be critical in raising funding for large-scale regional projects (e.g., hydropower stations, transmission lines, regional green economic corridors, and others), in developing financing facilities (e.g., regional disaster risk insurance), and for creating favorable regional investment conditions for private and official foreign investors in the region's new climate economy.

Implementation of national climate strategies needs the support of international development partners —an "all-of-partners" approach will be needed to complement an "all-of-government" and "all-of-country" approach. Development partners (DPs) need to provide official climate finance commensurate with their international commitments and the needs of the country concerned—especially adaptation finance, given the high vulnerability and limited national resource base of many of the CAREC countries. DPs can also provide critical advisory and capacity-building support in designing and implementing climate strategies, NDCs, and specific climate-relevant

programs and projects. All such assistance needs to apply an "all-of-partners" approach, under which information about DP financing and activities is shared, gaps in support identified and closed to the extent possible, overlapping support is coordinated, and appropriate division of labor among partners agreed on, brokered by or, at least, in consultation with the government. CAREC countries may wish to explore the new "country platform" approach being pioneered for South Africa, where the government and development partners work together in developing and funding a comprehensive national climate action plan. To take advantage of the regional interconnectivity in the CAREC region, DPs will increasingly have to look to support regional climate initiatives, which will ultimately ensure a greater impact on their engagement. Through this, they can build on current examples of DP-supported regional climate projects and programs highlighted in this report.

Regional cooperation among CAREC countries is an example of South–South Cooperation (SSC), and CAREC is an example of successful South–South and Triangular Cooperation (SSTC) with great potential in supporting regional action on climate change. SSC is particularly relevant in a regional context since the country context, country needs, regional public goods, and potential for mutual understanding are often more aligned among neighboring countries than among non-neighbors, although historic rivalries can also interfere with cooperation. As demonstrated in this report, the PRC can and does play a particularly important role as an SSC partner in the CAREC, given its size, resources, advanced technology, strong focus on climate change action, and engagement in the region (as elsewhere) with the Belt and Road Initiative (BRI). Climate change action could become a central focus under BRI since BRI was reoriented by the PRC authorities in 2019 toward greater engagement with social and environmental aspects. When international development partners support regional cooperation on climate change, as in the case of CAREC, this is a particularly powerful example of SSTC, which is strongly supported by the United Nations and by the Organisation for Economic Co-operation and Development (OECD).

Main Conclusions Regarding CAREC's Current and Potential Future Role

CAREC is potentially an important regional convenor and offers a platform for addressing climate change in the CAREC region, together with the CAREC Institute; however, CAREC has not yet focused systematically and strategically on the regional climate change agenda. Climate change is not a crosscutting focal area in the CAREC 2030 strategy, and no guidance is provided in CAREC 2030 or in the CAREC Development Effectiveness Review on what role CAREC should play in climate change. The same applies to CAREC sector and thematic strategies, with the exception of the Energy Sector Strategy, which prominently deals with climate change as one of the focal areas of CAREC's engagement in the energy sector. Some other regional platforms in the Asia region have more systematically and for a longer time addressed climate issues (Association of Southeast Asian Nations [ASEAN], Greater Mekong Subregion [GMS], South Asian Association for Regional Cooperation [SAARC]). Asian Development Bank (ADB) country strategies deal with climate issues prominently, but they generally do not address the regional dimension.

CAREC can draw on a strong knowledge base and an operational foundation in some sector and thematic areas with relevance to regional climate change issues, drawing on the work of CAREC Institute, ADB, and other development partners; and by national organizations and experts. Much of the knowledge and advisory work by development partners, national organizations, and

experts so far has not been carried out under CAREC, but can be a useful base for future regional climate change work in key areas. The CAREC project database provides a useful compilation of climate-related projects in the CAREC region, although it is not clear to what extent the projects have been initiated explicitly under the CAREC umbrella and whether all relevant regional projects are captured in this database. CAREC and CAREC Institute work in the energy sector is furthest advanced in focusing explicitly on climate change, with a special focus on mitigation; water, agriculture, and transport sector work have recently also incorporated climate adaptation concerns. Other potential priority areas (including climate-smart cities, disaster preparedness, and others) have been less systematically covered with regard to climate change concerns.

The list of climate issues identified in this report fit generally well within the structure of CAREC activity clusters as defined in the CAREC 2030 strategy. The two core climate issues that are currently not easily placed in the CAREC 2030 clusters are climate-smart cities and disaster preparedness. If CAREC identifies climate change as a new crosscutting strategic focus and a climate change strategy is developed then some of the crosscutting climate issues, which currently are not aligned with CAREC clusters and existing crosscutting areas, will need to be integrated as appropriate.

Looking ahead, CAREC will have to address how it can best employ and preserve its strengths, deal with weaknesses, capitalize on its opportunities, and manage threats. The report's strengths, weaknesses, opportunities, and threats (SWOT) analysis highlights the relevant factors (see the next table):

SWOT Analysis for Engagement by CAREC in the Regional Climate Change Agenda

Strengths	Weaknesses
• Strong commitment and capacity of ADB on climate change • Prior CAREC engagement and CAREC Institute (CI) knowledge products in core climate areas • Knowledge base in the region in some climate-related areas • Strong support by ADB and PRC for CAREC and CI • Engagement by other member countries • History of collaboration with Development Partners (DPs) • Example of GMS/Mekong Institute	• Limited research/knowledge base in some climate change areas • Weak planning and implementation capacity in member countries in the face of major policy challenge • Lack of systematic, strategic approach by CAREC to climate change • Predominant country focus by DPs, limited information on their activities and lack of coordination
Opportunities	**Threats**
• Global focus on climate change • Growing interest in climate change in the region • Climate change as a driver of regional cooperation • Win-win economic and climate outcomes in many areas • Growing cohesion in Central Asia (Uzbekistan) • Move climate change to center of CAREC 2030 strategy • CAREC/CI division of labor and collaboration • DP division of labor and coordination • Benefit from South–South cooperation	• Complexity of the climate change issues • Distraction by COVID-19 and economic crises • Interstate rivalries and distrust as a result of climate change impacts (e.g., water) • Political situation of Afghanistan impedes CAREC's regional cooperation • Insufficient interest in/ownership of CAREC and CI by member countries • Insufficient engagement in CAREC and CI by DPs (and ADB going it alone) • Insufficient capacity of and funding for CAREC Secretariat and CI

ADB = Asian Development Bank; CAREC = Central Asia Regional Economic Cooperation; COVID-19 = coronavirus disease; PRC = People's Republic of China; SWOT = strengths, weaknesses, opportunities, and threats.

Source: Authors.

Main Recommendations

The recommendations in this report are high-level and tentative. Final recommendations and their details will have to be worked out in subsequent consultations by the CAREC Secretariat with member countries representatives, other country stakeholders, and development partners.

Recommendation 1. CAREC to incorporate climate change as an urgent crosscutting issue in the CAREC 2030 Strategy.

Recommendation 2. The CAREC Secretariat to prepare a CAREC Climate Change Strategy for adoption by CAREC Ministers.

- The CAREC Climate Change Strategy will confirm the CAREC focus on climate change as a crosscutting strategic theme, will set priorities for CAREC and CAREC Institute engagement on climate change issues, and will include a results framework.
- The Strategy will identify—where appropriate—subregional groupings of countries for which regional climate actions in particular sectors or thematic areas may be required.
- The Scoping Study identifies a tentative set of priorities for the Strategy, which reflects not only the importance of the core climate change issues, but also the potential for a division of labor between CAREC and the CAREC Institute, and the potential for drawing on DPs for support in areas where they have demonstrated interest and strengths.

Recommendation 3. CAREC to establish a senior-level Steering Committee for the climate change agenda.

- The Climate Steering Committee will be similar to the one established under the CAREC Digital Strategy and consist of senior government officials, preferably representing ministries directly responsible for countries' climate change strategies. It will be assisted by a Climate Expert Working Group and climate subworking groups for selected CAREC sector committees.
- The Climate Steering Committee will develop a set of priorities for climate issues to be addressed by CAREC and the CAREC Institute. The report provides an indicative list of priorities to be considered.

Recommendation 4. The CAREC Climate Steering Committee, with the support of the CAREC Secretariat and advice of the CAREC Climate Expert Group, to develop a road map for freestanding climate change projects and targeted climate mitigation and adaptation components in other projects to be designed, implemented and financed under the CAREC umbrella.

The Climate Steering Group, with the support of the CAREC Secretariat and the Climate Expert Group, will also develop a proposal for the establishment of a facility to finance the preparation of freestanding bankable climate projects (potentially integrated with another project preparation facility).

Recommendation 5. CAREC and CAREC Institute to work closely together and to develop an agreed-on division of labor in the interest of maximum synergy.

The CAREC Institute will develop a research, data, capacity building, and networking strategy on climate change that aligns with and supports the CAREC Climate Change Strategy.

Recommendation 6. As part of its climate change strategy, CAREC to develop a strategic approach to engaging systematically with development partners (DPs) and other regional organizations in fostering interagency collaboration and in mobilizing financial and expert resources for regional climate investments, policy and advisory work, technology transfer and knowledge sharing, as well as research and data development, and capacity building.

CAREC and the CAREC Institute will cooperate in ensuring they maintain a comprehensive and accurate information base on DPs' and regional agencies' activities in regard to regional climate change initiatives in the CAREC region, including investment and technical assistance (TA) projects and other relevant knowledge, networking, and outreach activities as a basis for identifying potential division of labor.

Recommendation 7. CAREC to aim to develop and publicize a common position on global climate change negotiations (United Nations Climate Change Conferences of the Parties [COPs]).

Through joint statements, CAREC countries can augment their voices in calling on countries worldwide to reinforce their mitigation strategies so as to reduce the negative climate impacts on the CAREC region and also call on OECD countries and multilateral financial organizations to increase their concessional climate finance, especially for adaptation.

Recommendation 8. CAREC and the CAREC Institute to monitor and evaluate progress with the implementation of climate change strategies in the region.

- CAREC Institute will collect information on the status of preparation and content of NDCs' national climate strategies and adaptation plans in the region, assist in monitoring their implementation on a peer review basis, and share lessons that will help all CAREC member countries with the implementation of their climate commitments and plans.
- CAREC will monitor and evaluate the implementation of the CAREC Climate Strategy with reference to the Results Framework and recommend changes as appropriate.

1 Introduction

Climate change is the defining challenge for global development during the 21st century. If climate change is not effectively addressed through mitigation measures, the goal of limiting global warming to 1.5 degrees Celsius set by the Paris Agreement will not be reached. In that case, global prospects for prosperity, health, and survival will be severely threatened beyond current climate risks already evident.[1] The mitigation and adaptation challenge and its urgency are now well recognized worldwide,[2] and actions are being taken to address climate change and its impacts at the global, regional, and national levels, but not yet nearly enough (Box 1). However, with the coronavirus disease (COVID-19) crisis and the global and regional geopolitical tensions, the climate change agenda risks losing momentum in many countries and international forums. While this is to be expected, these crises must not deflect the international community and individual countries from tackling the climate change crisis on an urgent basis.

The Central Asia Regional Economic Cooperation (CAREC) region contributes to carbon emissions causing climate change and is highly vulnerable to the consequences of climate change with significant regional dimensions; therefore, CAREC needs to focus on climate change. Climate change was identified in the CAREC 2030 strategy as a crosscutting "consideration,"[3] but to date, the focus by CAREC on this topic has been limited. While some CAREC strategy and CAREC Institute knowledge products deal with climate change, there is no overall strategic framework guiding CAREC's engagement on climate change. The Asian Development Bank has commissioned this scoping study on how CAREC can best intensify its support for regional actions to respond to climate change.

The purpose of this scoping study is to lay the groundwork for the development of a systematic and strategic approach by CAREC to the climate agenda in the region. It does so by

- informing the CAREC member countries, Secretariat, and development partners about climate change issues and national and regional policies and instruments relevant to climate

[1] Intergovernmental Panel on Climate Change (IPCC). 2022. *Climate Change 2022: Mitigation of Climate Change: Summary for Policy Makers*. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf.

[2] The 2022 World Economic Forum Global Risks Perception Survey identified "Climate action failure" and "extreme weather" as the top two global risks for the next 10 years. https://unfccc.int/news/climate-tops-2022-wef-global-risks-report. There remain, however, debates on who bears principal responsibility for climate action—developed countries or also developing countries?—with the principle of "common but differentiated responsibility" widely accepted under the United Nations Framework Convention on Climate Change (UNFCCC), but its practical application still subject to negotiation. *Britannica*. 2022. Common but differentiated responsibility. https://www.britannica.com/topic/common-but-differentiated-responsibilities.

[3] Asian Development Bank (ADB). 2017. *CAREC 2030: Connecting the Region for Shared and Sustainable Development*. https://www.carecprogram.org/?publication=carec-2030-connecting-the-region-for-shared-and-sustainable-development.

Box 1

United Nations Secretary-General António Guterres Takes Stock of the Global Climate Change Challenge

Following is the text of UN Secretary-General António Guterres' video message on the launch of the third Intergovernmental Panel on Climate Change (IPCC) report, in New York [on 4 April 2022]:

"The jury has reached a verdict. And it is damning. This report of the Intergovernmental Panel on Climate Change is a litany of broken climate promises. It is a file of shame, cataloguing the empty pledges that put us firmly on track toward an unlivable world.

We are on a fast track to climate disaster. Major cities under water. Unprecedented heat waves. Terrifying storms. Widespread water shortages. The extinction of a million species of plants and animals. This is not fiction or exaggeration. It is what science tells us will result from our current energy policies.

We are on a pathway to global warming of more than double the 1.5°C limit agreed-on in Paris. Some government and business leaders are saying one thing, but doing another. Simply put, they are lying. And the results will be catastrophic. This is a climate emergency.

Climate scientists warn that we are already perilously close to tipping points that could lead to cascading and irreversible climate impacts. But, high-emitting governments and corporations are not just turning a blind eye, they are adding fuel to the flames.

They are choking our planet, based on their vested interests and historic investments in fossil fuels, when cheaper, renewable solutions provide green jobs, energy security and greater price stability.

We left COP26 [twenty-sixth Conference of the Parties to the United Nations Framework Convention on Climate Change] in Glasgow with a naïve optimism, based on new promises and commitments. But, the main problem —the enormous, growing emissions gap—was all but ignored. The science is clear: to keep the 1.5°C limit agreed-on in Paris within reach, we need to cut global emissions by 45 per cent this decade."

Source: Quoted from United Nations Press Release SG/SM/21228, 4 April 2022. https://press.un.org/en/2022/sgsm21228.doc.htm.

change, and by exploring the role and mechanisms of regional cooperation on climate issues in the region;

- reviewing CAREC and CAREC Institute climate change-related activities to date and identifying potential entry points for CAREC and CAREC Institute to engage on climate issues;
- proposing ways to incorporate climate aspects into the five operational clusters of CAREC; and
- recommending an appropriate niche for the CAREC program and CAREC Institute in promoting the regional and global climate agenda.

The approach for preparing this report involved three steps:

Step 1: A "horizon scanning" exercise to identify the key climate change issues facing the CAREC Region, involving the following steps:

- review of the relevant literature (all literature consulted is referenced in footnotes in the text and in References);

- webinars for consultations with national experts and experts from regional organizations and knowledge platforms (Appendix 1);
- interviews with climate experts of international organizations, including ADB and ADBI (Appendix 1);
- guidance received from CAREC officials on the direction and preliminary results of the study; and
- guidance from the CAREC Secretariat.

Step 2: A review of the activities of CAREC and CAREC Institute to date. This included a review of the CAREC 2030 Strategy and the CAREC Development Effectiveness Review, of CAREC sector strategies, of CAREC and CAREC Institute knowledge products addressing climate change, and of the CAREC project pipeline.

Step 3: An exploration of possible activities for CAREC and CAREC Institute going forward. In the course of this study, it has become clear that the work of CAREC and of the CAREC Institute on climate change issues should in the future be closely related to each other and, hence, this report considers both CAREC and the CAREC Institute. Therefore, the report recommends specific potential steps to be undertaken to assure that CAREC and CAREC Institute effectively address the regional challenges and opportunities of climate change in the CAREC region.

The scope of the study is broad but also subject to a number of limitations and constraints. The study casts its net deliberately widely to cover not only the main sector climate change issues commonly identified but also to explore a wide range of crosscutting thematic issues as well as potential "on-the-horizon" issues, i.e., issues that may not be commonly focused on as priority climate change issues now but may emerge as important issues over the medium- to longer-term. This has meant that a large range of issues need to be addressed, many interrelated with each other due to the systemic nature of the climate change threat. Indeed, most of the issues covered in this report were identified by the national and international experts consulted by the study team. But even these many issues may not fully cover what ultimately has to be considered, since according to a recent review of the literature on climate change in Central Asia, "[t]he IPCC identified 54 thematic areas that are critical to understanding the major impacts of climate change that are relevant for Central Asia."[4] This proliferation of issues, while important for a scoping study, also meant that the depth of analysis had to be limited, given time and resource constraints, as the main study phase was limited to 3 months of elapsed time. Moreover, much of the available documentation focuses not on the entire CAREC region, but on individual countries or subregions, especially the five republics of Central Asia. And even for Central Asia, as the abovementioned literature review concludes, there are serious gaps in academic and gray (i.e., nonacademic) literature research on climate change. Despite these limitations and constraints, this scoping study provides an effective basis for CAREC and the CAREC Institute to develop their respective approaches to help their member countries address the climate change challenge from a regional perspective.

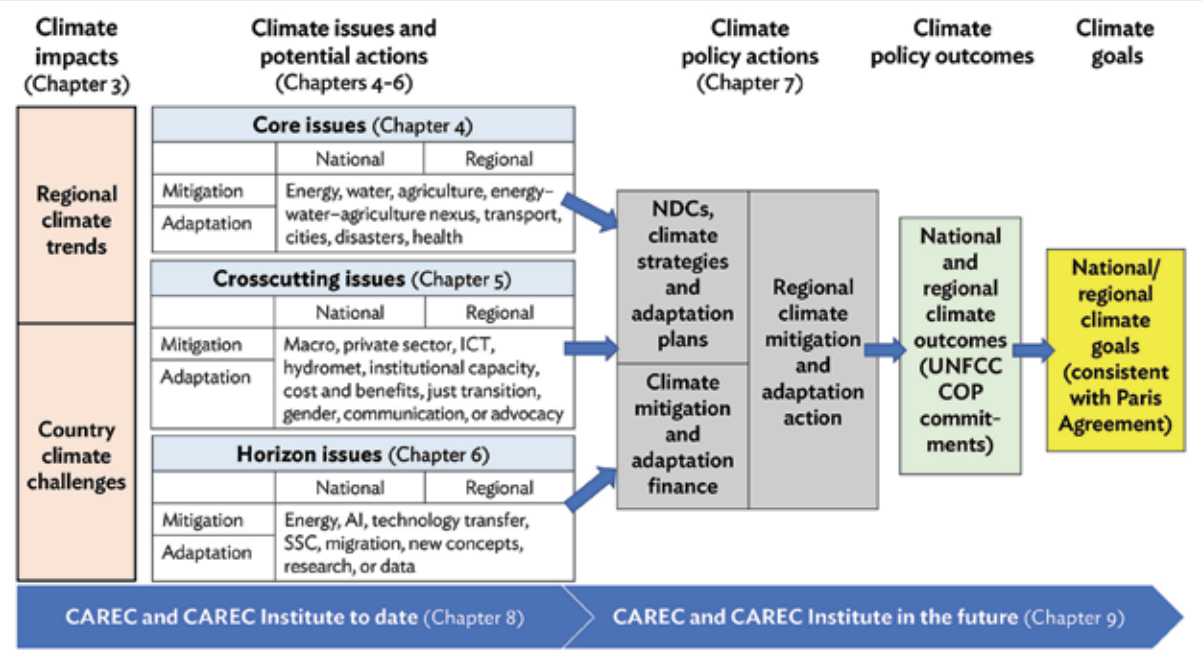
[4] Central Asian Survey. 2022. *A Void in Central Asia Research: Climate Change*. https://www.tandfonline.com/doi/pdf/10.1080/02634937.2022.2059447?needAccess=true.

Mongolia. Aerial photo of the 15-megawatt Sermsang Khushig Khundii Solar plant in Khushig valley, Tuv aimag (photo by Ariel Javellana/ADB).

2 The Framework and Structure for the Scoping Study

In view of the multitude and complexity of climate issues facing the CAREC Region, it is helpful to develop a Theory of Change (ToC) to guide the scoping study and its structure. In brief, the ToC applies in modified terms the standard format from left to right of "context," "inputs," "output," "outcomes," and "goals." Figure 1 lays out the key elements of the ToC adopted for this scoping study.

Figure 1: Theory of Change for the CAREC Climate Change Scoping Study



AI = artificial intelligence, CAREC = Central Asia Regional Economic Cooperation, COP = (United Nations) Climate Change Conference of the Parties, ICT = Information and Communication Technology, SSC = South–South Cooperation, UNFCCC = United Nations Framework Convention on Climate Change.

Source: Authors.

The ToC covers the key issues and aspects explored in this report as follows:

(i) The ***context*** is represented by a summary of the climate change trends in the CAREC region and climate change-relevant impacts for specific countries (in Chapter 3).

(ii) Expanding on this context, a horizon scan of climate change ***issues and actions*** is developed (in Chapters 4–6), separately focusing on

- core sector and thematic issues that are commonly the focus of current climate change policy, including energy, water, agriculture, the energy–water–agriculture nexus, transport, cities, disasters, and health (in Chapter 4);
- crosscutting thematic issues including macroeconomic issues, the private sector, information and communication technology (ICT) and digital, hydromet, institutional capacity, costs and benefits of transition, just transition, gender, and communication and advocacy (in Chapter 5);
- "on-the-horizon" issues (in Chapter 6), including "on-the-horizon" issues in energy, artificial intelligence (AI), technology transfer and South–South cooperation, migration, new concepts, and research and data (in Chapter 6).

For each of these issues, the general aspects are explored, their relevance to the CAREC region considered, potential actions identified along with expected results, and specific regional dimensions highlighted. Since many of these issues include aspects of both climate change mitigation and adaptation, these aspects are considered for each issue as appropriate. This part of the ToC (and chapters 4–6) combine input and output dimensions of the standard ToC.

(iii) The current status and challenges of ***national and regional climate change policy*** in the CAREC region are considered next by focusing on countries' climate change strategies (nationally determined contributions [NDCs], climate strategies, and climate adaptation plans), climate mitigation and adaptation finance, and regional climate mitigation and adaptation action (in Chapter 7).

(iv) National and regional climate change policies and actions are designed to lead to expected ***national and regional climate outcomes*** consistent with the commitments countries enter into under the agreements reached in the UNFCCC COP meetings which, in turn, serve the ***long-term national and regional climate goals*** consistent with Paris Agreement climate goals. The scoping study does not aim to quantify output targets or provide specific climate goals. This task will have to be undertaken as part of the preparation of the proposed CAREC Climate Change Strategy.

(v) Complementing the analysis of the ToC are the review of ***CAREC and CAREC Institute actions to date*** (in Chapter 8) and the ***proposed way forward for CAREC and CAREC Institute*** (in Chapter 9). The large number of potential climate issues worthy of consideration presents CAREC governments and CAREC with significant challenges. The challenge for governments is to structure, prioritize, and sequence appropriate policy action and investments across this vast range of interconnected issues and implement them in a "whole-of-government" approach.[5] The challenge for CAREC and the CAREC Institute will be to pursue a strategic and selective approach, determine what is their appropriate niche, and identify an appropriate division of labor among member countries and development partners in taking a lead on particular issues. Chapter 9 takes first stab at addressing this challenge.

[5] M.S. Ahluwalia and U. Patel. 2022. Climate Change Policy for Developing Countries, in H. Kohli, R. Nag, and I. Vilkeltye, eds. 2022. *Envisioning 2060*. Haryana, India: Penguin Random House.

3 The Context: Climate Trends in the CAREC Region, and Subregional and Country-Specific Challenges

The CAREC region comprises 11 countries with widely differing characteristics but also facing common climate change challenges. CAREC members include Afghanistan, Azerbaijan, the People's Republic of China (PRC), Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan. These countries differ in terms of land area, population size, geographic characteristics, natural resource endowment, per capita income, human capital development, institutional capacity, and political stability. Not surprisingly, therefore, they also differ in terms of their contribution to climate change and in their vulnerability to the impacts of climate change.[6] Accordingly, many of the solutions to the climate challenges in the region will have to be tailored to the conditions and needs of each country and to particular subregions. But there are also important commonalities and regional linkages and spillovers which make regional approaches and cooperation necessary and appropriate. This chapter provides an overview of general climate trends in the CAREC region and summarizes (sub)regional and country characteristics.

3.1 General Climate Trends in the CAREC Region

The CAREC region contributes to global emissions, some countries more intensively so than others. Table 1 shows the carbon dioxide (CO_2) emissions for the CAREC countries in comparison with selected high-income countries and the world. It shows a wide range of dispersion in terms of per capita emissions, with Mongolia, Kazakhstan, and Turkmenistan at the high end (higher or comparable to the United States [US]), while others, such as Afghanistan, Tajikistan, Pakistan, and the Kyrgyz Republic are at the lower end. Figure 2 shows the historical trends of per capita CO_2 emissions, indicating that CAREC countries lagged the US (representing broadly the industrial country trends) by about 60–70 years, with emissions accelerating rapidly in the former Soviet Union as a result of energy-intensive industrialization, collapsing during the deep economic recession post-independence, but then increasing again, rapidly in some of the republics of the former Soviet Union. The PRC's per capita emissions rapidly increased in the 2000s but started to level off in the mid-2010s.

[6] Global climate change research stresses that climate change impacts affect different regions, countries and subnational districts differently. National Bureau of Economic Research (NBER). 2022. *Climate Change Around the World*. https://www.nber.org/papers/w30338.

Table 1: Carbon Emissions by Country, 2020

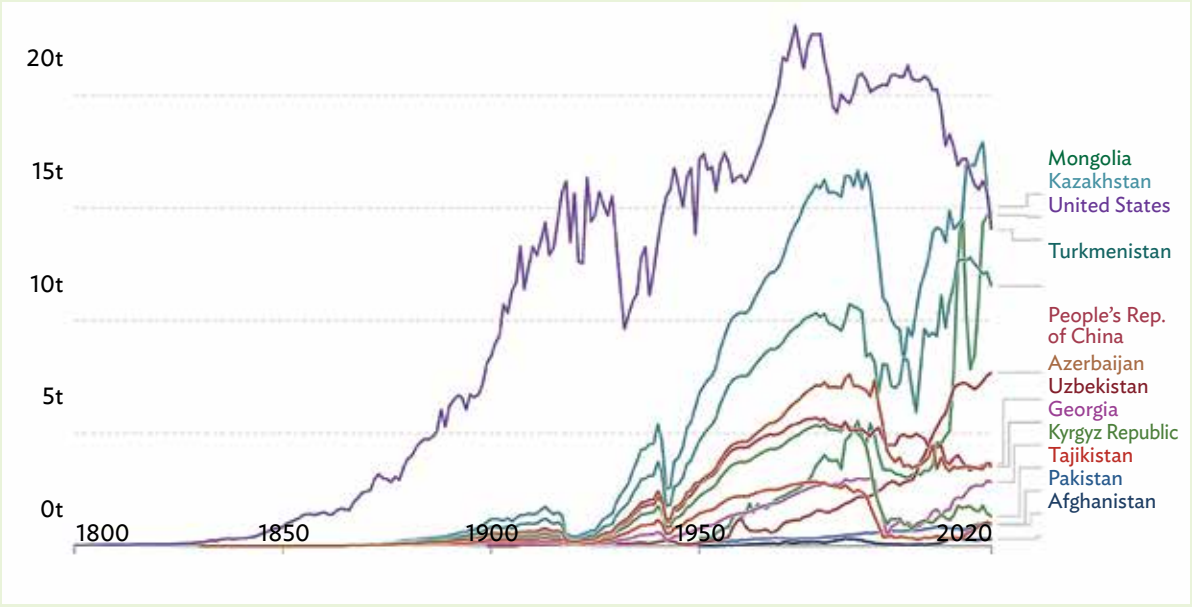
Country	Per capita emissions (tons CO_2)	Total emissions (million tons CO_2)
Afghanistan	0.3	12.2
Azerbaijan	3.7	37.7
Georgia	2.5	10.0
Kazakhstan	15.5	219.3
Kyrgyz Republic	1.7	11.5
Mongolia	26.9	88.4
Pakistan	1.1	234.8
People's Republic of China	7.4	10,667.8
Tajikistan	0.9	9.5
Turkmenistan	12.5	75.3
Uzbekistan	3.4	112.8
Germany	7.7	644.3
United Kingdom	4.8	329.6
United States	14.2	4,712.8
World	**4.5**	**34,797.9**

CO_2 = carbon dioxide.

Source: CO_2 emissions. *Our World in Data*. https://ourworldindata.org/co2-emissions.

Figure 2: History of Per Capita Carbon Dioxide Emissions for CAREC Countries and the United States

(in tons)



CAREC = Central Asia Regional Economic Cooperation.

Source: CO_2 emissions. *Our World in Data*. https://ourworldindata.org/co2-emissions.

One of the important drivers of CO_2 emissions in the CAREC region has been and will be population growth. The CAREC region has seen rapid population growth in the past and will continue to see rapid population growth in the future (with the exception of Georgia and the PRC (Table 2). While rapid population growth has potential upsides in terms of youthfulness and dynamism of the population, growth in the labor force, and hence, economic growth, it also will place increasing stress on the region's natural resources, drive increases in energy and water use, and reinforce the growth of cities, and thus represents an important driver of CO_2 emissions.

Table 2: Projections for Population of CAREC Countries and the World, 2030, 2040, and 2050

Country	Millions			% change relative to 2022		
	2030	2040	2050	2030	2040	2050
Afghanistan	49.7	61.6	73.5	22.6	51.8	81.1
Azerbaijan	10.7	11.0	10.9	3.5	6.3	5.3
PRC	1,416.9	1,380.0	1,316.9	–0.6	–3.2	–7.6
Georgia	3.7	3.5	3.4	–2.4	–5.8	–9.6
Kazakhstan	21.0	23.2	25.5	9.0	20.1	32.1
Kyrgyz Republic	7.4	8.4	9.4	12.3	27.6	42.6
Mongolia	3.7	4.1	4.5	10.2	21.8	33.5
Pakistan	271.6	320.2	365.7	16.3	37.1	56.6
Tajikistan	11.3	13.3	15.1	15.0	34.5	53.4
Turkmenistan	7.0	7.7	8.2	9.6	20.0	29.0
Uzbekistan	38.1	41.9	45.4	10.9	21.9	32.3
World	**8,511.7**	**9,158.7**	**9,687.4**	**7.2**	**15.3**	**22.0**

CAREC = Central Asia Regional Economic Cooperation, PRC = People's Republic of China.

Source: United Nations Population, Department of Economic and Social Affairs, Population Division. https://population.un.org/wpp/Download/Standard/Population/ (accessed 2 August 2022); and computations by the author of Asian Development Bank. Forthcoming. *Agriculture and Food Security in the CAREC Region.*

The CAREC region has been getting hotter over the last 100 years, more so than the global average, and will get hoter. A recent CAREC Institute publication analyzes past and projected future temperature increases over the last 100 years. Kazakhstan, the Kyrgyz Republic, Afghanistan, and Mongolia show the highest increases (of over 2 degrees Celsius) in the past; looking ahead, Afghanistan, Western PRC, and the Kyrgyz Republic are most exposed to further temperature increases.[7] Along with general increases in regional temperatures, there have also been increases in the number of days when countries in the region experienced excessive heat.[8]

For precipitation, the region saw increases in some parts and reductions in others over the last 100 years. Afghanistan and Pakistan saw the greatest decline in precipitation in the past, followed by parts of Kazakhstan, Mongolia, the PRC, and Turkmenistan. For the future, there is also a mixed outlook. Afghanistan is at the greatest risk of reduced precipitation, followed by Azerbaijan, Georgia, and parts of Turkmenistan also at risk. Western PRC and Kazakhstan are projected to see increases in precipitation. However, rainfall is likely to occur earlier in the year, which has negative implications

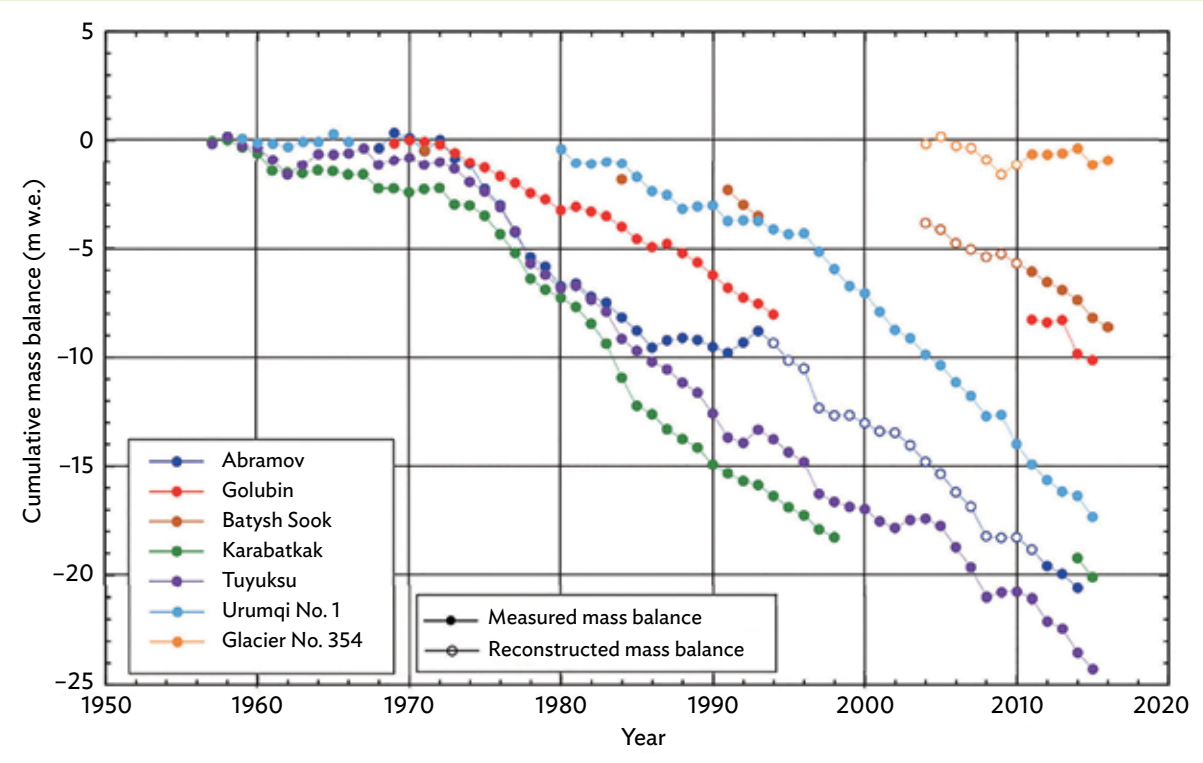
[7] CAREC Institute (CI). 2020. *Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region.* https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf.

[8] Central Asian Bureau for Analytical Reporting (CABAR). 2022. *Abnormally Hot Summer – New Normal for Central Asia.* https://cabar.asia/en/abnormally-hot-summer-new-normal-for-central-asia.

for agriculture (footnote 8). Moreover, the region has seen more frequent and severe droughts and floods (including a disastrous flood in Pakistan and a drought in the Yangtze River Basin in the PRC, both in 2022). And there is evidence that "desert climate has expanded northward by over 100 kilometers (km) in mid-latitudes Central Asia since the mid-1980s."[9]

Glaciers have been melting. As a result of the changing climate conditions, glaciers in the CAREC region have been melting (Figure 3) and are expected to continue doing so in the future.

Figure 3: Cumulative Mass Balance in Selected Glaciers in Central Asia, 1950s–2010s



Source: Q. Hu and Z. Han. 2022. *Northward Expansion of Desert Climate in Central Asia in Recent Decades*. AGU. https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022GL098895.

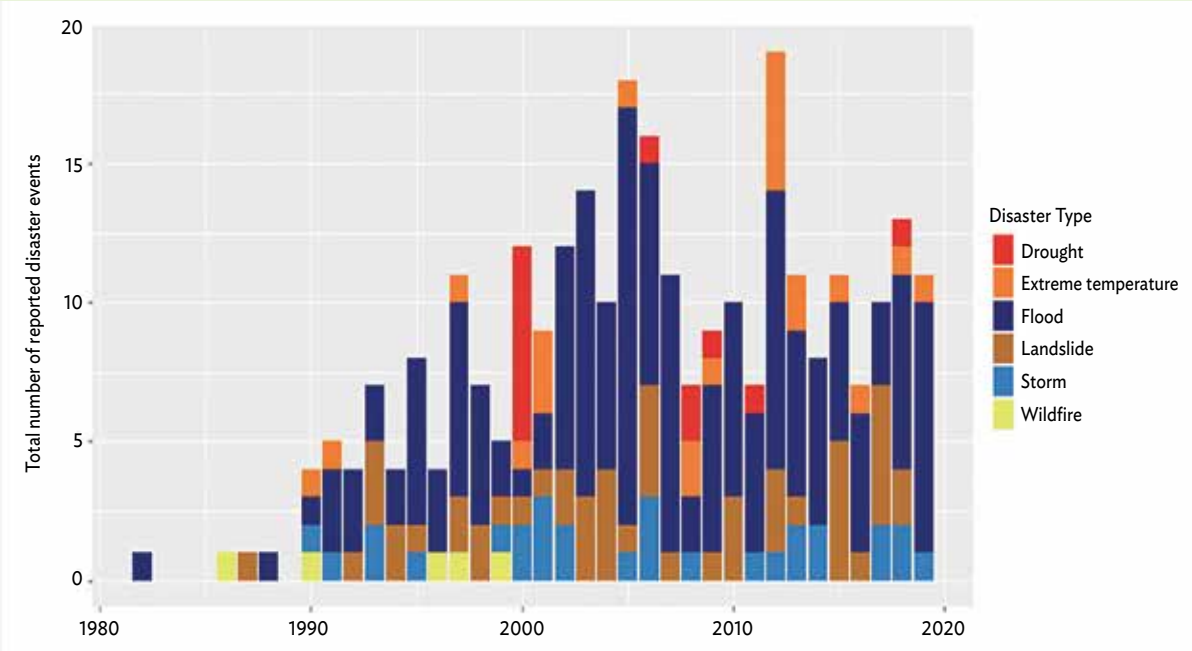
Extreme weather events have been on the rise in the CAREC region. Figure 4 shows the trend and distribution of the occurrence of extreme weather events in the CAREC region over the last 40 years, with floods being the most frequent disaster. The widely considered global Climate Risk Index ranks CAREC countries from high exposure to extreme weather events (Pakistan ranked 8th, Afghanistan 17th) to the middle (PRC 41st, Tajikistan 47th, Mongolia 48th) to relatively low (Kazakhstan 154th, Uzbekistan 170th).[10] However, even the relatively low-risk countries have

[9] Q. Hu and Z. Han. 2022. *Northward Expansion of Desert Climate in Central Asia in Recent Decades*. AGU. https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022GL098895.

[10] GermanWatch. 2022. *Global Climate Risk Index 2021*. https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf.

important exposure in certain areas to climate risk and, hence, need to be concerned about adapting to these risks.

Figure 4: Occurrence in Extreme Events in the CAREC Region, 1980–2019



CAREC = Central Asia Regional Economic Cooperation.

Source: GermanWatch. 2022. *Global Climate Risk Index 2021*. https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf.

The principal risks that require adaptation action are related to the impacts of climate change on the natural environment. Aside from the heightened incidence of severe weather events, they include as noted, melting glaciers and desertification, and rising sea levels.[11] These, in turn, can result in the loss of ecosystems, including biodiversity, soil quality, and others, and in increased water scarcity, and hence, reduced agricultural productivity. The widely used Environmental Performance Index (EPI) provides a summary of environmental challenges for countries, many of them aggravated by climate change. Table 3 summarizes the performance of CAREC countries according to this index.[12] CAREC countries overwhelmingly are to be found in the lower half of the ranking reflecting higher risks. Dealing with these risks will require investments in adapting and climate-proofing infrastructure (transport, housing, education, health facilities, water, and energy infrastructure) to increase resilience. In addition, climate-smart agriculture will need to be developed to maintain domestic food security and agriculture exports. Early warning and effective

[11] Rising sea levels are relevant only for the PRC, Georgia, and Pakistan. All other CAREC countries are landlocked.

[12] Three countries (Azerbaijan, Mongolia, and Tajikistan) show a decline in performance on this index, while the others show varying degrees of improvement. Yale, 2022. Environmental Performance Index 2022. https://epi.yale.edu/epi-results/2022/component/epi as compiled in CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

disaster response will also take on much-increased importance. Financing for investments in mitigation and adaptation has to be mobilized. The impacts of floods and droughts often extend beyond borders, especially for smaller countries, particularly in Central Asia. Preparedness and response will, therefore, benefit from a regional approach. Loss of ecosystems also tends to be regional in nature. The link between climate change, mitigation action, and air pollution also deserves consideration, as warming temperatures may increase the risk of pollution in certain locations, but may reduce them in others. These and other significant climate issues are explored in the remainder of this chapter.

Table 3: CAREC Country Rankings in the Environmental Performance Index
(out of 180 countries)

EPI Rank	Country	EPI 2022
81	Afghanistan	43.6
93	Kazakhstan	40.9
103	Georgia	39.1
104	Azerbaijan	38.6
107	Uzbekistan	38.2
117	Tajikistan	37.1
118	Turkmenistan	37.0
126	Kyrgyz Republic	35.7
155	Mongolia	29.6
160	People's Republic of China	28.4
176	Pakistan	24.6
CAREC AVERAGE		**35.7**

CAREC = Central Asia Regional Economic Cooperation, EPI = Environmental Performance Index.

Source: Yale, 2022. Environmental Performance Index 2022. https://epi.yale.edu/epi-results/2022/component/epi as compiled in CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

It is useful to bring together assessments of vulnerability and adaptive readiness. This is done under the Notre Dame Global Adaptation Initiative (ND-GAIN) Index, which measures vulnerability in six life-supporting sectors (food, water, health, ecosystem service, human habitat, and infrastructure) and adaptive readiness (consisting of three components: economic readiness, governance readiness, and social readiness).[13] Table 4 shows the ranking and value for the ND-GAIN index when the vulnerability and readiness measures are combined. The PRC, Kazakhstan, and Georgia are ranked in the top quartile of countries; Turkmenistan, Pakistan, and Afghanistan are in the bottom quartile. Figure 5 shows how CAREC countries perform when the vulnerability and readiness ratings are considered separately and allows comparison for the years 2001 and 2022. The good news is that countries in the CAREC region generally have moved toward lower vulnerability and increased readiness, i.e., from the top left quadrant in the graph toward the bottom right. However, Afghanistan and Pakistan remain clearly in the top left quadrant with the worst ratings on both variables.

[13] Global Adaptation Initiative. 2022. Notre Dame ND-GAIN Index. https://gain.nd.edu/our-work/country-index/.

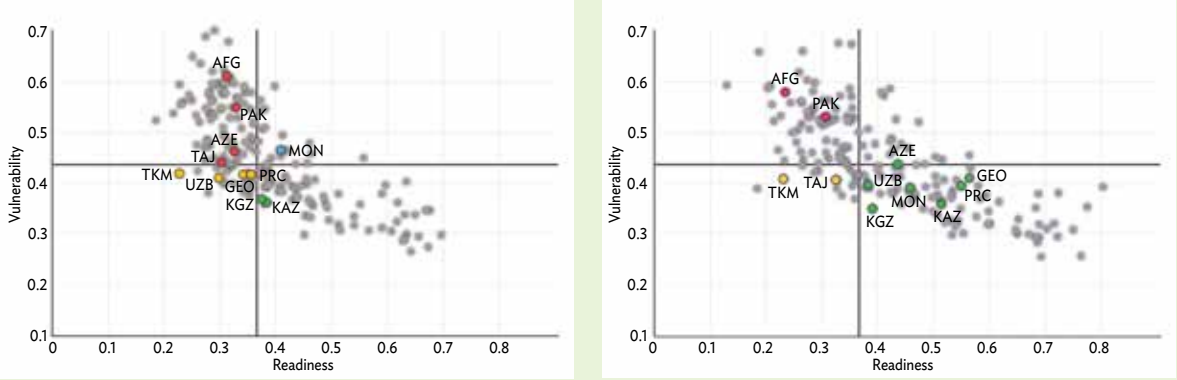
Table 4: CAREC Country Ranking and Index Value on the ND-GAIN Climate Index

Country	ND-GAIN Index Rank (of 182 countries)	ND-GAIN Index Value
People's Republic of China	39	57.9
Kazakhstan	39	57.9
Georgia	42	57.8
Mongolia	64	53.5
Kyrgyz Republic	69	52.2
Azerbaijan	77	50.1
Uzbekistan	83	49.4
Tajikistan	103	46.1
Turkmenistan	132	41.3
Pakistan	146	39.0
Afghanistan	175	33.3

CAREC = Central Asia Regional Economic Cooperation, ND-GAIN = Notre Dame Global Adaptation Initiative.

Source: Global Adaptation Initiative. 2022. Notre Dame ND-GAIN Index. https://gain.nd.edu/our-work/country-index/.

Figure 5: Climate Vulnerability and Readiness for CAREC Countries, 2001 and 2020



AFG = Afghanistan, AZE = Azerbaijan, CAREC = Central Asia Regional Economic Cooperation, GEO = Georgia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, MON = Mongolia, ND-GAIN = Notre Dame Global Adaptation Initiative, PAK = Pakistan, PRC = People's Republic of China, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

Source: Global Adaptation Initiative. 2022. Notre Dame ND-GAIN Index. https://gain.nd.edu/our-work/country-index/.

3.2 Overview of the CAREC Region's Climate Change Challenges by Subregion and by Country

While there are commonalities in climate challenges in the CAREC region, it helps to consider them separately grouped by subregions and countries. Detailed assessments of climate risks for each of the 11 CAREC countries can be found in the Climate Risk Country Profiles prepared jointly by ADB and the World Bank in 2021.[14]

3.2.1 Central Asia

The Central Asian subregion,[15] the core area of the CAREC region, has diverse climatic landscapes with high altitude glaciers, alpine pastures, fertile valleys, semi-arid lands, and deserts and is subject to serious climate challenges.[16] The waters generated from high mountain ranges feed valleys and protect fertile plains from desertification. The anthropogenic activities in the region have severely damaged this fragile ecosystem and global climate change further aggravates environmental fragility. Critical problems related to climate change in the countries of the region include the following:

(i) Global warming contributes to the melting of glaciers and loss and reduction of freshwater resources in the region in the long term. Growing water scarcity is becoming one of the key issues in the region negatively affecting other essential economic sectors such as energy, agriculture, and food security, and creating potential conflict between countries.[17] The effects of fast-melting snowcaps combine with intensifying extreme weather events to trigger natural calamities. Floods and landslides are happening with regular and increasing frequency and severity.

(ii) As a result of global climate change over the past 50–60 years, the area of glaciers in Central Asia has decreased by about 30%. According to calculations, by 2050, a decrease in water volumes in the Syr Darya and the Amu Darya basins is expected to reach 10%–15%.

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[14] ADB and World Bank. 2021. *Climate Risk Country Profiles*. https://www.adb.org/publications/series/climate-risk-country-profiles.

[15] Under "Central Asia" this report refers to the five Central Asian republics—Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

[16] Unless otherwise noted, this summary is based on the following sources: ADB. 2014. *Climate Change and Sustainable Water Management in Central Asia*. https://www.adb.org/publications/climate-change-and-sustainable-water-management-central-asia; CAREC Institute. 2020. *Regional Cooperation in Promoting Low-Carbon Energy Development in CAREC: Challenges and Opportunities*. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf; CAREC. 2021. *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf; CAREC Institute. 2022. *Sustainable Pathways to Energy Transition in the CAREC Region: A Governance Perspective*. https://www.carecinstitute.org/wp-content/uploads/2022/04/Sustainable-Pathways-to-Energy-Transition_GOVERNANCE-ATLAS-FINAL-REPORT.pdf; CAREC Institute. 2022. *Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change*; OECD. 2022. *Benefits of regional co-operation on the energy–water–land use nexus transformation in Central Asia*. https://www.oecd-ilibrary.org/docserver/7fcec36c-en.pdf?expires=1659230490&id=id&accname=guest&checksum=1B494C5F5399F0A37DA3904EAA7BC04E.

[17] This report does not address security and conflict issues resulting from climate change; but the risks are real and need to be addressed. Relevant analysis is found in these links: https://www.mdpi.com/2071-1050/13/6/3479/htm; https://jpia.princeton.edu/sites/g/files/toruqf1661/files/2008-9.pdf; https://peacelab.blog/2021/04/a-threat-to-regional-stability-water-and-conflict-in-central-asia; https://gspp.nu.edu.kz/en/what-s-wrong-with-water-discussion-on-water-security-in-kazakhstan-and-central-asia/; https://www.weforum.org/agenda/2019/01/security-in-central-asia-is-threatened-by-climate-change-here-are-4-ways-to-reduce-the-risks/.

By 2050–2100, the drop in water volumes in the Syr Darya basin may reach 15%–30%, and in the Amu Darya—21%–40%.[18] As a result, for example Uzbekistan's existing current water deficit could increase from 3 billion cubic meters to 7 billion cubic meters by 2030, and by 2050, 15 billion cubic meters.[19]

(iii) Central Asian countries are prone to various kinds of disaster triggered by natural hazards including floods, earthquakes, droughts, and mudflows. According to World Bank estimations, countries in the region since the time of their independence have been exposed 140 times to different nature-induced calamities that have affected more than 10 million people and caused more than $3.7 billion in damages.[20]

(iv) The region is home to two large desert zones—Karakum and Kyzylkum—and vast arid steppe lands. The shortage of water resources, increase in air temperature, high variability of precipitation, extreme heat spells, and deforestation lead to increased desertification of the region. It is estimated that 4%–10% of cultivated areas, 27%–68% of pastures, and 1%–8% of forests are currently significantly degraded in Central Asia and are subject to desertification.[21]

(v) The region possesses a favorable potential for developing renewable energy. Small-scale hydropower potential estimates range from 275 to 30,000 megawatts (MW), solar power from 195,000 to 3,760,000 MW, wind power from 1,500 to 354,000 MW, geothermal power from 2 to 54,000 MW, and bioenergy from 200 to 800 MW.[22] Despite a large potential for developing renewable energy facilities, there is still high dependency on fossil fuels, while development of renewable energy sources remains weak.

(vi) Central Asia is home to some of the most polluted cities in the world, especially in the winter, when the air quality drops to health-threatening levels.[23] There are several sources of air pollution, including intensive use of coal in thermal energy stations, district heating plants, and manufacturing factories; a large number of old automobiles; and growing spontaneous suburban settlements not connected to the electric grid, and thus burning coal for heating and cooking.

(vii) The population of the Central Asian region is growing fast. It stood at about 75 million people in 2020 and is estimated by the World Bank to reach 102 million by 2050.[24] The combination of rising populations and climate change will put great pressure on the natural resources of the region.

The underdeveloped legal frameworks, a weak institutional capacity, and limited fiscal resources constrain the region's ability to deal with the current environmental and climate challenges. Unless these constraints are addressed, climate mitigation and adaptation action will be severely hampered.

[18] A. Niyazi. 2022. *Problems of modernization in water and agriculture in Uzbekistan. Social and Economic Geography*. https://cyberleninka.ru/article/n/uzbekistan-problemy-sovremennoy-modernizatsii-vodnogo-i-selskogo-hozyaystva.

[19] Climate Adaptive Water Resources Management in the Aral Sea Basin Sector Project (RRP UZB 53120). https://www.adb.org/sites/default/files/linked-documents/53120-001-ssa.pdf.

[20] C. Huang and D. Moldabaeva. 2022. How to support Central Asia in enhancing resilience to climate change and natural disasters. *World Bank Blogs*. https://bit.ly/3zWHjV0.

[21] "Problem of depopulation at global and regional levels, RECCA. 2017." https://carececo.org/main/news/obzor-problema-opustynivaniya-na-globalnom-i-regionalnom-urovnyakh/.

[22] "M. Laldzhebaev, R. Isaev, and A. Saukhimov. 2022. Renewable energy sources in Central Asia: potential, utilization, prospects, and barriers. *Central Asia University*."

[23] "In Kazakhstan alone, air pollution contributes to over 6,000 premature deaths and causes estimated economic losses of over $ 1.3 billion per year." L. Burunciuc. 2021. Five steps for cleaner air in Central Asia. https://www.weforum.org/agenda/2021/07/central-asia-cities-air-pollution-climate-change-environment/.

[24] World Bank. DataBank Population estimates and projections. https://databank.worldbank.org/source/population-estimates-and-projections.

3.2.2 Other CAREC Countries and Subregions

Other CAREC countries and subregions outside the Central Asian subregion are experiencing the impact of climate change in some ways similar to those of Central Asia, but they also face some distinct issues.

(i) In **Afghanistan** since the 1960s, the average annual temperature increased by 0.6°C, and by 2060, it is forecasted to increase from 1.4°C to 4°C. During the same observed period, the average annual precipitation decreased by 0.5 millimeters (mm). The climate change issues will have negative socioeconomic impact through changing rainfall patterns, flash floods due to heavy rains and snowmelt; and droughts that could have extended duration and strength over coming years.[25] Eighty percent of the Afghan population live in the rural areas and rely on agriculture for food and income.[26] Afghanistan needs international support for climate change adaptation and mitigation.

(ii) **Mongolia**, a country in the continental climate zone, is experiencing serious effects of extreme weather patterns with warmer and drier summers and colder winters. Since 1940, the country has experienced an increase in temperature by 2.24°C, and for the same period of observation, the annual level of precipitation declined by 7%.[27] As a result, the traditional pastoralist livelihoods face great risks as the availability and productivity of pastureland is declining due to frequent droughts in summers and increased frequency of *dzuds* (extreme winter conditions leading to widespread loss of livestock) over the years. The permafrost areas in the country have shrank to 33.7% since 1970[28] increasing the risks of natural calamities. The efforts in developing renewable energy sources are still slow given a good potential of the country to use alternative energy sources. The use of coal for indoor heating and cooking is still widespread in the urban areas of Mongolia, resulting in serious air pollution and attendant health risks.[29]

(iii) **Pakistan** is one of the three countries of the CAREC region that has an ocean coastline and thus faces the risks associated with expected sea level rise (Georgia and PRC are the other two). And yet the largest problems the country experiences relating to impacts of climate change include heat waves, shrinking glaciers, water shortages, and both droughts and floods (including a disastrous flood in August 2022). Almost the entire 220 million population of Pakistan lives along the Indus River, the main water artery of the country, and about 5 million people are exposed to eminent threats of flooding,[30] as recently demonstrated by the tragic floods devastating much of the country.[31] Water scarcity will increase the risk of desertification and reductions in agricultural productivity, aggravating the country's dependence on external food supplies and putting a large amount of people at risk of food insecurity.

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[25] P. Hakimov. 2020. Climate change in Afghanistan, Kyrgyzstan, and Tajikistan: trends and adaptation policy promoting innovation, Central Asia University. http://www.cawater-info.net/afghanistan/pdf/khakimov20.pdf.

[26] Afghanaid website. https://www.afghanaid.org.uk/news/is-afghanistan-affected-by-climate-change.

[27] Mongolia's Third National Communication to the UNFCCC. 2018. https://bit.ly/3pkJXPj.

[28] B. Zamba. 2002. *1st CAREC Institute Climate Dialogue for Knowledge Exchange with CAREC Region National Experts on the CAREC Climate Scoping Study*. https://bit.ly/3zZ78np.

[29] UNICEF Mongolia. https://www.unicef.org/mongolia/environment-air-pollution.

[30] WB and ADB. 2021. *Climate Risk Country Profile: Pakistan*. https://www.adb.org/sites/default/files/publication/700916/climate-risk-country-profile-pakistan.pdf.

[31] https://www.mei.edu/publications/catastrophic-floods-understanding-gravity-pakistans-health-and-food-crises.

(iv) **The People's Republic of China (PRC)** occupies a large territory with diverse climatic and geographic zones, which face distinct climate change-related issues. The PRC's Xinjiang Uygur Autonomous Region and Inner Mongolia regions are facing improved water availability in northwestern PRC as a result of an increase in precipitation and melting of glaciers, which has eased the lack of water supply in these regions. However, according to climate projections, the long-term impact of climate change will negatively affect local ecosystems and livelihoods.[32]

(v) **The Southern Caucasus** subregion, which includes CAREC member countries Azerbaijan and Georgia, is also experiencing an increase in temperature and extreme weather events with heavy rainfalls alternating with droughts aggravating countries' vulnerability to natural hazards. The glaciers of the Caucasus mountains are shrinking, and overall, the climate is becoming drier. This trend will have a negative impact on agriculture, hydro-energy development, and human security. Georgia's fast developing tourism sector and popular wine industry, in particular, will face negative impacts of climate change. In Azerbaijan (and similarly in Georgia), extreme weather conditions that occur once every 20 years are currently observed once every 2 years. In other words, if 50 years ago droughts were observed every 20 years, now a drought is expected almost every 2 years.[33]

[32] C. Zhang. 2022. *1st CAREC Institute Climate Dialogue for Knowledge Exchange with CAREC Region National Experts on the CAREC Climate Scoping Study 2022*. https://bit.ly/3bVK8gU.

[33] N. Nasirli. 2020. Climate change in Azerbaijan has had a negative impact on agriculture. https://www.trend.az/azerbaijan/society/3188842.html.

Mongolia. Rural lands are experiencing drought (photo by Eric Sales/ADB).

4 Core Climate Change Issues and Actions for the CAREC Region

Key sector and thematic issues have been at the core of climate change analysis and action from early on and remain at the center of climate action for the CAREC region. Energy, water, agriculture, transport, cities, and disasters are common ingredients of national climate strategies and, in particular, of the nationally determined contributions (NDCs) to which countries have committed to (Chapter 7). They also are the main issues identified in the climate strategies of the multilateral institutions, such as the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), and the World Bank (WB).[34] And they are the key issues highlighted by the Global Commission on the Economy and Climate in 2018.[35] In this report, health has been added as a core area of climate change impact and response due to the severity of the impacts and the central importance of health and human welfare. Some analysts focus on climate-smart, sustainable, or resilient infrastructure,[36] while others stress the importance of the climate-smart industry as a core area of concern.[37] However, these areas are addressed implicitly in the core areas highlighted here and will not be addressed separately.

4.1 Energy

Countries in the CAREC region face significant challenges in managing the energy transition to a low-carbon economy. The energy sector is the principal area for climate mitigation action in the CAREC region. While many CAREC countries have CO_2 emissions roughly in line with or below global averages on a per capita and GDP per capita basis, as noted earlier, four have relatively high emissions: Kazakhstan, Turkmenistan, the PRC, and Mongolia. In any case, all countries are expected to contribute to mitigation in line with the UNFCCC's principle of "common, but differentiated responsibilities," if the Paris Agreement emission reduction targets are to be

[34] ADB. 2019. Tackling Climate Change, Building Climate And Disaster Resilience, And Enhancing Environmental Sustainability, 2019–2024. https://www.adb.org/sites/default/files/institutional-document/495961/strategy-2030-op3-climate-change-resilience-sustainability.pdf; EBRD. 2021. Action Plan on Mobilising Private Capital for Climate Finance. https://www.ebrd.com/news/2021/at-cop26-ebrd-launches-plan-to-mobilise-private-capital-for-climate-finance.html; World Bank. 2021. Climate Change Action Plan (2021–2025) infographic. https://www.worldbank.org/en/news/infographic/2021/06/22/climate-change-action-plan-2021-2025.

[35] New Climate Economy, Global Commission on the Economy and Climate. 2018. *Unlocking the inclusive growth story of the 21st century: accelerating climate action in urgent times.* https://newclimateeconomy.report/2018/wp-content/uploads/sites/6/2019/04/NCE_2018Report_Full_FINAL.pdf.

[36] Brooking. 2016. *Delivering on sustainable infrastructure for better development and better climate.* https://www.brookings.edu/research/delivering-on-sustainable-infrastructure-for-better-development-and-better-climate/.

[37] The World Bank's Climate Change Action Plan specifically mentions "industry" among the core areas for climate action.

reached.[38] According to the World Economic Forum Global Energy Transition Index 2021, many countries in the CAREC region rank in the middle or lower range of energy system performance and generally low in terms of transition readiness and, therefore, will require exceptional efforts to support an effective energy transition (Table 5). Principal areas for energy transition in the CAREC region include the following options to decarbonize the economy: (i) increase energy efficiency; (ii) electrify final demand; (iii) phase down coal; (iv) convert electricity production from fossil fuels to renewables; (v) investment in electricity interconnection, transmission, and access; and (vi) carbon pricing. These are briefly discussed in turn.

Table 5: World Economic Forum Global Energy Transition Index, 2021

Rank	Country	ETI	System Performance	Transition Readiness
33	Georgia	65.15	67.4	52.9
44	Azerbaijan	62.90	69.5	56.3
68	People's Republic of China	56.70	55.4	58.0
75	Tajikistan	55.00	55.7	54.3
83	Kazakhstan	53.75	64.1	43.4
94	Kyrgyz Republic	51.30	52.3	50.3
104	Pakistan	48.90	56.2	41.6
113	Mongolia	44.25	51.5	37.0

ETI = Energy Transition Index.

Source: CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery.*

4.1.1 Increase Energy Efficiency

Increased energy efficiency can be achieved through measures to reduce subsidies on energy consumption and/or through regulation (setting standards for energy efficiency in transportation and buildings). Table 6 shows that there are significant fossil fuel subsidies in CAREC countries (according to International Monetary Fund [IMF] estimates) and that electricity prices are relatively low. At the same time, electricity losses are relatively high (> 10%) for more than half of the CAREC countries (Table 6). The quality of regulation for energy efficiency ranges from low to middle by one comparative indicator, but is high in the PRC (Table 4).[39] Raising carbon prices, lowering electricity losses, and improving energy regulation for greater energy efficiency, therefore, remain as important challenges for many CAREC countries. For countries relying heavily on irrigated agriculture (especially in Central Asia), improved irrigation practices and technologies can contribute to improving energy efficiency. Changing the economic structure away from fossil fuel-intensive sectors (such as steel, cement, and others) is also an option, but more difficult and long-term in nature (Table 6). These measures are mostly national in nature, but regional

[38] As part of the "common, but differentiated responsibilities" (footnote 2), one must also recognize that some countries, in particular Afghanistan, Georgia, the Kyrgyz Republic, Pakistan, and Tajikistan have relatively low per capita emissions and, hence, limited mitigation needs, due to their heavy reliance on renewables, especially hydropower). Nonetheless, many of the energy sector policy prescriptions in support of climate mitigation are also relevant for these countries, since the very same policies (e.g., for greater efficiency of energy use) also improve national economic efficiency and growth.

[39] CAREC energy ministers in 2019 signed a declaration pledging to "...reduce fiscal subsidy [in the energy sector] and accelerate sector reforms including the gradual phaseout of fossil fuel subsidies..." p. 5. https://carecenergy.org/wp-content/uploads/2021/08/Ministerial-Declaration-v26Nov2019-1.pdf.

cooperation can help in setting national goals, sharing implementation experience, and monitoring progress on a comparative basis.

Table 6: Fossil Fuel Subsidies, Electricity Tariffs, and Electricity Losses in CAREC Countries

Country	Fossil fuel subsidies as % of GDP, 2020 (implicit and explicit)	Household Electricity Tariffs, 2020 $ cents/kWH	Electricity Losses, 2018 (%)	Energy Efficiency Regulation (RISE Indicator, 0–100)
Afghanistan	10.6	NA	NA	25
Azerbaijan	33.7	4.1	9	44
Georgia	11.6	5.9	7	NA
Kazakhstan	28.0	4.1	6	53
Kyrgyz Republic	15.3	1.0	18	26
Mongolia	22.7	4.1	14	34
Pakistan	9.4	5.4	17	28
People's Republic of China	15.6	8.5	6	74
Tajikistan	16.3	2.0	15	47
Turkmenistan	19.8	0.7	14	17
Uzbekistan	20.5	2.8	17	62
Germany	1.9	36.0	NA	89
United Kingdom	0.9	26.8	NA	92
United States	3.4	15.0	NA	85

CAREC = Central Asia Regional Economic Cooperation, GDP = gross domestic product, NA = not applicable, RISE = Regulatory Indicators for Sustainable Energy.

Sources: Fuel subsidies: IMF Climate Data Dashboard. https://climatedata.imf.org/pages/go-indicators; CAREC Institute. 2022. *Electricity tariffs and losses: Sustainable pathways to Energy Transition in the CAREC Region: A Governance Perspective.* https://www.carecinstitute.org/wp-content/uploads/2022/04/Sustainable-Pathways-to-Energy-Transition_GOVERNANCE-ATLAS-FINAL-REPORT.pdf; Energy Efficiency Regulation: RISE 2020. https://rise.esmap.org/data/files/reports/rise_2020_country_profiles.pdf.

4.1.2 Electrify Final Demand

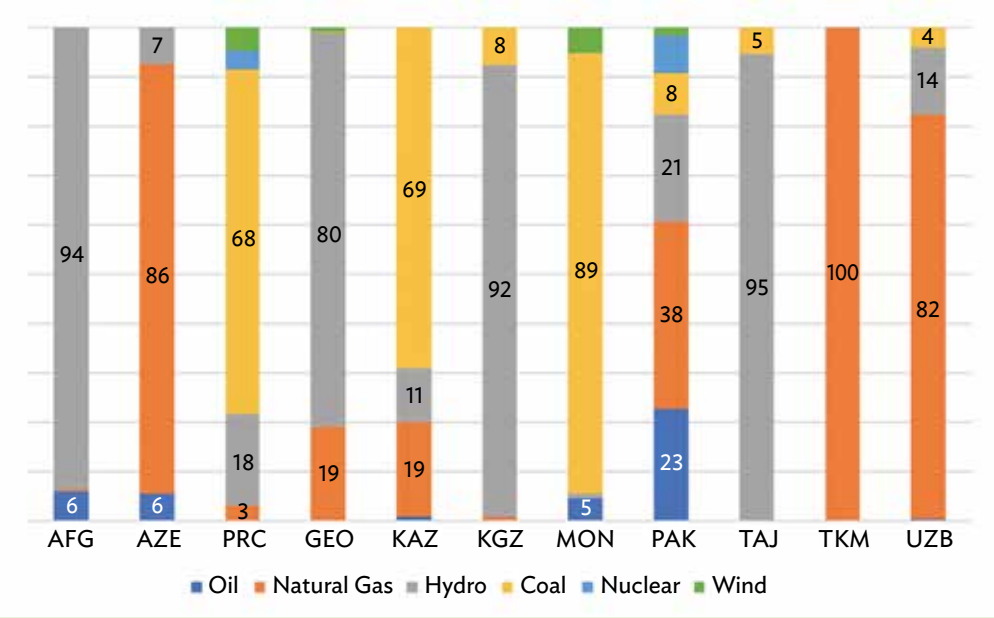
Greater reliance on electric vehicles in transport is a principal method to achieve this goal; another is to increase reliance on electricity in home heating. Electrification of railways is a relatively easy investment and one that has been supported by international development partners in the CAREC region, especially by the multilateral development banks (MDBs), and also under the PRC's Belt and Road Initiative (Figure 6). The development of electric vehicles (EVs) is comparatively far advanced in the PRC, but in its infancy in other CAREC countries. Uzbekistan is in the early stages of introducing EV production in its automobile industry with the support of a Chinese company, according to a recent announcement.[40] Over time, home heating will also have to move to electricity from coal- to gas-fired district heating plants and from individual home heating with coal and gas, a process which still has a long way to go in Central Asia. Action in these areas is mostly national in nature, but a regional approach can again support national action.

[40] *ETN*. 2022. BYD, UzAuto sign strategic MoU to develop new energy vehicles in Central Asia. https://etn.news/buzz/byd-uzauto-mou-develop-new-energy-vehicles-central-asia.

4.1.3 Reduce Reliance on Coal

Some CAREC countries are heavily dependent on coal-fired electricity generation (Figure 6). These countries will need to gradually reduce their reliance on coal by increasing their reliance on renewable energy sources and replacing coal with natural gas as a transition fuel. CAREC countries could aim to participate in ADB's Energy Transition Mechanism, which assists countries in speeding up their energy transition away from fossil fuels, especially coal.

Figure 6: Sources of Electricity in CAREC Countries (%)



AFG = Afghanistan, AZE = Azerbaijan, CAREC = Central Asia Regional Economic Cooperation, GEO = Georgia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, MON = Mongolia, PAK = Pakistan, PRC = People's Republic of China, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

Source: CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

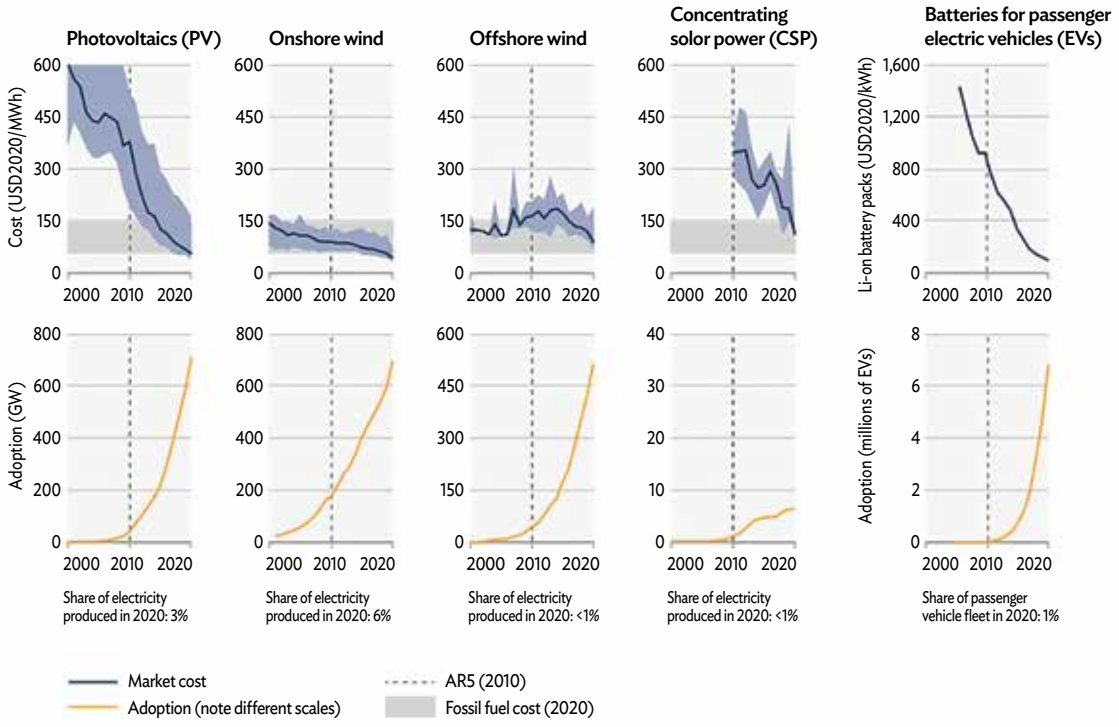
4.1.4 Convert Electricity Production from Fossil Fuels to Renewables

Conversion from principal reliance on coal, oil, and eventually gas to renewable energy sources is a major challenge for most CAREC countries, with the exception of Afghanistan, Georgia, the Kyrgyz Republic, and Tajikistan, which rely heavily on hydropower (Figure 7). There are two basic ways to increase the production of renewable energy:[41]

[41] Atomic energy can also contribute to emission-free energy production. This is briefly addressed under "frontier issues."

Figure 7: Renewable Energy Cost and Utilization Trends

The unit costs of some forms of renewable energy and of batteries for passenger EVs have fallen, and their use continues to rise.



AR5 = IPCC's Fifth Assessment Report, GW = gigawatt, kWh = kilowatt hour, MWh = megawatt hour.

Source: Intergovernmental Panel on Climate Change. *Climate Change 2022: Mitigation of Climate Change – Summary for Policy Makers*. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf.

(i) **Investment in hydropower.** This is of particular interest for the CAREC region in view of its large and still underdeveloped hydro potential in the "water tower" countries of the region (The Kyrgyz Republic and Tajikistan in Central Asia; and Georgia in the South Caucasus). Major dams have been constructed in the past (including Toktogul in the Kyrgyz Republic and Nurek in Tajikistan, currently being refurbished) and big, new dams are under construction (Rogun in Tajikistan) or in the planning stage (Kambarata 1 in the Kyrgyz Republic).[42] In many countries of the region, there is also potential for small hydropower plants and such plants are under development, for example, in the Kyrgyz Republic and Uzbekistan.[43] As glaciers in the region's mountains melt with climate change (Figure 3), the importance of the reservoirs will, if anything, increase to help store and regulate water flows in the big river

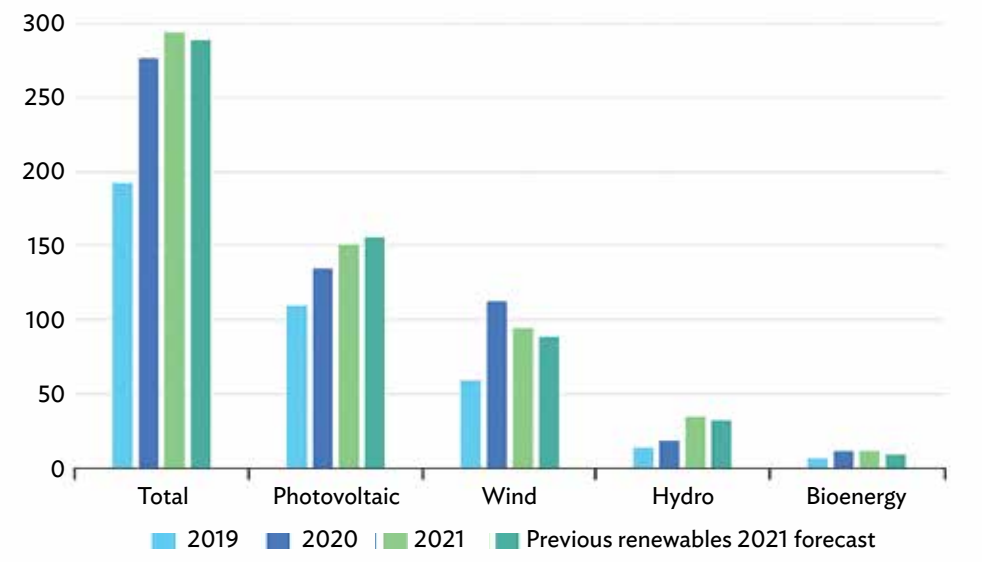
[42] CAREC Energy. 2022. *CAREC Finds Cooperation on Renewable Energy to Save Millions of Dollars*. https://carecenergy.org/carec-finds-cooperation-on-renewable-energy-to-save-millions-of-dollars/.

[43] CAREC Institute. 2022. *Sustainable pathways to Energy Transition in the CAREC Region: A Governance Perspective*. https://www.carecinstitute.org/wp-content/uploads/2022/04/Sustainable-Pathways-to-Energy-Transition_GOVERNANCE-ATLAS-FINAL-REPORT.pdf.

basins. The hydropower capacity of the region serves not only the needs of the hydropower producing countries, but also downstream power importing countries, provided appropriate regional transmission lines and interconnection of the electricity systems are in place. This requires strong and effective regional cooperation, not only for the planning and delivery of investments and management of interconnected power systems, but also for the sharing of water resources across countries for different usages (power generation, agricultural and industrial use, and personal consumption).[44] (See the discussion of the energy–water–agriculture nexus.) Hydropower will also be of critical importance for the region in providing the baseload capacity needed to balance the fluctuating availability of solar and wind energy as these sources of renewable energy grow in importance. However, in developing new hydropower plants (HPPs), social and environmental impacts (including resettlement, potential downstream and cross-border water losses) have to be addressed.

(ii) **Investment in solar and wind energy.** Unit costs of solar and wind energy have dropped dramatically in recent years and are now competitive with conventional fossil fuels; at the same time, adoption of these energy sources has grown dramatically worldwide (Figure 7). New solar capacity exceeds that for wind, and both are way ahead of hydro and bioenergy (Figure 8). The PRC is the worldwide leader in installation of net renewable capacity and, hence, can serve as an example for the other CAREC countries as well as a source of technology (Figure 9). The CAREC region has considerable solar and wind

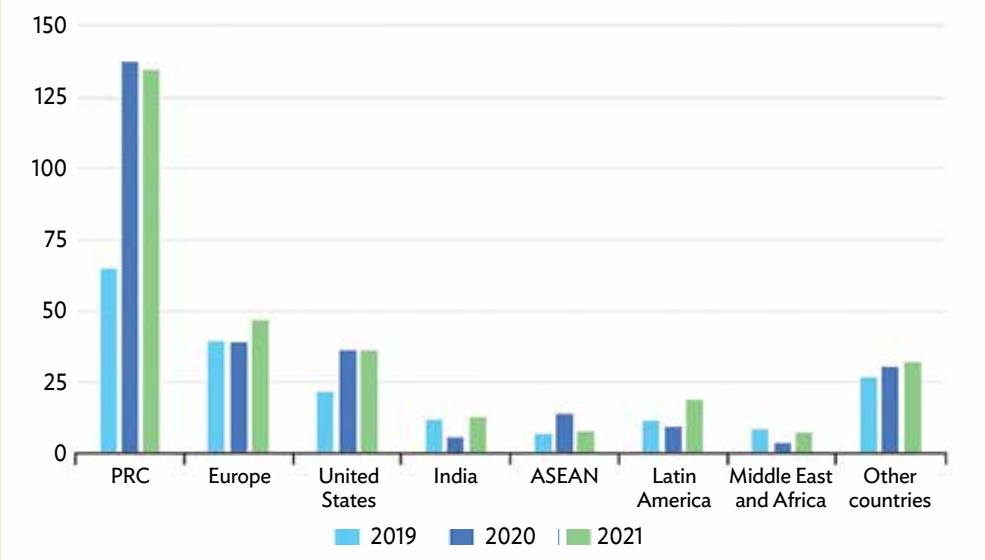
Figure 8: The World's Net New Renewable Energy Additions by Source
(gigawatts, 2019–2021, 2022 projected)



Source: World Economic Forum. These four charts show the state of renewable energy in 2022. https://www.weforum.org/agenda/2022/06/state-of-renewable-energy-2022/.

[44] CAREC Institute and Asian Development Bank. 2022. *Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change: Final Report*. https://www.carecinstitute.org/wp-content/uploads/2022/08/Report-on-Water–agriculture–energy-nexus-in-Central-Asia-through-the-lens-of-climate-change.pdf.

Figure 9: The World's Renewable Energy Net Capacity Additions
(gigawatts, 2019–2021)



ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China.

Source: World Economic Forum. These four charts show the state of renewable energy in 2022. https://www.weforum.org/agenda/2022/06/state-of-renewable-energy-2022/.

energy potential (Table 7) and some progress has been made in installing solar and wind capacity in the countries of the region other than the PRC (Figure 10). Further development of this potential will require investment, regulation, incentives, institutional capacity, and financial resources.[45] A recent CAREC Institute report presented a number of excellent case studies of renewable energy investments and associated policies in the CAREC region, including auctions and solar photovoltaic (PV) power plants in Kazakhstan, the Qartly wind farm in Georgia, and the Yeni Yashma wind farm in Azerbaijan. As previously noted, with the expansion of solar and wind energy, there will be a need to ensure effective baseload management given variability of these energy sources, which puts a premium on access to the hydropower potential of the region, in addition to managing peak demand to the extent possible. Under CAREC, a plan was developed to support regional cooperation for the integration of renewable energy in the regional energy grid of seven CAREC countries.[46]

[45] M.S. Ahluwalia and U. Patel. 2022. Climate Change Policy for Developing Countries in H. Kohli, R. Nag. and I. Vilkeltye, eds. 2022. *Envisioning 2060*. Haryana, India: Penguin Random House.

[46] "CAREC developed a regional cooperation mechanism for seven Central Asian countries (Afghanistan, Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan) to facilitate integration of large-scale renewable energy into the regional energy mix. The project examined whether the participating countries could share backup capacity reserves to mitigate the intermittent availability of renewable energy and save costs by cooperating regionally. The seven countries were selected because of their interconnected networks, enabling them to access backup generators and storage capacity in neighboring countries. Assuming a scenario in which intermittent renewable energy capacity will triple by 2030, the study found that regional cooperation will allow renewable energy integration at a cost saving of around $230 million annually by 2030 compared to a no-cooperation scenario." From CAREC Energy 2022. *CAREC finds cooperation on renewable energy to save millions of dollars*. https://carecenergy.org/carec-finds-cooperation-on-renewable-energy-to-save-millions-of-dollars/.

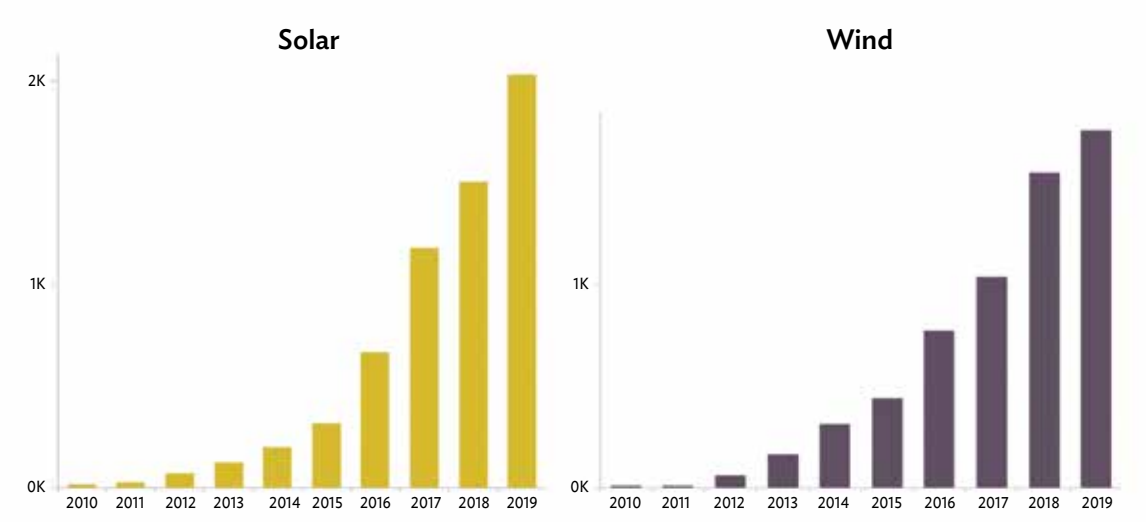
Table 7: Potential for Installed Renewable Resources in Selected CAREC Countries

Country	Solar	Wind	Hybrid	Biomass
Afghanistan	222,000 MW	66,700 MW	23,000 MW	NA
Azerbaijan	23,040 MW	3,000 MW	520 MW (small hydro)	380 MW
Georgia	108 MW	1,450 MW	15,630 MW	NA
Kazakhstan	3,760,000 MW	354,000 MW	170 billion kWh	300 MW
Kyrgyz Republic	267,000 MW	1,500 MW	18,500 MW	200 MW
Mongolia	4,774 TWh/year	1,113,300 MW	3,800 MW	
Pakistan	20,000 MW (Sindh and Baluchistan only)	340,000 MW NA	NA	1,844 MW (bagasse only)
Tajikistan	195,000 MW	2,000 MW	23,000 MW	300 MW
Uzbekistan	593,000 MW	1,600 MW	1,700 MW	800 MW

CAREC = Central Asia Regional Economic Cooperation, kWh = kilowatt hour, MW = megawatts, NA = not applicable or not available, TWh = terawatt hour.

Source: CAREC Institute. 2020. *Regional Cooperation in Promoting Low-Carbon Energy Development in CAREC: Challenges and Opportunities*. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf.

Figure 10: Installed Solar and Wind Energy Capacity in the CAREC Region, Excluding the People's Republic of China, 2010–2019
(MW)



CAREC = Central Asia Regional Economic Cooperation, K = thousand, MW = megawatts.

Source: CAREC Institute. 2020. *Regional Cooperation in Promoting Low-Carbon Energy Development in CAREC: Challenges and Opportunities*. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf.

4.1.5 Investment in Electricity Interconnection, Transmission, and Access

An important complement to expanded renewable energy generation is the expanded interconnection of systems and improved regional power system management, since they are essential for the efficient functioning of the regional electricity system. With renewable energy, this need is particularly relevant, as the regional management of an interconnected system allows for the effective balancing of intermittent and nonsynchronous solar and wind electricity supplies as well as demands. The Central Asia Power System (CAPS), which operated a unified energy grid for the five Central Asian republics from the former Soviet Union, broke down after independence but is now being revived with ADB and World Bank assistance.[47] The Central Asia Transmission Cooperation Association (CATCA) was approved by the CAREC Energy Sector Committee in April 2022 for planning and executing new regional interconnection projects, and for developing regional grid operation rules and standards.[48] An important part of an interconnected regional power system is an investment in major transmission lines. Such lines are critical to connecting major centers of power generation with regions and centers of electricity demand, national and regional. CASA-1000, the transmission line that, once completed, will connect HPPs in the Kyrgyz Republic and Tajikistan with electricity markets in Afghanistan and Pakistan, is a prime example of a regional transmission line.[49] The TUTAP (Turkmenistan–Uzbekistan–Tajikistan–Afghanistan–Pakistan) transmission line is another, [although still in the planning stage].[50] National transmission and distribution networks are critical for assuring access to electricity. Fortunately, in CAREC countries, electricity access is at 100% or close to it, with the exception of Pakistan, where it was 75% in 2020.[51] As and when private sector solar and wind energy generation become major contributors to national and regional electricity supplies, appropriate provisions, both in terms of infrastructure and regulation, have to be made.

4.1.6 Carbon Pricing

Carbon pricing is a tool to incentivize decarbonization throughout the economy. It extends the principle of eliminating explicit and implicit subsidies on fossil fuels to apply a universal price to all use of carbon. One form of such a pricing approach is the Emissions Trading System (ETS). Currently, in Central Asia, only Kazakhstan employs such a scheme, but other Central Asian countries are actively exploring this option. This process is supported by the international initiative REdiCAP, which involves, among others, ADB, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), and United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).[52] The PRC introduced a national ETS in 2018. In 2021, it covered 38.5% of CO_2 emissions from energy use according to the Organisation for Economic Co-operation and Development (OECD).[53] Monitoring the application of this system, sharing experience across the CAREC membership, and developing cooperative approaches to implementation will be valuable contributions to ensuring effective carbon pricing in the region.

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47 CAREC Institute. 2020. *Regional Cooperation in Promoting Low-Carbon Energy Development in CAREC: Challenges and Opportunities*. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf.

48 CAREC. 2022. CATCA. https://carecenergy.org/foundation-laid-for-new-regional-transmission-body-catca/.

49 See the CASA-1000 website: http://www.casa-1000.org.

50 CAREC Institute. 2020. *Regional Cooperation in Promoting Low-Carbon Energy Development in CAREC: Challenges and Opportunities*. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf.

51 Macrotrends. https://www.macrotrends.net/countries/ranking/electricity-access-statistics.

52 UNESCAP. 2021. *Report from the Regional Dialogues on Carbon Pricing (REdiCAP) in Central Asia*. https://unfccc.int/sites/default/files/resource/REdiCAP%20Central%20Asia%20Final%20Report%20and%20Roadmap%20EN.pdf.

53 OECD. 2022. *Carbon pricing in China*. https://www.oecd.org/tax/tax-policy/carbon-pricing-china.pdf.

4.2 Water

Improved management of water resources is of particular importance for adaptation. "Water is to adaptation what energy is to mitigation."[54] This general dictum applies strongly in the CAREC region, which is characterized by significant and increasing water deficits, falling as it does among one of the drier regions of the world.[55] The current deficits are a combination of poor water endowments in some of the countries, and poor national water management practices in much of the region, especially in agriculture (inappropriate cropping patterns, poor irrigation management, outdated technology, and the lack of effective water use regulation and pricing). Looking ahead, climate change along with population growth, urbanization, and an expanded agricultural production, will increase water scarcity and, hence, put an increasing premium on more effective water management.[56] Since regional watersheds straddle international borders, especially in Central Asia (but also between Afghanistan and Central Asia, and between the PRC and Central Asia), regional cooperation in water management is also critical, especially when there is an interdependency between hydro energy generation in upstream countries with agricultural water use in downstream countries, as is the case for Central Asia.

Water stress and climate vulnerability differ, but are serious across the CAREC region. Much of the CAREC region is now under conditions of significant water stress, as shown by the 2021 Water Stress Indicator rankings compiled by the World Resources Institute (Table 8). A recent CAREC

Table 8: Ranking of CAREC Countries According to the Water Scarcity Index

Rank	Name	Overall Index	Industrial	Domestic	Agricultural
11	Kyrgyz Republic	4.9	4.88	4.86	4.91
17	Kazakhstan	4.66	4.46	4.47	4.79
18	Pakistan	4.33	4.1	4.01	4.35
23	Turkmenistan	4.12	4.09	3.98	4.13
24	Azerbaijan	4.08	4.03	4.01	4.1
25	Uzbekistan	4.03	4.37	4.35	3.97
26	Afghanistan	4.03	3.35	3.51	4.06
34	Mongolia	3.65	3.93	3.93	3.24
44	Tajikistan	3.31	3.52	3.24	3.3
46	PRC	3.19	3.08	2.95	3.33
68	Georgia	2.2	2.05	1.99	2.41

CAREC = Central Asia Regional Economic Cooperation, PRC = People's Republic of China.

Source: CAREC Institute. 2021. Water Stress Index 2021 (WRI 2021); as compiled in *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

[54] World Bank. 2016. *High and Dry: Climate Change, Water, and the Economy*. https://www.worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy.

[55] IMF. 2022. *Feeling the Heat: Adapting to Climate Change in the Middle East and Central Asia*. https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/03/25/Feeling-the-Heat-Adapting-to-Climate-Change-in-the-Middle-East-and-Central-Asia-464856.

[56] CAREC Institute and Asian Development Bank. 2022. *Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change: Final Report.*

Institute Study developed a water sector vulnerability index for the CAREC region, combining measures of exposure, sensitivity, and adaptive capacity. It shows that Afghanistan, Pakistan, Turkmenistan, and Uzbekistan are particularly vulnerable (Table 9). When combining these vulnerability indicators with information on water withdrawal relative to water availability and water

Table 9: Estimated Water Sector Vulnerability Index for CAREC Countries, and Scores for Each Component (Exposure, Sensitivity, Adaptive Capacity)

Country	Scores			
	Exposure	Sensitivity	Adaptive Capacity	Index
Afghanistan	1,20	0,48	0,14	4,14
Azerbaijan	1,40	0,40	0,70	0,80
Georgia	1,40	0,06	0,81	0,11
Kazakhstan	1,00	0,21	1,31	0,16
Kyrgyz Republic	1,00	0,22	0,87	0,25
Mongolia	0,83	0,04	0,39	0,08
Pakistan	1,00	0,72	0,27	2,65
People's Republic of China	1,00	0,14	0,88	0,16
Tajikistan	1,00	0,31	0,67	0,47
Turkmenistan	1,20	0,90	0,31	3,52
Uzbekistan	1,20	0,87	0,28	3,71

CAREC = Central Asia Regional Economic Cooperation.

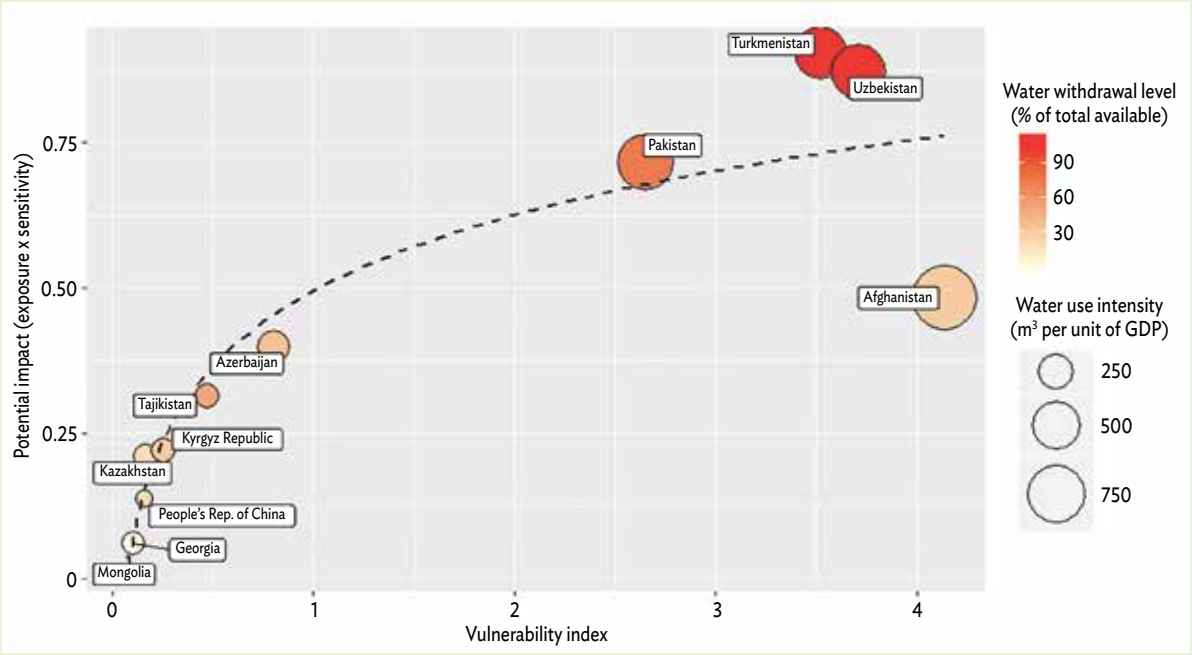
Source: CAREC Institute. 2020. *Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region*. https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf.

use intensity in relationship to GDP, one finds that Turkmenistan and Uzbekistan are particularly stressed by high water withdrawal and water use intensity, as well as highly vulnerable and subject to great potential impact from climate change. Pakistan and Afghanistan show only somewhat lower risk, while other countries in the region are much lower on the risk scale (Figure 11).

While water scarcity is a severe problem in much of the CAREC region today and will be reinforced by climate change, appropriate policies can provide significant relief. A recent World Bank study shows that if business-as-usual prevails in the management of the region's water resources, by 2050, the countries of the CAREC region will fall among those countries that will experience significant negative economic impacts from increased water scarcity, as indicated by the red areas on the upper map of the world. However, if appropriate, water management policies are applied, much of the CAREC region (with the exception of Afghanistan and Pakistan) will fall among the countries with improved economic impacts (as shown by the blue-shaded areas on the lower map).[57] For Central Asia, this effect of policy in reversing the effects of water scarcity is particularly significant. Figure 12 shows that the range of variation in GDP with improved water management policies is exceptionally wide for Central Asia, ranging from -10.7% to +11.5% by 2050. Thus, improved water management is highly important for the CAREC region, and this importance is much increased due to the impacts of climate change.

[57] The World Bank. 2016. *High and Dry: Climate Change, Water, and the Economy*. https://www.worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy.

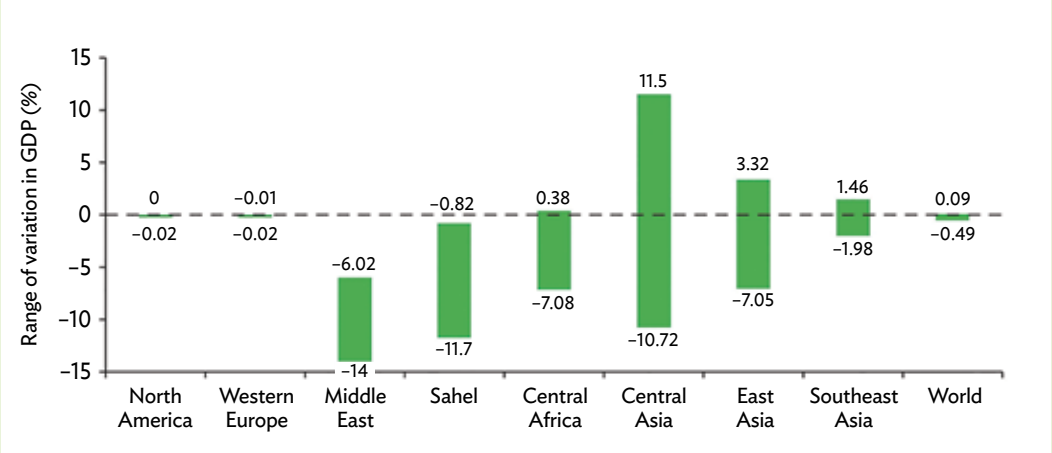
Figure 11: Relationship of the Estimated Vulnerability of the CAREC Region Countries to Climate-Induced Water Stress with Baseline Water Intensity



CAREC = Central Asia Regional Economic Cooperation, GDP = gross domestic product.

Source: CAREC Institute. 2020. *Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region*. https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf.

Figure 12: Climate-Related Impacts of Gross Domestic Product in 2050
(ranges of impacts determined by policies)



GDP = gross domestic product.

Source: World Bank. 2016. *High and Dry: Climate Change, Water, and the Economy*. https://www.worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy.

Analysis under the CAREC Water Pillar has identified the main impacts of climate change on water resources, most of them negative.[58] Table 10 summarizes the results of this analysis for upstream and downstream regions in Central Asia. Similar effects will prevail in much of the remainder of the CAREC region. The climate effects include changes in precipitation, increased evapotranspiration, lower snowfall, permafrost degradation, and glacier shrinkage. While for some areas, the impacts of these climate effects are ambivalent, for most they are negative and more so in the longer term. The Water Pillar report further notes that "dry years will become drier due to more pronounced inter-annual fluctuations in water resources, and less water security in dry and hot years; there will be a seasonal shift in water availability with peak flows happening earlier in the season; a less predictable and more variable seasonal regime, as the seasonal snow melt contribution will be smaller, and flows will thus depend to a larger extent on rainfall instead of snow."[59]

Table 10: Overview of Climate Change Effects in Central Asia, Horizon 2050

Expected Future Changes	Expected Dominant Impact on Water Tower Region Upstream	Expected Dominant Impact on Water Users Downstream
Changes in precipitation amounts and extremes	⊖⊕ Either positive or negative, depending on the region and climate scenario. Risks of extreme precipitation will likely be mitigated largely by reservoirs	⊖○ Even under a climate scenario with increasing rainfall amounts, increased extremes will likely have negative consequences
Increased evapotranspiration due to increased temperatures	⊖ Reduced runoff and thus reduced flows and inflows into reservoirs	⊖ Less water supplies from upstream and increased water demands
Lower snowfall fraction	⊖ Reduced runoff	⊖ Reduced river flows and seasonality shifts in tributaries without reservoirs
Permafrost degradation	⊖ Infrastructure stability and permafrost-related hazards (landslides, etc.)	○ None
Glacier shrinkage	⊕ Up to around 2050 likely more water from glacier melt ⊖ After 2050 significant decrease, especially for Amudarya	⊕ Up to 2050 likely more water from glacier melt ⊖ Increased inter-annual flow variability, so more severe droughts, and reduced flows after 2050

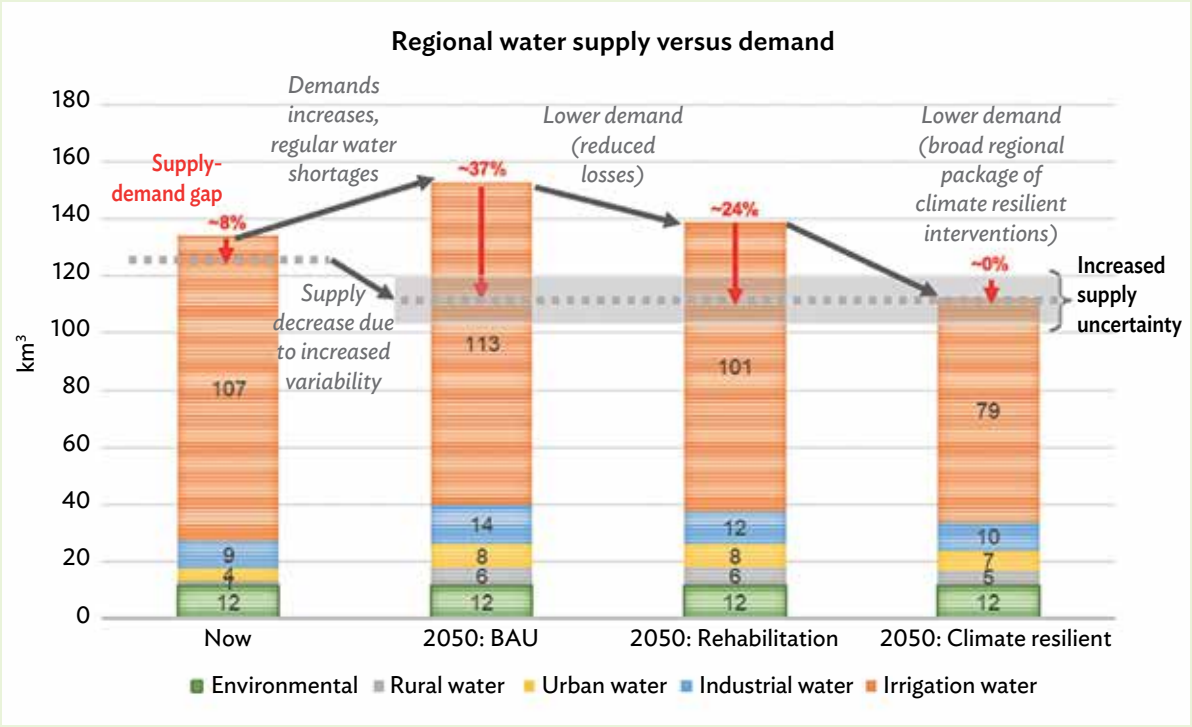
Source: CAREC. 2021. *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

[58] CAREC. 2021. *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

[59] CAREC. 2021. *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf. p. 20.

The CAREC Water Pillar report also identified key measures to address the increasing water deficit. Progressive application of appropriate measures to improve water use efficiency and, hence, reduce water demand is shown to eliminate the gap between the demand and supply of water resources in the Aral Sea Basin (Figure 13). Key measures identified by the report are summarized in Table 11. Irrigation is the most important area where water management has to be improved since it is by far the foremost user of water in Central Asia and likely throughout much of the CAREC region (Table 12). This is further explored in the next subsection dealing with agriculture. Since water is currently either free of charge (in irrigation) or sold below cost (in household and industrial use), the single most important measure to improve water efficiency in the CAREC region is to eliminate explicit and implicit subsidies for water use.

Figure 13: Gap between Regional Water Demand and Reliable Supply in the Aral Sea Basin
(The bars indicate the forecast demand for the five sectors; gray dotted line the projected supply)



BAU = business-as-usual.

Source: CAREC. 2021. *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

Table 11: Policy Measures for Improved Water Management

Climate-Resilient and Productive Systems	Sustainable Water Resources and Water Services	Nexus Solutions and Cross-Sector Learning
Strengthen regional information and analysis systems to manage uncertainty	Transition to less water demanding and self-financed water services	Facilitate transboundary co-ownership and joint management of shared assets
Build climate resilience and raise productivity through modernized irrigation systems	Catalyze performance gains through private sector involvement	Promote integrated water–energy–agriculture solutions
Increase resilience of communities through improved water supply and sanitation	Build toward a healthy water environment (including water reuse wetland restoration and salinity control	Incorporate evidence based-learning into planning decisions and management systems
Support capacity for climate adaptation and disaster risk management		
Climate-proof regional agreements and align national legal systems		

Source: CAREC. 2021. Adapted from *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

Table 12: Water Withdrawals by Sector in the Aral Sea Basin, 2018
(in km^3)

Country	Total	Irrigation	Household	Industry
Kazakhstan	18.7	12.3	0.9	5.5
Kyrgyz Republic	5.5	5.2	0.2	0.08
Tajikistan	12.3	10.2	0.7	0.3
Turkmenistan	25.3	22.3	0.5	1.5
Uzbekistan	51.6	42.3	2.2	5.4
Total	**113.5**	**92.4**	**4.6**	**12.9**

km^3 = cubic kilometer.

Note: Data for energy is not included.

Source: CAREC. 2021. Adapted from *ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC): Developing the Water Pillar*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

4.3 Agriculture

Agriculture is a key sector at the interface between climate adaptation and mitigation. The 2022 Global Food Policy Report: Climate Change and Food Systems by the International Food Policy Research Institute (IFPRI)[60] provides a powerful summary of the role that agriculture plays in connection with climate change:

> *"Food systems are inseparably linked to this unprecedented [climate change] crisis, which threatens the food security, nutrition, and health of billions of people. Our food systems are not only severely impacted by climate change, requiring an urgent focus on adaptation, but also play a role in causing about one-third of global greenhouse gas emissions, with two-thirds of that resulting from agriculture, forestry, and other land use. Investing in food systems transformation is a key piece of the climate change puzzle, yet it is vastly underfunded, with only a small part of climate finance directed toward this goal."* (p. 5)

> *"A number of promising innovations show potential to support adaptation and build resilience while also increasing productivity. New crop varieties can better withstand climate shocks as well as improve yields. Solar energy can be used to improve product storage as weather conditions worsen, and also contribute to mitigation. Digital technology can expand access to knowledge and services in rural areas, allowing producers to adapt practices to local conditions and improve market access. Many climate-smart innovations, such as no-till farming, agroforestry, and landscape management, will also support mitigation by sequestering carbon or reducing emissions. However, technical innovations will never reach their full potential without the right enabling environments, including policy incentives and governance approaches that promote climate-positive change and inclusion of all food systems actors."* (p. 9)

> *"Food systems account for as much as 34 percent of total greenhouse gas (GHG) emissions stemming from agriculture and land use, storage, transport, packaging, processing, retail, and consumption. Continued technological progress in the energy and transport sectors can reduce fossil-fuel use and emissions throughout food systems, including in irrigation, processing, transport, cold storage, and waste recycling, where emissions are currently increasing. But two-thirds of food system GHG emission—or about 21 percent of total emissions from all sources—are from agriculture, forestry, and other land use (AFOLU). AFOLU can deliver substantial emissions reductions and carbon sequestration. It is the only economic sector with serious potential to become a net emissions sink—pulling more GHGs out of the atmosphere than it emits—through creation and protection of carbon sinks such as forests."* (p. 10)

> *"For developing countries, the priority should be fostering agricultural practices that both raise productivity and turn the tide on AFOLU emissions."* (p. 11)

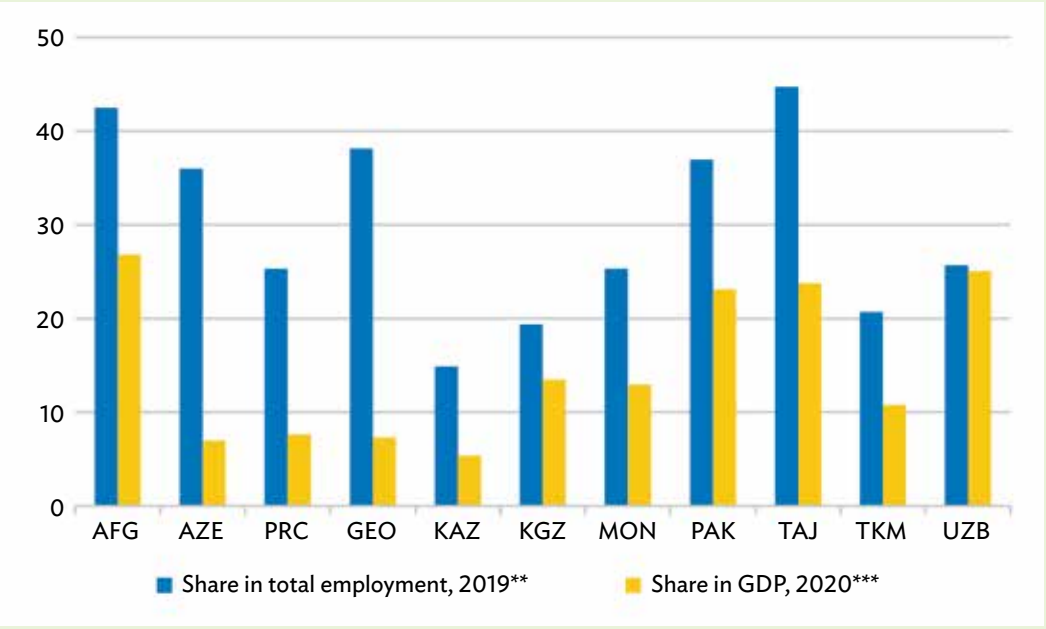
Agriculture remains an important sector in the CAREC region with a critical role in growth, employment, poverty reduction, food security, and climate mitigation and adaptation. Figure 14 shows the share of agriculture in the GDP and the employment rate of the countries in the CAREC region in 2016, demonstrating a wide dispersion across countries.[61] However, in 7 of 11 countries agriculture employs more than a quarter of the population, and in two countries (Afghanistan and

[60] International Food Policy Research Institute (IFPRI). 2022. *Global Food Policy Report 2022: Climate Change and Food Systems*. https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/135889/filename/136101.pdf.

[61] CAREC Institute. 2020. Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region. https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf.

Tajikistan) 40% or more. Figure 15 shows the share of land under cultivation for the major crops in the region, with wheat a staple in all countries, cotton in Tajikistan, Turkmenistan, and especially Uzbekistan (footnote 61). Rice is important, especially in the PRC. Different crops are differently affected by climate change. For Central Asia, a recent CAREC Institute report[62] notes that two alternative climate change projections show that wheat and cotton production will benefit from increased CO_2 concentrations, while rice and maize will suffer (Figure 16). However, as the same report stresses, these projections are made without taking into account the changing constraints in water availability, especially in the irrigated areas of Central Asia. Once an account is taken of the likely constraints on water availability, agricultural productivity is projected to be negatively affected in the irrigated areas of Central Asia.

Figure 14: Share of Agriculture* in Total Employment and Gross Domestic Product in CAREC Countries
(%)



AFG = Afghanistan, AZE = Azerbaijan, CAREC = Central Asia Regional Economic Cooperation, GDP = gross domestic product, GEO = Georgia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, MON = Mongolia, PAK = Pakistan, PRC = People's Republic of China, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

* Includes forestry and fishery.

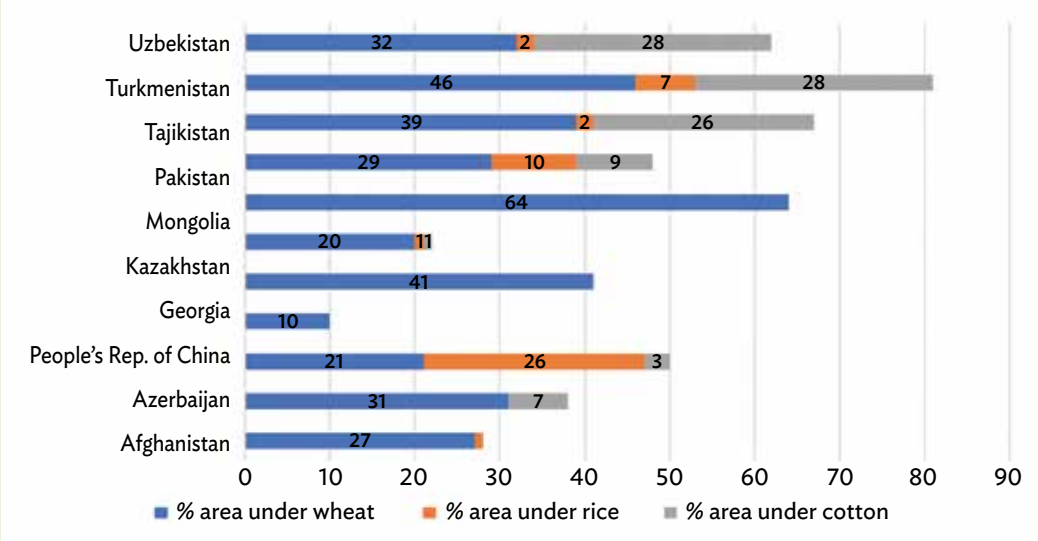
** For Georgia, total employment in the agriculture, fishery, and forestry sector was recalculated at 19% by its National Statistics Office using the new methodology adopted by the International Labour Organization at the 19th and 20th International Conference of Labor Statisticians.

*** The data on Turkmenistan is for 2019.

Source: ADB. Unpublished. Agriculture and food security in the CAREC region: A Background Report for the Cooperation Framework for Agricultural Development and Food Security in the CAREC Region.

[62] CAREC Institute. 2022. *Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change: Final Report.*

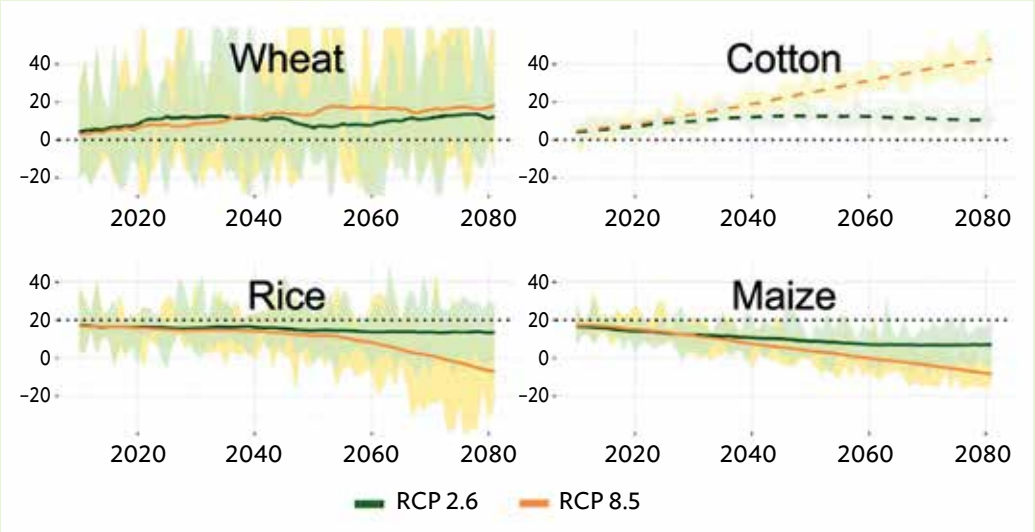
Figure 15: Share of Lands under Wheat, Rice, and Cotton in CAREC Countries



CAREC = Central Asia Regional Economic Cooperation.

Source: CAREC Institute. 2020. *Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region.* https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf (based on Food and Agriculture Organization data reported in 2019).

Figure 16: Projected Change in Crop Productivity in Central Asia under RCP 2.6 and RCP 8.5



RCP = representative concentration pathway.

Source: CAREC Institute. 2022. *Report on Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change.* https://www.carecinstitute.org/wp-content/uploads/2022/08/Report-on-Water%E2%80%93agriculture%E2%80%93energy-nexus-in-Central-Asia-through-the-lens-of-climate-change.pdf.

Agricultural policies and practices need to adapt to the impending negative impact of climate change on agricultural productivity and food security and contribute to mitigation efforts. Overall, climate change will certainly affect agricultural productivity in CAREC countries and also negatively impact food security.[63] All the measures mentioned in the quote from the IFPRI report apply to varying degrees in the CAREC region. Special attention, however, needs to be paid to irrigation, especially in Central Asia. More efficient distribution and use of scarce irrigation water will be a critical factor in maintaining and, to the extent possible, even increasing the productivity of water in irrigation. Irrigation infrastructure must be upgraded to allow more efficient distribution, advanced irrigation techniques (as pioneered, for example, in Israel, but also widely used in the PRC[64]) must be introduced, pricing of irrigation water must reflect its opportunity cost, and crops with higher water productivity must be planted. Reduction of CO_2 emissions in livestock farming, more efficient use of fuels and electricity (including the pumping of irrigation waters), and less carbon-intensive modalities in the entire agriculture and food value chain will also help the region's mitigation efforts.

Complementary water management and hydromet service policies will be required. Besides more efficient and climate-smart agricultural policies, agriculture also depends critically on the continued supply of water for irrigation and, hence, on the allocation and management of scarce regional water resources. This will be discussed in a section under the heading of "The Energy–Water–Agriculture Nexus." Another important factor for improved water management and agricultural productivity under conditions of climate change are improved hydromet services—this includes a better collection of weather, climate, and water observation data; better forecasting; and more effective outreach with relevant weather and water to concerned government agencies, to farmers, and private businesses in need of timely and accurate hydromet information (see section on "Hydromet Services"). These examples show how various climate change issues are interwoven with each other.

Improved land use, land use change, and forestry (LULUCF), and related forestry and biodiversity management are also critical. Forests, croplands, and grasslands, if properly managed, can represent important carbon sinks, i.e., absorb CO_2 from the atmosphere. But if poorly managed (deforestation and others), they also can and do contribute significant amounts of carbon emissions.[65] What is more, climate change itself contributes to land degradation (footnote 65). A similar two-way relationship exists between climate change and biodiversity: global warming is harmful to biodiversity, and loss of biodiversity can contribute to climate change in addition to many other negative implications for the natural environment and humanity.[66] The Royal Society (UK) recommends the following actions that will benefit both climate and biodiversity: "Building a sustainable food system with climate and biodiversity-friendly agricultural practices, responsible food trade, and equitable food distribution; Reducing rates of natural ecosystem loss and degradation; Protecting, restoring, and expanding natural ecosystems; Increasing landscape

[63] ADB. Unpublished. Agriculture and Food Security in the CAREC Region: A Background Report for the Cooperation Framework for Agricultural Development and Food Security in the CAREC Region.

[64] ADB. Unpublished. Agriculture and Food Security in the CAREC Region: A Background Report for the Cooperation Framework for Agricultural Development and Food Security in the CAREC Region. This draft report notes that the PRC is widely employing the Internet of Things in agriculture, advanced irrigation techniques, and drones. It also reports on selective use of modern agricultural technologies and techniques in Kazakhstan and Uzbekistan, but concludes that "the use of green/digital technologies in the agricultural sector of the CAREC countries remains limited."

[65] See UNFCCC LULUCF website. https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf.

[66] The Royal Society. 2021. Biodiversity and climate change: interlinkages and policy options. https://royalsociety.org/topics-policy/projects/biodiversity-climate-change-interlinkages/.

connectivity; Ensuring that expansion of renewable energy systems has positive biodiversity benefits built into its design; Discouraging ecosystem-based approaches to climate mitigation that have negative outcomes for biodiversity, such as tree planting in inappropriate ecosystems, monocultures, and unsustainable energy crops" (footnote 66). Finally, land restoration has important benefits regarding lowering the risks of disasters triggered by natural hazards. These are further considered in Section 4.7 ("Climate-linked disasters"). Clearly, these are important issues for Central Asia with its significant croplands, grasslands, and forest resources that are subject to significant climate impacts.[67]

Regional cooperation on agriculture and food security is needed to support national policies. Countries need to cooperate with appropriate regional trade policies for agricultural products to maximize market access; in allocating and managing regional water use; in research, development, and sharing of improved agricultural technologies; and in preparing for and responding to climate-related disasters (including the maintenance of regional food and seed banks, regional weather insurance services, and regional approaches to hydromet service improvements).

4.4 The Energy–Water–Agriculture Nexus

Energy, water, and agriculture are closely connected in their development opportunities and challenges and how they relate to climate change. This close relationship has given rise to the term "energy–water–agriculture" nexus, not only for Central Asia, but also for other large river basin, e.g., the Nile.[68] Figure 17 provides a useful summary of the major links between energy, water, and agriculture. The "nexus" arises since large rivers offer opportunities for power generation (mostly in the upstream mountain ranges), but also provide benefits downstream, principally for agriculture (especially with irrigation).[69] Moreover, reservoirs along the river offer opportunities to store water for optimal release over time and thus to manage the overall flow of the river to support agriculture during the growing season and, more generally, help avoid water shortages and flooding. To obtain the best results from the multiple economic functions that a river thus carries, river basin management requires basin-wide capacity for planning and implementation of investments and operation and maintenance (O&M) to ensure optimal sustained storage and flow management. Competition among potential uses of river water is complicated by seasonal variations in river flows and in demand for energy and irrigation water, which creates complex trade-offs over time for water allocation between alternative uses. Additional trade-offs result from the increasing need to use these rivers and their hydropower capacity as standby baseload for the intermittent supplies of renewable energy. Since temperature, rainfall, and glacier melt determine river flows annually and seasonally, the trade-off across water uses will likely become much starker as climate change proceeds. Managing these increasingly severe trade-offs is difficult even where a river basin is contained within the boundaries of one country, although even here, there are difficult choices and political challenges, as the rivalries among riparian US states in the case of the Colorado River demonstrate.[70] When river basins straddle borders, the scope for mismanaging the energy–water–

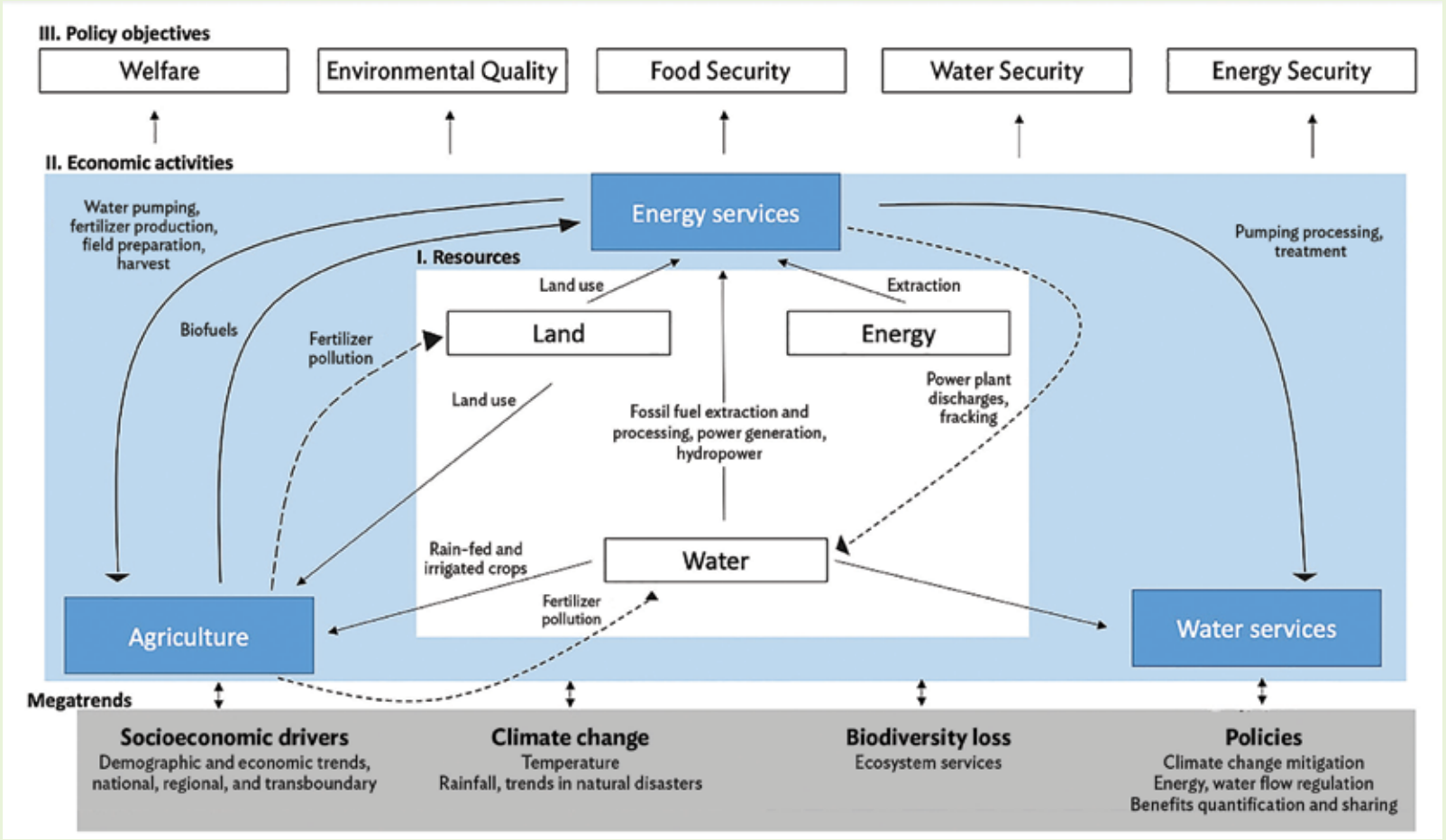
[67] See for example, Nunez et al. 2020. *Potential biodiversity change in Central Asian grasslands: scenarios for the impact of climate and land-use change*. https://link.springer.com/article/10.1007/s10113-020-01619-4.

[68] Elsayed et al. 2018. *The Nile Water Food and Energy Nexus Model*. https://www.researchgate.net/publication/340388897_The_Nile_Water_Food_and_Energy_Nexus_Model.

[69] If there are large cities located in the watershed, urban water supply will also compete with irrigation needs, as is the case for the Colorado River in the US (and Mexico). R.C. Brears. 2017. *The Green Economy and the Water–Energy–Food Nexus in the Colorado River Basin*. https://link.springer.com/chapter/10.1057/978-1-137-58365-9_10.

[70] Congressional Research Service. 2022. *Management of the Colorado River: Water Allocations, Drought, and the Federal Role*. https://crsreports.congress.gov/product/pdf/r/r45546.

Figure 17: Key Links in the Energy–Water–Agriculture Nexus



Source: Organization for Economic Co-Operation and Development. 2022. *Benefits of Regional Co-Operation on the Energy–Water–Land Use Nexus Transformation in Central Asia.* https://www.oecdilibrary.org/docserver/7fcec36c-en.pdf?expires=1659230490&id=id&accname=guest&checksum=1B494C5F5399F0A37DA3904EAA7BC04E.

agriculture nexus becomes that much greater as it is difficult for countries to agree on appropriate and predictable water allocation rules, optimal investment and O&M, and their financing. Interstate or cross-border community conflicts may arise if one or more countries or communities feel their vital interests are not met. Climate change will aggravate the risks of river basin mismanagement and increase the scope for conflict. Regional cooperation and coordination are, therefore, essential as they are difficult.

The Aral Sea Basin in Central Asia is a prime example of the energy–water–agriculture nexus and will be significantly affected by climate change. The Aral Sea, bordering Kazakhstan and Uzbekistan, has been fed by two large rivers, the Amu Darya and the Syr Darya originating in the high mountains of the Kyrgyz Republic and Tajikistan. During times of the former Soviet Union, the upstream water resources were developed with numerous dams and HPPs, while downstream water was utilized for irrigation to such an extreme and wasteful extent that the Aral Sea largely disappeared over the last 50 years (Box 2). Water resource allocation was centrally handled by the authorities of the former Soviet Union, which allowed for the maximum discharge of water during the spring and summer months when water was needed downstream for cultivation. This required reducing water flows to replenish reservoirs in the remainder of the year, thus also reducing upstream power supply, especially during winter months when upstream republics had high electricity demand. Free gas supplies from downstream republics during the winter months to upstream republics allowed the latter to produce the needed electricity in thermal power plants, thus, in effect, compensating upstream countries for their release of water during the summer months. This centrally managed system of allocation and compensation broke down after the fall of the former Soviet Union, as downstream countries (and in particular Uzbekistan) stopped making gas available freely in the winter, which led to greater than optimal releases of water during the winter months and resulting shortages of water downstream during the summer months.[71]

Many efforts have been made to address the energy–water–agriculture nexus in the Aral Sea Basin since Central Asian republics became independent, but much remains to be done for efficient and effective use of water, energy, and agricultural resources. Since the 1990s, the governments of the five Central Asian republics, with the help of international development partners, have undertaken steps to develop and implement regional agreements and regional institutional capacity for cooperation on water sharing and on responding to the Aral Sea crisis. This was supported by many efforts to analyze the challenges of the energy—water—agriculture nexus in the Aral Sea Basin and to develop proposals for a more effective management of these resources.[72] However, disagreements among governments prevented comprehensive agreements and stymied implementation even of those limited agreements that were reached. With a new government in Uzbekistan since 2016, a spirit of cooperation has taken hold in Central Asia, and there is now an opportunity to intensify efforts to address the energy–water–agriculture nexus issues in the Aral Sea basin. This is the more urgent, as the impact of climate change is expected

[71] UNDP. 2005. *Central Asia Human Development Report 2005* for a summary of the system of water management of the former Soviet Union in the Aral Sea Basin, and for the difficulties encountered after the fall of the former Soviet Union, including the disappearance of the Aral Sea, as reported in Box 2. https://hdr.undp.org/content/bringing-down-barriers.

[72] UNDP. 2005. *Central Asia Human Development Report 2005* for a summary of the system of water management of the former Soviet Union in the Aral Sea Basin, and for the difficulties encountered after the fall of the former Soviet Union, including the disappearance of the Aral Sea, as reported in Box 2. https://hdr.undp.org/content/bringing-down-barriers; ADB. 2014. *Climate Change and Sustainable Water Management in Central Asia*. https://drive.google.com/drive/folders/1h69alUIEYrQCTngOAHvLW0F6XXP8phds; CAREC Institute. 2022. *Water–Agriculture–Energy Nexus in Central Asia Through the Lens of Climate Change: Final Report; OECD. 2022. Benefits of regional co-operation on the energy-water-land use nexus transformation in Central Asia*. https://www.oecd-ilibrary.org/docserver/7fcec36c-en.pdf?expires=1659230490&id=id&accname=guest&checksum=1B494C5F5399F0A37DA3904EAA7BC04E.

Box 2

The Aral Sea Tragedy and Its Lessons for Energy–Water–Agriculture Management in the CAREC Region with Climate Change

The Aral Sea was once the largest inland lake in the world, offering significant economic opportunities to the riparian provinces of Kazakhstan and Uzbekistan, in fishing, agriculture, and shipping. The Aral Sea disappeared over 50 years, due to heavy and wasteful use of the waters of the Syr Darya and Amu Darya rivers as a result of dramatic expansion of irrigated agriculture, especially cotton, during the years of the former Soviet Union.

As a result, the livelihoods and health of millions of people were dramatically affected, especially in the Karakalpakstan region of Uzbekistan. Moreover, dust and salt picked up by storms from the dry lakebed have resulted in sand storms in the region and have been carried to and deposited on the glaciers of the Pamir and Tien Shan mountains, leading to more rapid melting of glaciers (from United Nations Development Programme. 2005. Central Asia Human Development Report 2005). This demonstrates the tremendous damage which ineffective water management and inefficient water use can produce to regional ecosystems. With climate change, the risks of such disasters being repeated will increase.

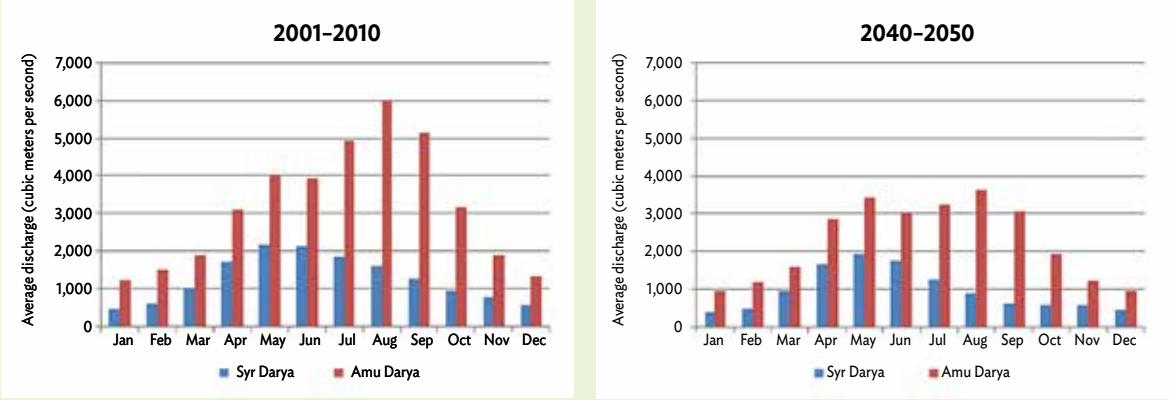
One particular large inland lake, for which the lessons of the Aral Sea disaster need to be learned and applied, is Lake Balkhash in Kazakhstan. Fed by the Ili River, the lake level and its water quality have been negatively affected by changing water volume in the Ili basin due to rapid socioeconomic development and the impact of climate change. Further climate change will threaten water flows in the Ili River and the survival of Lake Balkhash.

Sources: United Nations Economic and Social Commission for Asia and the Pacific. 2022. *The Aral Sea, Central Asian Countries and Climate Change in the 21st Century*. https://www.unescap.org/sites/default/d8files/knowledge-products/Aral%20Sea%20report_Part%20I_25%20April_clean_ENGreferences.pdf; Greenologia. 2020. ***Какие экологические проблемы озера Балхаш, включая нерациональное водопользование, могут привести к высыханию уникального водохранилища?*** https://greenologia.ru/eko-problemy/gidrosfera/ozero-balxash.html.

to reduce (and shift) water flows in the two principal rivers (Figure 18). This will put a premium on interstate cooperation and coordination for improved water sharing and management in the two major rivers, for more efficient water usage of water in agriculture, for the sizable investments needed in water storage, hydropower generation, and O&M; and for strengthened institutional capacity. Similar cooperation arrangements will be required for other cross-boundary watersheds and rivers, including the Balkhash Lake basin straddling Kazakhstan and the PRC (Box 2). The history of successful cooperation between Kazakhstan and the Kyrgyz Republic in the Chu–Talas River Basin is an example that should be emulated in other cross-border river basins, including its explicit focus on adapting to climate change[73] (Box 3).

[73] OECD. 2022. *Benefits of Regional Co-Operation on the Energy–Water–Land Use Nexus Transformation in Central Asia*. https://www.oecd-ilibrary.org/docserver/7fcec36c-en.pdf?expires=1659230490&id=id&accname=guest&checksum=1B494C5F5399F0A37DA3904EAA7BC04E.

Figure 18: Current and Future Monthly Flows in the Sur Darya and Amu Darya, If No Action Is Taken



Source: Asian Development Bank. 2014. *Climate Change and Sustainable Water Management in Central Asia.* https://www.adb.org/publications/climate-change-and-sustainable-water-management-central-asia.

Box 3

Cooperation in Chu–Talas Basin between Kyrgyzstan and Kazakhstan

"Kazakhstan and Kyrgyzstan share the transboundary rivers Chu and Talas, whose water is used for irrigation in both countries and offers opportunities for the generation of hydropower. All facilities to regulate the rivers, such as canals, dams, and water reservoirs are located in Kyrgyzstan. As such, Kazakhstan depends on the operation and proper maintenance of these facilities. Kazakhstan and Kyrgyzstan have a decade long history of cooperation in these basins. In January 2000, they signed an agreement on sharing the operation and maintenance costs of the facilities which would be shared on a pro rata basis according to the water volume received. In 2006, the Chu–Talas Commission was established to focus on (a) approval of water resources allocation; (b) determination of measures to maintain water facilities; and (c) approval of a financing plan for the above measures. In 2008–2011, the Organization for Security and Cooperation in Europe (OCSE)– United Nations Economic Commission for Europe (UNECE) project 'Developing co-operation on the Chu and Talas Rivers' (Chu–Talas II) focused on enhancing understanding on water resources, improving access to information, and involving new stakeholders in the river management process. More recently, the "Enhancing climate resilience and adaptive capacity in the transboundary Chu–Talas basin (2015–2018)" project focused on climate change adaptation in the basin. The project considers that glaciers in the basin may be fully exhausted by 2100. This project led to identification of pilot adaptation projects, such as restoration of floodplain forest and training courses on water efficiency measures for irrigation, that were implemented in partnership with local NGOs, such as Kyrgyz Association of Forest and Land users and Ecological Movement 'BIOM'."

Source: Quoted from OECD. 2022. *Benefits of Regional Co-Operation on the Energy–Water–Land Use Nexus Transformation in Central Asia.* https://www.oecd-ilibrary.org/docserver/7fcec36c-en.pdf?expires=1659230490&id=id&accname=guest&checksum=1B494C5F5399F0A37DA3904EAA7BC04E. p. 39.

4.5 Transport and Economic Corridors

Climate-smart transport solutions are critical for mitigation, adaptation, and resilient development in the CAREC Region as elsewhere.[74] The CAREC region covers a large geographic expanse, and most of the countries are landlocked and distant from the nearest ocean harbors and, hence, from world markets. Efficient overland transport and transit are critical for the economic development of the region.[75] The World Bank notes that climate-smart transport policies are also policies needed for an effective and efficient transport system more generally and, hence, represent a win–win solution.[76] Energy-efficient road and rail systems are critical. The expansion of electrified railways plays a particularly important role for long-distance transport in reducing the carbon footprint of long-haul freight and passenger transport.[77] CAREC countries, with the assistance of multilateral funders and the Belt and Road Initiative, have significantly expanded their electrified rail systems.[78] For truck transport, resilient road systems have to be built, upgraded, and maintained. As the World Bank notes, "increasing the robustness of particularly vulnerable segments; building system resilience by increasing redundancy; by system-wide efforts to address standards, methods, and materials; and by improving the effectiveness of preparation for and response to extreme climate events. Efficient freight systems, particularly fuller and better trucks, can deliver both lower costs and a lower carbon footprint. Moreover, to maximize the benefits of transport investments, it is important to make sure that different modes complement each other, and to allow people and goods to transfer seamlessly between different means of transport."[79] And improving the speed along transport corridors through improved alignment, elimination of bottlenecks and reduction of waiting times at borders will result in the reduction of the carbon footprint of the transport system—all policies long supported by CAREC and measured in its CAREC Corridor Performance Measurement and Monitoring Program, which is a unique instrument to monitor climate-smart transport sector development in the region.[80] Moreover, improved operation and maintenance (O&M) of transport infrastructure, which is a serious problem in much of Central Asia and the rest of the CAREC region, will play an essential role in ensuring a resilient and climate-smart regional transport system. Finally, since these transport systems in the CAREC region are by their very nature cross-border and regional, they require interstate cooperation and coordination, a fact that CAREC has long recognized and emphasized.

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74 This section addresses intercity and intercountry transport; the next section deals with in-city transport.

75 ADB. 2020. *CAREC Sector Strategy 2030*. https://www.adb.org/documents/carec-transport-strategy-2030.

76 World Bank. 2016. Climate-smart transport is a key piece of the sustainable development puzzle. https://blogs.worldbank.org/transport/climate-smart-transport-key-piece-sustainable-development-puzzle.

77 "Railways, as the preferred mode of transport along the corridor, are environmentally friendly. The average direct and indirect greenhouse gas emissions generated by railway transport are 18 g/ton-kilometer (tkm), which is only marginally higher than the transport used for long-distance maritime freight (12 g/tkm). Railway transport produces half the emissions of inland water transport, seven times less than road transport, and 30 times less than air transport per tkm. By considering emissions of greenhouse gases, particulate matter, and nitrogen oxides, which also have harmful effects on the environment and human health, railway transport can be safely described as the undisputed leader in environmental performance." E. Vinokurov et al. 2022. *International North–South Transport Corridor: Boosting Russia's 'Pivot to the South' and Trans-Eurasian Connectivity*. p. 5. https://www.researchgate.net/publication/362355512_International_North-South_Transport_Corridor_Boosting_Russia%27s_pivot_to_the_South_and_Trans-Eurasian_connectivity.

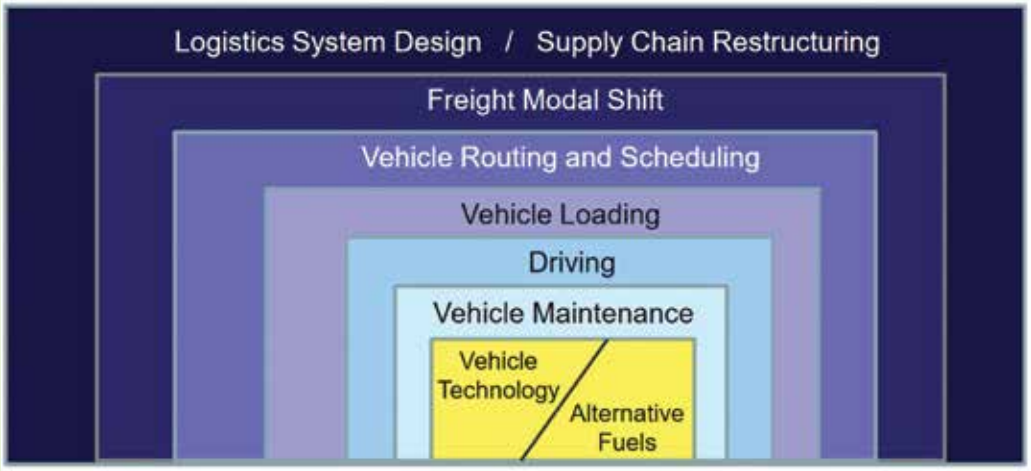
78 Kohli et al. Forthcoming. *The Belt and Road Initiative and Global 2030 Sustainability Goals: Evolution of the BRI after the Second BRI Forum in April 2019*.

79 World Bank. 2016. *Climate-Smart Transport is a Key Piece of the Sustainable Development Puzzle*. https://blogs.worldbank.org/transport/climate-smart-transport-key-piece-sustainable-development-puzzle.

80 CAREC. 2021. *CAREC Corridor Performance Measurement and Monitoring Annual Report 2020*. https://www.adb.org/publications/carec-cpmm-annual-report-2020.

Decarbonizing long-haul freight and bus transport is an option for the medium to longer term.[81] Long-haul trucks and buses are high-carbon emitting; they emit about 6% of carbon emissions in the European Union (EU). However, efforts are underway to design solutions for reducing truck emissions dramatically. EU regulations, for example, require 15% lower emissions for new trucks as of 2025 and 30% as of 2030. Some of these reductions can be achieved with existing fuel technologies, but for more significant progress new technologies are required. The most promising solution at this time is battery-powered trucks, but hydrogen fuel cell technology, catenary (overhead electric lines), and synthetic fuels are also options being explored. In addition, complementary measures to improve the efficiency of long-haul trucking must contribute to the reductions in emissions as shown in Figure 19.

Figure 19: A Comprehensive Approach to Reducing Emissions of Long-Haul Trucking



Source: S. Amelang. 2021. *Climate Targets Force Trucks into Race to Clean Up Transport*. https://www.cleanenergywire.org/news/climate-targets-force-trucks-race-clean-transport.

Economic corridors can be designed to support resilient and climate-smart development. CAREC has recently moved from supporting transport corridors to economic corridors where there is a strong economic potential for connecting major urban centers and their respective hinterlands, including across borders. As a recent CAREC document notes, "[t]he economic concept corridor is straightforward. The two city regions can achieve far more together than what can be achieved by either alone. The Almaty–Bishkek Economic Corridor (ABEC), which emanated from the Almaty Bishkek Corridor Initiative (ABCI), transforms the area into a single space where the exchange of ideas and movement of goods and people is fast, easy, and free of barriers. The cross-border agglomeration will allow businesses to specialize more, operate at a larger scale, and achieve greater diversification and competitiveness with the purpose of exporting goods and services to the world."[82] Economic corridors typically involve improvements in the corridor infrastructure,

[81] This section draws on S. Amelang. 2021. *Climate Targets Force Trucks into Race to Clean Up Transport*. https://www.cleanenergywire.org/news/climate-targets-force-trucks-race-clean-transport.

[82] CAREC Website. Economic Corridor Development. https://test0302.carecprogram.org/?page_id=33.

including effective rail services, a dense and well-maintained road network with well-developed primary, secondary, and tertiary roads, as well as power, telecommunication, and industrial parks. Climate-smart development of economic corridors will again represent a win–win outcome in terms of mitigation, adaptation, and resilient development. In some cases, as for the Almaty Bishkek Corridor, they will cross borders and will require close cross-border cooperation.

4.6 Climate-Smart Cities

Cities—and, more generally, urban areas—are key to meeting climate mitigation targets and adaptation goals and resilient growth objectives. Urbanization has been progressing rapidly worldwide. This trend is projected by the United Nations to continue well into the future. Urban centers are the hub of economic activity, and traditionally carbon-intensive, due to the industrial activity, urban transport, waste, heating, and cooling needs of the population. The need for greater efficiency and equity of urban growth has long been recognized.[83] Over the last 20 years, it has also been recognized that cities have to be climate-smart.[84] Many of the traditional policy recommendations for greater urban efficiency and equity are also climate-smart since they tend to reduce carbon emissions: denser residential development rather than urban sprawl; sound zoning and building codes; reduced reliance on the private automobile in exchange for mass transit, bicycling, and walking; and efficient provision of municipal services to all (electricity, water and sewerage, garbage disposal, central home heating, and others).[85] However, in addition, much more be done specifically focused on climate mitigation and adaptation.[86] This includes support for the development of transport that relies on renewable energy (including electrified mass transit and private automobiles), low-carbon district and individual home heating, more efficient cooling, and increased reliance on "circular economy" measures (including recycling of plastic, batteries, electronic equipment, and others). Some of the more prominent measures are summarized in Table 13, based on the World Bank's "Climate-Smart Cities" publication.

The CAREC region also has experienced rapid urbanization and will need to focus on making its cities climate smart. In a majority of CAREC countries, more than 50% of the population now lives in urban areas, and this percentage will continue to rise in all countries (Table 14). The largest city in each country ranges from just under 1 million people (Bishkek and Dushanbe) to over 26 million (Shanghai). The challenges of city management differ dramatically across this wide range of cities, but fundamentally all will have to address the abovementioned policy issues facing cities in the rest of the world. Among the key climate-related issues facing CAREC cities are the following:[87]

[83] Oxford University Press. 1983. Cities in the Developing World: Policies for their Efficient and Equitable Growth.

[84] The issues highlighted in this section for cities also apply to a substantial degree for medium-size town, and to a lesser degree to small urban areas.

[85] World Bank. 2020. *Catalyzing Private Sector Investments in Climate Smart Cities*. https://documents1.worldbank.org/curated/en/179101596519553908/pdf/Catalyzing-Private-Sector-Investment-in-Climate-Smart-Cities.pdf.

[86] Devex. 2022. We need to talk about climate change in global south cities. https://www.devex.com/news/opinion-we-need-to-talk-about-climate-change-in-global-south-cities-103646?mkt_tok=Njg1LUtCTC03NjUAAAGGT5YWBsiJYTHr1JIDdG3O9k25fWTmR9bPCUvd98ZYG88AJ2FMFB4Qqhx8XCFvK6Y_dkaoRGjhIwhy5NQMs8AbXzguu2N4x4GakvLgNff8T4PEiQ&utm_content=cta&utm_medium=email&utm_source=nl_newswire&utm_term=article.

[87] For examples of how selected ADB-supported projects helped address climate change in various cities of the CAREC region, see ADB. 2021. *100 Climate actions from cities in Asia and the Pacific*. https://www.adb.org/sites/default/files/publication/705086/100-climate-actions-cities-asia-pacific.pdf.

Table 13: Selected Measures to Achieve Climate-Smart Cities

SOURCES	Transport	Buildings	Energy	Waste	Industry
SOLUTIONS	An Integrated Transport Plan that plans for compact cities and multimodal, networked, electrified, active and green transport systems: walkability, bikeability; e-public transport (BRT, metro, light rail); e-vehicles (taxis, share-rides, private vehicles). Policy measures could consider: – increasingly stringent emission standards for existing cars – minimum fuel efficiency standards for new vehicles – quotas for cars that can be registered – high-occupancy vehicle and bus lanes – technology disruption, including self-driving and small flying vehicles.	An Integrated Systems Plan that promotes compact, green and efficient buildings and environment through urban form; centralized district approaches; building codes; zoning; appliance standards; incentives (permitting, subsidies) and green infrastructure and nature-based solutions such as trees, parks, green roofs, and water features to reduce urban heat island effect. Measures could include: – energy efficiency financing for refurbishment (e.g., Property Assessed Clean Energy [PACE]) – green mortgages for homes – energy performance disclosures for buildings – energy performance labels for buildings ('A' to 'F') – cap-and-trade program for buildings.	An Integrated Energy Plan fed by micro grids, urban grids and centralized utilities, supported by storage and renewable energy. Measures could include incentives for: – rooftop solar on city-owned, residential and commercial assets – rooftop solar for slum upgrades and social housing – solar street lighting – Community Choice Aggregation (CCAs) measures that allow local governments to procure power on behalf of their residents, businesses, and municipal accounts from alternative power sources.	A plan to move towards a circular economy and zero waste concepts of "reduce, reuse, recycle (materials), recover (energy) and only then dispose" for solid waste and for water. This includes demand-reduction measures such as: – reducing consumer packaging and extended producer responsibility; – ban on single-use materials (e.g., plastic bags); – encouragement for multiuse, recyclable, biodegradable materials; – pay-as-you-throw or landfill tax; – investments in composting and landfill fugitive emissions capture; – storm water diversion through urban design; incentives for permeable materials, green roofs, water gardens, and nature-based solutions for built environment.	A plan to reduce final energy demand in industry by one-third through renewables, energy efficiency, and green infrastructure planning. Increase recycling of materials and the development of a circular economy in industry. Measures include: – shifting to electrification of production processes where possible; – increasing recycling and circular economy in industry; – substituting towards renewable materials in high-carbon products (e.g., wood vs. steel or cement in construction sector, natural textile fibers vs. plastics); – investments in green technologies such molten oxide electrolysis powered by renewables for greening steel; concrete for carbon sequestration; direct air capture technologies.

BRT" = Bus Rapid Transit.

Source: Authors, based on World Bank. 2020. *Catalyzing Private Sector Investments in Climate Smart Cities.* https://documents1.worldbank.org/curated/en/179101596519553908/pdf/Catalyzing-Private-Sector-Investment-in-Climate-Smart-Cities.pdf.

Table 14: Urban Population as Percent of Total Population in CAREC Countries

Country	Urban Population 2020 (%)	Urban Population 2035 (%)	Population of Largest City, 2021 (million)
Afghanistan	26	32	4.3
Azerbaijan	56	63	2.4
Georgia	60	66	1.1
Kazakhstan	58	62	1.9
Kyrgyz Republic	37	44	1.1
Mongolia	68	72	1.6
Pakistan	37	43	16.5
People's Republic of China	61	74	26.3
Tajikistan	28	33	0.9
Turkmenistan	53	61	0.9
Uzbekistan	50	54	2.5

CAREC = Central Asia Regional Economic Cooperation.

Source: UN-Habitat. 2022. *World Cities Report 2022*. Table 11. https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf; https://worldpopulationreview.com/world-cities.

(i) **Heating and cooling needs.** Most cities in the CAREC region face a dual threat: cold winters and increasingly hot summers. Traditionally, heating has been the main challenge, with district heating widely provided, especially in the cities of the former Soviet Union. District heating was often based on carbon-intensive coal, rather than gas or renewable energy sources. In the Kyrgyz Republic and Kazakhstan, households without access to district heating were found often to use coal for heating and cooking, even though they were connected to electricity, due to the higher costs and intermittent supply of electricity.[88] Therefore, the scope for carbon reduction in the heating area is significant. A recent World Bank study for Almaty and Nur–Sultan found that heating contributes overwhelmingly to air pollution as well as carbon emissions, and advised measures to control the use of coal in residential heating, including retrofitting district heating plants, controlling the use of coal in residential buildings, and imposing a carbon tax.[89] While a warmer climate will reduce heating needs in winter, the cooling of buildings will be increasingly important in CAREC countries as extreme heat waves will become more common and extensive.[90] Assuring that the cooling technology adopted is energy- and carbon-efficient will be of great importance for all CAREC countries. One option is to apply districtwide solutions to both heating and cooling, an approach that is supported by UNEP's District Energy in Cities Initiative, which covers cities in Mongolia and the PRC (Box 4).

[88] ADBI. 2021. *What determines coal consumption for residential heating in Kazakhstan and the Kyrgyz Republic*. https://www.tandfonline.com/doi/full/10.1080/14486563.2021.1989328.

[89] World Bank. 2022. *Integrated Air Quality Management and Greenhouse Gas Reduction for Almaty and Nur–Sultan*. https://openknowledge.worldbank.org/bitstream/handle/10986/37938/P1708700f4b6f30f0bf1a05fe6c088bdd2.pdf?sequence=1&isAllowed=y.

[90] CABAR. 2022. *Abnormally Hot Summer – New Normal for Central Asia*. https://cabar.asia/en/abnormally-hot-summer-new-normal-for-central-asia.

Box 4
United Nations Environment Programme's District Energy in Cities Initiative

"District energy systems are increasingly climate resilient and low-carbon, allowing:

- up to 50 per cent less primary energy consumption for heating and cooling;
- the recovery and distribution of surplus and low-grade heat and cold to end-users (e.g., waste heat from industry, power stations, waste incinerators, and sewage treatment or cooling from water bodies and even liquefied natural gas [LNG] terminals);
- the storage of large amounts of energy at low cost—for example, solar heat for use during winter or conversion of surplus renewable power into heating or cooling for use during peak thermal demand;
- the integration and balancing of large shares of variable renewable power on electricity grids through thermal storage, cogeneration and heat pumps;
- a fast and cost-effective transition to sustainable refrigerants compliant with the Kigali Amendment to the Montreal Protocol.

"As one of six accelerators of the Sustainable Energy for All (SEforALL) Energy Efficiency Accelerator Platform, the Initiative aims to double the rate of energy efficiency improvements for heating and cooling in buildings by 2030, helping countries meet their climate and sustainable development targets. The Initiative supports local and national governments to build know-how and implement enabling policies that will accelerate investment in low-carbon and climate-resilient district energy systems. It currently provides technical support to cities in 4 pilot countries (Chile, the People's Republic of China, India, and Serbia) and 10 replication countries (Argentina, Bosnia and Herzegovina, Colombia, Egypt, Malaysia, Mongolia, Morocco, "Russia", the Seychelles, and Tunisia)."

Source: Quoted from the District Energy in Cities Initiative website. http://www.districtenergyinitiative.org/initiative.

(ii) **Water scarcity.** Since many of the cities are located in water-stressed regions and water scarcity will likely be reinforced by climate change, securing safe urban water supplies will become more difficult and costly. Recycling used water will eventually become an option that may need to be considered, a practice that is already being used in California, US.[91]

(iii) **Mass transit.** Expansion of climate-smart mass transit remains a critical area for urban planning and investment, with gradual transition from diesel to electric buses (battery powered or trolleys) a key solution. For example, Almaty recently expanded and modernized its city bus fleet, including putting locally assembled electric buses into operation.[92]

(iv) **Pollution control.** Climate change will likely worsen the serious air pollution problem already facing the cities of the CAREC region. According to the World Bank: "In Kazakhstan alone, air pollution contributes to over 6,000 premature deaths and causes estimated economic losses of over $1.3 billion per year."[93] Many of the climate mitigation actions considered in this section will also help reduce pollution and, thus, represent win–win solutions.

[91] Water Education Foundation. *Water Recycling*. https://www.watereducation.org/aquapedia/water-recycling.
[92] *Kazakhstan News Gazette*. 2019. In Almaty, there is Planned to Increase the Number of Buses for 4 Times. https://kazakhstannewsgazette.com/in-almaty-there-is-planned-to-increase-the-number-of-buses-for-4-times/.
[93] Quoted from L. Burunciuc. 2021. *Five steps for cleaner air in Central Asia*. https://www.weforum.org/agenda/2021/07/central-asia-cities-air-pollution-climate-change-environment/.

(v) **Disaster resilience.** With their high population, building and infrastructure densities cities are particularly at risk of damage from disasters, whether caused by climate change or other sources (pandemic health risks and, especially in Central Asia, seismic events). As these disaster risks increase with advancing climate change, cities have to adapt. The United Nations Office for Disaster Risk Reduction (UNDRR) supports disaster preparedness in the five Central Asia capital cities.[94]

Climate-smart city policies are nationally and locally driven, however, regional approaches can help with design and implementation. National urbanization policies and local city government action will mainly determine how effectively climate mitigation and adaptation are incorporated into urban planning and investment. A critical aspect will be to strengthen city governments' capacity and financing base to address climate change challenges. Regional initiatives and city alliances among neighboring countries can support national and local policy action by sharing experience, building capacity, supporting technology transfer, benchmarking, and monitoring progress, and building coalitions that create greater public awareness and policy commitment. CAREC has under execution a regional technical assistance (TA) project that supports such cooperation in promoting low-carbon development in selected CAREC program cities in Kazakhstan, Mongolia, and the PRC. The TA project pursues four goals during the period 2017–2023: "(i) Sustainable data management systems for GHG data assessed and enhanced at city level; (ii) recommended GHG emissions investment road maps for low-carbon economic growth at selected cities developed; (iii) a source book on successful practices and measures driving low-carbon economic development at city level developed and disseminated; and (iv) capacity for low-carbon city development among CAREC countries expanded."[95]

4.7 Climate-Linked Disasters

Climate change increases the frequency and intensity of weather and climate-related disasters and, hence, creates major adaptation challenges. As noted in Chapter 3 and in Figure 4, the CAREC region is exposed to severe risks of disasters, including those caused by extreme weather and climate events (floods, droughts, extreme heat events, landslides, and others). For Central Asia alone, according to the World Bank, natural hazards "impacted more than 10 million people and caused more than $3.7 billion in damages."[96] The nationwide, extreme flooding that hit Pakistan in 2022 is a particularly dramatic example of the threat to life and welfare that climate change represents. These floods resulted in $30 billion economic damage on top of claiming thousands of lives.[97] The year 2022 also saw a record-breaking drought in Yangtze River Basin that resulted in this huge river drying up with very serious economic and social consequences, including for hydropower

[94] The Central Asia Initiative of the European Union during the COVID-19 Crisis: The Way Forward in Preparing and Managing Risks. https://www.undrr.org/news/central-asia-initiative-european-union-during-covid-19-crisis-way-forward-preparing-and. This initiative is focused on resilience in the health sector, especially to pandemic events.

[95] Promoting Low-Carbon Development in CAREC Program Cities. CAREC TA project, ongoing, 2017–2022. https://www.carecprogram.org/?project=promoting-low-carbon-development-carec-program-cities. Project document. 2017. https://www.adb.org/sites/default/files/project-documents/50287/50287-001-tar-en.pdf.

[96] World Bank. 2022. How to support Central Asia build resilience against climate change and natural disasters. https://blogs.worldbank.org/europeandcentralasia/how-support-central-asia-build-resilience-against-climate-change-natural-disasters.

[97] *BBC*. 2022. How Pakistan Floods are Linked to Climate Change. https://www.bbc.com/news/science-environment-62758811; *American Red Cross*. 2022. New Report Links Pakistan Flooding to Climate Change. https://www.redcross.org/about-us/news-and-events/news/2022/red-cross-and-red-crescent-respond-to-flooding-in-pakistan.html; *Reuters*. 2022. https://www.reuters.com/world/asia-pacific/pakistan-floods-death-toll-nears-1500-2022-09-15/.

generation.[98] Disaster-proofing of buildings and infrastructure, appropriate zoning regulations and their enforcement, effective early warning, preparedness, and standby response capacity, are critical to helping prevent the loss of lives and minimize damage. For the case of flooding, Figure 20 summarizes the more important actions that can be taken to reduce the damages. A key ingredient for effective early warning is the availability of accurate weather and climate observations collected at the local level. When these are shared with the World Meteorological Organization (WMO) and the global weather service centers and integrated into global weather and climate prediction models whose results, in turn, are shared with national meteorological centers, this enables the national centers to make more accurate forecasts, which are critical for effective early warning (see discussion of hydromet services).

Figure 20: Actions to Deal with Risks of Flooding

CAFEWS = Central Asian Flood Early Warning System.

Source: World Bank. 2021. *Central Asian Flood Early Warning System*. https://www.worldbank.org/en/news/infographic/2021/12/10/cafews.

[98] *The Guardian*. 2022. China Drought Causes Yangtze to Dry Up, Sparking Shortage of Hydropower. https://www.theguardian.com/world/2022/aug/22/china-drought-causes-yangtze-river-to-dry-up-sparking-shortage-of-hydropower.

Regional cooperation is needed to deal with climate-induced disasters. Adverse weather and climate events often affect entire regions and can have significant cross-border impacts. And even where effects are localized within a country, early warning may require weather and climate observations in neighboring countries; moreover, support from neighbors can provide significant relief once a disaster occurs. There are regional initiatives for early warning and disaster preparedness which include the Strengthening Financial Resilience and Accelerating Risk Reduction in Central Asia program of the Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank. It supports the five Central Asian republics with quantifying regional disaster risks and capacity building on risk identification, establishing fundamental awareness and capacities for financial resilience at national and regional levels, and exposure mapping for improved risk analysis, disaster risk management, and awareness.[99] The Central Asia Flood Early Warning System (CAFEWS) supported by the World Bank and the WMO addresses flood risks in Afghanistan and the five Central Asian republics.[100] ADB is providing technical assistance to establish a disaster risk transfer facility in the CAREC region to support collaboration among CAREC countries in disaster risk financing.[101] The Center for Emergency Situations and Disaster Risk Reduction (CESDRR) was established by Kazakhstan and the Kyrgyz Republic in Almaty in 2016 as a regional center for disaster preparedness and response with support from GFDRR and other international agencies.

Land degradation increases the risks of disasters triggered by natural hazards in the CAREC region along with lowering agricultural productivity, is hastened by and contributes to climate change, and requires remedial action. The mountainous areas of the CAREC region, its steppes, and especially the region around the Aral Sea are subject to serious land degradation, including deforestation and salinization, reinforced by climate change. Land degradation lowers agricultural productivity and raises the risk of the disasters, including floods, landslides, and dust storms. According to the World Bank, "[l]and degradation—land losing its natural productivity—costs, on average, 4% of the countries' GDP. In Tajikistan, we estimated that land degradation in the mountains cost the country between $539 million and $950 million (equivalent to 8.1% and 13.4% of GDP) in 2019."[102] The World Bank further notes that sandstorms "can blow up to 75 million tons of sand, dust, and salt across Central Asia, generating economic losses of over $44 million every year."[103] Sandstorms also carry sand and salt onto the glaciers of the CAREC high mountain regions and so contribute to accelerating glacier melting. Land restoration includes support for reafforestation, improvements in rural communities' land and water management practices, and better infrastructure construction practices to limit damage to land are among the specific measures that can limit land degradation and restore the productivity of degraded land. These measures not only support climate adaptation for the affected communities, but also contribute to mitigation, since natural vegetation and, in particular, forests, act as important carbon sinks. Many of

[99] GFDRR website. *Strengthening Financial Resilience and Accelerating Risk Reduction in Central Asia*. https://www.gfdrr.org/en/program/SFRARR-Central-Asia.

[100] World Bank. 2021. *Central Asian Flood Early Warning System*. https://www.worldbank.org/en/news/infographic/2021/12/10/cafews.

[101] ADB. 2019. *Developing a Disaster Risk Transfer Facility in the Central Asia Regional Economic Cooperation Region*. https://www.adb.org/sites/default/files/project-documents/53198/53198-001-tar-en.pdf.

[102] World Bank. 2020. *Protecting Central Asia's Mountains and Landscapes to Transform People's Lives and Livelihoods*. https://blogs.worldbank.org/europeandcentralasia/protecting-central-asias-mountains-and-landscapes-to-transform-peoples-lives. According to ESCAP estimates, total economic losses due to land degradation in Central Asia was $5.85 billion in 2015, or 3% of regional GDP. ESCAP. 2022. *The Aral Sea, Central Asian Countries and Climate Change in the 21st Century*. https://www.unescap.org/sites/default/d8files/knowledge-products/Aral%20Sea%20report_Part%201_25%20April_clean_ENGreferences.pdf.

[103] World Bank. 2022. *Rethinking Landscape Restoration in Central Asia to Improve Lives and Livelihoods*. https://blogs.worldbank.org/europeandcentralasia/rethinking-landscape-restoration-central-asia-improve-lives-and-livelihoods.

the land degradation impacts are regional, and while land restoration action will generally have to be national, a regionally coordinated approach to land restoration will help assure the best results. This is reflected in the approach of the RESILIAND CA+ program, supported by the World Bank, which provides technical assistance and concessional credit financing "to help affected rural communities across Central Asia in restoring landscapes, protecting lives and livelihoods, and increasing resilience to further desertification, landscape degradation, and climate change. The program focuses on two distinctly different, yet very vulnerable areas: the Aral Seabed and the degraded mountain landscapes across Central Asia. RESILAND CA + also aims to catalyze transboundary collaboration across Central Asia's shared borders and ecosystems for improved connectivity of natural resources and increased resilience of transboundary communities and regional infrastructure against the impacts of land degradation, and greenhouse gas mitigation."[104]

4.8 Health

Climate change has a significant impact on health conditions, especially in the developing world, impacts which have to be addressed at a national, regional, and global level. As noted by the World Health Organization (WHO), climate change is a fundamental threat to global health conditions (Box 5). WHO also has identified key elements of the impact chain between climate change and health (Figure 21) and the main actions that need to be taken to strengthen the ability of health systems to deal with climate change-induced health threats.[105]

Box 5
Climate Change and Health: Key Facts According to the World Health Organization

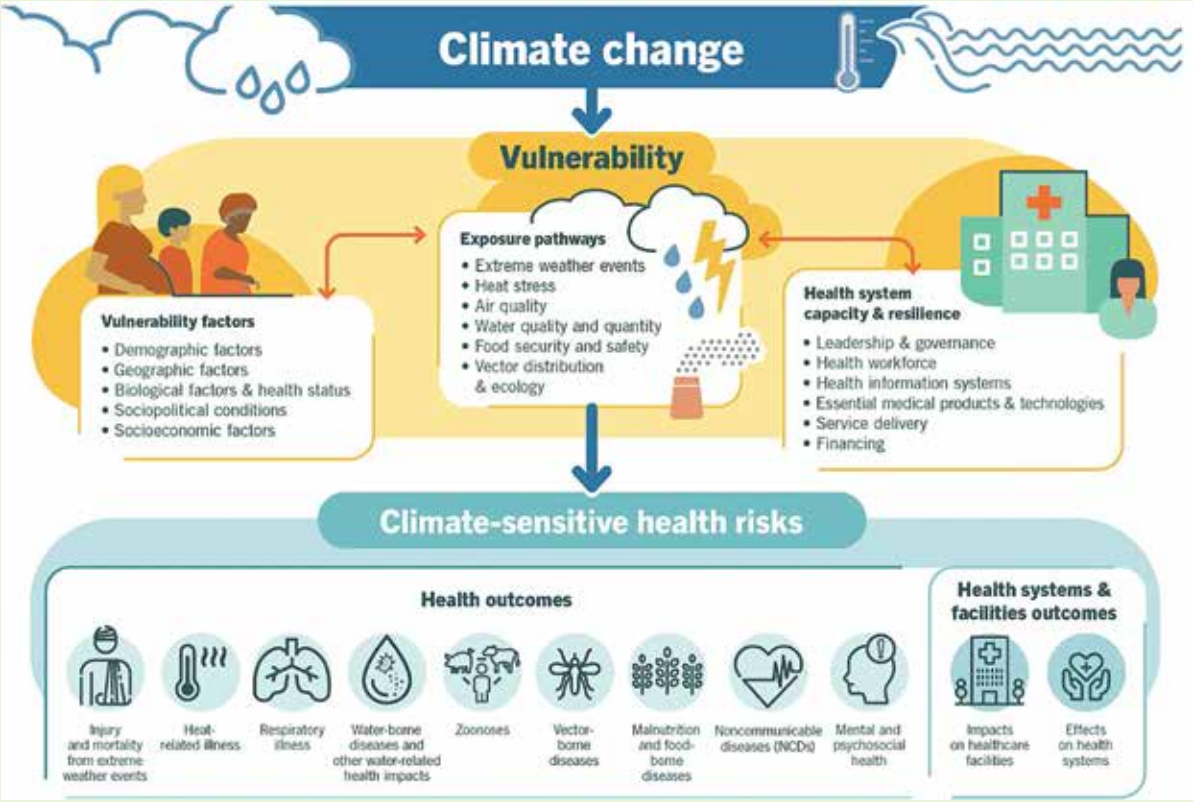
- Climate change affects the social and environmental determinants of health—clean air, safe drinking water, sufficient food, and secure shelter.
- Between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhea, and heat stress.
- The direct damage costs to health (i.e., excluding costs in health-determining sectors such as agriculture and water and sanitation), is estimated to be between $2 billion and $4 billion per year by 2030.
- Areas with weak health infrastructure—mostly in developing countries—will be the least able to cope without assistance to prepare and respond.
- Reducing emissions of greenhouse gases through better transport, food, and energy-use choices can result in improved health, particularly through reduced air pollution.

Source: WHO. 2021. *Climate Change and Health.* https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.

[104] Climate and Environment (CLIENT) Program in Central Asia: Pillar 1 RESILIAND CA+. https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Pillar%201.

[105] WHO. *Supporting Countries to Protect Human Health from Climate.* https://www.who.int/activities/supporting-countries-to-protect-human-health-from-climate-change.

Figure 21: Climate Change Causes Many Types of Health Risks



Source: World Health Organization. 2021. *Climate Change and Health*. https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.

The health impacts of climate change pose significant threats for the CAREC Region. The threats are manifested in a number of important areas:

(i) Despite the fast urbanization processes in the CAREC countries, a relatively large share of the population still lives in rural areas, where agriculture remains the main source of employment, income, and food. The natural hazards caused by the changing climate, such as water deficit, extreme weather conditions, droughts, flooding, desertification, and other similar factors, directly affect food production and productivity in both plant growing and cattle breeding by causing crop failure and livestock mortality, thus negatively affecting the level of nutrition and general health.[106]

(ii) The growing frequency of heat waves, floods, and droughts in the region in recent years have a direct impact on the health conditions of millions of people, especially among vulnerable groups such as children, elderly, and people with chronic diseases. The natural calamities caused by climatic events such as landslides, strong winds, and flash floods

[106] Climate Centre. *Fact Sheet 2021*. https://www.climatecentre.org/wp-content/uploads/RCCC-ICRC-Country-profiles-Region_Centra_Asia.pdf.

can pose direct threats to lives of people resulting in injuries and deaths, limiting access to clean water, electricity, transportation, and other public and health infrastructure. The hot summer days in the recent years in the region resulted in increased number of hospitalizations[107] and deaths[108] caused by heat.

(iii) Although the countries in the region achieved noteworthy progress in accessing clean water, that access is not yet universal. This infrastructural shortcoming will be aggravated by the growing water deficit due to climate change. The lack of access to the safe drinking and sanitation water can cause significant threats to the health of the population. The waterborne and other diseases outbreaks, which are already widely present in the region, will only increase in its frequency and scale.

(iv) According to WHO, the warming temperatures in the region will change the natural conditions, making it more favorable for insects carrying vector-borne diseases by spreading it wide areas, for example, hardly eradicated in 1970s, malaria is present again in the region. Climate change can lead to migration of new species of insects, which were not common in that geographic area, such as yellow fewer mosquito, and in general, mosquitos are expected to cover larger territories for a longer period of time due to extending warmer days.

(v) In the CAREC region, the climate change impacts the populations health directly and indirectly through various vulnerabilities as shown in Table 15.

The policy recommendations proposed by UNDP and WHO for how to deal with the impacts of climate change on health in the Europe and Central Asia region are of direct relevance also for the CAREC region:[109]

(i) *Enhancing climate and health evidence and risk knowledge* by better use of earlier warning and monitoring systems to analyze the climate impacts on health and allowing for more effective coordination among relevant national agencies.

(ii) *Ensuring that climate change and health considerations are mainstreamed* into solid national legislation and strategic development plans and policies for better health adaptation results.

(iii) *Building institutional capacity and enhance coordination* by improving both professional capacities of health institutions and material base of health facilities and effectively coordinating with other agencies for enhanced financial capacities of health-care system.

(iv) *Improving preparedness and enhancing climate action in the health sector* by supporting health ministries and health-care institutions to design and implement low-carbon emission development strategies, and guiding action toward climate-resilient health-care facilities.

(v) *Increasing climate and health literacy and promoting inclusive healthy lifestyles* through awareness raising campaigns and tailor-made learning and training resources integrating climate–health nexus knowledge into education system in all levels.

(vi) *Enhancing regional action and cooperation* by effectively engaging regional organizations and inter-state programs in finding meaningful synergies between climate and health initiatives and acceleration of knowledge sharing among relevant national agencies and research institutions.

[107] Sputnik. 2022, Due to the heat in Uzbekistan, thousand people were hospitalized. https://uz.sputniknews.ru/20220720/iz-za-jary-v-uzbekistane-gospitalizirovano-svyshe-4-tys-chelovek-26358844.html.

[108] A. Sharma, G. Andhikaputra, and Y-C. Wang. 2022. Heatwaves in South Asia: Characterization, Consequences on Human Health, and Adaptation Strategies. *Atmosphere.* 2022. 13(5). 734. https://doi.org/10.3390/atmos13050734.

[109] Summarized from WHO and UNDP. 2020. *Addressing Climate Change and Health in the Europe and Central Asia Region*. https://www.undp.org/eurasia/publications/addressing-climate-change-and-health-europe-and-central-asia-region.

Table 15: Direct and Indirect Health Impacts of Climate Change in the CAREC Region

The Direct Impact of Climate Change	The Indirect Impact or Long-Term Implications of Climate Change
• The risk of death and injury due to disasters: earthquakes, floods, landslides, mudflows, forest and steppe fires, and others. • Climate change aggravates the already existing shortage of water resources due to inefficient use and consumption. • An increase of air temperature and duration of hot days can pose threats of escalation or development of cardiovascular diseases. • The deterioration of air quality leads to increased incidence of various respiratory, allergic, and oncological diseases. • Global warming affects the prevalence of infectious diseases like cholera, hepatitis A, dysentery, encephalitis, and malaria.	• Impact on women's reproductive health due to lack of clean water and sanitation. • Reduced availability or increased cost of food leads to hunger and malnutrition. • Nature-induced calamities can lead to increased demand for electricity, power outages, and limited access to emergency and medical services. • Climate change can lead to forced migration of the population, the emergence of conflicts, unemployment, and an increase in crime. • Exacerbation of mental illness, such as stress, anxiety, and depression.[a]

CAREC = Central Asia Regional Economic Conference.

[a] WHO. 2022. Mental health and Climate Change: *Policy Brief*. https://www.who.int/publications/i/item/9789240045125.
Source: Adapted from UNDP 2022. How climate change affects the health of the population of Kazakhstan. https://www.undp.org/kazakhstan/stories/how-climate-change-affects-health-population-kazakhstan.

People's Republic of China. Vehicles passing through the Tarim oil and gas fields in Korla (photo by Deng Jia/ADB).

5 Crosscutting Climate Change Issues and Actions for the CAREC Region

Climate change action must address a number of crosscutting thematic issues. While not as central as the six core sector climate actions identified in Chapter 4, a number of important crosscutting issues also need to be tackled. These include (i) macroeconomic and structural policies; (ii) private sector and market mechanisms; (iii) ICT and digital processes; (iv) hydromet; (v) institutional capacity; (vi) cost and benefits of climate action (economic growth versus climate action); (vii just transition (winners and losers); (viii) gender; and (ix) communication and outreach (including education). Each item can be treated here only briefly.

5.1 Macroeconomic and Structural Policies

Coherent macroeconomic policies and structural policies in support of climate mitigation and adaptation are important complements to action in the core sector and thematic areas. That the International Monetary Fund (IMF) as the international guardian of sound macroeconomic policy has now become a key promoter of effective action on climate change speaks to the importance of macroeconomic policy as a tool to support climate change mitigation and adaptation. In a recent paper, IMF staff identified key macroeconomic policy instruments, distinguishing between fiscal, financial, and monetary tools[110] (Table 16). These instruments have both macroeconomic implications in the narrow sense (i.e., maintaining a stable and sustainable macroeconomic and fiscal position) as well as structural implications (i.e., supporting the transition toward a carbon-neutral economic structure through appropriate incentives and financing modalities nationally). Among the critical macroeconomic policy goals is to raise the domestic and external funding required to finance critical climate investments, while keeping inflation under control and avoiding an unsustainable external debt position for the country. This issue is further discussed under "financing climate action."

CAREC countries face difficult macroeconomic challenges as a result of the COVID-19 pandemic and the geopolitical tensions in the region that will in the short to medium term, complicate their efforts to address climate change. CAREC countries are profoundly affected by the current compound global economic crisis with rising commodity prices, inflation, and interest rates, disruptions in global value chains, with constrained access to global markets due to widespread sanctions (the Russian Federation, Iran, Afghanistan, and others). As a result, economic growth rates are depressed, access to domestic and international finance constrained,

[110] IMF. 2019. *Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature*. https://www.imf.org/en/Publications/WP/Issues/2019/09/04/Macroeconomic-and-Financial-Policies-for-Climate-Change-Mitigation-A-Review-of-the-Literature-48612.

Table 16: Macroeconomic Policy Tools for Climate Mitigation

Policy Area	Policy	Instruments	Examples
Fiscal Policy Tools	Carbon pricing, regulations	National carbon taxes, cap-and-trade (CaT) and emissions trading systems (ETS), emission or energy efficiency standards	Sweden carbon tax, California CaT, EU ETS, national feebates, EU regulations
	Public spending and investment	Public investment, social spending, lower labor, or capital taxes	EU Infrastructure Investment Plan
	Public–private partnerships	Partnership between private sector, government, development bank, long-term institutional investor	China Development Bank-Urban Development Investment Corporation
	Public guarantees	Loan commitments, credit or cash flow guarantees, multisovereign guarantees	World Bank Multilateral Investment Guarantee Agency (MIGA), European Investment Fund guarantee schemes
Financial Policy Tools	Redressing underpricing and lack of transparency of climate risks	Gathering climate-related financial data, climate-related risk disclosures, taxonomy of green assets, climate-related stress tests, macroprudential tools	Bank of England Supervisory Statement on Climate Change, France Article 173 of Energy Transition Law, Banco Central do Brasil, People's Republic of China mandatory disclosures
	Reducing short-term bias and improving governance frameworks of financial institutions	Prudential reforms, corporate governance reforms	Promotion of ESG criteria
	Supporting the development of green financial securities	Standardized taxonomy of green assets, low-carbon indices, platforms, and active issuance by authorities	PBoC national-level green bond taxonomy
	Actively promoting climate finance using financial regulatory tools	Green supporting and brown penalizing factors in capital requirements, international requirements of minimum amount of green assets on balance sheets, notional carbon prices	PBoC macroprudential policy framework, Banque du Liban reserve requirements
Monetary Policy Tools	Integrating climate risk analytics into collateral frameworks, central bank portfolio management, and QE	Developing own risk assessments, ensuring climate risks appropriately reflected in central bank asset portfolios	Bank of England, Bank of Japan, EIB bonds, Bangladesh Bank, DNB, Norges Bank
	Green QE and collateral frameworks	Better access to central bank funding schemes for banks that invest in low-carbon projects, central bank purchases of low carbon bonds issued by development banks	
	Credit allocation policies	Central bank credit allocation operations, adapting monetary policy frameworks	PBoC, Res. Bank of India, Bangladesh Bank

DNB = De Nederlandsche Bank; EIB = European Investment Bank; ESG = environmental, social, and governance; EU = European Union; PBoC = People's Bank of China; QE = quantitative easing.

Source: IMF. 2019. *Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature*. https://www.imf.org/en/Publications/WP/Issues/2019/09/04/Macroeconomic-and-Financial-Policies-for-Climate-Change-Mitigation-A-Review-of-the-Literature-48612.

and economic prospects are, at best uncertain.[111] Moreover, some CAREC countries are heavily indebted with limited access to additional external financial resources, aside from the financial support of bilateral and multilateral official funders which, however, are also limited and not costless (i.e., much of external official finance also adds to external debt). These realities will constrain the extent to which CAREC countries can pursue ambitious climate strategies that call for major new investments. However, these challenges should not stand in the way of pursuing many of the win–win strategies that promise climate transition benefits while also improving the efficiency of the economy and, hence, productivity or limiting detrimental environmental effects (e.g., pollution).

Decarbonization will present tough macroeconomic and structural policy choices for many governments of the CAREC region, especially those which have long relied heavily on oil, gas, and coal extraction; exports; and domestic consumption to sustain economic growth. Weaning countries off their reliance on these critical sources of energy will be economically and politically difficult. Even from a long-term perspective, it will be both inevitable and preferable to the alternatives. Inevitability arises because over time, nonrenewable energy will not likely remain competitive with renewables, and since trade policies in advanced countries will embody increasingly green requirements that restrict trade with countries that have failed to make the energy transition to renewables. The European Commission's Carbon Border Adjustment Mechanism introduced in 2021 represents a first step in this direction.[112] More analysis of these transition issues and advice to the countries concerned will be important and could be helpfully carried out on a regional basis.

Macroeconomic and structural policies are mostly national, but some regional coordination, benchmarking, and knowledge sharing can be helpful. Selected CAREC countries have pursued regional dialogue on macroeconomic management in the past, including under the umbrella of regular meetings of Central Bank governors and meetings of IMF constituency members.[113] Similar exchanges among ministers of finance and economy would be useful to help increase the focus on climate change in macroeconomic and structural policymaking and its harmonization among neighbors. The IMF's recently created regional office based in Almaty, the Caucasus, Central Asia, and Mongolia Regional Capacity Development Center (CCAMTAC) can serve as a partner for CAREC in supporting a regional dialogue on macroeconomic and structural policies.

5.2 The Private Sector and Market Mechanisms

The private sector plays a critical role in climate change mitigation and adaptation. Whether it is in the energy, water, agriculture, manufacturing, transport, or service sector, private businesses dominate the value chain. Even traditional publicly provided services rely on private firms to supply inputs and to

[111] IMF. 2022. *Regional Economic Outlook April 2022 Middle East Central Asia*. https://www.imf.org/en/Publications/REO/MECA/Issues/2022/04/25/regional-economic-outlook-april-2022-middle-east-central-asia; CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

[112] "On 14 July 2021, the Commission adopted a proposal for a new Carbon Border Adjustment Mechanism which will put a carbon price on imports of a targeted selection of products so that ambitious climate action in Europe does not lead to 'carbon leakage.' This will ensure that European emission reductions contribute to a global emissions decline, instead of pushing carbon-intensive production outside Europe. It also aims to encourage industry outside the EU and our international partners to take steps in the same direction." https://taxation-customs.ec.europa.eu/green-taxation-0/carbon-border-adjustment-mechanism_en.

[113] The Central Banks Governors' Club of Central Asia, Black Sea Region, and Balkan Countries also has met regularly since 1998, with its most recent meeting in December 2021, with one session focused on a discussion of the climate agenda and carbon neutrality. https://www.cbr.ru/eng/press/event/?id=12524.

purchase the output. Turning private businesses from positive to net-zero emitters,[114] which should be the long-term goal, requires a whole-economy approach. Relying on market mechanisms and incentives rather than on direct government involvement is generally the preferred approach. Many of the specific sector policies mentioned in the previous sections—including the elimination of energy and water subsidies, carbon pricing (see the energy section), climate-smart transport policies and economic corridors, and others—will go a long way to provide appropriate incentives for private business. Beyond that, the International Finance Corporation (IFC), the World Bank's private sector arm, stresses three more general policy prescriptions to unlock private investment for climate action: (i) achieve NDC goals, (ii) strengthen the private sector investment climate, and (iii) strategically use public sector finance (Box 6). In essence, private investors require a clear, long-term perspective on government policies toward climate change and a stable supportive policy regime. This will help them minimize the risks for business resulting from climate change as well as from climate policies. Therefore, well-designed and articulated climate change strategies, effective implementation of NDCs, and the development of realistic climate adaptation action plans will help convince private firms that they can move purposefully toward a net-zero business goal. [115]

Box 6

International Finance Corporation's Guide to Attract Private Investment for Climate Action

"To unlock private investment, governments must prioritize the following actions:

Achieve NDC goals. Countries should act quickly to integrate their NDC commitments into national development strategies and budget processes. Governments must put in place clear and consistent policies—such as carbon pricing, performance standards, and market-based support—and ensure that climate considerations are integrated into other sector policies.

Strengthen the private sector investment climate. Attracting private investment will require a robust domestic enabling environment, with reduced risks, strong competition, and measures to promote investment and capital flows.

Strategically use limited public finance. Government budgets will not be enough to address climate change. Governments should use public funds strategically to mobilize private capital by, for example, reducing risk and providing project support."

NDC = nationally determined contribution.

Source: Quoted from IFC. 2021. *Climate Investment Opportunities in Emerging Markets: An IFC Analysis.* https://www.ifc.org/wps/wcm/connect/59260145-ec2e-40de-97e6-3aa78b82b3c9/3503-IFC-Climate_Investment_Opportunity-Report-Dec-FINAL.pdf?MOD=AJPERES&CVID=lBLd6Xq.

[114] *McKinsey Sustainability*. 2022. Taking the First Steps Toward Net-Zero Emissions. https://www.mckinsey.com/business-functions/sustainability/our-insights/taking-the-first-steps-toward-net-zero-emissions?cid=other-eml-alt-mip-mck&hdpid=335a42e2-c11f-4f8e-8031-89708951a6f1&hctky=3196546&hlkid=3106a3f3c6054e619300a16700069790.

[115] For relevant insights on the role of the private sector and how to turn private business into net-zero carbon emission actors, see the following references on which this subsection is based: McKinsey Sustainability. 2022. Taking the First Steps Toward Net-Zero Emissions. https://www.mckinsey.com/business-functions/sustainability/our-insights/taking-the-first-steps-toward-net-zero-emissions?cid=other-eml-alt-mip-mck&hdpid=335a42e2-c11f-4f8e-8031-89708951a6f1&hctky=3196546&hlkid=3106a3f3c6054e619300a16700069790; IFC. 2021. *Climate Investment Opportunities in Emerging Markets: An IFC Analysis.* https://www.ifc.org/wps/wcm/connect/59260145-ec2e-40de-97e6-3aa78b82b3c9/3503-IFC-Climate_Investment_Opportunity-Report-Dec-FINAL.pdf?MOD=AJPERES&CVID=lBLd6Xq; EBRD. 2021. *Action Plan on Mobilising Private Capital for Climate Finance.* https://www.ebrd.com/news/2021/at-cop26-ebrd-launches-plan-to-mobilise-private-capital-for-climate-finance.html; ADB. 2021. *ADB Urges Private Sector Investments in Energy Efficiency in CAREC Region.* https://www.adb.org/news/adb-urges-private-sector-investments-energy-efficiency-carec-region; ODI. *The Private Sector and Climate Change in Developing Countries.* https://odi.org/en/insights/the-private-sector-and-climate-change-in-developing-countries/.

An array of policy instruments can, in principle, be deployed to support private sector engagement in support of climate change goals. Figure 22 summarizes the principal policy instruments, vertically grouped by information and empowerment instruments, control and regulatory instruments, economic and market instruments, institutional instruments, and financial instruments. Moreover, the principal policy instruments are horizontally grouped by whether they fix or shape markets (or create markets) and whether they work on the demand- or supply-side. More analysis is needed to apply these principles specifically in the CAREC region, which is beyond the scope of this study but could be one of the research tasks to be carried out in the future.

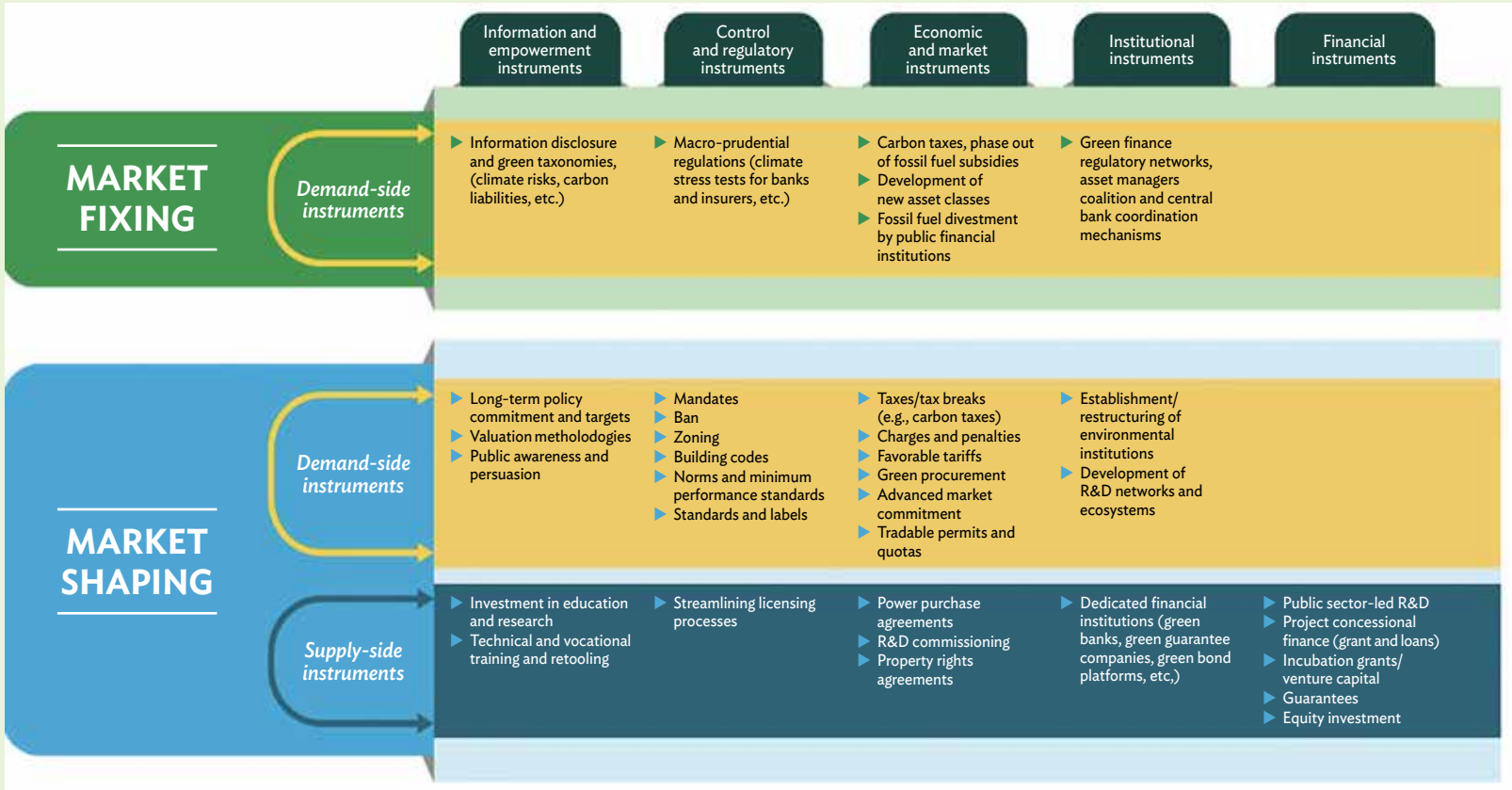
Beyond government policy and regulation, private firms may find it in their business interest voluntarily to pursue explicit environmental, social, and governance (ESG) goals. The importance of ESG is increasing in industrial countries, where it covers a wide range of environmental, social, and governance goals, including the climate-related goal of limiting greenhouse gas (GHG) emissions (Table 17). The key to an effective ESG approach is to set clear goals (e.g., a net-zero emissions target) and then monitor and report transparently on progress toward this target. Private investors in industrial countries increasingly consider the ESG performance of companies when making their investment decisions and this will likely also eventually affect foreign investments in the CAREC region. A recent paper prepared for the CAREC Institute's Annual Research Conference 2022 reviewed the application of corporate social responsibility (CRS) practices—a concept closely related to ESG—in selected firms in Kazakhstan and Mongolia and found that CRS is taking hold to some extent, especially in the extractive sectors, but notes that so far, much of this is driven by government regulations, rather than by spontaneous private business decisions or investor preferences.[116]

Private climate action can be supported by regional cooperation and coordination. Private investment —and especially foreign direct investment—in a particular country, especially in small countries, takes account of the business climate, policies, and business opportunities in neighboring countries, since value chains often involve purchasing from and selling to markets beyond the country's borders, especially for smaller and landlocked countries. Therefore, coordinated action by governments in a region in designing and implementing climate strategies and policies will support climate-responsive and proactive climate action by private businesses. Moreover, sharing knowledge and lessons among governments from engaging the private sector; creating supportive business environments; and preparing and implementing effective climate strategies, NDCs, and adaptation plans will be helpful. Finally, regional private investment forums, such as those supported by CAREC Energy, are good platforms for sharing opportunities, developing business links, and forming partnerships,[117] and national private business forums such as chambers of commerce should be encouraged to link up across borders and focus their activities on sharing knowledge, lessons, and best practices in the climate arena.

[116] CAREC Institute. 2022. *Corporate Social Responsibility (CSR) and Sustainable Economic Development in Kazakhstan and Implications for Mongolia*.

[117] CAREC Energy. 2021. *The 2021 CAREC Energy Investment Forum Focused on Energy Efficiency. Investing in Energy Efficiency*. https://carec-eif.org.

Figure 22: Policy Instruments for Developing Private Sector Engagement in Climate Change Action



R&D = research and development.

Source: Adapted by Y. Glemarec, based on Green Climate Fund. 2021. *Scaling Up Climate Finance in the Context of COVID-19*. https://www.greenclimate.fund/sites/default/files/document/scaling-climate-finance-context-covid-19-full-report_0.pdf.

Table 17: Environmental, Social, and Governance Factors

Environment	Social	Governance
Energy Management	Human Rights and Community Relations	Supply Chain Management
Biodiversity and Ecological Impact	Employee Engagement, Diversity, and Inclusion	Business Model Resilience
Air Quality	Workforce Health and Safety	Critical Incident Risk Management
GHG Emissions	Labor Practices	Management of the Legal and regulatory Framework
Water and Wastewater Management		Business Ethics and Transparency

GHG = greenhouse gas.

Source: Authors, based on EIG. 2022. *ESG and Climate Policy*. https://eigpartners.com/wp-content/uploads/2022/09/ESG-and-Climate-Policy-072022.pdf.

5.3 Information and Communication Technology Development and the Digital Economy

Information and communication technology (ICT) and the digital economy are important for climate change mitigation and adaptation in the public and private sectors. ICT and digital connectivity have become core drivers of economic growth. The COVID-19 crisis accelerated an already rapid progress in this area and demonstrated—if demonstration was needed—that without these drivers, economic and social development would be severely impaired in general, and especially in times of pandemic crisis and economic stress. Digital connectivity is also essential for climate change mitigation and adaptation. It supports the hydromet value chain (see hydromet section) as it allows the collection and sharing of digitalized real-time and historical climate data, facilitates the forecasting of extreme weather events and speeds up early warning communication with governments, communities, and individuals in the case of impending severe weather events.[118] Digitalization can make agriculture more efficient as well as climate-smart and resilient, with similar benefits accruing to other sectors in the economy, including energy, transport, trade (e-commerce), industry, and government (e-government). In each area, digitalization and digital connectivity have the potential to reduce the need for and increase the efficiency of carbon utilization by replacing in-person contacts with virtual contacts, while enhancing the efficiency of production processes, supply chain management and, hence, energy use.[119] Accordingly, the CAREC Digital Strategy identifies leveraging digital technologies as a way to mitigate the effects of climate change and natural hazards and reduce greenhouse gas emissions.[120]

[118] Systematic Financing Facility (SOFF). 2021. SOFF Terms of Reference. https://alliancehydromet.org/soff/.

[119] ADB. 2020. *Accelerating Climate and Disaster Resilience and Low-Carbon Development through the COVID-19 Recovery*. p. 9. https://www.adb.org/sites/default/files/publication/647876/climate-disaster-resilience-low-carbon-covid-19-recovery.pdf.

[120] CAREC Digital Strategy 2030. p. 11. https://www.adb.org/documents/carec-digital-strategy-2030#:~:text=and%20Inclusive%20Growth-,CAREC%20Digital%20Strategy%202030%3A%20Accelerating%20Digital%20Transformation,Regional%20Competitiveness%20and%20Inclusive%20Growth&text=The%20Central%20Asia%20Regional%20Economic,among%20the%20program's%20member%20countries.

However, to move up the digitalization ladder, CAREC countries need to improve their ICT and digital infrastructure and digital adoption, including through regional cooperation. Currently, many countries in the region have shortcomings in particular dimensions of digital infrastructure (Table 18) and adoption (Table 19). The CAREC Digital Strategy calls for regional cooperation to assure digital access and services are available to all (Box 7). Such cooperation will also help in implementing the ambitious climate goals of the countries in the CAREC region.

Table 18: Composite Digital Divide Index, 2020

	Cost and afford-ability	Access and infra-structure	Internet quality	Regu-lations	Digital security	ICT output	Digital FDI	CDDI
Azerbaijan	0.86	0.92	0.28	0.33	0.95	0.17	0.00	0.62
Georgia	0.88	0.88	1.00	1.00	0.85	0.04	0.09	0.86
Kazakhstan	1.00	1.00	0.81	0.57	1.00	1.00	0.95	1.00
Kyrgyz Republic	0.34	0.49	0.82	0.40	0.44	0.14	0.23	0.41
Mongolia	0.87	0.64	0.26	0.68	0.14	0.91	0.46	0.62
Pakistan	0.51	0.12	0.72	0.20	0.64	0.06	0.71	0.33
Tajikistan	0.00	0.21	0.64	0.12	0.03	0.01	0.26	0.08
Uzbekistan	0.76	0.70	0.20	0.24	0.73	0.01	0.37	0.40

CDDI = Composite Digital Divide Index, FDI = foreign direct investment, ICT = information and communication technology.

Note: The seven dimensions of the CDDI were derived through Principle Components Analysis based on 25 indicators reaching from the cost of broad band access in % of gross national income (GNI) per capita over e-commerce safety to FDI in the ICT sector of the CAREC economies; colors represent quartiles of the index scores, with dark green the highest quartile and dark red the lowest.

Source: CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

Table 19: Digital Adoption Index

Country	Digital Adoption Index (Rank)*	Digital Adoption Index	DAI Business Subindex	DAI People Subindex	DAI Government Subindex
Kazakhstan	45	0.671	0.600	0.573	0.839
Georgia	68	0.599	0.642	0.484	0.670
Azerbaijan	71	0.594	0.509	0.523	0.751
People's Republic of China	74	0.586	0.548	0.525	0.686
Mongolia	84	0.538	0.653	0.348	0.612
Kyrgyz Republic	96	0.499	0.609	0.349	0.539
Uzbekistan	121	0.401	0.359	0.313	0.531
Pakistan	122	0.400	0.471	0.162	0.566
Afghanistan	134	0.343	0.342	0.123	0.564
Tajikistan	141	0.323	0.417	0.236	0.317
Turkmenistan	154	0.272	0.440	0.293	0.085
Average of 180 countries	90.5	0.516	0.574	0.442	0.530

The DAI ranges from 0 to 1 (worst to best); green: highest, yellow: medium, red: lowest.

* Among 180 countries; blue italics indicate scores below average (assigned by the authors).

Source: Digital Adoption Index 2016; CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

Box 7

Regional Cooperation under the CAREC Digital Strategy 2030

"[T}he CAREC Digital Strategy 2030 adopts the mission of creating a data-driven digital regional economy with fast and reliable online access to relevant information and trusted, real-time, user-friendly digital services for all citizens, businesses, and administrations across the CAREC region. This mission will be achieved through the following objectives:

Encourage investment in the digital infrastructure across the region to close connectivity gaps.

Harmonize digital and data legislature to promote an enabling environment.

Develop new digital skills, including for women, disadvantaged, and minority populations, to create jobs.

Attract talent into the region to strengthen CAREC's innovation ecosystem.

Reduce regional trade barriers to increase cross-border trade and expand business opportunities for companies across the region, particularly in e-commerce.

Improve the digital foundations and create interoperable digital platforms to enable the development of CAREC's operational clusters."

CAREC = Central Asia Regional Economic Cooperation.

Source: CAREC. 2022. *CAREC Digital Strategy 2030*. https://www.adb.org/sites/default/files/institutional-document/777876/carec-digital-strategy-2030.pdf.

5.4 Hydromet Development

Weather and climate observations are critical elements in the deployment of hydrometeorological information for weather forecasts in support of farming; wind, solar, and hydro energy; transport and construction; and early warning regarding weather-related disasters, and they are critical inputs for longer-term climate prediction. The lack of accurate and reasonably densely spaced observations means that local, regional, and global weather and climate forecasts are substantially lower in quality than they need to be for the users of this information in the "hydromet value chain" (Figure 23). The global benefit from improved observations to an agreed-on minimum standard worldwide is on the order of $5 billion per annum. Investments to make this possible have a 25:1 benefit–cost ratio.[121] Since weather and climate patterns are regional (as well as global and local), investments in gathering and sharing local weather information have a regional public goods dimension and need to be planned, implemented, and maintained with the regional perspective in mind. This regional public goods perspective is reflected in the World Bank/GFRR decade-long CAWEP support for Central Asia's regional hydromet development. Under it, a regional platform is to be established for hydromet development in Central Asia (including potentially

Figure 23: Weather and Climate Observations Are Critical for Delivery of Resilient Development and Climate Action

Source: Systemic Observations Financing Facility. 2022. *Systematic Observations Financing Facility Terms of Reference*. https://alliancehydromet.org/wp-content/uploads/2021/10/SOFF-Terms-of-Reference.pdf.

[121] SOFF. 2022. *Systematic Observations Financing Facility Terms of Reference*. https://alliancehydromet.org/wp-content/uploads/2021/10/SOFF-Terms-of-Reference.pdf.

Afghanistan) supported by many development partners.[122] At a global level, the Systematic Observations Financing Facility (SOFF) was established in 2022 to provide support for assessments of hydromet gaps for all developing countries[123] and financing for investments and for operation and maintenance to ensure weather observation systems of the Small Island Developing States and Least Developed countries are up to global minimum standards.[124] Countries in the CAREC region can benefit from SOFF support individually or as a group. Since some of the meteorological centers in the region are providing high-quality services (for example, Kazhydromet was recently assessed as a high-quality meteorological service provider),[125] they could serve as peer advisers to other countries in the region with weaker capacity. The creation of a forum for meteorological and hydromet service providers could be established under the CAREC umbrella and with SOFF support.

5.5 Institutional Capacity

Institutional capacity for climate change strategy design and implementation needs to be strengthened in many CAREC countries. Effective climate action requires a "whole of the economy approach" in view of the many overlapping sectors and thematic aspects of climate challenges.[126] This, in turn, requires a strong capacity in government to develop and implement responsive and proactive policies, build collaborative mechanisms with relevant stakeholders (private sector, civil service organizations (CSOs), and academic communities) and support their activities with appropriate policies, interventions, and projects. The work with the private sector needs to unlock the potential of private entities to find solutions to climate change through blended finance, technology transfer, and applying sustainable practices, all of which require institutional capacity to deploy. The CSO sector's "watchdog" activities could compensate for the lack of effective and transparent monitoring functions of government agencies on climate, while think tanks and universities could offer their services in obtaining an evidence base to support national policies and reforms.

There are no good summary metrics for measuring the institutional capacity of countries for designing and implementing climate change strategies, but as a proxy, indexes of the effectiveness of governments can be used. The Government Effectiveness Index (GEI) is one such index that is widely used. Table 20 shows the rankings and index values of CAREC countries. Georgia and the PRC are in the top quartile of the ranking, and Kazakhstan in the second quartile; for all three the index values are positive, i.e., above average worldwide. Azerbaijan, Mongolia, Uzbekistan, the Kyrgyz Republic, and Pakistan are in the third quartile, while Turkmenistan and Afghanistan fall in the fourth quartile; for all these eight countries the index values are negative, i.e., below average. As a cross-check, Table 20 also shows the "governance index" of the Bertelsmann Transformation Index (BTI), which measures the steering and managing capacity of government.

[122] World Bank Hydromet Support in Central Asia. 2020. *22nd COSMO General Meeting*. http://www.cosmo-model.org/content/consortium/generalMeetings/general2020/plenary/WB_CentralAsia.pdf.

[123] The Hydromet Gap Report by the Hydromet Alliance for Development contains an assessment of the hydromet system in the Kyrgyz Republic. https://alliancehydromet.org/wp-content/uploads/2021/07/Hydromet_Alliance_Gap_Report_v7_LOW_RES.pdf.

[124] SOFF. 2022. *Systematic Observations Financing Facility Terms of Reference*. https://alliancehydromet.org/wp-content/uploads/2021/10/SOFF-Terms-of-Reference.pdf.

[125] World Bank. 2022. *Assessment of Kazakhstan's Capacity to Monitor, Forecast, Project and Warn on Climate-Related Hazards*. https://documents1.worldbank.org/curated/en/099610508192217437/pdf/IDU023b552a70b1d604d7b09cda0fa89e9fa3b59.pdf.

[126] M.S. Ahluwalia and U. Patel. 2022. Climate Change Policy for Developing Countries, in H. Kohli, R. Nag. and I. Vilkeltye, eds. 2022. *Envisioning 2060*. Haryana, India: Penguin Random House.

Table 20: Ranking of CAREC Countries in the Government Effectiveness Index, 2020, and the Bertelsmann Transformation Index,* 2022

Country	GEI Rank (of 192 total)	GEI Index 2020	BTI Index 2022
Georgia	45	0.79	5.6
People's Republic of China	47	0.65	5.3
Kazakhstan	72	0.16	4.6
Azerbaijan	103	–0.17	4.0
Mongolia	112	–0.34	5.9
Uzbekistan	124	–0.52	3.8
Kyrgyz Republic	126	–0.54	4.4
Pakistan	130	–0.55	3.5
Tajikistan	145	–0.71	3.2
Turkmenistan	169	–1.16	2.2
Afghanistan	182	–1.52	NA

BTI = Bertelsmann Transformation Index, CAREC = Central Asia Regional Economic Cooperation, GEI = Global Effectiveness Index, NA = not available.

* The index values refer to the BTI Governance Index.

Note: Green shading indicates more positive, pink and red more negative performance.

Source: The Global Economy.com. https://www.theglobaleconomy.com/rankings/wb_government_effectiveness/; The Bertelsmann Transformation Index. https://atlas.bti-project.org/share.php?1*2022*GV:SIX:0*CAT*ANA:REGION.

The GEI and BTI indexes provide broadly comparable results, except that Mongolia is ranked highest among CAREC countries under the BTI, and the Kyrgyz Republic also rates more highly than under the GEI. For the area of climate change, interviews with climate experts from multilateral organizations indicate that in their judgment, much needs to be done in the CAREC region to strengthen the governmental capacity for climate change strategy formulation and implementation across the entire public sector, at national, provincial, and local levels. This includes strengthening the capacity of regionally focused organizations and platforms. Among CAREC countries, the PRC very likely has the highest capacity for climate change strategy and policy analysis.

Efforts to strengthen climate change policy and implementation capacity need to be country-focused, but regional initiatives can help reinforce national efforts. Among the regional efforts, the CAREC Institute (CAREC) and the Central Asia Regional Environmental Center (CAREC-E) stand out for having demonstrated relatively strong capacities for climate change analysis, regional policy formulation, and capacity building. In addition, some of the universities and think tanks in the countries pursue regional approaches to climate change. Multilateral and bilateral development partners also engage in capacity-building efforts, including ADB with its technical assistance instrument (and the CAREC Secretariat, in particular, see Chapter 8), World Bank, and others. More of this will be needed in the future, as the skills base needs to be strengthened in many countries, including for hydromet-related capacities, for research in climate change prospects and impacts, for analyzing and interpreting policy options, and for the preparation of bankable projects.

5.6 Benefits and Costs of Climate Action

Climate experts and advocates argue that climate action promises benefits that will greatly exceed costs. However, in the popular and political debate, opinions differ and sometimes differ widely on whether the benefits of climate action outweigh the costs. Most climate scientists are convinced that the risks of inaction—or sticking with business-as-usual (BAU)—is a prescription for global disaster and that, therefore, the long-term benefits from addressing climate change far outweigh the costs and acting decisively and with urgency is essential.[127] But there is an even more far-reaching argument in favor of a transition to a low-carbon economy, that is an argument for a "New Climate Economy," which posits that climate action is not just needed to avoid critical long-term risks from global warming, but that growth— "quality growth"—will be enhanced by a timely and effective transition to a low-carbon economy. This argument is most forcefully articulated by the 2018 report of the Global Commission on the Economy and Climate: "The growth story of the 21st century will unlock unprecedented opportunities and deliver a strong, sustainable, inclusive global economy. The benefits of climate action are greater than ever before, while the costs of inaction continue to mount. It is time for a decisive shift to a new climate economy."[128] This argument was also supported by a 2020 publication of ADB, citing both a 2014 report of the Global Commission on the Economy and Climate and specific examples of significant benefits from climate action (Box 8). A 2022 report by McKinsey on the net-zero transition by 2050 broadly agrees with the conclusion that climate action has long-term benefits but also notes that investment requirements as a percent of GDP will be higher for developing and fossil-fuel-producing countries than for the advanced economies and the PRC and that the former set of countries will also face higher climate transition exposure and, hence, adaptation requirements. At the same time, the report argues, all countries, including the developing economies, face opportunities for enhanced growth and employment as they transition to a net-zero economy.[129]

A nuanced view on the costs and benefits of climate action and more research are needed for CAREC countries. It is difficult firmly to quantify costs and benefits of climate action at the country or regional level, but the net benefits (i.e., benefits net of costs) are highly likely to be positive and significant for five main reasons:[130]

(i) The impact of climate change is a lot worse than what was expected just a few years ago, and it is unevenly distributed in terms of warming and precipitation; for warming, Africa, South Asia, and Central Asia are worse affected than the global average. Climate action is a true global public good, requiring collective action with no free riders.

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[127] WMO. 2022. *State of the Global Climate 2021*. https://library.wmo.int/doc_num.php?explnum_id=11178; IPCC. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. https://www.ipcc.ch/report/ar6/wg2/.

[128] New Climate Economy, Global Commission on the Economy and Climate. 2018. *Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times*. https://newclimateeconomy.report/2018/wp-content/uploads/sites/6/2019/04/NCE_2018Report_Full_FINAL.pdf. This report builds on a 2014 report by the Global Commission on the Economy and Climate. https://sustainabledevelopment.un.org/content/documents/1595TheNewClimateEconomyReport.pdf).

[129] McKinsey & Company. 2022. The Net-Zero Transition: What it Would Cost, What it Could Bring. https://www.mckinsey.com/business-functions/sustainability/our-insights/the-net-zero-transition-what-it-would-cost-what-it-could-bring.

[130] The arguments in this paragraph represent a summary of an interview by the authors with Amar Bhattacharya, Senior Fellow of the Brookings Institution and co-author with Nicholas Stern and others of many reports on climate change, including A. Bhattacharya et al. 2022. *Financing a Big Investment Push in Emerging Markets and Developing Economies for Sustainable, Resilient and Inclusive Recovery and Growth*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, and Washington, DC: Brookings Institution. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/05/Financing-the-big-investment-push-in-emerging-markets-and-developing-economies-for-sustainable-resilient-and-inclusive-recovery-and-growth-1.pdf.

Box 8

Costs and Benefits of Climate Action: An Asian Development Bank View

"A low-carbon, resilient pathway will not necessarily raise the level of investment spending on the recovery effort. Rather, it will require a shift in the nature of interventions. Analysis done by the Global Commission on the Economy and Climate in 2014 established that strong climate action by countries between 2018 and 2030 could, by 2030, generate over 65 million new low-carbon jobs, deliver at least $26 trillion in net global economic benefits, and avoid 700,000 premature deaths from air pollution. There is a wide range of interventions that can deliver strong economic and social benefits to achieve recovery goals, and at the same time address climate change and improve resilience. Ample analysis exists to support this, as outlined in this technical note. For example:

- building insulation retrofits or clean energy infrastructure are labor-intensive in the early stages, can deliver high multipliers and have high returns over the long-term by driving down the cost of the clean energy transition. One widely cited model suggests that every $1 million in spending generates 7.49 full-time jobs in renewables infrastructure and 7.72 full-time jobs in energy efficiency but only 2.65 full-time jobs in fossil fuels;
- recent economic analysis by the Climate Council of Australia (as part of its proposed Clean Job Plan), estimates that investment in pilot-scale hydrogen facilities would unlock A$4 for every dollar of public investment; utility-scale renewable energy would elicit A$3 of every dollar invested; and electric vehicle infrastructure, improving the collection and processing of organic waste, and community scale energy and storage would return A$2 for every dollar invested; and
- recent estimates suggest that the net benefit of investing in more resilient infrastructure in low- and middle-income countries is $4 in benefit for each $1 invested." (p. viii)

"Recent estimates suggest that investing in more resilient infrastructure in low- and middle-income countries produces a net benefit of $4 for each dollar invested. Climate change makes action on resilience even more necessary and attractive: on average, the net benefits of taking resilience measures are doubled." (p. 10)

"Recent estimates show that investing $1.8 trillion globally in five climate adaptation areas, including strengthening early warning systems in 2020–2030, could generate a total of $7.1 trillion in new benefits." (pp. 10–11)

Source: ADB. 2020. *Accelerating Climate and Disaster Resilience and Low-Carbon Development through the COVID-19 Recovery: Technical Note*. https://www.adb.org/sites/default/files/publication/647876/climate-disaster-resilience-low-carbon-covid-19-recovery.pdf.

(ii) Costs of the net-zero transition have come down when comparing clean versus dirty energy, even in purely financial terms; after accounting for the cost of storage, the cost of renewables is now less than fossil fuel energy.

(iii) Co-benefits are large. There are many win–win actions as noted in this report, especially for energy, water, agriculture, and cities (e.g., pollution reduction).

(iv) For renewable energy, in particular, one tends to forget the high capital cost of fossil fuel development (exploration, production, and others). The savings from going clean energy are 10% of global GDP ($10 trillion) globally and higher yet in developing countries (in India: 23% of GDP). This is on the supply-side; additional investments are needed on the demand side for users to be able to use clean energy (transition from coal, oil, gas, to electric energy). Although there are no hard estimates, the conclusion is that clean energy has a win–win outcome.

(v) CAREC countries will in any case face significant adjustment requirements as the European Union (EU) is poised to introduce its Carbon Border Adjustment Mechanism

(CBAM), which will tax imports into the EU of products with high-carbon intensity to equalize the price of carbon between domestic products and imports.[131]

As noted in the section on macroeconomic and structural issues, there are, however, transition problems that need to be addressed. In particular, exit from coal, oil, and gas for existing energy producers with sunk capital costs and heavy reliance on fossil fuels in production, consumption, and exports, such as Kazakhstan and Turkmenistan, is a problem. More generally, carbon-intensive sectors will see reductions in output and employment, while low-carbon sectors and new climate action-responsive activities will see growth and employment opportunities. More research into what the most appropriate timing and sequencing of transition for CAREC countries will be helpful to inform decision-making at the national level. Regional-level research on this topic will be particularly helpful for CAREC countries, for which all climate change research as yet has been in short supply (the PRC excluded).[132]

5.7 A Just Climate Transition

While overall the climate transition should result in aggregate net benefits on a global and country basis, there will be winners and losers from climate change and climate change action and, hence, a just transition needs to be the goal. Climate change affects different social groups differently and actions to mitigate and adapt to climate change will also have differential impacts on different people. According to the World Resources Institute, "[a] just transition means equitably distributing the costs and benefits of climate action, ensuring that:

(i) Social dialogue and stakeholder engagement take place among workers, employers, governments, communities, and civil society;
(ii) Affected workers and communities receive the support, social protection, and investments they need to work and thrive in a zero-carbon future;
(iii) Revenue streams that governments currently receive from fossil fuel production will be replaced in equitable ways; and
(iv) Companies create decent jobs and contribute to economic growth while taking positive action on climate change."[133]

The Climate Investment Fund (CIF) notes that we need a just transition because it is a moral duty, because successful climate action depends on it, and because it is an opportunity to create a better society (Box 9).

With their vastly different economic and social structures, CAREC countries will face different transition challenges and, hence, different distributions of benefits and costs across communities and social strata. For example, oil, gas, and coal-rich countries (Kazakhstan, Turkmenistan, Uzbekistan) should expect over time to see these carbon fuel sectors lose business and

[131] For more background on CBAM see European Union. 2022. *Carbon Border Adjustment Mechanism*. https://taxation-customs.ec.europa.eu/green-taxation-0/carbon-border-adjustment-mechanism_en. According to CAREC Institute: "[m]ineral fuels accounted for 67 percent of Kazakhstan's exports in 2019. Of these, 59 percent (39 percent of Kazakhstan's total exports) went to the European Union. The figures for Azerbaijan are 90 percent of exports, of which about one-half go to the European Union." CAREC Institute. Forthcoming. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable and Inclusive Recovery*.

[132] For example, the McKinsey 2022 report on net-zero transition covers the PRC to some detail, but not other CAREC countries.

[133] World Resources Institute website. *About Just Transitions*. https://www.wri.org/just-transitions/about.

Box 9
Why Do We Need a Just Transition?

- It is a moral duty: Climate action is picking up pace and the kind of rapid and deep change it is seeking will impact many parts of society, and, in many cases, hit the most vulnerable hardest. There is now a pressing responsibility to prepare people and support them through the transition.
- Successful climate action depends on it: Equitable and inclusive climate action is likely the only way to successfully transition at the speed and scale required. Addressing the risks to and rights of affected communities and future generations in a changing climate can alleviate legitimate concerns and potential resistance to change.
- It is an opportunity to address injustices and build a more equal, safe, resilient, and sustainable society. Developing countries are presented with a significant opportunity to capitalize on green growth approaches that could see them leapfrog unsustainable and wasteful development patterns.

Source: Climate Investment Fund. 2021. Quoted from *Transition to a low carbon and climate resilient future*. https://www.climateinvestmentfunds.org/sites/cif_enc/files/meeting-documents/joint_ctf-scf_tfc.24_8_discussion_paper_supporting_just_transition.pdf.

employment; countries heavily dependent on agriculture may have to move from traditionally intensively irrigated crops to crops that depend less on irrigation, which will benefit certain farming communities and harm others. Some countries, and some communities within countries are more affected than others by disasters triggered by natural hazards and remedial action to cope with them. Each country will have to seek to design and implement its approach to a just transition as part of its national climate change strategy based on what are the climate change impacts and the climate transition requirements facing each country. However, countries can benefit from analysis of how other countries in a region are affected by climate change and how they respond to achieve a just transition. Establishing common benchmarks and jointly monitoring processes can add to the effectiveness of the implementation of just climate transition strategies.

Just transition could also mean fair and equitable distribution of costs and benefits from climate action across countries globally and within a region. Globally, it is well-established that advanced countries have contributed much more to cumulative carbon emissions than have developing countries, even though the developing countries' emissions have been rising at a more rapid pace in recent years than advanced countries' emissions, as developing countries aim to catch up with their advanced peers in terms of industrialization, urbanization, and prosperity. Finding a just distribution of mitigation requirements across countries, and a just level of financial contribution by the advanced countries to support the climate mitigation and adaptation measures in developing countries has been the subject of intense negotiations at the United Nations Framework Convention on Climate Change (UNFCCC) Conferences of the Parties (COPs) over recent decades and will continue in the years to come. Effective representation of the interests of the developing countries at COPs and their preparation is an important factor in ensuring that just outcomes are achieved. Regional organizations can be effective voices in the global climate forums in general, and at the COPs in particular. At COP26 in 2021, Central Asian countries stated their common position and had a joint pavilion at the conference to help give a more effective voice to their collective interest. Within a region, there are also issues of just transition to be considered since, as noted earlier, countries are differently affected. Particularly, countries that are more advanced

than others in a region may wish to provide support for the climate transition in the poorer countries, financially or with technology transfer and capacity-building efforts under the umbrella of South–South cooperation. The PRC's Belt and Road Initiative is an example of this kind of support and has since 2019 been focused more than previously on social and environmental issues, including climate change.[134] Moreover, where regional public goods are at stake, for example, in the water and energy area, assuring a just or fair allocation of water and the costs of investment in common infrastructure and of the benefits derived from it, difficult as it may be in practice to agree among countries how such agreements should be structured. Regional organizations such as CAREC can play a role in facilitation considerations and negotiations about what are just arrangements.

5.8 Gender

Just transition also commonly includes how men and women are affected by climate change and whether and how they are affected by and involved in climate transition action. Women face greater economic insecurity due to their reliance on threatened natural resources[135] and many women and girls face a heightened susceptibility to external events, such as climate-related disasters and its negative impact on their economic opportunities, as noted in the CAREC Gender Strategy.[136] The CIF paper entitled "Pathways for Just Transitions: Gender Responsive Policies & Place Based Investment"[137] provides additional examples of how the climate transition can differently affect women and men, e.g., in the mining sector, in how employment shifts within and across sectors, in terms of access to formal sector jobs and finance, in business development, and others, all of which come into play with the climate transition. The CIF paper also lays out approaches and tools for how the gender dimensions of the climate transition can be addressed, including gender-based impact analysis and policy assessments, training, and capacity-building, as well as community-based engagement and empowerment of women who often have less voice and limited access to resources than men.

Gender aspects have been recognized in the UNFCCC and also in the Nationally Determined Commitments of selected CAREC countries. UNFCCC acknowledged the link between gender and climate in 2001 with Decision 36/CP.7[138] formally addressing women's representation and participation. The UNFCCC's 25th Conference of the Parties (COP25) in 2019 led to an agreement on a 5-year Enhanced Lima Work Program on Gender (LWPG) and its gender action plan (Decision 3/CP.25).[139] Furthermore, the UNFCCC Paris Agreement[140] of 2015 and its implementation guidelines[141] of 2018 recognize gender equality and women's empowerment as guiding principles for climate action.[142] Under the Paris Agreement, all countries are to take into account the importance of adopting a gender-responsive approach in their NDC development and

[134] According to Kohli et al. Forthcoming. *The Belt and Road Initiative and Global 2030 Sustainability Goals: Evolution of the BRI after the Second BRI Forum in April 2019*, it is too early to tell whether the new directions announced by the PRC authorities have been substantially implemented.

[135] OECD. 2022. *Making Innovation Work for the Climate-Gender Nexus*. https://oecd-development-matters.org/2022/06/03/making-innovation-work-for-the-climate-gender-nexus/.

[136] CAREC Gender Strategy 2030. https://www.adb.org/documents/carec-gender-strategy-2030.

[137] CSIS/CIF. 2021. *Pathways for Just Transition: Gender Responsive Policies & Place Based Investment*. https://www.climateinvestmentfunds.org/sites/cif_enc/files/knowledge-documents/jti_pathways_report_web.pdf.

[138] UNFCCC. https://unfccc.int/files/bodies/election_and_membership/application/pdf/decision_36_cp7.pdf.

[139] UNFCCC. https://unfccc.int/sites/default/files/resource/cp2019_13a01E.pdf.

[140] UNFCCC. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[141] UNFCCC. https://unfccc.int/sites/default/files/resource/cma2018_3_add1_advance.pdf#page=3.

[142] IUCN. https://www.iucn.org/blog/202206/climate-change-gender-action-plans-method-moving-commitment-action.

implementation for tackling climate change and its negative impacts. A review of the latest NDCs, submitted between 2016 and 2021, shows that only 5 of 11 CAREC countries' NDCs refer to gender aspect. Of these, some NDCs, such as for Georgia and Pakistan, integrate gender across topics and use it as a crosscutting approach to climate action, while others' references such as Uzbekistan are less substantive. While traditionally, women's role is considered as those affected by climate change, some CAREC countries' NDCs, such as Georgia and Pakistan emphasize their role as "agents of change," active participants, and promote women's empowerment. The latter approach shows that the dominant narrative of women being viewed only as being vulnerable victims is shifting toward women being viewed as active and empowered participants in the climate change agenda. Considering the significant differences in cultures, religions, and political contexts across the CAREC region, gender-related climate issues and approaches will likely also differ; but, once again, a regional approach to a just gender-oriented climate transition can foster shared commitment, allow exchanges of approaches and lessons, as well as peer monitoring of progress. Examples include recent events such as a meeting organized by UN Women for Central Asian governments to discuss the integration of gender equality into climate change policies in February 2022[143] and the CAREC Forum on Women Economic Empowerment in August 2022.[144]

5.9 Climate Communication and Climate Education

Climate change challenges, solutions, and strategies need to be effectively communicated to decision-makers and the general public if they are to be understood, accepted, and acted upon. Climate change is a complex process, as is the required response. Some aspects, such as the increasing frequency and intensity of excessive heat, floods, and droughts, and the manifestations of glacier melt, and sea level rise may convince many people that climate change is a real problem. For Central Asia, there is considerable sensitivity to natural resource calamities because of the Aral Sea disaster and the prevalence of other disasters making frequent news. Nevertheless, many people will not take climate change as seriously and urgently as it needs to be taken, especially when the long-term impacts of climate change are displaced in the public consciousness by the immediate impacts of the COVID-19 pandemic, rising food insecurity and prices, general inflation, and looming debt crises. Moreover, with much disinformation in social media and other communication means, the facts may not reach people or may be drowned out.[145] Moreover, the front-loaded costs of action often appear exorbitantly high not only to the lay public but also to policymakers relative to seemingly uncertain climate risks and long-term benefits from today's actions. Therefore, key climate change and climate policy messages have to be communicated widely and effectively, tailored to the audiences one is trying to reach. Simple, graphic, video-enabled communication tools can be very helpful,[146] as can mobilization of the news media and journalists, proactive use of social media, and engagement of well-known personalities as champions. Climate education in schools is also an important means for mobilizing the young generation, which has the most at stake in ensuring that timely and effective climate action is taken.

[143] UN Women. 2022. *Central Asian Governments Discuss the Integration of Gender Equality into Climate Change Policies*. https://eca.unwomen.org/en/stories/press-release/2022/02/central-asian-governments-discuss-the-integration-of-gender-equality-into-climate-change-policies.

[144] CAREC Forum on Women Economic Empowerment. August 2022. https://www.carecprogram.org/?event=carec-forum-on-women-economic-empowerment.

[145] Union of Concerned Scientists. *Climate Disinformation*. https://www.ucsusa.org/climate/disinformation.

[146] For example, the CAFEWS' graphical communication effort to inform audiences about flood risks and what is being done about them: World Bank. 2021. *Central Asian Flood Early Warning System*. https://www.worldbank.org/en/news/infographic/2021/12/10/cafews.

Climate communication can be effectively organized on a regional basis. Communication efforts have to be tailored for the targeted audience in terms of content and language, and hence, much of it has to be designed and delivered at a country level. However, electronic documentation and video recordings can be organized for regionwide audiences as, for example, the World Bank's pictorial and video accounts of the Central Asian Flood Early Warning System (CAFEWS) and the videos of a Central Asia hydromet modernization project and of Central Asian weather, climate, and water information services.[147] Regional climate outreach to government ministries, universities, and think tanks in Central Asia is being supported by GIZ, the German aid agency, under the "Green Central Asia Initiative" for transboundary dialogue on climate, environment, and security in Central Asia. It is an example of how to "develop political dialogue and consequently create better access to information and data to enable countries to assess the impact of climate change more accurately and to develop cooperative preventive measures. The target group of the Initiative consists of the foreign ministries (and, through them, the respective institutions responsible for climate and environmental resources, including educational and research institutions) of Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan. and Uzbekistan."[148] The World Bank's Communication for Climate and Awareness (C4CA) initiative for Central Asia is "engaging with policymakers, civil society, media, youth, and affected communities to raise awareness and advocacy for Climate Resilience and Green Growth toward the achievement of Sustainable Development Goals (SDGs). Activities under this pillar also facilitate a regional dialogue and knowledge exchange on transboundary climate issues, green growth, circular economy, and air pollution and GHG emissions."[149] Convincing policymakers, private businesses, and the general public that climate change is real, that action is urgent, and that the benefits from action ultimately far outweigh the costs has to be an important part of the climate action agenda.

[147] CAFEWS Infographics. https://www.worldbank.org/en/news/infographic/2021/12/10/cafews; CAFEWS video. https://youtu.be/HIFxkgfRy90; Central Asia Hydromet Modernization Project video. https://youtu.be/vtJFlzgNWXg; Enhancing Weather, Climate, and Water Information Services across Central Asia video. https://youtu.be/_3LLeI9HbOs.

[148] Green Central Asia website. http://greencentralasia.org/en.

[149] C4CA webpage. https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Pillar%203.

Mongolia. Emissions from coal-fired power plants contribute to the air pollution in Ulaanbaatar (photo by Ariel Javellana/ADB).

6 On the Horizon: Climate Change Issues for the CAREC Region

In addition to the core and crosscutting issues discussed so far, there are a few additional climate change issues that deserve attention. These issues have gathered less attention than the others so far, and for CAREC are perhaps of less immediate concern. However, they need to be monitored on a national and regional basis to determine whether and when they require more intense attention and potential action. These include (i) a grab bag of specific issues in the energy sector; (ii) artificial intelligence; (iii) technology transfer, South–South cooperation, and scaling of climate action impact; (iv) migration; (v) new concepts and approaches (the circular economy, nature-based solutions, and tipping points); and (vi) research and data.

6.1 On the Horizon: Issues in Energy

The energy transition has a number of aspects that may become important for the CAREC region in the coming decade and beyond. They include the development of hydrogen and nuclear energy as alternative energy sources; energy storage; the development of rare earths; CO_2 capture; and cryptocurrencies. These are briefly discussed in turn:

(i) **Hydrogen.** Hydrogen is a source of energy that does not emit CO_2 when used. It can be readily stored and transported and can serve as an alternative to battery storage. Hydrogen can be widely used in transportation, industry, heating and cooling, and others.[150] Hydrogen production requires energy as input and depending on the production process, it can be cheap and fossil fuel-intensive, or expensive and fossil fuel-free (Table 21). The PRC is currently the largest producer of hydrogen in the world, but mostly does so using "gray" or "blue" production methods, with only little produced by the "green" method.[151] However, the PRC has plans to expand its green production and utilization capacity in the coming decade. The European Union similarly has a strategy for the development of its hydrogen production and utilization.[152] The potential for the development of hydrogen in and for the

[150] Belfer Institute. 2022. *MIGHTY: Model of International Green Hydrogen Trade. Harvard University*. https://www.belfercenter.org/sites/default/files/files/publication/Paper_MIGHTY_Final.pdf.

[151] Green Finance & Development Center. 2022. *Hydrogen: China's Progress and Opportunities for a Green Belt and Road Initiative.* https://greenfdc.org/hydrogen-chinas-progress-and-opportunities-for-a-green-belt-and-road-initiative/.

[152] EU Parliament. 2021. *EU Hydrogen Policy: Hydrogen as an Energy Carrier for a Climate-Neutral Economy*. https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689332/EPRS_BRI(2021)689332_EN.pdf#:~:text=The%20EU%20hydrogen%20strategy%2C%20adopted%20in%20July%202020%2C,public%20authorities%20and%20ciil%20society%2C%20to%20coordinate%20investment. A critical review of the EU's ambitious hydrogen plan is in D. Ansari. 2022. Electrolysers for the Hydrogen Revolution. https://www.swp-berlin.org/publications/products/comments/2022C57_Electrolysers_HydrogenRevolution.pdf. Many of the constraints for the EU identified in this paper likely will also apply to the CAREC region, except the PRC.

CAREC region, other than the PRC, so far appears not to have been established, although it was recently reported that the companies Chevron Munaigas and KazMunayGas are exploring the development of hydrogen production in Central Asia.[153] The experience of the PRC in promoting its hydrogen industry will serve as a valuable source of information for other CAREC countries.

Table 21: Comparison between Hydrogen Pathways

	Gray Hydrogen	Blue Hydrogen	Green Hydrogen
Main Production Routes	• Steam Methane Reforming (SMR) • Coal Gasification	• SMR + CSS • Coal Gasification + CSS	• Electrolysis Using Renewables
CO_2 Emissions	High	Low	Zero
Current Cost	Low	High	High
Social Acceptance	Low	Mid	High

CCS = carbon capture and storage, CO_2 = carbon dioxide.

Note: CCS stands for carbon capture and storage, but in the source, the abbreviation used is CSS.

Source: Green Finance & Development Center. 2022. *Hydrogen: China's Progress and Opportunities for a Green Belt and Road Initiative*. https://greenfdc.org/hydrogen-chinas-progress-and-opportunities-for-a-green-belt-and-road-initiative/.

(ii) **Nuclear power.** Nuclear power is a long-established alternative energy source that does not emit CO_2. However, it comes with environmental risks in operation and decommissioning that are regarded by some as prohibitive and that have led Germany to shut down its well-developed nuclear energy industry. There is an ongoing debate among climate experts and politicians, whether nuclear should be considered a "green" source of energy.[154] Among CAREC countries, Pakistan and the PRC operate nuclear power plants. The PRC with 54 reactors has the third-largest number in operation and with 23 additional reactors under construction, is expected to become the largest nuclear energy producer in the world.[155] Other countries in the region, including Kazakhstan and Uzbekistan, are exploring the development of nuclear power plants.[156] A regional perspective on nuclear power is warranted because it can serve as a baseload option for intermittent renewable energy and needs to be integrated into regional distribution networks. Another reason for looking at nuclear energy from a regional perspective is that risks from nuclear power plant accidents can have regional impacts, as the Chernobyl disaster demonstrated.

(iii) **Rare earths.** Rare earth elements (REEs; and rare metals [RMs]) are critical inputs to many modern industrial activities, including those supporting renewable energy and energy storage (batteries) (Figure 25). With the ongoing worldwide energy transition,

[153] *Asiafinancial*. 2022. Chevron to Explore Hydrogen, Carbon Capture in Central Asia. https://www.asiafinancial.com/chevron-to-explore-hydrogen-carbon-capture-in-central-asia.

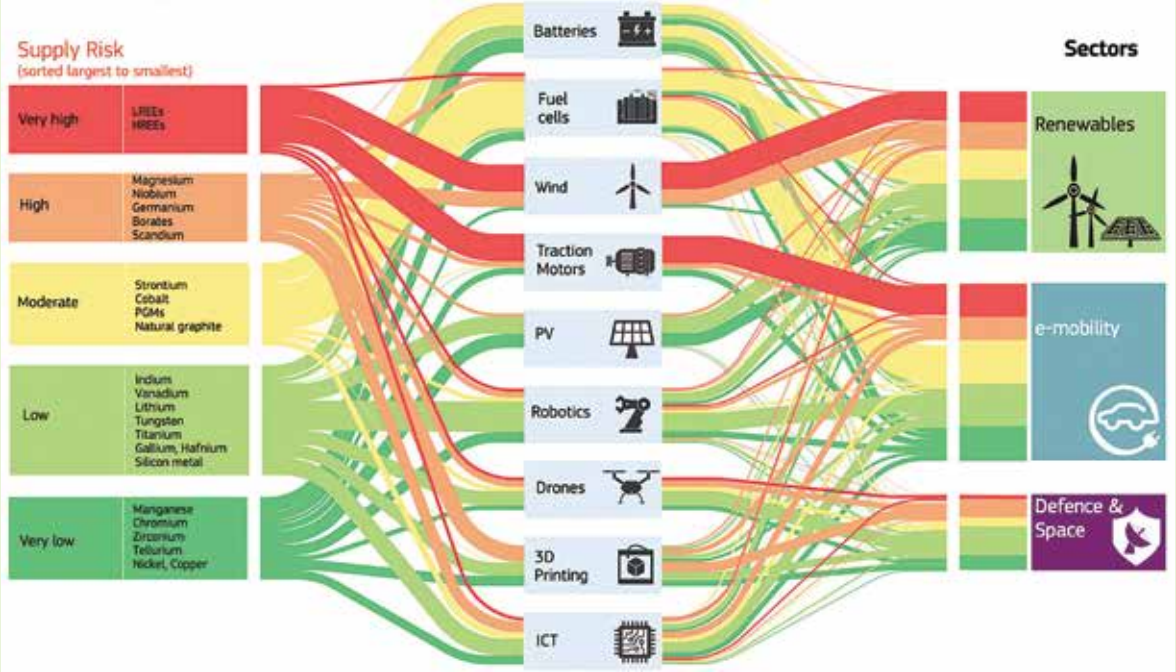
[154] Physics World. 2017. *How Green is Nuclear?* https://physicsworld.com/a/how-green-is-nuclear-energy/.

[155] China Scope. 2022. http://chinascope.org/archives/30761.

[156] *Caspian News*. 2022. Kazakhstan Mulls Building Second Nuclear Power Plant. https://caspiannews.com/news-detail/kazakhstan-mulls-building-second-nuclear-power-plant-2022-8-4-58/; Nuclear Engineering International. 2022. Uzbekistan NPP plans on schedule. https://www.neimagazine.com/news/newsuzbekistan-npp-plans-on-schedule-9795962. The PRC provided Pakistan with nuclear power installation capacity in the past, and is reported to be considering provision of nuclear power capacity to Kazakhstan. Currently, the PRC has no nuclear power plant in Inner Mongolia or Xinjiang. World Nuclear Association., 2022. *Nuclear Power in China*. https://www.world-nuclear.org/information-library/country-profiles/countries-a-f/china-nuclear-power.aspx).

the demand for REEs and RMs is expected to increase dramatically, while supplies are constrained and highly concentrated in a limited number of countries. Currently, the PRC is the world's dominant REE producer and also produces various RMs.[157] Central Asia also has such mineral deposits and according to one expert assessment, has "considerable undiscovered resources."[158] Central Asian countries could consider joining forces on a regional basis to explore how best to develop this promising potential, while also ensuring that the social and environmental damages frequently accompanying mining operations are minimized. As the search for REEs and RMs intensifies and extraction potential is established in more CAREC countries, addressing the potentially negative environmental and social implications of such minerals will become more urgent and of regional significance.[159]

Figure 24: Semiquantitative Representation of Flows of Raw Materials and Their Current Supply Risks to the Nine Selected Technologies and Three Sectors
(based on 25 selected raw materials)



3D = three-dimensional, EU = European Union, HREE = heavy rare earth element, ICT = information and communication technology, LREE = light rare earth element, PGM = platinum group metal, PV = photovoltaic.

Source: EU. 2020. *Critical Raw Materials for Strategic Technologies and Sectors in the EU: A Foresight Study*. https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf.

[157] World Atlas. *The World's Biggest Producers of Rare Earth Elements*. https://www.worldatlas.com/articles/the-world-s-biggest-producers-of-rare-earth-elements.html.

[158] USGS. 2018. *Rare Earth Element and Rare Metal Inventory of Central Asia*. https://www.usgs.gov/publications/rare-earth-element-and-rare-metal-inventory-central-asia.

[159] A related challenge is to cap CO_2 emissions from existing or closed mines is also of importance for the CAREC region. That multilateral development banks, including ADB, cannot fund projects designed to cap such emissions will be a constraint for CAREC to address this issue. Source: Comment by ADB staff.

(iv) **Energy storage.** A key challenge for renewable energy is energy storage. One solution already mentioned is the development of green hydrogen, and another is the further development of battery technology, which is particularly relevant as electric vehicles are poised to dominate the transportation sector.[160] Currently, lithium batteries are prevalent, but at current projections of demand for lithium, supply constraints may become binding, not least for geopolitical reasons; therefore, alternative technologies for battery storage are currently under development and hold some promise.[161] Monitoring the development of battery technology and its relevance to the energy transition in the CAREC region will be a task that can be effectively supported on a regional basis. Another option for energy storage that is of particular relevance to the CAREC region is pumped storage hydropower, which involves the reverse pumping of water from below the reservoir and hydropower plant (HPP) to the upstream reservoir during times of low demand for subsequent release and energy generation during periods of high demand.[162] Pumped power storage is used widely around the world, including prominently in the PRC.[163] In Central Asia, it appears that pumped power storage has not been used, but recent research points to the potential for using seasonal pumped power storage to meet regional energy and water demands in Central Asia more effectively, including the need to complement renewable energy supplies.[164] An exploration of the options for a regional approach to pumped energy storage in the CAREC region looks appropriate and timely, bringing to bear international and regional (especially for the PRC) experiences in considering the best options.[165]

(v) **CO_2 capture.** CO_2 capture and storage (CCS) is a means to extract CO_2 as it is produced, mostly in industrial production, and storing it indefinitely underground. The technology for CO_2 capture is still under development, but in Europe, the PRC, and the Middle East, there are examples of actual deployment of currently existing technologies as reported by the Global CCS Institute.[166] The Institute also notes that Mongolia and the PRC were among the few countries globally that mentioned CO_2 capture in their NDCs (Figure 25). Monitoring progress with the technology globally and regionally, exploring the potential for its application in the CAREC region, and gathering lessons from neighbors and internationally, would be well served by a regional approach for CAREC.

(vi) **Cryptocurrency mining.** Cryptocurrency mining has, in recent years, seen rapid expansion worldwide, but because of its intensive electricity requirements, it has put burdens on nations' power grids and raised questions about its compatibility with climate goals. In response, the PRC banned crypto mining in 2021, which reportedly resulted in such mining operations moving to Central Asia with its cheap electricity energy. However, there, too, the practice caused concerns, especially when "gray," i.e., not formally registered.

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[160] Rated Power. 2022. *The Power of Battery Storage: The Evolution of Batteries, Alternatives and Applications*. https://ratedpower.com/blog/battery-storage/.

[161] Atlantic Council. 2022. *Alternative Battery Chemistries and Diversifying Clean Energy Supply Chains*. https://www.atlanticcouncil.org/wp-content/uploads/2022/09/Alternative-Battery-Chemistries-and-Diversifying-Clean-Energy-Supply-Chains.pdf.

[162] USGS. *Pumped Storage Hydropower*. https://www.energy.gov/eere/water/pumped-storage-hydropower.

[163] ADB conference slides. 2021. *The Prospect of Pumped Storage Hydro in Asia*. https://assets-global.website-files.com/5f68760121a35e589e08f8d6/60cca8a6521f5dcb98df3a0e_IFPSH_ACEF_Slide%20Deck.pdf.

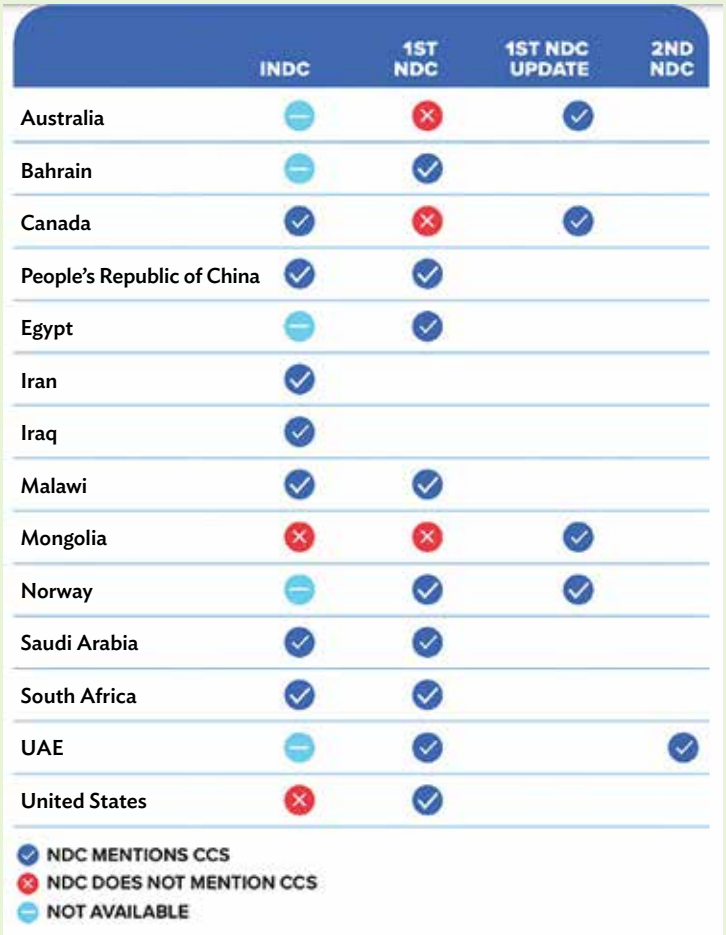
[164] Zakeri et al. 2022. *Role of Energy Storage in Energy and Water Security in Central Asia*. https://reader.elsevier.com/reader/sd/pii/S2352152X2200603X?token=86A09B57C037AEDD21B0769D6FDCB6DC7DE8099E3E32252F681B829BEDF82C2B779C0AEEDE9CAB6F59490AFCAE44AA05&originRegion=us-east-1&originCreation=20220822190218.

[165] The GCF in 2019 approved an equity investment in a solar power and pumped storage hydroelectric project to help decarbonize Chile's energy mix and catalyze private investments to the renewable energy market. https://www.greenclimate.fund/news/gcf-investment-supports-green-energy-transition-chile.

[166] Global CCS Institute. 2021. *Global Status of CCS 2021*. https://www.globalccsinstitute.com/wp-content/uploads/2021/11/Global-Status-of-CCS-2021-Global-CCS-Institute-1121.pdf.

Kazakhstan and Uzbekistan recently placed limits on crypto mining.[167] In response to these developments, the CABAR.asia analytical platform recently organized a meeting to discuss the pros and cons of crypto mining with representatives from Central Asia and international experts.[168] Such regional exploration of the crypto mining challenge on a CAREC-wide basis might be worth pursuing.

Figure 25: Mention of Carbon Dioxide Capture and Storage in Nationally Determined Contributions



CCS = carbon capture and storage, INDC = intended nationally determined contribution, NDC = nationally determined contribution, UAE = United Arab Emirates

Source: Global CCS Institute. 2021. *Global Status of CCS 2021*. https://www.globalccsinstitute.com/wp-content/uploads/2021/11/Global-Status-of-CCS-2021-Global-CCS-Institute-1121.pdf.

[167] Yahoo/Finance. 2022. Is Central Asia's Crypto-Mining Boom Going Bust? https://finance.yahoo.com/news/central-asia-crypto-mining-boom-180000394.html.

[168] CABAR.asia. 2022. Expert Meeting: Crypto Currency in Central Asia Has a Future? https://cabar.asia/en/expert-meeting-crypto-currency-in-central-asia-has-a-future.

6.2 Artificial Intelligence

Artificial intelligence (AI) has the potential to assist in the fight against climate change by making both mitigation and adaptation more efficient through the purposeful processing of large data (Box 10). The use of AI in managing larger energy systems, including solar and wind, on the supply- and demand-side is particularly notable.[169] AI has also great potential for adaptation, including for early warning and disaster response.[170] There are, however, also potential downsides to the use of AI for climate change: one is that managing large data sets can consume a lot of electricity, and the other is the potential loss of privacy and the possible abuses of information on individuals caught in bid data.[171] A regional platform of transparent and inclusive knowledge gathering and exchange on the most up-to-date information on AI applications for climate change, their benefits, and risks, could be a very worthwhile contribution for decision-makers in government, business, and civil society.

Box 10
How Can Artificial Intelligence Help Combat Climate Change?

"The technology is already being used to send natural disaster alerts in Japan, monitor deforestation in the Amazon, and design greener smart cities in [the People's Republic of] China. AI applications could also help design more energy-efficient buildings, improve power storage, and optimize renewable energy deployment by feeding solar and wind power into the electricity grid as needed. On a smaller scale, it could help households minimize their energy use—automatically switching off lights not in use or sending power from electric vehicles back into the grid to meet anticipated demand. By 2030, the tech could help cut global greenhouse gas emissions by 4%, according to a recent study by accounting firm PricewaterhouseCoopers for Microsoft, which is developing machine learning products for the climate change market."

Source: Quoted from World Economic Forum. 2021. *Here's how AI can help fight climate change.* https://www.weforum.org/agenda/2021/08/how-ai-can-fight-climate-change/.

6.3 Technology Transfer, South–South Cooperation, and Scaling Climate Action Impact

Technology transfer of climate technology will be an essential factor in combating climate change. According to the UNFCCC, technology transfer has been an element of the Convention from early on (Box 11), and the UNFCCC has set up a number of mechanisms at the global level to support climate technology transfer.[172] From the preceding discussion, it is apparent that technology transfer will also play an important role in the CAREC region's efforts for climate change mitigation

[169] Brookings. 2019. *How artificial intelligence will affect the future of energy and climate.* https://www.brookings.edu/research/how-artificial-intelligence-will-affect-the-future-of-energy-and-climate/.

[170] W. L. Filho et al. 2022. *Deploying artificial intelligence for climate change adaptation.* https://www.sciencedirect.com/science/article/abs/pii/S0040162522001949.

[171] World Economic Forum. 2021. *Here's how AI can help fight climate change.* https://www.weforum.org/agenda/2021/08/how-ai-can-fight-climate-change/.

[172] UNFCCC. *What is Technology Development and Transfer?* https://unfccc.int/topics/climate-technology/the-big-picture/what-is-technology-development-and-transfer.

and adaptation, whether it is in energy, water, agriculture, transport, smart city development, disaster prevention, hydromet, AI, and others. As noted repeatedly, a regional approach will be particularly helpful since identification of suitable technologies and developing effective methods for transfer and local adaptation in effect represents a regional public good.

Box 11
A Commitment to Technology Transfer under the Climate Convention

"Developing and transferring technologies to support national action on climate change has been an essential element from the beginning of the UNFCCC process. In 1992, when countries established the Convention, they included specific provisions on technology with the aim of achieving the ultimate objective of the Convention. The Convention notes that all Parties shall promote and cooperate in the development and transfer of technologies that reduce emissions of GHGs. It also urges developed country Parties to take all practicable steps to promote, facilitate and finance the transfer of, or access to, climate technologies to other Parties, particularly to developing countries. Furthermore, the Convention states that the extent to which developing country Parties will effectively implement their commitments will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology."

GHG = greenhouse gas, UNFCCC = United Nations Framework Convention on Climate Change.
Source: UNFCCC. *What is Technology Development and Transfer?* https://unfccc.int/topics/climate-technology/the-big-picture/what-is-technology-development-and-transfer.

South–South cooperation can play a special role in climate technology transfer[173] and is especially important in the context of regional cooperation platforms such as CAREC. As noted in the earlier sections of the report, the PRC has much climate-relevant technology to share with other CAREC members, has a special interest in fostering South–South cooperation, and instruments to promote it, such as the Belt and Road Initiative.[174] However, in a regional exchange, other CAREC member countries also have technological experiences to share.

More generally, the transfer of innovations in all aspects of managing climate change, including organizational and process innovations, and effective replication, absorption, and diffusion, i.e., scaling-up of impacts of innovation, will be important for the CAREC Region. This focus on the scaled-up impact of climate action-relevant innovations implies that efforts to develop, transfer, and scale innovations must not take the form of one-off initiatives, but must be promoted on a systematic and sustained basis by all concerned, governments, businesses, CSOs, and international development partners. Unfortunately, too much of traditional development and now climate action does not pay enough attention to the scaling-up imperative. Fortunately, however, scaling experience exists and can be brought to bear on the climate agenda, including the set of

[173] UNFCCC. Catalyzing the Implementation of Nationally Determined Contributions in the Context of the 2030 Agenda through South–South Cooperation. https://unfccc.int/files/resource_materials/application/pdf/ssc_ndc_report.pdf.

[174] Technology transfer is part of the Belt and Road Initiative's scope and there are lessons to be learned from the experience to date, including the importance of sharing up-to-date (rather than outdated) technology and ensuring appropriate transfer mechanisms are employed (training and manuals in national language, and others); EMF. 2019. China's Belt and Road Initiative: Potential Transformation of Central Asia and the South Caucasus. http://www.centennial-group.com/publication/chinas-belt-and-road-initiative-potential-transformation-of-central-asia-and-the-south-caucasus/.

scaling principles and lessons developed by the international Scaling Community of Practice.[175] Of particular interest is the PRC's approach to scaling development impact which is at the heart of the country's unique development experience.[176] Bringing to bear this experience in the context of regional climate change mitigation and adaptation efforts will be particularly valuable.

6.4 Climate Migration

Climate change will likely result in increased migration as part of the inevitable adaptation process globally and in the CAREC region. As sea levels rise, as water scarcity intensifies, as agricultural productivity is differentially affected across countries and regions, and as exposure to natural hazards increases, people will respond by migrating within countries and across borders, with up to 216 million climate migrants worldwide by 2050 for a business-as-usual scenario, according to the World Bank.[177] Countries in the CAREC region have a long history of migration, including rural-urban migration in the PRC, dislocation of people due to security situations in Afghanistan and Pakistan, and economic migration in Central Asia. A recent study by the World Bank has concluded that 2.4 million climate migrants or 3.5% of Central Asia's population could be on the move by 2050 under a more pessimistic scenario. But even with more climate-friendly and socially responsive policies, 1.7 million migrants (2.4%) would respond to climate change.[178] These migration numbers refer to internal migrants, but the probability is high that migration will also take place across borders, both within Central Asia and (most likely) to the Russian Federation. The World Bank report recommends—in addition to the standard climate mitigation and adaptation action—that migration aspects be factored explicitly into green, resilient development planning, allowing for a phased response informed by more research on the expected patterns of migration. Moreover, climate migration analysis, planning, and response would appropriately take a regional approach to deal with the regional implications of migration.

6.5 New Concepts and Approaches: Circular Economy, Nature-Based Solutions, and Tipping Points

With the development of climate change science and practice, new concepts and approaches have been identified. Some of these were already mentioned in earlier sections, including "the new climate economy" and "a just climate transition." Three additional ones highlighted here are the concepts of "circular economy," "nature-based solutions," and "tipping points." Time will tell what extent these concepts and the underlying approaches are truly different from those used earlier—"recycling," for example—or whether they represent fads. In the meantime, it helps to understand what these concepts refer to and how they are being used in academic and policy debates about climate change.

[175] Scaling CoP. 2022. *Scaling Principles and Lessons*. https://www.scalingcommunityofpractice.com/wp-content/uploads/2022/03/Scaling-Principles-and-Lessons_v3.pdf.

[176] Brookings. 2008. *Scaling Up: A Framework and Lessons for Development Effectiveness from Literature and Practice*. https://www.brookings.edu/research/scaling-up-a-framework-and-lessons-for-development-effectiveness-from-literature-and-practice/.

[177] World Bank. 2021. *Groundswell Part 2: Acting on Internal Climate Migration*. https://openknowledge.worldbank.org/handle/10986/36248.

[178] This report pinpoints specific hot spots of in- and out-migration in Central Asia, which allows for a more differentiated response. World Bank. 2021. *Internal Climate Migration in Eastern Europe and Central Asia*. https://openknowledge.worldbank.org/bitstream/handle/10986/36248/GroundswellPN-ECA.pdf?sequence=7&isAllowed=y.

The concept and approach of "circular economy" take recycling to a new level. While "recycling" commonly refers to the recycling of goods used by consumers, the circular economy concept is focused also on the producer side of the economy and, indeed, on the entire value chain from production to end user, with the goal to cut waste, produce longer lasting products, and encourage reuse in electronics and ICT, batteries and vehicles, packaging, plastics and textiles, construction and buildings, food, water, and nutrients.[179] The EU's Circular Economy Action Plan is an example of how these principles can be pursued at a regional level (footnote 183). In the CAREC region, the World Bank is supporting a circular economy approach as part of its Climate and Environment (CLIENT) Program in Central Asia[180] (Box 12).

Box 12
The World Bank's CLIENT Program Supports Circular Economy Initiatives in Central Asia

"Establishing a circular economy is a fundamental step in climate change adaptation, achieving green growth, and supporting sustainable development. Poor practices in extractive and industrial activities leads to resource depletion, inadequate energy efficiency, waste, and pollution. Circular economy is an economic development model designed to benefit businesses, society, and the environment. The principles are not just based on minimizing waste, pollution, and greenhouse gas (GHG) emissions, but also on improving longevity of products and materials and regenerating natural systems. By using fewer resources, the circular economy reduces costs, waste, and GHG emissions while building resilient ecosystems and livelihoods. Supported by Korea Green Growth Trust Fund (KGGTF) and NDC Support Facility under this pillar, the World Bank has partnered with Kazakhstan, the Kyrgyz Republic, and Uzbekistan in implementing the circular economy approaches in resource-intensive and polluting sectors that are in line with these countries' green growth goals and the EU's circular economy strategy."

Source: Quote from World Bank, *Climate and Environment (CLIENT) Program in Central Asia: Pillar 2. Circular Economy and Pollution Management for Green Growth*. https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Pillar%202.

"Nature-based solutions" are "actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature."[181] This definition, pioneered by the International Union for Conservation of Nature (IUCN), points toward the broad-gauged nature of this concept and approach. It includes not only climate change actions, but also biodiversity protection, antipollution action, wildlife and ecosystems conservation, disaster risk reduction, food and water security, health, and more. As the name indicates, the distinctive feature is to draw on solutions involving natural products and processes (e.g., mangroves to prevent coastal flooding and erosion, reafforestation to preserve water resources, wetland development to help prevent flooding, hillside terracing to limit soil

[179] European Commission. 2020. *A New Circular Economy Action Plan for a Cleaner and More Competitive Europe*. https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF.

[180] World Bank. *Climate and Environment (CLIENT) Program in Central Asia: Pillar 2. Circular Economy and Pollution Management for Green Growth*. https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Pillar%202.

[181] IUCN. *Nature-Based Solutions*. https://www.iucn.org/our-work/nature-based-solutions.

erosion, and climate-smart agriculture).[182] The World Bank has supported 70 projects with nature-based solutions, mainly in the water sector and disaster prevention areas. One example is a project in the PRC's Zhejiang Qiandao Lake and Xin'an River Basin, which supports climate-smart farming, environmentally sustainable forest management, and restoration of wetlands and degraded forests, with the goal of improving the water quality in the lake and, hence, of the potable water supply of the region (footnote 186). On a regional basis, IUCN and the Swedish aid agency Sida funded a regional project for nature-based solutions in the West Balkans with a focus on disaster risk reduction.[183]

A "tipping point" is "a critical threshold at which small change causes a larger, more critical change to be initiated, taking components of the Earth system from one state to a discreetly different state."[184] Tipping points leading to large-scale, irreversible ecological change that can be of global significance, such as the melting of the Antarctic or Greenland ice caps, or of regional significance, such as the disappearance of the Aral Sea. No systematic research was found on regional tipping points for the CAREC region; however, there could well be some (e.g., relating to the melting of glaciers, the future of Lake Balkhash, and others) that may deserve research and policy attention.

6.6 Research and Data

Evidence on the impacts of climate change and the results of actions taken in response are critical to effective policy-making at the national and regional levels. The preceding summary of climate change issues gives a sense of the large range of topics for which evidence is needed and some sense of the degree to which additional evidence and, hence, research is required. However, this scoping study did not carry out an analysis of research gaps. A rigorous inventory of the English language literature research on climate change for Central Asia is found in a recent academic article surveying the available academic and "gray" (i.e., not formally peer-reviewed) literature on climate change in the region.[185] The central finding of this review is that there is a fundamental lack of climate research for this subregion of CAREC. The same conclusion likely holds for the countries of the South Caucasus, Afghanistan, and Mongolia. For Pakistan, a quick internet search revealed a reasonably large range of articles on climate change, but a somewhat dated review of knowledge gaps in climate change research concluded that there are serious limitations of institutional capacity, data, and university-level educational opportunities.[186] For the PRC, there is likely to be a wide range of research available on climate change as it affects the country and regarding appropriate responses. In terms of the specific issues and gaps in research, Table 22 summarizes the findings of the abovementioned article on climate change research for Central Asia. The research gaps are serious for the socioeconomic impacts of climate change and no research appears to be available on perceptions of climate change and on what, if any, position Central Asian countries should take in global climate change negotiations. The article did not report on research regarding regional aspects of and action on climate change.

[182] World Bank. 2022. *What You Need to Know About Nature-Based Solutions to Climate Change*. https://www.worldbank.org/en/news/feature/2022/05/19/what-you-need-to-know-about-nature-based-solutions-to-climate-change.

[183] IUCN and SIDA. *ADAPT: Nature-Based Solutions in the Western Balkan*. https://iucn.org/sites/default/files/2022-08/adapt-flyer-eng-priprema-za-stampu_engl.pdf.

[184] D. Spratt and I. Dunlop, 2022. *Climate Dominos: Tipping Point Risks for Critical Climate Systems*. https://www.breakthroughonline.org.au/_files/ugd/148cb0_2a1626569b45453ebadad9f151e031b6.pdf.

[185] R. Vakulchuk et al. 2022. *A Void in Central Asia Research: Climate Change*. https://www.tandfonline.com/doi/pdf/10.1080/02634937.2022.2059447?needAccess=true. The scoping study team also searched for Russian-language literature on Central Asia and found a limited number of publications, which are to be found in the References section of this report.

[186] Rasul. 2010. *An Analysis of Knowledge Gaps in Climate Change Research*. http://www.pmd.gov.pk/rnd/rnd_files/vol7_issue13/1_An%20Analysis%20of%20Knowledge%20Gaps%20in%20Climate%20Change%20Research.pdf.

Table 22: Coverage of Climate Change Issues in Research for Central Asia

Climate Issue	Degree of Research Coverage
Temperature	
Precipitation	
Extreme weather	
Glaciers	
Irrigation	
Socioeconomic impacts	
- poverty	
- food security	
- health	
- gender	
- migration	
- conflict	
Local perceptions of climate change	
Position on global climate change negotiations	
Regional impacts and responses	Not available

Note: Green shows good coverage, yellow moderate, pink little, and red none.

Source: Authors, based on Vakulchuk et al. 2022. *A Void in Central Asia Research: Climate Change.* https://www.tandfonline.com/doi/pdf/10.1080/02634937.2022.2059447?needAccess=true.

Quality data are critical for credible evidence on climate change and policymaking. Data requirements span the whole range of research issues highlighted in this report and the preceding paragraph, from weather and climate observations to impacts on key environmental and socioeconomic variables. Some efforts are being made to assemble inventories of hydrometeorological, ecological, and socioeconomic data, the most notable of which is CACIP, the Central Asian Climate Information Platform, developed by the Regional Environmental Center for Central Asia (CAREC-Environment) (Box 13). A systematic assessment of available climate data for the CAREC region and potential gaps remains to be conducted.

Box 13
The Central Asian Climate Information Platform

"CACIP is the Central Asian Climate Information Platform, which is aimed is to help stakeholders to access, analyze, and visualize public-domain data to support improved awareness, assessment, and decision support. This is expected to make available comprehensive and up-to-date relevant data and information, linking with high-quality datasets (including time series and spatial information) from global, regional, and local sources, provide analytical tools and interfaces for the visualization and interpretation of data and information (e.g., mapping tools to layer data and map hotspots and areas at risk, screening tools, and others). CACIP development is funded by the World Bank within the framework of Climate Adaptation and Mitigation Program for Aral Sea Basin (CAMP4ASB), implementing by the EC IFAS and the Central Asia Regional Environmental Center (CAREC). CACIP covers the five Central Asian countries: Kazakhstan, "Kyrgyzstan", Turkmenistan, Tajikistan, and Uzbekistan. It also provides regional outlook, as well as country specific information."

Source: Quoted from the CACIP Webpage. https://ca-climate.org/eng/cacip.php.

Tajikistan. Nurek 500-kilovolt Switchyard Reconstruction Project provides clean electricity through hydropower (photo by Nozim Kalandarov/ADB).

7 Policy Response at National and Regional Levels

Policy responses include climate change action commitments and strategies at the national level, various instruments and approaches to financing climate action, and action at regional level. This chapter reviews these policy responses, challenges, and options.

7.1 Climate Change Commitments or the Nationally Determined Contribution, Climate Strategies, and Adaptation Plans

All CAREC countries have submitted Nationally Determined Contributions (NDCs) for the reduction of greenhouse gas (GHG) emissions as required under the Paris Agreement. Appendix 3 summarizes the content of the NDCs.[187] They differ widely across CAREC member countries in terms of the date of submission, the baseline year for and extent of planned reductions in GHG emissions, the sectors covered, and the financing estimates. Some are detailed, substantive technical documents (the Kyrgyz Republic, Pakistan), and others are brief and high-level (Kazakhstan, Azerbaijan). A preliminary review of the NDCs for the 11 CAREC countries raises a lot of questions on the comparability of the information provided, the level of ambition, and on implementation of the plans reflected in these documents. Further analysis, benchmarking, tracking, and support for the design and implementation of NDCs on a regional basis would be helpful. Moreover, a detailed cross-mapping of issues identified in this report covered in terms of their coverage in NDCs would help establish the potential gaps in coverage and identify opportunities for regional cooperation on issues of regional significance and common policy interest. The remainder of this section provides some more detailed insight into selected aspects of the NDCs and the status of national climate change strategies and planning, but more analysis of NDC content and implementation would be appropriate in the future.

The level of ambition regarding emissions reductions varies across NDCs. All NDCs indicate some targeted reduction in emissions in relation to the baseline, mostly in the 15%–35% range. Some countries indicate unconditional and conditional reduction targets, whereas the latter depends on the availability of external finance. However, data provided by the IMF which compare "implied emissions targets" with actual emissions in 2020, reflect a different picture, as shown in Table 23. Five of nine countries show actuals less than targets, in some cases, substantially so (Pakistan and Uzbekistan), while only three show targets falling below actuals and only in two cases,

[187] In connection or in parallel with NDCs, CAREC countries also have climate relevant policies and legislation, which is summarized in Appendix 3 to this report.

substantially so (the Kyrgyz Republic and Mongolia). The reasons for the apparent discrepancy between national emission reduction estimates and IMF estimates for some of the CAREC countries deserve further analysis to determine the actual level of ambition in emission reduction implied by the NDCs.

Table 23: Comparison of Nationally Determined Contributions' Greenhouse Gas Emissions Targets and Actual Emissions for Selected Countries, 2020

Country	Emissions of CO_2 Equivalent (million metric tons)		Target over Actual
	Implied Unconditional Target	Actual 2020	
Afghanistan	45	40	1.12
Azerbaijan	57	45	1.27
Georgia	NA	NA	NA
Kazakhstan	312	335	0.93
Kyrgyz Republic	15	21	0.71
Mongolia	57	106 (61 – 2018)	0.54 (0.93)
Pakistan	1,340	495	2.68
People's Republic of China	NA	NA	NA
Tajikistan	22	20	1.10
Turkmenistan	NA	134	NA
Uzbekistan	320	170	1.88

CO_2 = carbon dioxide, NA = not available.

Source: Calculated from data in IMF Climate Dashboard; for explanation of terms and basis of information, see IMF source at https://climatedata.imf.org/pages/re-indicators.

Most NDCs cover the core areas of infrastructure and economic connectivity, agriculture, and water, and of economic and financial stability, but only a few address human development, gender, and digital development. Table 24 shows the sector and thematic coverage of NDCs against the five pillars and the two crosscutting areas of CAREC engagement.

NDCs provide different levels of information on the financing required for the implementation of their implementation. As shown in Appendix 3 and summarized in Table 25, financing requirements are in the tens of billions United States dollars for most countries that show any numbers, $100 billion for Pakistan's energy transition alone, and $1.4 trillion for the PRC. These numbers not necessarily comparable across countries since they are likely based on very disparate assumptions and methodologies, but they are indicative of the orders of magnitude of financing requirements that countries expect to need to meet.

Table 24: Sector and Thematic Distribution of Nationally Determined Contribution Commitments by CAREC 2030 Clusters and Crosscutting Themes

Country	Five CAREC 2030 Operational Clusters and Crosscutting Themes							
	Economic and financial stability	Trade, tourism, economic corridors	Infra-structure and economic connectivity	Agri-culture and water	Human develop-ment (health, education)	Crosscutting themes		Other non-CAREC sectors
						Gender	Digital/ ICT	
Afghanistan	•		•	•			•	•
Azerbaijan			•	•			•	•
People's Republic of China	•	•	•	•	•		•	•
Georgia	•	•	•	•	•	•	•	•
Kazakhstan	•		•					
Kyrgyz Republic	•		•	•	•	•	•	•
Mongolia	•		•	•	•		•	•
Pakistan	•	•	•	•	•	•	•	•
Tajikistan	•		•	(i)	(ii)	(iii)	(iv)	(v)
Turkmenistan	•		•	•				(vi)
Uzbekistan	•		•	•	•	•	(vii)	(vii)

CAREC = Central Asia Regional Economic Cooperation, ICT = information and communication technology.

Source: Compiled based on https://unfccc.int/NDCREG.

Table 25: Financing Requirements Specified in CAREC Country Nationally Determined Contributions

Country	Nationally Determined Contributions Financing Requirements
Afghanistan	$17.4 billion ($10.8 billion mitigation, $6.6 billion mitigation)
Azerbaijan	NA
Georgia	$6.0 billion ($1.6 billion public, $4.4 billion private)
Kazakhstan	NA
Kyrgyz Republic	$10 billion (37% national, 63% external)
Mongolia	$11.5 billion ($6.3 billion mitigation, $5.2 billion adaptation)
Pakistan	$101 billion (for energy transition only) $209.8 billion (mitigation), $7 billion-$14 billion (adaptation)[a]
People's Republic of China	$1.4 trillion
Tajikistan	7% of GDP (over $1 billion per annum)
Turkmenistan	$10.5 billion (adaptation measures)
Uzbekistan	NA

CAREC = Central Asia Regional Economic Cooperation, GDP = gross domestic product, NA = not available.

[a] Pakistan. Climatewatchdata.org Countries' NDCs Database. https://www.climatewatchdata.org/ndcs/country/PAK/overview?document=revised_first_ndc&section=finance_and_support.

Source: Compiled by authors based on https://unfccc.int/NDCREG.

Some countries also have prepared climate change strategies and adaptation plans or strategies. Table 26 summarizes the available evidence for CAREC countries. More information on the status of preparation, the content of these strategies, and their implementation could usefully be assembled for the CAREC region.

Various support mechanisms are available to developing countries for the preparation and implementation of the NDCs, climate strategies, and adaptation plans, but more could be done to gather information on what is being done to prepare and revise these strategies and plans and monitor and peer review implementation on a regional basis. UNDP and the World

Table 26: Status of Preparation of Climate Change Strategies and Adaptation Plans and Strategies in CAREC Countries

Country	Climate Change Strategy	Adaptation Plan/Strategy
Afghanistan	Yes	No
Azerbaijan	Yes[a]	under preparation[b]
People's Republic of China	Climate Change Strategy is outlined in the National Climate Change Plan (2014–2020) issued in 2014[c]	Yes, passed in 2013, and published the new National Climate Change Adaptation Strategy 2035 in 2022
Georgia	Yes, passed in 2021[d]	The Government of Georgia plans to prepare and implement it in the nearest future[e]
Kazakhstan	under preparation[f]	no information
Kyrgyz Republic	no information	no information
Mongolia	National Action Programme on Climate Change (NAPCC), end year 2021	no information
Pakistan	National Climate Change Policy, 2012[g]	under preparation[h]
Tajikistan	no information	Yes, passed in 2019 and National Action Plan for Climate Change Mitigation passed in 2003
Turkmenistan	Yes, passed in 2012	under preparation[i]
Uzbekistan	No information	under preparation[j]

CAREC = Central Asia Regional Economic Conference.

[a] Socio-Economic Development Strategy 2022–2026 approved by the Decree of the President of the Republic of Azerbaijan No. 3378, dated 22 July 2022.

[b] United Nations Development Programme (UNDP). 2021. Azerbaijan marks the start of the National Adaptation Plan process for climate change resilience. https://www.undp.org/azerbaijan/press-releases/azerbaijan-marks-start-national-adaptation-plan-process-climate-change-resilience.

[c] Information provided by the Government of the People's Republic of China.

[d] Climate Change Laws of the World, Georgia. https://climate-laws.org/geographies/georgia/policies/georgia-s-2030-climate-strategy-and-action-plan.

[e] Information provided by the Government of Georgia.

[f] Official Information Source of the Prime Minister of the Republic of Kazakhstan. 2022. Kazakhstan presents plans to achieve carbon neutrality. https://primeminister.kz/en/news/kazakstan-komirtekti-beytaraptykka-kol-zhetkizu-boyynsha-zhosparlardy-tanystyrdy-19210.

[g] Climate Change Laws of the World, Pakistan. https://climate-laws.org/geographies/pakistan/policies/national-climate-change-policy-4a9d1103-1933-491c-98ff-87f4dd489c47.

[h] UNEP. 2021. Pakistan to Develop National Adaptation Plan for Climate Change. https://www.unep.org/gan/news/press-release/pakistan-develop-national-adaptation-plan-climate-change#:~:text=Thursday%2025th%20March%20%E2%80%93%20Pakistan%20has,Environment%20Day%20on%20June%205th.

[i] UNDP Transparency Portal. https://open.undp.org/projects/00102379.

[j] UNDP. 2021. Uzbekistan advances its climate change adaptation planning. https://www.adaptation-undp.org/press-release-Uzbekistan-advances-its-climate-change-adaptation-planning.

Source: Compiled by authors.

Bank manage multi-donor support programs for countries to prepare and implement their NDCs.[188] EBRD supports its member countries, including those in the CAREC region, in the preparation of strategies for the transition to low-carbon economies; these have been developed for Kazakhstan and Mongolia, with a strategy under preparation in Uzbekistan.[189] The World Resources Institute (WRI) hosts Climate Watch, "a leading climate data repository, with information on greenhouse gas (GHG) emissions, country policies, and mitigation and adaptation commitments. With over 200,000 visitors annually, it informs a broad audience on the prioritization, development, and implementation of climate policies, investments, and targets."[190] The Climate Action Tracker assesses climate targets and implementation for 39 countries, including for Kazakhstan and the PRC.[191] The Climate Change Performance Index ranks 60 countries according to their climate change mitigation policies and practices, including for Kazakhstan and the PRC.[192] Building on these and other NDC and climate strategy support and tracking mechanisms, CAREC could develop a process of peer review, benchmarking, and capacity development support to assist countries with the design and implementation of their NDCs in a way that complements and integrates other support mechanisms for maximum benefit for the region as a whole.

7.2 Climate Finance

Climate change commitments, strategies, and action plans need to be financed, and there is wide agreement among experts that climate finance needs are large, urgent, and so far, unmet at a global level. Climate action requires upfront investment in climate-smart production capacity and in infrastructure, as well as in ongoing operation and maintenance of the assets created, and in the development of national and regional institutional capacity. These, in turn, require finance—national and international, public and private finance. One estimate of the climate mitigation and adjustment financing needs for developing countries (without the PRC) concludes that on average, a total of 4% of GDP is required annually, with 1.6% of GDP mobilized domestically and the rest from international sources.[193] In 2009, developed countries committed to providing $100 billion annually by 2020 and beyond to developing countries to assist with climate mitigation and adaptation action. The most recent OECD estimate shows that in 2020, $83.3 billion was raised, with the $100 billion target likely to be reached only by 2023.[194] Even when reached, this target likely falls short of the total needed for an effective climate response in developing countries, especially as regards adaptation finance requirements.[195]

[188] UNDP NDC Support Program. https://www.ndcs.undp.org/content/ndc-support-programme/en/home.html; World Bank NDC Support Facility. https://www.worldbank.org/en/programs/ndc-support-facility.

[189] Interview with EBRD representative.

[190] World Bank. 2021. NDCs: *Navigating Complex Data on Paris Commitments*. https://www.worldbank.org/en/topic/climatechange/brief/the-ndc-platform-a-comprehensive-resource-on-national-climate-targets-and-ation.

[191] Climate Action Tracker. https://climateactiontracker.org/about/privacypolicy_legal/.

[192] Climate Change Performance Index. https://ccpi.org/countries/.

[193] M.S. Ahluwalia and U. Patel. 2022. Climate Change Policy for Developing Countries, in H. Kohli, R. Nag, and I. Vilkeltye, eds. 2022. *Envisioning 2060*. Haryana, India: Penguin Random House.

[194] OECD. 2022. Statement by the *OECD Secretary-General on Climate Finance Trends to 2020*. https://www.oecd.org/environment/statement-by-the-oecd-secretary-general-on-climate-finance-trends-to-2020.htm.

[195] LSE-Brookings. 2022. *Financing a Big Investment Push in Emerging Markets and Developing Countries for Sustainable, Resilient and Inclusive Recovery and Growth*. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/05/Financing-the-big-investment-push-in-emerging-markets-and-developing-economies-for-sustainable-resilient-and-inclusive-recovery-and-growth-1.pdf.

Climate finance requirements are also substantial in the CAREC region. Applying the ratios of funding requirements to GDP for developing countries noted in the previous paragraph to CAREC countries (excluding the PRC), climate finance requirements would amount to $26 billion annually in total financing, or $10 billion in domestic financing and $16 billion in international financing.[196] These estimates demonstrate that substantial funding will have to be mobilized during difficult times, if climate goals are to be met. According to the UNFCCC, international climate finance flows to the Central Asian and Southern Caucasus countries were $9.1 billion between 2013 and 2018 while South–Southwest Asian countries, Afghanistan, Pakistan, and Iran received $6.3 billion, with 76% of the climate finance flows directed to mitigation activities and the remaining 24% to adaptation.[197]

Each country in the CAREC region has its own approach to meeting the climate change challenge and, hence, financing needs (Appendix 2). The country-specific financing needs can be gleaned from the NDCs, but these numbers are likely not directly comparable and further analysis will be needed for the CAREC countries to get reliable estimates of climate change finance requirements. Countries generally, though, would not only like more external climate finance on favorable terms, but want to see more climate finance directed to adaptation than has so far been the case. The preference for adaptation finance is especially strong for those countries that contribute little to emissions because of their heavy reliance on hydropower, while at the same time being highly vulnerable to the effects of climate change (especially Georgia, the Kyrgyz Republic, and Tajikistan).[198] There is a lot of analytical and empirical work currently underway to address the issue of climate finance at a global level,[199] but so far, there appears to have been no analysis for CAREC countries that would help inform a regional response to mobilizing finance.

Climate financing needs can be met from various sources, domestic and external, public and private, and an appropriate financing strategy will be tailored to the specific characteristics of a country. Table 27 provides a mapping of climate finance by source—domestic resource mobilization, official development assistance, multilateral nonconcessional assistance, and private finance—purpose and country income, which can provide a high-level guide to exploring climate financing options in the CAREC region. Specific sources, their pros and cons, and their relevance for CAREC countries can be summarized as follows:[200]

(i) **Domestic resource mobilization (DRM).** Domestic resource mobilization is critical in support of climate change since external sources will not suffice to cover the costs of mitigation and adaptation, even if increased substantially over current levels, which is by no means guaranteed, given the current global economic situation. Specific DRM instruments include general tax revenues, elimination of energy, water, and transport subsidies, and green public finance (including carbon pricing). The pros are that domestic

[196] GDP figures are for 2020, based on World Bank data. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=TJ&name_desc=false.

[197] UNFCCC Update on the Need-Based Finance Project 2020–2021. https://unfccc.int/sites/default/files/resource/NBF%202020-2021.pdf.

[198] Based on consultations with country experts and representatives.

[199] For example, LSE-Brookings. 2022. *Financing a Big Investment Push in Emerging Markets and Developing Countries for Sustainable, Resilient and Inclusive Recovery and Growth*. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/05/Financing-the-big-investment-push-in-emerging-markets-and-developing-economies-for-sustainable-resilient-and-inclusive-recovery-and-growth-1.pdf.

[200] For additional insights on climate finance issues and options see LSE-Brookings. 2022, and for Central Asia, see World Bank. 2020. Financing Climate Actions in Central Asia. https://zoinet.org/wp-content/uploads/2020/10/CA-climate-finance-en.pdf. For specific examples of different forms of climate financing in CAREC countries, see Appendix 4.

Table 27: Financing Heat Map—Which Type of Spending Is Most Important for Which Source of Finance

Category	DRM [Domestic Resource Mobilization]	Official Finance		Private Finance
		ODA [Official Development Assistance]	Multilateral Nonconcessional	
Human capital	High	Medium	Medium	Low
Infrastructure	Medium	Low	High	High
AFOLU	Medium	High	Medium	Medium
Adaptation and resilience	Medium	High	Medium	Low
Low-income	Medium	High	Low	Low
Lower middle-income	Medium	Medium	High	Medium
Upper middle-income	High	Low	Medium	High

AFOLU = agriculture, forestry, and other land use; LIC = lower-income country: Afghanistan; LMICs = lower-middle-income country: the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Uzbekistan; UMICs = upper-middle-income countries: Azerbaijan, Georgia, Kazakhstan, the People's Republic of China, Turkmenistan.

Source: LSE-Brookings. 2022. *Financing a Big Investment Push in Emerging Markets and Developing Countries for Sustainable, Resilient and Inclusive Recovery and Growth*. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/05/Financing-the-big-investment-push-in-emerging-markets-and-developing-economies-for-sustainable-resilient-and-inclusive-recovery-and-growth-1.pdf.

revenues are under national control and do not create debt; they can improve efficiency and support climate goals if aligning prices with economic and environmental costs (elimination of subsidies and introduction of carbon and other green taxes. The cons are that DRM is politically difficult to implement, may create inefficiencies, and can displace private savings (general taxation). A recent IMF publication provides detailed recommendations for DRM with direct relevance to the CAREC countries.[201]

(ii) **Official climate finance.** The sources for official finance include bilateral and multilateral flows on official development assistance (ODA) terms (grant or highly concessional), as well as loans on favorable market terms principally by the multilateral development banks (MDBs). A large number of official agencies are active in the CAREC region, including the MDBs (ADB, AIIB, EBRD, EIB, IsDB, EIB, the Eurasian Development Bank, and the World Bank Group), also the specialized climate funds (including GCF, GEF, CIF, Adaptation Fund and, most recently, the Systematic Observations Financing Facility [SOFF]); the UN agencies (including IFAD, UNDP, UNEP) and many bilateral development partners (French Development Agency [AFD], GIZ, Japan International Cooperation Agency [JICA], Korean International Cooperation Agency [KOICA], Sida, United States Agency for International Development [USAID], and others). The pros of this type of finance are that it is concessional (i.e., at no or low cost to the recipient country), it often comes with technical assistance, and, at times, is focused on regional, not just country climate issues. The cons are that the amounts of funding are limited; the financing architecture is highly

[201] IMF. 2022. *Revenue Mobilization for a Resilient and Inclusive Recovery in the Middle East and Central Asia*. https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/06/30/Revenue-Mobilization-for-a-Resilient-and-Inclusive-Recovery-in-the-Middle-East-and-Central-513773.

fragmented and, hence, difficult to manage;[202] the priorities are ultimately at the discretion of the funder; funding is linked to conditions that are seen as onerous by the recipients; and funding processes are often time-consuming and burdensome; moreover, many funders focus primarily on national, rather than regional initiatives.

(iii) **Private finance.** Private finance will be of critical importance globally if climate change goals are to be met. This also applies to the countries in the CAREC region. Private finance takes many different forms, the most important include (a) private green equity investment (foreign or national) in private firms, which has the advantage that it does not create debt and, in the case of direct foreign investment, supports the transfer of technology, management knowhow, and others; (b) green bonds for private or public projects that offer the opportunity to access domestic and international capital markets; and (c) weather and climate insurance, which has the benefit of automaticity of payment in the event of a weather or climate disaster. The challenge for private climate finance is that it has to overcome perceptions and realities of a poor investment climate in many countries, needs clear signals of a government's commitment to a credible climate strategy, and requires a strong capacity to prepare and negotiate bankable projects or bond deals. The issuance of green bonds faces specific challenges (Box 14). Since there is generally a dearth of bankable projects, CAREC is in the process of preparing a Regional Infrastructure Projects Enabling Facility, which will help identify bankable infrastructure projects that could include specifically climate-smart infrastructure.[203] Another issue is that private finance tends to be costly due to the perception (and reality) of high risk. One way of attracting private finance at reasonable terms is for a public financier (e.g., a multilateral development bank or fund, such as EBRD, IFC, Multilateral Investment Guarantee Agency [MIGA, and others) to derisk private investments by providing guarantees or by blending public and private finance in other ways.[204] CAREC is currently preparing a Disaster Risk Transfer Facility specifically targeted to transfer disaster risk.[205]

Disasters require special consideration for financing the losses that they cause. As noted in the section on disasters triggered by natural hazards (Chapter 4), climate-related disasters cause huge losses that will likely increase in future years. Traditional financing mechanisms relying on domestic budgets and foreign humanitarian and reconstruction assistance are insufficient to deal with these threats. Alternative mechanism relying on the insurance principle or risk-transfer mechanism are, therefore, being developed. These mechanisms include:

(i) **Risk transfer.** Shifting the responsibility to bear the financial consequences of natural hazard to another party, usually an insurance firm that charges a regular premium to cover the economic loss;

[202] For a detailed discussion of the extent and problems of aid fragmentation and reference to a detailed report, see World Bank. 2022. *Insights on Proliferation and Fragmentation to Boost Aid Effectiveness During Crises*. https://blogs.worldbank.org/voices/insights-proliferation-and-fragmentation-boost-aid-effectiveness-during-crises.

[203] CAREC. 2020. *CAREC Regional Infrastructure Projects Enabling Facility*. https://www.carecprogram.org/?project=carec-regional-infrastructure-projects-enabling-facility.

[204] For a discussion of de-risking and blended finance, see One Planet Lab. 2021. *Blended finance for scaling up climate and nature investments*. https://www.oneplanetsummit.fr/sites/default/files/2021-11/Blended%20Finance%20for%20Scaling%20Up%20Climate%20and%20Nature%20Investments%2C%20November%202021.pdf.

[205] "The project has three main components: (i) development of disaster risk assessments and modeling in all CAREC countries; (ii) design of a regional pilot disaster risk transfer facility for at least three CAREC countries; and (iii) capacity building and awareness raising activities to sensitize key public and private stakeholders in all CAREC countries about the benefits of disaster risk reduction, risk retention and risk transfer solutions." Quoted from GEM. Willis and GEM to work together on Disaster Risk Transfer Facility project by ADB for Central Asia Regional Economic Cooperation Region (CAREC). https://www.globalquakemodel.org/GEMNews/willis-and-gemto-work-together-on-adb-carec-project.

Box 14

Challenges for Issuing Green Bonds

The People's Republic of China (PRC) is the largest green bond issuer not only in the Central Asia Regional Economic Cooperation (CAREC) region, but also globally. In 2021, 16% of all green bonds are issued in the PRC (see figure). Other CAREC countries started to issue green bonds from 2020. However, many CAREC countries (excluding the PRC) are (or may be) facing certain set of difficulties in promoting green bond issuance in Central Asia:

To attract international investors and/or buyers, bonds are usually issued in United States (US) dollars or Euros. This is challenging for many countries as national currencies tend to fluctuate often against major currencies. To pay back the debt, countries convert revenues collected in national currencies into foreign currency, with the national issuer bearing all the exchange rate costs and risks. For example, Georgia issued $1.5 billion (by Georgian Railways and Georgia Global Utilities) and Pakistan (by Pakistan Water & Power Development Authority) issued $0.5 billion green bonds denominated in US dollars. As an exception, Kazakhstan's Damu Fund issued tenge (KZT) 200 million ($0.5 million) denominated in KZT targeting domestic investors (buyers). Local demand is necessary for green bonds denominated in domestic currencies in Central Asia.

International rating agencies, such as Moody's, usually provide low (or no) grades for bonds issued from developing countries unless those bonds were issued by the government with guarantees, and even then, the interest cost tends to be high compared to the rates charged by official multi- and bilateral lenders. Green bonds add to national debt levels which in some countries are already unsustainably high.

The cost of labeling bonds as "green" is high for Central Asia, especially the cost of external review. It requires detailed expertise against green bond standards or principles, including external review. The market of specialized local experts or consulting firms for green bonds is not developed yet, so usually, expensive international consultants have to be hired. The solution to this problem could be Green Bond Grant, which was successfully implemented in Asia, e.g., Singapore; Malaysia; Hong Kong, China; and Japan. Green Bond Grants usually cover 90%–100% of the cost of external review for labelling bonds "green" with a maximum cap of around $70,000. Such green bond grant was also provided in Kazakhstan.

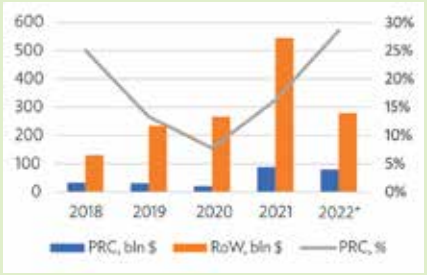
In developed countries, many private enterprises go green despite the high cost because of reputational reasons to improve their image in competitive environment. However, this is still a minor factor in Central Asia.

Central Asia countries have limited experience in issuing a conventional (nongreen) bond, let alone issuing green bonds that come with additional complications, efforts, and cost of labeling.

Islamic green finance (green sukuk) could gain popularity in Central Asia as a predominantly Muslim region, but so far, Central Asia has no significant experience in issuing sukuk either.

Green Bond Issuance in CAREC

a) **PRC** ($ billion)



b) **CAREC (excluding the PRC)**, ($million)

bln = billion, CAREC = Central Asia Regional Economic Cooperation, PRC = People's Republic of China, RoW = rest of world.

* January–14 September 2022.

Source: This box was prepared by Dina Azhgaliyeva, Research Fellow, ADB Institute, based on data from *Bloomberg* terminal (accessed 14 September 2022).

(ii) **Risk retention.** Self-insurance by the government, setting special funds to compensate the damage in case of natural calamity;

(iii) **Risk pooling.** Establishing common fund of several stakeholders that provides funding to member entities cover losses caused by disasters triggered by natural hazards, such a pool can be created by two or several countries or national and international private entities; and

(iv) **Index-based or parametric insurance.** Development of specific indicators for different types of natural hazards that would measure the level of loss and provide estimated payment depending on scale of damage.

Despite a growing interest in disaster risk financing, the level of development, access, and use of ex-ante disaster risk financing instruments for post-disaster response are still in their infancy in the CAREC countries. This is due to demand- and supply-side constraints of the insurance sector. On the demand side, there is a lack of sufficient information, mistrust of insurance firms in their ability to provide necessary payment in case of a disaster event triggered by natural hazard, and a general lack of understanding of insurance by the local population. On the supply-side, there is weak technical capacity and limited interest by international insurers.[206] Recognizing these constraints, ADB has been implementing a TA project on "Developing a Disaster Risk Transfer Facility in the Central Asia Regional Economic Cooperation Region" that aims to improve collaboration between CAREC countries in disaster risk financing, including disaster insurance.[207]

Regional approaches can help with mobilizing climate finance. Countries in the CAREC region will benefit from a regionwide assessment of climate financing flows relative to needs, from a collection of information on the activities of various funders and their funding processes, from capacity building for engaging with public and private funders, and from sharing lessons and best practices about specific financing options. Particular facilities, such as the abovementioned Project Regional Infrastructure Projects Enabling Facility and the Disaster Risk Transfer Facility, offer excellent opportunities for regionwide engagement. Official external funders have a special role to play in identifying and supporting regional programs and projects, rather than focusing mainly or even exclusively on national climate programs and engaging proactively with CAREC in developing and financing regional initiatives. Fortunately, there are some excellent examples where funders are doing just that, as noted earlier in this report. The practice needs to be reinforced and, wherever possible, expanded.

7.3 Regional and Subregional Cooperation for Climate Change Action

Regional cooperation plays an important role in achieving effective climate change action. Many climate change impacts are regional, and a regional response is required for effective mitigation and adaptation action. This requires cooperation among governments in a particular region, a message that is often repeated by senior international climate officials and experts. For example, Patricia Espinoza, who served as the executive secretary of the United Nations Framework Convention on Climate Change from 2016 to 2022, in 2022, called regional collaboration

[206] UNESCAP. 2017. *Disaster Risk Transfer Mechanisms: Issues and Considerations for the Asia-Pacific Region.* https://www.unescap.org/sites/default/files/pre-ods/REV_E-ESCAP-CDR5_3%20Disaster%20Risk%20Transfer%20Mechanisms_29%20Aug%2017.pdf.

[207] ADB. 2019. *Developing a Disaster Risk Transfer Facility in the Central Asia Regional Economic Cooperation Region.* Technical Assistance Report. https://www.adb.org/sites/default/files/project-documents/53198/53198-001-tar-en.pdf.

"a climate-action catalyst."[208] Reflecting the importance of regional cooperation, the UNFCCC in 2015 set up five regional cooperation centers, one of them in Bangkok for the Asia and Pacific region,[209] and organized regional climate weeks, including one for Asia and the Pacific in 2021.[210] ADB included regional cooperation prominently in its climate change action plan[211] and has integrated it into the work of its sector operations and into its support for regional cooperation platforms, e.g., the Greater Mekong Subregional (GMS) program. The World Bank's Climate Change Action Plan 2021–2025 promises support for regional cooperation, especially in the energy and water sectors,[212] and the World Bank has supported regional cooperation in other areas of climate change action also, including in Central Asia, e.g., for hydromet development, disaster prevention, Aral Sea Basin recovery, land restoration, and climate change and environmental research, as documented earlier in this report. Experts who have called for regional cooperation on climate change action include Homi Kharas from Brookings who argues that regional cooperation is critical both for delivering regional public goods that respond to climate change and for representing regional interests and priorities in international climate negotiations.[213]

Regional cooperation must be tailored to the regional climate change issue that is to be addressed. Five basic types of regional cooperation may be distinguished: (i) joint or coordinated support for investment and operation and maintenance (O&M) of assets, mostly infrastructure; (ii) joint or coordinated formulation and implementation of policies and regulations; (iii) cooperation on technology transfer and knowledge sharing; (iv) cooperation on research and collection and assembly of data on climate change; and (v) regional support for institutional capacity building, including that of regional institutions. Table 28 provides an indicative picture of how these five types of regional cooperation apply across the different climate change issues explored earlier in this section.

(i) **Investment and O&M.** Cooperation on investment and O&M will usually be appropriate in cases where the assets created are linked across borders (e.g., power transmission lines, transport corridors) or create positive or negative cross-border spillovers (e.g., investment in upstream water reservoirs in river basins crossing borders creates both types of spillover, literally). It is important that cooperation not only covers the investment phase of a project but also extends to the O&M requirements of an asset over its lifetime (e.g., O&M of a dam, canal, or road).

(ii) **Policies and regulations.** Cooperation on policies and regulations will be important in cases where appropriate usage of regional infrastructure is necessary for maximum regional benefit (e.g., electricity and water pricing), or where policies or regulation are needed to prevent negative spillovers across borders (e.g., pollution) or help bring about positive spillovers (e.g., macroeconomic management, improvements in business climate).

[208] P. Espinoza. 2022. *Regional Collaboration is a Climate-Action Catalyst*. https://climatechampions.unfccc.int/regional-collaboration-is-a-climate-action-catalyst/.

[209] Brochure for the Asia and Pacific Regional Cooperation Center. https://unfccc.int/sites/default/files/resource/RCCBangkokBrochure2020.pdf.

[210] https://unfccc.int/APCW2021.

[211] ADB. 2019. *Tackling Climate Change, Building Climate and Disaster Resilience, and Enhancing Environmental Sustainability, 2019–2024*. https://www.adb.org/sites/default/files/institutional-document/495961/strategy-2030-op3-climate-change-resilience-sustainability.pdf.

[212] World Bank. 2021. *Climate Change Action Plan 2021–2025*. https://openknowledge.worldbank.org/bitstream/handle/10986/35799/CCAP-2021-25.pdf?sequence=2&isAllowed=y.

[213] H. Kharas. Brookings. 2022. *A Global Sustainability Program: Lessons from the Marshall Plan for Addressing Climate Change*. https://www.brookings.edu/wp-content/uploads/2022/05/Global-Sustainability-Program.pdf.

Table 28: Type of Regional Climate Cooperation, by Issue

Climate Issue	Principally for Physical Connectivity or Spillover		Relevant for All Issues, Even Where No Physical Connectivity or Spillover		
	Joint investment and O&M	Joint policy and regulatory action	Technology transfer and knowledge transfer	Research and data	Capacity building
Core Issues					
Energy					
Efficiency			•	•	•
Electrify final demand	•	•	•	•	•
Phase down coal				•	
Renewables	•	•	•	•	•
Electricity interconnection	•	•	•	•	•
Carbon pricing		•	•	•	•
Water					
Infrastructure	•	•	•	•	•
Policy (pricing, and others)		•	•	•	•
Allocation		•	•	•	•
Agriculture					
Irrigation	•	•	•	•	•
Agricultural technology		•	•		
Agricultural policy			•	•	•
Energy–water–agriculture nexus	•	•	•	•	•
Transport					
Investment/O&M	•	•	•	•	•
Decarbonize freight	•	•	•	•	•
Cross-border economic corridors	•	•	•	•	•
Climate-smart cities					
Heating and cooling			•	•	•
Mass transit and EVs			•	•	•
Water and sanitation			•	•	•
Pollution control		•	•	•	•
Disasters	•	•	•	•	•
Land restoration		•	•	•	•
Health			•	•	•

continued on next page

Table 28 *continued*

Climate Issue	Principally for Physical Connectivity or Spillover		Relevant for All Issues, Even Where No Physical Connectivity or Spillover		
	Joint investment and O&M	Joint policy and regulatory action	Technology transfer and knowledge transfer	Research and data	Capacity building
Crosscutting Issues					
Macroeconomic and structural			•	•	•
Private sector			•	•	•
ICT and digital	•	•	•	•	•
Hydromet	•	•	•	•	•
Institutional capacity			•	•	•
Benefits and costs				•	
Just climate			•	•	•
Gender			•	•	•
Communication and advocacy			•	•	•
Frontier Issues					
Hydrogen	•	•	•	•	•
Nuclear	•	•	•	•	•
Rare earths			•	•	•
Energy storage			•	•	•
CO_2 capture	•	•	•	•	•
Cryptocurrency		•	•	•	•
Artificial Intelligence			•	•	•
Technology transfer, SCC, scaling			•	•	•
Migration	•	•	•	•	•
Circular economy			•	•	•
Nature-based solutions			•	•	•
Research and data	•	•	•	•	
Other					
NDCs			•	•	•
Climate finance			•	•	•

CO_2 = carbon dioxide, EV = electronic vehicle, ICT = information and communication technology, NDC = nationally determined contribution, O&M = operation and maintenance, SCC = South–South Cooperation.

Source: Authors.

(iii) **Technology transfer and knowledge sharing.** These may accompany physical investments, but can also be freestanding. Technology transfer applies usually to specific technologies that can be shared across countries (e.g., for electric vehicle [EV] production). Knowledge sharing applies to all types of knowledge which helps countries understand the climate change challenges they face and improve the way in which they manage their climate transitions. Cooperation on knowledge sharing is advisable across most climate change issues, while cooperation on technology transfer is likely to be more limited to selected specific areas (especially the core areas and some of the "on-the-horizon" areas, such as hydrogen, energy storage, and CO_2 capture).

(iv) **Research and data.** Research provides the basis for understanding which existing technologies may be usefully applied (and adapted) to climate change issues in a country or to create new technologies where appropriate and possible. Research also creates knowledge about what climate change challenges a country and region face, and what solutions work, how, and under what circumstances and, thus, research helps guide policy and investments. Accurate data are a critical input for research and for effectively managing many responses to climate change (e.g., weather, water, and glacier observations). Research and data, in effect, create regional (and even global) public goods which need to be provided (or supported) on a regional basis. Cooperation on research and data is advisable for most climate change issues.

(v) **Capacity building.** Countries need to develop the institutional and human capacity to assess and respond to the many climate challenges they face. There are benefits from regional cooperation for national capacity building because, while institutional challenges can differ across countries, many of them are very similar (e.g., the capacity required to prepare NDCs or to prepare projects for external financing) and there are efficiencies to be gained from assembling the advisory and training resources needed on a regional basis. Examples are not only the capacity building efforts of the CAREC Institute, but also of the Regional Environmental Center for Central Asia (CAREC-E) and of the IMF's recently created Caucasus, Central Asia, and Mongolia Regional Capacity Development Center (CCAMTAC). In addition, there is the important task of strengthening the capacity of regional organizations and platforms to deal with the regional climate challenges.

There are specific examples of regional cooperation platforms that focus on climate change action and can offer lessons for CAREC's approach to climate change. Four examples of regional platforms with climate change agendas are briefly considered as relevant to CAREC—the European Union (EU), Association of Southeast Asian Nations (ASEAN), South Asian Association for Regional Cooperation (SAARC), and Greater Mekong Subregion (GMS):

(i) **The EU.** The most notable example of regional cooperative planning and implementation of climate change action is the EU's European "Green Deal." It is ambitious in its goals ("transform the EU into a modern, resource-efficient, and competitive economy, ensuring: no net emissions of greenhouse gases by 2050; economic growth decoupled from resource use; no person and no place left behind") [214] and comprehensive in its coverage (Figure 26). According to the European Climate Foundation: "Practically, the European Green Deal is a set of policy initiatives coordinated across the EU and its Member States to speed up the transition toward net zero greenhouse gas emissions by 2050, including by reaching emissions reductions of at least 55% by 2030

[214] EU Green Deal Website. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

Figure 26: What the European Green Deal Aims to Deliver

Source: EU Green Deal Website. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

compared to 1990 levels. It provides an EU legislative framework requiring all Member States to take a certain level of action, as well as offering financial support for those most affected by the transition."[215] While the EU approach is special and certainly not replicable by CAREC, considering the EU's strong formal regional cooperation structures and the political cohesion of the Union, specific aspects will be worth studying for their relevance to the CAREC region.

(ii) **ASEAN.** Another regional grouping—and one more comparable to CAREC—is ASEAN, which in 2011, developed an action plan for a joint response to climate change, prepared in 2021 an ASEAN State of the Climate Report, and also in 2021, submitted a joint statement of ASEAN countries at COP26.[216]

(iii) **SAARC.** SAARC—in which Afghanistan and Pakistan are members—has since 1987, focused on environmental threats and climate change, especially disasters triggered by natural hazards, on rise in ocean levels, on food security, and others, with official declarations, statements, frameworks, networks, a SAARC Food Bank, and more.[217] However, an assessment by two academic experts in 2018 concluded as follows: "Despite a significant number of declarations to combat climate change and its security risks, many policies are still not operational, and others are yet to be ratified. As scholars often point out that though several institutions have been established, they have not been able to produce concrete results in accordance with declarations, conventions and action plans produced at SAARC" (footnote 220). Another academic paper, published in 2021,

[215] European Climate Foundation. *European Green Deal*. https://europeanclimate.org/the-european-green-deal/.

[216] ASEAN. 2011. *ASEAN Action Plan on Joint Response to Climate Change*. https://asean.org/legaldocumentparent/asean-action-plan-on-joint-response-to-climate-change/; ASEAN. 2021. *ASEAN State of Climate Change Report*. https://www.worldbank.org/en/news/feature/2019/12/24/improving-regional-cooperation-to-better-manage-disaster-risks-in-central-asia; ASEAN. 2021. *ASEAN Joint Statement at COP26*. https://asean.org/wp-content/uploads/2021/10/10.-ASEAN-Joint-Statement-to-COP26.pdf.

[217] F. Krampe and A. Swain. 2018. *Is SAARC Prepared to Combat Climate Change and its Security Risks?* https://climate-diplomacy.org/magazine/environment/saarc-prepared-combat-climate-change-and-its-security-risks.

presents a more upbeat assessment: "The declarations and policy-statements have produce [sic] norms and conceptual foundations on which the SAARC countries can embark upon and cope with ecological system and environmental change. The SAARC environmental action plan 1997, SAARC action plan 2008, Delhi statement 2009, and Thimphu silver jubilee declaration 2010 have produced normative structure to define the issue areas, enhance cooperation, and ensure its implementation in the region. Most significantly, the cooperation has helped the SAARC to come out with a common position and present it on international forums." Both papers note that existing interstate rivalries among SAARC member countries have to be set aside if SAARC is to play its potentially critical role in regard to climate change.

(iv) **GMS.** GMS program is most comparable to CAREC, in that it has had improved regional connectivity as a key goal, is supported by ADB as one of its premier regional initiatives (ADB hosts the GMS Secretariat). Established in 1992, 8 years earlier than CAREC, GMS has focused since 2005 on environmental issues, starting that year with its GMS Core Environmental Program (CEP) and added climate resilience as a focus under the CEP's 2012–16 phase.[218] According to a 2015 report, key activities included:

- "Developing a participatory framework for climate vulnerability assessment and identification of adaptation responses in GMS rural communities, and building capacity of GMS practitioners to apply the framework;
- Investigating the role of financial strategies and instruments, such as savings, micro-insurance, and contingency funds, as part of an adaptation strategy for rural communities, focusing on delivery mechanisms such as Community Development Funds;
- Establishing an online regional knowledge base, which hosts climate projection data along with analytical tools, the assessment guideline, and training materials, to support climate change adaptation planning in the GMS;
- Developing climate profiles for the seven transboundary landscapes, and supporting development of climate integrated conservation strategies for these landscapes;
- Coordinating the GMS Climate Change Roundtable, an ADB-led dialogue and joint-action forum among development and research institutions working on sustainable livelihoods and climate change in the GMS.
- Implementing demonstrative pilot projects, including those on ecosystem-based adaptation (EbA) and REDD+ readiness, and identify opportunities for upscaling at both the landscape and community levels."

In 2019, ADB approved TA funding for the Greater Mekong Subregion Climate Change and Environmental Sustainability Program,[219] which supports a large range of climate change-related actions, summarized in a chart providing detailed listing of expected outputs and their timing in three major areas: (i) climate and disaster resilience enhanced; (ii) low-carbon transitions facilitated; and (iii) climate-smart landscapes promoted and environmental quality enhanced.[220] GMS has supported a GMS Working Group on Environment with an environment website and a GMS Environment

[218] IISD. 2015. *Promoting Climate Resilience in the Greater Mekong Subregion: The Role of the GMS Core Environment Program*. http://sdg.iisd.org/commentary/guest-articles/promoting-climate-resilience-in-the-greater-mekong-subregion-the-role-of-the-gms-core-environment-program/.

[219] ADB. 2019. *Greater Mekong Subregion Climate Change and Environmental Sustainability Program: Technical Assistance Report*. https://www.adb.org/sites/default/files/project-documents/53390/53390-001-tar-en.pdf.

[220] https://www.adb.org/sites/default/files/linked-documents/53390-001-sd-01.pdf.

Operations Center in Bangkok since 2019.[221] Despite all these intensive activities directed at the environment and climate agenda, according to a 2021 evaluation of GMS by ADB's Independent Evaluation Department, the record has been mixed (Box 15).

Box 15
Results of an Independent Evaluation of the Greater Mekong Subregion Program's Environment and Climate Support

"The evaluation finds that ADB has provided critical institutional support for the GMS Program to remain as an effective and stable platform for the member countries to work together with joint development objectives … It made less contribution … to improving environmental conditions overall, including effectively tackling climate change. (p. VII)

"In environment, ADB contributed to increased conservation of nature, including through its support to the GMS Biodiversity Conservation Corridors which is helping prevent and mitigate the fragmentation of biodiversity-rich forest landscapes in Cambodia, the Lao PDR, and Viet Nam, and restoring habitat on degraded farmlands. ADB also made efforts to incorporate climate resilience and disaster risk management strategies in GMS sector investments and to strengthen regulatory environments for sustainable development through improved policies and regulations. During 2010–2018, several regional environment and nature reserve indicators did not improve. Deforestation ranged from less than 1% to 3% of forest area annually in GMS countries, except for the PRC and Viet Nam where the forest cover slightly increased. Carbon dioxide emissions in metric tons per capita increased (12%), the average GMS carbon dioxide emissions (kilo per PPP $ of GDP) did not change. The GMS overall environmental performance index declined." (para. 113)

ADB = Asian Development Bank, GDP = gross domestic product, GMS = Greater Mekong Subregion, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: This evaluation is not focused specifically on climate change; references to climate change are scattered throughout the report.

Source: ADB IED. 2021. Evaluation of ADB Support for the Greater Mekong Subregion Program, 2012–2020. https://www.adb.org/documents/evaluation-adb-support-greater-mekong-subregion-program-2012-2020.

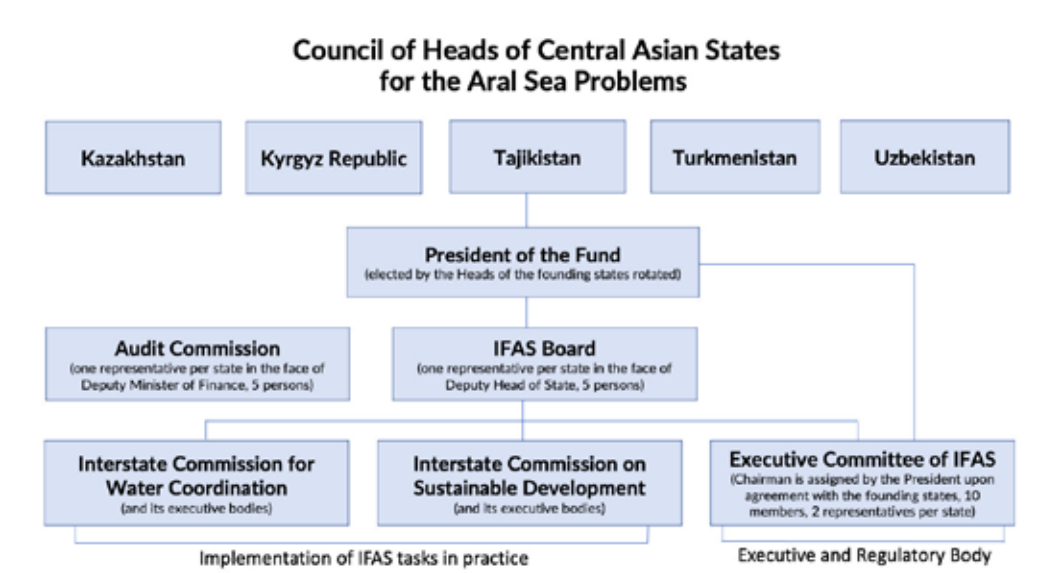
Lessons can also be learned from—and partnerships formed with—regional platforms in the CAREC region that deal with climate change. The regional cooperation platforms that focus on climate change (other than CAREC and CAREC Institute, which are discussed in the next chapter) are subregional in coverage, many of them dealing only with Central Asia, rather than the CAREC region as a whole. Many of them have been mentioned in the preceding discussion of specific climate change issues. A detailed description and assessment of these platforms is beyond the scope of this scoping study, but an effort should be made in the future to assess whether and how CAREC and CAREC Institute should collaborate with these organizations on the climate change agenda. Some of the most relevant examples are briefly highlighted here.

[221] GMS Environment website. https://us02web.zoom.us/j/82892266509?pwd=UGVBcTIjS2ITRmpZYm04MWxJUXc4UT09; GMS Working Group on Environment website. https://www.greatermekong.org/wge; GMS Environment Operations Center. http://www.gms-eoc.org/.

(i) **Regional Environmental Center for Central Asia (CAREC-E).** Most notable is CAREC-E,[222] which serves as a hub for information, research, policy advice, capacity building, and advocacy on environmental and climate issues.[223] It covers the five Central Asian republics, which founded CAREC-E in 2001 together with the EU and UNDP. According to its website, CAREC-E has received funding from bilateral donors and partnered with many multilateral and bilateral agencies, including ADB; CAREC and CAREC Institute are not listed among its partners. According to the consultations carried out for this scoping study, CAREC-E intends to broaden its regional scope to also work in Afghanistan and other neighboring countries and would welcome cooperation with CAREC and CAREC Institute.

(ii) **International Fund for Saving the Aral Sea (IFAS).** Founded in 1993 by the heads of state of the five Central Asian republics, IFAS addresses environmental and socioeconomic challenges affecting the Aral Sea basin. According to its website, its areas of activity include integrated water resources use, environmental protection, socioeconomic conditions, and improvements in institutional and legal mechanisms.[224] The most important program under its direction is the multiphase Aral Sea Basin Program (ASBP-1, -2, -3, and -4), which have been supported by multiple donors since 1997.[225] The organizational structure of IFAS is shown in Figure 27, with its subsidiary bodies, which include the Executive

Figure 27: Organizational Structure of International Fund for Saving the Aral Sea



IFAS = International Fund for Saving the Aral Sea.

Source: Interstate Commission for Water Coordination (ICWC) website. http://icwc-aral.uz/ifas.htm.

[222] The official abbreviation is CAREC. CAREC-E is used in this report to distinguish it from the Central Asia Regional Economic Cooperation forum (CAREC also).

[223] Regional Environmental Center for Central Asia website. http://www.carececo.org/en/main/.

[224] The Executive Board of the International Fund for saving the Aral Sea in the Republic of Kazakhstan. https://kazaral.org/en/.

[225] https://kazaral.org/en/ifas/asbp/. ASBP-4 is currently under consideration by the members of IFAS, ICWC, and ICSD. https://ecifas-tj.org/en/meropriyatiya/aral-sea-basin-program-4-asbp-4/.

Committee of IFAS as the executive and regulatory body, the Interstate Commission for Sustainable Development (ISCD), and the Interstate Commission for Water Coordination (ICWC), which serve as implementation arms of IFAS.

(iii) **Interstate Commission for Sustainable Development (ICSD).** According to the Head of the ICSD Secretariat, ICSD was set up under the auspices of IFAS.[226] It developed the Regional Programme on Environmental Protection for Sustainable Development (REP4SD). REP4SD CA is a strategic framework document that defines priority areas for regional cooperation in the field of environmental protection until 2030. REP4SD has the following goal: To identify priority areas in addressing environmental issues in Central Asian countries through the formation of effective mechanisms for regional cooperation, ensuring stable socioeconomic development, conservation, and sustainable management of natural resources. Its objectives are (a) to strengthen the institutional, legal, and expert capacity to attract project funding for priority areas identified in the REP4SD CA from IFAS member states, donors, private sector, and other stakeholders (including mandate on environmental, climate issues have been given to the ICSD. Other REP4SD priorities related to water, ecosystems); (b) to improve coordination of activities within the REP4SD CA priorities framework and relevant national strategies and programs, as well as civil society and academia projects; and (c) to harmonize legal and institutional frameworks of ICSD structures at national and regional levels, including the ongoing legal and institutional reform process of the IFAS. ICSD expressed its interest in cooperating with CAREC on climate issues during consultations with the scoping study team.

(iv) **Scientific Centre of the Interstate Commission for Water Coordination in Central Asia (ICWC).** According to its website, the ICWC has responsibility for making binding decisions on allocation and use of Aral Sea basin water resources among the five member countries, including setting schedules for the operation regimes of reservoirs. It also is charged with development of a water pricing policy and a legal framework for water use, with the coordination of large water infrastructure projects, with the creation of a common information base on water resource use, management and conservation, and with developing joint programs for disaster prevention and relief.[227]

(v) **Centre for Emergency Situations and Disaster Risk Reduction (CESDRR).** CESDRR was founded in 2016 by the governments of Kazakhstan and the Kyrgyz Republic. Membership is open to other countries upon application. Afghanistan was granted observer status. Its function is to support interstate cooperation on disaster reduction, early warning and preparedness, and response. The center also mobilizes and coordinates resources for these purposes, including international financing and implements projects in the area of disaster risk reduction.[228]

(vi) **Caucasus, Central Asia and Mongolia Regional Capacity Development Center (CCAMTAC).** CCAMTAC is a regional center of the IMF, based in Almaty, Kazakhstan, and according to its website, focuses on macroeconomic analysis, fiscal policy, and monetary policies. In view of the importance of these policies in connection with climate change in which the IMF has been recently much engaged, and since the IMF has been an active development partner of CAREC since its formation in 2000, CAREC may wish to explore whether and how CCAMTAC could contribute to CAREC's evolving regional climate agenda.

[226] This paragraph is based on a statement by the Head of ICSD during a consultation session of this study.

[227] ICWC website. http://icwc-aral.uz/mandate.htm.

[228] Information about CESDRR. https://www.unescap.org/sites/default/files/Center_for_Emergency_Situations_and_Disaster_Risk_Reduction_Eng_0.pdf.

(vii) **United Nations Special Program for the Economies of Central Asia (SPECA).** SPECA is a grouping of the five Central Asian republics and Afghanistan. It is supported jointly by the UN Economic Commission for Europe (UNECE) and the UN Economic and Social Commission for Asia and the Pacific (UNESCAP). SPECA works on regional cooperation in six areas: (a) water, energy, and the environment; (b) sustainable transport, transport, and connectivity; (c) trade; (d) statistics; (e) innovation and technology for sustainable development; and (f) gender and SDGs.[229] While climate change is not explicitly mentioned as a topic in these six areas (and the annual SPECA work plan for 2020–2021 also does not mention work on climate change),[230] it is relevant to all of them —and vice-versa—as is clear from the preceding discussion in this report. The next annual meeting (later in 2022) is expected to deal with climate issues. Representatives of UNECE and UNESCAP indicated during consultations with the team that they are interested in partnering with CAREC.

There are also various sector and thematic platforms for regional cooperation in the CAREC region supported by development partners. Development partners have initiated a variety of regional platforms relevant for climate change in the CAREC region, mostly for Central Asia, including those mentioned earlier in this report, such as "Green Central Asia" for transboundary dialogue on climate, environment, and security supported by GIZ;[231] the EU-funded "Strengthening Financial Resilience and Accelerating Risk Reduction in Central Asia Program" for "(i) providing common analytics and metrics, (ii) fostering training and sharing of knowledge and technology, (iii) developing solutions for national and regional as well as transboundary issues," [232] implemented by the World Bank and GFDRR; and the World Bank-supported 5-year Climate and Environment (CLIENT) Program with its three subprograms (Resiliand+ for resilient landscape and restoration, CEPM for circular economy and pollution reduction, and C4CA for climate communication);[233] and the EU/UNDP-supported Project on Climate Change and Resilience in the Fergana Valley (the Kyrgyz Republic, Tajikistan, and Uzbekistan).[234] There are others, including those supported by CAREC and ADB, which will be discussed in the next chapter. These regional platforms, programs, and projects add significantly to the ongoing work of the main platforms and organizations mentioned earlier, but it will be important to find ways to link them with other complementary initiatives to benefit from synergies and to ensure they are not just temporary donor-driven initiatives that disappear when donor support ends.

[229] SPECA website. https://unece.org/speca.

[230] SPECA. 2020. *SPECA Work Plan for 2020–2021*. https://unece.org/fileadmin/DAM/SPECA/documents/gc/session14/SPECA_WORK_PLAN_FOR_2020-2021_English.pdf.

[231] Green Central Asia website. http://greencentralasia.org/en.

[232] Strengthening Financial Resilence and Accelerating Risk Reduction (SFRARR) website. https://www.gfdrr.org/en/program/SFRARR-Central-Asia.

[233] CLIENT website. https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Overview.

[234] Project website. https://www.undp.org/uzbekistan/projects/enhancing-adaptation-and-strengthening-resilience-farming-climate-change-risks-fergana-valley.

8 Approach of CAREC to Climate Change to Date

Considering the importance of the climate change challenge for the countries of CAREC and the need to address them on a regional basis, it is timely that CAREC is considering how to approach the climate change issues. This chapter takes a look at the approach which CAREC has taken to date to the climate change agenda in its CAREC 2030 strategy, its sector and country strategies, CAREC's and CAREC Institute's knowledge work, and its project portfolio.[235]

Overall, the review of relevant CAREC documents shows that climate change has been touched on in the CAREC 2030 strategy and CAREC sector strategies, and that selected sector and thematic CAREC and CAREC Institute studies have considered climate issues in some depth. Particularly in the energy and water sectors, CAREC's and the CAREC Institute's work has focused on important aspects of climate change. However, overall, CAREC's coverage of and approach to climate issues has not been systematic, comprehensive, and strategically targeted to address priority issues in an action-oriented, regionally focused manner. Moreover, there has been only limited focus on the regional dimensions of climate change and climate action, on what other organizations are doing in addressing regional climate issues, and on the specific modalities for CAREC to engage in the climate space. Chapter 9 offers recommendations on how CAREC may wish to further develop its approach to the climate agenda systematically and strategically.

8.1 The CAREC 2030 Strategy and the CAREC 2030 Development Effectiveness Review

CAREC 2030 states at the outset that it will align its activities with the national and international climate agenda:

"*CAREC 2030* aligns its activities with national strategies and development plans and with the new international development agenda embodied in the Sustainable Development Goals (SDGs) and the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) global climate agreement. It will support regional actions that must complement national efforts to successfully address the SDGs and climate change. *CAREC 2030* will embrace such areas as resilient infrastructure development, natural capital and the environment, sustainable

[235] Climate issues in the CAREC region have also been addressed by ADB and ADBI; relevant knowledge documents and technical assistance projects are summarized in Appendix 5 to this scoping study. Technical reports by other development partners and by other regional organizations and development experts have been cited in preceding chapters of this report.

urbanization, and inclusive social development. It will also devise sustainable financing plans to support these ambitious goals."[236]

The remainder of the CAREC 2030 strategy deals only intermittently with climate issues. CAREC 2030 identifies five operational clusters going forward: (i) economic and financial stability; (ii) trade, tourism, and economic corridors; (iii) infrastructure and economic connectivity; (iv) agriculture and water; and (v) human development. It also proposed to pursue two crosscutting priorities: gender and ICT. CAREC 2030 notes that "considerations of sustainability and climate resilience will cut across all CAREC investments" (p. 4); that CAREC will help countries deliver on their national climate commitments (p. 13); that interventions for enhanced energy efficiency and clean and renewable energy support the climate agenda (p. 14); that the vulnerability of agriculture points to adaptation needs and that gaps in weather data, analysis, and prediction negatively affect farmers (p. 14); and that there is a possibility of setting up an expert group for climate change (p. 18). In contrast to ICT, climate is not explicitly listed as a crosscutting issue in the figure on p. 16, which summarizes the institutional framework for CAREC 2030.[237]

The recently published CAREC 2030 Development Effectiveness Review (DER) only has a limited focus on climate.[238] The DER refers to climate as a crosscutting CAREC theme along with gender and ICT. It notes that the climate agenda is reflected in the energy sector with a focus on green energy and energy efficiency, as well as in the water and agriculture areas. However, there is no assessment of how effectively CAREC has pursued the climate agenda, in contrast to the Review's treatment of the crosscutting area of gender. Nor are there any recommendations about improving the focus on climate, in contrast to such a recommendation for ICT. In short, climate change has been on CAREC's "radar screen," but it has not been a central strategic focus so far.

8.2 CAREC Sector and Thematic Strategies

CAREC has prepared seven sector and thematic strategies for specific areas of its regional cooperation agenda with a varying degree of focus on climate change. These strategies fall in important areas that overlap with the climate agenda: energy, transport, railways, tourism, health, gender, and ICT/digital. The energy sector strategy focuses squarely on climate change and the role of the energy transition in addressing climate change. Other sector strategies deal with climate change in passing.

The CAREC Energy Sector Strategy (2019)[239] deals most explicitly among all the sectors and thematic strategies with the link between sector investment/policy and climate change. The strategy highlights the high vulnerability of the CAREC region to the effects of climate change, such as rising temperatures, water shortages, and extreme weather events which pose a serious threat to physical infrastructure in the region. Mitigating climate change and building resilience to

[236] ADB. 2017. CAREC 2030. https://www.carecprogram.org/uploads/2017-CAREC-2030.pdf. CAREC 2030 also notes that under the previous strategy, CAREC 2020, climate was treated as a "second tier" optional area of focus.

[237] Climate is also not listed in the CAREC Website under "Cross-cutting Themes"; only "Gender" and "Digital" (ICT) are listed and given a description with a reference to the gender and digital strategy documents.

[238] CAREC and ADB. 2022. *CAREC 2030 Development Effectiveness Review (2017–2020)*. https://www.adb.org/publications/carec-2030-development-effectiveness-review-2017-2020. An independent evaluation of CAREC is currently under preparation. Its findings will be reviewed in the scoping study if there is enough time.

[239] CAREC and ADB. 2019. *CAREC Energy Strategy 2030: Common Borders. Common Solutions. Common Energy Future.* Institutional Document. https://www.adb.org/documents/carec-energy-strategy-2030.

its impacts must be an important consideration in energy investment decisions throughout the region. The greening of the power sector through the rapid deployment of renewable energy and acceleration of energy efficiency is key in formulating a climate change-responsive approach to energy sector planning in the CAREC region. The strategy emphasizes the role of private sector engagement in ensuring investments in renewable energy and the importance of spreading awareness of clean energy and energy saving in greening the regional energy system for long-term sustainability. It notes that a low-carbon economy requires factoring in the role of transition fuels, especially gas, which is abundant in the CAREC region, and stresses that this topic should be included in the regional debate around the energy transition to ensure that the transition is realistic and sustainable. Given the region's vulnerability to the impact of climate change, the strategy also stresses that smart, adaptive approaches and measures are needed to enhance the resiliency of existing and new energy assets. The strategy recommends regional cooperation to leverage more cost-competitive energy storage options. Finally, the strategy envisages the establishment of a joint platform—a green-energy marketplace—to bring together project developers and potential financiers to support the energy transition with sufficient and innovative financing. In response, CAREC has developed and adopted the CAREC Green Energy Alliance to create a shared regional fund accessible to all CAREC members seeking cofinancing for investments in energy efficiency, renewable energy, and other climate mitigation projects.[240]

The CAREC Transport Strategy (2020) focuses on railways and road asset management as important elements of a climate-smart transport policy.[241] The strategy notes that the efficient use of railways can help countries meet sustainable development goals on climate change since they are generally a carbon-efficient mode of transport on a ton-kilometer or passenger-kilometer basis. In the context of strengthening road asset management in the CAREC countries, the strategy refers to the expected climate change impact on the road network and its users that governments need to analyze to make more informed choices on the allocation of funding to either develop, rehabilitate, or maintain an ever-expanding network of roads.

The CAREC Railways Strategy (2017) stresses the importance of railways in addressing climate change.[242] The strategy states that the transport sector is critical for the achievement of the Paris Agreement climate goals since transport is responsible for about a quarter of the carbon dioxide emissions and 13% of all greenhouse gases. It also notes that the greenhouse gas emissions per ton-kilometer (km) for a freight train can be less than 30% of those of trucks and that passenger train emissions per passenger-kilometer are less than 40% of those for passenger cars. The strategy, therefore, intends to increase the use of rail transport to help reduce carbon emissions. The strategy also notes that climate change considerations are to be incorporated in the cost–benefit analysis and multicriteria analysis of selection and planning railway investments.

The CAREC Tourism Strategy (2020) takes note of climate threats in passing.[243] In the analysis on strengths, weaknesses, opportunities, and threats (SWOT), one of the threats mentioned in the strategy includes climate change with global warming and environmental degradation.

[240] CAREC Energy website. CAREC to form Green Energy Alliance. https://carecenergy.org/carec-to-form-green-energy-alliance/.

[241] CAREC and ADB. 2020. *CAREC Transport Strategy 2020*. Institutional Document. https://www.adb.org/documents/carec-transport-strategy-2030.

[242] CAREC and ADB. 2017. *Unlocking the Potential of Railways: A Railway Strategy for CAREC, 2017–2030*. Institutional Document. https://www.adb.org/documents/railway-strategy-carec-2017-2030.

[243] CAREC and ADB. 2020. *CAREC Tourism Strategy 2030*. Institutional Document. https://www.adb.org/documents/carec-tourism-strategy-2030.

The CAREC Health Strategy (2022) flags climate change as an important driver of health problems in the region:[244] The health strategy mentions climate change and the resulting disasters triggered by natural hazards among the factors shaping regional health security (including the spread of infectious diseases and antimicrobial resistance), along with weak health systems capacity, migration, and lack of sustainable financing. It notes that responding to these health security threats requires capacity for risk reduction (prevention, preparedness, and mitigation) and building the resilience of health systems at local, national, regional, and global levels.[245]

The CAREC Gender Strategy (2021) highlights that women are especially affected by the consequences of climate change.[246] The gender strategy notes that many issues linked to climate change affect women in CAREC countries because of their disproportionate exposure to risk. It notes that climate change can compound women's time burden because of the need to travel farther for water and fuel in the face of increasingly depleted water reservoirs and scarce forestry resources. Women may also face reduced economic opportunities as sources of employment and income from agriculture, forests, and rivers are compromised. The strategy calls for support for the development of new technologies for climate change adaptation beneficial to women's agricultural productivity. The strategy also flags that women, in particular women farmers, are often among the worst affected by disasters because they lack resources and assets to offset the losses and damage caused; hence, improved regional disaster risk management and reducing climate-change-related risks are critical to improving women's security and resilience.

The CAREC Digital Strategy (2022) notes that digital development can play an important role in addressing climate change in the CAREC region:[247] The strategy mentions that a comprehensive approach to digital adoption in agriculture is required to transform agriculture into an economic recovery engine for the region, especially in light of the COVID-19 pandemic, rising concerns about food security, and the need to make the sector more resilient to climate change. The strategy also points to the need to leverage the use of digital technologies to mitigate the effects of climate change and natural hazards, reduce greenhouse gas emissions, and promote green sustainable development.

8.3 Knowledge Products by CAREC and the CAREC Institute

The CAREC Institute (CI) has produced various reports that include a focus on climate change in the CAREC region. The relevant sector reports focus mostly on the energy, water, and agriculture sectors and address climate issues and the issue of regional cooperation on climate change in

[244] CAREC and ADB. 2022. *CAREC Health Strategy 2030*. Institutional Document. https://www.adb.org/documents/carec-health-strategy-2030.

[245] Appendix 3 of the strategy, which lists CAREC country policies that reflect regional health cooperation, Afghanistan is shown in a list of Main Policy Document(s) Focusing on Regional or Global Health Cooperation (laws, decrees, agreements, policies, plans) a document, Regional Cooperation Component—increasing investment in health and addressing climate change in trans-Himalayan initiative. And in the list of Bilateral Agreements, Appendix 3 shows a document, The International Centre for Integrated Mountain Development—on cooperation to mitigate the adverse effects of climate change across the trans-Himalayan region.

[246] CAREC and ADB. 2021. CAREC Gender Strategy 2030: Inclusion, Empowerment, and Resilience for All. Institutional Document. https://www.adb.org/documents/carec-gender-strategy-2030.

[247] CAREC and ADB. 2022. CAREC Digital Strategy 2030: Accelerating Digital Transformation for Regional Competitiveness and Inclusive Growth. Institutional Document. https://www.adb.org/documents/carec-digital-strategy-2030.

CAREC to varying degrees. The papers overall provide a strong basis of knowledge about important core areas of climate change and were very useful in the preparation of this scoping study.

8.3.1 Energy

Sustainable Pathway to Energy Transition the CAREC Region: A Governance Perspective (CI 2022).[248] The paper examines the role of government in promoting renewable energy (RE) through legislative and institutional reforms to encourage private sector access to the energy market. It proposes distribution be oriented toward the installation and commissioning in aggregate of about 153,000 MW of solar and wind energy capacity to meet the region wide demand, in addition to the business-as-usual growth of capacity in hydropower and other cleaner technology options. Creating a favorable business environment for clean energy producers would help eventually to phase out the coal use. In addition, the paper proposes (i) the introduction of RE power purchase agreements (PPA) that would need to meet international standards and be considered "bankable"; (ii) end user electricity prices to be set at levels that would encourage investments into energy efficiency and conservation (EEC) measures; (iii) CAREC countries to work with international financial institutions in assisting governments to formulate energy transition policies and launch RE auctions; (iv) legislation in CAREC countries to provide assurances of non-curtailment of RE plant and prompt payments against supply of power; and (v) regionwide governance structures to enhance coordination in generation and transmission.

Regional Cooperation in Low-Carbon Energy Development in CAREC (CI 2020).[249] The paper concludes that "[T]he cooperation among CAREC countries on low-carbon energy development is still at its infancy stage. However, considering the respective policy targets already set to achieve diversification of the energy mix, emission reduction, renewable energy, and energy efficiency in all CAREC countries, regional cooperation should move to the next level, which is "coordination plus," characterized by the search for common policy considerations for renewable energy development, investment, technology deployment, exchange of knowledge, and expertise." The paper identifies a set of challenges in developing RE (lack of governance arrangements in electricity trade, strong reliance on fossil fuels, dated energy infrastructure), and trends that provide opportunities (reduced cost of RE technologies, global shift to investing in RE, cost-effectiveness of cooperation in low-carbon development). The paper recommends harmonization of legal and regulatory frameworks, cross-border technology transfer, knowledge exchange, engagement, and participation of all key stakeholders, particularly market participants and the private sector, and better integration of renewable energy into the electricity grid.

8.3.2 Water

Policy Brief: Determinants of Vulnerability of Climate-Induced Water Stress in CAREC (CI 2020).[250] The report notes that the impact of climate change on water resources depends on the level and nature of a country's dependence on water resources for pursuing economic activities. The CAREC region comprises the most water-intensive countries in the world in terms of water withdrawals per capita and GDP. Furthermore, several CAREC countries (especially Turkmenistan, Uzbekistan,

[248] CAREC Institute. 2022. *Sustainable Pathway to Energy Transition the CAREC Region: A Governance Perspective*. http://bitly.ws/rTPf.

[249] B. Tsevegjav. 2020. *Regional Cooperation in Low-carbon Energy Development in CAREC*. CAREC Institute. https://www.carecinstitute.org/wp-content/uploads/2020/09/VFP-2020-low-carbon-energy-development-ED.pdf.

[250] A. Umirbekov et al. 2020. *Determinants of Vulnerability of Climate-Induced Water Stress in CAREC*. CAREC Institute. https://www.carecinstitute.org/wp-content/uploads/2020/10/CI-policy-brief-water-stress-26-Oct-2020.pdf.

and Pakistan) exhibit an extremely high ratio of water withdrawal as a proportion of the availability of water. The water withdrawal ratios are moderate in Tajikistan, Afghanistan, and Azerbaijan, but have increased during the past 2 decades. The report further notes a mismatch between adaptive capacities and emerging challenges. Since the adaptive capacities of the CAREC countries are restrained by their economic performance, development finance will remain important for strengthening climate resilience toward increasing water stress. Moreover, successful adaptation implies that CAREC countries should improve their capacities to design and implement effective policies.

Developing the Water Pillar (CAREC 2021).[251] This scoping study for the CAREC Water Pillar presents a framework for regional cooperation on water that responds to the growing demand for water at a time of increasing climate-related uncertainty, focused initially on cooperation within the Aral Sea Basin subregion. It compiles the results of detailed analysis of current and projected water scarcity and potential actions to address it. It makes recommendations for the structure of the CAREC Water Pillar, proposes that CAREC support infrastructure investment, knowledge creation, dialogue, and capacity building, including proposals for potential areas of investment projects.

8.3.3 Agriculture

Assessing economic impact of climate change on agriculture in Central Asia (CI 2020).[252] The core content of the paper is built on the results of regression analysis, which revealed a positive correlation between increases of temperature and agricultural net revenues. However, the paper concludes that in the long-run, temperature increase will lead to revenue losses.

8.3.4 Trade

Impact of Environmental Regulations on Pollutive Industrial Trade: CAREC vs. OECD Regions (CI 2021).[253] This study examines the impact of environmental regulations on trade competitiveness for CAREC countries and their bilateral export flows with environmentally stringent OECD countries in the wake of the COVID-19 pandemic. This study is a first attempt to investigate the export competitiveness of most pollutive industries of selected CAREC countries and whether the CAREC region has become a pollution haven of industrial exports to OECD countries during 2006 to 2020.

8.3.5 Cross-Sector

Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region (CI 2020).[254] This is a comprehensive report, covering current and future impacts of climate change, with a special focus on water and agriculture and on the water–energy–agriculture nexus. It assesses the losses from climate change without and with adaptation, considers the financing instruments that can help mitigation and adaptation, and presents best-practice examples of climate financing in the CAREC

[251] CAREC. 2021. *Developing the Water Pillar. ADB Regional Technical Assistance TA-9977 Central Asia Regional Economic Cooperation (CAREC)*. https://www.carecprogram.org/uploads/CAREC-Water-Pillar-Scoping-Report-30Nov21.pdf.

[252] S.B. Kunwar. CAREC Institute. 2020. *Assessing Economic Impact of Climate Change on Agriculture in Central Asia*. http://bitly.ws/rTQB.

[253] CAREC Institute. 2021. *Impact of Environmental Regulations on Pollutive Industrial Trade: CAREC vs. OECD Regions.* https://www.carecinstitute.org/wp-content/uploads/2022/02/CI-VFP2021-environmental-regulations-and-pollutive-industrial-trade-Dec-2021.pdf.

[254] CAREC Institute. 2020. *Climate Vulnerability, Infrastructure, Finance and Governance in CAREC Region.* https://www.carecinstitute.org/wp-content/uploads/2020/05/CI-climate-research-report-29-May-2020.pdf.

region. It explores climate governance and develops a CAREC climate vulnerability index which shows that "four countries of the CAREC region, namely Afghanistan, Pakistan, Turkmenistan, and Uzbekistan, will likely experience significant risks associated with climate change impacts unless their existing [inefficient] agricultural cropping systems, agricultural diversification programs, value chains, adaptation of water, and land conservations technologies are revisited." (p. 68)

Regional Climate Cooperation – Challenges and Perspectives (CI 2020).[255] The main objective of this policy brief is to lay out the regional aspects of climate change and how CAREC countries can work together to address climate change challenges as well as seize potential opportunities for collective way forward. The paper is based on key takeaways from the Institute's research report on Climate Vulnerability, Infrastructure, and Governance in CAREC Region (CAREC Institute 2020) and a virtual policy dialogue held in June 2020 along with personal viewpoints and analysis of the author.

8.3.6 Forthcoming CAREC Institute Publications

Water–agriculture–energy nexus in Central Asia through the lens of climate change (CI forthcoming). This study examines the climate vulnerabilities of Central Asia's water, agriculture, and energy sectors at the province level, using an index-based approach that quantifies their exposure, sensitivities, and adaptive capacities.

Excessive use of natural resources and sector over-reliance are behind Central Asia's vulnerability to compound climate challenges (CI forthcoming).

Regional cooperation is key for overcoming climate challenges along water–agriculture–energy nexus in Central Asia (CI forthcoming).

8.4 Investment and Technical Assistance Projects under the CAREC Umbrella

Over the period 2015–2022, 29 projects related to climate mitigation and adaptation efforts and falling under the CAREC umbrella were approved with a total financing of $4.2 billion. This is an estimate based on the database of approved projects found on the CAREC website.[256] For a summary of how the estimate arrived at and some of its limitations, see Box 16. For the period 2015–2022 the CAREC project database included 124 projects with the total amount funding of $15.5 billion. Among that total number of projects, 29 projects are related to climate mitigation and adaptation efforts, from which 25 of them are ongoing and 4 were completed recently. The total amount of funding for climate-related projects is $4.2 billion, or 27% of total project funding for the period under consideration. Among these climate projects, 15 are investment projects funded by loans and grants and 14 projects are technical assistance (knowledge sharing, capacity development, and pilot projects).

[255] CAREC Institute. 2020. *Policy Brief: Regional Climate Cooperation – Challenges and Perspectives*. https://www.carecinstitute.org/wp-content/uploads/2021/01/CI-policy-brief-climate-cooperation-24-Dec-2020.pdf.

[256] CAREC website. *Project list*. https://www.carecprogram.org/?page_id=1726.

Box 16
The CAREC Project Database

The Central Asia Regional Economic Cooperation (CAREC) Program's website includes a CAREC project database that records a large number of projects of different types and scales approved since CAREC's inception in 2001. Most of the projects listed in the database are financed by international organizations (Asian Development Bank, European Bank for Reconstruction and Development, European Union [EU], United Nations Development Programme, World Bank, and others) and a few also by bilateral and other development partners. Projects are added to the database by the CAREC Secretariat based on criteria laid out in a CAREC document published in 2021, which allows for a very comprehensive and inclusive definition of regional projects. As of 31 December 2021, the list contained 510 projects, with a total of $41.1 billion committed under investment projects and $579 million under technical assistance projects. Of the total investment, 75% was for transport, 22% for energy, 3% for trade, 0.4% for tourism, and 0.3% for agriculture. No investment projects were identified as "climate" projects.

The key criteria for selection of climate-related projects from the CAREC project database were that they could be identified as contributing to climate change mitigation (directly or indirectly supporting to decrees of greenhouse gas emissions) or adaptation (building better climate resilience). The project selection covered the period from 2015 until now.

Two limitations of the analysis should be noted: first, without delving more deeply into the project documentation than was possible for this scoping study, it is difficult to be sure how significant is the climate dimension of the projects selected and whether some relevant projects were omitted. Second, and potentially more significant, is the fact that the CAREC project database, while it is a useful compilation of projects, appears to omit some important projects. For example, the CASA-1000 power transmission project connecting the Kyrgyz Republic and Tajikistan with Afghanistan and Pakistan, which is funded by a consortium of multilateral and bilateral development partners, is not in the database. Nor are the EU's "Green Central Asia" project or various projects by the World Bank that were mentioned in Chapter 4 ("Resiliand+" and "CLIENT"). Also of concern might be that there has been a significant decline in the number of projects listed for recent years compared to earlier years (83 projects for 2017–2021 as compared with 120 projects for 2012–2016 and 185 projects for 2007–2012. Only one project is listed for the World Bank for 2019, and none since.

Source: Authors.

The bulk of CAREC-supported climate projects falls in the energy sector. Energy projects account for 83% of the total climate project volume and 76% of the total number of projects (Table 29). Most of the funding for climate-related energy projects is for improvements in energy supplies, energy efficiency, and improving existing hydropower stations. The next largest areas are transportation and cross-border connectivity. Water only shows one TA project. Among the "other" projects, there is a project each for climate-resilient development, low-carbon development of cities, and the disaster risk preparation facility previously mentioned. This is not surprising, since CAREC formally included water in its agenda only since the approval of the CAREC 2030 strategy. ADB provided by far the greatest share of the funding for 11 projects, followed by the World Bank (6 projects), the Eurasian Fund for Stabilization and Development (3 projects), and the Afghanistan Reconstruction Fund (1 project) (Table 30). Other funders have contributed smaller amounts. Of the 29 projects, 10 were of a regional scale, and 19 were country-specific, but with regional implications (according to the CAREC selection criteria). The Kyrgyz Republic received six of the country-specific projects, Tajikistan and Uzbekistan four each, Turkmenistan two, and Afghanistan, Azerbaijan, and the PRC, one each. In sum, CAREC has made a significant contribution to climate change mitigation through its support for green energy and transportation, and cross-border connectivity projects, but appears to have done relatively little in supporting climate adaptation in the region.

Table 29: Sector Distribution of CAREC Climate Projects, 2015–2022

Sector	Number of Projects	Amount ($ million)
Energy	22	3,472
Improving energy supply	(5)	(2,009)
Improving energy efficiency	(5)	(728)
Improving existing hydropower stations	(5)	(682)
Regional cooperation and trade in energy	(3)	(4)
Solar energy	(2)	(5)
Access to energy for the private sector	(1)	(43)
Technical assistance for energy project preparation	(1)	2
Water	2	6
Transportation (railway electrification)	1	341
Cross-border connectivity	1	406
Other	3	9

CAREC = Central Asia Regional Economic Cooperation.

Source: Calculated by authors from Central Asia Regional Economic Cooperation (CAREC) project database.

Table 30: Distribution of CAREC Climate Projects by Development Partner, 2015–2022

Development Partner	Number of Projects	Amount ($ million)
Asian Development Bank	11	1,895
World Bank	6	972
United Nations Development Programme	3	10
Clean Energy Fund	5	9
Eurasian Fund for Stabilization and Development	3	205
Afghanistan Reconstruction Fund	1	450
Global Environment Facility	1	43
European Bank for Reconstruction and Development	1	7
Multiple sources	4	78

CAREC = Central Asia Regional Economic Cooperation.

Source: Calculated by authors from Central Asia Regional Economic Cooperation (CAREC) project database.

Kazakhstan. Wind turbines along the new highway from Almaty to Bishkek turns wind energy to electricity, reducing air pollution and carbon dioxide emissions (photo by Andrey Terekhov/ADB).

9 Future Directions for CAREC

CAREC has a unique and urgent opportunity to chart a course of proactive, systematic, and strategic engagement in supporting its member countries in reinforcing, modifying, and implementing existing national strategies on climate change mitigation and adaptation and in developing a range of regional actions in response to the nature of many climate change impacts and solutions. This concluding chapter summarizes the evidence presented in this scoping study in support of making climate change a key crosscutting focus of CAREC, and it presents recommendations on how to implement engagement in an impactful manner.

9.1 Summary of Findings and Key Messages

The findings of this study can be grouped by key messages for climate issues in the CAREC region and for CAREC's role to date and potential future role. This structure logically follows the structure of the paper and offers a high-level summary of the main insights.

9.1.1 Key Messages Regarding Climate Issues in the CAREC Region

The report leads to ten main concluding messages regarding climate issues in the CAREC region. Many of these messages refer to national impacts and national response at the country level. This does not mean that the national perspective has primacy over the regional perspective. Given the regional interconnectedness of countries in many of the climate issues identified in this paper and considering that a regional approach to sharing knowledge, experience, and scarce capacity is so important, the national and regional perspectives must be treated as complementary. This complementarity, however, is reflected in the messages and recommendations for CAREC presented in the remainder of this report.

Message 1. **Climate change presents a major challenge and opportunity globally and for CAREC and requires an urgent and powerful response.**

- The impacts of climate change will be severe worldwide as well as regionally and nationally for the countries in the CAREC region.
- But climate change also offers the opportunity to develop a "new climate economy" that can sustain growth, employment, and prosperity even as climate change mitigation and adaptation will require major transitions.
- The transition to the new climate economy will have to be just (i.e., distribute gains and losses fairly and ensure that the most vulnerable are protected) and apply nature-based

solutions (i.e., draw on natural rather than human-made resources in a way that helps solve climate change and environmental problems).

- Even though many of the more severe impacts of climate change appear to be a long time away, many critical actions have to be taken urgently, rather than being deferred to an uncertain future date.

Message 2. **Climate change raises many complex issues for policymakers, both in mitigation and adaptation, that are closely interrelated and, hence, require a systemic perspective.**

- This report identified and explored 43 climate change issues to be considered by policymakers in the CAREC region. This is by no means exhaustive; additional ones may need to be added on further consideration.
- The issues are complex since they involve highly technical aspects, typically involve winners and losers, have regional and global implications, and many of them are strongly interrelated, as most obviously in the case of the energy–water–agriculture nexus.
- Because of these interrelationships, action requires awareness of the entire ecosystem affected by climate change and of the potential interactions between responses.

Message 3. **The systemic nature of climate change and of the response to it requires an "all-of-government" and an "all-of-country" approach with the development and implementation of a national climate change strategy.**

- "All-of-government" means that all government branches and agencies, including provincial and local governments, need to be made responsible for integrating climate considerations into their policies and programs, even where there is one ministry or agency in charge of climate change (as in Pakistan).
- "All-of-country" means that not only the central government, but all national stakeholders, including private business and bankers, farmers, teachers, health-care professionals, university and think tank experts, civil society and community organizations, women, men, and young people, have to be engaged in learning about, tracking, and responding to climate change.
- Therefore, a national climate strategy typically needs to be developed, which incorporates the nationally determined contributions (NDCs), mostly relating to mitigation and, where contained in a separate document, the planned national adaptation actions (Adaptation Plan).
- The strategy needs to take into consideration the interests of all major stakeholders and should be prepared in a transparent and participatory manner.

Message 4. **National climate strategies need to set priorities for action among issues and it helps to structure the issues into broad buckets for high-level strategic decisions.**

- Given limited institutional and financial capacity, as well as often limited political bandwidth, priorities have to be set across issues and over time and responsibilities allocated to the appropriate national actors.
- This report uses a categorization of issues into "core" issues, "crosscutting" issues, and "on-the-horizon" issues:
  - the core issues have been bundled under seven major headings each deserving the attention by the appropriate national authorities; they will likely need to be part of any national climate change strategy;

  - the crosscutting issues need to be addressed in considering specific actions in each core area;
  - "on-the-horizon" issues need to be monitored and acted upon as and when the right time arrives; new such issues will arise over time, and existing ones integrated into particular core area action plans.
- Climate strategies will have to define further priorities and sequencing in the core areas with appropriate action plans.

Message 5. **Strategies and commitments are not enough; they need to be implemented, transparently monitored, and adapted in light of lessons learned.**

- All countries in CAREC have prepared NDCs, some have climate change strategies, and others have adaptation plans. This is most welcome, but implementation has to be assured.
- Monitoring is an essential complement to implementation to be sure implementation is happening and achieves the intended results.
- Lessons learned from implementation need to be reflected in adaptations of the strategy.

Message 6. **Next to the government, the private sector is the most critical element in any national climate strategy.**

- Private business takes on most production and distribution tasks in national value chains and is the critical player in developing, integrating, scaling, and financing innovative green solutions.
- Therefore, climate-smart policies, regulations, and business conditions need to underpin private sector responses in support of the climate change strategy.

Message 7. **Financing is a critical ingredient of—and often a severe constraint at the country level on—climate change action and has to be actively planned and accounted for.**

- Climate strategies will need credible financing plans, which include domestic public and private resources, as well as international public and private resources.
- Macroeconomic constraints, and especially the sustainability of external debt, have to be respected and addressed.
- Domestic public resource mobilization can play the dual role of raising revenues for green investments, while also providing incentives for the transition to a carbon-neutral society (by eliminating carbon subsidies).
- Green private finance can play a role in raising national and international finance, but requires the development of domestic capital markets and the capacity to prepare and negotiate bond issuance.

Message 8. **Implementation of national climate strategies needs the support of international development partners—an "all-of-partners" approach will be needed to complement an "all-of-government" and "all-of-country" approach.**

- Development partners (DPs) need to provide official climate finance commensurate with their international commitments and the needs of the country concerned—especially adaptation finance, given the high vulnerability and limited national resource base of many of the CAREC countries.

- DPs can and do also provide critical advisory and capacity building support in designing and implementing climate strategies, NDCs, and specific climate-relevant programs and projects.
- All such assistance needs to apply an "all-of-partners" approach, under which information about DP financing and activities is shared, gaps in support identified and closed to the extent possible, overlapping support is coordinated, and appropriate division of labor among partners agreed-on, brokered by or, at least, in consultation with government.
- CAREC countries may wish to explore the new "country platform" approach, which is being pioneered for South Africa, where the government and development partners work together in developing and funding a comprehensive national climate action plan.[257]

Message 9. Climate change has important regional impacts, and many climate issues need to be addressed on a regional basis for maximum effect.

- Climate change affects weather and climate conditions regionally and, therefore, requires regional weather and climate observations and prediction and based on those, regional or regionally coordinated planning and action—i.e., an "all-countries" approach that covers all relevant countries.
- In the CAREC region, such action is especially required for energy, water, agriculture, transportation, and disaster early warning and response, where regional infrastructure has to be built and maintained and/or regional public goods (shared energy and water) or bads (disasters, pollution, and others) have to be addressed jointly.
- A regional approach to green technology transfer and knowledge sharing, research and data, and capacity building creates a special kind of regional public good through the creation and diffusion of relevant knowledge and best practice.
- Regional climate action requires a readiness by countries to cooperate, it demands a regional strategy that complements national climate change strategies, and it needs a regional institutional capacity to support the cooperation process. CAREC is such an institution.

Message 10. Regional cooperation among CAREC countries is an example of South–South Cooperation (SSC), and CAREC is an example of successful South–South and Triangular Cooperation (SSTC) with great potential in supporting regional action on climate change.[258]

- SSC is particularly relevant in a regional context since the country context, country needs, regional public goods, and potential for mutual understanding are often more aligned among neighboring countries than among non-neighbors, although historic rivalries can also interfere with cooperation.
- As demonstrated in this report, the PRC can and does play a particularly important role as an SSC partner in the CAREC, given its size, resources, advanced technology, strong focus on climate change action, and its engagement in the region (as elsewhere) with the Belt and Road Initiative (BRI). Climate change action could become a central focus under BRI since BRI was reoriented by the PRC authorities in 2019 toward greater engagement with social and environmental aspects.

[257] H. Kharas. 2022. *A Global Sustainability Program: Lessons from the Marshall Plan for Addressing Climate Change.* https://www.brookings.edu/wp-content/uploads/2022/05/Global-Sustainability-Program.pdf.

[258] United Nations. *South–South and Triangular Cooperation*. https://developmentfinance.un.org/south-south-and-triangular-cooperation.

- When international development partners support regional cooperation on climate change, as in the case of CAREC, this is a particularly powerful example of South–South and Triangular Cooperation, which is strongly supported by the United Nations and by the OECD.[259]

9.1.2 Key Messages Regarding CAREC's Current and Potential Future Role

CAREC is potentially an important regional convenor and offers a platform for addressing climate change in the CAREC region, together with CAREC Institute. This section summarizes the four main messages regarding CAREC's current and potential future role.

Message 11. **CAREC has not yet focused systematically and strategically on the regional climate change agenda.**

- Climate change is not a crosscutting focal area in the CAREC 2030 strategy, and no guidance is provided in CAREC 2030 or in the CAREC Development Effectiveness Review, what role CAREC should play on climate change.
- The same applies to CAREC sector and thematic strategies, with the exception of the Energy Sector Strategy, which prominently deals with climate change as one of the focal areas of CAREC's engagement in the energy sector.
- Some other regional platforms in the Asia region have more systematically and for a longer time addressed climate issues (ASEAN, GMS, SAARC).
- ADB country strategies deal with climate issues prominently, but they generally do not address the regional dimension.

Message 12. **CAREC can draw on a strong knowledge base and an operational foundation in some sector and thematic areas with relevance to regional climate change issues, drawing on the work of CAREC Institute, ADB, and other development partners and by national organizations and experts.**

- Much of the knowledge and advisory work by DPs and national organizations and experts so far has not been carried out under or with reference to CAREC, but it will be a useful base for future regional climate change work in key areas.
- The CAREC project database provides a useful compilation of climate-related projects in the CAREC region, but it is not clear to what extent the projects have been initiated explicitly under the CAREC umbrella and whether all relevant regional projects are captured in this database.
- In energy, CAREC has done a considerable amount of work in support of the regional climate change agenda, much of it under the CAREC Energy umbrella, especially regarding CAREC projects with climate relevance.
- In water, CAREC's engagement started only recently with the launch of the CAREC 2030 strategy (in 2017), but the work under the Water Pillar promises significant and strategically directed work that will include a focus on climate change and sustainable development. CAREC Institute, regional think tanks in Central Asia, and some of the other development partners have done useful knowledge and advisory work.

[259] OECD. *Triangular Co-Operation*. https://www.oecd.org/dac/triangular-cooperation/.

- In agriculture, also a recent addition to the CAREC agenda under the CAREC 2030 Strategy, it does not appear that CAREC-supported activities have focused on regional climate change yet, but a report is currently under preparation for CAREC which explores how CAREC will address the regional agriculture agenda with a strong focus on climate change.
- On the water–energy–agriculture nexus, CAREC Institute, the regional think tanks, and some of the development partners have done important knowledge work.
- On transport, ADB and the World Bank have supported electrification of railways in the CAREC region.
- On disasters triggered by natural hazards, ADB and the World Bank, as well as a regional disaster center, have done important knowledge and project work.
- On landscape restoration and hydromet services, the World Bank has been active with knowledge and project work.
- On climate change communications, GIZ is supporting "Green Central Asia."
- Other climate change issues appear to be less well covered so far from a regional perspective.

Message 13. **The list of climate issues identified under this report fit generally well within the structure of CAREC activity clusters as defined in the CAREC 2030 strategy.**

- Table 31 shows the alignment of specific issues with specific clusters and crosscutting areas (gender and ICT/digital) of CAREC's strategic focus.
- The two core climate issues that are currently not easily placed in the CAREC 2030 clusters are climate-smart cities and disaster preparedness.
- If CAREC identifies climate change as a new crosscutting strategic focus and a climate change strategy is developed, as recommended, then some of the crosscutting climate issues, which currently are not aligned with CAREC clusters and existing crosscutting areas, will need to be integrated as appropriate.

Table 31: Mapping Climate Issues to CAREC 2030 Clusters and Crosscutting Issues, and Their Priority

(Principal CAREC 2030 cluster under which climate issues are to be considered)

Climate Issue	Economic and Financial Stability Cluster	Trade, Tourism, Economic Corridors	Infra-structure and Economic Connectivity	Agri-culture and Water	Human Develop-ment	Gender and ICT/ Digital
Core Issues						
Energy						
Efficiency			• P			
Electrify final demand			• P			
Phase down coal			• P			
Renewables			• P			
Electricity interconnectivity			• P			
Carbon pricing			• P			
Water						
Infrastructure				• P		
Policy (pricing, and others)				• P		
Allocation				• P		
Agriculture						
Irrigation				• P		
Agricultural technology				• P		
Agricultural policy				• P		
Energy–water–agriculture nexus			• P	• P		
Transport						
Investment/O&M			• P			
Decarbonize freight			• P			
Cross-border economic corridors			• P			
Climate-smart cities						
Heating and cooling			• P2			
Mass transit and EVs		•	• P2			
Water and sanitation			• P2			
Pollution control			• P2			
Disasters			• P			
Land restoration				• P2		
Health					• P2	

continued on next page

Table 31 *continued*

Climate Issue	Economic and Financial Stability Cluster	Trade, Tourism, Economic Corridors	Infra-structure and Economic Connectivity	Agri-culture and Water	Human Develop-ment	Gender and ICT/ Digital
Crosscutting Issues						
Macroeconomic and structural	• DP					
Private sector		• DP	• DP	• DP	• DP	• DP
ICT and digital		• CI	• CI	• CI	• CI	• CI
Hydromet			• DP	• DP		
Institutional capacity	• PC	• PC	• PC	• PC	• PC	• PC
Benefits and costs	• CI	• CI	• CI	• CI	• CI	• CI
Just climate transition	• PC	• PC	• PC	• PC	• PC	• PC
Gender		• PC	• PC	• PC	• PC	• PC
Communication and advocacy	• PC	• PC	• PC	• PC	• PC	• PC
Frontier Issues						
Hydrogen			• CI			
Nuclear			• CI			
Rare earths			• CI			
Energy storage			• CI			
CO_2 capture			• CI			
Cryptocurrency			• CI			
AI		• CI	• CI	• CI	• CI	• CI
Technology transfer, SSC, scaling		• PC	• PC	• PC	• PC	• PC
Migration					• CI	• CI
Circular economy		• CI	• CI	• CI		
Nature-based solutions		•	•	•		
Research and data	• CI	• CI	• CI	• CI	• CI	• CI
Other						
NDCs	• PC	• PC	• PC	• PC	• PC	• PC
Climate finance	• PC	• PC	• PC	• PC	• PC	• PC

AI = artificial intelligence, CAREC = Central Asia Regional Economic Cooperation, CO_2 = carbon dioxide, EV = electronic vehicle, ICT = information and communication technology, NDC = nationally determined contribution, O&M = operation and maintenance, SSC = South–South cooperation.

Notes: P = highest priority for CAREC clusters; P2 = second-order priority for CAREC clusters; PC = priority for Climate Change Steering Committee; DP = priority for Development Partner; CI = priority for CAREC Institute (research or watching brief).

Source: Authors.

Message 14. Looking ahead, CAREC will have to address how it can best employ and preserve its strengths, deal with weaknesses, capitalize on its opportunities, and manage threats.

- The strengths, weaknesses, opportunities, and threats (SWOT) matrix in Table 32 summarizes the relevant factors.
- **Strengths** of CAREC include ADB's strong commitment and capacity for climate change; CAREC has already been engaged in some core climate areas (especially energy), and CAREC Institute (CI) has created a knowledge base, which complements an existing knowledge base in the region (e.g., on the energy–water–climate nexus in Central Asia); strong support by ADB and the PRC for CAREC and CI, including generous financial support; high-level engagement by the other member countries in CAREC and a history of collaboration by other development partners (DPs) in CAREC's activities; and finally, that CAREC and CI can draw on the experience of GMS and the Mekong Institute (and climate initiatives of other regional organizations).

Table 32: SWOT Analysis for Engagement by CAREC in the Regional Climate Change Agenda

Strengths	Weaknesses
• Strong commitment and capacity of ADB on climate change • Prior CAREC engagement and CAREC Institute (CI) knowledge products in core climate areas • Knowledge base in the region in some climate-related areas • Strong support by ADB and PRC for CAREC and CI • Engagement by other member countries • History of collaboration with Development Partners (DPs) • Example of GMS/Mekong Institute	• Limited research/knowledge base in some climate change areas • Weak planning and implementation capacity in member countries in the face of major policy challenge • Lack of systematic, strategic approach by CAREC to climate change • Predominant country focus by DPs, limited information on their activities and lack of coordination
Opportunities	**Threats**
• Global focus on climate change • Growing interest in climate change in the region • Climate change as a driver of regional cooperation • Win-win economic and climate outcomes in many areas • Growing cohesion in Central Asia (Uzbekistan) • Move climate change to center of CAREC 2030 strategy • CAREC/CI division of labor and collaboration • DP division of labor and coordination • Benefit from South–South cooperation	• Complexity of the climate change issues • Distraction by COVID-19 and economic crises • Interstate rivalries and distrust as a result of climate change impacts (e.g., water) • Political situation of Afghanistan impedes CAREC's regional cooperation • Insufficient interest in/ownership of CAREC and CI by member countries • Insufficient engagement in CAREC and CI by DPs (and ADB going it alone) • Insufficient capacity of and funding for CAREC Secretariat and CI

ADB = Asian Development Bank; CAREC = Central Asia Regional Economic Cooperation; COVID-19 = coronavirus disease; GMS = Greater Mekong Subregion; SWOT = strengths, weaknesses, opportunities, and threats.

Source: Authors.

- **Weaknesses** of CAREC include that there are serious gaps in the research and knowledge base on climate change in the CAREC region; many CAREC member countries have weak planning, implementation, and financing capacity in the face of major climate challenges; CAREC so far lacks a systematic and strategic approach to climate change; and DPs focus mostly on the countries' climate agendas, rather than on regional climate issues and cooperation opportunities.
- **Opportunities** for CAREC include that there is now a strong global focus on climate change and a growing concern in the CAREC region about the need to address climate change; climate change could become a driver of critical policy action (e.g., carbon and water pricing) and on regional cooperation in areas where cooperation has been lagging (e.g., on water), underpinned by the fact that there are important win–win opportunities in terms of socioeconomic, environmental, and climate benefits generated by policy action (e.g., pollution control); there have been encouraging signs of increasing regional cohesion in Central Asia after the change in government in Uzbekistan in 2016; CAREC has a major opportunity now to move climate change to the center of its CAREC 2030 Strategy, to develop a strong collaboration between CAREC and CI on the CAREC agenda, and energize DP cooperation and coordination with a special focus on climate change; finally, the climate change area will offer a great opportunity for intensive South–South cooperation.
- **Threats** to CAREC's ability to tackle the regional climate change agenda arise from the complexity of the climate change issues which may make this area hard to address effectively, especially when policymakers are distracted by the COVID-19 pandemic and the fallout from global economic and financial crises on their own countries; threats also arise from long-standing rivalries and conflicts between countries, potentially reinforced by the impacts of climate change (e.g., possible disagreements over allocation of scarce waters); and from an insufficient interest in CAREC and CI by the member countries and insufficient engagement by development partners, compounded by the threat of lack of capacity and funding for an ambitious CAREC climate agenda, including for the CAREC Secretariat and CAREC Institute.

9.2 Recommendations

The recommendations in this report are high-level and tentative. Final recommendations and their details will have to be worked out in subsequent consultations by the CAREC Secretariat with member countries representatives, other country stakeholders, and development partners. The process for further developing and for finalizing these recommendations should be informed by the experience with the preparation of CAREC sector and thematic strategies. There are eight main recommendations with subsidiary recommendations for some of the main recommendations.

Recommendation R1. CAREC to incorporate climate change as an urgent crosscutting issue in the CAREC 2030 Strategy.

This action will put climate change on an equal footing with the crosscutting CAREC priorities of gender and ICT/digital.

Recommendation R2. The CAREC Secretariat to prepare a CAREC Climate Change Strategy for adoption by CAREC Ministers.

- The CAREC Climate Change Strategy will be comparable to those prepared for the crosscutting CAREC priorities of gender and ICT/digital.
- The Strategy will build on the information on climate changes issues assembled in this scoping study.
- It will reflect and/or adapt the recommendations R3–R8 in this scoping report.
- It will cover not only the areas of energy, water, agriculture, and disasters, but also other areas not traditionally seen as areas of primary concern for regional climate action (e.g., health, education, communication, advocacy, research, and capacity building).
- The Strategy will pay particular attention to the requirements of a "just" climate transition, including who are the likely winners and losers, how remedial programs and social safety nets can be improved to deal especially with the most vulnerable, and how potential gender issues can best be addressed.
- The climate strategy will address organizational and resource implications for CAREC of the new focus on climate change.

Recommendation R2.1.** The CAREC Climate Change Strategy to include **a results framework.

- The results framework links CAREC principles and interventions through outputs and outcomes to specific climate impacts.
- The results framework is structured by CAREC clusters and other crosscutting priority areas.
- This follows the examples of the CAREC gender and ICT/digital strategies. This will help assure effective linkage of the climate priority with the programs under the CAREC clusters and other cross-priority areas.

***Recommendation R2.2.** The CAREC Climate Strategy to identify, where appropriate, **subregional groupings of countries** for which regional climate actions in particular sectors or thematic areas may be required.*

CAREC member countries vary in regard to the level of interconnectedness of climate issues and the potential for cooperation. Therefore, subregional segmentation of CAREC countries may be needed to build better and effective interstates cooperation.

***Recommendation R2.3.** The CAREC Climate Strategy to direct CAREC support for **the harmonization of national climate strategies** in key areas where regional cooperation is of critical importance (energy, water, agriculture, transport, disasters, and others).*

The Strategy will build on and complement national climate strategies, and it will provide inputs to those strategies in formulating the regional perspective of the required climate mitigation and adaptation response.

Recommendation R3. CAREC to establish a senior-level Steering Committee[260] for the climate change agenda.

- The Climate Steering Committee will be similar to the one established under the CAREC Digital Strategy and consists of senior government officials, preferably representing ministries directly responsible for countries' climate change strategies. The terms of reference of this Committee will be similar to that of the Digital Steering Group (Box 17).

[260] The group could be given a different name (e.g., Climate Coordinating Committee or simply Climate Change Committee). What matters is that this body has well-articulated functions similar to those shown in Box 17.

Box 17
Terms of Reference of the CAREC Digital Steering Committee

- Develop the CAREC Digital Transformation Project portfolio,
- Launch specific initiatives to strengthen the enabling environment by harmonizing the legal and regulatory environment and by building capacity,
- Build and maintain a multistakeholder consensus across the region,
- Gather and share best practices for regional digital development,
- Develop and launch a strategic communications plan,
- Prioritize the CAREC Digital Transformation Project portfolio and create the CAREC Digital Strategy 2030 implementation road map,
- Work with development partners to secure project funding,
- Build public–private partnerships (PPPs) for project implementation,
- Establish a monitoring system to measure progress, and
- Future-proof the strategy to adapt to changing scenarios and needs.

CAREC = Central Asia Regional Economic Cooperation.

Source: CAREC Digital Strategy. https://www.adb.org/sites/default/files/institutional-document/777876/carec-digital-strategy-2030.pdf.

- The Climate Steering Committee will oversee the preparation of the CAREC Climate Change Strategy.

Recommendation R3.1. *CAREC to establish a* ***Climate Expert Group****.*

- This Expert Group will consist of climate experts from the CAREC member countries, from ADB, ADBI, and CAREC Institute, and from development partners, as well as other international climate experts.
- It will advise the Climate Steering Committee on scientific and technical aspects of the CAREC climate agenda.
- A special expert working group could be established on the issues of the **energy–water–agriculture nexus**, with a particular focus on the Aral Sea Basin, in support of the agenda set by the presidents of the five Central Asian republics.

Recommendation R3.2. *CAREC to establish* ***climate subworking groups*** *for selected sector and crosscutting committees.*

- These subworking groups will work out specific sector and thematic climate actions to ensure that the CAREC climate agenda and results framework is effectively implemented in the work of the CAREC clusters and crosscutting priorities by identifying and supporting suitable climate-relevant projects, knowledge and capacity building activities.
- The subworking groups will pay special attention to how existing infrastructure and newly to be constructed in infrastructure can be made disaster-resilient in light of the increasing disaster vulnerability of CAREC countries in the wake of climate change.

- Such subsector working groups will be especially important for energy and transport under the Infrastructure and Economic Connectivity cluster, and for agriculture and water under the Agriculture and Water cluster. They could also be established for health, digital, and gender, and possibly others.

Recommendation R3.3. *The Climate Steering Committee to develop a set of* ***priorities*** *for climate issues to be addressed by the Committee, by the cluster subworking groups, development partners, and the CAREC Institute.*

- Table 30 provides an indicative prioritization. It shows that among the "core" climate issues energy, water, agriculture, transport, and disasters are of highest priority for the cluster subworking groups to pursue. Other core issues (climate-smart cities, land restoration, and health), while clearly also important, are of secondary importance for CAREC, considering that the regional dimensions on these areas are less significant than for the other core issues.
- Among the crosscutting issues, some can be distributed across selected development partners where they have strong prior engagement in these areas (for example, macroeconomic issues for the IMF, private sector for EBRD, and hydromet for the World Bank). Others more in the nature of research can be pursued by the CAREC Institute (ICT/digital, and benefits and costs), while the important issues of institutional capacity, just climate transition, gender, and communication and advocacy should be taken up by the Climate Sector Committee as a matter of priority.
- For the "on-the-horizon" issues, CAREC Institute should consider developing research and monitoring activities and bring any issues requiring CAREC engagement as a matter of priority to the attention of the Climate Steering Committee. The area of technology transfer/SSC/scaling is an exception, considering the importance of this area for the CAREC climate agenda. Here, as well as for monitoring and advising on NDCs and climate finance, the Steering Committee should be in the lead, with support from the CAREC Institute through the provision of appropriate knowledge products.

Recommendation R4. The CAREC Climate Steering Committee, with the support of the CAREC Secretariat and advice of the CAREC Climate Expert Group, to develop a road map for freestanding climate change projects and targeted climate mitigation and adaptation components in other projects to be designed, implemented, and financed under the CAREC umbrella.

- Freestanding climate projects (i.e., projects that have climate change mitigation or adaptation as their primary objective) are so far the exception rather than the rule for climate-related projects in the CAREC project portfolio.
- The road map will help define criteria for identifying freestanding climate change projects and develop ideas and suggestions for a pipeline of potential freestanding projects.
- The road map will also indicate how other projects can go beyond climate-proofing to incorporate components that target specific climate mitigation and adaptation actions.[261]

Recommendation R4.1. The Climate Steering Group, with the support of the CAREC Secretariat and the Climate Expert Group, to develop a proposal for the ***establishment of a facility to finance the preparation of freestanding bankable climate projects****.*

[261] An ADB reviewer suggested as an example that CAREC conduct a climate vulnerability assessment of regional transportation corridors and based on that, identify projects that address regional climate risks along principal corridors.

- There is currently a dearth of bankable climate projects both for private and public sector financing, from both domestic and external sources.
- The facility could either be freestanding or part of a broader infrastructure preparation facility, such as the one under development by ADB for CAREC.

Recommendation R5. CAREC and CAREC Institute to work closely together to ensure maximum synergy and develop an agreed-on division of labor.

- The governing bodies of CAREC and the CAREC Secretariat will principally focus on developing the strategic directions and strategy documents on regional climate change action for CAREC, ensure the integration of the climate change aspects in the work of the CAREC clusters, and develop the abovementioned road map for freestanding climate change projects, with a particular focus on the core areas and crosscutting areas identified in this scoping study and on the investments and improvements in policy and regulatory action needed that are of regional significance.
- CAREC Institute will focus on research, development of knowledge products, and capacity building related to climate change and in support of CAREC's regional climate investment and policy agenda. Through its research and networking with universities and think tanks, CAREC Institute will monitor developments of "on-the-horizon" issues and engage in "horizon scanning" to identify new issues and solutions in the climate change field. It will bring relevant developments to the attention of CAREC governing bodies and the CAREC Secretariat, as and when an issue warrants potentially greater attention by CAREC.
- Both CAREC and CAREC Institute will cooperate on technology transfer and knowledge sharing and on communication and advocacy.

***Recommendation R5.1.** The CAREC Institute to develop a **research, data, capacity building, and networking strategy on climate change** that aligns with and supports the CAREC Climate Change Strategy.*

- This CAREC Institute climate change strategy will identify the main directions for research and capacity building and review existing policies in CAREC countries that can be entry points for strengthening climate change action. It will identify the modalities of the Institute's interaction with CAREC and its governing bodies in the climate change area and the expertise and budget required to deliver a high-impact research and capacity building output.
- A key area for future CAREC Institute research is (i) the assessment of climate change financing needs of the region, including specifically the financing needs for regional programs, (ii) the collection of information on what climate finance is actually being accessed from which source, and (iii) developing proposals for CAREC to support the mobilization of resources.[262]
- The strategy will also identify opportunities for CAREC and CAREC Institute to support the development of improved climate-relevant research capacity and data collection, management, and access in the CAREC region.

[262] This work can build on research CAREC Institute has carried out in parallel with this scoping study on the engagement of development partners on climate issues in the CAREC region.

- The CAREC Institute research strategy will also identify principal knowledge partners in the region and internationally on whose work CAREC and the Institute can draw and with whom it can develop networks of knowledge exchange, communication, and advocacy.

Recommendation R.5.2. *ADBI also to develop a program of knowledge work in support of the CAREC climate* ***strategy.***

Recommendation R6. As part of its climate change strategy, CAREC to develop a strategic approach to engaging systematically with development partners (DPs) and other regional organizations in fostering interagency collaboration and in mobilizing financial and expert resources for regional climate investments, policy and advisory work, technology transfer, and knowledge sharing, as well as research and data development, and capacity building.

Experience shows that it is difficult to obtain and maintain a high degree of engagement, information sharing, coordination, and cooperation among DPs and regional organizations. However, effective cooperation is critical if CAREC wishes to make a significant contribution to the regional climate agenda in the CAREC region. CAREC can build on the analysis and recommendations of an earlier report on involving DPs more generally in CAREC's work.[263]

Recommendation R6.1. *CAREC and CAREC Institute to cooperate in ensuring that they maintain a comprehensive and accurate* ***information base on DPs' and regional agencies' activities*** *in regard to regional climate change initiatives in the CAREC region, including investment and TA projects and other relevant knowledge, networking and outreach activities.*

This will build on CAREC's project database and the CAREC Institute's ongoing effort to collect information on DPs' climate change activities in the CAREC region.

Recommendation R6.2. *CAREC to identify potential areas for* ***division of labor among DPs,*** *based on their interests and capacity as revealed by the patterns of past engagement, and to support enhanced cooperation and coordination in areas where DPs' activities overlap.*

Recommendation R6.3. *CAREC to organize the* ***next DP Forum event*** *with a focus on the topic of regional climate change cooperation in the CAREC region.*

Considering that climate change is high on the agenda of all DPs and that DP forums tend to work best when they are focused on specific, actionable areas, this has the dual benefit of both advancing the CAREC climate change agenda and the agenda to get increased DP engagement in and cooperation under CAREC.

Recommendation R6.4. *The CAREC Secretariat and the CAREC Institute to develop links with their counterparts in other regional organizations focusing on climate change (including SPECA, GMS, and the Mekong Institute).*

Recommendation R7. CAREC to aim to develop and publicize a common position on global climate change negotiations (COPs).

- CAREC statements can build on the statement by the five Central Asian governments submitted to COP26 and on other similar statements by other regional bodies.
- Through these statements, CAREC countries can augment their voices in calling on countries worldwide to reinforce their mitigation strategies so as to reduce the negative climate impacts on the CAREC region and also call on OECD countries and multilateral

[263] J. Linn for CAREC Secretariat. 2020. Preparation of the first CAREC Development Partners' Forum: a background paper.

financial organizations to increase their concessional climate finance, especially for adaptation.

Recommendation R8. CAREC and the CAREC Institute to monitor and evaluate progress with the implementation of climate change strategies in the region.

This will take two forms:

- CAREC Institute will collect information on the status of preparation and content of NDCs' national climate strategies and adaptation plans in the region, will assist in monitoring their implementation on a peer review basis, and will share lessons that will help all CAREC member countries with the implementation of their climate commitments and plans.
- CAREC will monitor and evaluate the implementation of the CAREC Climate Strategy with reference to the Results Framework and recommend changes as appropriate.

Appendixes

APPENDIX 1

Consultations with International and Regional Organizations Conducted during 1 June–2 August 2022

Name	Title or Position
Asian Development Bank (ADB)	
Belinda Hewitt	Senior Disaster Risk Management Specialist, East Asia Department (EARD)
Malte Maass	Climate Change Specialist, Sustainable Development and Climate Change Department (SDCC)
Kathleen Anne C. Coballes	Climate Change Officer, Central and West Asia Department (CWRD)
Bahodir Ganiev	Consultant
Safdar Parvez	Advisor to EARD
Thomas Panella	Director, EARD
Sujata Gupta	Director, EARD
Mark Bezuijen	Principal Environmental Specialist, EARD
Silvia Cardascia	Water Resources Specialist, EARD
Alfredo Bano Leal	Senior Energy Specialist, EARD
Lei Zhang	Senior Energy Specialist, EARD
Asian Development Bank Institute (ADBI)	
Dina Azhgaliyeva	Research Fellow
Brookings Institution	
Homi Kharas	Senior Fellow
Amar Bhattacharya	Senior Fellow
Harvard University	
Nargis Kassenova	Senior Fellow, Program on Central Asia, Davis Center for Russian and Eurasian Studies
European Bank for Reconstruction and Development (EBRD)	
Eric Livny	Regional Lead Economist, Central Asia
Nurgul Esenamanova	Associate, Country Engagement
Maira Karassayeva	Associate Banker
Konstantin Kintsurashvili	Regional Lead for Climate Strategy and Delivery
Dmitri Gvindadze	Lead economist for East Europe and the Caucasus
Anvar Nasritdinov	Principal Manager, Country Engagement Eastern and South-Eastern Europe, Caucasus, Western Balkans

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Name	Title or Position
Green Climate Fund (GCF)	
Svetlana Frenova	Regional Advisor, Eastern Europe, and Central Asia Regional Desk, Country Programming Division
United Nations Development Programme (UNDP)	
Laura Altinger	Head of Regional Nature, Climate and Energy Team, UNDP Bureau for Europe and Central Asia
Stanislav Kim	UNDP Recovery, Early Warning Systems and Response Programme Specialist, Istanbul Regional Hub
Isomiddin Akramov	Head of the Project on Climate Change and Resilience in the Fergana Valley (the Kyrgyz Republic, Tajikistan, and Uzbekistan), UNDP Uzbekistan
United Nations Economic Commission for Europe (UNECE)	
Dmitry Mariyasin	Deputy Executive Secretary
Chiara Giamberadini	Programme Management Unit (PMU) at the Office of the Executive Secretary at UNECE
Elise Zerrath	Associate Expert, Sustainable Development and Gender Unit
Mario Apostolov	Regional Adviser, Trade Development and Timber Division
Alicia Tornero Albertos	Programme management officer
Harikrishnan Tulsidas	Economic Affairs Officer, United Nations Framework Classification for Resources (UNFC) and Resource Management
Nicholas Bonvoisin	Chief of Section, Environment Division
United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)	
Nikolay Pomashchnikov	Head of the Subregional Office for North and Central Asia
Sanjay Srivastava	Chief of Disaster Risk Reduction Unit
World Bank	
Sascha Djumena	Senior Country Officer for Central Asia
Marc Sadler	Senior Climate Expert
Paola Agostini	Lead Natural Resources Management Specialist, Europe and Central Asia
Andrea Liverani	Lead Specialist, Sustainable Development, Europe and Central Asia
Elena Strukova-Golub	Environmental Economist
Rajesh Kairala	Natural Resources Management Specialist
Serge Mandiefe Piabuo	Environmental Economist
Daniel Kull	Senior Disaster Risk Management Specialist
Central Asia Regional Economic Cooperation Program (CAREC) Institute	
Syed Shakeel Shah	Director
Iskandar Abdullaev	Deputy Director (II)
Huang Jingjing	Deputy Director (I)
Ghulam Samad	Senior Research Officer
Hans Holzhacker	Chief Economist
Shakhboz Akhmedov	Senior Research Fellow, Knowledge and Research Networking
Ilhom Abdulloev	Specialist on Research and Knowledge Connectivity
Central Asia Regional Environment Centre (CAREC Environment)	
Zafar Makhmudov	Executive Director
Organization: Scientific Centre of the Interstate Commission for Water Coordination in Central Asia (ICWC)	
Dinara Zanginshina	Director

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Appendix 1 *continued*

Name	Title or Position
International Fund for Saving the Aral Sea (IFAS)	
Batyr Mammedov	Head of the Secretariat of the Interstate Commission for Sustainable Development
Green Central Asia (GIZ)	
Aleksandr Nikolayenko	Senior Regional Adviser
International Water Management Institute (IWMI)	
Oyture Anarbekov	Country Manager and Researcher
Lead National Experts from the CAREC Countries	
Shahmar Hajiyev	Lead Advisor, Center for Analysis for International Affairs, Azerbaijan
Zhang Chi	Researcher, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, People's Republic of China
Mariam Tsulukidze	Deputy Head of Energy and Environment Research Policy Center, ISET Policy Institute, Georgia
Zhanna Babagaliyeva	Climate Change Expert, Kazakhstan
Erkin Isaev	Research Fellow, University of Central Asia Kyrgyz Republic
Batjargal Zamba	Chief Scientific Advisor, Climate Change Research and Cooperation Centre, Mongolia
Kurbonali Partoev	Head of plant genetics and breeding laboratory of Institute botany, plant physiology, and genetics of the National Academy Science of Tajikistan
Sayyora Abdullaeva	Chief Specialist, the State Committee for Ecology and Environmental Protection, Uzbekistan

APPENDIX 2

CAREC Countries' Nationally Determined Contributions

Country	Year of Approval	Base Year	Time Frame	Target	Principal Sectors	Financing Requirements
Afghanistan	2016	2005	2020–2030	There will be a 13.6% reduction in greenhouse gas (GHG) emissions by 2030 compared to a business-as-usual (BAU) 2030 scenario, conditional on external support.	Energy, natural resource management, agriculture, waste management, and mining	$17.405 billion, including $10.785 billion for adaptation and $6.62 billion for mitigation. These are all conditional on external support.
Azerbaijan	2017	1990	2030	A 35% reduction at total emissions level compared to the base year. Total emissions reduction for 2030 compared to the base year: 25.666 Gg carbon dioxide (CO_2) equivalent (excluding Land Use, Land-Use Change, and Forestry [LULUCF] 24.374 Gg CO_2 equivalent [including LULUCF]).	Energy, oil and gas, residential and commercial sectors, The use of alternative and renewable energy sources, transport, industry, agriculture, waste, and LULUCF	National funds plus development partner support as well as the private sector is required. However, because the country lacks big international financial support to combat climate changes to fulfill nationally determined contributions (NDCs) commitments, the country needs additional resources such as international assistance in the form of financial support and technology transfer. To increase climate finance in the country, an effective, working mechanism of public–private partnership is highly important. Also, NDCs should be supported across all levels and should be coordinated across policy levels. Cooperation between main stakeholders such as public bodies, civil society, educational institutions, private sector representatives,

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Appendix 2 *continued*

Country	Year of Approval	Base Year	Time Frame	Target	Principal Sectors	Financing Requirements
						major industrial facilities, and nongovernment organizations (NGOs) could be also very effective mechanism.[1]
People's Republic of China (PRC)	2021	2005	2030, 2060	Lower CO_2 emissions per unit of gross domestic product (GDP) by over 65% from the 2005 level; peak carbon dioxide emissions before 2030 and striving to achieve carbon neutrality by 2060.	Cities; coastal erosion areas; Qinghai–Tibet Plateau; other key ecological areas; agriculture; forestry and grassland; water resources; public health; infrastructure.	As much as $1.4 trillion in annual investment is needed over the next decade to meet the climate targets and environmental protection standards that the PRC established in 2015.[2]
Georgia	2021	1990	2030	Unconditional target: 35% below 1990 level of its domestic total GHG emissions by 2030; conditional target: 50% to 57% of its total GHG emissions by 2030 compared to 1990, in case of international support.	Seven economic sectors such as transport, buildings, energy generation and transmission, agriculture, industry, waste, and forestry. Though vulnerable sectors are identified, there does not exist a national adaptation strategy and policies are limited to only some sectors and regions.[3]	National funds plus development partner support as well as private sector. The total budget of the Climate Strategy and Action Plan 2030 is lari (GEL)3,537,118,642 ($1,203,101,563.27); the total budget of private sector involvement amounts according to the plan is GEL4,392,477,936 ($1,494,040,094.86). The lack of national financial resources is one of the barriers that to some extent hinders efforts.

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[1] According to the national experts' views shared during 1st Climate Change Dialogue for Knowledge Exchange with CAREC Region National Experts on the CAREC Climate Scoping Study. https://elearning.carecinstitute.org/learning-modules/carec-dialogue-series/1355.html.

[2] Climate Policy Initiative. 2021. *The Potential for Scaling Climate Finance in China*. https://www.climatepolicyinitiative.org/wp-content/uploads/2021/02/The-Potential-for-Scaling-Climate-Finance-in-China-1.pdf.

[3] According to the national experts' views shared during the 1st Climate Change Dialogue for Knowledge Exchange with CAREC Region National Experts on the CAREC Climate Scoping Study. https://elearning.carecinstitute.org/learning-modules/carec-dialogue-series/1355.html.

Appendix 2 *continued*

Country	Year of Approval	Base Year	Time Frame	Target	Principal Sectors	Financing Requirements
Kazakhstan	2016	1990	2021–2030	Unconditional target: A 15% reduction in GHG emissions by 31 December 2030 compared to the base year; conditional target: A 25% reduction in GHG emissions by 31 December 2030 compared to the base year, subject to additional international investments, access to low-carbon technologies transfer mechanism, green climate funds, and flexible mechanism for country with economy in transition.	All intergovernmental panel on climate change (IPCC) sectors are covered, namely: energy, agriculture, waste, LULUCF	Commitments are conditional on additional international investments, access to low-carbon technologies transfer mechanism, green climate funds and flexible mechanisms for countries with economies in transition. Achieving Kazakhstan's mitigation climate commitments and building resilience to the impacts of climate change require substantial policy reforms and significant investments in key sectors. Also, mobilizing private capital will be important as public resources are scarce.
Kyrgyz Republic	2021	2017	2017–2030	By 2025, reduce GHG emissions by 16.63% under the BAU scenario, and with international support by 36.61%. By 2030, the Kyrgyz Republic can reduce GHG emissions by 15.97% of the GHG emission levels under the BAU scenario, and by 43.62% with international support.	Primary mitigation capacity is concentrated in the energy, agriculture, forestry, and other land uses sectors. Adaptation covers the sectors: water resources and agriculture, energy, emergencies, public health, forest and biodiversity, as well as new intersectoral sections: climate-resilient areas and green cities.	$10 billion estimated cost to implement mitigation and adaptation measures. Of which, 37% will come from own resources (funding by private sector, international donors, and national budget); and 63% to be sourced from international financial assistance.
Mongolia	2020	2010	2030	A 22.7% reduction in total national GHG emissions by 2030, compared to the projected emissions under a BAU scenario for 2010; in addition, if conditional mitigation	This NDC now includes sectors that were not previously considered such as agriculture, waste, and some industrial sectors.	The initial estimate of financial needs for this NDC implementation is around $11.5 billion, of which $6.3 billion for mitigation, and $5.2 billion for adaptation.

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Appendix 2 *continued*

Country	Year of Approval	Base Year	Time Frame	Target	Principal Sectors	Financing Requirements
				measures such as the carbon capture and storage and waste-to-energy technology are implemented, then Mongolia could achieve a 27.2% reduction in total national GHG emissions. Along with that, actions and measures to remove GHG emissions by forest are determined, which set the total mitigation target of Mongolia as 44.9% of GHG emission reduction by 2030.		
Pakistan	2021	2015	2030	Overall, 50% reduction of its projected emissions by 2030, with a 15% drop below BAU from the country's own resources, and an additional 35% drop below BAU subject to international financial support.	Mitigation covers four sector initiatives: renewable energy, transportation, coal, land-use change and forestry. Adaptation: Recharge Pakistan Program; Protected areas	To achieve the target by 2030, Pakistan intends with 15% from the country's own resources and 35% subject to provision of international grant finance that would require $101 billion just for energy transition.
Tajikistan	2021	1990	2030	Unconditional target: emissions cap of 60% to 70% of existing GHG emissions in 1990 level by 2030, conditional target: emissions cap of 50% to 60% compared to the 1990 level by 2030, if provided access to affordable financial resources, technology transfer, and technical cooperation.	IPCC Sectors are covered namely: Energy; Industrial processes and Product Use (IPPU); AFOLU (a) Agriculture; (b) Forestry and Other Land Use (FOLU); Waste.	National funds plus development partner support as well as private sector. At least 7% of Tajikistan's GDP is required for financing climate change activities throughout the decade of 2020–2030. The last implies that the overall climate finance required by 2030 could represent more than $1 billion per year. Furthermore, the Republic of Tajikistan expects that of the total costs for climate change, the energy, and transport sector should each have 20% of the share,

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Appendix 2 *continued*

Country	Year of Approval	Base Year	Time Frame	Target	Principal Sectors	Financing Requirements
						followed by water supply and sewerage with 10%, and water irrigation with 15%, biodiversity and disaster triggered by natural hazard with 15% and agriculture with 20%. Thus, the Republic of Tajikistan asks to channelize on an equitable basis the finance for funding its mitigation as well as its adaptive measures.
Turkmenistan	2016	2000	2020–2030	As specified in the "National Strategy of Turkmenistan on Climate Change" without referring to numbers.	Mitigation covers the following sectors: energy; industrial processes; agriculture; waste. Adaptation: it is important to prepare a detailed national action plan including adaptation measures for sectors of water, agriculture, soil and land resources, ecosystems.	Means of implementation are primarily the national sources of Turkmenistan plus international support (as well as private sector).
Uzbekistan	2021	2010	2030	Reduce specific GHG emissions per unit of GDP by 35% by 2030 from the level of 2010.	Mitigation covers sectors: energy; Industrial Processes and Product Use (IPPU); Agriculture; Forestry and Other Land Use (AFOLU), and Waste. Adaptation: water management; agriculture, climate adaptation of social sphere; mitigating the Aral Sea disaster; ecosystem; strategic infrastructure and production facilities.	Support of international organizations and financial institutions is required to achieve the target.

Source: https://unfccc.int/NDCREG and p. 44 of the Central Asia Regional Economic Cooperation (CAREC) Institute Background report. *Framework for Revitalizing Regional Cooperation for a Green, Sustainable, and Inclusive Recovery*. 23 July 2022.

APPENDIX 3

Overview of National Legislation and Policies of CAREC Countries

Country	Climate Change Strategy	Adaptation Plan or Strategy	National Laws and Policies
Afghanistan	Yes	No	**Laws:**[1] Legislative Decree on the Endorsement of the Power Services Regulation Act, 2015; Law on Disaster Response, Management, and Preparedness, 2012; The Law on Regulating Forest Affairs 2011. **Policies:**[2] National Renewable Energy Policy, 2015; National Renewable Energy Policy (ANREP), 2015; Rural Renewable Energy Policy (RREP), 2013; Strategic National Action Plan for Disaster Risk Reduction (SNAP), 2011; The National Environmental Action Plan (NEAP), 2009; National Forestry Management Policy (NFMP), 2007.
Azerbaijan	Yes[3]	Under preparation[4]	**Laws:** Law on Environment Protection dated 8 June 1999 № 678-IQ;[5] Law of the Republic of Azerbaijan on Joining to Kyoto Protocol of United Nations Climate Change Framework Convention dated 18 July 2000 № 912-IQ;[6] Law of the Republic of Azerbaijan on Effective use of energy resources and energy efficiency dated 9 July 2021 № 359-VIQ.[7] **Policies:**[8] National Forest Program, 2013; "State Program on the use of alternative and renewable energy sources in the Republic of Azerbaijan" approved by the Presidential Decree dated 21 October 2004 № 462;[9] Presidential Decree on Measures regarding establishment of green energy zone at territories liberated from occupation dated 3 May 2021 № 2620.[10]

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1 Climate Change Laws of the World, Afghanistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Afghanistan&geography%5B%5D=1&type%5B%5D=legislative.
2 Climate Change Laws of the World, Afghanistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Afghanistan&geography%5B%5D=1&type%5B%5D=executive.
3 Socio-Economic Development Strategy 2022-2026 approved by the Decree of the President of the Republic of Azerbaijan No. 3378 dated 22 July 2022 includes "Clean environment" and "green growth country" framework. It covers such areas as ensuring sustainable use of natural resources, measures preventing climate change, development of efficient waste management system, biological diversity protection, increase of water bioresources and development of aquaculture, strengthening the protection of forested areas and greenery, increasing the use of resources of renewable energy, ensuring energy efficiency, use of environmentally-friendly vehicles and other green technologies, creation of National Database on Climate Change, preparation of National 2 Adaptation Plan and "State Program for Low Carbon Development" for sectors more vulnerable for climate change. Information provided by the Government of Azerbaijan.
4 Climate Change Laws of the World, Azerbaijan. https://www.undp.org/azerbaijan/press-releases/azerbaijan-marks-start-national-adaptation-plan-process-climate-change-resilience.
5 National e-database. https://e-qanun.az/framework/3852.
6 National legal e-database. https://e-qanun.az/framework/339.
7 National legal e-database. https://e-qanun.az/framework/48129.
8 Climate Change Laws of the World, Azerbaijan. https://climate-laws.org/legislation_and_policies?from_geography_page=Azerbaijan&geography%5B%5D=11&type%5B%5D=executive.
9 National legal e-database. https://e-qanun.az/framework/5796.
10 National legal e-database. https://e-qanun.az/framework/47397.

Appendix 3 *continued*

Country	Climate Change Strategy	Adaptation Plan or Strategy	National Laws and Policies
People's Republic of China (PRC)	Climate change strategy is outlined in the National Climate Change Plan (2014–2020) issued in 2014[11]	Yes, passed in 2013, and published the new National Climate Change Adaptation Strategy 2035 in 2022[12]	**Laws:**[13] Wetlands Conservation Law of the People's Republic of China; Forest Law of the People's Republic of China; Electric Power Law; Law on the Prevention and Control of Atmospheric Pollution; Circular economy promotion law; Energy Conservation Law; Environmental Protection Law of the People's Republic of China. **Policies:**[14] Notice on Financial Support for Carbon Neutralization of Carbon, 2022; Medium- and long-term plan for the development of the hydrogen energy industry (2021–2035); 14th Five-Year Plan on Modern Energy System Planning, 2022; National Economic and Social Development Plan (2021 and 2022); Five-year plan on the National Agricultural and Rural Science and Technology Development (2021–2025); 14th Five-Year Plan for New Energy Storage Development Implementation Plan, 2022; Implementation plan on promoting green consumption (notice 107 of the National Development and Reform Commission), 2022; 14th Five-Year comprehensive work plan for Energy saving and Emission reduction 2021–2025 (Notice 33); Climate Investment and Financing Pilot Work Plan, 2021; The overall plan for the pilot program of the comprehensive reform of the market-based allocation of production factors (notice 51 of the State Office), 2021; Action Plan for Carbon Dioxide Peaking before 2030 ('1+N'), 2021; White paper on China's Policies and Actions to Address Climate Change; National Carbon Emission Trading Market Power Construction Plan (2017), 2021; Notice 655/2021 on Pollution Control, Energy Conservation and Carbon Reduction, 2021; 14th Five-Year Plan, 2021; New Energy Vehicle Industry Development Plan and 2020 New Energy Vehicle Promotion Subsidy Plan, 2020; National Innovation-Driven Development Strategy Outline, 2016; Regulation 530/2008 on energy conservation in buildings of civil usage.
Georgia	Yes, passed in 2021[15]	Under preparation[16]	**Laws:**[17] Law on the protection of windbreaks in agricultural fields, 2021; Law of Georgia on Energy; Efficiency, 2020; Law 5652 on promoting the Generation and Consumption of Energy from Renewable Sources and amending law 7023, 2019; Forest Code and other Georgian laws, 2020; Law of Georgia on Energy Efficiency of Buildings, 2020; Law of Georgia on Protection of Ambient Air, 2016; Law of Georgia on Environmental Protection, 2014; the Climate Change Law of Georgia is under preparation. **Policies:**[18] Decree 54/2020 establishing the Climate Change Council, 2021; Georgia's National Renewable Energy Action Plan, 2019; National Environment and Health Action Plan of Georgia 2018–2022 (NEHAP-2) approved by Ordinance N680/2018; The National Forest Concept for Georgia, 2013.

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11 Information provided by the Government of the PRC.
12 Information provided by the Government of the PRC.
13 Climate Change Laws of the World, PRC. https://climate-laws.org/legislation_and_policies?from_geography_page=China&geography%5B%5D=36&type%5B%5D=legislative.
14 Climate Change Laws of the World, PRC. https://climate-laws.org/legislation_and_policies?from_geography_page=China&geography%5B%5D=36&type%5B%5D=executive.
15 Climate Change Laws of the World, Georgia. https://climate-laws.org/geographies/georgia/policies/georgia-s-2030-climate-strategy-and-action-plan.
16 Information provided by the Government of Georgia.
17 Climate Change Laws of the World, Georgia. https://climate-laws.org/legislation_and_policies?from_geography_page=Georgia&geography%5B%5D=65&type%5B%5D=legislative.
18 Climate Change Laws of the World, Georgia. https://climate-laws.org/legislation_and_policies?from_geography_page=Georgia&geography%5B%5D=65&type%5B%5D=executive.

Appendix 3 *continued*

Country	Climate Change Strategy	Adaptation Plan or Strategy	National Laws and Policies
Kazakhstan	Under preparation[19]	No information	**Laws:**[20] Law on the transition to green economy, 2016; Ecological Code of the Republic of Kazakhstan, 2021; Law on Energy Saving, 2011; Law about Support of Use of Renewable Sources of Energy No. 165-4, 2009; Law on Power Industry, No 588-II, 2004; Law providing for management of natural and technological disasters, 1996 Land Code, 2003; Water Code, 2003; Forest Code, 2003; Code on Subsoil and Subsoil Use, 2017 **Policies:** [21] The Concept of Transition of the Republic of Kazakhstan to Green Economy approved by Presidential Decrees No 216/2006 and 557/2013; Government Decree No 857, on wind energy development, 2003.
Kyrgyz Republic	No information	No information	**Laws:**[22] Law no. 137 'On the energy efficiency of buildings', 2011; Law No. 283 'On renewable sources of energy', 2008; Law no 71/2007 about state regulation and policy in the field of emission and absorption of greenhouse gases, 2007; Law no. 88 'On energy saving', 1998. **Policies:**[23] National Development Strategy of the Kyrgyz Republic for 2018–2040, 2021; Presidential Decree 77/2021 on measures to ensure environmental safety and climate sustainability, 2021; Decision 87/2021 on emergency situations and environmental protection, 2021; Program for the Development of a Green Economy in the Kyrgyz Republic for 2019–2023; Strategy for the Sustainable Development of the Industry of the Kyrgyz Republic for 2019–2023 and Action Plan, 2019; Climate Investment Programme - Operational Framework for Managing and Accessing Climate Finance in the Kyrgyz Republic, 2018; Development Programme of the Kyrgyz Republic for the period 2018–2022.
Mongolia	National Action Programme on Climate Change (NAPCC), end year 2021	No information	**Laws:**[24] 2015 Law on Energy Conservation; State policy on the energy sector of Mongolia, 2015; The Forest Law, 2012; Law on Air Quality, 2012; Law on Soil Protection and Prevention of Desertification, 2012; Law on Disaster Prevention, 2003; The Energy Law, 2007; Renewable Energy Law, 2007. **Policies:**[25] Resolution 407/2019 on approving the NDC, 2019; National Energy Conservation Program 2018–2022 (NEEAP); Sustainable Development Vision 2030, 2016; Green Development Policy (GDP), 2014; National Action Program to Promote Quality and Environmental Management Systems, 2012; State policy on food and agricultural sector, 2010.

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[19] "Kazakhstan presents plans to achieve carbon neutrality", Official Information Source of the Prime Minister of the Republic of Kazakhstan https://primeminister.kz/en/news/kazakstan-komirtekti-beytaraptykka-kol-zhetkizu-boyynsha-zhosparlardy-tanystyrdy-19210.

[20] Climate Change Laws of the World, Kazakhstan https://climate-laws.org/legislation_and_policies?from_geography_page=Kazakhstan&geography%5B%5D=88&type%5B%5D=legislative.

[21] Climate Change Laws of the World, Kazakhstan https://climate-laws.org/legislation_and_policies?from_geography_page=Kazakhstan&geography%5B%5D=88&type%5B%5D=executive.

[22] Climate Change Laws of the World, Kyrgyzstan. https://climate-laws.org/legislation_and_policies?from_geography_page=Kyrgyzstan&geography%5B%5D=94&type%5B%5D=legislative.

[23] Climate Change Laws of the World, Kyrgyzstan. https://climate-laws.org/legislation_and_policies?from_geography_page=Kyrgyzstan&geography%5B%5D=94&type%5B%5D=executive.

[24] Climate Change Laws of the World, Mongolia. https://climate-laws.org/legislation_and_policies?from_geography_page=Mongolia&geography%5B%5D=118&type%5B%5D=legislative.

[25] Climate Change Laws of the World, Mongolia. https://climate-laws.org/legislation_and_policies?from_geography_page=Mongolia&geography%5B%5D=118&type%5B%5D=executive.

Appendix 3 *continued*

Country	Climate Change Strategy	Adaptation Plan or Strategy	National Laws and Policies
Pakistan	National Climate Change Policy, 2012[26]	Under preparation[27]	**Laws:**[28] Global Change Impact Studies Centre Act, 2013; Pakistan Climate Change Act, 2017; National Energy Efficiency and Conservation Act 2016; Alternative Energy Development Board Act, 2010; The Pakistan Council of Renewable Technologies Act, 2010; The National Disaster Management Act 2010. **Policies:**[29] National Electricity Policy 2021; National Electric Vehicle Policy, 2021; Energy Efficiency and Conservation Strategic Plan 2020–2023 by National Energy Efficiency and Conservation Authority NEECA, 2020; Green Stimulus Package, 2020; National Action Plan: Sustainable Energy For All, 2019; Alternative and Renewable Energy Policy 2019; National Biodiversity Strategy and Action Plan 2017–2030 (NBSAP), 2018; 10 Billion Tree Tsunami program (Plant4Pakistan), 2018; National Flood Protection IV, 2018; National Water Policy, 2018; Pakistan National Action Plan on SDG 12: Sustainable Consumption and Production, 2017; National Forest Policy, 2010; Pakistan 2025: One Nation, One Vision, 2014; National Power Policy, 2013; Framework For Implementation of Climate Change Policy 2014–2030, 2013; National Sustainable Development Strategy (NSDS): Pakistan's pathway to a sustainable and resilient future, 2010.
Tajikistan	No information	Yes, passed in 2019 and National Action Plan for Climate Change Mitigation passed in 2003	**Laws:**[30] Law No.587 on Promoting the Use of Renewable Energy (Renewable Energy Law), 2010; Law No.29 on Energy Saving, 2002; Law No.228 on Protection of the Atmospheric Air (Law on Air Protection), 1996. **Policies:**[31] Order no. 602/2018 approving the national strategy of the Republic of Tajikistan on the decrease in risk of disaster triggered by natural hazard, 2018; Governmental Order No. 189 on the Committee on Environmental Protection, 2008; Governmental Order No. 41 on the Complex Programme for the Widespread Use of Renewable Energy Sources, 2007.
Turkmenistan	Yes, passed in 2012	Under preparation[32]	No information.

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[26] Climate Change Laws of the World, Pakistan. https://climate-laws.org/geographies/pakistan/policies/national-climate-change-policy-4a9d1103-1933-491c-98ff-87f4dd489c47.

[27] UNEP. Pakistan to Develop National Adaptation Plan for Climate Change. https://www.unep.org/gan/news/press-release/pakistan-develop-national-adaptation-plan-climate-change#:~:text=Thursday%2025th%20March%20%E2%80%93%20Pakistan%20has,Environment%20Day%20on%20June%205th.

[28] Climate Change Laws of the World, Pakistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Pakistan&geography%5B%5D=134&type%5B%5D=legislative.

[29] Climate Change Laws of the World, Pakistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Pakistan&geography%5B%5D=134&type%5B%5D=executive.

[30] Climate Change Laws of the World, Tajikistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Tajikistan&geography%5B%5D=177&type%5B%5D=legislative.

[31] Climate Change Laws of the World, Tajikistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Tajikistan&geography%5B%5D=177&type%5B%5D=executive.

[32] UNDP website. Project information. https://open.undp.org/projects/00102379.

Appendix 3 *continued*

Country	Climate Change Strategy	Adaptation Plan or Strategy	National Laws and Policies
Uzbekistan	No information	Under preparation[33]	**Laws:**[34] Constitutional Law No. ZRU-737/2021 on the state of emergency, 2021; Law on the Rational Use of Energy; and the Parliamentary Decree regarding the procedure of enforcing the Law on the Rational Use of Energy, 2020. **Policies:**[35] Concept note for ensuring electricity supply in Uzbekistan 2020–2030, 2019; Strategy on the Transition of the Republic of Uzbekistan to a "Green" Economy 2019–2030, 2019; Resolution of the Cabinet of Ministers No. 183 validating the Regulation on the State Hydrometeorological Service and Cabinet Decision no. 606, 2017; Decree no UP-4512 About measures for further development of alternative energy sources, 2013; Resolution of the Cabinet of Ministers No. 245 validating the Regulation on use of electric and thermal energy, 2009.

[33] UNDP. 2021. Uzbekistan advances its climate change adaptation planning. https://www.adaptation-undp.org/press-release-Uzbekistan-advances-its-climate-change-adaptation-planning.

[34] Climate Change Laws of the World, Uzbekistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Uzbekistan&geography%5B%5D=194&type%5B%5D=legislative.

[35] Climate Change Laws of the World, Uzbekistan. https://climate-laws.org/legislation_and_policies?from_geography_page=Uzbekistan&geography%5B%5D=194&type%5B%5D=executive.

APPENDIX 4

Country Overview on Climate Finance Flows

Each of the countries of the Central Asia Regional Economic Cooperation (CAREC) region has its own climate priorities, international commitments, and national plans and strategies. The climate actions require resource mobilization efforts, and each country individually identified its needs and mobilization plans for green finance.

In **Afghanistan**, international climate donor agencies played a major role not only as a source of financing, but also in providing necessary technical support in project design and facilitation. After the fall of the previous government in mid-August 2021, many donors placed their regular assistance to Afghanistan on hold and also as their funding approaches were shifted from development to humanitarian and basic human needs support.

Azerbaijan is actively pursuing climate adaptation and mitigation efforts. The government uses public funding to finance green projects through its sovereign national fund—the State Oil Fund of Azerbaijan. The Fund invested in areas such as improving water supply, irrigation, and transport. The State Agency for Alternative and Renewable Energy Sources is cooperating with international donor agencies to attract investment in renewable sources of energy. The International Bank of Azerbaijan, a commercial bank owned by the state, acted as creditor to a large project on constructing a wind plant "Yeni Yashma" in Khizi region.[1] Some other commercial banks also serve as intermediaries to international donors' environmental credit lines.

The People's Republic of China (PRC) is currently one of the largest greenhouse gas (GHG) emitters. However, the country aims to achieve carbon neutrality by 2060. In the PRC, currently there are more than 100 climate-focus funds of different forms that are operating with combined assets equal to $47 billion.[2] In the last several years, the country became one of the global leaders in issuing green bonds, green loans, and other financial products designed to support clean energy, transport, and manufacturing.

The Government of **Georgia** adopted its Climate Strategy 2030 and Action Plan 2021–2023. The primary source of funding will come from the state budget, and resource mobilization from international donors will be conducted. The JSC Georgian Energy Development Fund, founded in 2010, supports exploring and development of promising renewable energy projects and, within this framework, makes relevant procurements for further development of pilot projects on renewable energy.[3] In 2020, the reported volume of green loans amounted to around $123 million, and the total amount of green loans outstanding was at around $416 million. Three entities in the country have issued green bonds in the total amount of $755 million.[4]

Kazakhstan is the largest economy in Central Asia, and the country received external funding for climate financing amounting to more than $1.7 billion over the past 10 years. This funding includes grants, technical assistance, loans, and cofinancing arrangements. The largest part of funding came

[1] S. Hajiyev. 2022. Presentation, the 1st Environment Dialogue of CAREC Institute.
[2] *Bloomberg*. 2022. https://bit.ly/3PJ0W9P.
[3] Government of Georgia. 2021. *Georgia's 2030 Climate Change Strategy*. https://mepa.gov.ge/En/Files/ViewFile/50123.
[4] National Bank of Georgia. 2021. *Sustainable Finance in Georgia*. https://www.sbfnetwork.org/wp-content/assets/policy-library/765_Georgia_Sustainable_Finance_in_Georgia_Status_Report_2021.pdf.

from the Green Climate Fund and Climate Investment Fund that provided $1.3 billion combined. Significant contributions were received from development banks, government-affiliated donor agencies, United Nations (UN)-affiliated programs and the Global Environment Facility (GEF) whose cumulative value of projects in Kazakhstan exceeded $300 million.[5] Astana Financial Hub[6] is activating its work on climate investment with private sector participation.

The dependence from external climate funding for the **Kyrgyz Republic** accelerated the country's efforts to establish a policy framework to effectively facilitate financing climate activities. The government recently established the Climate Finance Center of the Kyrgyz Republic[7] to work closely with international and regional funding agencies. The Center is a coalition of several local financial institutions to work on climate investment in the country. The combined financial support from climate agencies reached $150 million (footnote 5). A similar amount of financial support was received from multilateral development banks (MDBs) to improve energy efficiency, water resilience, and disaster risk reduction, including early warning and climate observations. Long-term loans also were approved by MDBs to modernize hydropower stations.

The environmental regulations in **Mongolia** are in line with international standards, but the implementation of state-run projects is still weak due to insufficient allocation and management of funding sources. In recent years, the country actively cooperated with international organizations and funds not only in attracting funding, but also improving institutional capacity of relevant agencies in green finance. The Government of Mongolia is taking actions in tapping internal resources for climate action. With the help of international organizations, two local funding agencies were created to work with national financial institutions and the private sector—Mongolian Green Credit Fund and Mongolia Green Finance Corporation.[8]

The Government of **Pakistan** has the Ministry on Climate Change with a Climate Finance Unit. The government is actively pursuing efforts to access external funding as well as developing internal resources mobilization for climate financing. In May 2021, the Pakistan Water and Power Development Authority issued a $500 million green bond to fund a hydroelectric project.[9] The Global Environment Facility has provided Pakistan more than $101.5 million in total financing including in cofinancing.[10] This does not include financing of projects at regional and global levels that included Pakistan among other focus countries. The Green Climate Fund's total funding to Pakistan was $131 million as of 2022 up from $89 million in 2019.[11] These funds are not enough to meet financing needs of the country; thus, more active and effective efforts are needed to raise climate finance.

Tajikistan is one of the most vulnerable countries in the world to the effects of climate change. The country has received significant amounts of external financial support for climate adaptation and mitigation activities. The combined amount of funding in the last decade reached more than

5 World Bank. 2020. *Financing Climate Actions in Central Asia*. https://zoinet.org/wp-content/uploads/2020/10/CA-climate-finance-en.pdf.

6 Astana International Finance Center. https://aifc.kz/tseli/.

7 KYRCEFF website. https://www.kyrseff.kg/.

8 GGGI. December 2019. *Review of GGGI's Experience to Design and Operationalize National Financing Vehicles to Finance Climate and Green Growth Policy Implementation*. https://gggi.org/site/assets/uploads/2020/01/GGGI-Technical-Report-No.-9.pdf.

9 Pakistan Issued First Green Bond, Green Finance Platform. 2021. https://www.greenfinanceplatform.org/policies-and-regulations/pakistan-issued-first-green-bond.

10 Green Climate Fund. https://www.greenclimate.fund/countries/pakistan.

11 Green Environment Facility. https://www.thegef.org/projects-operations/country-profiles/pakistan.

$1 billion, of which $450 million were provided by international climate agencies (footnote 5). The MDBs are providing funding for hydropower modernization, greening agriculture, and other climate-relevant measures. Most international climate financing in Tajikistan comes as grants or concessional loans. The government has issued euro-bonds for $500 million to finance the construction of Rongun Hydropower Station, which is regarded by some experts as having aggravated the country's already increasing indebtedness.[12]

Turkmenistan receives external help to address the country's climate change issues in the form of grants and technical assistance. However, despite growing and evident problems caused by climatic factors, the amount of donors' aid is not large in comparison to other countries in the region. The climate-related projects implemented in the country have an estimated combined budget at around $200 million. The GEF and the Adaptation Fund are the main international funding sources over the past decade. The GEF also continues supporting the country in climate reporting, policy development, and demonstration projects (footnote 5).

The government policies in **Uzbekistan** aim to catalyze foreign investments in clean energy and climate resilience. The government is actively cooperating with various donor agencies and MDBs to attract financing to green projects. European Bank for Reconstruction and Development (EBRD) is investing about $500 million to climate resilience of water supply, hydropower, green economy facility, and supporting wind and solar power in the country. The World Bank's $200 million Energy Efficiency Facility for Industrial Enterprises supports Uzbekistan in developing low-carbon energy production projects. Uzbekistan is promoting private sector engagement which resulted in $650 million worth projects in solar and wind power development funded through public–private partnership (footnote 5).

[12] EurasiaNet. 2021. *Central Asia Bond Review*. https://eurasianet.org/analysis-central-asia-bond-review.

APPENDIX 5

Asian Development Bank and ADB Institute Knowledge Products and Technical Assistance Projects on Climate Change in the CAREC Region

ADB Country Strategies

Asian Development Bank (ADB) country partnership strategies (CPSs) address climate change and most mention regional cooperation under the Central Asia Regional Economic Cooperation (CAREC) umbrella, but do not consider specifically the need and options for regional cooperation on the climate agenda. A review of the ADB CPSs for CAREC countries (Table 27) shows that all the country strategies address climate change to some depth in the context of green economy and resilient development. Most of them also mention CAREC as an umbrella for economic cooperation initiatives, especially in connection with ADB support for investments in regional connectivity and facilitation of the sharing of experiences, best practices, and innovation, including for trade, transport, economic corridors, and tourism. However, only a few mention issues of regional cooperation on climate change and mention CAREC in that connection. ADB staff mentioned, during consultations, that ADB country teams in general are mostly focused on the national policy and investment agenda and do not prioritize opportunities for supporting regional initiatives. This is not unusual for country teams of other development partners.[1] ADB, along with its development partners, will need to assure that their country strategies and their implementation pay due attention to regional cooperation in addressing climate change.

Table A5: Asian Development Bank's Country Partnership Strategy Coverage of Climate Change and Regional Cooperation

Country	Years	Mention CAREC	Cover Climate Change (CC)	Cover Regional Cooperation on CC
Afghanistan	2017–2021	Yes	Yes	No
Azerbaijan	2019–2023	Yes	Yes	No
Georgia	2019–2023	Yes	Yes	No
Kazakhstan	2017–2021	Yes	Yes	No
Kyrgyz Republic	2018–2022	Yes	Yes	No
Mongolia	2021–2024	No	Yes	No
Pakistan	2021–2025	Yes	Yes	No
PRC	2021–2025	No	Yes	No
Tajikistan	2021–2025	Yes	Yes	No
Turkmenistan	NA	NA	NA	NA
Uzbekistan	2019–2023	Yes	Yes	Yes

CAREC = Central Asia Regional Economic Cooperation, NA = not available, PRC = People's Republic of China.

Source: Authors' review of ADB Country Partnership Strategies.

[1] This observation is based on the experience of the study's team leader in working with many different development partners over 5 decades.

Other ADB and ADB Institute Knowledge Products

Renewable Energy in Central Asian Economies: Role in Reducing Regional Energy Insecurity (ADBI 2019).[2] The paper provides a good overview of renewal energy (RE) sources and production capacities in Central Asian countries as an alternative to minimize energy insecurity. It also reviews internal and regional barriers that impede the further development of RE. The paper notes that there are political economy constraints to RE development in the fossil-fuel rich countries of Central Asia.

The Economics of Climate Change Mitigation in Central and West Asia (ADB 2017).[3] "This report assesses the economics of mitigation greenhouse gas emissions in three countries in Central and West Asia—Azerbaijan, Kazakhstan, and Uzbekistan—with a focus on the most emissions-intensive sectors, energy and transport. [The report provides] an overview of policy measures and technologies available for emission reduction, as well as scenarios of future emission trajectories in Azerbaijan, Kazakhstan, and Uzbekistan. A comforting result of the analysis, perhaps, is that a significant amount of emissions reduction (against the business-as-usual case) can be achieved with little to no cost, and with significant co-benefits to health." (p. vii)

What Determines Coal Consumption for Heating Residential Space in Central Asia? (ADBI 2021).[4] The paper analyzes the factors that affected households' choice of fuel for heating in Kazakhstan and the Kyrgyz Republic. Although these countries have relatively high rates of electrification, the use of coal for residential heating is widespread. The paper concludes that access to natural gas pipelines and central heating systems, together with higher prices for coal and lower prices for clean electricity could reduce usage of coal. Authors used microdata from the national household surveys from Kazakhstan in 2017 and the Kyrgyz Republic in 2016.

Household Energy Consumption Behaviors During the COVID-19 Pandemic in Mongolia[5]

Why Energy Access Is Not Enough for Choosing Clean Cooking Fuels? Evidence from the Multinomial Logit Model[6]

Firm Investment in Renewable Energy: An Empirical Evidence from the People's Republic of China[7]

Climate Change and Sustainable Water Management in Central Asia (ADB 2014).[8] The analysis includes future projections of climatic changes in the region using various models. Areas that will be impacted by climate change include these: melting glaciers, the water resource generation process,

[2] E. Shadrina. 2019. *Renewable Energy in Central Asian Economies: Role in Reducing Regional Energy Insecurity*. ADBI. https://www.adb.org/sites/default/files/publication/522901/adbi-wp993.pdf.

[3] ADB. 2017. *The Economics of Climate Change Mitigation in Central and West Asia*. https://www.adb.org/sites/default/files/publication/223731/economics-climatechange-cwa.pdf.

[4] ADBI. 2021. *What Determines Coal Consumption for Heating Residential Space in Central Asia?* https://www.adb.org/publications/what-determines-coal-consumption-heating-residential-space-central-asia.

[5] ADBI. 2022. *Household Energy Consumption Behaviors During the COVID-19 Pandemic in Mongolia* (Chapter 9). https://www.adb.org/sites/default/files/publication/784141/adbi-covid-19-and-economic-recovery-potential.pdf.

[6] ADBI 2021. *Why Energy Access Is Not Enough for Choosing Clean Cooking Fuels? Evidence from the Multinomial Logit Model*. https://doi.org/10.1016/j.jenvman.2021.112539.

[7] ADBI. 2022. *Firm Investment in Renewable Energy: An Empirical Evidence from the People's Republic of China*. https://www.energy-proceedings.org/firm-investment-in-renewable-energy-an-empirical-evidence-from-the-peoples-republic-of-china/.

[8] ADB. 2014. *Climate Change and Sustainable Water Management in Central Asia*. https://www.adb.org/sites/default/files/publication/42416/cwa-wp-005.pdf.

future of major rivers, floods, permafrost and landslides, and drying of lands. The directions of potential interventions are summarized in three broad categories: (i) expanding the supply of water available in the future, (ii) increasing the productivity of water, and (iii) reducing future demand for water. Within each category, options include increasing reservoir capacity, improving agricultural practice, increasing reuse of water in irrigated agriculture, increasing reuse of water for domestic use, reducing irrigated areas, reducing domestic demand, and employing deficit irrigation (the application of water below full crop requirements).

Agriculture Development in CAREC Member Countries (ADB 2019).[9] The paper explores a wide range of issues related to agricultural development including agricultural production, the trade policy framework, the natural resource constraints, and climate change. The chapter dedicated to the last theme describes key issues on climate change and natural risks (relative to agriculture) for CAREC's three subregions (Central Asia and the Caucasus, Mongolia and the People's Republic of China, and Afghanistan and Pakistan).

Climate Risk Country Profiles (ADB and World Bank 2021). This is a series of documents published by the World Bank and ADB that describe various risks caused by climate change specific to the country.

ADB Technical Assistance Projects Addressing Climate Change Issues in the CAREC Region

ADB has a large technical assistance (TA) program under implementation in support of climate change-related activities in the CAREC region. A preliminary search[10] of TA documents for January 2019 through July 2022 identified a total of 42 projects related to climate change. Of these, 11 projects have a regional or multicountry coverage, 12 are for Mongolia, 6 for Uzbekistan, 4 for Pakistan, 3 for Tajikistan, 2 each for Georgia and Kazakhstan, and 1 each for Azerbaijan and the Kyrgyz Republic. The imbalance across countries is surprising and worthy of consideration. As regards sector and thematic coverage, 13 TA projects address energy. They mostly relate to power sector upgrading, transmission and interconnection, and to renewable energy (mostly solar energy). There is one energy sector project addressing energy storage. As regards other sectors, seven TA projects deal with disaster reduction, six with the water sector (mostly irrigation), five with climate-resilient agriculture, and two with transport (railway electrification). One of the projects (the Tajikistan Climate- and Disaster-Resilient Irrigation and Drainage Modernization in the Vakhsh River Basin Project) is the first gender equity-themed irrigation and drainage (I&D) investment of ADB in Tajikistan with the goal to develop policies and strategies for gender equality to enhance women's participation in land and water management.[11]

[9] ADB. 2019. *Agriculture Development in CAREC Member Countries*. https://www.adb.org/sites/default/files/publication/549916/agriculture-development-carec-countries.pdf.

[10] It is not clear whether the quick review carried out for this scoping study captured all relevant TA projects. It is surprising, for example, that there are no such projects for the PRC, except where the PRC is covered by regional or multicountry projects. A more thorough review would be appropriate, in terms of the completeness of the list and in terms of the analysis of their substantive coverage, outputs, and results.

[11] ADB, 2021, *Tajikistan Climate- and Disaster-Resilient Irrigation and Drainage Modernization in the Vakhsh River Basin Project*. https://www.adb.org/projects/53109-001/main.

TA projects also support regional or multicountry interventions or approaches to climate change actions. Among the 42 TA projects with climate change relevance, 11 were identified as being regional or multicountry in coverage. Of these

(i) Two projects were in support of setting up new regional initiatives by ADB (development of a disaster risk transfer facility for the CAREC region and development of a climate change strategy for ADB's Central and West Asia region);
(ii) One project is an ADB-wide project that relates to the establishment of mechanisms to measure, monitor, and report on commitments made under the Paris Agreement, in particular, under the nationally determined contributions (NDCs), but only includes Tajikistan among the CAREC member countries;
(iii) Two projects support power sector development with a focus on renewable energy (one of these is specifically focused on innovation and technological partnerships);
(iv) Two projects focus on resilient agricultural and food systems development, with one of them providing project readiness support;
(v) One project supports knowledge sharing of the experience with the Yangtze River Economic Belt (involving Mongolia and the PRC);
(vi) One project deals with green city development;
(vii) One project supports the enabling environment for disaster risk reduction; and
(viii) One project addresses coastal resilience in the Asia and Pacific region, with relevance for Pakistan.

The ADB TA programs, those ones focused on regional issues as well as the country-specific ones, create important knowledge and lessons on climate change in the CAREC region. CAREC could systematically mine this knowledge base as well as offer strategic guidance on which sectors and themes deserve particular attention across the countries in the region.

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CAREC 2030: Supporting Regional Actions to Address Climate Change

A Scoping Study

The countries in the Central Asia Regional Economic Cooperation (CAREC) region face severe impacts of climate change that must be addressed urgently and effectively. The CAREC Secretariat commissioned this scoping study on regional climate change issues in the CAREC region. The study's overarching conclusion is that CAREC has a unique and urgent opportunity to chart a course of proactive, systematic, and strategic engagement in supporting its member countries in reinforcing, modifying, and implementing existing national strategies on climate change mitigation and adaptation, and in developing a range of regional actions in response to the regional nature of many climate change impacts and solutions.

About the Central Asia Regional Economic Cooperation Program

The Central Asia Regional Economic Cooperation (CAREC) Program is a partnership of member countries and development partners working together to promote development through cooperation, leading to accelerated economic growth and poverty reduction. It is guided by the overarching vision of "Good Neighbors, Good Partners, and Good Prospects." CAREC countries include: Afghanistan, Azerbaijan, the People's Republic of China, Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members —49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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